SMART PACE

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by

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ABSTRAK

Teknologi Maklumat sedang berkembang dengan kadar yang begitu pesat sekali. Perubahan teknologi pada dasarnya dirujuk sebagai revolusi maklumat Revolusi ini telah banyak membuat perubahan kepada kehidupan kita sekarang. Tetapi, pada masa yang sama juga dapat memperbaiki kualiti kehidupan kita dalam menghadapi kelebihan persaingan di era baru teknologi maklumat. Pusat Pendidikan Profesional dan Lanjutan (PACE) di Universiti Utara Malaysia yang mempunyai peranan utama menyediakan program pendidikan jarak jauh serta latihan kursus korporat telah menerima cabaran teknologi ini untuk memperbaiki kesemua kemudahan-kemudahan dan perkhidmatan-perkhidmatan mereka yang ada.

Untuk mencapai matlamat utama dalam member&an pembelajaran yang berkesan serta latihan yang cekap, satu cetakan biru untuk mengkomputerkan keseluruhan pusat ini yang dipanggil sebagai SMART PACE telah dicadangkan dalam laporan ini. Cetakan bit-u ini mengandungi maklumat terperinci bagaimana PACE dapat meneruskan pembangunan pengotomatan sistem pejabatnya dengan menggunakan konsep e-Pengurusan serta konsep e-Pembelajaran bagi program-program jarak jauhnya. Laporan ini juga membincangkan dengan terperinci keperluan perkakasan dan perisian serta cadangan rangkaian komputer yang baru untuk menghasilkan projek SMART PACE dengan jayanya.

ABSTRACT

Information technologies are expanding at an extremely rapid rate. The fundamental technological change now is referred to as the information revolution. The revolution has done a lots of changes to the way we lives today, but at the same time is improving our life quality for facing the competitive advantage in new Information Age. Centre for Professional and Continuing Education (PACE) in Universiti Utara Malaysia (UUM) whose main role is to provide a distance learning program and corporate training, has accepted the technologies challenge in improving the facilities and services provide by them.

In achieving their main goal for giving an effective learning and efficient training, a blueprint for entire centre computerization has been proposed in this project report called a SMART PACE. The blueprint contains in details of how PACE may proceed for developing an automation system in the office by using the e-Management concept, and e-learning concept for their distance learning programs. This paper discusses in detail the hardware and software requirements with the proposed computer networking in order to develop a successful project.

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CHAPTER ONE

INTRODUCTION

1.0   BACKGROUND

PACE centre is an acronym for Professional and Continuing Education Centre in Universiti Utara Malaysia (UUM) and was formed on 1st. April 1999 to fulfil the university ambition to be the World Status University. The main role of PACE is to offer an education to non-traditional group such as distance learning program and franchising or twinning program with other private institution or corporate training.

There are three units under PACE administration; Distance Learning Unit (DLU), Franchise and Twining Unit (FTU) and Corporate Learning Unit (CLU).

DLU is responsible in planning and offering programs for the schools in UUM, training program for the academic staff, and appropriate programs that is aim to cater for the current need of the market. Distance Learning Unit's future plan is to make an improvement for distance learning methodology and to be more effective in using new collaborative technology.

FTU main objective is to coordinate the program offered jointly with private institutions under the franchise and twinning modes. This unit's future plans include working closely with reputable public and private agencies and to offer more professional and in-house programs and courses.

CLU is responsible to handle the offering of professional programs and short courses to the general public. The unit works closely with all schools in UUM in designing and planning of courses to be offered. Customized courses and seminars is also offered with special arrangement. Facilitators and tutors are academicians who are experts in their various fields. This unit also engages in smart partnerships with outside agencies.

Distance Education term is often interchanged with Distance Learning. This is inaccurate because institution or instructors will control the educational delivery while the student is responsible for learning. In other words, Distance Learning is the result of Distance Education. For this report, the Distance Education term will be used to represent the Distance Learning program offered by the PACE.

Today, the distance education environment has changed dramatically. Educators increasingly seek new solutions to a myriad of challenges including rising costs, reduced operating budgets, over-utilized resources (from faculty to the physical plant), and growing competition for a declining student pool. At the same time, advances in both two-way interactive and one-way broadcast video technologies have made distance learning more versatile and cost-effective than ever, ideal for a wide range of educational applications. (Walsh & Reese, 1995)

Demand for higher education in the United States is expanding rapidly as both demographic trends and fundamental shifts in the economy produce more prospective students seeking some form of post-secondary education (Dewayne, 1998). Maybe, by using information technology (IT) for improving education system to fulfill the growing needs for more training and education among the world community could be the solution of the "lifelong learners".

Bates (1996) has listed four most frequently reasons for using technology in education:

- to improve access to education and training;

- to improve the quality of learning;

- to reduce the costs of education; and

- to improve the cost-effectiveness of education.

E-government toward the paperless office is one of the seven flagships in Multimedia Super Corridor (MSC). These has lead Malaysian government to update their offices with the latest computers and IT in an effort to increase efficiency (Creed, 1999).

Over the last ten years, dramatic economic, political and structural forces have altered the nature of organizations. To address these dynamic changes, many corporations have embarked on campaigns fundamentally to redesign their business processes to enhance productivity and competitiveness (Alter, 1990; McCormick, 1991 as cited in Kettinger et. al, 1996).

In this study, PACE has been identified in preparing a blueprint report for computerized the whole centre in either their management system or distance learning program offered by them. In this blueprint, it shall cover the computerization for the whole centre of PACE. With the complete planning in this blueprint, hopefully PACE may expand their services by offering more online courses in future and at the same time can maintain their efficiency and productivity.

1.1 PROBLEM STATEMENT

PACE has been established in consistent with UUM to be the World Status University. Under the education philosophy, learning is a life-long endeavor; PACE is offering courses to a group of non-traditional audience. Non-traditional students have been defined as those adult students over 25 years of age and who are employed full-time in the business community (Whisnant et.al; Walsh & Reese, 1995).

Among the three units under PACE, DLE unit has the most in-house activities. This unit offers university programs, which are similar to the university full-time under graduate programs. But the only difference is that it will be offered as a part-time course. Their target customer is for non-traditional students who are employed full-time. In effort to provide the highest-quality learning experiences for its customers, a need to improve the facilities and services is very important.

Since UUM is moving toward a world status university, a need for planning to improve distance learning services by PACE is a priority with the new e-learning technology. PACE should not be left behind in its effort to improve their services to attract more customers.

Distance education can be expensive, that it requires careful planning, management, and course design. To choose a delivery method in distance education, we must also consider whether it can save the money, reach the intended audience, and provide better instruction than the traditional teacher. It also wills helps to study existing programs for covering more largely and rural states (Schamber, 1988).

1.2 OBJECTIVES FOR THE STUDY

The main objective of this study is to produce a blueprint for SMART PACE. A study will be conducted with the existing system available in PACE in order to produce a proposed SMART PACE system.

