The Second Thailand Information and Communication Technology (ICT) Master Plan (2009-2013)

Ministry of Information and Communication Technology

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The Second Thailand Information and Communication Technology (ICT)
Master Plan (2009-2013)
ISBN 978-616-12-0011-4

1st Edition (October 2009)
500 issues

Published and distributed by

Office of the Permanent Secretary of MICT
Ministry of Information and Communication Technology
The Government Complex Commemorating His Majestic (Building B)
The King's 80th Birthday, 5th December, B.E. 2550 (2007)
120 Chaengwattana Rd., Laksi, Bangkok. 10210
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Executive Summary

The Second Thailand Information and Communication Technology (ICT) Master Plan (2009-2013)

I. Background

Thailand's Information and Communication Technology (ICT) policy for 2001-2010 (IT 2010) places a priority on the role of ICT in social and economic development by emphasizing the improvement of the quality of life and society through developing a knowledge-based society. The policy provided the framework for developing the First ICT Master Plan (2002-2006) which was approved by the Cabinet on 25 September 2002 for adoption by all ministries, departments and state enterprises as the guideline for developing or adapting their ICT master plans in order to ensure consistency. On 11 September 2007, the Cabinet called for an extension of the First ICT Master Plan until 2008. The ICT Ministry, in collaboration with the National Electronics and Computer Technology Center (NECTEC), accelerated the development of the Second ICT Master Plan for 2009-2013.

The Second ICT Master Plan carries forward policies from the IT 2010 policy framework and the First ICT Master Plan. At the same time, it puts in place new policies and sharpens the focus on certain key areas, in response to technological, economic and social changes that have presented both opportunities and challenges to Thailand. It addresses existing weaknesses and builds up on existing strengths, so that Thailand can maximize benefits from ICT in social and economic development in the most efficient and effective manner, in order to achieve the development goals laid out in the National Economic and Social Development Plan.

II. Thailand development direction and the role of information and communication technology

2.1 Policy directions for economic and social development in Thailand

The Tenth National Economic and Social Development Plan (2007-2011) is the primary plan directing social and economic development in Thailand. The underlying

philosophies which have been applied to the Plan are the Sufficiency Economy principle and the human-centric approach to development. The vision of the Plan is to create a "Green and Happiness Society, where Thai people have both morality and knowledge and are abreast of global developments; families are close-knit; communities are strong; society is peaceful; the economy is of high-quality, stable and just; and the environment is sustainable. This society should be managed under the system of good governance, as a democracy with the king as the head of state and as a dignified member of the world community." There are five strategies for the achievement of the Plan's goals, as follows:

1. Improving the quality of life of Thai people and society through the development of a knowledge-based society, so that people will be in good shape both spiritually and physically, have good balance, are able to grasp religious principles, have both morality and knowledge, have right livelihood and enjoy stability in life.
2. Strengthening communities and society as a stable base for the country, so that communities are peaceful and free from poverty.
3. Adjusting the structure of the economy to be more balanced and sustainable, so that the economy will be robust, by building an economy that has more balance, stability and economic justice.
4. Ensuring biodiversity, a stable natural resource base and environmental quality, in order to safeguard the natural resources, conserve environmental quality and lay the foundation for the adjustment of the economic structure to develop biodiversity.
5. Reinforcing governance in national administration by improving governance in all sectors and strengthening democratic knowledge.

The plan refers to reinforcing and promoting ICT in various aspects, for instance, developing ICT infrastructure in order to support economic sector restructuring, the use of ICT to access education resources for life-long learning, and ICT for the development of government services and administration in the form of e-Government.

In addition to the National Economic and Social Development Plan, there are also other national policies and plans that have been developed by other agencies to move Thailand towards a knowledge-based society and economy. These policies and plans, although differing in emphases in accordance with the different responsibilities and

purposes of each agency, nonetheless share the same direction. They also refer quite clearly to the role of ICT in development, with common policies as follows:

- Human resource development, as people are the foundation for national development.
- Targeted economic and industrial development, emphasizing strategic industries (agriculture, manufacturing and services).
- Social and community development that allows for participatory approaches to local development and management, including the revival and transmission of Thai cultural diversity, such as way of life, customs, values and local wisdom.
- Building of a stable natural resource base, by focusing on addressing environmental problems, including natural disaster warning.
- Better governance, by emphasizing transparency in the public and private sector and allowing the people to participate in the social and economic development process.
- Infrastructure development and the establishment of specialized agencies and institutions to mobilize development.

2.2 Framework for ICT development in Thailand

The Second ICT Master Plan was developed under the framework set by ICT policy for 2001-2010 (IT 2010) which was approved by the Cabinet on 19 March 2002. The policy framework of IT 2010 set the following targets:

1) Build capacity in using technology as a tool for national development in order to leverage Thailand's status as a "potential leader" country, as measured against the United Nations Development Programme "Technology Achievement Index".
2) Increase the percentage of knowledge workers to account for 30 percent of the labor force.
3) Develop the Thai economy by increasing the value of knowledge-based industries to account for 50 percent of GDP.

In order to achieve these targets, the IT 2010 policy framework has established five strategies for the concurrent development of the country and a knowledge-based society,

namely: e-Industry, e-Commerce, e-Government, e-Education and e-Society. The underlying connections and common factors of the five strategies are innovation, knowledge, research and development, science and technology, and the development of human resources and basic telecommunication infrastructure. If these five strategies are followed and the underlying factors are also strengthened, then the resulting development will be sustainable.

The IT 2010 policy framework has been transformed into a strategic plan, namely the First ICT Master Plan (2002-2006), which has clearly set forth a vision, missions, objectives, strategies, work plans and activities, with the key goals as follows:

1) Development and upgrade of the economy by using ICT;
2) Enhancement of the competitiveness of the ICT industry;
3) Development of human resources by increasing the application of ICT in education and training;
4) Strengthening of rural communities for sustainable development.

In order to achieve these ICT development goals, the First ICT Master Plan has devised seven key strategies, namely: 1) development of the ICT industry into a regional leader; 2) utilization of ICT to enhance the quality of life and society; 3) reform and enhancement of capacity for ICT research and development; 4) reinforcement of social capacity for future competition; 5) development of entrepreneurial capacity for future competition; 6) utilization of ICT in small and medium enterprises; and 7) utilization of ICT in government administration and services.

The Second ICT Master Plan has been developed with consideration for ensuring policy continuity within the framework of IT 2010, while rapidly addressing weaknesses that have hampered the comprehensive achievement of the goals of the First ICT Master Plan.

2.3 The status of ICT development in Thailand

In the global context, the development of ICT in Thailand can be considered average, when measured against worldwide indices such as the “Networked Readiness Ranking” and “e-Readiness Ranking” indices. However, when Thailand is compared to other countries in Asia, especially with neighboring countries such as Singapore and Malaysia, it turns out that they are more developed than Thailand in all the indices.

The main factor holding back the development of ICT in Thailand in all indices is the readiness of the information and communication infrastructure, which is still not widely available and accessible. This has constrained the efficiency and effectiveness of developing and using ICT for building up knowledge, developing enterprises, and serving the government. Thus, the development of ICT infrastructure is an important issue that the Second ICT Master Plan must resolve.

This analysis is consistent with the SWOT analysis carried out concerning the development of ICT within the five-year timeframe of the Master Plan. In terms of infrastructure, Thailand has developed the backbone network that has a higher transmission capacity and rate, which can meet the increasing user demand for information. However, the problem of digital divide still affects people in the provinces and remote areas, and those who are disadvantaged such as the people with disabilities. Thus, the network needs to be expanded in both geographic coverage and quality in order to be more effective, particularly in order to ensure last mile access.

Constant technological development, including technological convergence among computer technology, communication technology and broadcasting technology provides Thailand with more choices. Thailand can take advantage of these advances in order to improve the effectiveness of the existing infrastructure and, at the same time, reduce the digital divide in the provinces or remote areas, by using technology with higher transmission effectiveness that is available at lower prices.

In terms of ICT human resources, there has been a continuous expansion alongside the expansion of ICT usage. Presently, Thailand has a growing skilled workforce both in the public and private sector. Graduates in related fields at the tertiary and vocational level are also increasing. Nonetheless, there is still a major shortage of ICT human resources, both in terms of quantity as well as quality, particularly highly-skilled personnel and specialized personnel in various sub-sectors. Although the ICT HRD situation is still regarded as a weakness, nevertheless, Thai ICT human resources are considered to have high potential in software production, animation and various forms of digital entertainment media.

For the general public, the usage of ICT is still low and limited in coverage. The majority of the Thai public access information through traditional media (such as television and radio), more so than through computer technology. The group of ICT users is smaller than other groups, such as those in remote areas, the disabled persons and the elderly. In

addition, the general public uses ICT in inappropriate ways, such as 1) prevalent use of ICT for entertainment (more than for educational purposes, commercial transactions or government transactions), 2) the inflow of foreign cultures and inappropriate content, and 3) the rise in computer crime. Thus, in planning the development of ICT in the future, this variable should also be considered.

In terms of the public sector, most government units still lack personnel who are knowledgeable about ICT and the applications of ICT in order to improve the effectiveness in undertaking work. Even though all government units have a Chief Information Officer (CIO), however, most CIOs still lack knowledge, understanding and skills in technology. Furthermore, government units also face a lack of ICT personnel, due to the lower benefits and incentives.

In terms of management, there are many government agencies and state enterprises which are responsible for directing, handling and promoting ICT development, such as the Ministry of Information and Communications Technology (and agencies under its umbrella), the National Telecommunication Commission (NTC) and the National Electronics and Computer Technology Center (NECTEC). Nonetheless, the SWOT analysis shows that there are many areas of concern regarding ICT management in general. The role and responsibilities of these agencies still overlap, resulting in overlapping activities that are not well integrated. Furthermore, the agencies are not well-coordinated. In addition, the management of ICT programs still lacks effectiveness, since activities are undertaken in an uncoordinated manner, often in different directions. A clear coordinating mechanism is still lacking in the implementation of policies. ICT workplans are also not integrated and budget allocations are not coordinated. An important problem and obstacle is the lack of an agency responsible for ensuring that activities are undertaken in accordance with the ICT Master Plan. An effective monitoring and evaluation system for this is still lacking.

In summary, the SWOT analysis by stakeholders of ICT development in Thailand shows that Thailand's ICT development and usage has continuously increased. Its strengths include a clear promotion policy, increased number of ICT personnel, and expansion of the backbone network. There are also positive opportunities arising from external factors, such as the future expansion of the market and technological convergence that have led to new services, which in turn has diversified consumer choices and increased opportunities for e-commerce. The areas which **require further attention are the many weaknesses that**

still remain. The most urgent issues that should be addressed in the timeframe of the Second Master Plan are the development of human resources, both in terms of quantity as well as quality, along with the improvement of national ICT governance whose effectiveness must be enhanced. Otherwise, these will become obstacles for the development of other activities, since these two issues are fundamental factors for development.

III. Summary of the key principles of the Second ICT Master Plan

1. The Master Plan aims for the development of a knowledge-based society, which is consistent with the development objectives set forth in the National Economic and Social Development Plan, which is the key national development framework.

2. The Master Plan seeks to ensure continuity within the policy framework of IT 2010 and the First ICT Master Plan by continuing to emphasize the development and application of ICT for e-Commerce and e-Industry (fifth and sixth strategies), e-Education and e-Society (first and third strategies), and e-Government for the promotion of good governance in government administration and services (fourth strategy). In addition, it also places a priority on carrying forward activities in the First Master Plan that have not achieved their targets, in order to demonstrate rapid progress.

3. The Master Plan emphasizes addressing two current weaknesses as a first priority, namely: 1) developing people who are smart and information literate (see the following section for definitions) and 2) managing ICT at the national level in accordance with the principles of good governance. In addition, it also places a priority on accelerating the development of the high-speech network with universal access and reasonable prices. This is considered key infrastructure for the development of the knowledge economy and society that is dependent on ICT as a driver, and is an area in which Thailand still lags behind many other countries.

4. The Mater Plan takes into consideration goals and obligations Thailand has committed herself in international arena, notably the development of Information Infrastructure as declared in the Declaration of Principle at the World Summit on the Information Society and APEC's Bangkok Declaration.

5. The Master Plan gives priority to development which promotes good governance both in ICT administration at the national level (Strategy 2) and the use of ICT in the public sector to promote good governance in public administration (Strategy 4). These objectives are stipulated in the Tenth National Economic and Social Development Plan.

Strategy 2 calls for rapid implementation to address one of the most important weaknesses of ICT development. As shown in the SWOT analysis, Thailand needs improvement in ICT governance at the national level, which concerns with the issues such as, the agency to spearhead the development, the roles and responsibilities of all relevant agencies/organizations, the policy development and implementation mechanism, including resource allocation. This is to facilitate integration and avoid duplication.

The point in Strategy 4 should also be implemented as the government is an important mechanism in national development. It should have a leading role in ICT application in order to improve the efficiency and quality of public administration and services for the citizens, and strengthen good governance, which, according to UNESCO, includes the following aspects: participation, rule of law, transparency, responsiveness, consensus orientation, equity and inclusiveness, effectiveness and efficiency, and accountability.

6. The Master Plan provides practical guidelines consistent with the sufficiency economy philosophy that aims for development which is balanced with internal strengthening, through:

i. Developing people so they will have the capacity to develop the products that they consume. Strengthening domestic industries by promoting research and development and supporting businesses so they can be self-sufficient in the long term.
ii. Taking into consideration the existing resources and their judicious use.

7. The Master Plan prioritizes development and use of ICT in order to strengthen the competitive advantage of the economic sector in which Thailand has potential, while building on its' uniqueness of local wisdom, Thai culture and Thai identity. In particular, these sectors include agriculture, tourism and health services.

IV. Vision, Mission, Objectives and Goals

4.1 Vision

"Driving toward Smart Thailand through ICT"

"Smart Thailand" refers to a society that develops and uses ICT in a smart manner and adheres to the principles of the sufficiency economy philosophy. People at all levels of society should be smart and information literate. This leads to benefits for themselves and society as a whole. ICT should be managed with smart governance in order to support the development of a knowledge- and innovation-based society and economy that are sustainable and stable.

4.2 Mission

(1) Develop a labor force of adequate quality and quantity, including ICT professionals and personnel in other fields, at all levels, that are knowledgeable, skilled in the efficient use of technology and information literate, in order to develop Thailand into a knowledge- and innovation-based society and economy that are sustainable and stable.

(2) Develop a widely accessible high-speed ICT network, with quality service, and reasonable prices, in order to serve as the main information infrastructure which all sectors can use in accessing information and building capacity, and which the business and industrial sectors can use in adding value to the nation's economy.

(3) Develop good ICT governance, with proper mechanisms, regulations, management structure and monitoring system in place. This will allow for integrated development that is unified, efficient and participatory in order to support smart governance that is consistent with the goals of the National Economic and Social Development Plan.

4.3 Objectives

(1) To develop ICT professionals of adequate quantity and quality to meet market demand and personnel in other fields, at all levels, that are knowledgeable, skilled in the efficient use of technology, and information literate, in order to develop Thailand into a knowledge- and innovation-based society and economy that are sustainable and stable.

(2) To develop good ICT governance using the sufficiency economy philosophy. It should emphasize independence, integration, judicious use of resources and participation by all stakeholders, in order to ensure that benefits from development will reach all stakeholders equitably, through using public-private partnerships as appropriate.

(3) To support economic sector restructuring for value creation of goods and services on the basis of knowledge and innovation by using ICT.

(4) To strengthen communities and individuals to access and use information in household and community activities, including seeking knowledge, building wisdom, participating in politics, governance and everyday life, in order to lead to self-sufficiency and poverty alleviation, especially among the disadvantaged, the disabled persons and the elderly.

(5) To build the capacity of ICT businesses and industries by emphasizing on increased domestic value-added, research and development and the use of local wisdom, Thai culture and Thai identity, in order to develop Thailand into a knowledge and innovation-based society and economy that are sustainable and stable.

4.4 Goals

(1) At least 50 percent of the population will have the knowledge and capacity to access, create and use information in an information-literate way in order to benefit education, work and everyday life.

(2) Raise the ICT readiness ranking of the country to be at the top quartile group in the Networked Readiness Rankings by 2013.

(3) Enhance the role and importance of the ICT industry in the national economy, by increasing its share of GDP to at least 15 percent by 2013.

V. ICT development strategy

In order to achieve the objectives and goals in developing ICT under the conditions which are the strengths, weaknesses, opportunities and threats (SWOT) of ICT development in Thailand, this Master Plan has issued six main strategies. The public and private sectors should collaborate in implementing the strategies in 2009-2013. The aim is to use ICT in building the nation's capacity to become self-sufficient and globally competitive, and for developing a knowledge-based society and economy that will lead to better quality of life of the population as a whole. The six strategies are as follows:

Strategy 1: Develop ICT professionals and general population to be information literate

The aim of this strategy is to accelerate the development of personnel of adequate quantity and quality to support the development of Thailand into a knowledge and innovation-based society. Both ICT professionals as well as personnel in other fields, along with youth, the disadvantaged, the people with disabilities and citizens at all levels should have the knowledge and skills to be information literate. More specifically, they should have the knowledge and skills to create, produce, and use ICT in an efficient, effective, ethical and considerate manner. There are three key measures under this strategy as follows:

The development of ICT professionals

(1) Produce tertiary and vocational graduates who have the necessary skills and qualities to meet the demand of the industrial sector. This requires ICT academics to develop their knowledge continuously and undertake research and development in advanced ICT. There should be a mechanism for academics to work closely with business and industry counterparts in order to better understand the needs of the industrial sector. Teaching/learning methodologies at the bachelor's and master's levels should be improved in order to focus on practical applications in the industrial sector. Open source software should be promoted as a tool in teaching and learning. Research should be built up to promote a new generation of developers. Thailand is still lacking ICT personnel with advanced skills. In order to increase both quantity and quality in this area, universities or institutions specialized in ICT should be

established, either through setting up new universities or upgrading existing ones. Graduates from other fields should be given the opportunity to study further in order to become trained ICT professionals.

(2) ICT professionals working in the industrial sector should be further developed to have improved knowledge, skills and potential. Incentives need to be created for getting training and internationally-recognized professional certification. A mechanism should be established for technology and knowledge transfer to Thai businesses from multinational companies that take part in government ICT projects. This will provide an incentive for businesses to invest in the development of ICT professionals.

Development of personnel in other fields and the general population

(3) ICT should be used as a tool for teaching and learning in education at all levels, with a priority emphasis on basic education. The upgrade in ICT skills of teachers should be undertaken in conjunction with curriculum reform to improve skills in thinking, analyzing and problem-solving by using ICT as a tool. At the same time, the ethics of using ICT should also be taught as part of the required curriculum at all levels. Electronic teaching materials should be developed, knowledge resource repositories in schools should be established, and online communities of students should be promoted as a platform for knowledge exchange and self-expression. In the promotion of various education activities, public-private partnerships should be encouraged and monitoring should be carried out at regular intervals.

(4) ICT education outside the formal education system should be developed in order to promote life-long learning. Community ICT centers should be set up that provide a range of electronic media, training for users, access to sources of central and local knowledge as well as information that will benefit livelihoods and everyday life. Databases and applications that are user-friendly and searchable, either through a computer or mobile phone, should be developed to assist in improving livelihoods and everyday life.

(5) ICT skills should be developed among labor forces in the workplace, in order to apply ICT for improving efficiency and effectiveness. Incentives should be given to workplaces to invest in ICT knowledge and skills development, either through conventional training or an e-Learning.

(6) ICT education should be developed for the disadvantaged, the persons with disabilities and the elderly. ICT hardware, software, assistive technologies, educational materials and digital content should be produced and disseminated for different disadvantaged groups. Different measures should be put in place to provide opportunities for the disadvantaged to access information in an equitable manner. This includes research and development of necessary assistive technologies for persons with disabilities and ICT training for the elderly.

(7) ICT knowledge and skills should be developed for public sector employees. ICT knowledge and skill standards should be established for public sector employees at all levels. Public sector employees should be trained to have the knowledge, capacity and skills that are in line with the standards at their level. A specialized ICT training center for public sector employees should be established. Incentives, compensation and opportunities for advancement of ICT personnel in the public sector should also be developed.

