I INTRODUCTION

In the new era of information society, it is information that is the mostimportant factor of production and wealth creation. How well an individual, an organization, and an entire society can harness, access, share, and make use of available information will ultimately decide their ability to generate economic growth and to enhance the quality-of-life for all.

Behind it all will depend on the ability to integrate and apply such technologies as computer, telephone, television, electronic mail, on-line information search, multimedia, and a multitude of other related technologies. They make up what is collectively called information technology or IT.

The far-reaching use of IT in the information society will alter significantly the way one lives, works, learns, and entertains. All because of the two empowering properties of IT. With computer and automation technology, it extends the intellectual capacity of man, as well as frees human-being from routine, repetitive and dangerous types of work. With telecommunications technology, it tears down distance, geographical, and time barriers, and in many instances can substitute for traveling.

The wide-spread use of IT, therefore, holds promising potential to spread economic activity, democratic principle, wealth distribution, and social benefits across every region of the country, thus greatly enhances the possibility of reversing the migration trend to the Bangkok Metropolis and stems the tide of ensuing social ills. IT might also help to reduce pollution and traffic, and could facilitate telecommuting from home or a nearby telecommuting center. Wide-spread and affordable rural communications networks could provide on-line information or serve as the vehicle to deliver public services to remote rural residents such as distance learning and telemedicine. Telephones, electronic mail (e-Mail), and facsimile (fax) can, in addition to traditional postal service, be used to instantly gather citizens' opinion or problems. Similarly, television, radio, on-line information service, and two-way flow of information with citizens can complement prints to arm citizens with needed information or allow them to participate in government decisions and policies, thus strengthening democracy and improve governance.

Not only it is important for citizens and the government alike to understand and recognize IT as a key to increase productivity of individuals, business, or evengovernment, but it is also just as vital to realize that IT must be viewed as a tool for achieving broader national objectives, both social and economic. IT is definitely not merely an end in itself.

To harness the full potential of IT investment for a nation, IT must be treated as an invaluable tool not only for business, but also for government to use in support of various major national policies and development programs.

In sum, IT can play a pivoted role in particular to support many of the government's policies for better distribution of wealth and opportunity to rural inhabitants; for equal opportunity to personal and corporate development, healthcare and other public services; for solving the chronic traffic gridlock and worsening pollution; for conservation of the nation's natural resources and environment; in addition to that of making the country a regional hub for finance, manufacturing and trade, transportation and tourism.

However, it is no less important also for the government to ensure that anystrategies for IT development must be so geared with an aim firmly in mind to reduce the substantial gap between the information "haves" and "have-nots", not to further widen it. For, it is all too easy for the more affluent and the better educated segments of society to gain most from the use of IT. Whereas the city-poor and the rural residents alike are more likely to be left even further behind.

The overriding objective is therefore one whereby information and the applications of IT in support of national development can create equal opportunity and provide benefits for all segments of society, including the under-privileged, the disabled, and the remote rural residents. Only then will our national social and economic development be successful in transforming Thailand into a sustainable economic power-house of Southeast Asia where a high standard of quality living is for all to share in the Age of Information.

And here is a vision of how we strive to do just that.

II FROM VISIONS TO REALITY: THE KEYS TO SUCCESS.

As we have underscored, IT empowers human ability to reason and gain wisdom, to bridge distances and to interact, communicate and work.

IT not only make what we can do today much more easily, quickly, and efficiently. IT can also make possible new ways of working, learning, communicating, and solving problems. Generally, IT can improve the quality of life.

Through a host of new technologies: computers, data communications, and electronic media, IT offers new possibilities and opportunities to support the quest for :-

- a well educated population and a well-being society
- a more effective rural development and wealth distribution program
- a better environment and natural resources conservation effort
- a new direction to build economic strength and social harmony

Several new world conditions have emerged in recent time. There are, for examples, the ending of the larger conflict in Indochina, the conclusion of GATS, the formation of NAFTA, AFTA, etc. These conditions pose both new sets of opportunities and threats to many countries, Thailand included.

Thailand now stands at a crossroads. We must set out to develop the country into a modern regional hub in Southeast Asia for:

- Financial Services
- Manufacturing and Commerce
- Transportation and Tourism
- Human resources development

or others, waiting in the wing to seize the opportunities, will.