The specific objectives for the study is:

a) To identify the new hardware configurations; software requirements; and new computer networking in PACE in the process for developing the SMART PACE infrastructure.

b) To identify the types and component of e-learning system that may be developed in SMART PACE.

c) To identify the types of e-management system that may be implemented in SMART PACE.

In e-Learning development for SMART PACE, a prototype of e-Learning in PACE will be studied. The blueprint will give some proposal for improving the existing e-Learning prototype.

1.3 SIGNIFICANCE OF THE STUDY

The main significance of this study is based on the following rationales:

1. Assisting the UUM top management in decision making for developing a fully automated office in PACE centre in future development planning.

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2. Give a better choice in recognizing the suitable hardware or software for a better performance.

3. Give a full view of application available for using the e-management technology.

4. Give a full view of application available for using the e-learning technology

5. To improve the quality of services and facilities available in the distance learning program offered.

6. With a complete computerization system, PACE could provide a strategic advantage in penetrating potential new market segments, such as corporate training, continuing adult education and job training.

CHAPTER TWO

LITERATURE REVIEW

2.0   INTRODUCTION

Information technology (IT) in the form of computers and data communication been among the fastest growing innovations in both production and use during the past four decades, and the prospects for future growth appear equally bright (Kraemer, et. al, 1990). Strategies involving IT and information system in organizations has became one of the important element for organization to provide the all-important competitive advantage (Long, 1989).

We are now moving from industrial society to an information society. Our economy is now built on the production, management, and use of information. The challenge to management of organizations today is to achieve success in a world that is changing daily. Organizations that have a good information and use it in the management are more likely to be successfully, and those that do not will fall farther behind (Senn, 1990).

An information system is a set of people, hardware, software, data and procedures that work together to provide useful information. Information workers are people who create, distribute, and communicate information. Data workers are people who involved with distribution and communication of information such as clerks and secretaries. While knowledge, workers are people who involved with the creation of

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information. Management information system (MIS) is as a set of formal business systems designed to provide information for an organization.

Most organizations nowadays are moving towards computerized system that has change the way people work from manual operation to automation. The reason why computerizing system, because it will improve management and planning; give a good quality of service and increase productivity.

Since IT and information system is growing rapidly, the system is not only been computerized but moving towards networking that sharing information is a must in organization nowadays. The networking concept does not apply for inter-networking between the same organizations but has been expanding to network with multi organizations.

The Internet is the world's largest, most powerful computer network connecting personal computers, sophisticated mainframes, and high speed supercomputers around the globe. Internet itself is already a network of networks.

The emerging global network that interconnects a wide variety of computing devices located around the world offers great utility for communications between individuals and organizations, whether for work, education, leisure or commerce. Internet has open opportunities for organizations to do business electronically that has now emerged of what we call as electronic commerce.

Borgman (2000) points that since Internet is capable to interconnect computer networks and various forms of information technologies around the world, we are in the process of creating a global information infrastructure.

2.1 DISTANCE EDUCATION

Distance education is an instructional delivery that does not constraint the student to be physically present in the same location as the instructor. Distance education is not new because it has been enjoyed great popularity in various forms since 1800's when it existed as correspondence schools. Mail, radio, television, videotapes, and audiotapes are some examples of media that are used by educators to deliver education to remote students.

What is new is the affordability and advancement of digital transmission technologies with powerful multimedia computer systems. These, coupled with the accessibility of the Internet and the need to reach more students in a cost-effective manner, are creating a new surge in the distance education community. Technology makes education more accessible, especially for working adults.

Some open, flexible or distance learning courses may use e-mail, WWW or video-conferencing, but many are still likely to use traditional written and audio-visual materials and tutorials, tutorial support by telephone and post and some attendance at workshops or residential. The numbers of completely on-line courses is growing, but some examining or professional institutions expect you to attend for examinations, practical applications or have some kind of local face-to-face supervision. Open, flexible and distance learning can often make it easy to study by unit or module and for many subject areas, we can study for pleasure and interest as well as for qualifications.

Distance learning (including traditional correspondence courses) usually means learning at home or work, with no need to visit the learning centre (although the Open University has regional centers and encourages students to attend residential). Some Open University courses also designed to be studied by friends and community groups working together. Students receive materials and equipment, where appropriate, and are allocated tutors for specific and general support.

Becker (1999) points out that distance education is not only for offering academic but also on-the-job training and learning. Companies have long provided investments in employee education mostly in-house, eliminating travel time to off-site schools. Distance learning offers an opportunity to outsource teaching to specialized companies without taking employees away from their work. Web-based courses are rapidly developing in information technology, finance, accounting, marketing, management, the global economy, and many other subject areas.

Romiszowski (1993) has identified that distance education has been through four generation of developments. During the "first generation", the print-based model of correspondence education supported by distance instruction through written messages has been utilized intensively. Then in "second generation" of distance education through 60's and 70's was characterized by heavy reliance on open broadcast by either radio or television still supported by correspondence instruction and print materials.

The "third generation" of distance education has been characterized by teleconferencing system and also with another parallel development that was the video conferencing. Steinberg points that today, we are entering the fourth phase of development of distance education based on the integrated use of new developments

in telecommunications and computing and characterized by the integrated use of remote study materials supported by computer-based multimedia teleconferencing (as cited in Romiszowski, 1993).

Those integrated multimedia computer technologies will provide the platform, which will resemble real-time, interactive instruction. Online distance education, virtual universities and collaborative learning environment are among the new forms of delivery methods that have emerged with the use of technology. Maybe for the next generation, virtual reality, artificial intelligence and knowledge system would be implemented in the distance education (Kerka, 1996).

There are two categories of distance education delivery systems, synchronous and asynchronous. Synchronous instruction requires the simultaneous participation of all students and instructors. The advantage of synchronous instruction is that interaction is done in "real time". Forms of synchronous delivery include Interactive TV, audio-graphics, computer-conferencing, IRC, and MOO.

Asynchronous instruction does not require the simultaneous participation of all students and instructors. Students do not need to be gathered together in the same location at the same time. Rather, students may choose their own instructional time frame and gather learning materials according to their schedules. Asynchronous instruction is more flexible than synchronous instruction.

Moreover, in the case of telecommunications such as email, asynchronous instruction allows and even may encourage community development. Forms of asynchronous delivery include email, listservs, audiocassette courses, videotaped courses, correspondence courses, and WWW-based courses (though WWW will probably offer synchronous formats in the near future).

The Corporation for Public Broadcasting/Annenberg Project (1988) developed the following general profile: over 26 years of age, highly motivated, goal-oriented, and unable to attend the traditional classroom setting (as cited in Parrott, 1995). Chattanooga State Technical Community College (CSTCC) reported that the majority of its distance learners are working adults seeking degrees or specialized training, students planning to transfer to four-year institutions, or homebound students or other shut-ins (Hyatt, 1992).