Other support measures for overall human development

This includes the development of a database of the national ICT workforce to be used in human resource planning; promotion of associations, clubs and networks that promote the use of ICT in a creative and beneficial way; and translation of foreign language books into Thai for dissemination through various channels.

Strategy 2: Strengthen National ICT governance

This strategy aims to improve mechanisms and processes of ICT management and monitoring to achieve good governance framework by emphasizing on ensuring operational unity, efficient use of resources and participation from all sectors. There are four key measures under this strategy as follows:

(1) **Improve the national ICT governance structure.** A few agencies responsible for various aspects of ICT development should be put in place or strengthen. These include: a central unit in the ICT Ministry that is responsible to drive the national ICT agenda, including promoting and monitoring the implementation of the Master Plan, the agency to drive the implementation and enforcement of the e-Transaction Act BE 2001 and 2008, and support the e-Transaction Commission, the agency/unit responsible for cyber security. A mechanism should be developed for working in a collaborative and integrated manner among government agencies that are involved with national ICT development. An ICT Council should be established to serve as the representative of the private sector to assist in mobilizing public-private partnerships to advance the national ICT agenda.

(2) **Improve the process of proposing and allocating budgets related to ICT by the public sector.** This will ensure budget usage that is worthwhile and efficient, non-duplicating and consistent with the directives in the ICT Master Plan.

(3) **Develop or improve related laws and regulations and their enforcement mechanisms in order facilitate the use of ICT and the conduct of e-Commerce/e-transaction.** This includes improving the rules and regulations concerning ICT procurement in the public sector to be more effective and result-oriented, by putting more emphasis on the desired results and quality rather than considering only price. Furthermore, government agencies should be allowed to hire ICT architects, software designers, or other specialized consultants to help in the various phases of ICT procurement process.

(4) **Improve the national ICT development indicator database system.** This will support the monitoring and evaluation of national ICT development and the implementation of the ICT Master Plan.

Strategy 3: Develop ICT infrastructure

This strategy aims to develop and manage ICT infrastructure in order to provide universal access to businesses and citizens around the country, including the disadvantaged and people with disabilities. It will encourage businesses to put in place

infrastructure that can keep up with technological evolution, in order to meet increasing consumer demand. The infrastructure should support multimedia services, e-Commerce and other services that are useful for modern lifestyles in a knowledge-based society. At the same time, this strategy also focuses on reducing the digital divide which will then lead to a peaceful and happy society where people enjoy a better quality of life. There are four key measures under this strategy as follows:

(1) **Establish the mechanism that coordinate and connect relevant agencies responsible for setting government policy direction on telecommunication businesses and those responsible for setting regulatory framework for telecommunication businesses so that they are consistent and move in the same direction.**

(2) **Expand the types of services, expand service coverage areas and improve the efficiency of the communication network.** This should be undertaken under the principle of fair and open competition and should yield practical results. Both domestic and foreign investment should be encouraged. Thai businesses should be supported, especially for local businesses to provide last mile access. In accordance with the sufficiency economy theory, expanding ICT infrastructure should follow the principle of focusing first on provincial centers and Muang districts around the country, before expanding to the other areas in due time.

(3) **Develop ICT infrastructure to enhance education and life-long learning.** Incentives should be developed for businesses to develop ICT infrastructure for education. ICT budgets should be allocated to schools, covering equipment cost, service fees and funds for training staff. In terms of non-formal education and life-long learning, ICT infrastructure should be provided that is suitable for each facility, such as local libraries and community information centers, in order to provide electronic services and promote education for other groups in the community. At the same time, local content should be developed that will be useful for community education, work, well-being and public health.

(4) Develop ICT infrastructure for key social sectors responsible for public safety and quality of life of the citizen. The government, in cooperation with the Telecommunications and Broadcasting Regulatory Agency, are to provide telecommunication resources and ICT networks to serve the key social service sectors, including public health, monitoring, disaster warning and post-disaster management. Appropriate ICT budget will be allocated to agencies responsible for these activities, such as hospitals and clinics in rural areas around the country, national disaster management center.

(5) Increase the efficiency of telecommunication and ICT network resource management. A database of national telecommunication networks should be developed in order to identify areas that are underserved. Technological progress and trends should be studied and analyzed regularly and in a continuous manner in order to compare various technology alternatives in order to be able to respond to the impacts that may have been caused by technological developments. Examples are the study on appropriate transition mechanism in response to the switch from analog to digital broadcasting and frequency reallocation to proper ICT services to reduce the digital divide, the impact of technological convergence, or the development of consumer protection policy related to telecommunication and ICT services in line with global standards.

(6) Accelerate the achievement of information security. Information security should be ensured for government agencies and agencies involved with the nation's critical infrastructure. Knowledge and awareness about the dangers and impacts that may occur should be developed in order to devise protection measures and appropriate solutions.

Strategy 4: Use of ICT to support good governance in public administration and services

Government agencies should use ICT to improve governance in administration and services. A citizen-centric approach should be adopted to provide services in an efficient, effective, transparent and just manner. Participation from all relevant sectors should be encouraged.

(1) Strengthen central agencies responsible for setting the framework and standards needed for developing electronic government services in an integrated manner. A central agency should be in charge of designing the Government ICT Architecture, devising a policy framework for information and information-sharing, and setting needed ICT standards in line with global standards. This will allow all government agencies to link and exchange information in a united and efficient manner. The establishment of a Civilian Map Department, in accordance with the Ministry, Bureau and Department Reform Act (2002), should be accelerated and completed soon, in order to take charge in the development and management of the National Spatial Data Infrastructure (NSDI), so that spatial data can be integrated and shared among agencies as quickly as possible.

(2) Develop electronic services by all government agencies. All government agencies should adjust their information and management systems in order to link with the main infrastructure, such as TH e-GIF, NSDI and GIN. All government agencies should use ICT as a way to promote and support participation by civil society in national administration.

(3) Strengthen ICT capacity for provincial government agencies and local government units. Local government units should designate personnel to be responsible for ICT who will liaise with central government agencies in order to learn about various standards and resource management, and help promote ICT activities that are in line with central guidelines. Mechanisms should be developed to encourage collaboration between the provincial CIO and CIO of the local governments in order to cascade the implementation of various ICT standards from the provincial level down to the local government unit level.

Strategy 5: Upgrade competitive capacity of the ICT industry to add value and increase earnings

This strategy seeks to upgrade competitiveness of Thai ICT businesses by promoting research, development and innovation by the public sector, academic sector and private sector to upgrade technological capability of the Thai ICT businesses to more upstream technology. Technology transfer of research outputs to businesses should be encouraged. The businesses environment should also be improved. The priority sectors are software industry and digital content production industry, with the aim to increase the sector's contribution to national economy and earnings. For other industries that have potential, such as the electronics industry (embedded systems or advanced electronic design) and the telecommunications equipment industry, the focus will be on research and development to build upstream capacity. This will allow them to be developed into income-generating industries in the future. There are five key measures under this strategy as follows:

(1) **Provide funding support or subsidies to incubate new businesses.** In particular, financial assistance will be provided to support R&D projects to develop industrial prototypes. At the same time, the government should support investment in procuring equipment, intellectual property and central facilities to provide business consultancy for private companies to rent and operate their business. This will help reduce the risk and build competitiveness for start-up companies.

(2) **Upgrade Thai ICT product and service standards to meet global standards.** Funding will be provided for research and development and innovation in ICT. This will help to create or build up the capacity of Thai businesses in producing more upstream technology. A mechanism should be developed to help inventors and innovators register patents both domestically and abroad. At the same time, intellectual property protection regimes that are effective and enforceable should be developed, which will give impetus to businesses to continuously develop and innovate. Furthermore, the institutions and mechanisms involved in testing and certifying the quality of locally produced ICT goods and services should be strengthened.

(3) Create opportunities in marketing and competition for Thai businesses. An ICT Council should be set up to serve as an interest group for private sector in ICT industry to push the industry development agenda for consideration by the government. Having this kind of mechanism will strengthen the capacity of Thai private companies and help create opportunities in marketing and competition for Thai businesses in both the domestic and foreign markets. In expanding the domestic market, government should be the lead consumer. Domestic businesses should not be discriminated against by the conditions set in TORs for procuring ICT goods and services for government ICT projects. For expansion to foreign market, the government should support Thai businesses by providing necessary information to help develop their marketing plans and providing assistance for them to join the trade exhibition in foreign countries.

(4) Promote domestic and foreign investment in ICT industries. The government will make ICT infrastructure universally available and accessible in order to attract ICT investment in up-countries, especially in regional provincial centers. Incentive mechanisms and measures should be provided for foreign investment in ICT industries, especially high-tech ones. At the same time, mechanisms should be developed to encourage knowledge and technology transfer from multinational corporations to Thai companies.

(5) Promote open source software businesses and services in Thailand by promoting understanding of license agreements among developers and users as well as building opportunities to apply open source software in education sector and public sector. There should be no discriminatory measures against open source software systems in TORs for public sector ICT projects.

Strategy 6: Use ICT to build sustainable competitiveness for Thai industries

This strategy aims to promote access and use of ICT in the production of goods and services in all sectors to enhance competitiveness by increasing domestic value-added and at the same time being environmentally friendly. This will help prepare businesses to compete under global free trade regimes in the future. Special emphasis will be given to sectors in which Thailand has comparative advantage and potential to compete, such as agriculture, health services and tourism. Small and medium enterprises (SMEs) as well as

community enterprises will also be targeted for development. There are five measures under this strategy as follows:

(1) **Build awareness and develop capacity in ICT for businesses.** This will promote the use of ICT in business operations, including the management of logistic systems to achieve greater efficiency and effectiveness.

(2) **Apply ICT to develop and manage the logistic system more efficiently and effectively.** Entrepreneurs need to be encouraged to apply up-to-date logistics management techniques by promoting e-logistics in strategic industrial clusters, based on open standards.

(3) **Build confidence in electronic transactions.** The government should build confidence among businesses and consumers in using electronic transaction by expediting the necessary laws and regulations that are in the development pipeline. Furthermore, the enforcement mechanism of existing laws and the upcoming ones should be strengthened for greater efficiency and effectiveness. On-line consumer protection mechanisms should also be strengthened.

(4) **Promote the use of ICT in strategic manufacturing and service sector.** This measure gives special emphasis to agriculture, health services and tourism sector. Development priorities are to build and link necessary databases relevant to each sector that are conformed to global standards, as well as to develop and disseminate information to stakeholders in the value chain for use in marketing and promotion of goods and services. The development of goods and services in these sectors should take advantage of local wisdom, Thai culture and Thai identity.

(5) **Enhance competitive capacity of small and medium enterprises (SMEs) and community enterprises.** SMEs should be able to access and use ICT in undertaking business transactions. Necessary incentives should be given to encourage ICT investment. E-commerce for local products, such as OTOP, should be promoted, taking the advantage of Thai wisdom and local cultures in creating value for goods and services, especially those with high market potential. In this regard, existing facilities and locally available ICT

infrastructure, such as sub-district information centers, should be used to to the greatest extent.

(6) Promote the use of ICT in energy-saving measures to reduce business expenditures and enhance sustainable competitiveness. Research projects concerning the use of ICT for energy-saving measures should be promoted in order to reduce operating expenditures and promote competitive capacity at all levels. Furthermore, energy savings projects that have high potential for success should be promoted or supported on a pilot basis, such as virtual online conferences on high-speed networks and intelligent transport system, etc.

On an ending note, the successful implementation of the 2nd ICT master plan requires the setting up of governance mechanisms that manage, monitor, and evaluate the plan performance in order to ensure efficiency and effectiveness. The principles of implementation can be summarized as follows:

- Assigning clear ownership of responsibility within the MICT for spearheading national ICT initiatives – Designated tasks include the formulation of ICT policy/ master plans, implementation, and setting up of committees -- made up of in-house staff as well as outside agencies -- to work on corresponding strategies.
- Putting in place appropriate collaboration mechanisms – Examples include a mechanism to facilitate cooperation and integration across development-related government agencies; a resource allocation model that pulls together the ICT Master Plan, the budget plan, and the human resource plan; and a framework or basic guide for outside agencies to conducting a joint review of ICT initiatives with the policy coordinating unit of the MICT (to be established).
- Appointing an ICT committee in each Ministry/Department to oversee the implementation and operationalization of their ICT plans – The committee is to be chaired by their Ministry's CIO and must submit a progress report on their ICT projects every six months.
- Providing a forum for the private sector to raise issues relating to ICT development – The roles of the private sector here involve working in conjunction with the government to promote skill standards for ICT professionals as well as

representing the interests of business/entrepreneurs during a dialogue with the government that will promote public-private-partnership (PPP) for ICT initiatives.

- Creating a list of indicators to monitor and evaluate the level of success and impact of the 2nd Master Plan – Databases on ICT core indicators as well as development indicators at all levels will be created and maintained by networked agencies responsible for the tasks. Resulting data will be integrated, analyzed and reported to the public. Also, these indicators must be regularly benchmarked with their counterparts worldwide so as to keep their definitions up-to-date and relevant.

- Closely monitoring and evaluating the implementation of the plan – The monitoring of work plan will be done on an annual basis while the evaluation will be carried out at the middle of the ICT implementation plan (2011/ 2012).

Content

1 Introduction

Thailand's Information and Communication Technology (ICT) policy for 2001-2010 (IT 2010) places a priority on the role of ICT in social and economic development by emphasizing the improvement of the quality of life and society through developing a knowledge-based society. Such concept served as the basis for developing more concrete policies and strategies through the First ICT Master Plan (2002-2006) which was approved by the Cabinet on 25 September 2002. Subsequently, the Master Plan provided the framework for all ministries, bureaus, departments and state enterprises, to draft or adapt their ICT plans accordingly in order to ensure consistency.

On 11 September 2007, the Cabinet called for an extension of the First ICT Master Plan until 2008. It also requested the ICT Ministry to coordinate with the Ministry of Science and Technology in the development of the Second ICT Master Plan for 2009-2013, as well as the ICT Policy Framework for 2011-2020 (ICT 2020).

As the designated ministry responsible for developing and leading the implementation of the Second ICT Master Plan for Thailand, the ICT Ministry collaborated with the National Electronics and Computer Technology Center (NECTEC), under the National Science and Technology Development Agency, to accelerate the completion of the Second ICT Master Plan in order to meet the changes in the economy, society and technology that were occurring domestically in Thailand and globally.

The Second ICT Master Plan (2009-2013) is the national coordination plan which reflects continuity in policy from Thailand's Information and Communication Technology (ICT) Policy for 2001-2010 (IT 2010) and the First ICT Master Plan (2002-2006). At the same time, it makes provisions for new policies and stronger emphases in certain areas in order to respond to changes in the economy, society and technology that represent both opportunities as well as challenges for Thailand. With this, Thailand will be able to leverage information and communication technology towards socio-economic development more efficiently and effectively, which will help contribute to achieving the development targets set out in the National Economic and Social Development Plan.

This Master Plan provides situation analyses, a vision, mission, objectives, goals, strategies, workplans and the role of related agencies. The structure of the Masterplan is as follows:

1. *Development direction of Thailand and the role of information and communication technology.* This presents key points of various national policies and development plans, such as the Tenth National Economic and Social Development Plan and the Information and Communication Technology (ICT) Policy for 2001-2010 (IT 2010) in order to provide an understanding of the development context.

2. *The situation of information and communication technology development in Thailand.* This presents the situation of the development of information and communication technology in Thailand, in terms of the overall picture and various dimensions. It also undertakes a SWOT analysis of the development of information and communication technology in Thailand over a five-year period, which leads to setting out the vision, mission, objectives and main strategies of the Master Plan.

3. *ICT Development Strategies*. This provides the vision, mission, objectives and goals of the Master Plan, along with development strategies.

4. *Management, monitoring and evaluation of the ICT Master Plan.*

2 Thailand Development Direction and the Role of Information and Communication Technology

2.1 Thailand economic and social development context

The structure of the Thai economy and society has seen changes in various aspects over the past 10 years (1998-2008). The national economy has been expanding continuously, with the service sector growing in greater importance. The service sector is the sector with the highest contribution to GDP and highest value added. This is followed by the industrial sector and the agricultural sector. Although the economic forecast indicated steady growth in 2008, however, record-breaking high oil prices have led to a rise in the cost of industrial capital. Furthermore, global climate change has also caused natural disasters in various countries, further increasing the prices of agricultural commodities such as rice to historic highs.

There have been many changes in contemporary Thai society, notably, the transformation into an aging society. The proportion of the population over 60 years old has steadily increased and is expected to trend upwards, from 10.8 percent of the population in 2007 to 25.1 percent in 2030.[1] In addition, changes in the way of life have reduced the role of the family, educational institutions and religious institutions in educating and inculcating values and morals in Thai people and youth. The values and actions of Thai people now increasingly reflect materialism and consumerism. At the same time, the quality of education is not sufficient for a knowledge-based society and economy. Regarding technology, Thai people are increasing their use of technology in their daily life. This can be seen in the number of internet users and mobile telephone owners which has risen steadily. In 2007, 47.2 percent of the population, or 28.3 million people, used mobile telephones and 9.3 million people used the internet.

The use of technology is considered an important opportunity and threat facing Thai society (see Figure 2.1). The increasing use of technology can be considered a good opportunity which will allow Thai citizens to access more information and knowledge more

[1] Thai Population Forecast Based on Average Population Growth Rate (www.nesdb.go.th)

quickly, and to apply it towards improving their lives. On the other hand, it can also be a threat if the use of technology is not appropriate. For instance, new forms of crime are now on the rise, such as increased and easier abuse of intellectual property. Technology can also facilitate anti-social behavior, such as abuse of private/personal information, use of other's private information for illicit gain, and access to child pornography that has increased and is harder to prevent. From studies by Child Watch,[2] it was found that at the present time, 20.3 percent of Thai children and youth have mobile telephones, 16.0 percent send SMS's on a daily basis, and 34.0 percent play computer or online games regularly. In addition, 56.0 percent use the internet daily (averaging 105 minutes), while only 81 minutes are spent reading books. This reveals that internet usage has a trend towards inappropriate behavior.

Social Changes Resulting from Transformation to e-Society

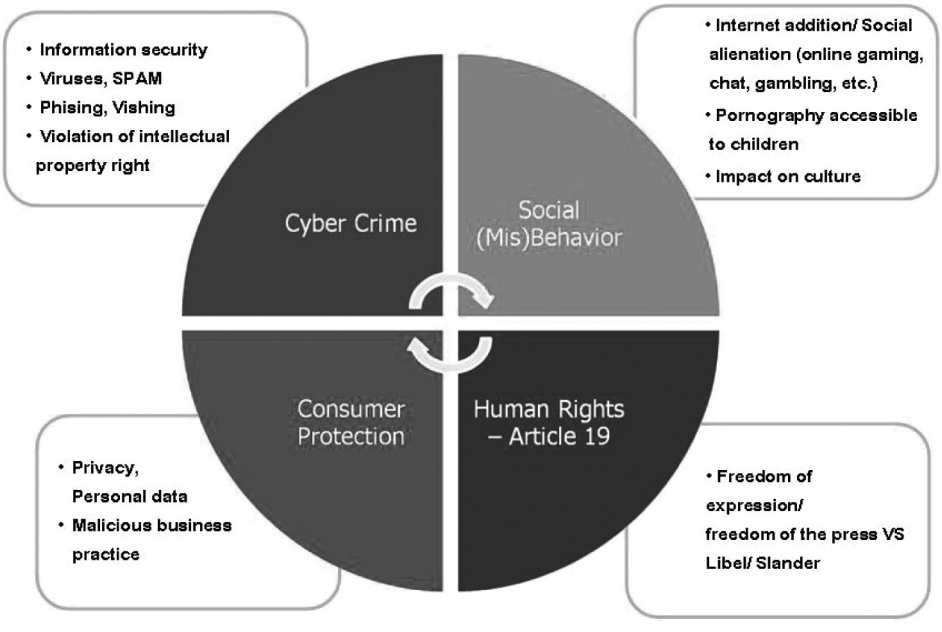

Figure 2.1 Opportunities and Threats for Thai Society from the Use of ICT

Source: ICT Master Plan Working Committee, March 2008

[2] The Child Watch program of the Child and Youth Council 2005-2006. From secondary data and 400 samples from surveys conducted in provinces with universities, totaling 25,000 persons, from February-March 2006.

