The Role of Information Technology\footnote{Country Report presented to ASAIH Annual Meeting held in Australia, 12-14 June 1996} in Education Development in Thailand

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ABSTRACT

The growing importance of both the computer and telecommunications components of information technology (IT) is demonstrated by the world-wide popularity of the Internet. In the first four months of 1996 the number of Internet users grew from 60 million to 100 million and by the year 2000 it is expected that there will be 1.2 billion users of the Internet. This technology has been adopted in almost every country of the world, including Thailand. This paper examines the close connection between IT and the Internet in Thailand by examining the role of IT in educational development, administration, and policy, the teaching of IT and its role in non-computer subject matters, and by looking at the Internet in Thailand. The article also includes an example of an Internet project at Assumption University.

INTRODUCTION

Many papers have been written about Information Technology (IT) in Thailand [1-26]. IT Applications in the country may be classified into five stages. The first stage started with introduction of the abacus. Although the abacus still exists in Thailand, the first stage may be considered ended with the introduction of unit record equipment. The second stage started in 1937 when the Ministry of Interior acquired unit record equipment such as electric card punching machines, card counting sorters and tabulators for census work; they were used in 1947 and 1957.

The third stage or the most important stage of modern Information Technology in Thailand may be said to have started in 1960 when his Majesty the King of Thailand visited Silicon valley in the United States. HM the King has provided and is still providing his vision, leadership and inspiration for all Thais to realize the importance of Information Technology in national and social development as well as education. The educational sector has been
following HM’s lead in many directions. For example, in 1961, the SEATO (South East Asian Treaty Organization) Graduate School of Engineering attached to Chulalongkorn University at that time decided that a computer center must be established in Thailand. With the help of the US government, a scholarship was provided for the graduate with the highest score to study for a Ph.D. at Georgia Institute of Technology. That person happened to be the senior author of this paper. The purpose of his Ph.D. dissertation was explicitly written so as to prepare the candidate to assume the leadership position in the first computer center to be established in Thailand. The first two computers were installed in Thailand in 1964. One of these was at Chulalongkorn University. The person who was given scholarship also earned his Ph.D. in 1964. His dissertation was on Numerical Analysis which in 1964 was in the core of computer science. He decided to stay on in the US to gain more experiences and eventually became the Director of Graduate Studies in Computer Science at the University of Missouri in Columbia, Missouri from 1968 to 1973 and then a Full Professor of Computing Science at the State University of New York in 1973-1974. In 1974, he returned to Thailand to become Professor of Applied Statistics and Chairman of the Department of Computer Data Processing at the National Institute of Development Administration which is a graduate school in Thailand.

The fourth stage may be considered to have started in 1978 when a few microcomputers were introduced. The number of microcomputers then grew so fast that it became much higher than the number of mainframe and minicomputers.

The fifth stage started in 1987 when Internet was introduced into Thailand for the first time. By 1994, the number of Internet users in Thailand became about 5,000 and increased rapidly to about 65,000 in 1996. It is expected that by the end of 1996 the number of Internet users in Thailand will be over 100,000.

This paper presents an account of the policies of Information Technology (IT) in Education in Thailand, teaching of IT subjects, IT in non-IT subjects, IT in educational administration, and Internet in Thailand.

POLICIES ON IT FOR 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 1.3 million in 1996.

In developed countries, the three most popular computer applications are in airlines, banking, and manufacturing plants. However, in Thailand, the 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.
Table 1. Number of Computers in Thailand

<table>
<thead>
<tr>
<th>Year</th>
<th>Number 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>
</tbody>
</table>

By 1976, the Ministry of University Affairs established a Subcommittee to Coordinate Computing Activities responsible for computing activities of all government universities, all private colleges and all departments in the Ministry. The senior 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 18 other members who were from government agencies, universities, and computer companies.

