2000 The Year of E-Everything and E-Commerce

Prof. Dr. Srisakdi Charmonman and Dr. Kanokwan Wongwatanasin

Dean of Internet and E-Commerce
Assumption University of Thailand
charm@ksc.net

President of Internet KSC
Bangkok, Thailand
kanokwan@thailand.net

1. Introduction

We are surrounded by reminders of the growth in the capabilities of information and communication technologies, especially the Internet. The use of the Internet as an interface between the public administration and citizens as well as businesses comprises a broad and growing range of applications but the most important is the Internet and World Wide Web. The Internet will change the way you live. The Internet will change the way you learn. The Internet will change the way you work. The Internet will change the way you play. The Internet will change everything. Everything will converge on the Internet. All of those activities are occurring with the help of the Internet Service Providers (ISPs) and related organizations providing access to the Internet and related services such as electronic commerce. By January 2000, about 69.59 million Internet hosts are connected in about 250 countries and territories. A host may have 1-100 terminals. A terminal may serve 1-20 persons. Assuming that a host serves 10 persons, the number of people on the Internet may be said to be about 347 - 695 million in the year 2000 and expected to be over one billion in a few years. The year 2000 may also be said to be the year of “e-everything” from “a through z”, such as e-auction, e-banking, e-booking, e-commerce, e-dating, e-education, e-entertainment, e-fax, e-government, e-housing, e-knowledge, e-learning, e-loan, e-mail, e-music, e-phone, e-reservation, e-tour, e-trading, e-travel, etc., up to e-zoo. This paper presents a brief history computerization and Internet in Thailand, Internet for Education (E-education), E-Government, and E-Commerce.

2. Computerization and Internet in Thailand.

As shown in Figure 1, the number of Internet hosts in over 250 countries as of January 2000 is 69.59 millions. If there are 5 - 10 users per host, the number of Internet users would be 347 - 695 millions. An Internet host may have only one user, but another may have several hundred users.

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1 Invited keynote presented to the Seminar Program Assumption Graduated School at Dusit Resort Pattaya, February 5-6, 2000
The number of Internet users vary widely from one source to another source. While the estimate according to the number of hosts above is 347-696 millions for the year 2000, the estimate from Jupiter Communication is only about 228 millions for the year 2002. Jupiter Communication said that 62% of all Internet users are in the United State, that there is one new user every 1.67 seconds, and that by the year 2002, the USA market will hit 85 million users. Jupiter Communication indicated that in the year 2000, non-US users are the majority of Internet subscribers, and that by the year 2002, the Internet users for the whole world will reach 228 millions users with 85 million in the United States and 140 million outside the United States.

In July 1960, His Majesty the King provided the first and most important inspiration for modern computerization of Thailand by visiting the IBM computer plant in San Jose, California, USA, as shown in Figure 2. In 1961, the SEATO Graduate School of Engineering (now AIT or Asian Institute of Technology), which was a part of Chulalongkorn University, confirmed the realization of the importance of computer technology by presenting a scholarship for a Ph.D. level studies in computations in the United States, to the M.S. graduate of the first graduating class with the highest grade. The scholarship was given to Srisakdi Charmonman who went to Georgia Institute of Technology in the United States in 1962. In June 1964, after only two and a half years, he earned his Ph.D. in Computations with the written purpose of preparing the graduate to play a key role in computerization of Thailand.
However, in order to gain more practical experience, Dr. Srisakdi stayed on to become Director of Graduate Studies in Computer Sciences at the University of Missouri-Columbia, and later Full Professor of Computing Sciences at the State University of New York before returning to Thailand to become Professor of Applied Statistics, Head of Computer Department and President of the Staff Association at the National Institute of Development Administration (NIDA). Later, Dr. Srisakdi became the first engineering professor in Thailand to be promoted to the C-11 level (the highest level in government service) or Distinguished Professor of Computer Engineering at King Mongkut’s Institute of Technology.

His Majesty the King and Her Royal Highness Princess Maha Chakri Sirindhorn have always shown their interest and leadership in the computerization of Thailand. An example is shown in Figure 3 where HM the King and HRH the Princess visited the computer exhibition at King Mongkut’s Institute of Technology Ladkrabang. Another example is shown in Figure 4 when HRH Princess Maha Chakri Sirindhorn presided over the opening ceremony of the seminar on Computer in Ratanakosin Era.

Figure 3. HM the King HRH Princess Maha Chakri Sirindhorn at KMITL Computer Exhibition.

Figure 4. HRH Princess Maha Chakri Sirindhorn Presided over the Opening Ceremony of the Seminar on Computer in Ratanakosin Era.
Another example is shown in Figure 4 when HRH Princess Maha Chakri Sirindhorn presided over the opening ceremony of the seminar on Computer in Ratanakosin Era.

In 1964, the first computer, IBM 1620, was installed in Thailand at Chulalongkorn University and the second, IBM 1401, which was ordered before the one at Chulalongkorn, was installed at the National Statistics Office.

Minicomputers were introduced in Thailand in 1972 and microcomputers in 1978. One of the first microcomputers brought into Thailand, Radio Shack TRS 80, was hand carried by Dr. Srisakdi and used to start the first Bachelor’s degree program majoring in Business Computer at Assumption University. The term “Business Computer” as a formal education major had not been used in any other countries except Thailand where it has since been adopted at most universities in the country. By the year 2000, the number of computers in Thailand is over 2 million and the approximate numbers from 1964 to 2000 are shown in Table 1.

<table>
<thead>
<tr>
<th>Year</th>
<th>Approximate Numbers of Computers</th>
</tr>
</thead>
<tbody>
<tr>
<td>1964</td>
<td>2</td>
</tr>
<tr>
<td>1975</td>
<td>70</td>
</tr>
<tr>
<td>1985</td>
<td>23,000</td>
</tr>
<tr>
<td>1995</td>
<td>1,000,000</td>
</tr>
<tr>
<td>1996</td>
<td>1,300,000</td>
</tr>
<tr>
<td>1997</td>
<td>1,600,000</td>
</tr>
<tr>
<td>1998</td>
<td>1,800,000</td>
</tr>
<tr>
<td>1999</td>
<td>2,000,000</td>
</tr>
<tr>
<td>2000</td>
<td>2,300,000</td>
</tr>
</tbody>
</table>

In 1981, an international computer publication called “Computer Asia” published in Hong Kong set up an international committee to select “Asian Computer Man of the Year.” As a proof that Thailand is not behind any other countries in the computer field, a Thai was voted “Asian Computer Man of the Year 1981” as shown in Figure 5 which is the front cover of the magazine.

Figure 5. Asian Computer Man of the Year 1981.
Another proof that the Thai government realized the importance of the computer field is on human resource. Earlier, the highest position a computer professional could reach in civil service was Position Classification Level 8 such as Director of the National Computer Center. Therefore, after a computer professional had reached C-8 in civil service, he had to change his field if he wished to be promoted higher. Later, the Thai government allowed a computer professional to be promoted, if he is qualified, to the highest level of C-11 which is equal to the Permanent Secretary of a Ministry. The first computer professional to be promoted to C-11 was in 1988 when Dr. Srisakdi became Distinguished Professor in the field of Computer Engineering at King Mongkut’s Institute of Technology Ladkrabang and later awarded the highest royal decoration as shown in Figure 6.

2.1 The Birth of the Internet.

Many papers have been published and/or presented concerning Internet and related topics in Thailand [1-45].

In 1969, the US Department of Defense (DOD) Advanced Research Project Agency (ARPA) established ARPANET as an experimental network to support armed forces research. In war, it has to be assumed that any part of the network could be destroyed at any moment and the remaining portion must still work. Therefore, to send a message on the network, a computer puts the message in an envelope which is called an Internet Protocol (IP) packet and put the receiving address on the envelop. The responsibilities of sending the packet is not placed on the network (which is assumed to be unreliable) but on the sending and receiving computers.

The Internet Protocol software have been made available on all kinds and brands of computers. Thus, a user can buy whichever computer he likes and connect it to the Internet.

Then came UNIX operating system with Internet Protocol and the popularity of local area network (LAN). So, the whole LAN can have connectivity with ARPANET, i.e. each computer on the LAN can have access to ARPANET.

In the late 1990’s, NSF (the US National Science Foundation) established five supercomputer centers. Dr. Srisakdi visited one at the University of Illinois and found that the cost was over 70 million US$. That kind of cost is expensive even in the US standards. As supercomputers should be shared, a researcher closer to any supercomputer should have his terminal connected to that computer. The ideal solution at that time was to use ARPANET for the connection but it did not work because of bureaucracy. So, NSF decided to build its own network based on ARPANET’s IP technology. The network was called NSFNET. It connected the five supercomputer centers by 56 kbps telephone lines and any user can use telephone to connect to the nearest center to access the network. In 1987, NSFNET became overloaded and the 56 kbps lines had to be replaced by lines which were faster by a factor of about twenty.