2.2 Policy directions for economic and social development in Thailand

In response to these social and economic changes, national policies and plans have been developed as the mechanisms to drive Thailand towards a stable new socio-economic era. The Tenth National Economic and Social Development Plan (2007-2011)[3] is the primary plan directing social and economic development in Thailand. The underlying philosophies which have been applied to the Plan are the Sufficiency Economy principle and the human-centric approach to development. The vision of the Plan is to create a "Green and Happiness Society", where Thai people have both morality and knowledge and are abreast of global developments; families are close-knit; communities are strong; society is peaceful; the economy is of robust, stable and just; and the environment is sustainable. This society should be managed under the system of good governance, as a democracy with the king as the head of state and as a dignified member of the world community." There are five strategies for the achievement of the Plan's goals, as follows:

1. Improving the quality of life of Thai people and society through the development of a knowledge-based society, so that people will be in good shape both spiritually and physically, have good balance, are able to grasp religious principles, have both morality and knowledge, have right livelihood and enjoy stability in life.
2. Strengthening communities and society as a stable base for the country, so that communities are peaceful and free from poverty.
3. Adjusting the structure of the economy to be more balanced and sustainable, so that the economy will be robust, by building an economy that has more balance, stability and economic justice.
4. Ensuring biodiversity, a stable natural resource base and environmental quality, in order to safeguard the natural resources, conserve environmental quality and lay the foundation for the adjustment of the economic structure to develop biodiversity.
5. Reinforcing governance in national administration by improving governance in all sectors and strengthening democratic knowledge.

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[3] National Economic and Social Development Board. *Tenth National Economic and Social Development Plan*. Approved by the Cabinet on 12 September 2006. (http://nesdb.go.th/Default.aspx?tabid=139)

In addition to the National Economic and Social Development Plan, there are also other national policies and plans that have been developed by other agencies to move Thailand towards a knowledge-based society and economy. Notably, these include: the 2007 Constitution, Science and Technology Development Strategic Plan (2004-2013), Knowledge Infrastructure Master Plan (2007-2012), National Research Policy and Strategy (2008-2010). These plans and policies, although differing in emphases in accordance with their respective objectives and the roles and responsibilities of each agency, are nonetheless consistent in their direction. The main policy directions common to these policies and plans include the following:

Human resource development: Every plan and policy emphasizes the importance of developing human resources, particularly the Higher Education Master Plan, which has highlighted the importance of human resources development to respond to ICT technological changes in many aspects. The Knowledge Infrastructure Masterplan and the Science and Technology Development Strategic Plan both consider the human resource the basic foundation for developing basic knowledge infrastructure and the high priority for developing science and technology in the country.

Targeted economic and industrial development (including services): Every national plan and policy refers to key or priority industries and services. For instance, the Tenth National Economic and Social Development Plan has identified three target industrial sub-sectors whose value chain development should be supported, as follows: (1) the ICT industries that have high potential, namely, printed circuit boards, hard disk drives, radio, and television; (2) other high-potential industries, namely, automotives, petrochemicals, rubber, and fashion; and (3) new industries, namely, bio-fuels, bio-materials, and nutritional supplements. It also identifies service sectors that should be focused upon, such as tourism, education, health and spa, ICT, Thai movie, and logistics. Meanwhile, the Science and Technology Development Strategic Plan places a priority on integrating science and technology with the economy as a driver for developing Thailand, as shown in Figure 2.2.

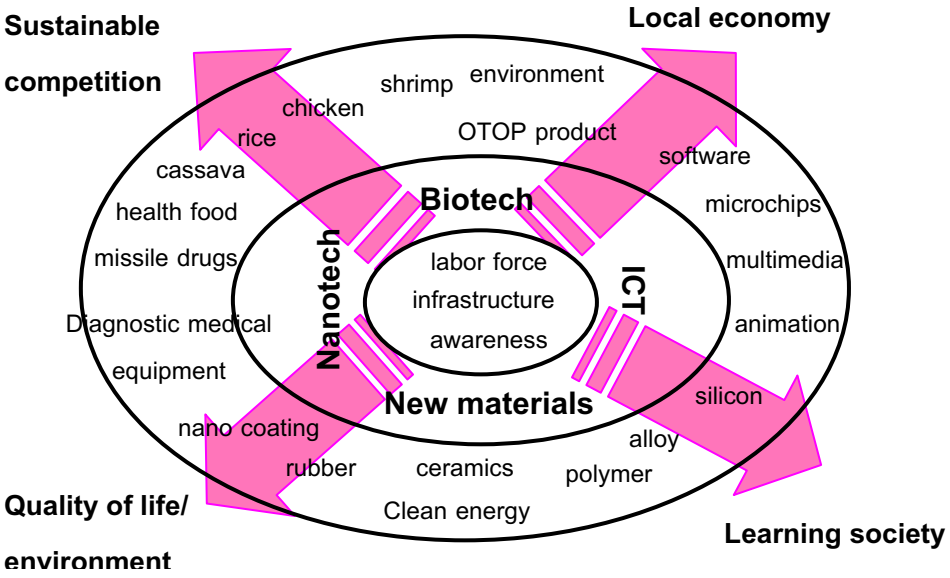

Figure 2.2 Integration of Science and Technology with the Thai Economy and Society

Source: Science and Technology Development Strategic Plan (2004-2013)

The Public Administration Plan refers to development that should drive industries in which Thailand has high potential and comparative advantage, such as food, steel, automotives, petrochemicals, energy and electronics into a regional and global manufacturing base. The higher education master plan has emphasized that higher education should be linked to the industrial sector, which will strengthen the country in the long term.

Social and community development: The 2007 Constitution calls for greater public participation in social and community development by becoming directly involved in local development and management. The Tenth National Economic and Social Development Plan and the Public Administration Plan have clear policies regarding society and quality of life, in terms of education, life-long learning, workers' quality of life, and health. They also call for the revival and transmission of Thai cultural diversity, as seen in ways of life, traditions, noble values, local wisdom, safeguarding of historic parks, monuments and various museums for the sake of learning and creativity.

Building of a stable natural resource base: The maintenance and safeguarding of natural resources and the environment is a high priority in the national plans. The Tenth National Economic and Social Development Plan has multiple goals concerning natural resources and the environment, including safeguarding the richness of the natural resource base and biodiversity, maintaining environmental quality at an appropriate level for quality of life and preventing ecological threats. The Public Administration Plan and government policies include policies about creating and developing biodiversity, managing water resources, warning against natural threats and research about energy-saving technologies.

Better Governance: The Tenth National Economic and Social Development Plan places a priority on improving governance in administering the country by emphasizing transparency in both the public and private sector. It also calls for civil society to participate more in decision-making and public administration, in order to create balance in allocating benefits from development. The Science and Technology Development Strategic Plan stipulates that the reform of the science and technology governance system should be carried out on an urgent basis. The Public Administration Plan includes policies for good administration by emphasizing the need for decentralization of government administration, the development of legislation that keeps up with changes, and access to public sector information.

Infrastructure development and the establishment of specialized agencies and institutions : Various plans refer to strategies related to institutional structure and/or integrating the work of various related agencies. For instance, the Science and Technology Development Strategic Plan promotes the establishment of a unit to develop science, technology and innovation policies. The Public Administration Plan stipulates the establishment of units that will have an impact on driving policies of various agencies. This will include setting up an agency to reform policies and an agency to reform a justice process, following the Constitution. In addition, it also calls for various aspects of infrastructure development, such as expanding the ICT infrastructure to cover the entire country, developing the national highways to connect the transportation system, etc.

The ICT Master Plan should be considered a coordinating plan for various national plans and policies, in particular between the Tenth National Economic and Social Development Plan and local implementation plans or ICT master plans at the level of ministries, bureaus and departments. As such, the overall development framework should consider the direction and trend set by the national plans and policies.

2.3 Framework for ICT development in Thailand

The ICT Policy for 2001-2010 (IT 2010) that was passed by the Cabinet on 19 March 2002 set the following targets:

1. Build capacity in using technology as a tool for national development in order to enhance Thailand's status as a "potential leader" country, as measured against the United Nations Development Programme's "Technology Achievement Index".
2. Increase the percentage of knowledge workers to account for 30 percent of the labor force.
3. Develop the Thai economy by increasing the value of knowledge-based industries to account for 50 percent of GDP.

In order to achieve these targets, the IT 2010 policy framework has established five strategies for the development of the country into a knowledge-based society, namely: e-Industry, e-Commerce, e-Government, e-Education, and e-Society. The underlying common factors of the five strategies are innovation, knowledge, research and development, science and technology, human resources, and basic communication infrastructure. If these five strategies are followed and the underlying factors are strengthened, then the resulting development will be sustainable. The strategies for e-Industry and e-Commerce emphasize economic development, while the strategies for e-Education and e-Society emphasize social development. Meanwhile, e-Government refers to the administrative system of the public sector, which needs to be improved in order to be able to use ICT as an important tool in administration and providing services to the citizens (Figure 2.3). This strategy will help the Thai people to be more informed, the economy to be more robust and the governance of the country to be improved, in accordance with the goals of the National Economic and Social Development Plan.

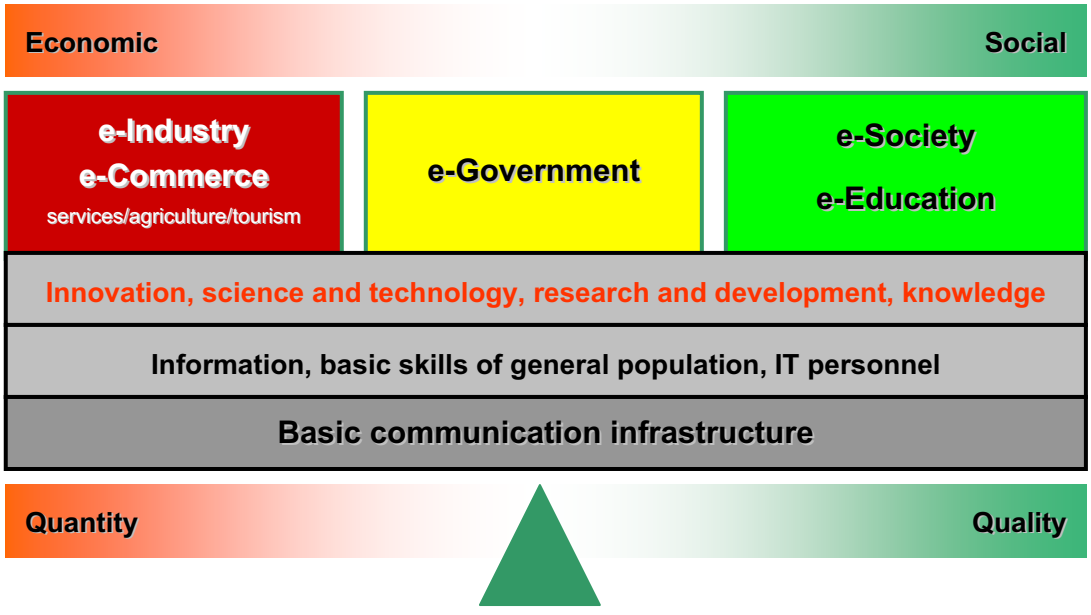

Figure 2.3 Link between Development Strategies and Related Factors (Innovation, Knowledge, Information, Human Development and Basic Communication Infrastructure)

Source: ICT Policy for 2001-2010 (IT 2010), April 2001

2.4 Evaluating the status of ICT development under the ICT Policy for 2001-2010 (IT 2010)

From the evaluation report of the status of ICT development under the ICT Policy for 2001-2010 (IT 2010),[4] the conclusions concerning implementation towards policy goals are as follows:

1) **Enhance the development capacity of the country using technology as a tool.** The evaluation showed that in 2005, Thailand's score on the Technology Achievement Index (TAI)[5] was 0.3445, putting it in the group of countries in the range of 0.35-0.49 that are potential leaders. However, as Thailand's score puts it in the lower bound, this aspect still requires further development.

[4] *Evaluation Report of the ICT Policy for 2001-2010 (IT 2010)* under revision by Silpakorn University, June 2008.

[5] Technology Achievement Index (TAI) of the United Nations Development Programme (UNDP).

2) **Developing knowledge workers in Thailand.** The evaluation showed that in 2006, the majority of the workers in the country (78.9 %), are still engaged in the agricultural, fisheries, service and other basic vocations in sales and services. The proportion of knowledge workers was only 21.1 %, including decision-makers, senior government officials, managers, technical professionals and skilled workers. Therefore, in the remaining implementation timeframe of IT 2010, the creation of knowledge workers should be supported in order to achieve the target of 30 percent.

3) **Developing the national economy by increasing the proportion of knowledge-based industries.** The evaluation showed that in 2006, knowledge-based industries only constituted 25.12 percent of GDP. Therefore, in the remaining time, value added should be urgently generated so knowledge-based industries will grow in a continuous manner, in order to reach the target of 50 percent of GDP.

2.5 The First ICT Master Plan (2002-2006)

The First ICT Master Plan (2002-2006) was drafted in order to transform the IT 2010 policy framework into a strategic plan for the first five years by clearly setting forth a vision, mission, objectives, strategies, workplans and activities, with the key goals as follows:

1) Development and upgrade of the economy by using ICT;
2) Enhancement of the competitiveness of the ICT industry;
3) Development of human resources by increasing the application of ICT in education and training; and
4) Strengthening rural communities for sustainable development.

In order to achieve these ICT development goals in a concrete manner, the plan has devised seven key strategies, namely: 1) development of the ICT industry into a regional leader; 2) utilization of ICT to enhance the quality of life and society; 3) reform and enhancement of capacity for ICT research and development; 4) reinforcement of social capacity for future competition; 5) development of entrepreneurial capacity for future

competition; 6) utilization of ICT in small and medium enterprises; and 7) utilization of ICT in government administration and services. The strategies have been prioritized in order to facilitate realistic implementation through workplans and projects. The plan has proposed to start with the strategies aimed at economic impacts first, which are developing potential and enhancing capacity to compete (strategies 1 and 3), along with the strategies to create new economic impacts (strategies 5 and 6). The outcome of this earlier phase will subsequently be extended to other sectors of the economy, as shown in Figure 2.4.

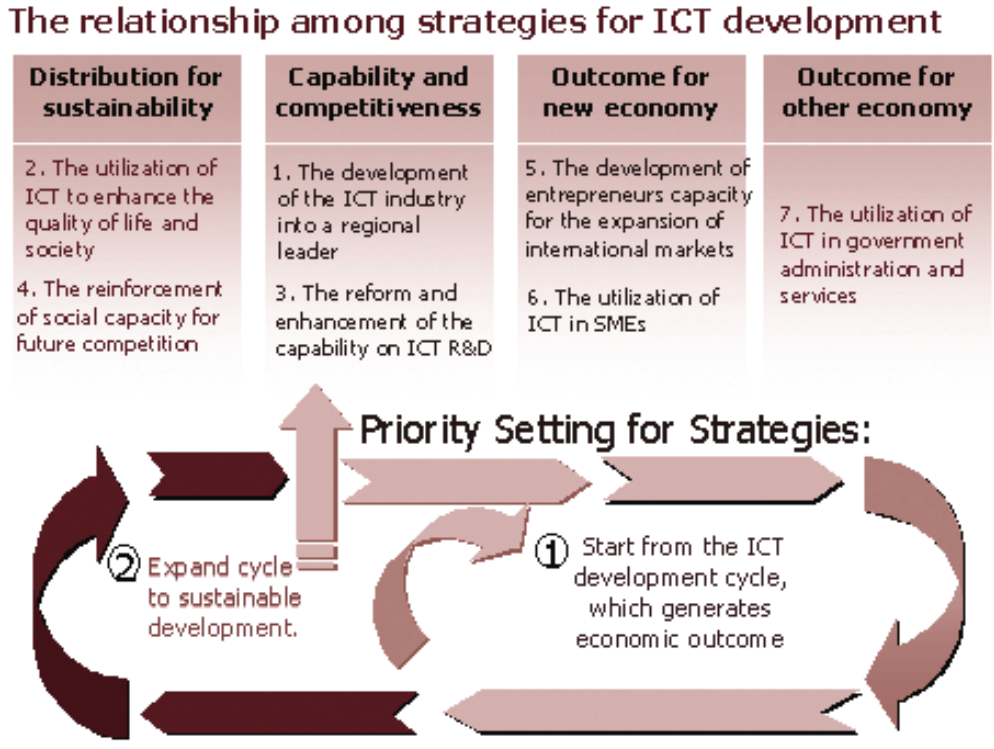

Figure 2.4 Relationship Between the Strategy, Target Results and the Implementation Steps

Source: The ICT Master Plan (2002-2006), September 2002.

2.6 Evaluating the status of implementing the First ICT Master Plan (2002-2006)

The evaluation of implementation of the First ICT Masterplan[6] against the target goals reveals, the following:

Strategy 1: Development of the ICT industry, particularly software, into a regional leader

The evaluation results show that implementation of this strategy has achieved 20 percent of the goal. Although the private sector has had a major role in catalyzing the software industry, however, the development of the industry has encountered numerous problems and obstacles. For instance, the public sector lacks concrete support in terms of necessary information and intellectual property management; Thai consumers prefer imported software; human resources with qualifications required by industry are lacking; and software license piracy makes entrepreneurs unwilling to invest since it is not cost-effective; etc.

Strategy 2: Utilization of ICT to enhance the quality of life and society

This emphasizes ICT development to achieve universal access so that ICT will help to improve the quality of life of Thai people and Thai society. The evaluation results show that implementation of this strategy has achieved 55.56 percent of the goal. The areas in need of improvement include the provision of community access centers, access to information by the disadvantaged, improved teachers quality, etc.

Strategy 3: Reform and enhancement of capacity for ICT research and development

The primary goal is to build capacity in research and development of new technologies for Thailand. The evaluation results show that the implementation of this strategy has achieved 25 percent of the goal, particularly with regards to expenditures and personnel involved in research and development.

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[6] *Evaluation Report of the First ICT Masterplan (2002-2006)* under revision by Silpakorn University, June 2008.

Strategy 4: Reinforcement of social capacity for future competition

This emphasizes the development of human resource to have capacity to compete in the future. The evaluation results show that the implementation of this strategy has achieved 33 percent of the goal. The important area that has not been so successful is the development of ICT knowledge and skills among workers and youth with primary educational attainment.

Strategy 5: Development of entrepreneurial capacity for future competition

This emphasizes supporting businesses to have knowledge and experience in managing modern technology in order to improve the manufacturing process and marketing. The evaluation results show that the implementation of this strategy has achieved the goal. The private sector has a major role in the implementation, which has generated a profound impact on the economic development of the country.

Strategy 6: Utilization of ICT in small and medium enterprises

This emphasizes catalyzing small and medium enterprises (SMEs) to use ICT to develop businesses and raise competitive capacity, particularly in management, managing production and connecting to large businesses. The evaluation results show that the implementation of this strategy has achieved 66.67 of the goal. The area remaining for improvement is to increase the number of SMEs that use ICT in the core work of their businesses.

Strategy 7: Utilization of ICT in government administration and services

This emphasizes the government establishing a national agency which will be responsible for developing and promoting ICT in the public sector, in order to integrate and unify government information systems, plan, coordinate and allocate budgets. There should be transparent procurement processes and duplication in investment should be reduced, so that the public sector will be able to exchange and share information. Furthermore, there should be a highly-secured information system for public administration and for providing efficient services to citizens. The evaluation results show that the implementation of this strategy has achieved 44.44 percent of the goal. The area remaining for improvement are: basic services should be provided via electronic channels; data exchange among ministries should be encouraged in order to enable comprehensive e-services for citizens; and legislation and guidelines should be reformed to facilitate ICT usage.