IT will be instrumental in turning these opportunities into reality, only if we learn how to. We must compete or lose them to rivals who are more able to exploit the potential of IT.

For us to be able to utilize the full potential of IT, to achieve the widest possible use across all social sectors and geographical regions in the country, three fundamental prerequisites must be in place and function together. They are:-

- A National Information Infrastructure (NII)

- A Well-educated Populace and Adequate IT Manpower
- A Dare to Dream and A Resolve to Act

At the most basic level, we must have the physical infrastructure -the so called superhighways and access roads- to transport information in the coming Information Age. We will also need a population capable of generating and utilizing the information and knowledge in the offering via the NII to the fullest extent possible. Equally importantly, we must dare to dream, to paint visions of new applications, new ways of doing things in ways that suit us most. That we cannot import or copy wholesale from elsewhere.

It will be the inter working of these three pillars that will bring about the most social and economic benefits to the widest breadth of society, that will enhance our ability to compete on a worldly basis, and that will lead to sustainable good quality of life for all.

In short, IT empowers us to succeed as a part of the global community in the 21st century. And this is what we must do.

AGENDA # 1 : INVEST IN AN EQUITABLE INFORMATION INFRASTRUCTURE :-TO EMPOWER HUMAN ABILITY & ENHANCE LIFE QUALITY.

The phrase national "information infrastructure" or NII encompasses more than a nationwide telecommunications facility to carry, exchange, store, or process message, voice, data, and images.

NII includes: telephones, pages, fax machines, switches, copper wire & coaxial cable, satellites, fiber optic cable, microwave transmission, computers, printers, compact discs, scanners, bar-code readers, cameras, televisions, monitors, and an ever wide-ranging range of new equipment and technologies, notably in applications and systems software.

The most basic building block for a NII is the telephone service and the high-speed telecommunication backbone linking the entire nation. It must be one that is both *universally available* and *accessible*, just like superhighways and roads that are easily and openly accessible to transport goods and people in our present Industrial Age.

While a NII is as equally costly to build as the transportation network of highways and roads, it is nonetheless far much quicker to do so. It also invokes far more interest on part of the private sector. It yields much faster and higher rates of return. And it brings about much more social and economic benefits to the wider sector of society. All because NII provides the means to tear down geographical barrier that transportation network cannot completely or cost-effectively be capable of overcoming.

Where Do We Stand Now in NII?

Our current position with respect to the telecommunication backbone is in many ways better than many other countries.

In terms of voice, data and TV transmission, Thailand can boast of a front-line position in the use of state-of-the-art technology. We had reached a high 71% in digital switches, leapfrogging such countries as the US, UK, Australia, and Japan, for examples. Digital transmission easily surpasses the 90% mark overall, while all the switches and transmission for international telecommunications are fully digital.

Thailand has already laid several thousand kilometers of optical fiber cable linking major cities across the nation. The backbone is augmented by two national satellites operating in both the C and Ku bands. In addition, the country had invested in several submarine optical fiber network that will link the country to the rest of the world.

In the arena of wireless telecommunications, there has been a dramatic growth in paging, and particularly cellular telephone. By the end of 1994, the number of cellular telephones, both analog and digital, should be around half a million, representing some 17% of fixed line telephones.

Nonetheless, several key weaknesses remain to be tackled. Thailand now lags considerably behind when it comes to service quality, unmet demand, network utilization, and especially, the telecommunication regulatory regime. Moreover, the total number of computers and ,in particular, data terminals is extremely low by any standard.

What is particularly worrisome is the question of universal service, namely an NII that is both universally available and at affordable costs.
The Important Issue of Universal Availability

If the state is to succeed in implementing its major policies to create job opportunities and achieve a more equitable wealth distribution to all regions, or to provide equal opportunity to receiving education, healthcare, and other state services to all, or to conserve and protect the environment and whatever natural resources that remain, the government must act now to redress the grossly imbalance availability of basic telecommunications services.

A widely available and affordable basic telephone service is one important condition to effective rural development. Failing that, we will not derive the utmost benefits from all the mammoth NII investment already carried out, underway ,or planned for.