Also in 1984, the Ministry of Education approved a plan to introduce computer subject as a major in junior colleges. A committee was earlier established in 1982 to prepare textbooks for the course and the senior author happened to be named the Chairman of the Committee. He wrote 2 books for the purpose. Similarly, 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 high schools selected to offer computer courses was Triem Udom Suksa School which is a 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. By 1996, all government and most private universities in Thailand each offers at least one degree program in IT area. The senior author of this paper was appointed by the Ministry of University Affairs, as the Chairman of the Computer Curriculum Committee for Government Universities and Chairman of the Computer Curriculum Committee for Private Universities, positions which the author still holds.

TEACHING OF INFORMATION TECHNOLOGY

The role of IT in education may be classified as:

- Teaching of IT subjects
- Use of IT in teaching of non-IT subjects
- Use of IT in educational administration.

For teaching of IT, Thailand is as advanced as any other country in the world. For example, Assumption University of Thailand offers 6 IT-related degree-level programs, more than the number of IT programs offered by many universities in the US. Sample IT-related education programs in Thailand are:

- Ph.D. in Computer Science and Ph.D. in Telecommunication at Asian Institute of Technology
- Ph.D. in Computer Information Systems at Assumption University
- Ph.D. in Computer and Engineering Management at Assumption University
- Ph.D. in Electrical Engineering (with specialization in Computer Engineering) at Chulalongkorn University and King Mongkut's
Institute of Technology Ladkrabang
Master's degree in Computer Engineering, Computer Science, Telecommunication Engineering and Telecommunication Science at almost all government universities and several private universities such as Assumption University, Bangkok University, Rangsit University, etc.
Bachelor's degree in Computer Science, Computer Engineering, Business Computer, Information Technology, Telecommunication and some such at almost all government universities and private universities.

The educational sector in Thailand has developed strong IT research activities. Sample titles of projects are given below:

- A Computerized Rectilinear Scanner
- A Conceptual Framework for Design and Development of a Knowledge Based System for a Development Planning of the Southern Region of Thailand
- A Decision Support System for Coalition Government Formation
- A Design and Construction of Asynchronous to Synchronous Data Transmission Converter
- A Design and Construction of System Software for Communications between Microcomputers under the Local Area Network
- A New Transistor with MOIS Structure
- A Procedure for Producing Realistic Images Using Linear Shading
- A Strategy for Selection of Reasoning Rules
- A Thai-English machine Translation
- An Experiment with a Domain-Independent Export System Shell
- AI Approach in Thai Syllable Separation
- Analog Simulation Using General Purpose Circuit Simulation Programs
- Audio Power Amplifier Quality Improvement by Using CVCC Circuit
- Automatic Emergency Call via DTMF Telephone Network to Paclink Network
- Beginning and Ending Points Detection of Isolated Utterances
- Boolean Functions for Edge Detection in Binary Image
- Character Recognition
- Computer Human Resource Planning for a Development Country
- Contextual Question-Answering System
- Contour Following by Window Method
- Control Flow Model for Prolog
- Decorrelated Texture Feature Selection Using Principle Component Analysis Method
- Design and Fabrication of MOS NAND & AND GATE ICs
- Development of Analog Data Acquisition System on the IBM PC/XT
- Development of 16 Bit Microcomputer and Basic Input Output System
- Development of Digital Signal Processor Board for IBM PC
- Development of Microcomputer Algorithm and Programming Language for Industrial Robot
- Development of PABX Control Program by Using STL Language
- Development of Reading Head for Pattern Tracking System
- Digital Radio Raging for Near Distance
- Edge Detection Technique in Image Processing
- Edge Detection with Auto-Adaptive Threshold
- English-Thai machine Translation
- Experience with medical Expert Systems
- Filter Coefficients of Band-Reject Recursive Digital filters with Maximally
Flat Group Delay and Adjustable Cutoff Rate
- Image Processing Applied to the measure of the Eyeus Torsion Movement in Real Time
- Intelligent Home Appliance
- Intelligent Tutor in Medical Technique
- Linear Control System Analysis and Design Program I
- Microcomputer Application in CNC Machines
- Microcomputer Application in PCB Design
- Microcomputer Application in Programmable Controller Simulation
- Microcomputer Application to Logic Circuity Design
- Microcomputer-Based patient Monitoring System for the Intensive Care Unit
- Microcomputer-Based Thai-English Machine Translation for Thai Rice-Mill Correspondence
- Microcomputer Simulation of Self-Tuning Temperature Controller
- Natural Language in Computer Simulation
- Properties of Combining Function in Group Expert Systems
- Reasoning Under Dynamic Knowledge Base
- Satellite Image Classification
- Text-Image Wordprocesser
- The Design and Construction of Digital PABX
- Use of Microcomputer-Controlled VTR for CAI