2.7 ICT development under other related policies and plans

In addition to the IT 2010 Policy and the First ICT Master Plan, the agencies related to ICT development have developed various plans to contribute to ICT development in two forms, namely, direct ICT development and the application of ICT to other development areas.

Table 2.1 ICT Development Direction in National Policies/Plans[7]

	Human Resource Development/ education	Enhance competitive capacity	Develop ICT industry	Better governance/ management	Preserve the environ-ment	Develop infrastruc-ture	Research and develop-ment
IT 2010	X	X	X	X		X	X
First ICT Master Plan	X	X	X	X		X	X
e-Government Roadmap			X	X		X	
Second Telecom-munications Master Plan	X		X	X		X	X
Telecom R&D Master Plan	X	X	X			X	X
Spectrum Management Master Plan	X			X		X	
ICT Security Master Plan	X		X			X	X
IPv6 Policy Framework	X					X	X
ICT Industry Promotion Plan	X	X	X			X	X
Software Development Master Plan	X	X	X			X	

[7] The policies and plans which have been studied are (1) ICT Policy for 2001-2010 (IT 2010), (2) First ICT Master Plan (2002-2006), (3) e-Government Roadmap (2005-2007), (4) Second Telecommunications Master Plan (2008-2010), (5) Thailand Telecommunications Research and Development Master Plan (2005-2009), (6) Spectrum Management Master Plan, (7) ICT Security Master Plan (2007-2010), (8) IPv6 Policy Framework (2007-2010), (9) Thailand ICT Industry Promotion Plan (2008-2011), (10) Software Development Master Plan

From the analysis of the ICT development direction in the specialized policies and plans (Table 2.1), it can be concluded that all the plans call for Thailand to develop and use ICT as an important engine to drive economic and social development towards a knowledge-based economy and society. The key strategies in all the plans are human resource development and education, and the development of the ICT industry. In addition, of equal importance is building capacity and reinforcing potential in research and development. Together, these will allow Thailand to develop in a sustainable manner and reduce its dependence on imported technology in the long run.

3 The Status of ICT Development in Thailand

3.1 Overall picture of ICT development in Thailand measured against various indices

In the global context, the development of ICT in Thailand can be considered average. However, when compared with six other countries in Asia, such as Japan, Korea, Taiwan, India, Singapore and Malaysia, it was found that Thailand was ranked below all, except India, with neighboring countries such as Singapore and Malaysia having higher rankings than Thailand in all indices.

Table 3.1 Comparative ICT Development Rankings of Thailand

Index / Country	World Competitiveness Scoreboard (2007) *55 countries*	Networked Readiness Index (2007-8) *127 countries*	Digital Opportunity Index (2005-6) *181 countries*	e-Readiness Ranking (2008) *70 countries*	e-Government Readiness (2008) *192 countries*	IT Industry Benchmarking (2007) *64 countries*
Thailand	33	40	82	47	64	41
Japan	24	19	2	18	11	2
Korea	29	9	1	15	6	3
Taiwan	18	17	7	19	N/A	6
India	27	50	124	54	113	46
Singapore	2	5	5	6	23	11
Malaysia	23	26	57	34	34	36

Source: World Competitiveness Scoreboard – IMD, Networked Readiness Index – ITU, e-Readiness Ranking – EIU, e-Government Readiness – UN, IT Industry Benchmarking – BSA

Analysis of the rankings revealed that the main factor holding back the ICT development ranking of Thailand in all indices is the lack of readiness of the ICT infrastructure,[1] which is still not widely available and accessible. This has constrained the efficiency and effectiveness of developing and using ICT for building up knowledge, developing enterprises, and serving the government. Thus, the development of ICT infrastructure is an important issue that the Second ICT Master Plan must resolve.

[1] The readiness of basic ICT infrastructure includes the distribution of computers, telephone lines, mobile telephones, broadband penetration, broadband affordability, etc. Details are provided in the annex.

In terms of the environment, Thailand has achieved high rankings in the business environment or the overall economic condition, as seen in the World Competitiveness Scoreboard rankings of 28 and 48, referring to the overall ranking and the ICT infrastructure ranking, respectively. However, in terms of economic capacity, Thailand was ranked at 15, which is higher than Taiwan, Japan, and South Korea. As for the e-Readiness ranking, Thailand scored highest for the business environment (receiving a score of 6.99 out of 10), but for the ICT infrastructure, the score was 3.80 out of 10 The evaluation of the business environment is based on various indicators, including the strength of the economic system, political stability, tax collection system, and trade policy.

3.2 The status of ICT human resource development

3.2.1 The status of ICT personnel

In terms of ICT human resources, there has been a continuous expansion alongside the expansion of ICT usage. Presently, Thailand has a growing skilled labor force both in the public and private sector. Graduates in related fields at the tertiary and vocational level are also increasing. Nonetheless, there is still a major shortage of ICT human resources, both in terms of quantity as well as quality, particularly highly-skilled personnel and specialized personnel in various sub-sectors.

The study of ICT personnel in Thailand shows that the majority of personnel, or 70 percent of the population, are in the low-skill category. A career-wise comparison in 2007 showed that of the 18 positions of Thai ICT personnel, the largest group was the system operator, accounting for 45.83 percent of all ICT personnel. The next groups were computer technicians (8.29 percent) and programmers (6.74 percent). In comparison, specialized experts were the smallest group (comprising 0.48-1.59 percent, depending on the field of specialty).

Table 3.2 Number of ICT Personnel in Thailand

Career Profession/Position	Number	Percentage
System operator	95,199	45.83
Others	44,278	21.32
System technician	17,219	8.29
Programmer	13,993	6.74
Computer trainer	3,634	1.75
System manager	3,595	1.73
Data communication specialist	3,296	1.59
Database specialist	3,263	1.57
Application software specialist	2,962	1.43
System analyst and designer	2,873	1.38
IT security specialist	2,871	1.38
CAD & CAM specialist	2,865	1.38
Software engineer	2,721	1.31
CIO	2,473	1.19
Project manager	2,121	1.02
Webmaster	1,723	0.83
IT quality assurance specialist	1,622	0.78
Multimedia software specialist	993	0.48
Total	**207,701**	**100**

Source: Ministry of ICT, 2007

With respect to demand for human resources, there are several studies all pointing in the same direction that Thailand still has a dire need for more ICT personnel. For example, in the software industry, it was forecasted that approximately 6,000 highly-skilled technical workers would be needed.[2] The three frontrunners in personnel demand are 1) programmer/software developers, 2) software engineers/software analysts and designers, and 3) database administrators. In other areas like hardware,[3] the need is also substantial; it is expected that annual demand is more than 20,000 persons on average.

[2] The Study of Software Market Potential, National Electronics and Computer Technology Center, 2007.

[3] Final Report on Mechanisms for Raising the Potential of Personnel in the Hard Disk Drive Cluster, National Electronics and Computer Technology Center, 2007.

In addition, it was found that although there are increasingly more students interested in studying ICT, with 19,735[4] university graduates, there is still a problem related to the qualification of these students. From the brainstorming exercise conducted as part of drafting this Master Plan, a number of entrepreneurs are of the view that the ICT curricula of various universities are still lagging behind the rapid change in technology. It has become the burden of businesses to upgrade these graduates so that they can perform as needed. In addition, Thailand still does not have a clear ICT certification exam system. It can be concluded that the quality of education for ICT personnel outside the educational system in Thailand is still not up to standard.

Notwithstanding the above, while the status of ICT personnel in Thailand still seems to be more of a weakness rather than a strength, nevertheless, Thai ICT personnel are considered to have high potential in software production, animation, and various forms of digital entertainment media. This is due to the following positive factors: 1) several animation companies are trusted internationally and are hired by foreign firms, 2) many Thai personnel in this area have won many international competitions, 3) animation films have been produced locally at international-quality standards such as the film *Karn Gluay*, 4) market value has been growing continuously, and 5) Thailand is competitive in creative works, fine arts, and aesthetics.[5]

3.2.2 ICT Diffusion and Usage

From the national survey conducted by the National Statistical Office, it was found that ownership and usage of ICT of the Thai people is still at a low level. Only 15.5 percent of population can access and use the internet.[6] The majority of Thais still access and use ICT in the form of television and radio. There is a vast difference between usage in urban and provincial areas. The group of people with lower access and use of ICT than other groups is the disadvantaged and those in the periphery due to the widening gap in ICT access. This group includes those in remote areas, the handicapped, and the elderly.

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[4] IT Human Resources in Thailand, National Electronics and Computer Technology Center, 2007.

[5] Thai Digital Content White Paper, Software Industry Promotion Agency, 2007.

[6] Survey on Household Ownership and Usage of ICT, National Statistical Office, 2008.

Apart from low use of ICT and limited coverage among the general public, the use of ICT is also inappropriate, such as 1) prevalent use of ICT for entertainment (more than for educational purposes, commercial transactions, or government transactions), 2) the inflow of foreign cultures and inappropriate content, and 3) the rise in computer crime.

The above factors call for national planning in the development of ICT in the future to consider these variables. While the use of ICT for entertainment by the youth may show that Thai youth can learn to use ICT quickly, but at the same time, it also points to a danger that parents and society should respond to by seeking a way to direct the potential of these youths towards beneficial and constructive ends.

In conclusion, the development of human resources, including ICT personnel and the public at large, is a vital need. Critical areas that need urgent action in the near future are:

- ICT personnel need to be developed, both in terms of quantity and quality, in order to enlarge the capacity of the Thai ICT industry to meet the domestic market demand and compete with foreign competitors.
- ICT personnel in the production and service sectors need training in order to apply their skills to increase production efficiency. Value added to the goods and services are particularly needed, especially in the strategic industries and services for Thailand, such as the food industry, agriculture, fashion, automotives, electricity and electronics, or the service industry such as tourism services, health services, etc.
- General ICT users, particularly the disadvantaged and marginal groups, including rural dwellers, handicapped, or elderly, should obtain training so that they can make use of ICT to improve their quality of life in terms of the household economy, well-being, and most importantly, access to information. In addition, there is an urgent need to give importance to ICT educators so that these teachers become qualified and have the capacity to transmit their knowledge to the youth and the public.

3.3 Status of ICT infrastructure

3.3.1 Inequality in information access

The study of the status of ICT infrastructure in Thailand revealed that Thai families have near universal access to information via television and radio. In 2004, 93 percent of households have television and 63.6 percent have radios, with the percentage in each region being quite close.[7]

The diffusion of fixed telephones has been declining steadily, with the number of users in the first quarter of 2007 at 6.84 million numbers or 10.89 numbers per 100 persons. Moreover, fixed telephone service is concentrated in the urban center, while coverage in rural areas is still lagging behind. In 2005, the proportion of telephones in Bangkok and the suburbs was 41.5 numbers per 100 persons, whereas other parts of the country have only 5.6 numbers.[8] The government tried to reduce this discrepancy by stipulating in the First ICT Master Plan that every village must have at least seven telephone numbers that can receive or transmit information by 2005.[9] The TOT carried this out under the Universal Service Obligation (USO) by providing long distance telephone services to villages. Initially, three public telephones were installed in every village; this has been increased to 6 units in certain villages under the second phase. However, these public telephones cannot enable access to internet services.[10]

The diffusion of mobile telephones, however, is basically equal between the urban and rural areas, with steady increases in usage. In 2007, the percentage of users of mobile telephones was 47.2 percent on national average, while in Bangkok and the suburbs, it was 68.4 percent, and the provincial usage was between 37.8 and 55 percent.

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[7] Report of the 2000-2004 Household Socio-economic Survey of the Whole Kingdom, National Statistical Office.

[8] National Statistical Office, 2005.

[9] First ICT Master Plan, 2005.

[10] Data as of August 2005. ICT Ministry Master Plan Integration Project.

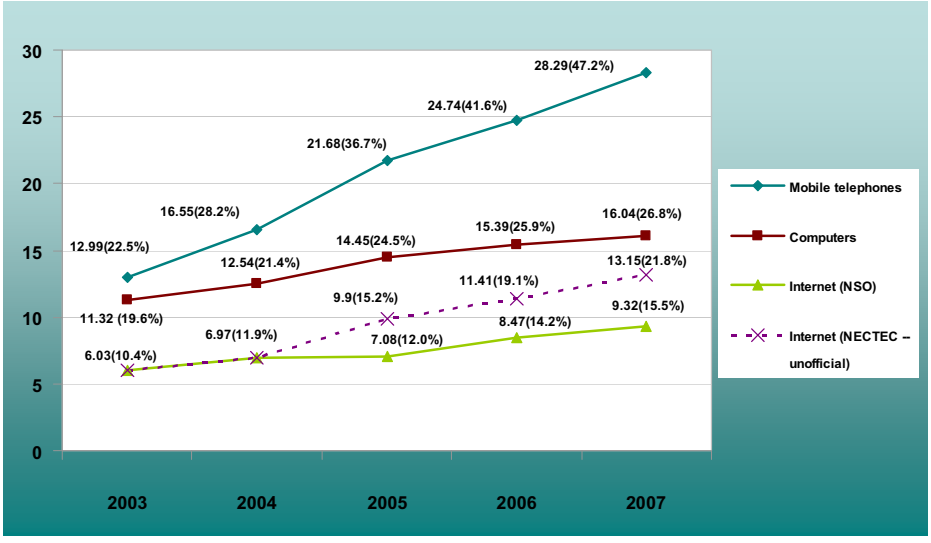

Figure 3.1 Diffusion of Mobile Phones, Computers and Internet in Thailand (2003-2007)

Source: National Statistical Office, 2007

The use of computers and internet is still rather low when compared with other countries in the region such as Singapore and Malaysia. In 2007, the percentage of computer users in the country was 26.8 percent, while internet users accounted for 5.5 percent of the total population. The gap of ICT use between those in Bangkok and its suburbs and those in other provinces was rather large. In the past, the government has tried to solve this digital divide by initiating programmes and measures to induce more computer and internet usage in educational institutions and offices at the community and sub-district levels. In 2006, the computer to school ratio was 4:1 and the ratio of computers to students was 1:61.[11] The percentage of teachers with training in ICT was 58.4 and the number of computers installed at district administrative offices all over the country totaled 7,734.[12]

[11] Unofficial data from the website of the Ministry of Education's operation center as of 8 February 2008 which shows that the current computer to student ratio is about 1:40. The report of the Office of Basic Education states that there is a shortage of 100,000 computers for all schools. http:www.moc.moe.go.th/modules.php?name=news&file=article7sid=6305 (accessed on 20 May 2008)

[12] Masterplan Integration Project, ICT Ministry.

However, it was found that there was a continuous increase in the use of high speed internet. There were 1.3 million high speed internet users in 2007 or 2.1 percent of total population, accounting for 14.12 percent of the urban population and 0.9 percent of the rural population.[13] However, this number is still considered low when compared with other countries in the region such as Singapore, Malaysia, or Taiwan.

In conclusion, it can be said that the development of ICT infrastructure in Thailand, in particular, the case of fixed telephone and internet, still requires improvements in efficiency and scale of services so that access can be improved, particularly in the provinces and remote rural areas. This will enable people to have access and use information more equitably. In the case of mobile phone, fierce competition has enabled consumers to reap benefits by being able to use this technology widely at all income levels and localities. Coupled with new technologies forthcoming in the near future, such as 3G or Worldwide Interoperability for Microwave Access (WiMAX), mobile telephones, which are highly efficient in receiving and transmitting signals, provide an important channel for access to ICT and have the highest feasibility for the majority of the people. The government must therefore pay attention to the design of various electronic services for the people in the future.

3.3.2 Evolution of ICT and technological convergence

Although Thailand is currently beset with the problem of inequality in access to information, the new technologies that will be available soon may provide a partial solution. They are:

- Backbone network which receives and transmits more information more rapidly. This will meet the continuously increasing demand of people. Currently, the communications operators in Thailand are generally ready in terms of backbone network, but they must expand the network in terms of area coverage and quality of the network in order to achieve better efficiency.

[13] TOT, Brainstorming seminar for preparing the Second ICT Master Plan (2008).

- Last mile access that connects the end user with the backbone network, which has been developed to transmit more information more rapidly at a cheaper price. They must be more versatile such as XDSL, cable modem, optic fiber cable, satellite network, broadband over power lines, WiMAX, and 3G. These will allow operators and users to have more options.
- Cellular mobile that has evolved from 2G and 3G to 4G at the present time. During the 3G age, the service was provided in many countries around the world. The outstanding features were bandwidth expansion in the wireless channel and the expansion of services from voice to new broadband services which can connect to the internet and can receive or transmit video at high speed while the phone is rapidly moving. The technology is being further developed to reach 4G, which can receive and transmit a greater volume of information at even higher speeds.
- Broadband wireless access. This includes technology which is being widely used in the country such as WiFi or technology that is now coming in such as WiMax and 3G. The advantage of the technology is that it requires lower investment than fixed technology. Many countries therefore use this technology in expanding their communication network to far-flung areas or areas with low population density, where there would be low returns on investing in fixed lines.
- Short-range wireless. It allows electronic equipment in the same area to communicate with each other. It is widely used now in private areas, but has the potential for much greater use in the future as it can receive and transmit a great volume of information while using less power. This technology has the potential to be applied for large-scale products or services in agriculture, health care, or transportation, which the country can develop in a competitive manner.

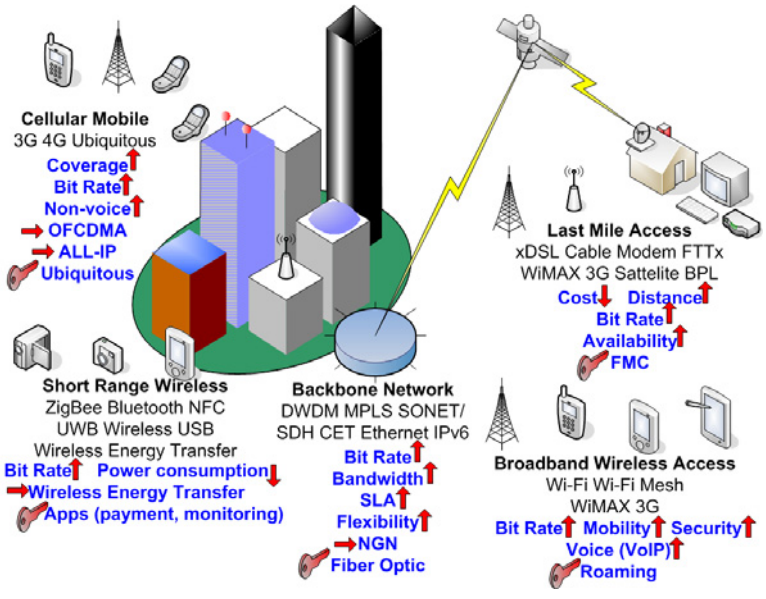

Figure 3.2 Trend of ICT infrastructure development

The evolution of technology has now reached the technology convergence age, leading to the convergence of media and services. Telecommunications technology has changed from analog system to digital system. Therefore, new applications that have been developed, such as VoIP and multimedia information transmission can be conducted through all forms of media, both fixed or wireless. The operators must compete to provide services, allowing consumers to recoup the greatest benefits.

The convergence of technology and media also covers broadcasting technology, which in the past has been separated from telecommunications technology. The change from analog to digital has allowed the integration of the two technologies and it is now difficult to separate them, as can be seen in many countries where television broadcasting has switched from analog to digital system. The benefit is not only the improvement in television picture and sound quality, but the efficiency in the signal transmission and reception has also improved. This allows for a two- to three-fold increase in the number of channels within existing frequencies. The surplus frequency from the abolition of analog can be used in other communication services or broadcasting. This also reduces inequality in accessing information and knowledge. Broadcasting can be carried out in all media, including TV in the form of internet protocol TV (IPTV) or using internet protocol for computer TVs (mobile TV). This involves the transmission and reception of video signals by communications equipment such as mobile telephones, laptops, PDAs, and others. This

greatly opens up access to information and knowledge. Currently, Thailand does not have a clear-cut policy to meet these upcoming technological changes, while other regional and global bodies have already discussed in many arenas in order to develop various consensus and plans to address these changes.