CSTCC students take distance courses over other courses because of convenience, personal constraints prohibiting regular classroom attendance, flexibility of time to receive instruction, distance to campus, and cost-savings (Hyatt, 1992). When Howard Community College Spring 1992 telecourse enrollees were asked about their reasons for registering, 82% indicated that a lack of time for in-class attendance was a very important reason (Parrott, 1995).

Also, the fact that taking a telecourse could be combined with family responsibilities was very important to 65% of the enrollees (Livieratos and Frank, as cited in Parrot). These student profiles suggest that distance education serve a population of students whose life circumstances may not allow them to participate in the traditional classroom experience. McGinn (2000) points out that only 16 percent of enrollments in higher education this year are the full-time students, which their age are between 18 to 22. This result shows that the balance percentage of the higher education in higher education is an adult.

Research shows that comparing distance education with the traditional instruction indicates that teaching and studying at a distance can be as effective as traditional instruction, when the method and technologies used are appropriate to the instructional tasks (Willis, 1995). Boosters say that students actually get more faculty contact online than in lecture hall (McGinn, 2000).

Although technology plays a key role in the delivery of distance education, educators must also remain focused on instructional outcomes, not the technology of delivery. The key for effective distance education before selecting the delivery system, is focussing on the needs of the learners, the requirements of the contents, and the constraints faced by the teacher (Willis, 1995).

Kerka (1996) has summarized the strategies that intended for making distance learning more effective by a few researchers as following:

- Understand the technology's strengths and weaknesses.

- Provide technical training and orientation.

- Plan for technical failures and ensure access to technical support.

- Foster learning-to-learn, self-directed learning and critical reflection skills.

- Develop information management skills to assist learners in selection and critical assessment.

- Mix modes – for example by combining e-mail discussion with audio/ video methods to enhance the social aspects.

- Structure learner-centered activities for both independent and group work that faster interaction.

- Successful distance education programs also rely on the consistent and integrated efforts of students, faculty, facilitators, support staff, and administrators (Willis, 1995).

As we approach the beginning of the twenty-first century, there is a great need not only for more training and education but also for more effective and more efficient training.

Vargo (1997) points that effective learning is not just about the efficient transfer of certain quantities of knowledge, but it is also about developing skills and attitudes for life-long-learning, experiencing the joy of learning, about both factual knowledge and developing good judgement.

A key to success is the application of cost-effective technologies that distribute education and training electronically. The challenge to implement the right combination of synchronous and asynchronous technologies to create a rich mosaic of networked learning environments consistent with the mission of the educational provider, learner expectations, and the delivery style of the instructor (Chute et. al., 1996).

2.2 E-LEARNING

According to Slay (1997), in examining current research, it becomes apparent that many educators are now evaluating the use of the Internet in creating an effective learning environment. This is especially true with the current trend towards the delivery of courseware via the World Wide Web or what we call as e-Learning environment.

Advantages of delivering distance learning on the Internet include the following (Bates 1995; Eastmond 1995; Wulf 1996):

i.   time and place flexibility;

ii.   potential to reach a global audience;

iii. no concern about compatibility of computer equipment and operating systems;

iv.   quick development time, compared to videos and CD-ROMs;

v.   easy updating of content, as well as archival capabilities; and

vi.   usually lower development and operating costs, compared to satellite broadcasting, for example.

Webb (1997) has listed the advantages and disadvantages to the learner in an Internet Learning Environment as shown in Table 1.

Table 1: The advantages and disadvantages to the learner in an Internet Learning Environment

Advantages	Disadvantages
Freedom of where to study	Need face-to-face contact (human interaction)
Freedom of when to study	Loss of immediacy in communications
Personal tuition	Computer literacy is required by both students and teachers
All students have direct communication with teacher	Access to computer equipment is required.
Peer group support	Access to the Internet is required
Gain from questions asked by others	
Participate in group discussion	

Carefully designed Internet courses can enhance interactivity between instructors and learners and among learners, which is a serious limitation of some Distance Learning formats (Kerka, 1996). Filipczak (1996) notes that distance education on the Internet can be cheaper, faster, and usually more efficient than other learning modes but not necessary more effective.

The WWW and Web browsers have made the Internet an user-friendlier environment. The ability to integrate graphics, text, and sound into a single tool means that novice users do not have to struggle hard to learn for using them. For educators, the WWW provides an exciting new opportunity for distance teaching and learning.

Cross (2000) points out that an e-Learning environment generally includes: self-paced training; one-to-many virtual events such as virtual classroom, virtual lecture hall or expert-led discussion; one-to-one mentoring (which might entail coaching, help desk, office hours, periodic check-in or e-mail exchange); and simulation because we are learning by doing.

The challenge for educational developers for designing learning experiences is to use the knowledge of learning together with an understanding of the features of the WWW. These promote a deep approach to learning so that 'what' students learn is a deep understanding of the subject content, the ability to analyze and synthesize data and information, and the development of creative thinking and good communication skills (Alexander, 1995). There are a number of features of the World Wide Web that determine the way in which it might be used for teaching and learning.

The Internet learning environment clearly has a role to play for distance education but it could also improve the quality of education delivered in colleges. Some of the ways in which Internet-based training in colleges could improve learning are (Webb, 1997):

1. Ability to repeat lessons. Some students, particularly students from non-English speaking backgrounds (NESBs), that have trouble with language will be able to review lessons and thereby study at their own pace.

2. Lessons are never missed. In addition to sickness, students miss lessons or parts of lessons because:

    - they have work commitments (many full-time students have full-time jobs and some part-time students have jobs that require them to travel)

    - they have family commitments (particularly parents who have to retrieve children from care centres and look after sick children)

3. Travel difficulties. Some students travel long distances, which they find time consuming and unrewarding. These students could complete part of their study at home.

4. Easy access to a world of information accessible only through the world-wide web (WWW). For example, access to FAQs (specialist information maintained by individuals as a community service), newsgroups, product information and library catalogues.

5. Development of some of the Mayer key competencies through use of the learning environment.

6. Development of Internet literacy by doing. (Internet literacy will be a necessity just as computer literacy was seen as an essential skill 10 years ago.)

According to a 1999 IDC survey of corporate training purchasers, convenience, flexibility, and ease of access are the top reasons for recommending Internet-based training, followed by cost-effectiveness and efficiency (as cited in Terry, 2000). The basic pressures driving online learning are global employees, speed to market, just in time learning, flexibility and cost saving (ibid.).

Just In Time (JIT) training to students, has resolves many issues inherent in traditional training paradigm such as distributed and location independent and also flexibility (where student study at their own pace and time). Features in the Web for providing a truly cross-platform, non-proprietary mechanism for the delivery of the materials, are electronic mail, bulletins boards, chat room, multi-media rich content and automated testing (Guided Learning, 1997; Hwang & Chao, 1997).