With the increase of popularity of the Internet, other networks like Bitnet, DECnet, Fidonet, etc. developed methods of connecting to the Internet. At first, the connection was for transferring electronic mail only but later some of them have developed full service translator.

The International Standards Organization (ISO) has designed OSI (Open Systems Interconnect) protocol which is
allowed in many of the Internet’s component networks. Consequently, users of OSI also have connectivity to the Internet.

A citizen of Thailand got to use the Internet when it first started in the United State in 1969. At that time, the US Department of Defense (DOD) Advanced Research Project Agency (ARPA) established ARPANET as an experimental network to support research. From 1968 to 1973, Dr. Srisakdi was Director of Graduate Studies in Computer Science at the University of Missouri, Columbia, Missouri, USA and also Directors of a few research projects supported by the US National Science Foundation. Therefore, he became the first Thai to use the Internet. Figure 7 shows a group of Computer Science Department Heads from universities in the USA joining a teach-the-teacher conference organized by Dr. Srisakdi in his capacity as the NSF-funded project director. All NSF-funded research project directors were encouraged to use the Internet which was also funded by NSF after its birth from DOD.

2.2 Internet for Education in Thailand

Similar to the case of the US, the early stage of the Internet in Thailand was made available only for education and research.

In 1987, the Asian Institute of Technology (AIT) in Thailand entered into an agreement with the Department of Computer Science at the University of Melbourne in Australia to operate Internet email service on a regular basis. The Australian node would call AIT three times a day to send and collect emails. Dr. Srisakdi was the President of AIT Alumni Association and got to use the Internet in Thailand also when it was started.

In 1987, AIT charged 200 baht (about US $8 at that time) per month for up to 15,000 characters transferred (counting characters both in and out combined) plus one baht for every additional 50 characters. One of the problems was the inability to control any incoming mail, especially the lengthy Calls for Papers, list of references, etc. which were not asked for, and had to be

Figure 7. Some of the Early Educators Who Used the Internet in the US.
paid for because they had automatically entered the mailbox. This problem was later solved when the rate was changed to a fix amount per month rather than varying with the number of characters. Another problem was that during the connection to Australia, usually three times a day at 02:30, 15:30 and 19:30, users were requested not to call the only dial-in number with the only modem available at that time.

In 1988, Prince of Songkhla University in the southern part of Thailand established an Internet node connected to Melbourne University a few times a day. Two dial-in telephone numbers were made available from 09:00 in the morning till 19:00 in the evening.

In 1991, Digital Equipment Corporation (DEC Thailand) acquired an Internet address for internal and research-related usage. No dial-in number was made available and users had to use the machine at the company. As of the year 1999, DEC has been purchased by Compaq and is not in existent any more.

A major breakthrough occurred in 1991 when Chulalongkorn University (Chula) became the first international Internet gateway in Thailand. After sufficient testing, full operation was started in July 1992 with a 9600 baud (bits per second or bps) leased line to Virginia, U.S.A. and later upgraded to 64 Kbps line. In 1992, the fees for the leased line with 25% educational discount from the Communications Authority of Thailand (CAT) were about 5.2 million baht per year. Initially, only one telephone line was made available but by 1993, twenty lines were accessible. The all day, all night and full Internet service at Chula were obviously much better than the email-only at AIT. Instead of waiting a day or so for the message to be routed through Australia, one could communicate as many times a day as necessary and desirable. One could use the “talk” command to enter into interactive communication. When calls for papers were received from the network, one could ask for and obtain clarification right way. So, as an associated faculty at Chula, Dr.Srisakdi got another email address there.

In January 1992, the National Electronics and Computer Technology Center (NECTEC) established the NECTEC e-mail Working Group (NWG). In February 1992, NWG established a network named ThaiSarn (Thai Social/scientific, Academic and Research Network) with a machine donated by IBM, and two dial-in telephone lines available 24 hours a day for NWG connections. UUCP (UNIX-UNIX Copy) was made hourly with Thammasat University and Prince of Songkhla University, and international connection with Australia through AIT three times a day. The service was later upgraded to included six dial-in telephone lines and 24 hours per day international connection through Chula. Then in September 1993, NECTEC became the second international Internet gateway from Thailand and it was also connected to Virginia, U.S.A. (the same place Chula connected to) by a 64 Kbps leased line. Dr.Srisakdi also got an e-mail address from NECTEC.

In January 1992, Thammasat University (TU) Information Processing Institute for Education and Development (IPIED) was also registered as an Internet node. One dial-in telephone number was made available 24 hours a day.

The Faculty of Engineering at King Mongkut’s Institute of Technology Ladkarbang started experimenting with Internet in mid 1992, connected to Thammasat. At the beginning, only about 40 users were approved. Later the Computer Research and Service Center which served all the faculties established a central node for
Ladkrabang. By October 1993, about 500 Internet addresses had been given.

Digital Equipment joined ThaiSarn in January 1992 but was later disconnected because commercial organization was not allowed to use educational Internet in Thailand. Prince of Songkla University and AIT joined ThaiSarn in 1992 but AIT later installed a direct leased line to Chula.

After several years of usage of Internet in Thailand through AIT and Chula, Dr. Srisakdi was convinced that the system should be made available to the whole university. Therefore, in August 1993, he proposed to the Assumption University Board of Trustees and got approval to implement the Internet project by setting up an Internet network called AuNet. The purposes of AuNet include the followings:

- To educate the students, faculty and staff member on the concepts of local and international networking.
- To prepare the students to enter into information society where networking will be the norm rather than the exception.
- To provide full Internet access to all students, faculty and staff members for their personal and educational usage.

On the financial side, the Board of Trustees of Assumption University approved the proposal to let the students pay for the project. The Board decreed that Internet knowledge and experience become a requirement for graduation in any and all educational programs at AU. Each undergraduate student was charged 100 baht per month and graduate student 200 baht per month. The rate for undergraduate was increased to 200 baht per month later. All the income is earmarked for the development and maintenance of the project.

### 2.3 Commercial Internet in Thailand

From 1987 to 1994, Internet was available in Thailand only for educational and research purposes. In June 1994, Rev. Bro. Dr. Prathip Martin Komolmas, President of Assumption University signed an agreement with Dr. Srisakdi who is the Board Chairman and Kanokwan who is the President of Internet KSC for Assumption University to serve as the “Incubator” for KSC Group.

As shown in Figure 8, on January 19, 1995, Her Royal Highness Princess Maha Chakri Sirindhorn graciously presided over the opening ceremony of the International Internet Gateway at Assumption University paid for by KSC, also 64 Kbps linked to UUNET in Virginia, USA. This international Internet gateway may be considered the third international Internet gateway from Thailand or the first private-sector international Internet gateway from Thailand. The two earlier gateways were in the government sector.

It may be said that breakthrough for commercial Internet in Thailand occurred at the end of 1994 when the Communications Authority of Thailand (CAT) Board of Directors approved the proposals for CAT to have joint venture agreements with two organizations, namely, NECTEC and Internet Knowledge Service Center Co., Ltd. (KSC), to offer commercial Internet in Thailand for the first time. For flexibility in operation, it was agreed that each joint venture be made a private company in order to avoid the red tape and bureaucracy associated with government agencies. However, the joint venture with NECTEC was supposed to become a private company named Internet Thailand Co., Ltd. in 1995 but the Ministry of Commerce refused registration on the ground that government agencies cannot register a private company.
without special approval from the Cabinet of Thailand. NECTEC requested the special Cabinet approval but the Cabinet at that time did not give approval. So, NECTEC was allowed to operate commercial Internet on a trial basis until another Cabinet gave approval for it to register as a private company on May 13, 1997, becoming the 16th private company in Thailand to offer commercial Internet as shown in Table 2.

Almost all ISPs waited until a month or so prior to the time that all the paperwork were completely settled to start the service. KSC and Internet Thailand were exception. Internet Thailand ran into unexpected difficulty at the Ministry of Commerce and could not be registered until May 13, 1997.

Right after the Communications Authority of Thailand (CAT) gave approval for CAT to enter into joint venture with Internet KSC on October 31, 1994, KSC started soft launching of the service. Many individuals not full-time members of educational institutions were given e-mail addresses at <ksc.au.ac.th> in 1994 using the international link at Chulalongkorn University (Chula). A complaint was lodged with CAT that KSC should not start providing commercial Internet service. CAT asked Chula to investigate by seeking information from KSC. Chula threatened to disconnect KSC from the Internet. So, KSC requested negotiations with Chula and CAT. KSC argued that CAT Board of Directors had approved the joint venture with KSC in October 1994. The Ministry of Commerce approved the registration of KSC Commercial Internet Co., Ltd. on December 21, 1994, to become the joint venture company with CAT. In KSC point of view, the remaining paperwork was just formality. To be successful, business should act very fast. While negotiations were going on, KSC continued to provide the commercial Internet service. KSC also argued that with Assumption University as the incubator, KSC must comply by the special law governing the university which states that one of the four functions of a university is to provide services to the community and, so, KSC must provide service to the community by offering Internet services. Thus, in effect,
KSC started the Soft Launch of commercial Internet service in Thailand in 1994 and continued undisrupted until the Formal Launch in May 1995. The conflict between Chula and KSC was resolved on January 19, 1995 when KSC switched from the 64Kbps link with Chula to its own 64 Kbps international Internet Gateway at Assumption University, the opening ceremony of which was graciously presided over by HRH Princess Maha Chakri Sirindhorn.

