

TEACHING INFORMATION LITERACY FOR SEAMLESS PERSONAL WORKSPACE

--ATTEMPTS FOR OPENING THE NEW ERA OF INFORMATION LITERACY--

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1 Introduction

Technology is advancing and the population of the computer 'capable' is growing. While, we frequently misunderstand the computer capable as the information literate, though. The information literate can cope with the technological change and the cultural change caused by technological advancement. Devices continue to go down in price. It becomes realistic that everyone will have own computer.

This paper addresses the design issues on the computer facility for education as the attempts for opening the new era of information literacy. In his theory, information literacy is defined as the essential stable attitude for computer readiness and network readiness of each individuals in the Internet age.

2 The Past and the Present as the Historical Background

2.1 Before 1996 : Number Crunching Services to Personal Computing Assistance

Since 1988, the author had been a member of the research lab at Aoyama Gakuin University Information Science Research Center (ISRC) , the computer center, until 1996 Spring, when he moved to the faculty for School of International Politics, Economics and Business (SIPEB). At ISRC, he had been in the position for exploring the state of the arts computer technologies and designing new systems.

Before the author joined ISRC in 1988, the computer system had been a quite typical traditional system, with main frame computers, terminals, and the inter-campus links for TSS service and batch processing. There also were several personal computer rooms which were not connected fully, and remote job entry facilities to a computer system outside of the university.

In 1988, the author had introduced TCP/IP technology to the university as his research project for heterogeneous multicampus network system [1]. He designed an early intranet system

which connects three campuses of the university, by introducing workstations and connecting the net to the Internet, allowing the super computer, various personal computers and phone line access to be a part of the net. The system was called Apostle and had been working for several years by ambitious uses and inherited to the kernel for the current Aoyama Gakuin computer network system. ISRC have completely renewed the whole system in summer 1997.

2.2 Attempts at SIPEB for Global Classroom

SIPEB was the first real organizational user of the system designed by the author. SIPEB started the international business game course for its graduate school in 1991, which used the Internet connection as the media to transfer the business game data between SIPEB and CMU GSIA under the leadership of Dean Itoh (SIPEB). This real class room use was the origin of the global challenge of SIPEB as far as the author understand, which is then turned into the current Global Classroom initiative. Now the Global Classroom utilizes its own video conferencing facilities and SIPEB Internet backbone, and connects several universities in Asia and in North America with the state of the arts technologies.

3 Possible Keywords to Start a New Process With

3.1 Dream

The random list from the author's dream has the following items.

Home computing and business computing will converge.

Internet will connect home and business.

Every device will talk each other.

Wireless LAN at home and business makes things different.

Computer will be used as personal assistant wherever it goes. Connecting to the world is not luxury but necessity.

There exist lots of complicated standards. Everyone will be happy with a single and simple standard device, which does everything.

The author believes the following will be true in the future.

No classroom level system administration

Network computers plus the WebTop

Courseware set up in the WebTop

3.2 Fashionable Keywords

To start a process for conceptualizing the Information Literacy, there are various technical keywords to choose and consider such as;

World Wide Web, Video Conferencing, Mobile Computing, Electronic Commerce,

Smart Card, Java, JavaScript, Network Computer, Virtual University, Digital Camera,

PHS, Internet Phone, Multimedia ...

And, more powerful CPUs and better performance new peripheral hardware are coming constantly.

Furthermore, we may need consideration of the Internet access provision for entertainment, such as game playing, TV, and more...even for university computing center. We also may need changing the learning model. Old model is that teachers give lectures to students and so on. New model might be teachers and students SHARE the intellectual databases. Furthermore, we may need new communication systems beyond campus when we are going to think the study environment of students.

But, while hardware in the world can be unified into a single standard, software cannot be. How we should go ?

3.3 Easy Prescriptions?

There is no standard answer. Once there was a speaker at a conference, who think the following combination is the answer, and it solves almost all the problems.

MS Office for typical advanced users (MS Office is OS),

Linux for CS Dept. (Lintelux?),

WebTop for most users (just do it).

Are there any further idea?

4 Paradigm Shift and the Mega-trends

We should recognize that we are in the transition from the traditional education model to a new one which is going along with the change of our society and life style.