3.4 Status of the ICT market and industry

3.4.1 ICT market

The ICT market in Thailand has been growing continuously due to widespread and increased acceptance of technology by various users in the country, including the public sector, private sector, and the general public. There is an awakening to the greater use of technology, in accordance with global technological changes and progress, along with better functionality, greater diversity, and dropping equipment prices. This is particularly true for the private sector, which gives more importance to using ICT for business administration. In 2007, the ICT market in Thailand had a value of about Baht 537,818 million. The majority, or 72.7 percent, was the communications market value. In 2008, it is expected that the ICT market in Thailand[14] will grow at a rate of 13.1 percent, while the GDP growth forecast[15] was at 5.6 percent. The highest growth market is in the computer service segment, followed by software and hardware, respectively. This shows clearly that ICT, particularly software and computer services, remains an industry with high potential in Thailand.

When comparing the use of ICT among the public sector, private businesses, and households, it was found that the public sector, although making increased use of ICT, still has lower usage than other sectors.[16] In the private sector, it is expected to see an increasing trend in ICT use. However, when the business establishments using ICT are compared with the total number of businesses, they still account for a very small percentage. It is therefore a good opportunity for Thai ICT businesses to expand the market by getting private sector consumers to use ICT to increase productivity and improve their competitiveness in the world market significantly.

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[14] Software Market Potential Study 2007, National Electronics and Computer Technology Center, 2008.

[15] Fiscal Policy Office, January 2008.

[16] Software Market Potential Study 2007, National Electronics and Computer Technology Center, 2008.

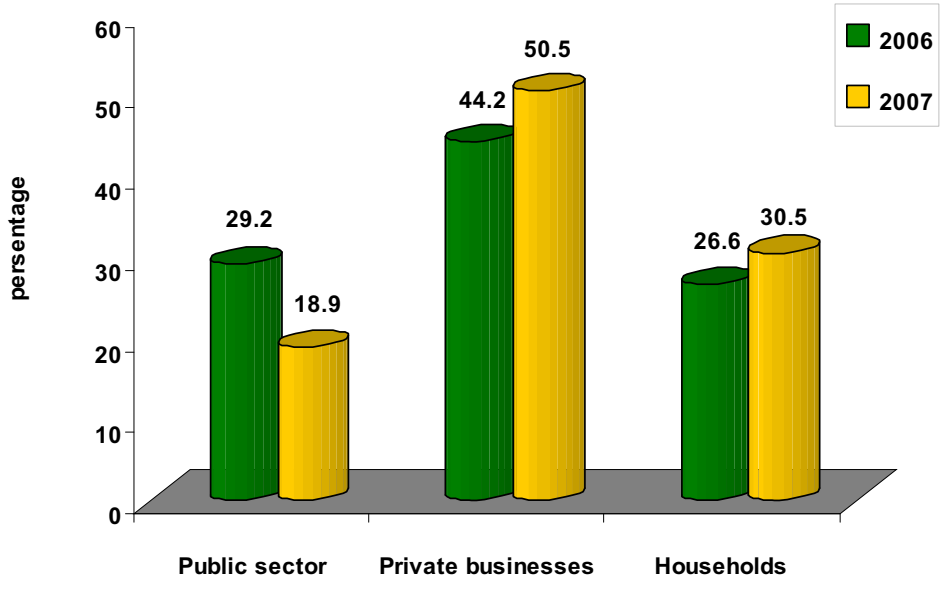

Figure 3.3 ICT Market Share by Types of Consumers

Source: SIPA/NECTEC/SWP

3.4.2 Software and digital content industries

The software and digital content industries are considered ICT industries with potential for Thailand at the present time. This can be seen from the growth of the market, which has expanded continuously. Since 1999, the average growth of the software industry has been at 20.7 percent, and it is expected to have a market value of Baht 67,262 million in 2008.[17] Currently, there are more than 1,300 operators in this industry. At the same time, the digital content industry in Thailand has also seen continuous growth both in production and consumption. During 2003-2006, the Thai digital content industry in animation and gaming grew more than 50 percent.[18] It is expected that the Thai animation industry will have a value of Baht 8,700 million in 2010.

The important aspect of the software and digital content industries is that they employ human capital or creativity as the main factor of production. Although the market is dominated by producers in the west, nonetheless, producers in Thailand have continually upgraded their outputs. If these industries receive vigorous support by the government, they would have a chance to enter the world market, which has immense value.

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[17] Ibid.

[18] Animation and Game Industry in Thailand Study 2006. SIPA, 2007.

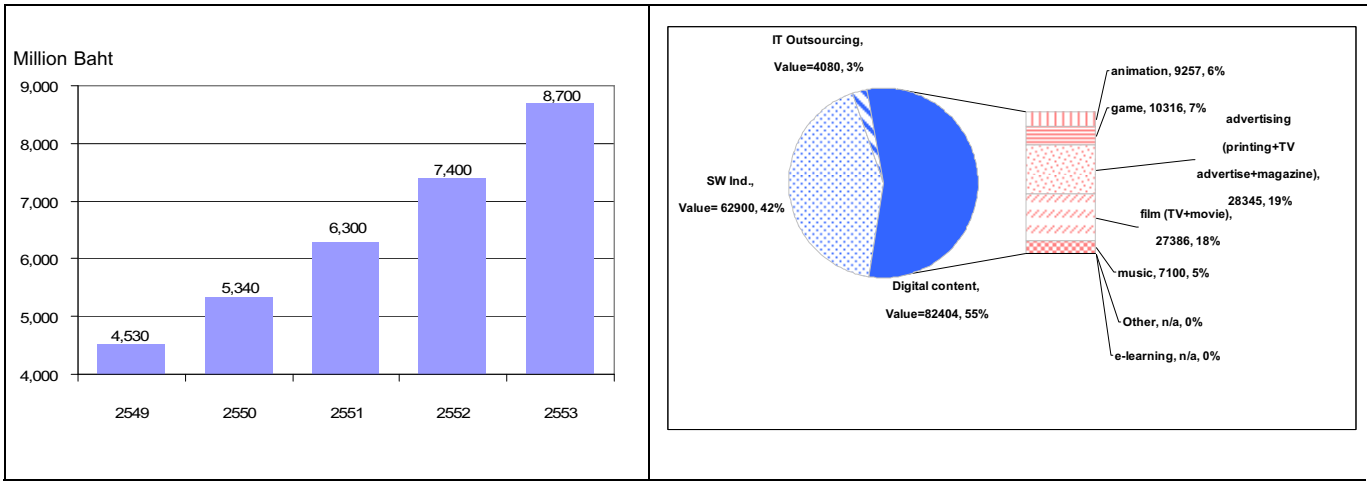

Figure 3.4 Animation Market Value in Thailand (2006-2010) and Software Industry Market Value and Breakdown (2008)

Source: SIPA, 2007

3.4.3 Changes in technology and their impacts on the ICT market and industry in Thailand

The changes in technology have significant implications on the development of ICT in the country, since Thailand still relies upon technology from abroad. Thus, the changes in technology present an opportunity in the sense that they enable Thailand to be able to select the appropriate technology that is cheap and advanced. Instead of having to develop this technology by itself from scratch, Thailand can build upon this available technology. On the other hand, technology can be a major constraint to ICT development (as well as other development) for Thailand if the appropriate technology is not selected. In this case, the country will tend to adopt technology that is expensive and not in accordance with Thai culture and way of life. In the near term, hardware technology around the world will see decreases in the price of equipment (when measuring effectiveness against pricing). But the initial price will be adjusted upwards according to the capacity and potential of the equipment. All hardware will become smaller and will have greater mobility. At the same time, they will become more versatile, including in communication and connection. There will be a shift from centralized to distributed-pervasive computing, towards a cluster operational model.

Thailand is presently the world's largest manufacturing base for hard disk drives (HDD). Hence, the continuous technological progress in HDD will strengthen opportunities in the development of the HDD industry, HDD components and related support industries, such as high precision molding, automation, etc. Other hardware components which will likely to have an impact on Thai industries include RFID. New technology has caused the price of RFID per unit to decrease significantly. All industries should therefore be able to apply RFID more broadly in the next one to two years. This will allow both large and small businesses to connect their data at all times and places. This will allow the related software industry in Thailand to have a role in the application of RFID in the context of Thailand.

There will be tremendous changes in software technology in the next five years. It is expected that software services will be able to connect all systems, including computers, mobile telephones, and other small mobile devices. The services will be increasingly on the web and software service charges will be transaction-based rather than license-based. There would be new intelligent program applications that are automatic, able to integrate data from various several sources, and able to better meet data and business needs of the users. They can be in the form of intelligent software agents supporting data access, business needs and communication with other software agents. They will be better able to meet the needs of each user. The support technology includes Web 2.0, Software-as-a-Service, Semantic Web, etc. As for open source technology, these will be more widely applied and will become an option for new users who have limited capital. In addition, open source will provide an opportunity for Thai developers to demonstrate their potential and further develop the country's research and development output.

Similar to hardware and software technology, communications and network technology will tend to become more user-friendly, more convenient, and there will be more options available. There will also be more options for internet access. This will be an important opportunity for last mile access for Thailand, which should place an emphasis on ensuring capacity for broadband and multimedia that requires high transmission and reception speed. At the present time, DSL is the most commonly used. However, it is expected that broadband wireless such as WiMAX and 3G will be used more often and will become the main technology in providing broadband services due to their low investment cost and fast equipment installation. In addition, Thailand needs applied technology

research and development for secured networks in a continuous and vigorous manner, in order to strengthen network security, and minimize loss and risk in information and communication.

3.4.4 ICT research and development

Presently, Thailand undertakes relatively little research and development when compared with other countries around the world. The competitiveness rankings of 61 countries in 2006 by the Institute for Management Development (IMD) found that in terms of expenditure on research and development as a fraction of GDP, Thailand ranked 58, while it ranked 55 in terms of the expenditure on ICT by businesses as a fraction of GDP. The number of researchers is also low. The data from the Science Citation Index (SCI) showed that the ICT and electronics publications per one million people (while higher than those of Vietnam, India and Indonesia) were lower than other countries in the region, such as Singapore and Malaysia. As for patents, Thailand only had 10 patents in ICT registered in 2005.

Thailand research and development expenditure is also low. In 2003, the research and development expenditure as a fraction of GDP was only 0.24 percent, which shows that inventions and innovation are still limited in Thailand. It was therefore found that Thailand spent a great deal in foreign exchange to import technologies. However, the above data concerns research and development in all areas; there is no data collection on research and development specifically focused on ICT.

3.5 ICT diffusion and usage in the business sector

Overall, it was found that the business sector still uses ICT (computers, internet, and websites) on a limited scale. A survey conducted by the National Statistical Office in 2006 revealed that only 20.5 percent of businesses in Thailand use computers in their offices, 11.3 percent are able to connect to the internet, and 3.9 percent have their own website for disseminating information or other purposes.

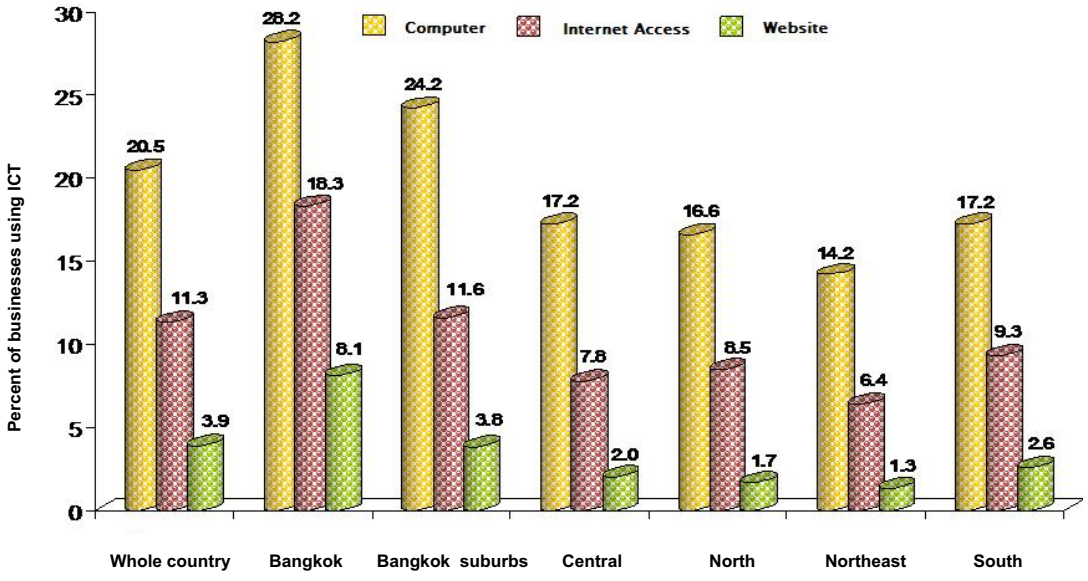

Figure 3.5 Percentage of ICT Use in the Production/Business Sector in 2006, By Region

Source: Survey of ICT Usage in Business Sector, National Statistical Office (2007)

When comparing ICT use among the different regions, it was found that ICT use, whether of computers, internet, or websites, was heavily concentrated in Bangkok and the suburbs. This shows that there is a rather large discrepancy in ICT access among business enterprises in Thailand. There is significantly higher ICT use in the south and central regions than in the north and northeast regions.

When considered in terms of business size, it was found that small businesses employing 1-15 persons use ICT the least. The size of the business has a direct bearing on the use of ICT. Big businesses having over 200 employees invariably use computers in almost all cases, as well as the internet, accounting for 99.5 percent and 93.5 percent, respectively.

Table 3.4 Percentage of Business Enterprises Using ICT, By Size of Business

Number of employees	Computers	Internet	Website
1-15 persons	18.1	9.2	2.8
16-25 persons	78.6	54.7	21.2
26-30 persons	88.0	64.4	28.0
31-50 persons	90.1	69.6	35.0
51-200 persons	96.7	83.5	46.3
More than 200 persons	99.5	93.5	65.6

Source: Survey of ICT Usage in Business Sector, National Statistical Office (2007).

It can be concluded that business enterprises in Bangkok and its suburbs have an advantage over those in other regions in the use of ICT for increasing productivity. This conclusion is consistent with the high concentration of ICT infrastructure in Bangkok and its suburbs. In addition, the survey conducted by the National Statistical Office revealed that big enterprises in Thailand use ICT (computers, internet, and websites) at a rather high rate while SMEs still hardly use any. This may be due to the fact that small enterprises (mostly family-run) still do not use ICT in business or do not see clearly the benefits of using ICT. This calls for an urgent solution since SMEs comprise a very large number in Thailand and they are distributed throughout the rural areas. If their productivity can be raised by developing appropriate technology, the value added of goods and services will be greatly enhanced for the economy as a whole.

3.6 The status of ICT use in the public sector

Covering three areas, namely, 1) public sector websites, 2) ICT infrastructure, and 3) human resources, the global e-Government Readiness[19] ranking revealed that Thailand ranks 64 out of 192 countries around the world. In terms of websites for conducting business with the public sector, Thailand ranked 50, behind other ASEAN countries including Malaysia, Singapore, and the Philippines. The fundamental obstacle related to e-Government in Thailand is due to the readiness of the infrastructure.

[19] UN e-Government Survey 2008: From e-Government to Connected Governance, http://unpan1.un.org/intradoc/groups/public/documents/UN/UNPAN028607.pdf

The evaluation of the First ICT Master Plan[20] shows that ICT development in the public sector has not yet achieved its goals regarding the linkage of databases, personnel, and management, due to various constraints such as the law, regulations, and government policy.

In terms of electronic data and services, it was found that the Government Information Network (GIN) has been developed to cover 274 government departments. Since 2006, data and information can be connected among departments in the same ministry. However, the number of connections between departments is still low. The development of databases and standards of information exchange are still at an early stage under the Information Exchange Support Program of TH e-GIF (Thailand e-Government Interoperability Framework) Phase I. In addition, the management of Geographic Information Systems (GIS) and the National Spatial Data Infrastructure (NSDI) are not sufficiently coordinated in terms of data and joint development, which would help economize costs and ensure the use of the same standards. With regards to e-Government services, it was found that they are mostly aimed at providing information or interacting with the people through web-boards (information and interaction level). There are only seven government units that provide integrated services in a single window manner.

As for human resource development, most government departments still lack personnel who are well-qualified in information management. Even though there are Chief Information Officers (CIOs) in the government units, most CIOs still lack an understanding of how to make the government information networks beneficial in providing services to the people. In addition, government departments still lack ICT personnel as the salary levels are low and there is a lack of incentives.

Regarding public administration, there are several public bodies and independent agencies supervising and promoting ICT, including the Ministry of ICT, the Ministry of Science and Technology, SIPA (Software Industry Promotion Agency), NECTEC, and TRIDI (Telecommunication Research and Industry Development Institute). However, the roles of these agencies are overlapping. Therefore, some work is duplicated, unintegrated, and not unified. The overall ICT governance is still inefficient, as each body acts according to its own perogative, so they are not moving in the same direction. There is no clear coordinating mechanism in implementing the ICT policies and there is little integration of ICT Master Plans and budget allocations. Another important constraint is the lack of a

[20] Evaluation Report of the First ICT Master Plan (2002-2006), under revision by Silpakorn University, June 2008.

supervisory body to ensure implementation in accordance with the ICT Master Plan. There is also no system to monitor and evaluate the implementation of the Master Plan in a serious manner.[21]

In developing public sector ICT systems leading towards e-Government, there are three main factors: 1) ICT infrastructure, 2) linkage of ICT networks of various departments together to improve convenience and speed in exchanging information and providing services to the people with greater efficiency and security, and 3) the development of new services by using networks linked between the public and private sector in order to reach more people. Therefore, infrastructure development should first be strengthened, both inside and outside the organization.

3.7 SWOT analysis summary of ICT development in Thailand

The analysis of the conditions related to the strengths, weaknesses, opportunities, and threats (SWOT) of ICT development in Thailand examines the environment, internal variables in terms of the strengths and weaknesses, and external variables in terms of opportunities and threats to the ICT development in Thailand. The study draws on stakeholders or those who are directly involved in ICT in the country. It also considers the status of ICT development that has already been presented earlier. These inputs have been used to reach the conclusions of the SWOT analysis. The top seven conclusions are presented in Figure 3.6.

In summary, the SWOT analysis of ICT development in Thailand shows that Thailand's ICT development and usage has continuously increased. Its strengths include a clear promotion policy, increased number of ICT personnel, and expansion of the network. There are also positive opportunities arising from external factors, such as the future expansion of the market and technological convergence, that have led to new services, which in turn has diversified consumer choices and increased opportunities for e-commerce. The areas which **require further attention are the many weaknesses that still remain. The most urgent issues that should be addressed in the timeframe of the Second Master Plan are the development of human resources, both in terms of quantity as well as quality, along with the improvement of national ICT governance, whose**

[21] Stakeholders' opinions, SWOT analysis meeting.

effectiveness must be enhanced. Otherwise, these will become obstacles for the development of other activities, since these two issues are fundamental factors for development.

The above strengths, weaknesses, opportunities and threats have led to the development of the vision, mission, objectives, goals, and strategies for ICT development in Thailand as will be presented in the next chapter.

Opportunities SWOT	Strengths SWOT
● The policy to develop the country as a knowledge-based society will increase the need for e-learning content. ● The trend for more e-business demand opens up opportunities for developing ICT infrastructure services. ● The internet opens up business opportunities. Technological progress enables services to become more convenient and speedy, thus facilitating e-commerce. ● Thailand can make use of the convergence of computer technology, telecommunications, video and audio broadcasting in providing services and developing ICT infrastructure. ● The food, agriculture, and tourism industries, which are the country's strategic industries, still have very low use of ICT. ICT can be applied to generate more value added. ● Learning basic ICT at all levels will promote the ICT market. ● Opening up of free trade (FTA, WTO) will enlarge the market size, which will not be limited only to Thailand.	● There is a good backbone system serving the whole country and providing good linkages abroad. ● The government has policies and programs to promote the ICT industry and expand ICT into rural areas. This will help build up confidence for foreign countries. ● There is an increasing pool of people with ICT knowledge and skills. There are more ICT graduates inside and outside the system. ● Administrators in both the public and private sectors appreciate the importance of ICT more, thus increasing the use of ICT in the country. ● Fixed and wireless ICT infrastructure provides full coverage in the big urban service areas such as Bangkok and Chiang Mai. ICT can be used to increase business opportunities in the provincial areas. ● New operators that receive the permit from the National Telecommunication Commission such as the Metropolitan Electrical Authority and the Provincial Electrical Authority may allow small operators to lease dark fiber and invest in BPL (Broadband over Power Line) technology so they can provide last mile access themselves. ● Thailand has the potential to produce software and digital content (such as animation) and entertainment companies can get contract jobs from abroad.