Another evidence to show the order of establishment of ISPs in Thailand is the Autonomous Systems (AS) numbers. The number has to be obtained before an ISP could be independently routed and identified by other Internet systems. The number is AS4274 for KSC, AS4618 for Internet Thailand, and later numbers for all the other ISPs.

The international Internet Society came into existence in January, 1992, by a worldwide cross-section of individuals and organizations who recognized that the Society was a critical component necessary to evolve and globalize the Internet and Internet technologies and applications, and to enhance their availability and use on the widest possible scale. Assumption University of Thailand is the only Founding Member from Southeast Asia. As a founding member, Assumption University sends Dr.Srisakdi Charmonman to be a member of the Advisory Council and Dr. Kanokwan Wongwatanasin his alternate.

In June 1996, the Internet Society approved the establishment of Thailand Chapter of the Internet Society with Dr. Srisakdi Charmonman as the Founding President. Figure 9 shows some of the members of the Board.

<table>
<thead>
<tr>
<th>Registration Approved by Commerce Ministry</th>
<th>Registration No.</th>
<th>Name of Company</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Jun 7, 1994</td>
<td>(2)2414/2537</td>
<td>Internet KSC Co., Ltd.</td>
</tr>
<tr>
<td>2. July 20, 1994</td>
<td>(1)1816/2537</td>
<td>C.S. Communication Co., Ltd. (CS Internet)</td>
</tr>
<tr>
<td>3. Dec 21, 1994</td>
<td>(2)5675/2537</td>
<td>KSC Commercial Internet Co., Ltd.</td>
</tr>
<tr>
<td>5. Nov 9, 1995</td>
<td>(1)2867/2538</td>
<td>Chomanan WorldNet Co., Ltd. (CMN)</td>
</tr>
<tr>
<td>6. Dec 8, 1995</td>
<td>(3)2716/2538</td>
<td>A-Net Co., Ltd. (Anew)</td>
</tr>
<tr>
<td>8. Feb 19, 1996</td>
<td>459/2539</td>
<td>Loxley Information Services Co., Ltd. (LoxInfo)</td>
</tr>
<tr>
<td>9. March 7, 1996</td>
<td>(2)1141/2539</td>
<td>Asia Infonet Co., Ltd. (AsiaNet by CP and TA)</td>
</tr>
<tr>
<td>11. Apr 1, 1996</td>
<td>989/2539</td>
<td>Samart Infonet Co., Ltd. (Samart Cybernet)</td>
</tr>
<tr>
<td>13. May 13, 1996</td>
<td>(2)2188/2539</td>
<td>Data Line Thai Co., Ltd. (Line Thai)</td>
</tr>
<tr>
<td>16. May 13, 1997</td>
<td>(1)430/2540</td>
<td>Internet Thailand Co., Ltd. (Internet Thailand)</td>
</tr>
</tbody>
</table>
In June 1999, Dr. Srisakdi became the first Thai to be elected one of the 15 members of the Board of Trustees of the international Internet Society for a three-year term.

The largest cost for all ISPs in Thailand is for the bandwidth to the USA, accounting for 35-50% of the operating costs. When Chula started the first international gateway in July 1992, the bandwidth was only 9,600 bits per second and later upgraded to 64 Kbps. In September 1993, the second international Internet gateway was established at NECTEC and it was also 64 Kbps. In January 1995, the third international Internet gateway in Thailand or the first private-sector gateway was established at Assumption University and KSC and it was also 64 Kbps. Each international link for ISPs has to be leased in two parts, i.e. half circuit from Bangkok to the US leased from CAT, and half circuit from the US to Thailand leased from an international carrier such as AT&T, Global One, KDD, MCI, TeleGlobe, etc.

The combined bandwidth from all ISPs in Thailand to the US from 1992 to 1999 are shown in Table 3.

Table 3. Combined International Bandwidth to the US in Mbps

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>0.064</td>
<td>0.13</td>
<td>2.77</td>
<td>4.77</td>
<td>10.25</td>
<td>32.5</td>
<td>37</td>
<td>109.875</td>
</tr>
</tbody>
</table>
The details of the bandwidth to the USA in October 1999 for each of the 15 ISPs plus UNINET (4 Mbps) which is the ISP for education operated by the Ministry of University Affairs are shown in Table 4.

All Thai ISPs have indicated that they will be increasing their bandwidth to the USA. For example, KSC announced that its bandwidth to the USA will be increased to 87-90 Mbps in the year 2000, and probably 180 Mbps by 2001.

**Table 4. Thai ISP Connectivity to the US Sorted by Bandwidth, October 99**

<table>
<thead>
<tr>
<th>No.</th>
<th>Company Name</th>
<th>Bandwidth to USA</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Internet KSC Co., Ltd. (KSC)</td>
<td>46 Mbps</td>
</tr>
<tr>
<td>2</td>
<td>Internet Thailand Co., Ltd. (Inet)</td>
<td>16 Mbps</td>
</tr>
<tr>
<td>3</td>
<td>Loxley Information Services Co., Ltd. (LoxInfo)</td>
<td>7.5 Mbps</td>
</tr>
<tr>
<td>4</td>
<td>A-Net Co., Ltd. (A-Net)</td>
<td>6 Mbps</td>
</tr>
<tr>
<td>5</td>
<td>C.S. Communication Co., Ltd. (CS)</td>
<td>6 Mbps</td>
</tr>
<tr>
<td>6</td>
<td>Samart Infonet Co., Ltd. (Samart Cybernet)</td>
<td>4.5 Mbps</td>
</tr>
<tr>
<td>7</td>
<td>Asia Infonet Co., Ltd. (AsiaNet by CP and TA)</td>
<td>4.5 Mbps</td>
</tr>
<tr>
<td>8</td>
<td>World Net &amp; Services Co., Ltd. (Wnet)</td>
<td>4.5 Mbps</td>
</tr>
<tr>
<td>9</td>
<td>Siam Global Access Co., Ltd. (SGA)</td>
<td>2.25 Mbps</td>
</tr>
<tr>
<td>10</td>
<td>Info Access Co., Ltd. (Info News)</td>
<td>1 Mbps</td>
</tr>
<tr>
<td>11</td>
<td>Asia Access (Thailand) Co., Ltd. (Asia Access)</td>
<td>0.5 Mbps</td>
</tr>
<tr>
<td>12</td>
<td>Chomanan WorldNet (Chomanan WorldNet, CMN)</td>
<td>0.5 Mbps</td>
</tr>
<tr>
<td>13</td>
<td>Idea Net Co., Ltd. (IDN)</td>
<td>0.25 Mbps</td>
</tr>
<tr>
<td>14</td>
<td>Far East Internet Co., Ltd. (Far East)</td>
<td>0.25 Mbps</td>
</tr>
<tr>
<td>15</td>
<td>Data Line Thai Co., Ltd. (Linethai)</td>
<td>0.125 Mbps</td>
</tr>
<tr>
<td>16</td>
<td>UNINET, Thaisarn, SchoolNet, and IIG</td>
<td>10 Mbps</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>109.875 Mbps</td>
</tr>
</tbody>
</table>

**Figure 10. The Late Dr. John Postel (right)**
in Charge of IP and DNS.
The top-level domain of “th” for Thailand was given to a group of persons at Asian Institute of Technology (AIT) because AIT was the very first organization in Thailand to be connected to the Internet. At that time, Dr. John Postel of the University of Southern California was in charge of IP addresses and domain names. Dr. Postel and his associates used the principle of “First comes, first served”, i.e. whoever asks for it first would get it first. The group at AIT later set up what is called “ThNIC” standing for “Thailand network information center” InterNIC” for “International” and “APNIC” for “Asia Pacific”. Figure 10 shows Dr. Postel with Dr. Srisakdi who attended the ITU (International Telecommunication Union) meeting in Geneva, Switzerland, in his capacity as an elected member of the Board of Directors of APNIC.

To register a domain name under “.th” user has to pay ThNIC a certain amount of money every year. To avoid such payment and still has a domain name to use in Thailand, KSC has registered “.th.com”, “.th.org”, and “.th.edu”.