The Web can provide communication and collaboration tools for students and instructors; student evaluation; and individually customized course materials when combining with an appropriate management system (Guided Learning, 1997).

Slay (1997) has generate a following table that extends George's analysis of graduate qualities associated with particular teaching and learning arrangements (refer to Table 2).

Table 2: Graduate qualities associated with use of the Internet in teaching and learning

Technology	Application to Teaching and Learning	Associated Graduate Quality
World Wide Web	• Electronic delivery of paper-based course work and assessment • Flexible delivery to on-campus students • Information repository - linking and bookmarking • Simulations	• operating on a body of knowledge • preparation for life-long learning • problem solving • working autonomously • ethical action • international perspective
Computer-mediated multimedia conferencing	• CU See-Me, allows transmission of sound and video by Internet • CoolTalk - computer audio conferencing	• preparation for life-long learning • working collaboratively • communicating effectively • ethical action • gaining an international • perspective
e-mail	• Teacher-student communication	• preparation for life-long learning • communicating effectively • working collaboratively • ethical action • international perspective
E-mail listserve	• Teacher-class, • expert-teacher-student, • peer communication	• communicating effectively • working collaboratively
Newsgroups	• On-line discussion with peers and experts • Foreign language communication	• preparation for life-long learning • communicating effectively • working collaboratively • ethical action • demonstrating international perspective
MUDs and MOOs	• Virtual, interactive classroom	• working collaboratively • communicating effectively

Diotalevi (1999) points that a copyright is one of the latest legal issues regarding the information available in Internet or Information Super Highway. Basically, most felt that the law is unclear concerning about copyright law regarding electronic or online issues.

In the process of developing e-Learning for SMART PACE, regarding the copyright issue, PACE will own the copyrights. Since it is not easy to control the user accessibility of the materials provided, as a suggestion, permission to use will only be granted to their respective user only.

2.3   E-MANAGEMENT

Electronic government (e-government) is one of the seven-flagship applications for Multimedia Super Corridor (MSC) that is expected by running of a multimedia networked paperless administration. Improving system and work procedures, management skills, financial management, organizational structures, human resource planning and work ethics is the dynamic challenges for our government in form of increasing creativity, professionalism, managerialism, privatization, outsourcing use of information technology (Rais, 1998).

Electronic Government is applying new technologies to transform the way government communicates information, provides services and interacts with citizens (Indstry, 1999). Electronic Services, Electronic Procurement, Generic Office Environment, Human Resource Management Information System and Project Monitoring System were the five pilot projects implemented in 1997 for Electronic government (e-government) application in Malaysia. Those applications was the culmination of a new groundbreaking approach in the Government, that is one of

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collaboration between the private and the public sectors in line with the Malaysia Incorporated concept (Marjuni, 2000).

Office Automation Systems (OA systems) are small, microprocessor-based Automated Information Systems that are used for such functions as typing, filing, calculating, sending and receiving electronic mail, and other data processing tasks. Managers, technical employees, and clerical employees are commonly using OA systems to increase efficiency and productivity. Examples of OA systems include personal computers, word processors, and file servers.

Information systems and technology can be the tools that open the world. Learn to effectively deploy, support, and promote them in your organization and you, your patients, and your organization will benefit (Waldo, 1998).

Willis (1995) points that support staff and administrators are among the key players in a successful distance education. Most successful distance education programs consolidate support service function to include student registration, materials duplication and distribution, textbook ordering, securing of copyright clearances, facilities scheduling, processing grade reports, managing technical resources and other support staff functions.

As for administrators, they must also involve during the distance education operational instead being only the planner of the program, which means they are the consensus builders, decision makers and also referees (Willis, 1995). This point out that all personal in the distance education organization must also be equipped with technology parallel with the e-learning planning.

Herman (1999) point out that e-management has a broad concept, that Manage.com claim their e-management embodies new customer interfaces and management software, the management of inter-enterprise systems and new revenue and profit models. Another example is Kadiri Inc. that provide e-management applications that applications automate key business activities and streamline the decision making process in the organization (Business, 2000). Many organizations, either private firms, governments or higher institutions is turning their way for e-management system for improving their management system.

Alter and McCormick points that, over the last ten years, dramatic economic, political and structural forces have altered the nature of organizations. To address these dynamic changes, many corporations have embarked on campaigns fundamentally to redesign their business processes to enhance productivity and competitiveness (as cited in Kettinger et.al., 1996).

CHAPTER THREE

METHODOLOGY

The research done for this study is the applied research. Applied research defined by Zikmund (1993) as a research conducted when a decision must be about specific real-life problem. These research encompasses those studies undertaken to answer questions about specific problems or to make decisions about a particular course of action or policy.

Emory & Cooper (1991) points that in business context, the research project originates in the needs of the manager. To define the decision making, they categorize them to three types of problem. In this study, the decision making type of problem is the set of management decisions involving the generation and evaluation of solutions. A blueprint to computerize the whole centre of PACE is the solution for improving the PACE centre management.

The methodology that will be used in this study is by doing the observation techniques and the library research. Observation technique such as interviewing the PACE officer and staff for getting a clear view of the whole scenario. This will lead to the way of how to plan and suggest a better application for PACE.

Data and information for the study will be done by the fact-finding method that will be gathered from the:

1. Books and journals available in the libraries.

2. Media sources such as computer magazines.

3. Commercial sources such as advertisement or product pamphlets.

4. Computerized data archives such as CD-ROMs assessed.

5. Internet

For latest information of hardware, software or system available, it will be collected from various vendors. Comparison of each product will not be done in this study but will be extracted from any article or report done previously with that product.

CHAPTER FOUR

THE EXISTING NETWORK CONFIGURATION

4.0   INTRODUCTION

Before we could proposed a new automation system for PACE, we will look at

the existing system available in UUM campus. UUM Campus Network existing today

is the UUM Campus Network Gigabit Backbone. The network system was previously

known as Integrated Sintok Local Area Network (ISLAN) and has been completely

linking all the computer resources in the campus in February 1996.

UUM campus-wide network links all the 16 building and over 2000 computers

in all offices, laboratories and seminar rooms.

In this report, a very technical detail of the entire UUM networking is not

discussed. A discussion from the user scenario for the entire existing networking will

cover only the basic networking configuration and basic hardware and software used

by PACE.

4.1   UUM CAMPUS NETWORK GIGABIT BACKBONE

Two units of Lucent Cajun P550 Gigabit Switches have been installed for

UUM Campus Network. Diagram in Appendix A, show the entire UUM Network

Design with the two units Lucent Cajun P550 Gigabit Switches. The first Cajun P550

was installed in Computer Centre while the second unit was installed in a Library.

Both units are connected with Dual Gigabit long-wavelength (2 x 1000 BaseLX) link, which enables a gigabit connection (Paradine, 1997).