Threats SWOT	Weakness SWOT
● The government's rules and regulations are obstacles to providing e-services, thus making the e-Government development slower than in neighboring countries. ● The important competitor countries (Singapore, Malaysia, Vietnam, India, Philippines) have more rapid ICT development than Thailand in many respects. This makes countries investing in ICT more interested in these countries, instead of Thailand. ● There are shortages in qualified instructors that meet the standards and have teaching experience, making ICT skills development lag behind. ● There is still social and income inequality, along with an age gap. This makes access to ICT more difficult structurally. ● Knowledge and skills in mathematics and science, which provide the important foundation for developing ICT knowledge among Thai youth, are weak. ● Most businesses (particularly SMEs) lack experience in technology so they cannot effectively use ICT. ● Thais have low awareness of intellectual property and they do not see the value of their fellow Thais' intellectual property.	● The ICT for education budget is insufficient and imbalanced, resulting in differences in educational institutions in the urban and rural areas and imbalanced budgets for the acquisition of equipment, software, and personnel development. ● Basic infrastructure of ICT for education and for business development in the rural areas is still insufficient for quality development. ● There is still a shortage of highly-qualified personnel such as engineers, designers, programmers, and other specialized workers as labor is limited and hard to produce. ● The expansion of ICT infrastructure coverage in rural areas is limited, including telephone and internet networks. ● The government departments lack integration and data exchange between departments. There is a lack of public administration to allow people to have easy access to data and services. ● The standard formal education system has not been upgraded to meet the rapidly changing situation. At the same time, Thailand has not yet supported other forms of education (such as self-learning to obtain certification). ● Lack of English language skills in communication, learning, and application. This has prevented the application of knowledge and effective business negotiations with foreigners.

4 Information and Communication Technology Development Strategies

This chapter will present the vision, commitment, objectives, strategy and work plans related to each strategy of the Master Plan, which have been developed based on the SWOT analysis and input from stakeholders in both the public and private sectors. Key principles to be highlighted are as follows:

1. The Master Plan aims for the development of a knowledge-based society, which is consistent with the development objectives set forth in the National Economic and Social Development Plan, which is the key national development framework.

2. The Master Plan seeks to ensure continuity within the policy framework of IT 2010 and the First ICT Master Plan by continuing to emphasize the development and application of ICT for e-Commerce and e-Industry (fifth and sixth strategies), e-Education and e-Society (first and third strategies), and e-Government for the promotion of good governance in government administration and services (fourth strategy). In addition, it also places a priority on carrying forward activities in the First Master Plan that have not achieved their targets, in order to demonstrate rapid progress.

3. The Master Plan emphasizes addressing two current weaknesses as a first priority, namely: 1) developing people who are smart and information literate (see the following section for definitions) and 2) managing ICT at the national level in accordance with the principles of good governance. In addition, it also places a priority on accelerating the development of the high-speech network with universal access and reasonable prices. This is considered key infrastructure for the development of the knowledge economy and society that is dependent on ICT as a driver, and is an area in which Thailand still lags behind many other countries.

4. The Mater Plan takes into consideration goals and obligations Thailand has committed herself in international arena, notably the development of Information Infrastructure as declared in the Declaration of Principle at the World Summit on the Information Society and APEC's Bangkok Declaration.

5. The Master Plan gives priority to development which promotes good governance both in ICT administration at the national level (Strategy 2) and the use of ICT in the public sector to promote good governance in public administration (Strategy 4). These objectives are stipulated in the Tenth National Economic and Social Development Plan.

Strategy 2 calls for rapid implementation to address one of the most important weaknesses of ICT development. As shown in the SWOT analysis, Thailand needs improvement in ICT governance at the national level, which concerns with the issues such as, the agency to spearhead the development, the roles and responsibilities of all relevant agencies/organizations, the policy development and implementation mechanism, including resource allocation. This is to facilitate integration and avoid duplication.

The point in Strategy 4 should also be implemented as the government is an important mechanism in national development. It should have a leading role in ICT application in order to improve the efficiency and quality of public administration and services for the citizens, and strengthen good governance, which, according to UNESCO, includes the following aspects: participation, rule of law, transparency, responsiveness, consensus orientation, equity and inclusiveness, effectiveness and efficiency, and accountability.

6. The Master Plan provides practical guidelines consistent with the sufficiency economy philosophy that aims for development which is balanced with internal strengthening, through:

i. Developing people so they will have the capacity to develop the products that they consume. Strengthening domestic industries by promoting research and development and supporting businesses so they can be self-sufficient in the long term.

ii. Taking into consideration the existing resources and their judicious use.

7. The Master Plan prioritizes development and use of ICT in order to strengthen the competitive advantage of the economic sector in which Thailand has potential, while building on its' uniqueness of local wisdom, Thai culture and Thai identity. In particular, these sectors include agriculture, tourism and health services.

4.1 Vision, Mission, Objectives, and Goals

Vision

Driving toward “Smart Thailand” through ICT

“Smart Thailand” refers to a society that develops and uses ICT in a smart manner and adheres to the principles of the sufficiency economy philosophy. People at all levels of society should be smart and information literate. This leads to benefits for themselves and society as a whole. ICT should be managed with smart governance in order to support the development of a knowledge- and innovation-based society and economy that are sustainable and stable.

Mission

(1) Develop a labor force of adequate quality and quantity, including ICT professionals and personnel in other fields, at all levels, that are knowledgeable, skilled in the efficient use of technology and information literate, in order to develop Thailand into a knowledge- and innovation-based society and economy that are sustainable and stable.

(2) Develop a widely accessible high-speed ICT network, with quality service, and reasonable prices, in order to serve as the main information infrastructure which all sectors can use in accessing information and building capacity, and which the business and industrial sectors can use in adding value to the nation’s economy.

(3) Develop good ICT governance, with proper mechanisms, regulations, management structure, and monitoring system in place. This will allow for integrated development that is unified, efficient, and participatory in order to support good governance in government administration that is consistent with the goals of the National Economic and Social Development Plan.

Objectives

(1) To develop ICT professionals of adequate quantity and quality to meet market demand and personnel in other fields, at all levels, that are knowledgeable, skilled in the efficient use of technology, and information literate, in order to develop Thailand into a knowledge- and innovation-based society and economy that are sustainable and stable.

(2) To develop good ICT governance using the sufficiency economy philosophy. This should emphasize unity, integration, judicious use of resources and participation by all stakeholders, in order to ensure that benefits from development will reach all stakeholders equitably, through public-private partnerships as appropriate.

(3) To support economic sector restructuring for value creation of goods and services on the basis of knowledge and innovation by using ICT.

(4) To strengthen communities and individuals to access and use information in household and community activities, including seeking knowledge, building wisdom, participating in politics, governance and everyday life, in order to lead to self-sufficiency and poverty alleviation, especially among the disadvantaged, the handicapped, and the elderly.

(5) To build the capacity of ICT businesses and industries by emphasizing on increased domestic value-added, research, and development and the use of local wisdom, Thai culture, and Thai identity, in order to develop Thailand into a knowledge- and innovation-based society and economy that are sustainable and stable.

Goals[1]

(1) At least 50 percent of the population will have the knowledge and capacity to access, create, and use information in an information-literate[2] way in order to benefit education, work, and everyday life.

(2) Raise the ICT readiness ranking of the country to be at the top quartile group in the Networked Readiness Rankings by 2013. (See the box for details.)

(3) Enhance the role and importance of the ICT industry in the national economy, by increasing its share of GDP to at least 15 percent by 2013.

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[1] The overall goals and goals for each strategy represent the targets to be achieved by the end of the Masterplan (2013), unless some of the goals refer to other years or annual targets, which will be clearly specified.

[2] There is no official Thai translation for information literacy yet. In the past, there have been several translations. The key point is the awareness of the importance of accessing and being able to use ICT individuals in their daily life and their jobs. The role of ICT is now widely accepted in collecting, producing and disseminating information and knowledge more rapidly and broadly.

UNESCO (Towards Information Literacy Indicators: Conceptual Framework Paper, 2008) defined information literacy as the individual's ability to (1) recognize information needs, (2) locate and evaluate the quality of information, (3) store and retrieve information, (4) make effective and ethical use of information, and (5) apply information to create and communicate knowledge.

UNESCO is currently preparing an index to assess information literacy. Indicators will be collected to indicate level of information literacy based on the indicators, concepts, and targets reached in important international agreements such as Education for All, the Millennium Development Goals, and the World Summit on the Information Society.

Networked Readiness Index (NRI)

This index indicates the readiness of ICT development and opportunities for using ICT in national development in all sectors, including the general public, the business and the public sector. This index was developed by the World Economic Forum and is reported in the Global Information Technology Report annually. The NRI index comprises three sub-index groups, as follows:

(1) The environment and fundamental factors impacting ICT development, namely: (i) the business environment, for example, adequate number of scientists and engineers, state regulations, the impact of tax measures, etc; (ii) the political and public administration environment, such as relevant laws regulating ICT, the effectiveness of enforcing legal measures, and intellectual property protection; and
(iii) the infrastructure environment, such as electricity, telephones, etc.

(2) Network readiness, which includes the readiness of the end users, including individuals, businesses, and the public sector. The sample indicators are: (i) connection and investment in the network, including internet access by schools, access to telephone by households/businesses, government procurement of ICT; (ii) factors impacting on human resource development, including the quality of education in the country, investment in training by local businesses, the importance accorded to building and developing knowledge in science and technology; and (iii) the use of other indices in evaluation, such as the e-Government Readiness.

(3) The capacity to make use of ICT by individuals, businesses, and the public sector. The indicators can be grouped as follows: (i) the spread of infrastructure for use by individuals and institutions including computers, telephones (fixed and mobile), and internet; the level of ownership and use of ICT by government; (ii) the capability to make use of ICT, for example, to absorb technology by businesses and the effectiveness of ICT use by the government; and (iii) the level of ICT use, such as the number of online government services, the use of internet by businesses, internet traffic, etc.

NRI has an outstanding status because of its comprehensiveness and the number of countries included in the study. In the most recent year (2007-2008), this totaled 127 countries.
[Source: http://www.weforum.org/en/initiatives/gcp/Global%20Information%20Technology%20Report/index.htm]

ICT development strategies

In order to achieve the objectives and goals in developing ICT under the conditions which are the strengths, weaknesses, opportunities, and threats of ICT development in Thailand, this Master Plan has issued six main strategies. The public and private sectors should collaborate in implementing the strategies in 2008-2012. ICT should be used for building capacity to become self-sufficient and globally competitive, and for developing a knowledge-based society and economy that will lead to better quality of life of the population as a whole. The six strategies are as follows:

- Strategy 1: Develop ICT professionals and general population to be information literate
- Strategy 2: Strengthen national ICT governance
- Strategy 3: Develop ICT infrastructure
- Strategy 4: Use of ICT to support good governance in public administration and services
- Strategy 5: Upgrade competitive capacity of the ICT industry to add value and increase earnings
- Strategy 6: Use ICT to build sustainable competitiveness capacity for Thai industries

The high priority strategies that should be implemented urgently are those that aim to solve the two most important weaknesses, namely, human resources and national ICT governance (Strategy 1 and Strategy 2). Another urgent ICT strategy is the development of ICT infrastructure (Strategy 3), since Thailand's ICT infrastructure still lags behind many other countries.

Strategy 1: Develop ICT professionals and general population to be information literate

Accelerate the development of personnel of adequate quantity and quality to support the country development into a knowledge and innovation-based society. Both ICT professionals as well as personnel in other fields, along with youth, the disadvantaged, the people with disabilities and citizens at all levels should have the knowledge and skills to be information literate. More specifically, they should have the knowledge and skills to create, produce, and use ICT in an efficient, effective, ethical, and considerate manner.

Goals

ICT personnel

1. To ensure that the ICT graduates each year has those with post-graduate qualifications (master's degrees or other post-graduate ICT training), accounting for at least 15 percent of all ICT graduates

2. To ensure that the ICT personnel with professional certification that are internationally recognized accounts for no less than 30 percent of all ICT personnel

General population and personnel in other professions

3. At least 70 percent of general population can access and make use of ICT in their daily life.

4. At least 40 percent of workers can access to and make use of ICT in their work and learning.

5. At least 50 percent of public sector employees can access to and make use of ICT in their work and learning.

6. At least 10 percent of the disadvantaged can access and make use of ICT in learning and in their daily life.

7. To have websites on the internet for various groups, both inside and outside the education system, that are useful for learning, working, health and hygiene, and performing business transaction with the government, etc. Of these, there should be at least 1,000 websites with regular visits at an average rate of 1,000 unique IP per day.

8. At least 70 percent of all website visits are for learning and for creative purposes..

Strategies

I. The development of ICT personnel

1.1 Improve the format and methodology of teaching/learning in vocational schools and universities

(1) Promote the learning of ICT at the undergraduate and post-graduate level by emphasizing practical industry experience in various ways (ie, co-operative education, practice school, finishing schools), so that graduates will have the necessary qualifications that meet the needs of the market. There should also be measures to promote this, including budget allocations and tax incentives for businesses who will provide joint support.

(2) Promote open source software in the curricula of education institutions and support the use of open source software as tools for teaching/learning and research, in order to develop skills in software development, skill in software R&D, promote a new generation of developers, and support software development that builds upon the collaboration of developers from around the world.

1.2 Increase the quantity and quality of high-skilled professionals

(1) Establish a university or specialized ICT institutes to develop ICT personnel with skills in the fields that are of high priority or face high future demand, such as software engineering, information/network security, telecommunications and network engineering, and upstream ICT equipment/device manufacturing. This can be upgraded from existing institutions in order to become more specialized and strengthened.

(2) Support graduates from other fields to enroll in the institutes mentioned in point 1) or other universities in order to be retrained as ICT professionals. This can be achieved by providing incentives to students or employers, as appropriate.

1.3 Promote the development of ICT teachers in vocational schools and universities

(1) Building capacity of teachers by exposing them to new technologies continuously through train-the-trainer programs, in order to meet the rapid changes in ICT

(2) Support and promote university professors to work with various business establishments so that they are conversant with the needs of the industrial sector. This can be achieved through site visits, on-site practical training, and joint research programs. The government should provide support or other incentives, as appropriate.

(3) Encourage university professors to carry out ICT research and development at the advanced level or in new technologies. This will increase the knowledge base of the country, allowing for more sustainable development in the long run. The government should provide appropriate incentives.

1.4 Promote the development of ICT personnel for the manufacturing and service sectors

(1) Enhance the quality of ICT personnel in the manufacturing and service sectors to be up to internationally accepted standards. Incentives should be provided for training and passing professional certification examinations that are internationally-accepted level.

(2) Set up a mechanism for transfer of ICT technology by transnational corporations which are involved in government contract to Thai counterparts.

(3) Provide incentives to businesses to invest in upgrading ICT personnel through various means including advanced ICT skills training. The government may use tax measures or establish a joint public-private fund to support capacity building of ICT personnel.

(4) Promote the establishment of software developer communities in different fields such as open source software, embedded systems, and robotics, as well as,

develop a support mechanism for Thai developers so they can take part in international forums. This will facilitate further research and development and strengthen Thai ICT personnel.

II. Development of personnel in other fields and the general population

1.5 Promote the use of ICT as a tool for teaching/learning at all levels of the educational system

(1) Train/develop skills in ICT for teachers in schools so that they can use ICT in teaching various subjects.

(2) Revise/Modify the curriculum at all levels, to place an emphasis on the ability to think, analyze, and solve problems, with ICT as a tool.

(3) Teach the ethics of using ICT as part of the required curriculum at all levels.

(4) Develop electronic educational materials with appropriate content for various subjects at all levels. Existing materials should be upgraded to the standard and the government should commission the development of new materials where there are shortcomings. Once approved, they should be publicized and/or disseminate to schools both online and off-line, as appropriate.

(5) Promote the development of learning centers in schools that are equipped with various electronic media for various subjects and grades. Exchange with other schools should be encouraged in order to share the materials. Open source should be used as much as possible in developing these learning centers so that teachers and students can learn how to use open source tools along with engage in further development.

(6) Promote on-line communities for students as a forum for exchanging knowledge and opinions related with the learning subjects. Appropriate incentives should be provided such as providing recognition or awards for communities that have such exchanges. Awards should also be given to teachers who support these communities.

(7) Evaluation should be conducted of ICT programs that have been carried out, particularly in terms of the impacts on students, so it can provide the basis for future planning.

1.6 Develop ICT skills in business establishments

(1) Raise awareness within business establishments about the benefits of using ICT and encourage them to train their personnel in ICT both to gain skills and shift their job profiles to ICT instead (through training, re-training, and conversion programs).

(2) Cooperate with the private sector in the form of public-private partnerships (PPP) to promote e-learning systems for good quality ICT learning at various levels, both in terms of content and method, for the benefit of business establishments.

1.7 Develop ICT skills for public sector personnel

(1) Set ICT skills standards for public sector personnel at all levels, both for ICT personnel and other personnel who use ICT as a tool in their work. A mechanism should be created so that public sector employees should have the knowledge, capacity, and skills that are in line with the standards for their level in order to better serve the people.

(2) Set up an institute to build ICT capacity for state employees, both ICT personnel and other personnel who use ICT as a tool in their work. Suitable cooperation with the private sector should be sought. Emphasis should be placed on developing areas that face shortages or high priority areas such as information security or network engineering.

(3) Provide incentives, financial motivation, scholarships for training or further education, or career path upgrades for ICT personnel in the public sector. An evaluation study should be carried out to assess the success[3] or failure of the policy which required that each ministry/department or other agencies with equal level to appoint public sector Chief Information Officers (CIOs). This will show to

[3] The objective of having CIOs in the public sector is to let high-level officials in charge of ICT have a clear-cut role and a career path with adequate incentives.

what extent this policy has achieved its goals or how it can be improved so that the CIOs can play an effective role in leading ICT administration in their respective organizations/departments.

(4) Develop knowledge and skills in ICT and management for CIOs in the central government, regional government, and local government (to be established in the future) so that these CIOs can play a leading role and be responsible for ICT in their unit in an effective manner.

(5) Develop knowledge and skills in open source software for public sector employees so as to increase the usage of OSS in public sector.

1.8 Develop ICT learning outside the education system for life-long learning of the general public

(1) Assess the performance of community information service centers currently run by various government units, and use the findings as background for the future workplan.

(2) Set up community ICT learning centers, by building up from existing centers, units, or existing venues such as public libraries, temples, and community information centers. Electronic media should be provided along with suitable training. Portals should be developed for easy access to data/information that is useful to livelihoods and daily life of the people. One part of the information will be common information that can be used in all areas, while another part will be local information. The efforts should be coordinated with the private sector and local government units.

(3) Promote the development of content, databases, and application programs that are useful for the livelihoods and daily life of the people, such as databases concerning agriculture, health, and medical treatment, etc. These should be easy to use, searchable, and accessible via computers or mobile telephones.

(4) Promote the establishment of ICT manufacturing and repair centers in the community so as to make the best use of available ICT components in accordance with the sufficiency economy principle. Moreover, it will also help to develop basic learning about ICT for the community by relying on the

manufacturing and repair know-how of local educational institutions and businesses.

(5) Search for the champion/change agent in local areas (i.e., community leaders) who are interested and will help drive the learning process in the community, using support from the government as appropriate.

1.9 Develop ICT learning for the disadvantaged, the handicapped, and the elderly

(1) Promote the production and dissemination of various learning materials for the disadvantaged, the handicapped, and the elderly, such as audio-books using the Digital Accessible Information System (DAISY) for those who are hearing-impaired, etc.