The registration of “.com”, “.net”, and “.org” has been assigned by the US National Science Foundation (NSF) to a private company for which a founder is an American mathematics professor, Dr. Donald Telage. The company name is Network Solution Inc. (NetSol) which runs InterNIC. Figure 11 shows Dr. Telage (standing in the back row) of Network Solution at the signing ceremony for KSC to represent NetSol in Thailand.

2.4 Internet Users in Thailand.

On July 13, 1998, the National Economic and Social Development Committee announced in the Mass Communication and Information Technology Development Plan for Human Resource and Social Development (1999-2008) in Paragraph 2.2 (5), Chapter 4, Visions, Objectives, and Goal:

“To facilitate computer communication in all tambon, and Internet usage by 20 percent of the whole population”

By the year 2008, the government plans call for approximately 14 million Thais using the Internet.

Figure 11. Network Solution in Charge of .com, .net, and .org
By the year 2006, when telecommunication is completely liberalized in Thailand, there should be about 12 million Internet users. Customers of all ISPs should be greatly increased by then. For example, KSC plans to increase the number of customers of about 0.25 million in 1998 to about 3.6 million customers in 2006. The rough estimate of the numbers of Internet users in Thailand and of KSC for 1998 and 2006 are given as shown in Table 5.

The approximate numbers of Thai nationals using Internet from 1969-2009 are given in Table 6.

Information concerning corporate users with ISPs in Thailand have been guarded as commercial secret because each ISP may be afraid that another ISP may try to take away the corporate customer. As an example, KSC has about 380 corporate customers in 1999. Altogether, the total number of corporate in Thailand connected to all the ISPs may be about 1,000.

As shown in Figure 12, the largest individual Internet link in Thailand is for HRH Princess Maha Chakri Sirindhorn and it is 2 Mbps provided by Assumption University and KSC. The largest link for universities is at Assumption University and it is 3 Mbps to the US.

<table>
<thead>
<tr>
<th>Table 5. Rough Estimate of Numbers of Internet Users in Thailand and KSC</th>
</tr>
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<th>Table 6. Approximate Numbers of Internet Users from Thailand</th>
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*Notes: Assumption University got in with 25,000 users.
3. **E-Everything**

Whether you want food, facts, or fun, you can find it on the Web. First there was e-mail. Then came e-zines. Before we knew it, we were in the midst of 1998’s e-commerce explosion. Now, this is the year of e-business, but perhaps it might be better to simply call it the year of e-.

That’s because the Internet has become such an easy way to do nearly everything. You can put an e- in front of any aspect of society and make it relevant to people’s lives or at least that’s how it seems. In fact, the e-culture has become so commonplace, one site has proclaimed that we are all e-citizens www.e-citizen.org. As shown in Figure 13.

So as an e-citizen, you can accomplish almost everything by typing an e- in front of what you want to do and the Web will serve as taskmaster.

Need to pay your utility bill? E-citizens can go to e-city hall www.e-cityhall.org to pay bills, report potholes, contest zoning changes, and get building permits. When it’s time to elect officials, e-citizens can cast their ballots at the e-vote www.evote.com Web site, which has election news, polls, and debate transcripts. Likewise, e-citizens don’t have to sweat tax time. They simply visit e-smart www.etaxforms.com for tax forms and tax law information.

But e- isn’t all about politics and government. Maybe you’re relocating or looking for a bigger house. In either case, you can go to e-homes www.e-homes.com where there are houses and land for sale. If you happen to be moving to Colorado, you’re even luckier. You can visit Colorado’s
e-life site www.softronics.com/colochat, which offers information on everything you need to know about living in the Rocky Mountain state.

Perhaps you’re a little worried about your finances? Then, try e-trade www.etrade.com as shown in Figure 14 for financial investment and retirement planning strategies. Or if you want to sell or buy merchandise as an investment, how about trying e-bay www.ebay.com, the popular online flea market for e-citizens?

Of course, if you have extra cash in your pocket, you can always take a vacation. In that case, you need to visit e-travel www.e-travel.com, where they will send you anywhere you want to go. Or, perhaps, investing in art is a better idea. Then try Erl’s Gallery www.incunabula.com/gallery/index.htm, which specializes in e-art, or visit the e-museum at Minnesota State University.

Feeling a little hungry? You can order your groceries and have them delivered by signing on to PeaPod www.peapod.com, as shown in Figure 15, which offers e-food. Need to send a birthday card? Go to e-card www.horsburgh.com/card to send an electronic greeting to someone you love. Maybe you want to send a gift as well. Music is always nice. So visit e-music www.emusic.com and get a CD. As shown in Figure 16.

To keep up with your favorite sports team, check out e-sports www.e-sports.com for all the scores you need. In fact, streaming media now lets e-citizens watch sports and other e-broadcasts www.broadcast.com right on their computers.

There’s also the e-phone www.emagic.com for your convenience. The Electric Magic Co. has created a digital phone service that works through your computer.
The Internet isn’t only for adults. E-kids www.e-kids.org features games, educational experiences, and activities for children of e-citizens. Your kids can now attend a virtual camp or join the e-kids club.

Finally, for outdoor enthusiasts, there’s e-land www.gmi.edu/~cram0438/, created by a student at Kettering University in New South Wales, Australia. E-land offers information on exciting activities such as skydiving, rock climbing, and SCUBA diving.

With all this already available on the Web, it seems probable that the power of e-mail soon be even more unbelievable.

4. Internet for Commerce (E-Commerce)

As the world is moving towards the Internet economy, it has come to the point that business has to expand their strategy to support the development of the digital world. New opportunities presented by the fast growth of virtual company in the market because this kind of companies can quickly take advantages of the Internet by doing Electronic Commerce. The wonderful thing about E-Commerce is that it can cut cost and be efficient in every sector of business. The following section of this paper will presented a brief history of Internet in business, opportunities of E-Commerce, E-Commerce market statistics, and the examples of successful e-commerce business.

4.1 History of Internet in Business

Although E-Commerce has been taking place on a big scale for a few years, the current commercial free-for-all began in 1991 when the federal government of USA made it known that it no longer intended to limit the network's backbone for use in research.

That policy shift created an incentive for three major Internet access providers—Performance System International Inc. (PSI), Uunet Technologies Inc., and General Atomics' Cerfnet—to create their own commercial backbones, allowing them to skirt the government-controlled National Science Foundation NSFNet. These providers, along with nine others, formed the Commercial Internet Exchange (CIX). Today, virtually every form of commercial traffic is allowed to pass through CIX network providers, through unsolicited junk mailing are still frowned on by the Internet community.

In reality, the potential for commercial exploitation of the Internet was always present. Because many large corporations already have TCP/IP networks in place, it's been relatively simple for them to connect computers in distant offices via the Internet. For another, low connection cost provides a cost effective alternative to building and maintaining expensive proprietary WANs, which also require leasing expensive long-distance lines or hooking up with commercial networks such as CompuServe or MCI Mail.

These day, the Internet as a worldwide home shopping network where consumers will ultimately be able to order products displayed via their computer, palmtop either full-motion video, access interactive games, and chat “live” with other users who they see on their computer or television screens. What's more, the Internet's attractiveness to big corporations also makes it a opportunities to direct marketers. Recent demographic studies indicate that the Internet community is affluent and well-educated. Not only do the corporate executive who log onto the Internet have
money to spend on goods and services, but so do the collage kids who dial up to swap e-mail, research papers, and play games.

4.2 Opportunities in E-Commerce

What are the hottest business opportunities on the Internet today? Although hundreds of entrepreneurs are rushing in to set up roadside stands, hoping to sell products and services via the Internet. Furthermore, the success of any business—online or off-line—relies upon two things, which are customer satisfaction and loyalty. While customer acquisition is critical, a company's ability to retain valued customers.

There are some key factors that can be met in order for your business to achieve online success for examples:

4.2.1 Provide Value

Two of the most successful online ventures: Yahoo! and Amazon.com. They provide tremendous value to the Web. Your website must provide free resources, foster a sense of communities and show real value to your visitors.

4.2.2 Quality Presentation

Your website must be presented a quality, which means fast, clear web design that looks good and is easy to understand. That will make your users quick determinations about the quality of your website. High quality will result in repeat visitors.

4.2.3 Be Unique

Your website have to own something no one else has because you don't know anything about with a website that looks exactly like hundred of others. If you don't have your own unique website then you're nothing.

4.2.4 Build your brand

Yahoo! valued at 10 times more than Infoseek because of their band name. Yahoo! is now virtually synonymous with the Internet and also Amazon.com. Both companies have formed a name that people can easily remember and with a comfortable to go to. Your website brand name needs to be catchy and meaningful, and also express a feeling or image in the mind of the consumer.

4.2.5 E-Commerce

Your website must have a fully functions E-commerce system built in it, as your business can do through the web. Visitors to be able to purchase a product or service at any times with just a click button. Your website needs to make fast shopping, fun and easy experience. Forrester Research found that online retail sales will hit $108 billion by 2003.