Cajun P330 switches are used for creating a segmentation networking for Schools in UUM. There are been connected from the first Cajun P550 in the Computer Centre. For example, a stack of Lucent Cajun P330 switches in the School of Information Technology (STM) are connected from the Cajun P550 for creating a segmentation local area network (LAN) within the STM building.

Referring to Appendix A, based on the user requirements and capacity, the connection between other school or UUM centre to the main Lucent Cajun P550 are connected either with Dual Gigabit short-wavelength (2 x 1000BaseSX), 1000 BaseLX, 2 x 100BaseFX (Fiber optic cabling).

Diagram in Appendix B shows how the first Lucent Cajun P550 Switches was installed in Computer Centre. It also shows that the external connection to the Internet in the Computer Centre is through modem NetBuilder 222. UUM Internet backbone connection capacity is 2 Megabyte (MB).

All mainframe computer, computer servers and minicomputers are located in the Server Farm area. There are seven units of SUN server, 2 units of Macintosh server and a few PC servers available. These servers are mainly used for University's application systems, e-mail system, Internet and campus networking.

The Network Management System (NMS) administration is also done in the Computer Centre. The NMS is responsible in monitoring and controlling the network.

PACE centre is situated in the School of Economic building. A link from Computer Centre to the School of Economic is a short distance connection using 2 x 1000BaseSX. Diagram in Appendix C shows the network design for School of Economic. PACE centre networking is connected to the Rack-A of the Cajun P330 Switches in School of Economic with a 100MHz UTP Category 5 link.

Diagram in Appendix D shows the existing computer networking in PACE office. Basically, there are twenty-six computers in the office connected with the UUM Campus Network system. A computer server that is used for developing a prototype E-learning system and E-management system is also has been installed in PACE office.

Generally, each personnel in the PACE office have the facility to connect to the UUM Campus Network. Computers used in PACE office are generally a personal microcomputer that are able to work either as stand-alone or connected to the existing UUM Campus Network system. Software applications used are generally the basic software packages such as Lotus Notes or Microsoft Office.

PACE office is located at the first floor in the School of Economic building. In the existing PACE networking architecture, a printing room for printing students' manuals does not have any networking connection with the existing UUM Campus Network system. The personnel in the printing room office task does not require a computer, maybe that is the reasons why there is no networking facility available in that office.

4.2   EXISTING HARDWARE

4.2.1   Cajun™ P550™ Gigabit Switches

UUM Campus Network system is using two main Cajun™ P550™ Gigabit
Switches. One unit of the switch has been installed in UUM Computer Centre and the
second unit is in the UUM Library. Both switches enable to perform multicast pruning
that will only send Internet Protocol (IP) multicast traffic to only those ports that are
involved in the multicast group.

The main reason why the two Cajun P550 switches have been selected is
because it is able to satisfy the demanding requirements of bandwidth-starved campus
backbone and high-performance workgroup environments. The switches can also
cater for future expansion for example a wireless LAN as well with its huge backbone
switching and multimedia ready feature.

The available multimedia capability in the switch configuration includes the
Bell Labs traffic management for voice and data. The switches also claim that it is one
of the most powerful GigaBit networking, supporting Visual LAN (VLAN) trunking
and Layer 3 supported switch.

The basic Cajun P550 Switch performance and capacity specification are as
below:

- Multi layer Fault-tolerant backbone switching (backplane) capacity of
  45.76 gigabit per second (Gbps).

- Switching throughput capacity of 22.88 Gbps

- Wire speed performance up to hundred-twenty Ethernet and twenty-four Gigabit Ethernet per switch.

- Unique Lucent OpenTrunc capability for Load Balanced redundancy over multiple links that allows VLAN tagging formats.

- Queue Management Engine for traffic prioritization and optimized multicasting.

- Packet Routing Engine for traditional packet-by-packet routing of Layer 3 IP and IPX routing capacity of up to 12 x 1 Gbps.

- Address Filtering Engine that support Layer 1 (port-based), Layer 2 (MAC address-based) and in the routing switch, support Layer 3 (protocol-based) VLAN lookup at wire speeds.

- Virtual Local Area Network (VLAN) capabilities exceeding the current requirements of UUM that is UUM future extension plan.

Cajun P550 switches has been designed to be able to combine 10/ 100/ 1000 Mbps (Mega bit per second) Ethernet Layer 2 and wire speed IP/IPX Layer 3 routing. Virtual LANs is UUM future plan in networking development and the switches have this flexibility for catering the virtual LANs feature.

4.2.2 Cajun P330 Modular Stackable Switching System

Cajun P330 Modular Stackable Switching System has been used for creating segmentation networking. The P330 workgroup 10/100 Mbps switch has been installed at the strategic location that support 100 Mbps bandwidth. The P330 switch has been used because it can support the 10Mbps or 100Mbps dedicated link to all port connections and support the VLAN connections. It can also solve the entire broadcast, collision, latency and packet drop problems.

Cajun X330 Ethernet expansion modules was used with the Cajun P330 Modular Stackable Switching System for expansion the UUM Campus Network.

4.3 DESKTOP COMPUTER SYSTEM

Computers in PACE office available is a personal computer that can either work as a stand-alone computer or a workstation and is connected to the UUM Campus Network. In PACE office, basically the desktop personal computer has the following specification:

- Range of processor from Intel 486 until Pentium III.

- RAM capacity from 16 to 64 MB.

- Harddisk capacity from 1.2GB to 8 GB.

A server has been installed for developing an e-learning and e-management prototype system with the following specification:

- Intel T440BX server board with a built-in VGA, USB port, network card 10/100Mbps, 4 slot PCI, 2 slot ISA, 1 slot AGP, 1 slot SCSI and 2 slot IDE.

- 256 MB RAM with Intel PIII 450Mhz processor.

- 9.1GB harddisk.

- 40 x CD-ROM drive with 3.5" Floppy drive.

- and 15" monitor screen.

4.4   NETWORK MANAGEMENT SYSTEM

The network management system used in the UUM Network System is the CajunView™ Suite, which is the Lucent Technologies Cajun Campus Solution. CajunView™ Suite system is a comprehensive suite of SNMP-based (Simple Network Management Protocol) that simplifies the task of managing complex enterprise network installations. It can maximize network uptime and increase effectiveness in all aspects of network management, including network configuration, upgrade implementation and proactive capacity planning.

CajunView™ Suite uses SMONMaster™ with the Switch Monitoring (SMON) for managing the multi-level switching in UUM Campus Network system. The system enables simultaneous real time monitoring of traffic as below:

- across multiple switches in a network

- across all ports in a single switch

- across all ports in a VLAN

- across all hosts in a VLAN

- either by VLAN, by priority or by packet type.