USE OF IT IN NON-IT SUBJECTS

From the time of introduction of computers into Thailand in 1964, computers have been used in the teaching of non-IT subjects. The first computer installed at Chulalongkorn University was in the Faculty of Accounting and Commerce where it has been used in the teaching of many courses in that faculty. By 1996, all departments in all Faculties of all universities in Thailand use microcomputers. Some vocational schools and commercial colleges have 200-400 microcomputers each. Many high schools have dozens of computers. Even some kindergartens have computers. The Internet also makes use of computers in teaching of non-IT subjects even more popular.

Another important area of IT in education is CAI for Computer-Assisted Instruction, or CBT for Computer Based-Teaching, or CMI for Computer-Managed Instruction. Many CAI courseware packages have been developed in Thailand. Commercial companies such as ISOFAC (International Software Factory) developed CAI packages for export to the US and other countries. Sample CAI packages developed in Thailand are for teaching of arithmetic, statistics, languages, and many more.

USE OF IT IN EDUCATION ADMINISTRATION

Similar to administration of any other organizations, the concept of M^I is applicable. The "M's" are man, money, machine, and material and the "I" is information. The concept has to be used in the seven areas of educational planning, organizing, staffing, directing, coordinating, reporting, and financing.

The Ministry of Education as well as of University Affairs do employ Information Technology in Administration. The Ministry of Education is in charge of all levels of education except most of higher education at the degree-granting level. There are 21 government universities (13 in Bangkok) and 31 private universities (18 in Bangkok). By
1996, all universities in Thailand do use IT for educational administration. Even high schools do use microcomputers in administration.

INTERNET IN THAILAND

Some Thai students and visitors to the US had been given Internet addresses but could not maintain them in Thailand because of the high cost of international telephone connection. 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 an Internet e-mail service on a regular basis. The Australian node would call AIT three times a day to send and collect mail.

AIT charged 200 baht (about US$8) per month for up to 15,000 characters transferred (counting both in and out messages combined) plus one baht for every additional 50 characters. One of the problems was the inability to control incoming mail, especially the lengthy Calls for Papers, list of references, etc., which was not asked for, and had to be paid for because they had automatically entered the mailbox. This problem was later solved when the rate was changed to a fixed 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 one 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 until 19:00 in the evening.

In 1991, Digital Equipment (Thailand) Ltd. acquired an Internet address for internal and research-related usage. No dial-in number was made available and the user had to use the machine at the company.

A major breakthrough occurred in 1991 when Chulalongkorn University became the first international Internet gateway in Thailand. After sufficient testing, full operation was started in July 1992 with a 9,600 baud leased line to Virginia, USA, later upgraded to a 64 K line. The fees for the leased line, with a 25% educational discount from the Communications Authority of Thailand (CAT), were about 5.2 million baht per year (about US$468,000). 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 Chulalongkorn University was obviously much better than the e-mail-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 away.

In January 1992, the National Electronics and Computer Technology Center (NECTEC) established the NECTEC E-mail Work 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 Chulalongkorn University. Then in September 1993, NECTEC became the second gateway from Thailand and it was connected to Virginia, USA by a 64 K leased line.