While the statistics may look impressive. There will be about one telephone for every 10 persons by 1996, and one for every 5 persons by 2001. In reality, only about a third of the population residing in the Metropolis and large cities will benefit from it. Many tambons (sub-districts) and almost all the 60,000 plus mu-baan (villages) are still without public telephone service. All the one million telephone lines currently under installation by a private

firm in the provincial area will only serve large cities and major towns where revenues are highest.

The prevailing situation can only lead to further widening of the income gap. The issue of service costs (to be discussed later) further aggravates the situation, as it tends to favor users in the Bangkok Metropolis and penalize users in the faraway cities locating in Zone 3 the most. Such a situation would only deter the current drive by this government to promote and attract business investments to some 60 provinces in Zone 3.

There has not been real interest on part of the state, not to mention the private sector, to invest in basic telephone service to the outer rural and remote villages. There has been little or no clear focus at all on the role of telecommunications in promoting rural development efforts.

In contrast, the US, and similarly in UK, Japan and Australia, telephone service had long since been made available to every home that requests one. Moreover, in the US cable television service now can reach 96% of all homes. The US Congress had also adopted in 1993 the National Information Infrastructure Act designed to promote a seamless web of communications networks, computers, databases, to link people, businesses, schools, factories, hospitals and private clinics, government departments, universities, research institutes and libraries across the country. Such an NII will connect small businesses in the most rural region of America to the entire national and international market place never before envisaged.

It is true to say that, line on line, it costs much more to invest in telephone service among the remote rural villages than in cities and towns, by several to tens of times more. It also yields much less return in direct revenues generated as would be the case for cities or towns.

However, it is also true that, line on line, the *indirect economic return* from rural telephone service (or more precisely, the saving from economic loss incurred by not having telephone services) is much more enormous than the direct revenue generated by a city line. In addition, there are numerous other unquantifiable but clearly identifiable social benefits derivable from it as well.

The Issue of An Equitable and Affordable Access

An adequate number of installed telephone lines is a necessary pre-condition, but not a sufficient one. Line and service quality at acceptable standard is also very important. Service charges must further be more equitable and reasonably affordable, so as not to exclude the larger segment of society that is less endowed or living in more remote regions from Bangkok.

Traditionally, transmission technologies used to be distance cost-sensitive. It costs more to communicate the further apart are the communicating parties.

All that have been changed by modern technologies. Satellite transmission cost is essentially the same irrespective of distance. Fiber optical cable's potentially unlimited capacity also make distance less relevant to cost factors.

A more affordable long-distance rates would encourage uses and hence likely to more than adequately compensate for the loss of revenues from rates reduction, as telecommunications is widely known to exhibit price-elasticity. Moreover, the increased usage by users is likely to fuel further demand in new services. That would lead to new revenues and improved network utilization rates, thus making better use of idle capacity and capital investment.

The South Korean policy makers proved to be farsighted in anticipating and exploiting new opportunities created by new technologies. In its 10-year Rural Telephone Network Modernization Program (1978-1987), some 24,100 villages with more than 10 households were all connected to the nation's telephone network.

In so doing, South Korea has achieved a more balanced social development and a more equitable distribution of economic activities and income across all sectors of society.

AGENDA # 2   : INVEST IN PEOPLE
:- BUILD A LITERATE POPULACE & AN ADEQUATE INFORMATION TECHNOLOGY MANPOWER BASE

Having a widely available and accessible NII is an important pre-requisite. It is also very important that the NII be given **valuable contents that are useful and attractive** to most segments of society. Only that could attract a critical mass of active users, and derive the maximum benefits. The active use of facilities will in turn drive the pace of investment in NII and new service introductions.

To attract many users, services, applications, and information access must be very simple or **user-friendly**. It invariably requires a host of qualified professionals and specialists to develop suitable applications that are user-friendly, as well as to develop information, databases, and any other services that are useful. It is important to understand that applications and information contents that meet local needs best can never be wholly imported, but to a large part they must be developed locally.

The NII would therefore need an adequate well-trained IT manpower stock to design, install, operate and maintain, in addition to helping other experts developing useful and friendly applications to ride on the NII.

Moreover, for the benefits to filter down to all segments of society, there must be a literate and well-educated population. Without that, the society as a whole could not be expected to be active generator and consumer of new knowledge and information. Only so

will the country be able to move up into higher plane in preparation for the coming Information Age of the 21st century.