4.2.6 Promote

Use targeted advertising to tell the world about your site, search engines, ezines, email marketing and other online promotional tools. Advertise on the radio, newspapers let everyone know that you exist and your business.

4.2.7 Patience

You have to be patient and think in long-term. It takes a lot of hard work to be successful and it won't happen overnight. You have to focus on your strategy and develop the right moves for the right time, take business step by step.
4.3 E-Commerce Market Statistics

The Internet today is a highly effective tool for communications, information gathering, multiple-site collaboration, and also the business. The biggest barrier to doing business on the Internet today, we believe, is differentiating your message from the tons of information that washes over each user every time they come near the network and standing out from the crowd in a way that allows your company to be viewed as a contributor to the growth of the network and online community, not a detractor from its original vision and goals.

In the present, the Internet, or whatever the name the information superhighway takes, will be a busy thoroughfare for all kinds of voice, data, video traffic transaction because the Internet become user-friendlier for users and more new technologies like E-Commerce. Now, more than 400,000 U.S. companies have Website, which are trying to sell products and services.

There are all kinds of E-Commerce market statistics available on the web and some interesting one are given bellows:

- The number of Internet users in Asia is expected to expand by 422 percent within the next five years (2005), according to a recent study by London-based Philips Group. The region currently has 43.6 million online users, but the study expects that number to increase to about 228 million in 2005 and 370 million in 2006. The prediction for Japan will likely retain the largest number of users until 2004, but China will surpass Japan in 2005.

- The survey from the Electronic Commerce Promotion Council of Japan and Andersen Consulting founded that the market for Business to Consumer (B to C) electronic commerce in Japan in 1999 was 248 billion yen, or roughly four times the 64.5 billion yen of 1998. Moreover, the next prediction for 2003, will search more than 3.5 trillion yen, or a total of 4.4 trillion yen, when including real estate. In 2004, the scale of the market is expected to be 5.5 trillion yen without real estate and 6.7 trillion-yen including real estate. Categories expected to significantly increase in market scale include automobiles, travel and real estate, each of which should top one trillion alone in 2004.

- Jupiter Communications which done the research about e-commerce in Europe concluded that in 2003, e-commerce in Europe will be valued of 18.6 billion Euros.

- IDC Research Institute expected that the growth of electronic commerce in Asia Pacific will be expanded. The end of 1999 will have the value of $1.9 billion and in 2003 B-to-B electronic commerce will reach $13 billion while B-to-C will reach $13 billion.

- Forrester expects Online retail in US as show in Figure 17, the value of business to business e-commerce (B2B) revenues will swell to $1.3 trillion over the next three years (2003).
According to a study by the Boston Consulting Group (BCG), one-fourth of all US business-to-business purchasing will be done online by the year 2003. The Boston Consulting Group shows that 25 percent of all business-to-business purchases will be accounting for $2 trillion in business-to-business sales and $780 billion coming from private network purchases.

North America currently dominates the global business-to-business e-commerce picture, with a $700 billion market that is twice the size of the non-North American nations combined. “North America will likely retain its significant lead over the next few years, but the global dynamics of business-to-business e-commerce will shift.

North American market will still come close to doubling the rest of the world, by 2003, which will reach $3 trillion in business-to-business e-commerce, while the rest of the world will contribute about $1.8 trillion.

BCG predicts that more than 65 percent of all business-to-business e-commerce purchases will be concentrated in six sectors over the next five years: retail, motor vehicles, shipping, industrial equipment, high tech and government. “Cost savings, rather than strategic opportunities, will drive most of the initial adoption.”

4.4 Example of Successful E-Commerce Cases

Even though the new concept of electronic commerce will help business reduce cost of operation while distributing their products and services to customers around the world, the way to success in e-commerce is not easy. About 10% of those entering into E-Commerce have been successful.

4.4.1 Amazon.com

Amazon founded in July 1995 by Jeff Bezos, intended to be the leader of fastest,
easiest and fun for the buyers in selling the books on Internet. Since that time Amazon has becoming widely known and the number of the books sale are increasing. Now a day, there are many things that Amazon provided other than the books such as cds music, video, dvd, toys and games plus the electronics and software, auctions, home improvement and zShops.

There are 13 million customers worldwide shopping in Amazon. According to the research by Media Metrix, the number of unique visitors who shop the online stores for the week ending November 22, 1999 through December 19, 1999 as the number of days for shipping gifts in time for Christmas, Amazon went to number one rank in the top 10 web sites that have the visitors came to its web site by having 6,079,000 visitors during that time.

Amazon operates two international Web sites: www.amazon.co.uk in the United Kingdom and www.amazon.de in Germany. Amazon also operates PlanetAll (www.planetall.com), a web-based address book, calendar, and reminder service. It also operates the Internet Movie Database (www.imdb.com), the Web's comprehensive and authoritative source of information on more than 150,000 movies and entertainment programs and 500,000 cast and crew members dating from birth of film in 1892 to the present. Amazon.com also operates LiveBid.com (livebid.amazon.com), the sole provider of live-event auctions on the Internet.

In addition, Amazon.com has invested in leading Internet retailers that are improving the lives of customers by making shopping easier and more convenient: drugstore.com, an online retail and information source for health, beauty, wellness, personal care and pharmacy, at www.drugstore.com; Pets.com, the online leader for pet products, expert information, and services, at www.pets.com; HomeGrocer.com, the first fully integrated Internet grocery-shopping and home-delivery service, with operations in Seattle and Portland, Oregon, at www.homegrocer.com; and Gear.com, which offers brand-name sporting goods at prices from 20 to 90 percent off retail, at www.gear.com.

The one example that obviously shows how Amazon success is expanding the products range which is Cds music back in June, 1998. This is the result in the leader of Cds music in the first quarter of the year 1999. After the Cds store was opened for 6 months, it followed by videos store and gifts store. Since that time, Amazon is also the leader of videos retailing store just only 6 weeks since the store was opened.

The other reason making Amazon successful is 1-Click ordering. It securely stores billing and shipping information so that each customer needs only one click of the mouse to buy a selected item, rather than entering the same information over and over again for each purchase.

Last year 1999, the fourth quarter sales was $650 million (US$). However Amazon is still getting some losses. The reason why Amazon still gets loss is that Amazon spends money much on promotions and marketing and also as it spent heavily to lure holiday shoppers end of last year. However Jeff Bezos believe that Amazon will get more profits soon.

4.2.2 Dell Computer (www.dell.com)

Dell Computer Corporation was founded in 1984 by 19 years old Michael S. Dell in that time company called PC's Limited. His
office is his dorm room at the University of Texas at Austin, he knew he had no access to the channel. So he invested $1,000 of his personal savings in advertisements in PC publications and began selling computer components through the mail. From this channel's 10 to 15 percent markup allowed him to sell at a lower price, and savvy buyers were happy to pocket and saving. Soon he expanded beyond the dorm room and began offering complete PC.

His basic idea was to eliminate the middleman and building relationship with suppliers, reducing inventories and receiving direct input from customers. On the meeting in 1986, when the company had $60 million in sales, he identified three key strategies. First focus on the largest corporate customers, ignoring time-consuming first-time buyers. Second, the company would offer a level of service unprecedented in the PC industry and the third is Dell would take its direct model global.

Dell is providing more performance, optimize the products to meet customer desires, every customer contact with Dell's toll-free-number on Dell's Website. Every service call and resolution are recorded, when a customer call Dell's representative can see customer purchase history.

Dell entered Asia Pacific in select markets and began investing in regional facilities and management, service and technical personnel. Moreover, Dell operated a Asia Pacific Customer Center (APCC) in Malaysia and China also website www.dell.com/ap which now support 16 country specific site for Asia Pacific, using five language including Chinese, Korean, Thai and Japanese.

4.2.3 eBay (www.ebay.com)

eBay was lunched on Labor Day in September 1995 as a result of a conversation between Pierre Omidyar and his wife, an avid Pez™ collector (she currently covets a collection of more than 400 dispensers). His wife commented to him that how great it would be if she were able to collect Pez dispensers and interact with other collectors over the Internet. As an early Internet enthusiast, Pierre knew that people needed a central location to buy and sell unique items and to meet other users with similar interests. He started eBay to fulfill this need.

eBay is the world's largest personal online trading community. eBay created a new market: efficient one-to-one trading in an auction format on the Web. Individuals—not big businesses—use eBay to buy and sell items in more than 1,600 categories, including collectibles, antiques, sports memorabilia, computers, toys, Beanie Babies, dolls, figures, coins, stamps, books, magazines, music, pottery, glass, photography, electronics, jewelry,
gemstones, and much more. Users can find the unique and the interesting on eBay—everything from chintz china to chairs, teddy bears to trains, and furniture to figurines. As the leading person-to-person trading site, buyers are compelled to trade on eBay due to the large amount of content available and users can participate in ongoing auctions 24 hours per day.

eBay generated consolidated net revenues of $58.5 million in the third quarter of 1999, a 169 percent increase over the $21.7 million reported for the same period last year. Consolidated net income for the quarter was $1.4 million, or $0.01 per share on a diluted basis. eBay's consolidated net income excluding the effects of certain non-cash charges was $3.2 million, or $0.02 per diluted share, compared with $1.8 million, or $0.02 per diluted share during the third quarter of 1998. eBay's expansion into local auction site, now has 20 auction sites, and will expand 10 new auction site

There are some reasons to make eBay become successful for example:

- eBay is the present their website as a person to person online trading community not a business trading.
- eBay focus on their core business and provide great customer service, the network capacity.
- eBay is great collections has partnered with some of the finest galleries, dealers and auction house in the world to offer a vast selection.
- eBay always create a new site for local auction sites and in other country and has country-specific categories and content, also ability to trade in that country dollar currency.