First, the elements for the change in education model is introduced in 4.1, and second, we are going to focus on the social and life style change in 4.2.

4.1 Paradigm Shift in Education

We know we are in the phase from quantity centric view to quality centric view as a whole.

There are six shifts recognized.

- 1) Teacher-centric to student-centric
- 2) Provider driven to individualized learning
- 3) Synchronous learning to perpetual learning
- 4) Rigid, pre-designed functional systems to flexible, process-based object systems

Purpose of education is education, not the utilization of the facility. Introduction of every new technology is for better quality, not for teachers' convenience. All the IT (Information Technology) should be interaction oriented, not mass broadcast oriented.

All the processes needs the faculty's support. Faculty members are in general afraid of new technology for education. So we can not neglect the support for them. And the most important thing is the institutional leadership.

4.2 The Paradigm Shift in Social and Life Style Framework

The above shifts described in 4.1 is the result of more general trends in the social and life style change listed below;

- 1) "Technology defines process" to "Technology supports processes"
- 2) Fixed Information boundaries to Open access
- 3) Domestic focus to Global challenge. Or Technology for Global Vision
- 4) Lifelong education becoming norm

And the author would like to propose a new terminology "Corpetition". "Corpetition" shall be a keyword to mean cooperative competition.

4.3 The Changes in the Computer Technology to Consider

We should never marry with one single electronic technology but industrial standard if it is really so. There is the importance of industrial neutral standards to keep market and fair competition.

The major technological trends to consider is as follows.

Network Connectivity to Network Services

(Accessibility to the Internet to Being a part of the Internet)

Two Tier Client/Server to N Tier, Distributed Architecture

Visit and Use to Mobile Use, Location Independence

Computer Equipped Classroom with Staff to Internet ready Classroom with zero administration

GUI to NUI, WebTop

4.4 Distance Education as a Current Trend

Distance Learning is not merely a hot, new trend. Instead, it represents a genuine transformation in the delivery of higher education curricula. The information literate is ready to join distance education.

95% (est. for '96) of USA schools are involved in Distance Education anyway [2]. 61% of the institutions with Distance Education programs have been operating for less than 5 years. Technology and delivery infrastructure is being developed to deliver education to where the student wants it. According to a survey [2], the most popular distance learning uses are:

1. Undergraduate Credit (70%)
2. Continuing Ed (50%)
3. Meetings Forums (45%)

4. Graduate Credit (40%)
5. Adult Ed (35%)
6. Class Supplement (30%)
7. Non Credit (25%)
8. Teacher Training, .. (>25%)

5. The Cybercampus Model

The author defines the student workspace as cybercampus. This model of the author attempts to describe the current process of re-designing our computer resource allocation. The process is a sort of SPR (Social Process Re-engineering). We cannot think the process as BPR (Business Process Re-engineering). We think this SPR process is involving not only the computer center but also the whole university system and the whole relation outside the world including inter-university relation, and relation between students' home and university.

This model has the following elements to open the new era in information literacy;

- 1) ISP introduction (balancing the facility in Campus and seamless space for individuals),
- 2) Mobile computer (tools for creativity of individuals),
- 3) Digital handy cellular phone (connectivity),
- 4) Network computer (less administration for client machines),
- 5) Global challenge.

5.1 ISP Introduction

University computer center has been providing everything for faculties and students. We may need to provide public phone access at least, if the computer center is going to support everyone's information literacy. The external access into university computer center becomes serious business to carry out. So, there are two choices for computer centers of universities. One is to make itself as an ISP. The other is to get the assistance of commercial Internet Service Providers. In other words, outsourcing. ISP (Internet Service Provider) is a recent successful business in computer related industry. ISP provides internet access for organizations and individuals. We decided to introduce this outsourcing by having a special contract with the Microsoft Network for our case. The Microsoft Network provides us most of the functions in satisfactory level. Here is the analysis for that.

1) Internet Access is now for everyone. It was for CS department in the past.

2) Internet access service requires mass service for university and by university. The number of accounts should be greater than 10 K. PCs on campus becomes more than 1 K. To cope with the distribution of homes, multiple access points and enough access lines are needed, including typical analog lines, digital lines for ISDN connection, and wireless communication. This scale

of service is ISP. Then computer center should play a role of ISP?