The critical shortage of almost all types of technical and managerial manpower must be urgently eliminated. The greatest shortfall of all is in software and telecommunications engineers and technicians. It had been estimated that in 1996, there will be an unmet demand in IT manpower at the degree levels of close to 10,000. Should the trend continues, the shortage will grow to over 15,000 by 2001.

With the accelerated pace of high economic growth expected to be brought about by continuing strong exports performance, the future Southern Growth Triangle and the Northern Growth Quadrangle Developments, the Air train Gateways, etc. the needs for technical manpower and particularly in IT manpower can only accelerate further.

The current weakness in the provision of education and training facing the country could in part, be cost efficiently and effectively corrected by the use of IT and NII.

Distance education employing information technology such as multimedia, interactive video, the Internet , and so on can augment the education and training of school children and higher education students, or provide necessary continuing education to adults to develop further skills and knowledge.

It can help provide the opportunities otherwise denied to a large portion of society who attained four or less years of basic education to learn at a time, place, and pace that suit each individual's learning needs. Advances in IT also offer novel means to present and demonstrate difficult concepts and theories in ways more interesting to learn and easily understood.

Here again, we will need supports from professionals and experts to produce the necessary quality courseware for electronic delivery on demand to the home, school, or workplace.

To prepare for a future workforce in the Information Age, and to ensure an adequate IT manpower base the country will need, all school children must learn to use IT. Teachers and university lecturers must provide role models in the use of IT. The training of teachers and lecturers in acquiring at least an adequate basic IT skills is therefore very important; so is the need to instil in children the ability to seek out only what is good and reject the undesirable among information on the future information highway.

A massive program to introduce computers, multimedia, and distance education facilities to all state schools is timely, appropriate, in fact, imperative. The drive must be accompanied by the development of suitable courseware specifically designed for delivery electronically using IT. Training of human resources to undertake the development is the utmost top priority for all investments to be cost worthy.

The current administration is well aware of the paramount importance of human resources, the most important and enduring resources of all. Education unprecedentedly receives the largest share in public expenditure. The government is in the process of expanding compulsory schooling from 6 years of primary education to lower secondary or 9 years of basic education.

The effort to build a better human resources base and better future for the country includes measures to provide milk to pre-primary kids between 3-5 years old, and to provide lunches to needy school children. The school milk program now extends to all state's primary one pupils, moving on to include primary two next year and so on. Under the current fiscal year, the government has budgeted 3.6 billion baht for the free milk and free lunch programs.

A school computerization program can well supplement the government's firm commitment to build a healthy and well-educated population. Such a plan would not only directly benefit schooling pupils and teachers alike, but the investment would also be instrumental for adult education and training, through the Non-formal Education Department. The investment needs not be so high as well compared with the school free milk expenses, a recurring yearly budget.

AGENDA #3: INVEST FOR GOOD GOVERNANCE

Information Technology holds promises to profoundly change the way we live, work, learn, and play. The changes that may well follow from such a pervasive and enabling technology can only be described as revolutionary.

The undertaking to develop IT must involve everyone in society, not least is the critical role of the government.

The state must provide the prime moving force. It must dare to dream and conjure up visions, visions of how to harness the potentials, how to apply for the fullest benefits of all, how to prevent or reduce ill effects that naturally arise from changes, and what a drastic change it is with IT.

The state must be vigilant against and find solutions to possible ill effects. Risk of information disparity must not materialize. There should be universal communications services to bridge the current knowledge and income gap, and not widening it just because the poor cannot afford to use IT. Personal integrity and privacy must not be violated. Intellectual property right for electronic information must be protected. Cultural dominance must be safeguarded against, and so on.

The state must play the important role to encourage, promote, support, and coordinate the development, institutional, infrastructure, industry, or human resources. The state must function to remove critical obstacles. It must, itself, believe in and make full use of IT, to provide a role model to society.

National Information Technology Committee Secretariat

The transformation into a fully-grown Information Society will be an arduous journey. We must start on that journey sooner or later. The journey will be smoother in reaching its intended destination only if the whole society take active part. For that, the state has the mandate to show the way forward.