And another website such as

- **Ben and Jerry’s Homemade** ([www.benjerry.com](http://www.benjerry.com))

  Started in a renovated gas station in Vermont, Ben Cohen and Jerry Greenfield became famous for their ice cream flavors. Their web allows customers to fire an ICBM which does not stand for “Inter-Continental Ballistic Missile” but “Ice Cream By Mail” anywhere in the world. It was said that Ben and Jerry ice cream was sent to a US ship off the coast of Bosnia. The ice cream is packaged in six packs in liquid nitrogen and can be sent overnight by Federal Express. Netscape software has been used to provide animated graphic which includes a “cemetery” for discontinued ice cream flavors with dancing skeletons.

- **CDnow** ([www.cdnow.com](http://www.cdnow.com))

  This web was started by two 27-year-old twin brothers in their parents’ basement and became a highly successful business entirely on the Internet. Each month, more than half a million shopper order from more than 200,000 CDs, albums, cassettes, music videos, CD-ROMs, laser discs, T-shirts, and other music-related accessories. The idea to start CDnow occurred when Jason Olim, one of the twin, wanted to buy classic and alternative rock music but could not find any local store to satisfy his needs and so had to start his own company to provide the service on the web.
CitySearch (www.citysearch.com)

This site was developed by Bill Gross as a one-stop interactive resource guide to several local communities such as Pasadena and San Francisco in California, Raleigh and Chapel Hill in North Carolina, Austin in Texas, Salt Lake City in Utah and New York City in New York. The idea started when Bill Gross looked in the Yellow Pages for a place to have a hair cut in New York City. Then he took a taxi to the barber shop and found that it was not the kind he liked to use. This web provides easy interface for customers to browse community information and make a sophisticated searches by keyword, time, and location to obtain information such as shops, shopping area, movies, plays, weather, sports reviews, profiles of community leaders, etc.

5. Internet for Education or E-Education

The Internet will make everybody equal in terms of education and knowledge. Using the Internet in education is a global and grassroots phenomenon. Internet Education or Electronic Education allows everyone who is interested in getting educated or in learning by using Internet can do so easily from over 800 million pages of information on the Internet as well as from many virtual Universities. In addition to those written information, all kinds of educators, experts and consultants are also readily reachable through the Internet.

5.1 Education in Thailand

Education in Thailand was first documented in the reign of King Ramkamhaeng the Great of Sukhothai (A.D. 1279-1300), and the first two computers were brought into Thailand about 700 years later in the reign of King Rama the Ninth. The number of computers in Thailand are shown in Table 1. From only two computers in 1964, the number of computers in Thailand has grown steadily to about 70 in 1975, 23,000 in 1985, and greatly increased to about 2.3 millions in the year 2000.

In developed countries, the first three most popular computer applications are in airlines, banking, and manufacturing plants. However, in Thailand, the first three most popular applications of computers are in banking, airlines, and education.

The first known policy on computers for education in Thailand was started around 1960 when the Asian Institute of Technology, which was affiliated with Chulalongkorn University at that time, proposed that a computer be installed in Thailand for the first time. The purpose was, of course, for education.

By 1976, the Ministry of University Affairs established a Subcommittee to Co-ordinate Computing Activities responsible for computing activities of all government universities, all private colleges and all departments in the Ministry. The author happened to be named the head of the Working Group and later the Chairman of the Subcommittee for 8 consecutive years. In 1979, the Ministry of Education started a project to acquire a mainframe computer for educational purpose. In August 1982, St. Joseph Convent which is a private high school became the first school in Thailand to install microcomputers and started teaching basic concepts of computers to a group of students. In his capacity as Academic Chairman of the Parent-Teacher Association (PTA), the senior author convinced the PTA to raise fund for the purchase of the computers.
In March 1984, the Council of Ministers of the Royal Thai Government approved the resolution for the Ministry of Science, Technology and Energy to promote computer software industry. A national-level Committee to Promote Software Industry was later established with the senior author of this paper as the Chairman and the other 18 members were from government agencies, universities, and computer companies.

Also in 1984, the Ministry of Education approved a plan to introduce computer major in junior colleges. A committee was earlier established in 1982 to prepare textbooks for the major and the senior author happened to be named the Chairman of the Committee. He wrote 2 books for the purpose. Similar to the case of the junior colleges, teacher colleges as well as the Institute of Technology and Vocational Education (a college under the Ministry of Education) were authorized to offer computer majors at the level of higher certificate, associate degree, and Bachelor's degree. In 1984, high schools in Thailand were also officially allowed to offer 2 computer courses, namely, Introduction to Computer, and BASIC Programming.

One of the first few high schools selected to offer computer courses was Triem Udom Suksa School which is the leading government high school. In his capacity as the Computer Chairman for the Triem Udom Parents-Teachers Association, the senior author conducted training for a group of teachers.

By 1988, at least one kindergarten in Bangkok has installed microcomputers for kids to play with. Officially, about 1,000 microcomputers have been installed in schools in Thailand by that year. Unofficially, the number may be much higher. The reason for the discrepancy in the official and unofficial figures may be because the National Computer Committee (NCC) made it, to say the least, difficult for government schools to acquire computers officially. Therefore, Parents-Teachers Associations (PTA) had to purchase computers and borrow rooms at schools to store the computers which were officially the property of the PTA’s and not the schools. However, schools can use the computers unofficially. By 1996, all high schools in Thailand do have microcomputers.

Also at another meeting at the Ministry of Education, the Institute for Promotion of Teaching Science and Technology was instructed to consider additional computer courses for elementary and high schools. The following 16 courses have been approved:

1. Introduction to Computer
2. Word Processing Package
3. Introduction Database Package
4. Introduction to Spreadsheet Package
5. Intermediate-Level Database
6. Intermediate-Level Spreadsheet
7. Introduction to Programming Concepts
8. Beginning BASIC
9. Intermediate BASIC
10. Beginning PASCAL
11. Intermediate PASCAL
12. Introduction to Electronics
13. Introduction to Digital Computers
15. Introduction to Microprocessors
16. Modern Electronic Technology

By 1996, all government and most of private universities in Thailand each offers at least one degree program in IT area. The senior author of the papers happens to be the Chairman of the Computer Curriculum Committee for Government Universities and Chairman of the Computer Curriculum Committee for Private Universities appointed by the Ministry of University Affairs.

For using Information Technology to improve Thai education by providing
Internet access to all schools and Universities throughout the country. Internet becomes new technologies of choice for the year 2000 because of its readily availability, low cost, and ease of use. In the study area also provide opportunities for the education and access to instructional resources via the World Wide Web, business travelers and students in isolated areas can enjoy e-education from interactive classrooms no matter where they are and what time it is. In effect, the Internet will provide electronic education opportunities “for anyone, at anytime, and anywhere” in the world.

5.2 Pros and Cons of E-Education

Similar to the case of a coin having two sides, E-Education through the Internet has both advantages and disadvantages.

5.2.1 Advantages

- Teachers and students can communicate through the Internet on a regular basis even though they are in different places and different time zones.
- Students can review their lessons at their convenience since the materials are kept in either the database or the students’ computers.
- Information available on the Internet supports self-paced learning. This information is also updated on a regular basis.
- E-education from virtual classrooms are an educational alternative for the students to choose based on their preferences.
- E-education through the Internet widens students’ knowledge because discussion on a variety of topics from academics, professionals and other experts are widely available on the Internet.
- E-education for youth helps to build up strong family tie because parents have to participate in the youth’s education. Further, education through the Internet provides safety for the children in the sense that all courses can be taken at home.

5.2.2 Disadvantages

- There is no class schedule for education through the Internet and the students have to set the timetable by themselves. Hence, their success or failure depends on their own determination.
- Students need to have an Internet account in order to take Internet-based classes. If their account is expired, they cannot access the lessons.
- Although many activities are available in the virtual classroom, they are disorganized. Searching for a particular piece of information on the Internet is time consuming. In addition, students may be deviated by other attention gutters while they are surfing the Internet.
- All activities in the virtual classroom may be done via the monitor without actual human interaction and may create boredom instead of joy and interest.