- 3) Partial outsourcing is our conclusion.

The background of the analysis are following 4 items.

- 1) Students have their own work spaces. Then they have their groups such as club activity, other than university work spaces.

- 2) Students do not always be happy, even if university provides nice computer facility on campus. Namely, they do not always come to campus everyday.

- 3) University cannot control or design students' home computers. Such computers are properties of their homes mostly of their parents.

- 4) University cannot provide 24 hours hot line service using phone line. Namely most of the students do their homework in night or even in the midnight. They need assistance in the night, while university stuffs are out of duty for such time.

5.2 Mobile computers for Everyone

This model is the result of the discussion for the following symbolic questions:

"Students must come to campus to use computers and the Internet?"

The answer should be "No." Since we recognize students' work space is broad, we have designed specification for our mobile computers instead of providing PCs on campus. The specifications contain the following items.

- a) 1 Kg, smaller than A4, preferably B5
- b) Internet Connectivity and basic Internet software.
- c) Word Processor and other modern 'electronic stationary'
- d) Must be robust with wireless communication
- e) Local storage (it does not always mean to have hard disk inside)
- f) Color LCD display, PCMCIA
- g) multimedia ability

We have chosen Toshiba Libretto for our case in 1997. It has Windows 95 with MS Word, Excel, Lotus organizer, Tokyo Street Map, and so on. It has Pentium 75 MHz for CPU, 16 MB main memory, 810 MB HD and 33.4K pcmcia modem. Our initial project started with 400 students. 150 students have wireless access tools using PHS handy phone system and PIAFS data card.

5.3 Give Wireless Access with PHS

PHS (Personal Handy phone System) becomes popular and most students are familiar with the technology as wireless phone. So there is no high hardle for them. We have judged the 32kbps digital data capability of it is worth to experience.

PHS specification is defined by MPT TTC (Telecommunication Technology Council) in April 1993. Technical data for PHS is follows:

- a) 1.9Ghz (1895.150 MHz - 1917.950MHz, 300MHz ea.) Currently 32ch are provided.
- b) TDMA (Time Division Multiple Access)
- c) TDD (Time Division Duplex), QPSK (Quadrature Phase Shift Keying)

With this TDD/QPSK each physical channel is shared by 4 logical channels. As a result, 128 simultaneous access are given.

- d) Below 10 mW. The power for PHS is very tiny.

- e) PIAFS standard for digital communication. PIAFS is the PHS Internet Access Forum Standard. The main characteristics is it employs 32 Kbps digital link protocol. PIAFS uses special packet format on top of ISDN packet format. PIAFS is used for digital multimedia communication, IP packet transfer for PPP, and so on.

The origin of PHS is actually cordless phone. It is a digital cordless phone with lower power than cellular phone. Antennas for PHS are placed everywhere such as subway stations in Tokyo. So, for city life, PHS is not inconvenient. PHS is almost equivalent to PCS (Personal Cellular phone System) in the United States.

PHS has multiple functionality. It can be used as ordinary cordless phone, and as cellular phone. And with the assistance of digital data transferring facility it can be used for special purposes such as campus extension system equipment or transceivers or wireless data terminal.

In Japan, cellular phone and PHS are getting increasing populations. MPT reports, in May 1997, 22,554,000 cellular phones and 6,654,000 PHS units are installed in Japan (total 29,208,000). For 1997, 7,520,000 PHS units will be sold, which is larger than 7,192,000 (PCs sold in 96) according to the report. Since cellular phones were 15 M units and PHS were 4M units at May 1996, we observe the rapid growth for cellular phone and PHS last year. The number 29,208,000, which is the total number of the units, is about 20 % of total population in Japan. It means that 1 out of 5.

5.4 Network Computer

Network Computer (NC) is attractive idea for systems administrators and users both. For systems administrators, NC releases them the software delivery labor, since NC based system has a feature to automatic delivery of software while NC is connecting to the server. Systems administrators are only required to place or update application software at server, so they will be free from the maintenance job for each personal computers. For users, it is more robust, lighter and is giving better and quick response since NC has simple small kernel system inside the machine. NC is believed to be a less or zero administration machine. We are evaluating NC as a computer in between PDA and notebook computer. If we choose Java for NC, we can obtain more freedom and power. The overall analysis is written in [3].