Considering that some decades ago when mainframe computers became commercially available to the world, the Thai government was a clear leader in utilizing IT, followed only by the banking sector. Now the state has slipped far behind the private sector in all counts. At present the government sector's investment in IT is extremely low and uneven. Only about 25% of all IT manpower work in the government departments and state-own enterprises. The state is experiencing considerable IT manpower brain drain to the private sector. The fast pace of technological changes makes continuous training and skills upgrading in IT a necessity to avoid obsolescence. Yet training of IT personnel in the government sector amounts to about one tenth that of the private sector. The gap is widening with ever accelerating pace of technological changes.

In contrast, the US government, for example, spent some $25 billion in 1993 for IT alone, a sum almost equal to the entire national budget for Thailand.

All public agencies and government departments must be equipped with IT and their personnel adequately trained to utilize the potential of IT. Such opportunities to use IT, if properly capitalized on, will improve public services and administration work. It will also reduce administrative costs and improve working conditions.

Public databases, geographical information systems, and information networks can play an important part in the use of IT by the public administration, businesses, and the general public. They are, for example:

- statistics (economic, social, and demographics etc.)
- agriculture price information and extension services
- education data
- public health and patient records
- laws and regulations
- business registrations
- international trades and markets
- natural resources, energy and weather forecast
- tourism
- land, sea, and air transportation
- land ownership, etc.

Wherever possible, the public service sector must provide citizens and businesses with choice to contact public agencies electronically, riding the NII. All government departments must have the ability to send and receive electronic mail, or to search databases for needed

information. At the same time, government information that are public should be made accessible by the general public electronically on demand.

In the process, it will set good example as an IT user to the public. A society whose citizens can clearly perceive the benefits of IT will turn them into active users themselves.

But merely to invest in IT facilities and personnel is only a pre-condition. To achieve the likely full benefits, more rational work routines and new ways of working must be designed and introduced.

III THE WAY FORWARD: OUR RECOMMENDATIONS

While IT undoubtedly holds enormous potential to better the life quality of citizens. One must understand that IT is merely a tool to help realize our aspirations. Investment in IT alone cannot achieve what we long for by itself. First, one needs to be aware of possibilities and requirements. Then, we must clearly define our goals and objectives. And lastly, there must be a persistent will and efforts by all concerned to carry them through.

For that, the government has a critical role to play in a range of issues. The least is in tackling and fulfilling the common agenda outlined in Section II, namely:
- o to build an equitable national information infrastructure
- o to invest in people
- o to reengineer the public sector and enhance government service

In the following, we propose strategic directions and initiatives which should be taken in the above three most important areas of IT development.

1. BUILD AN EQUITABLE NATIONAL INFORMATION INFRASTRUCTURE

Strategic Directions:

- **Wire up rural Thailand necessary to support the government's major policies to create employment and distributes wealth to rural regions of the country, to open up new opportunity and equality for education and personal development, to create a more open and equal access to basic public services.**
- **Reform the Telecommunications Acts to make them more relevant to modern technological and global business environments.**

Initiatives:

(a) Provide all villages throughout the country with basic telephone services within 5 years.

(b) Improve the quality of communications networks, both metropolitan and rural, up to no less than internationally practiced norms and standards.

(c) Make available access to data transmission service to all parts of the country, and to all parties, be they large or small business and organizations, as and when required .

(d) Rationalize, through legislative amendments, all communications rates (local, long-distance, and international) for a more equitable access in order to meet all basic and some value added service needs of the widest segments of society.

(e) Undertake a comprehensive review of all related legislation with an aim to correct and introduce new legislation and regulations that will promote the development and the widest possible use of IT.

Policy Recommendations:

1.1 Embark on a Five-year Rural Thailand Communications Expansion and Modernization Program.

Specific goals:

(a) To install telephone lines to no less than 12,000 remote tambons and villages with over 6,000 million baht a year for five years so as to provide nationwide universal service by the year 2000.

(b) To provide all villages with 20 households or more with at least one public telephone booth, and also ensure the overall public telephone penetration rate in the provincial areas to be over 2 : 1,000 population.

(c) To meet the data transmission need of large and small business and organizations located in rural provincial areas throughout the country with transmission service capacity of up to at least 64 kbps.