5.3 Website for E-Education

Education at the level of kindergarten to high school in the US is called “K-12”, where “K” stands for “kindergarten” and “12” for “grade 12” which is the highest level in high school. The use of the Internet in this level is a powerful option. The Internet Society, the leader of developing and promoting the Internet, realized the academic importance of the Internet and has been providing a K-12 course in its training programs at every one of the annual conferences. It also provides strong support on the use of the electronic education via Internet.

On the Internet, there are numerous web pages for this level of education. Those web pages include school homepages,
educational-aid web pages, knowledge-for-children web pages, and resource web pages as well as actual teaching and learning through the Internet.

K-12 school websites also include sites for out-of-school children, sites for gifted and talented children, and sites for ordinary children. Teaching-and-learning-aid websites usually contain games and other entertainment, for example, vocabulary games, mathematical games and comics. These kinds of websites make school lessons more attractive and comprehensible as well as stimulate children’s interest in the lessons. Samples of knowledge-for-children Web pages are websites of museums, zoos, and organizations such as NASA. All the websites mentioned are not only for children but also for their parents because they are designed to have parents involved in the learning process. The purpose of parents’ involvement is to build up family tie.

5.3.1 Internet Home School

The website <www.InternetHomeSchool.com> as shown in Figure 20 was designed for parents to be responsible for their children’s learning. The first step to get started is to take the online English and Mathematics assessment tests. Students can download communications freeware from the Internet or directly download from the school’s website. Those communication freeware could be AOL Instant Messenger, ICQ, Microsoft Net Meeting, mIRC, Adobe Acrobat Reader, etc.

Parents and students will communicate with the school’s staffs via chatroom, which is available within the school website. Parents and students could assess this service by one click at the chat’s link. For security reasons, the users have to enter usernames and passwords to enter the chat room.

Once access to the online system has been granted, the student has to attend classes every school day, the same as in any physical school. He has to sign in as shown in Figure 14 to inform the teacher that he is beginning his daily activities. During this session, the teacher may issue any additional instructions and assignments.

Parents will take care of their children’s daily activities by following strategies prepared by the school to structure the time students spend daily on each subject. In each week, each student is required to hand in one written assignment such as answers to the quiz in each subject, using Internet means of communication such as e-mail. Each student should contact the online teacher to make arrangements for completing this task every week.

For <www.InternetHomeSchool.com>, the Internet is supplemented by the physical textbooks which are sent to the students and parents. After the student receives a textbook, his parents must acquire a password to access the secured section of the

Figure 20. InternetHomeSchool.com

Figure 21. Signing in at InternetHomeSchool.com
school’s website containing answer keys to daily assignment and weekly examination. This is the point where parents are involved in their children’s education, because the parents will have to check daily assignments and weekly test for correctness and report any deficiencies in the student’s ability to perform work activities to the school every week. Parents are responsible for reporting the weekly grade of the assignment in the electronic “Grade Book”.

When all of the work from a ten-week quarter is completed and graded, parents will be given another password for downloading the final examinations covering what student had learned in the first 10 weeks. If the student scores on each exam are at least 70%, he can continue to the next section of the curriculum. If the score is below 70%, the student is required to repeat a part of the learning process again.

After graduation, the student can apply for a community college or university (which support <www.InternetHomeSchool.com>) for credit in the college level courses. However, the student must be at least 15 years of age and has earned at least B+ average in the virtual learning.

Tuition for the Internet Home School is 400 US dollars which includes 150 US dollars for textbooks and 250 US dollars for registration fees.

5.3.2 4K12.Com

Another example of K-12 distance learning website is <www.4K12.com> as shown in Figure 22. This website is an Internet educational school offering Internet-based education for students worldwide. All courses would be distributed through streaming audio and video, e-mail, video conferencing, electronic collaboration, net meetings, and computer simulations.

The web <www.4K12.com> represents global Internet education for the 21st century since this on-line school applied modern technology to provide education for children all over the world. Student worldwide may attend the school for English language lesson, advanced technology training as well as using the job placement service. Other courses as well as tutoring and courses for gifted and talented students are also offered.

Over 1,400 courses in 17 languages will be available by June 2000. Teachers will be available 24 hours a day and 7 days a week to assist students. About 140,000 students worldwide, on the first comes first serve basis, have registered for the inaugural session to start in June 2000. Tuition for each course in <www.4K12.com> is 21.99 US dollars a month for unlimited access. Another option of payment is annual tuition at 265 US dollars a year. The only requirement to attend the school is to have access to the Internet.


Figure 22. 4K12.com
5.3.3 Gridlink Online Education System

Located in the United Kingdom, Gridlink is a virtual school that offers on-line educational service for students who are not receiving a full-time school education because of chronic sickness, recovering from illness/injury, special needs, school-phobics, and children whose parents prefer home education. Gridlink online education systems curriculum is a full-time curriculum using UK National Curriculum standards exactly the same as in traditional schools. The school offers on-line instruction up to 50 weeks a year for students aged 8-16 years old.

The educational services offered by Gridlink Online Education Systems are based on the latest computer and Internet technology, and educational software. Academic programs are adjusted to suit each student, and educational interaction with teachers. The Internet school address is <atschool.eduweb.co.uk/ctrh/home.html> as shown Figure 23.

5.3.4 Virtual School for the Gifted

The Virtual School for the Gifted is at <www.vsg.edu.au> as shown in Figure 24. It is specially designed for the gifted children. The gifted children are quick learners and have specific educational needs that are not generally or adequately catered for in traditional classrooms. Gifted students often exhibit an advanced capacity to achieve at higher than average levels. They have multiple, specialized, and unique interests. They may have an advanced ability to conceptualize. They may have intense and long-range concentration on topics of interest. They may have a sense of humor and pleasure in thinking divergently. They may have curiosity and interest in the unusual and independence in learning. They may have a higher sense of self-awareness, sensitivity, and idealism. Because of such characteristics, these student’s learning needs can present difficulties in the traditional classroom. Boredom and a lack of appropriate challenge can turn off students with considerable potential.

Virtual School for the Gifted are exclusively designed based on theories in the field of gifted education. Students have to study and do their assignments for each course at least 3 hours per week in each semester.

5.3.5 Virtual University

The website <www.vu.org> as shown in Figure 25 is a non-profit organization founded in the 1960’s under the realization that “knowledge is the mortar of a free
society and lifelong learning is the key to personal success, happiness, and well being.” As of the year 200, Virtual University is a worldwide learning community and the largest educational portal on the Internet. The original tasks of Virtual University involved in the Free Clinic movement and helped establish bi-coastal counseling centers, a “safe house” for teen runaways, a suicide prevention hotline, and drug education workshops. In the 1970's, the school established the Discovery Center in Los Angeles, hosting free classes on self-help and public service topics attended by thousands of adult learners who came from all over the West Coast to participate.

As of the beginning of the year 2000, over a half-million people from 128 countries have attended classes at Virtual University. The school has been featured on many well-known news television programs and publications around the world. Courses offered at the Virtual University include the Internet, Writing and Arts, self improvement, etc.

5.3.6 The University of London Internet-Based Program

The website <www.lon.ac.uk/external>, as shown in Figure 26, is the virtual campus of the University of London, which is a federation of 17 separately incorporated, self-governing, directly-funded colleges, together with a range of central academic activities. It offers distance learning and independent study at all levels of undergraduate and postgraduate degrees and collectively ensures the standards of the University's degrees and are research-based higher education institutions committed to undergraduate and postgraduate teaching of the highest quality in a research environment. Services provided for external students include the University Library, Careers Service, Intercollegiate Halls of Residence, Accommodation Office and the University of London Union.

![Figure 25. Virtual University](image)

![Figure 26. The University of London Internet-Based Program](image)

In addition to receiving the same standard of work as that of a regular or an internal student, an external student may apply to the external program without concerning about quotas for entry and will pay lower fees than students on conventional university courses. Although most courses
are via the Internet, students in such area as MSc in Dental Public Health are required to attend an intensive course in the UK for two or three weeks each year. Taking all examinations is also required the students to contact a physical, local centers of the school, which are available worldwide and the center list is posted on the University’s website. However, students in musical and modern language programs are required to take the examination in a London campus.

The virtual campus of the University of London has 26,000 students, in addition to 102,000 students of the physical campuses.

5.3.7 Michigan Virtual University

Michigan Virtual University (MUV) is a name used at Michigan State University (MSU) to refer to course and instructional programs offered through the Internet. The Virtual University is designed to fulfill needs of students’ learning without the time and place constrains of traditional university programs.

A variety of courses are offered at MUV such as Introduction to the Internet, Administration, Research, and Mass Communications, etc.