SMON also provides a powerful drill down capability to enable the network manager to move from global view to all traffic to individual conversations between two users. The advantage of the Lucent Switch Network Management can be summarized as follows:

- VLAN Traffic Utilization

- Switching Fabric Utilization

- Standard RMON 7 Group Support.

Majority, the operating system been used in the all PACE microcomputers are Windows™ 95/98 or Windows NT.

4.5   CURRENT ISSUE

Basically, all computers in UUM are networked to the UUM Campus Network. From the user perspectives, the networking system in UUM Campus Network is not performing very well for giving good facilities to their user. Below is the summarize problems encountered by the user:

- Network communication always "down". And most of the time it will effect the entire UUM Campus Network system not only in a single network segmentation involved.

- Network communication system appears to be "slower" due to LAN congestion.

- Internet communication is always down.

- The duration time for the entire network communication "down" always takes a few days to recover.

4.6 SUMMARY

As a conclusion from the problems listed in Current Issue (4.6) above, generally, the UUM Campus Network system is not functioning well which could be due to the network congestion.

Seifert (1995) has listed some effects of LAN congestion as follow:

- *Increased Network Delay*

  Most all LANs have a finite data carrying capacity. During a short-term overload, LAN will distribute the load over time. Thus, when load is light, the average time from submission of a frame for transmission by the host on the LAN will be short. So, when there is heavy instantaneous offered load, the average delay (known as service time) will increase. The network appear "slow" is due to the longer time for sending the same amount of data under congestion conditions compared when the load is light.

- *Observable Parameters.*

  Seifert (1995) explains that many parameters of LAN operations can be measured to assess network performance. Standard controllers and host software can automatically measure some of those parameters, while others parameters typically require special monitoring equipment such as protocol analyzers or remote monitors (RMONs).

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Some of the important metrics includes Channel Utilization; Collision Counts; Application Performance Degradation; and User Dissatisfaction (ibid.).

In order to solve the problems in UUM Campus Network system, below are the blueprint suggestions that may be used to solve the network problems:

- Check the existing cabling. Since the UUM Campus Network has been established since 1996, maybe some of the old networks cabling has to be upgraded or rewiring.

- The Network Management System may be not fully utilized by all the available functions or features in the system for catering the network.

- Previous UUM Campus Network is using the Asynchronous Transfer Mode (ATM) connection and at present has been upgraded to a new Gigabit connection. Maybe some configuration in the existing Network Management System has not been properly configured to cater the new network environment.

- For the Internet connection, the existing 2MB backbone may not be sufficient enough to support the Gigabit networking. Upgrading the Internet backbone to 10 MB may be sufficient.

CHAPTER FIVE

PROPOSED NETWORK CONFIGURATION

5.0   INTRODUCTION

PACE vision is to be a center of excellence in providing professional and continuing education programmes in Asia. For achieving those visions, PACE has to reconstruct their facilities especially in computerization of the networking facility, or computer hardware and software available. This blueprint will propose a new computerization system for PACE to achieve the centers' vision.

5.1   PROPOSED NETWORKING CONFIGURATION

PACE current goal is to improve the student access to quality education through distance learning and increasing administrative efficiency. The existing network system in PACE office is not sufficient enough in trying to fulfil the goal. An existing computer networking configuration in PACE must be reconstructed.

Diagram shown in Appendix E, is the proposed connection architecture for the new PACE networking that is the SMART PACE. Comparing with the diagram in Appendix B, a link from the switches in Rack A in the School of Economics to PACE existing networking will be changed.

A new set of full-duplex switches is required and must be installed in the PACE office area for handling a new network configuration in PACE. A special server room is required for this purpose. As a suggestion, the Executive Meeting room can be converted to a server room that will locate the switches and the new server.

The new set of full-duplex switches has to be added in SMART PACE in order to create a more highly-efficient optimization for LAN internetworking that could completely automatic ease the networking administration and configuration in proposed SMART PACE. Since UUM Campus Network is using the Cajun P333 switches, it is advisable to use the same switches for the flexibility and easier network management in the existing UUM Campus Network system.

The requirement of the connection between the new switches set from the existing switches in Rack A is 100BaseFX with a multimode link for supporting the future workload of the new server in PACE office. The main reason why 100 Mbps multimode fiber optic cabling has been selected because optical fibers cabling is known to be capable of increasing reliability, providing expanded service and could also reducing cost in the long term basis (Fiber-to-the-Desk, 1999).

From the switches to the server connection, the connection requirement is Dual 100BaseTX that will use a high-quality UTP (Unshielded twisted pair) Category 5. This connection will be able to offer a good performance for the new server with 100-Mbps data rate transmission (Stallings, 1990).

For the connections from the new switches to all workstations in PACE office is requiring 10/100BaseTX with high-quality UTP Category 5 cabling. This connection known sufficient for supporting a full-duplex operation with 10/100 Mbps data rate transmission for workstations communication (Stallings, 1990).

The existing wiring network cabling must be reconstructed so that it shall follow the proposed architecture for future SMART PACE development. A few ports may be added to have more workstations installed. The proposed architecture of SMART PACE is shown in diagram in Appendix E.

PACE also has another printing room that is located at the ground floor in the same building with the PACE office. At present, the printing room does not have any connection to the existing UUM Campus Network system. In this blueprint, the printing section will also be connected to SMART PACE networking as shown in Appendix E.

5.2   PROPOSED SERVER CONFIGURATION

In order to create a SMART PACE environment, a powerful computer server is required. A powerful server is required for SMART PACE system because in SMART PACE planning, an e-Learning system and e-management system will be installed for PACE office. The server can also be used not only for catering the Distance Learning Unit functions but also the other two PACE unit that is Franchise and Twinning Unit and Corporate Learning Unit functions.

Once the SMART PACE has been established, the number of students or users for accessing the server will be increasing from time to time based on the SMART PACE future planning development.

Basically, the server specification requirements for better performance in the SMART PACE system are as shown in Table 3 (The easy server, 2000; Dell, 2000).