(2) Promote equitable information access by the disadvantaged, the persons with disabilities, and the elderlies by advocating the use of appropriate standards such as web accessibility standards for the visually-impaired, closed captions for the hearing-impaired, etc.

(3) Promote research to develop technology, tools, and assistive technologies, and support technology transfer of the research outputs into products and/or services for the benefit of persons with disabilities.

(4) Support the provision of ICT equipment, software, digital content, and assistive technologies to the libraries of the disabilities associations and schools, to serve as learning centers for persons with disabilities.

(5) Collaborate with elderly associations around the country in the preparation of ICT curricula and training programs for the elderly who are interested, by possibly making use of universities and institutes throughout the country.

III. Other supporting measures

1.10 Develop a national database of ICT personnel to be used in human resource planning and development, including the demand and supply for ICT personnel annually, salary scale/wage by type, capability, and skills in each profession, based on type of professional standards.

1.11 Support associations, clubs, and networks that promote the use of ICT in a creative way.

1.12 Support the translation of foreign language books into Thai for dissemination through various channels, including electronic means, in order for Thai people to access to useful knowledge.

1.13 Support Thai people to improve their language skills, including Thai, English, and other foreign languages used internationally, to be able to read, write, and communicate well. This should start from youth and young people.

Strategy 2: Strengthen national ICT governance

Improve governing mechanisms and processes of ICT management and monitoring to achieve good governance framework by emphasizing on ensuring operational unity, efficient use of resources, and participation from all sectors.

Goals

1. To set up a central unit that will drive the national ICT agenda and coordinate integrated development. There should be a designated body with clear responsibility for national ICT development that works efficiently. There should be a mechanism for collaborating among agencies/organizations in an integrated manner.

2. To set up an ICT Council that will represent the private sector in policy coordination and collaborating with the public sector in advancing ICT policies and measures.

3. To have necessary laws and regulations that will facilitate the use of ICT and electronic transactions.

4. To have a process for budget allocation that is more efficient, avoids overlaps, helps to achieve integrated development, and uses resources efficiently.

Strategies

2.1 Improve the national ICT governance structure

(1) Establish a central unit in the ICT Ministry that is responsible to drive the national ICT agenda, including the development of ICT policies and master plans, overseeing the implementation of the plans, and developing a mechanism for monitoring and evaluating the master plan in accordance with international indicators. It should have adequate freedom in its actions and an efficient mechanism for coordinating with all related parties, which will lead to integrated development.

(2) Strengthen the unit acting as the secretariat of the e-Transaction Committee by providing appropriate personnel and budget, in order to effectively implement the Electronic Transaction Act of 2001 and 2008 and to monitor and enforce the law efficiently.

(3) Establish an ICT Council to serve as representative of the private sector to present and provide input regarding ICT development to the government. It should collaborate with the government to establish professional skill standards. It should also serve as the representative of the private sector in coordinating policy and cooperating with the government, in order to mobilize public-private partnerships (PPP).

(4) Create a mechanism for working in a collaborative and integrated manner among government agencies that are involved with national ICT development. Indicators should be identified that reflect successful implementation along these lines, which should be included in the annual performance agreement of the public sector. Such agreement will be used in developing guidelines for annual performance evaluation accordingly.

(5) Assign an agency/unit and personnel responsible for disposing or recycling electronic products and equipment, in order to avoid adverse impacts from the use of technology on the environment (such as toxic waste, wasteful use of resources, etc.)

(6) Set up an agency/unit responsible for national information security, which will be a central body charged with carrying out research for the purpose of setting policies and measures for information security at the national level. Personnel should be developed or knowledge should be transferred to the related agencies, in order to ensure implementation in accordance with the policies, guidelines, and standards.

2.2 Improve the process of proposing and allocating budgets related to ICT by the public sector

(1) Create a mechanism for collaboration among the Budget Bureau, ICT Ministry, and public sector CIOs in preparing and allocating budgets for ICT annually, to make budget allocations efficient, integrated, non-duplicating, and cost-effective. In the case of software, open source software should be considered as an option to achieve appropriate budget usage.

(2) A feasibility study should be undertaken for any government project where ICT content exceeds Baht 350 million. In the process, the project should be presented to the public or to those who will be impacted by the project in order to receive their feedback. The views of the ICT Council should also be sought. All this feedback will be used and considered in the feasibility study. When the project is under implementation, there should be a public announcement on the name of the project, brief description, budget, timeframe, and implementer or contractor. The announcement should be made to the public on the government websites and other popular public websites that have many users.

(3) Allocate ICT budgets in accordance with the direction and guidelines of the ICT Master plan.

(4) There should be an annual review and evaluation mechanism on the success of project implementation and the use of budget, both during project and at its completion.

2.3 Develop or improve related laws and regulations and their enforcement mechanisms in order facilitate the use of ICT and the conduct of e-Commerce/ e-transaction.

(1) Develop or improve related laws and regulations and their enforcement mechanisms in order to facilitate the use of ICT and electronic transaction. Also, expedite the enactment of the laws that are in various stages of approval such as the ICT Infrastructure Development Law, the Personal Data Protection Law, etc.

(2) Set up mechanisms for effective enforcement of existing laws in order to build confidence among individuals and businesspeople.

(3) Improve the ICT procurement process in the public sector to emphasize results and quality rather than considering only price. A mechanism and budget should be provided to a government agency to hire software architects, developers, and consultants to take part in the various phases of ICT procurement process. There should also be a mechanism for risk management, such as in the case of implementing project(s) with a very low price offer that performance are likely to be below the acceptable quality level.

2.4 Improve the national ICT development indicator database system to support monitoring and evaluation of national ICT development and the implementation of the ICT master plan

(1) Develop database of ICT core indicators, by requiring each unit responsible for corresponding indicators to continuously update the indicators and link them to the central unit in the Ministry of ICT, so they can be disseminated to other organizations/people. Furthermore, there should be a mechanism to follow and/or monitor the development of these indicators at the international level on a constant basis in order to continually update the Thai indicators accordingly to suit the changing environment and/or context.

(2) Prepare an online reporting and monitoring system on the implementation of the master plan by emphasizing progress on indicators listed in the plan so that other agencies and the public at large can be informed.

Strategy 3: Develop ICT infrastructure

Develop and manage ICT infrastructure in order to provide universal access to businesses and citizens around the country, including the disadvantaged and people with disabilities. The information system and network should be secured. Businesses/Service providers should put in place infrastructure that can keep up with technological evolution, in order to meet increasing consumer demand. The infrastructure should support multimedia services, electronic transactions, and other services that are useful for modern lifestyles in a knowledge-based society. At the same time, this strategy aims at reducing the digital divide which will then leads to social happiness and public at large to enjoy a better quality of life.

Goals

1. To have a backbone network which can support multimedia services for the citizen, using network technology and services that suit the geographic location and community needs with appropriate level of investment.

2. To have a high-speed broadband network with minimum speed of 4 Mbps at a fair price for the service rendered

- Every household and business establishment in the key provinces of each region and all Muang districts around the country should have access to the high-speed broadband network.
- The ratio of households and business establishments with access to the high-speed broadband network in the Muang district of the remaining province, should not be lower than 50 percent.

3. To have an ICT infrastructure to support education quality improvement and promotion of life-long learning for the citizen

- All educational institutions at the secondary level and above should be connected to the high-speed internet with minimum speed of 10 Mbps and have a ratio of computers to students of at least 1:30 by 2011 and 1:20 by 2013
- Public libraries and learning centers/community information centers at the province, district, and sub-district levels should be connected to the high-speed internet with minimum speed of 4 Mbps.

4. To have an ICT infrastructure to support services that are vital to public safety and quality of life of the citizen

- Community information centers at the sub-district level and above should have data/information for learning and employment, including internet services which the general public, including the disadvantaged, the persons with disabilities, and the elderlies, can access and use.
- All health care facilities and health centers in the rural areas are connected to the internet with minimum speed of 4 Mbps and have a telemedicine system that are functional and efficient.
- A system of disaster warning and management should be available, especially in the most needy and high risk areas, which can provide services that meet international standards by 2011.
- An appropriate resource allocation, including telecommunication resources, modern ICT network, and well-trained personnel capable of handling necessary public safety measures, ready to be operational by 2010..

5. To have in place a National Information Security Master Plan by 2010

Strategies

3.1 Establish the mechanism that coordinate and connect relevant agencies responsible for setting government policy direction on telecommunication businesses and those responsible for setting regulatory framework for telecommunication businesses so that they are consistent and move in the same direction.

3.2 Expand types of services, expand service coverage areas, and improve efficiency of the telecommunication network

(1) Set policies for telecommunication businesses on the basis of free and fair competition that will yield practical results. Measures will be undertaken to terminate all BTO (Built-Transfer-Operate) contracts by 2010. To this end, the state-owned operators must prepare plans to receive the ending of such contracts so that the possessed assets will be suitably utilized for future benefits.

(2) Expedite the development and enactment of the laws pertaining to satellite and submarine optical fiber cable telecommunication business. This will allow foreign operators to invest in network facilities and services under Thai sovereignty, and to promote efficient and high quality interconnection between Thai telecommunication networks with international networks. Subsequently, this will enhance the possibility for future expansion to become a regional information hub.

(3) Promote both domestic and foreign investment to construct and connect Thai telecommunication networks with international networks with greater capacity and higher quality. There should be suitable options for technology and routing, in order to resolve inadequate communication networks to support multimedia service both internationally and domestically.

(4) Promote investment in backbone network, both wired and wireless, to achieve quantity and combination of both systems in accordance with fair competition standard and to improve management efficiency. Support Thai operators, especially in local communities, to invest in technology options that are not exceedingly capital-intensive in order to build, connect, and provide last mile access services efficiently. Provide necessary support to regulator to issue rules and regulations for these operators to ensure that they provide services according to the principles of free and fair competition.

(5) Prepare an accelerated plan for developing ICT infrastructure in key provinces that are regional development center, as well as all sub-provincial districts throughout the country. An implementation plan should also be prepared to develop ICT infrastructure in the rest of the country at a suitable pace, in accordance with the sufficiency economy principle.

(6) Study and initiate planning for construction of high-speed broadband internet connecting with optical fiber network to serve as ICT infrastructure for modern services such as 3G mobile cellular or WiMAX. A plan should also be prepared to construct Thailand Next Generation Network (NGN), including factors for expansion of the present internet network to the new internet generation (IPv6), successfully. This will support future investment in building networks and services to be utilized for extensive benefits to Thai society, within the time frame abreast with other ASEAN countries. Implementation of such agenda has to be jointly conducted among the Ministry of ICT, the National Broadcasting and Telecommunication Regulatory Agency, and operators in broadcasting and telecommunication business. This joint implementation must be regarded as a new national agenda which is considerably important to Thailand's future economy.

3.3 Develop ICT infrastructure to enhance education and life-long learning

(1) Provide suitable incentives such as tax measures, special loans, etc so that the parents of school children can buy computers for home use. Promote private operators to supply computers for schools in rural areas.

(2) Provide incentives to operators in developing ICT infrastructure for education, such as offer special fees for operators and provide investment support, etc.

(3) Provide sufficient and suitable ICT resources allocations for education institutions around the country, including primary, secondary, and vocational schools and universities taking into consideration their readiness in terms of personnel and infrastructure. A balance should be maintained between budgets allocated for equipment, internet services, software, teaching materials, maintenance, and budgets allocated for training personnel.

(4) Promote the development of Thai language and local content that will be useful for supporting learning, livelihood, health, and public health through providing budget allocations and incentives to the private sector.

(5) Develop provincial, district, and local libraries to be partial electronic libraries so as to provide knowledge free of charge or at a low fee. The extent of services is to be consistent with the surrounding environment, readiness, and number of users.

(6) Expand the sub-district information centers, post-offices, or other community information centers so the people can access the services. Government budget support and user charges can make this a sustainable operation.

3.4 Develop ICT infrastructure for key social sectors responsible for public safety and and quality of life of the citizen

(1) The National Telecommunications Commission (NTC) or the body which will be established to oversee radio and television broadcasting and telecommunications businesses should develop guidelines to allocate resources for telecommunications, broadcasting, and ICT networks in order to provide social services critical to public safety and quality of life. This includes public health, risk monitoring, warning systems, post-disaster management, and saving lives and property. This could be achieved through setting conditions while granting businesses licenses or through other incentives.

(2) The government should promulgate laws and other measures to achieve Article 78 of the 2007 Constitution, which states, “The State should decentralize power to local administrative organizations for self- administration. The local administrative organizations should be involved in implementing state policies, developing the local economy, public utilities, and ICT infrastructure in an equitable manner all over the country.”

(3) Allocate ICT resources for health care facilities and health centers in rural area around the country in an equitable manner, by ensuring balance between budgets allocated for equipment, internet services, software, maintenance, and budgets allocated for training personnel.

(4) Promote the use of TeleHealth services that are efficient and effective so that people can have universal access to quality medical and public health services while reducing unnecessary travel.

(5) Allocate ICT resources to units responsible for warning and managing disasters so they can procure modern equipment to efficiently monitor natural disasters, such as land slides, earthquakes, floods, etc. They must also be able to provide adequate

warnings in a timely fashion, in line with international standards, in order to save lives and property.

3.5 Increase the efficiency of telecommunication and ICT Network resource management

(1) Accelerate promulgation of the Act to establish a body to allocate frequencies and oversee radio, television and telecommunications businesses, in accordance with Article 47 of the 2007 Constitution so it can enter into force as soon as possible.

(2) Establish policies and principles to oversee broadcasting and telecommunications activities, in accordance with technological evolution, by coordinating with the NTC or other regulatory bodies so that it will become a competitive industry, thereby eliminating monopolies in broadcasting and telecommunications or joint monopolies in broadcasting and telecommunications.

(3) Prepare for the impacts resulting from the switch in the broadcasting industry from analog to digital and from technological convergence. Clear-cut policies and timeframes are needed for the broadcasting development. There should be measures to integrate the allocation of resources for radio and television broadcasting and for telecommunications businesses, under one supervisory body in accordance with the law. The backbone network is to be used efficiently and there should be no duplication in investment. Technical supervisors are to be segregated from supervisors of the content that is provided to consumers through telecommunications networks and radio and television broadcasting networks.

(4) Undertake studies to set guidelines for analog to digital switching and guidelines for re-allocating frequencies for activities and/or services in an appropriate manner in order to reduce the digital divide.

(5) Prepare a database on the demand of ICT services and conduct a survey on network services that are currently available. This information should be used to monitor national ICT network development and draft policies that will yield practical results by identifying high priority areas or activities, setting timeframes, and determining the scope of suitable investment.

(6) Undertake studies to monitor technological progress and trends and to analyze technological options at suitable intervals. This will be used for making decisions concerning network expansion, resource allocation, and types of services that are suitable. These should be coordinated closely with the telecommunications business regulatory authority.

(7) Develop clear consumer protection policies that require operators to provide services that meet international standards at a fair price, while discouraging unjust competition in various forms that result from the proliferation of ICT services in the supply chain.

3.6 Accelerate the achievement of information security

(1) Specify security levels of public and private networks.

(2) Prepare a National Information Security Master Plan, which will provide measures for both hardware and software, in order to protect the information systems of organizations in the country from destruction caused by various means, such as crime and acts of terrorism.

(3) Introduce the National Information Security Master Plan, after administrative approval, for broad implementation by various government agencies and the private sector. Implementation should begin with the public sector and agencies involved in critical infrastructure such as the financial sector, public utilities, transportation, etc.

(4) Promote knowledge and understanding about the risks that may occur to information systems, which may have pervasive negative impacts on businesses using information systems in all sectors of the country. This will help devise suitable protection measures.

Strategy 4: Use of ICT to support good governance in public administration and services

Government agencies should use ICT to improve governance in administration and services. A citizen-centric approach should be adopted to provide services in an efficient, effective, transparent, and just manner. Participation from all relevant sectors should be encouraged.

Goals

1. Develop public services in a manner that is citizen-centric and facilitates business operation of the private sector. All government units should adopt the common e-Government Interoperability Framework (e-GIF) based on open standards, in order to link and exchange information. This will lead to single window service that can be expanded to provide government services online through various media by 2010.

2. Central and local government agencies should provide online channels for citizen to participate in decisions making about public policies and for disseminating public information.

3. Raise e-Government performance by 15 rankings on the e-Government rankings.

Strategies

4.1 Strengthen central agencies responsible for setting the framework and standards needed for developing electronic government services in an integrated manner

(1) Appoint a central agency responsible for designing the Government ICT Architecture, which will undertake the following:

- Set policy frameworks related to data and data communications in accordance with international standards so that every agency can link or exchange information effectively. The agency will also set policies and work plans for the government networks to be able to handle and provide IPv6 internet service by 2012.

- Set necessary standards as follows: data standards, interoperability standards, legal standards, information security standards, web accessibility standards, and other standards necessary for government ICT uses in the future. The use of open standards is encouraged to handle exchange between systems and to allow adequate flexibility for future systems expansion, without being attached to one technology.
- Enforce the standards among all government agencies using a proper mechanism so that all the systems can function together, given the multiple systems currently being used in each agency.
- Promote knowledge and understanding about the use of Open Source Software among government agencies.

The central agency should provide support and facilitate information integration and/or exchange among government agencies. Whereas government agencies that have data/information needed by other agencies should cooperate information link under the Government Information Network (GIN), and expand the networks to cover provincial and local agencies in the future. Examples of information that should be shared are water information resources, geographic information resources, etc.

(2) Declare the use of open standards in the development of ICT system in the public sector to support interoperability, and allow for flexibility in future expansion, without having to adhere to any one particular technology.

(3) Accelerate the establishment of a Civilian Map Department by 2010 in accordance with the Ministry, Bureau and Departmental Reform Act (2002), so that it can serve as the central agency for managing, overseeing, and taking responsibility for the National Spatial Data Infrastructure (NSDI) in order to accelerate work related to the Fundamental Geographic Data Set (FGDS), develop Open GIS Software, and create a mechanism for sharing geographic spatial data.

(4) Initiate an evaluation study of government e-services, with emphasis on the impacts on services recipients and/or agencies or business establishments that deal with the government. Impacts on government agencies such as the reduction of

expenses, the reduction of work procedures, increase in efficiency, etc., should be considered, so that it will serve as information for future work plans.

4.2 Develop electronic services by all government agencies

(1) All government agencies should adjust their information and management systems in order to link with NSDI and the Government Information Network (GIN), both within and between agencies, and within the framework of the TH e-GIF (Government Interoperability Framework).

(2) All government agencies should use ICT as a way to promote and support participation by civil society in national administration, especially with regard to policy and legal development, and in monitoring government's work. The Office of the Public Sector Development Commission (OPDC) should specify indicators in developing the administration system that relates to participatory public administration accordingly.

4.3 Strengthen ICT capacity for provincial government agencies and local government units

(1) Strengthen CIOs at the ministerial, departmental, and provincial levels, along with personnel in charge of ICT at all levels of the local administrative organizations. Training should be provided to enhance knowledge and skills as appropriate and in keeping with their roles and responsibilities. Practical training should also be provided through joint programs so that the overall ICT activities will be unified and consistent with ICT policies and the Master Plan.

(2) Local government units should designate personnel to be responsible for ICT who will liaise with central government agencies in order to learn about various standards and resource management, and help promote ICT activities that are in line with central guidelines. Mechanisms should be developed to work with the provincial CIO in order to implement the adoption of various standards in ICT development from the provincial level down to the local government unit level. The focus should be on the provincial level during the first three years, before expanding to the municipality and local government unit in subsequent years, when ready.

Strategy 5: Upgrade competitive capacity of the ICT industry to add value and increase earnings

Upgrade competitiveness of Thai ICT businesses through research and development and domestic innovation by the public sector, academic sector and private sector. Technology should be transferred from research to businesses. The businesses environment should also be improved, with a special focus on the software industry and digital content production

Goals

1. The domestic software market value will exceed Baht 100,000 million.

2. The proportion of software produced in the country will be more than 50 percent of the combined software market value in the country.