MSU degree candidates may register for Virtual University courses through regular enrollment. Besides, the MSU student will be given password for searching special documents exclusively provided for MUV students.

Students may register for non-credit courses through toll-free numbers but this option is only applied for US residences. If students face difficulties in enrollment, they can contact the Virtual University 24 hours. The university’s Internet address is www.vu.msu.edu as shown in Figure 27.

5.3.8 University of California Extension Online

The website <learn.berkeley.edu>, as shown in Figure 28, a collaboration between UC Berkeley Extension, the continuing education part of University of California Berkeley, and UC Extension's statewide distance learning division, the Center for Media and Independent Learning. It was designed based on its successful AOL (America On Line, the largest ISP in the world) campus to give people an opportunity to continue their education and update their skills. The University of California Extension Online assures the same high-quality curriculum contents and instructors approved by the University of California as other UC Extension classes.

UC Extension offers several certificate programs and professional sequences yet does not offer degrees. However, credit from college-level UC Extension courses is
accepted at the University of California and other accredited institutions.

Courses that the University of California Extension Online offers include Business and Management, Computer Science and Engineering, Natural Sciences, etc. Like other Internet-based courses, those at the University of California Extension Online can be completed at the student’s convenience via services available on the Internet such as online course materials, web message board, e-mail, and group discussion through real-time communication. Even though most course materials are available online, textbooks and physical examination remain important in studying at the University of California Extension Online. The students have to study based on their textbooks and take each final examination under supervision of selected proctors.

5.3.9 California Virtual University

In 1996, the governor and academic leaders of the State of California originated the idea of setting up California Virtual University to offer distance education to Californians and foreigners. It has been agreed that California has more foreign students than any other states in the US. California Virtual University was established in 1997 with the website <www.california.edu> as shown in Figure 29. More than 2,000 online courses offered by accredited public and private California universities may be taken by students anywhere on the World Wide Web.

5.4 Life-Long Learning from E-Education

In addition to formal education available on the Internet, all kinds of informal education or life-long learning are also readily available. Examples such as freeENGLISH.Com, HouseNet.Com, ThaiGrocer.Com, E-Zoo, and an electronic museum are discussed in this Section

5.4.1 freeENGLISH.Com

This website, <www.freeenglish.com> as shown in Figure 30, was started based on the idea of the company named “eduverse.com”, to provide high-quality English resource for students and educators. Lessons on this website are provided free because it is supported by income from banner advertisement, in the same manner that TV commercials make television programs available free. The premium-quality educational programs and games on this website are designed by experts in the field of language training. To take the lessons with freeENGLISH.com, students have to register, download a software called “ENGLISH PRO Web Edition”, and download each English lesson. It is recommended that the student use only one account because the proctor will track the student’s progress by using the e-mail address given on the registration form.
5.4.2 HouseNet.Com

The HouseNet website, www.house.net.com as shown in Figure 31, is an award-winning web site that is the ultimate resource on home, garden, and today's lifestyle. It provides free advice and how-to knowledge that thousands of home enthusiasts have been exploring from its archive. It is composed of six major sections which are home improvement, home decorating, lawn and garden, sewing ideas, real estate, and smart savings. The origin of this website is back to 1991 as Homeline BBS, a computer bulletin board system, started by veteran home writers. The initial purpose was to share the knowledge of home repair and remodeling to other people online. The HouseNet web has been moved to the Internet since 1994 and on AOL since 1995. With over 400,000 visitors a month, the HouseNet website was ranked as “Best of the Web”, top 100 sites for 1998, by Yahoo.Com.

5.4.3 ThaiGrocer.Com

This American-based Thai grocery cybershop was established in 1998, claimed to be the first and complete Thai grocery store on the Internet. It physical office is located in Chicago, USA. ThaiGrocer, or <www.thaigrocer.com> as shown in Figure 32, offers Thai cooking lessons and Thai food product via E-Commerce. ThaiGrocer divides its cooking school into three sections which are the main page, the basic school, and the advanced school. The main page provides articles and features such as The Story about Thai Food, Amazing Thai Herbs and Spices, Learning Thai Language around Dinning Table, etc. The basic school presents information about utensils used in Thai cuisine and the advanced school gives sample daily menu. The cooking information available on this website is similar to that on any cooking book which is composed of a recipe and an instruction. The grocery store offers a variety of products for cooking Thai food such as chilly and curry paste, spices and herbs, sauces and condiments, etc.

5.4.5 The Virtual Museum of Traditional Japanese Arts

Kodansha International Ltd. produces the website <www.jinjapan.org/museum/index.html> as shown in Figure 33 for the Ministry of Foreign Affairs of Japan. Virtual museum provides a variety of great arts in
Japan. The visitors who are interested in artworks can take this advantage to explore this website at anytime. It contains varieties of Fine Arts, Craft, Performing Arts, Pastimes, Martial Arts, etc. In each category, the visitors will find some more subcategories inside. In addition to arts, this website also provides the history of Japan for the visitors who are interested in how Japan was originated.

5.4.6 Electronic Zoo

The website <netvet.wustl.edu/e-zoo.htm> as shown in Figure 34 is a part of the <netvet.wustl.edu> which was originated in 1993 to make information about animal and veterinary medicine available on the Internet as well as to help people and their animals in the spirit of academic interest in telecommunications for the veterinary profession. In the early stage of this non-profit website, it was supported by the Argus/University of Michigan Clearinghouse, the W3 Virtual Library Consortium, GNN, the Whole Internet Catalog, Point Communications, McKinley Group, Internet World, NetGuide, .net Magazine, Microsoft Network, CompuServe, Prodigy, and the many others.

6. E-Government

Commercial enterprises increasingly using Internet to reach out to their customers and business partners providing dramatic improvements in levels of service and convenience. Such developments in the commercial world lead to the question of whether governments have yet to realize the full benefits from the Internet. Some governments have taken this initiative. In addition to potential improvements in the delivery of Government services, some see the Internet as possibly having much wider and deeper effects on society and even affecting the nature of democracy.

The term “Electronic Government or E-Government” in a broad sense describes the use of Internet to support the workings of governments and public administration. Usually, there are three main effects expected as follows:

- There is the use of the Internet to improve the efficiency and effectiveness of the ‘executive functions’ of government including the delivery of public services.

- The Internet open up new possibilities for governments to be more transparent to the citizens and businesses, giving access to a greater range of the
information collected and generated by government.

- The adaptation of the Internet may enable fundamental changes in the relationships between the citizen and the state, and between nation states, with implications for the democratic process and structures of government.

Electronic government services are seen as having a potential role in improving four key areas:

- speed of carrying out transactions;
- convenience/access;
- flexibility in options and hours of service;
- empowerment (bring services closer to the public and allowing them to choose how/when to carry out transactions).

E-government has multiple dimensions, each dimension demands leadership, strategy, cross-coordination, and know-how, all combined with a technology strategy to take vision to reality.

Some Example of E-government will be given in this Section.

6.1 Taiwan

The Taiwanese government has been promoting computerization of its services for many years. The project of an online government was designated in 1997 and one of project is to put 13 public services online in a “full service window.” Among the services would be household registration, which encompasses voter registration, land tax and schooling matters and business registration. By the end of this year, Taiwan will hopefully have an “E-government”. Citizens will be able to identify themselves online so that government agencies can open the relevant files and deal with the inquiry. E-commerce for government is another strategy the government plans to embrace. Government procurement will be done online. Suppliers will be paid electronically. Moreover, the government plans to put all its publications online and the Government Information Office already publishes an English - language electronic newspaper every weekday.

6.2 Malaysia

Malaysian government has established an automated office system designed by Microsoft. This new product called the Generic Office Environment (GOE) will allow government users to collaborate, access and manage information in more meaningful way. The GOE is a part of “E-government”, a flagship application for Prime Minister Mahathir Mohamad's Multimedia Super Corridor (MSC) project. The aim of e-government is to create a completely paperless environment for the new federal administrative center built in Putrajaya, which Malaysia hopes to attract global technology companies to test and develop new products and services. On July, 1999 an Intelligent City, Cyberjaya, what opened by Prime Minister Mahathir Mohamad. Cyberjaya is one the flagship of the MSC project.

7. Concluding Remarks

This paper present a brief history of computerization and Internet in Thailand, Education in Thailand, Pros and Cons of E-Education, Website for E-Education, Life-Long Learning from E-Education, E-Government with example from Taiwan and Malaysia, E-Commerce starting with history
of Internet in Business, Opportunities in E-Commerce, E-Commerce Market Statistics, Examples Successful E-Commerce cases. The dam blocking the Internet has been broken. The Internet water from behind the dam is flooding everywhere. Therefore, to survive, everyone will have to learn to swim or learn to use the Internet. If you are not planning to use the Internet in education, government, and commerce, you are planning to be out of education, government and commerce.

Reference