Table 3: The minimum proposed server specification requirements

Processor	Minimum with Intel® Pentium® III Xeon™ 800 Mhz Processor w/256K on-chip L2 Full-Speed Cache.
Memory	2 x 128MB DIMMs (Total 256MB) expandable up to 2 GB maximum memory capacity
Controller	Integrated, dual-channel Ultra2 SCSI controller
Video	Integrated 1024x768, 256 color, non-interlaced monitor with minimum 4MB SDRAM video memory
Network Interface Card	Minimum data rate 100MHz
CD-ROM Drive	40x max-speed SCSI
Internal Storage	Two 9GB SCSI Hard Drives with 7200 RPM (rotation per minute)
I/O Expansion Slots	Minimum 5 PCI slots (with three 32-bit and two 64-bit slots)
Built-in I/O Ports:	With minimum requirements of: • Two 9-pin RS-232 serial ports • One 25-pin parallel • One external SCSI knockout port • One mini-DIN mouse • One mini-DIN keyboard • One SVGA port • Two USB ports

Mass Storage Shelves with minimum seven shelves	• One preinstalled 3.5-inch flexible disk drive • One preinstalled CD-ROM drive • One open common tray removable media bay suitable for tape backup • Four low-profile shelves for internal hard disk drives
Flexible Disk Drive	3.5-inch, 1.44MB flexible disk drive Keyboard and Mouse Bundled keyboard and mouse
Maximum Internal Storage	Up to 145.6GB (4x36.4GB low-profile drives)
Installation and Configuration	• NetServer Navigator with automated, menu-driven system setup and configuration • Guided network operating system installation • Automatic installation of monitoring tools
System Management Software	• A comprehensive server management solution with intuitive browser-based user interface, facilitates troubleshooting, administration, and detailed inventory information. • Easy integration with other leading network and system management products
Service and support	Supplier service support with at least three-year guarantee onsite, parts and labor.

Intel Pentium III Xeon processor has been selected for server processor because Intel claimed that this processor at 800Mhz brings an amazing increase of 48% performance for a 27% increase in clock speed (Performance, 2000). Performance (2000) reported that in improving the 700MHz performance with the previous processor, Intel has designed the new Advanced Transfer Cache (ATC) architecture with a new 256-bit link to the processor core, that is four times wider from earlier processor. For making cache content retrieval more efficient, ATC also implements higher cache associativity (which is now with 8-way).

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In order for server protection since the server is considered a critical network system, a unit of Automatic Voltage Regulator Uninteruptable Power Supply (AVR UPS) is required. Advanced protection prevents power problems from causing catastrophic system damage or long-term component wear. AVR constantly corrects low and high voltage conditions without using battery power, and effectively providing connected equipment with computer-grade 220-240V power at all times.

Reliable battery backup keeps system up and productive during blackouts. AVR should be able to protect the computer system against surges, spikes and line noise. For saving open files and automatically shuts down connected equipment during a blackout, even if left unattended, a special Power Alert software and cabling should take into consideration for the proposed AVR UPS. Those special UPS management software, which is the Power Alert software must be compatible with all operating system installed in the server.

The basic proposed AVR UPS system specifications for the SMART PACE server are as follow (IBM UPS Systems):

- 500 VA (300 watts) output power rating

- Minimum 15 minutes half load and 5 minutes full load backup time.

- DB9 serial port for network interface which is SNMP compatible.

- Minimum 6 AVR protected outlets.

- Diagnostic LEDs

- 1-3 years warranty for parts and labor.

5.3 PROPOSED DESKTOP CONFIGURATION FOR PACE WORKSTATIONS

Currently, the workstation desktop available in the PACE office is the personal computer (PC) but the number of computer is still not enough to ensure the success of the proposed SMART PACE. In order to ensure the new SMART PACE system will be fully utilized by all personals in the PACE office, the number of personal computer must be added based on the number of personnel in PACE office with a few extra PC for system development.

For purchasing a new PC in PACE office, some issues has to take into consideration such as:

- A computer facilities for all staff in PACE office including the printing office at the ground floor.

- For existing computers that have a processor below Pentium, it also has to take into consideration for replacing with a new computer configuration.

The proposed configurations for the new PC with a minimum configuration requirement in the proposed SMART PACE are as shown in Table 4.

Table 4: The minimum personal computer specification requirements

Processor	Pentium III 550 MHz processor
Memory	64 MB SDRAM memory
Video	Non-interlaced 14" colour monitor capable of 1024 * 768 pixels resolution in this mode (low radiation and green power management) 64 bit graphics accelarator card with al least 4MB RAM
Network Interface Card	Network Interface Card 10/100
CD-ROM Drive	40x CD-ROM Drive with 16 bit sound card
Harddisk	6.4 GB Harddisk
Flexible Disk Drive	3.5-inch, 1.44MB flexible disk drive Keyboard and Microsoft Mouse Bundled keyboard and mouse
Operating system	Windows 95/98 operating system
Service and support	1-3 years warranty for parts and labour

For protecting the PC available in the PACE office for the SMART PACE system, each of the system must be protected with an automatic voltage regulator (AVR) unit. The basic specifications for the AVR unit are as follow:

- Input 180-240 VAC

- 60Hz frequency

- 220 ± 5% Output for three outlets.

- 500VA capacity.

5.4 PROPOSED OPERATING SYSTEM

Since SMART PACE system will be installed in the new proposed server system, a selection for installing a network operating system (NOS) must also take into the consideration for a better performance. Price and capabilities are two major factors that play a key part in NOS selection decision making. The three main NOS competitors on the market seem to be Linux, Novell and Windows NT (Waters, 1999).

Some of the Linux basic features as pointed by Waters (1999):

- A multi-user operating system that capable to allow multiple logons with each user having more than one program active at the same time.

- Very capable of controlling access to system resources making the system more secure and highly configurable to a person's exact needs.

- Current development on making Linux supports multiple processors (SMP) more efficiently.

- Samba a piece of software in Linux allows Linux computers to seamlessly integrate on a network with machines running the Windows operating system.

- The basic hardware requirements with a minimal configuration is a 386SX/16, 1 MB Ram, 1.44 MB floppy, any supported video card, and at least a 100 MB HDD. For better results, it is best to use at least a 486, 8 MB RAM, and at least a 500 MB HDD.

- Linux will boot and run a full GUI (Graphical User Interface), and surf the web with Netscape with 8 MB of RAM.

- The cost of acquiring Linux is essentially free. It is distributed under the GNU General Public License (GPL).

Waters (1999) also points out some basic feature of Windows NT 5.0 as follow:

- NT 5.0 provides the Windows '98 GUI (Graphical User Interface) for improved ease of use and Internet integration. New features ease configuration and administration in a networked environment. Primary among these is the Active Directory structure, which allows users to easily find all available resources on the network and helps network administrators manage and secure those resources.

- Some minimum requirements recommended to run Windows NT Server include: 804866 or higher processor (a Pentium is best), 32 MB of memory, 1.44 MB floppy drive, and minimum disk space of 124 MB free drive space.

- Companies are choosing Microsoft Windows NT Server as their operating system platform because they need a single infrastructure to support a number of services.

Kirch (1999) points out that generally Linux has more features comparing with Windows NT Server 4.0 as shown in Table 5.