3. Thai ICT businesses will undertake more large government projects, accounting for at least 20 percent.

4. The value of the digital content market in the country will exceed Baht 165,000 million, with the locally-made portion accounting for at least 50 percent.

5. The value of Thai software exports will grow at least 30 percent between 2008-2013.

6. Projects run by Thai entrepreneurs will win at least 50 prizes in international competitions annually.

7. Certain cities in Thailand will become world-class ICT development centers.

8. The funding for ICT research and development in the public and private sectors will increase at a rate of at least 15 percent between 2008-2013.

9. The number of businesses that provide open source software services increases, to the ratio of at lease 10% of the total software businesses.

Strategies

5.1 Provide funding support or subsidies to incubate new businesses

(1) Establish a mechanism for the government to invest jointly with private entrepreneurs and alliances in order to strengthen and grow the ICT industry, particularly the software and digital content industries.

(2) Establish a mechanism to reduce the burden of seeking capital for entrepreneurs in the software and digital content industries, particularly for research and development and acquisition of equipment. This can include making available low-interest loans and research and development matching funds, in order to expand research and development by Thai entrepreneurs and to create projects and industrial prototypes which are in line with government demand. Providing royalty fees to owners for platform or software used is another option.

(3) Provide government assistance for supporting investment in procuring equipment, protecting intellectual property and establishing resource centers to provide business advice and services to businesses. This will reduce risk and build the competitive capacity for start-up businesses.

5.2 Upgrade Thai ICT product and service standards to meet global standards

(1) Provide funding for research and development and innovation in ICT. This will help to create or build up the capacity of Thai businesses in producing more upstream technology, especially in the electronics industry (embedded systems and high-level design), telecommunications equipment industry, digital content industry, and the software industry.

(2) Develop effective and enforceable intellectual property protection regimes, which will give impetus to businesses to continuously develop and innovate.

(3) Develop a facilitation mechanism to help inventors and innovators register patents both domestically and abroad.

(4) Strengthen institutions and mechanisms involved in testing and certifying the quality of ICT goods and services produced in Thailand in accordance with international

standards. In this connection, an agency directly overseeing ICT standards or a national committee may be set up to oversee ICT standards, which will work closely with the central body concerned with standards in Thailand.

(5) Promote research and development of technology that is an important foundation for developing networks and services in the future, for instance, future communications technology, wireless high-speed communications, and telecommunications technology options. A mechanism for transferring suitable technology should be developed to provide incentives to entrepreneurs. Emphasis should also be given to promoting participation by the private sector in research and development.

5.3 Create opportunities in marketing and competition for Thai businesses

(1) Promote the establishment of an ICT Council to bring together businesses to lobby the government about important ICT policies and/or measures that will strengthen the enterprises and boost their competitiveness overseas.

(2) The ICT Council should prepare and present to the government recommendations and pro-active measures for expanding the ICT market in Thailand and promoting opportunities in the domestic and foreign markets for Thai enterprises.

(3) Promote the creation of market opportunities for Thai businesses to compete with foreign counterparts. In expanding the domestic market, the government should be the lead consumer. Domestic businesses should not be discriminated against by the conditions set for procuring goods and services in TORs for government ICT projects. The government should promote the work of Thai businesses in foreign markets and should develop information to be used in marketing plans for both domestic and foreign markets. This should include promoting the work of Thai businesses in foreign arenas, such as international road shows, competitions, and projects.

(4) Promote the development and strengthening of software and ICT systems for sectors in which Thailand has a competitive advantage, such as tourism, agriculture, and health services. There should be a mechanism for cooperation between the software enterprises and businesses in the above sectors.

(5) Set up an ICT industry intelligence unit by promoting the development of databases pertaining to the ICT market and industry in Thailand and abroad. The information would be used for planning marketing activities both in Thailand and abroad.

(6) Promote brand building for Thai ICT goods and services so they will become well-known and accepted in the domestic and foreign markets. There should also be campaigns to "Buy Thai First" for ICT goods and services.

(7) Designate an agency responsible for the development of the national digital content industry and its strategy, in order to create necessary mechanisms for expanding market opportunities and reinforcing the potential for the Thai digital content industry.

5.4 Promote domestic and foreign investment in ICT industries

(1) The national ICT infrastructure should be developed to achieve comprehensive coverage in order to attract ICT investment in all regions and in provincial centers. ICT urban centers should be set up to absorb the growth of the industry and respond to ICT demand in the provinces. This also includes the setting up of more networks of related agencies like SIPA and Software Park in the provinces. This will incubate and strengthen ICT operators in the local areas.

(2) Provide mechanisms and incentive measures for foreign investment in ICT industries, especially industries that are related to advanced technologies. Mechanisms should be developed to facilitate knowledge and technology transfer from transnational corporations to Thai businesses or personnel. This may include setting conditions for establishing research and development units that will hire Thai researchers primarily or encouraging partnerships with Thai universities.

(3) Review conditions and/or steps related to securing privileges under the Board of Investment (BOI) so that ICT operators at all levels, particularly those in the software and digital content industries, can receive full benefits from these schemes.

5.5 Promote open source software businesses and services in Thailand

(1) Promote understanding among developers and users of open source software and electronic media, particularly with regard to license agreements so they understand them and make use of them properly.

(2) Build opportunities in applying open source software in the education sector and public sector. There should be no discriminatory measures against open source software systems in TORs for public sector ICT projects.

(3) The agency which supports the software industry development in the country should provide support using a funding or subsidy scheme (in 5.1) in order to have more developers with expertise in open source software.

Strategy 6: Use ICT to build sustainable competitiveness for Thai industries

Encourage manufacturers to access and use ICT to produce and trade products and services that are knowledge-based, use innovation and environmentally friendly. This will develop the competitive capacity of businesses by value creation and domestic value added, and will prepare businesses to compete under free trade regimes in the future.

Goals

1. Increase the proportion of businesses that use ICT in their business activities, with 50 percent of businesses connected to the internet.

2. Increase the number of small enterprises (employing 1-15 persons) with internet connections by 25 percent.

3. Increase proportion of businesses that sell and provide services on the internet by 5 percent.

4. Increase the value of electronic commerce in the form of B2B and B2C in the country by at least 50 percent a year.

5. Reduce logistical expenditures to 16 percent of the GDP in 2011 (as specified in the Logistics Development Strategy of Thailand, 2007-2011).

6. Increase employment for ICT-related personnel in business sectors to 200,000 persons.

7. Increase the number of agricultural cooperative networks to at least 10.

8. Set up a national health information system that is integrated among various agencies and is functional.

9. Raise the ranking of Thailand in the e-Readiness rankings of the Economist Intelligence Unit (EIU) up by 10.

Strategies

6.1 Build awareness and develop capacity in ICT for businesses to allow ICT to be used for business applications by providing suitable incentives or developing public-private partnerships. This may begin with pilot projects in sectors in which Thailand has high potential, before expanding into other areas later.

6.2 Apply ICT to develop and manage the logistic system more efficiently and effectively

(1) Encourage entrepreneurs to apply up-to-date logistics management techniques by promoting e-Logistics in strategic industrial clusters, such as automotives, electronics, and food. This modern technology that is based on open standards will allow for linking information and systems more efficiently. There should be an implementation plan that is functional and having mechanisms to deal with problems that may arise.

(2) Review the lessons from the evaluation of the state single window service and improve the national logistics system to make it more comprehensive and efficient.

6.3 Build confidence in electronic transactions

(1) Accelerate the adoption of laws currently under review, for instance, the Personal Data Protection Law, the sub-laws of the Electronic Transactions Law and other laws necessary for building confidence in electronic transactions. Enforcement mechanisms for existing and future laws should be enhanced for greater efficiency and effectiveness.

(2) Promote knowledge and understanding for citizens and businesses in order to build confidence in electronic transactions. This will be achieved through disseminating information and public relations so people will understand the laws and their enforcement.

(3) Accelerate the strengthening of consumer protection mechanisms and the process to facilitate settlement of disputes relating to online transactions.

6.4 Promote the use of ICT in strategic manufacturing and service sector

Agriculture

(1) Develop and connect important information concerning farming, particularly information related to water resources management in the community, agricultural products price, and land use. Strengthen cooperatives so they can use information and knowledge to improve quantity and quality throughout the complete agricultural trading cycle (including logistics management from production to processing, wholesale and retail sales in the country, and export). Start by studying the data needs of farmers and supply chains in detail, in order to develop an understanding of the behavior and information demand that can be applied for real practice.

(2) Promote ICT learning networks for farmers through existing channels in rural areas, such as community service centers, schools, temples, post offices, cooperatives, and other rural organizations. Build up “trainers” in rural areas to provide advice about ICT to farmers.

(3) Provide infrastructure and information development (in Thai) by concerned agencies. The private sector should oversee the format and the distribution method, using a suitable business approach so that it will be a sustainable undertaking in the long term. Pilot projects should be conducted in sample communities.

(4) Promote and support pilot projects for precision agriculture so that production can be controlled to meet established goals. This will increase agricultural output and quality in communities that are ready.

Tourism

(1) Promote ICT use and develop ICT capacity (such as internet, e-commerce, payment systems, reservation systems, online marketing, etc) for tourism businesses and related industries such as transport, so that technology can be applied systematically to serve tourists throughout the tourism supply chain.

(2) Promote the production of online information to recommend tourism sites in the country as well as popular service establishments, in particular, heritage tourism sites or local sites with Thai cultural identity and local wisdom content. This can be in many forms such as video clips, web-based information, etc, which will help support existing tourism web portals and initiate the development of online booking for various services.

(3) Follow up and evaluate various plans or projects carried out by the public sector, for instance, online marketing master plan for tourism, website development, etc, with emphasis on the impact on operators and end users, in order to review and make improvements in the future.

Health

(1) Develop the National Health Information System for practical use by integrating data collection projects related to medicine and public health from various public agencies. It should be expanded by connecting to private hospitals and clinics that are well-prepared. Emphasis should be placed on setting data standards, integrating data, developing a mechanism for protecting private data, and promoting the use of the standards that have been established.

(2) Develop systems for follow up, monitoring, and warning for new and emerging diseases that are consistent with international standards and connected to international networks using suitable technology.

(3) Publicize and disseminate the progress of Thailand's health services to foreigners through several channels, including tourism networks, to attract visitors and build up confidence in the Thai health care system.

6.5 Enhance competitive capacity of small and medium enterprises (SMEs) and community enterprises (OTOP)

(1) Evaluate past projects/activities with a focus on their impacts on entrepreneurs and consumers, to serve as the basis for further improvement and planning future work plans and projects.

(2) Promote SMEs to have access and use ICT for their activities by providing incentives for investing in ICT, for instance, through tax measures allowing deduction of ICT expenses that are above actual expenses. Promote greater use of Thai software, for instance, through setting up a software cluster in each industry or raising business consumer confidence in using Thai software by issuing certificates to Thai software companies that meet the standard.

(3) Develop ICT capacity of SMEs and community enterprises by providing suitable incentives or cooperation mechanisms with the private sector. This can be achieved by conventional training or e-learning.

(4) Promote the use of e-commerce by community enterprises (OTOP) so as to support the use of local wisdom and culture in creating value for goods and services that have high market potential. Locally-available ICT infrastructure, such as local information centers and sub-district administrative offices, should be used to enhance the commercial potential of these products.

(5) Use ICT to share best practices or success stories, such as winning awards, disseminating results, supporting expansion, etc through social webs.

(6) Let public sector units benefit from using ICT which is widespread in the community (mobile telephones, radios, televisions) in order to disseminate knowledge about livelihoods and economic news useful for developing goods and services. This is in order to raise the capacity of community enterprises.

6.6 Promote the use of ICT in energy-saving measures to reduce business expenditures and enhance sustainable competitiveness

(1) Promote research projects about the use of ICT for energy-saving or conserving the environment in order to develop equipment, tools, and systems which will help to reduce energy use and/or conserve the environment in the long term, both within each agency and for the country as a whole.

(2) Promote successful petroleum fuel-saving projects on a pilot basis, such as working from home, virtual online conferences on high-speed networks, intelligent transport systems, etc.

5 Management, Monitoring and Evaluation

To effectively implement the Second ICT Master Plan for 2009-2013, a framework for management, monitoring and evaluation will be an important tool.

5.1 Management

In order to ensure implementation of the Master Plan, the ICT Ministry should establish a central coordinating unit in the Ministry to take responsibility for advancing the national ICT agenda; developing policies and master plans; directing and driving the plans towards implementation; and developing mechanisms for monitoring and evaluating the implementation of the plan using indices conforming to international standards, as stated in Strategy 2.

Moreover, a working committee should be established for each strategy, which will include internal ministry personnel and personnel from other related ministries, in particular, the units that have been designated the key agencies in various measures of each respective strategy. Meetings should be called to formulate the working guideline for each strategy, in order to develop plans and identify priorities for various measures and pilot projects that will be consistent with the timeframes indicted in the Master Plan. Clear milestones should be identified for each measure, including urgent projects.

The management of the Master Plan will emphasize the development of working mechanisms that will lead to cooperation and integration among the government agencies that are involved in ICT development. These include the National Telecommunications Commission, the National Information and Communication Technology Committee, the Electronic Transactions Commission, the Ministry of Science and Technology, etc. The ICT Ministry must promote understanding, acceptance and cooperation in using the national ICT Master Plan as the basis for developing ICT master plans at all levels by each agency, in particular, agencies that are identified in each measure and strategy. Each agency should draft or adjust their five-year master plans in order to be consistent with the timeframe of

the national Master Plan. In promoting understanding and acceptance of the national Master Plan, the ICT Ministry must allocate funding for public relations targeted at both central and provincial agencies to increase awareness and understanding of the importance of the national Master Plan.

In addition, mechanisms for appropriate resource allocation should be developed by linking work plans, budget plans and human resource plans. A framework and principles should be drawn up for considering public sector work plans and projects jointly by the central coordinating unit of the ICT Ministry, the Budget Bureau, government CIO representatives, the Civil Service Commission and the Office of Public Sector Development Commission, in order to ensure that implementation by government agencies will be consistent with the Master Plan. A monitoring and evaluation system must be developed, along with indicators for efficiency and effectiveness at the project level. The central coordinating unit under the ICT Ministry should be the primary unit charged with managing these mechanisms.

As for implementation by other ministries and attached units, there should be an ICT Committee for each ministry and unit, which will be responsible for managing plans at each respective level. The CIO should serve as the chairman of each committee. The committees should report to their higher-level committees every six months. The National ICT Committee will be responsible for managing the Master Plan at the overall level, with implementation support from the central coordinating unit of the ICT Ministry.

In order to ensure that ICT development successfully fulfills the stated goals and can respond to the demands of all parties in an efficient manner, the government should allow the private sector to be involved in providing input to the government regarding ICT development, to collaborate with the government in setting professional standards for ICT personnel, and to be involved in coordinating policies and implementing public-private partnerships (PPP). An ICT Council should be established to serve as the representative of the private sector in this regard, in accordance with Strategy 2. Furthermore, the government r should provide opportunities to the civil society to provide input and suggestions concerning public policies and legislation, in accordance with Strategy 4.

5.2 Monitoring and assessment

The implementation of the Master Plan should be monitored so that the implementation by the related agencies (ministries, departments and attached units) is in accordance with and comprehensively addresses the goals and main strategies for development which are laid out in the Master Plan. The agencies should be involved in developing the monitoring and evaluation system, as follows:

(1) Developing indicators to measure success and impacts of the implementation of the Master Plan, which will be useful in monitoring and evaluation. There should be three levels of indicators, namely, outcomes, output and efficiency of the implementing units.

(2) Developing a database of core ICT indicators and indicators for development achievement at all levels. A network should be created to link databases by requiring agencies in charge of each indicator to constantly update their data and link the data to the central unit for dissemination to other agencies and the general public. The indicators should be studied and monitored regularly, particularly at the international level, to improve the list and the definition of Thailand's indicators in a timely manner.

The central coordinating unit of the ICT Ministry should be the main agency in charge of developing these indicators and creating this database system, in cooperation with the National Statistical Office and in coordination with other main agencies, such as the National Economic and Social Development Board, the Budget Bureau, the Civil Service Commission, the Office of the Auditor General, and the Office of Public Sector Development Commission, etc., in order to ensure that the database uses the same standard.

The central coordinating unit of the ICT Ministry will be responsible for monitoring and evaluating progress in implementing work plans and projects on an annual basis. Systematic evaluation will be undertaken at the mid-point of the Master Plan. The monitoring and evaluation results should be disseminated to all agencies and the general public. They should also be used in improving the management system or in adjusting the master plans and work plans of each agency to best respond to any future situations. The Office of Public Sector Development Commission should also consider incorporating these indicators in the annual performance evaluation of the public sector agencies as well.

The initial achievement indicators for the Master Plan include, as follows:

1. Overall indicators for the Master Plan
    - Information literacy Indicator of the Thai people
    - Rank of Thailand in the Networked Readiness Rankings (NRR) of the World Economic Forum (WEF)
    - Percentage of GDP accounted for by ICT industry
2. Indicators for Strategy 1
    - Proportion of ICT labor force with educational attainment higher than Bachelor's degrees
    - Number of ICT personnel who have been certified against internationally-accepted professional standards
    - Number of personnel who have specialized knowledge and skills, particularly in the areas of network/information security, software engineering and telecommunications and network engineering
    - ICT access and usage rate among the general public
    - ICT access and usage rate for work and education among enterprises
    - ICT access and usage rate for work and education among public sector personnel
    - ICT access and usage rate for education and daily life applications among the disadvantaged
    - Proportion of people accessing websites for educational or creative purposes
    - Number of public sector employees who have knowledge and skills on open source software
3. Indicators for Strategy 2
    - Existence of a central unit that will drive the national ICT agenda
    - Existence of an ICT Council that will represent the private sector in coordinating policy and collaborating with the public sector in advancing ICT policies and measures
    - Existence of laws and regulations that will facilitate the use of ICT and e-commerce

- Cost-savings from integrating public sector projects that are overlapping in nature

4. Indicators for Strategy 3
    - Number of households and businesses around the country (in target provinces, districts, cities and other locations) that can access the high-speed network
    - Number of secondary schools that are connected to the high-speed internet
    - Ratio of computers to students in educational institutions at all levels around the country
    - Number of public libraries and community learning centers/telecenters at the provincial, district and sub-district level around the country that are connected to high-speed internet
    - Number of public libraries and community learning centers/telecenters at the provincial, district and sub-district level around the country that provide special services for the disadvantaged, handicapped and elderly
    - Number of health facilities and clinics around the country that can access high-speed internet and tele-medicine services in an effective and functional manner
    - Allocation of telecommunications resource and ICT networks for public safety programs
    - Number of personnel who have received correct training in public safety
    - Unit which is responsible for coordinating among various agencies that are involved in public safety
    - Development of a national information security master plan
5. Indicators for Strategy 4
    - Number of government agencies which use the TH-e-GIF standard and can actually connect and exchange data
    - Single window service by government units that provide services to citizens
    - Satisfaction of citizens regarding government e-services
    - Number of central and provincial government agencies that provide on-line channels for citizens to participate in public policy decision-making

- Rank of Thailand in UN e-Government rankings

6. Indicators for Strategy 5
    - Value of domestic software market and the proportion of software produced in the country
    - Number of large government projects undertaken by Thai ICT businesses
    - Value of the digital content market in the country and the proportion of digital content locally-made
    - Value of Thai software exports
    - Number of projects run by Thai that win international prizes
    - World-class ICT cities
    - ICT research and development expenditures by government and private sectors
    - Number of businesses that provide open source software services
7. Indicators for Strategy 6
    - Proportion of businesses that use ICT in their business activities
    - Proportion of businesses that sell and provide services on the internet
    - Value of electronic commerce in the form of B2B and B2C in the country
    - Expenditure for logistics in the country
    - Number of the labor force within ICT in the entire business sector
    - Number of agricultural cooperative networks that use advanced ICT and receive tangible benefits
    - National health information system that is integrated among various agencies and is functional
    - Ranking of Thailand in the e-Readiness rankings of the Economist Intelligence Unit (EIU)

Appendix

The Working Group on Formulating The Second Thailand ICT Master Plan (2009-2013)

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Published and distributed by

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