While NC is not real yet in consumer sense, there are lots of industrial efforts for it and

there are several successful early systems for now. We are judging the introduction of NC into university in 1998 or later.

5.5 Global Collaboration

On top of the technical elements described in this chapter, there is the fifth element, Global collaboration. Global collaboration is not a technical issue but more general principle for our direction. The decision of us is symbolized as the answer for the following question; What will we do in the new era?

We all know global collaboration is a keyword. We also know global challenge or global competition becomes more serious subjects for universities. As one of our attempts, SIPEB has a initiative for Global Classroom lead by the Dean. Under this initiative, we are trying to explore new style of collaboration and to spread our friendship to various nations. We are trying to have open alliance. Global Classroom itself is for international economics and business course. Global Classroom features electronic conferencing facilities. Through Global Classroom we have been trying to have a concrete vision and procedures to share with this idea among various nations and universities.

We also know that the importance of individual research and development efforts to explore the basic technology and infrastructure for globalized virtual campus. Global research collaboration is not a scheme for getting information in one way. Rather, it is the real frame work for mutual understanding and mutual stimulation among universities in different regions. For real work, two way media is important than one way broadcasting media such as TV. This is the basic reason why we feel the Internet is attractive. PCs at home and on campus can be used as a media for this type of communication, in other words, information exchange through Internet. The development of Internet technology itself is also a subject for global research collaborations. After we had set up the infrastructure, we can make a next step of research collaborations in the applied area of information technology. Aoyama Gakuin SIPEB had already began the process. We welcome new people at any time.

The most important nature which we need to constantly aware is "Pan Pacific Nations have different cultures". We recognize the economic development phases of such nations are different. Each country is in different step. Especially in Asia, each region has each historical background and culture. We cannot evaluate using a single measure. The Internet is the network of networks, which means the group of many independent groups. We feel we can live with the Internet.

6 Conclusion

6.1 Toward the creativity of people

Our attempts are characterized in the following word. Individualization of Organization. It means two things; one is each individual entity should be organized as a autonomous entity. It

should have a system inside and should have communication facility to outside world. The other one is one organization will be a collaboration of several different sub groups. In other words, distributed system. We are pushing the cutting edge bit by bit constantly. In a broader sense, we are trying to improve the system daily or we should design the system as a subject for dynamic and incremental object.

For the conclusion, the author wants to describe the following prescriptions for IT education.

- 1) Human resource is the key element for national development. Creativity of the individuals is the key subject for human resource development. To expand the creativity, it requires the continuous attempts for higher level education.
- 2) Traditionally, giving a higher level education have meant elite creation. Now we are seeking to give equal opportunity for everyone who wants it.
- 3) Distance education will give the chance for everyone on the earth. Not to give limited number of people better education opportunity, we feel the importance for the growth of ordinary people's creativity. Many nations have trivial difficulties to provide every citizen to give their children a chance for better education because of a physical or geographic condition. Distance education is suitable for such cases. Without physical going to a school or a university every students can get higher level knowledge, and can acquire the globally grown culture to share.
- 4) Information technology gives not only efficiency improvement but also social structural change. If IT is only applied for efficiency reason, there is no cultural advancement expected by employing IT. IT itself means the structural change of computing style and communication style. As a result, social structure cannot stay in the same position. Social structure itself is going ahead with the IT technology. Individual workspace is the basic element for social structure.

6.2 Some Further Technical Issues to Solve

Security and intellectual property protection is the primary concern especially when multimedia being introduced. Hyper link can connect author's text and outputs of other people or organizations efforts. Especially, if the linked property is the commercial or the art. It may cause intellectual property protection problems. Secure transaction must be kept for every Internet communication.

The price for each equipment must be affordable to individuals. Every computer will be owned by individuals not by organizations. If the price for such device is higher than they cannot spend, new era cannot come.

We need robust and highest bandwidth communication media to connect each organization and each individual. If the bandwidth is lower than the needed for multimedia communication, we cannot introduce multimedia live interaction such as animated image, sound, and TV like real time video facilities.

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