Also in January 1992, Thammasat University (TU) Information Processing Institute for Education and Development (IPIED) 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 Ladkrabang started experimenting with the Internet in mid-1992, connected at Thammasat. At the beginning, only about 40 users were approved. Later the Computer Research and Service Center which serves all the faculties established a central node for Ladkrabang. The number of users was about 500 in 1993 and increased to about 2,000 by 1996.

Digital Equipment (Thailand) joined ThaiSarn in January 1992 but was later disconnected because commercial organizations were not allowed to use the educational Internet in Thailand. Prince of Songkhla University and AIT joined ThaiSarn in 1992 but AIT later installed a direct leased line to Chulalongkorn University.

THE INTERNET AT ASSUMPTION UNIVERSITY

As of May 1996, Assumption University (AU) and KSC Commercial Internet Co.,Ltd (Internet KSC) have the largest Internet system in Thailand. The system includes five SunSparc 1,000 computers each with eight CPU's. The amount of disk space is over 123 Gb. More than 100 sets of Sun computers and several hundred sets of microcomputers are connected through a campus network with a speed of 100 million bits per second (Mbps) to be upgraded to 155 Mbps ATM. For telecommunication, over 800 telephone lines are available for dial-in at up to 28.8 kbps and additional 2,000 telephone lines have been requested.

The Internet project at Assumption University was started soon after AIT spearheaded the Thailand connection to the Internet in 1987. The senior author of this paper was the President of the AIT Alumni Association and had an Internet account at 200 baht per month. Since he was also the Honorary Vice President of Assumption University, his Internet fees at AIT as well as the costs of the computer and modem were paid for by Assumption University.

After several years of usage of the Internet through AIT, the authors were convinced that the system should be made available to the whole university. Therefore, in August 1993 they proposed the project to the AU 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 following:

* To educate the students, faculty and staff members on the concepts of local and international networking.

* To prepare the students to enter into the 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 education usage.
On the financial side, the Board of Trustees 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 is charged US $4 per month and each graduate student US $8 per month. All the income is earmarked for the development and maintenance of the project.

On 19 January 1995, Her Royal Highness Princess Maha Chakri Sirindhorn graciously presided over the opening ceremony of the International Internet Gateway at Assumption University. This international gateway may be considered the third international Internet gateway from Thailand or the first private-sector international Internet gateway. The two earlier gateways are in the government sector. By 1996, AU and KSC have two international Internet gateways to be increased to six in a few years.

Another major Internet breakthrough in Thailand occurred at the end of 1994 when the Communications Authority of Thailand (CAT) entered into 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 operations, it was agreed that each joint venture be made a private company in order to avoid red tape and bureaucracy associated with government agencies. However, although the joint venture with NECTEC is supposed to become a private company named Internet Thailand Co., Ltd, it turned out not to be a private company unless an approval is given by the Cabinet of Thailand. NECTEC was allowed to operate commercial Internet on a trial basis for one year and allowed to register as a private company in May 1996. CAT has also entered into joint venture agreements with nine other companies.

In December 1994, a private company was registered as KSC Commercial Internet Co., Ltd (Internet KSC) and subsequently CAT got a 32% share in KSC free of charge. Another 3% share was to be sold to CAT employees, and 65% went to Internet KSC Co., Ltd. Assumption University agreed to serve as the incubator for KSC for a period of not more than two years. Later, CAT and KSC decided to set up the second Network Operations Center (NOC) outside of AU. By 1996, KSC has established several NOC's at commercial colleges and vocational schools. Many colleges and schools are now using Internet in teaching, research, and administration.

CONCLUDING REMARKS

IT applications in Thailand may be classified into five stages, starting from the stage of abacus, the stage of unit record equipment, the stage of mainframe computers, the stage of microcomputers, and the stage of Internet. Thailand has developed policies on IT for education, developed IT curricula, developed packages for use of IT in teaching of non-IT subjects, developed IT projects, as well as IT education administration. Internet, the most modern example of IT, was brought into Thailand 1987 and by 1996, Thailand is as advanced in Internet as any country in the world. It has been said that by the time Hong Kong reverts to China, Thailand may become the capital of Internet in South East Asia.
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