Such an investment compares negligible to the overall budget merely to upgradehighways across the nation into four-lanes network, at a cost of 40,000 million baht for the first phase and an expected cost of 103,330 million baht over the next 10 years for the second phase with more to come.

Both the highway network and the proposed rural telephone network expansions all aim to support the present government's policy to distribute economic development to rural regions and to cut travel costs.

1.2 In All Future Major Communications Projects, Government Must Ensure a Reasonable Share of the Benefits Be Given to the Rural Region.

Specific goal:

(a) For the planned six million telephone expansion during the 8th Plan, and including any other projects, a certain equitable portion must be enforced to meet needs of remote rural residents, a measure which the current one million provincial telephone installation project had missed out.

(b) Differing needs of communities, large or small, must not be over- looked.Views of local residents should be sought and incorporated in so far as they do not deviate from the national objectives.

1.3 Establish An Independent Telecommunications Regulatory Body.

Specific goal:

   (a) Through legislative reform, an independent telecommunications committee
        should be given the important function of facility and pricing regulation.
   (b) To set up a fair and transparent regulatory framework so as to encourage private
        sector participation in NII and to ensure services provision under a fair and truly
        competitive environment.

The objective is to ascertain the development toward a national communications network and
services that are equitable, accessible, and of sufficient quality to meet societal needs. At the
same time, the committee must balance the above overall objective with the interest of all
networks and services providers, so that there is a fair and reasonable return on investments
derivable.

1.4 Review and Reform the existing Telecommunications Acts and Other Related Acts.

Specific goals:

   (a) To establish a flexible telecommunications regime that can meet the future
        challenge under a rapid changing technology and a strong competitive climate of
        the world.
   (b) To introduce legislative measures useful to facilitate and promote IT use across
        the society. Prioritized issues demanding attention are, for examples,legality of
        electronic orders or signatures, data and information ownership, freedom of
        public information, personal privacy protection, protecton against information
        deemed damaging to culture or the best interest of Thai society, or even a Public-
        sector Paperwork Reduction Act.

2. INVEST IN PEOPLE

Strategic Directions:

   - **Accelerate the supply of IT manpower at all levels to eliminate the current
     critical shortage and to meet the expected huge demand growth in future.**
   - **Make IT an integral tool in education and training at all levels. The use of IT
     in education must not be restricted to science and technology, but to include
     the humanities and the arts as well.**

Initiatives:

(a) Give all teachers, college lecturers and professors, all school children and college students opportunities to learn to use IT. The objective is to employ IT as an enabling tool to access information and gain knowledge through self-paced learning, or through interactions with teachers and fellow students.

(b) Link schools, colleges, universities, and libraries electronically to provide students, teachers and lecturers an enriched environment in which distant resources can be made available remotely at finger tips.

(c) Make full use of IT and distance education to meet the needs and aspirations of all citizens for continue education and skills upgrading without regards to age, profession, distance, or geography. Special attention must be given to the disabled in particular.

Policy Recommendations:

2.1 Implement a "National School-Informatization Action Program"

Specific goals:

(a) To achieve within five years a PC density in all state schools throughout the country of:
- at least one per 80 primary school pupils
- at least one per 40 secondary school pupils

(b) To allocate, on a continuous basis, an annual budget of 1,000 million baht to acquire the IT equipment necessary, such as PCs, communication modems, and where appropriate, satellite receivers and multimedia equipment. The amount should be sufficient to equip state schools with up to 30,000 PCs a year, a substantial part of which should be linked into networks. The need for hardware and software maintenance and upgrading and of training of users must be taken into full account.

(c) To connect all universities, colleges, and later on, secondary schools to the Thaisarn/Internet, so as to allow students, teachers and lecturers to communicate with one another as well as to access libraries, databases, and computing resources nationally and globally.

The investment represents no more than 30% of the current expenditure level to provide free milk and lunches to pre-primary and primary-one school pupils in 1994.

2.2 Establish a "National Interactive Multimedia Institute" to Facilitate the Development of Educational Courseware and Application Software.

Specific goals:

(a) To make the Institute the a national center to oversee the development of interactive multimedia technologies and its dissemination, the design and development, the outsourcing and the distribution of courseware and interactive CAI/CAL packages, or the licensing and adaptation of useful commercial packages.

(b) To provide an annual budget of at least 400 million baht as a start to support the development of technologies and courseware packages both within and through outsourcing. The diverse knowledge base widely spread across each region throughout the country should be exploited to create a thriving localized information service industry made up of large and small firms and professionals.

(c) To make available as wide a range of courseware as possible to cater for all segments of society, from formal education to non-formal and specific skills training both for school and college students, and adults, including working professionals, teachers and lecturers, etc. In particular, all schools where resources are minimum must be adequately supported in technical and administrative matters to gain the most from the facility so made available.

(d) Make full use of large and centrally located schools, colleges and universities that are well equipped during the evening and over weekend for adult education and skills upgrading through remote training employing IT facilities available.

This is a critical component in maximizing the benefits to be gained from the National School-Informatization Action Program. It will also minimize the unnecessary and wasteful duplication of efforts and of highly specialized and difficult-to-find expertise that the country could ill afford in the development of relevant quality distance-education and self-learning training materials.

2.3 Intensify IT Manpower Production At All Levels.

Specific goals:

(a) To raise significantly the production of technicians and engineers in IT, grossly insufficient now and in the near future. In particular, the supply of computer and telecommunications manpower should at least be doubled in 5 years.

(b) To upgrade curriculum and facility in IT courses at college and university, and take drastic measures to recruit and to retain faculty staff in areas of critical shortage, including the employment of expatriate lecturers from overseas as a stop-gap measure. Immigration regulations and laws are to be amended to allow the issuance of work permit covering the entire duration of employment contracts.

(c) To promote aggressively private sector participation in the provision of secondary and tertiary education, especially in IT related education and training.

3. ENHANCE GOVERNMENT SERVICES AND FORGE A STRONG INFORMATION INDUSTRY

Strategic Direction:
- **Seize and make fuller use of new opportunities offered by IT by all public agencies in order to deliver good and efficient services to all citizens, whereby setting a good example as an active IT user to society, while simultaneously improve substantially the effectiveness of governance as well.**
- **Provide top priority supports in particular to SMEs everywhere in order to build a strong and thriving local information industry from hardware, software, contents, to a whole range of information and other necessary supporting industries.**

Initiatives:

(a) Invest substantially in IT to support the provision of essential public services such as education, health care and medical services, agriculture extension services, and other important social needs of all citizens.

(b) Re-engineer public agency work routines and methods in order for the use of IT to produce improved service and reduce public administration costs.

(c) Promote electronic connections among public agencies, and between the public sector and citizens or companies, including the ability to receive and answer electronic mails, to access public databases, or to obtain many other public services on-line, without wasting valuable resources in seeking them.

(d) Provide adequate incentives and essential supports in creating a conducive operating environment for the private sector to play a key role in the quest for a strong future information industry. A close public and private sector collaboration in various undertakings such as marketing, research and development (R&D), technology diffusion, human-resources development and so on will be vital for the country to fully realize the vast potentials the private sector is capable of achieving in the manufacturing as well as the utilization of information technology.

Policy Recommendations:

3.1 Launch a "Nation-wide Government Informatization Program ".

Specific goals:

(a) To mandate no less than 3% of the state's annual total personnel expenditure for IT investment in the public sector. Of this, 2% shall be used for the acquisition of computers and network facilities, including software and databases. The other 1% shall be used for human resources development of government employees in relation to the utilization of IT and the provision of information databases.

(b) To allocate as evenly as possible across all state agencies and departments in proportion to one's annual personnel expenditure. This would be in addition to any large scale IT investments for special purposes to be approved on a case-by-case basis by the Cabinet.

(c) To earmark no less than 200 million baht a year to develop or procure relevant and easy-to-use common applications such as in searching public information from state databases, exchange of electronic mails, on-line declaration and payment of fees and taxes, application for licenses, and other public services provisions.

(d) To provide one-stop public service kiosk wherever possible, for example, by using ATM terminal pools throughout the nation. This will safeguard against any likely social discrimination so that all can equally receive these benefits.

It is known that proper use of IT has resulted in considerable labor productivity gain well in excess of 5%. In the public sector, the Singapore experience showed that its government computerization program launched in 1986 had resulted in a return of $2.71 for each $1 of IT investment. The benefits included better and speedier public services to citizens resulting in considerable saving of social costs.

The ease-of-use feature of these applications is particularly essential in realizing the most in productivity gain, which not only results in substantial reduction of public administration expenditure and social cost, but also in gaining greater public confidence and approval in the use of IT as well.

3.2 Make IT Planning an Integral Part of the Annual Government Budgeting Exercise and IT Policy Research an On-going Effort.

Specific goals:

(a) To make NITC, backed by ample support, to conduct on-going IT policy research necessary to provide on a continuous basis:
- the foresight, needed directions, and policy decisions in IT to aid the planning of state agencies and departments;
- a good understanding of the impacts, especially those adversely affecting society at large, with recommendations to prevent, alleviate or overcome impending or existing social ills associated with the use of IT.

(c) To issue a set of comprehensive guidelines through the collaboration of the Ministry of Finance and the NITC, to be used by all state agencies with an aim to make IT planning an integral part of the annual plan and budget appropriation exercise.

(d) To consolidate all such departments' plans into an overall National IT Implementation Plan which provides details with regard to each agency's:
- goals and objectives to be achieved
- budget allocation
- specific activities to be undertaken
- results achieved from previous year's plan
- problems and impediments in meeting goals and objectives
- recommendations and suggestions

It is recommended that each department submits its IT plan annually in the form of a rolling, three-year forward procurement plan. Such a plan should detail the agency's estimated expenditure on IT related activities, including hardware and software procurement and write-off, the areas and functions under the agency to be automated, and the results to be expected from the implementation plan.

Many governments had introduced mandatory forward IT procurement plan by state agencies, for example, Australia with three, the US. and Malaysia with five year forward plan, to be reviewed on a yearly basis.

3.3 Support the Development of a Strong Local Information Industry.

Specific goals:

(a) To ensure the provision for adequate and long-term investment for R&D and technology diffusion in all areas from software, hardware, information networks, multimedia to manufacturing technology, service provisions, and useful applications like healthcare, education, trades and manufacturing, for examples.

(b) To encourage full private sector partnership with the state in the development of information technology through such useful measures as tax and fiscal incentives, availability of loans, and government procurements and outsourcing. The private sector can and must be encouraged to play a vital role in financing the construction of NII, or in the provision of information and telecommunications services, hardware manufacturing, media creation, R&D, technology acquisition and diffusion, education and training of IT manpower etc.

(c) To ensure that a major portion of the software development and training be outsourced to promote local information service industry, particularly to the SME's in the rural regions across the country. To help make outsourcing of software development transparent, as well as resulting in better compatibility and higher success rate, a set of standard system development methodology should be adopted for use by all government agencies.

(d) To monitor, through NITC's research arm, the world and local market and technological trends in IT (both hardware and software) so as to identify any market niches, and to propose appropriate strategies and measures to promote local information industry development, the investment for skills upgrading, technology transfer, R&D, the adequate protection of intellectual property, the promotion of market and local job creation throughout the country.

(e) To strengthen public and private sector institutions. For instance, the National Electronics and Computer Technology Center could well serve as a national center for the diffusion and the exchange of relevant information and knowlege in IT, among manufacturers, users, or between users and manufacturers and service providers.

3.4 Promote and Support Electronic Means for Citizens and Businesses to Interact or Trade with Government, Among Themselves, or With

the World Community.

Specific goals:

(a) To pave the way in making Thailand a fully-fledged regional center for trade and industry by speeding up the implementation time-table of EDI for international trade, as well as to facilitate efforts to set up EDI standards and to promote the wide usage of EDI in other main areas of importance, such as in public administration, manufacturing, finance and commerce, and transportation.

(b) To consider the establishment of a Government Information Network (GINet) with an aim toward a more efficient government, which not only can reduce costs and improve effectiveness in public administration, but also lay the basis to realize opportunities for government to deliver many public services to citizens and businesses alike electronically.

> For further information, please contact :
> NITC Secretariat, National Electronics and Computer Technology Center
> Ministry of Science Technology and Environment
> 73/1 NSTDA Building
> Rama VI Rd., Rajtevi, Bangkok, 10400, Thailand
> tel (662) 644-8150..99 fax (662) 644-6653
> Internet : nitc-sec@nwg.nectec.or.th
> Web : http://www.nitc.go.th