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Table 5: The comparison table of Linux and Windows NT Server 4.0 (Kirch, 1999)

Component	Linux	Windows NT Server 4.0
Operating System	Free, or around US$49.95 for a CD-ROM distribution	Five-User version US$809 10-User version US$1129 EE 25-User Version US$3,999
Free online technical support	Yes	No
Kernel source code	Yes	No
Web Server	Apache Web Server	IIS
FTP Server	Yes	Yes
Telnet Server	Yes	No
SMTP/POP3 Server	Yes	No
DNS	Yes	Yes, though reports indicate that it is a broken implementation with limited functionality.
Networking	TCP/IP, IPv6, NFS, SMB, IPX/SPX, NCP Server (NetWare Server), AppleTalk, plus many other protocols	TCP/IP, SMB, IPX/SPX, AppleTalk, plus many other protocols
X Window Server (For running remote GUI-based applications)	Yes	No
Remote Management Tools	Yes, all tools	Web Administrator 2.0 (a recent addition) offers a large, but still not complete, set of tools.
News Server	Yes	No
C and C++ compilers	Yes	No
Perl 5.0	Yes	No
Revision Control	Yes	No
Number of file systems supported	32	3
Disk quotas support	Yes	No
Number of GUIs (window managers) to choose from	4	1

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From the literature discussed above, this blueprint is suggesting the Linux as the PACE server Network Management System. Generally, the cost and features available in the software comparing with other NOS software is undeniable a better choices. As for the expert support, our country Malaysia

5.5   SUMMARY

In this chapter, the proposed of the SMART PACE computer networking, hardware facilities and operating software requirements has been discussed. Since the SMART PACE system development will be expanding from time to time, at a present time, the configuration listed in this chapter is quite sufficient enough to support the future expandable. Since technology is changing in a rapid rate, the configuration may need a little adjustment in future development.

CHAPTER SIX

E-LEARNING

6.0 INTRODUCTION

The evolution of educational technologies has started since the first business computer was completed in 1951 that heralded a wave of new applications for computers (Alexander, 1995). Kulik, Bangert & Williams (as cited in Alexander, 1995) points that educationalists in 50s have dreamt that college classroom would be connected to computers which would serve as patient tutors, scrupulous examiners and tireless schedulers of instruction. Further, it was expected that the benefits to students would include the freedom to follow their own paths of learning, at their own pace at a time convenient to them, with richer materials to work with and automatic measurement of their progress. They would have access not only to the computers but also to teachers who would now be able to work individually with students since there was now less drudgery and repetition in their work and they would have access to more accurate appraisal and documentation of student progress.

Early studies for evaluations the Computer Based Instruction (CBI) began to appear by the late 1960s and early 1970s, which in general supported the effectiveness of computer-based teaching as a supplement to conventional instruction. CBI was reported to reduce time required to learn and to be effective for teaching mathematics and a number of other disciplines (Kulik, Kulik & Cohen, 1980).

Anyway, information technology (IT) playing the main role for creating an effective teaching and learning nowadays. By the end of 20th Century, computer technology is characterized by the convergence of multimedia and networking, which has increased the popularity of computers among educators.

The latest in this long line of learning technologies is the World Wide Web (WWW). The greatest potential of the Web however, lies in the fact that we have a chance to learn from the lessons of the previous faded technologies, and an opportunity to develop new learning experiences for students which have not been possible before (Alexander, 1995).

WWW has opened a door for improving and changing the face of education and training to a Web-based training. The requirement of training and education has changed particularly because of the increasing training costs, the need for continuos reskilling and shorter product life-cycles (Guided Learning, 1997).

Alexander (1995) said that adopting new educational technologies for their own sake almost always leads to failure. The Internet learning environment should not be used as a replacement for traditional classrooms unless there are clear-cut, measurable benefits to the college or to the learner.

Educators have always been attracted to issues involved with students' learning achievement and treatment. Since technology rapidly advances in teaching and learning activities, the problems of individual differences can be taken care of more effectively. Owing to computer network technology, individualized instruction becomes more pervasive.

However, because of environmental and cost considerations, some teaching has to be carried out in the mass instruction format. In this case, Oliver (as cited in Hwang & Chao, 1997) points that designing a flexible learning environment is very desirable because it can allow students to catch up on learning they have missed in the classroom and because student achievement will be enhanced via the utilization of computer-based technologies (CBL).

According to Hwang & Chao (1997), an asynchronous learning environment has great impact on student learning. In this learning environment, it has been found that peer interaction increases compared to a traditional learning environment. Hwang & Chao (1997) also points that in creating an asynchronous learning environment, one must consider the following elements: access to large amounts of information, developing effective teaching and learning activities to suit individual needs, transmitting contents via multiple forms of media, high levels of learner control, etc.

Several studies indicated that lower costs and increasing capabilities of hardware and communications technology would lead directly to the development and use of audio, graphics, and full-motion video programs for distant learners in this learning environment (ibid.).

Generally, e-Learning has been defined as learning on Internet Time or Internet-enabled learning or Internet Learning Environment. In the Internet learning environment, learners learn from resource-based materials that are delivered from a computer or a server.

Basically, Cross (2000) has summarize the definition of e-Learning as:

(1)   Focus on the needs of the learner, not the trainer or institution;

(2)   Take advantage of the network to enable learning real time, anywhere and anytime;

(3)   Bring people together to collaborate and learn together;

(4)   Personalize, often by combining "learning objects" on the fly;

(5)   Offer more than one learning method for example virtual class, simulation and self-paced instruction; and

(6)   Incorporate administrative functions such as registration, payment and charge-backs, monitoring learner progress, testing and maintaining records.

Masie (as cited in Cross, 2000) points that eLearning blends the best of traditional and new classroom; on-the-job; coaching and informal mentoring; reading; stand-alone technology; online technology; and digital collaboration.

As a conclusion, generally e-Learning is a Web-based learning through the Internet that is capable to create a synchronous or asynchronous learning environment. In this blueprint, a discussion for designing a learning and teaching environment in the Web-based environment for SMART PACE.

6.1 DESIGNING E-LEARNING

Designing an appropriate learning environment has been a perennial challenge to university educators. The use of IT in the teaching and learning environment of Higher Education institutions, however it is difficult for those institutions to take a strategic and informed approach to its implementation. Reid (1999) has proposed some possible approaches that can be invoked to analyze the place of IT within University teaching and learning are business models, IT models and organizational models.

In business models approach, the development of online teaching in universities is clearly impacted upon by the forces that changing business environment. The teaching and learning resources, viewed as 'products', and the methods of their 'production' within this business paradigm, will need to have these characteristics if the university is to compete with other institutions within this highly fragmented and interconnected marketplace.

Reid (1999) points that IT models needs to be framed in a more dynamic and ephemeral paradigm to invoke in the development of systems with mid to long-term life spans or the development of learning technologies in which universities find themselves in.

A number of organizational frameworks for the consideration of online learning interventions for organizational model have been proposed. Reid (1999) points that two such models, those focuses on institutional strategies and models uses institutional types as organizing principles

Rahardja (1999) points that the usability of a system, whether it is an information system, a multimedia product, or a web site, much depends on whether we have identified the right users or the target audience at the beginning of the systems life cycle. According to him not only the users, but also the stakeholders of the system will play an important role in the web design.

The term of stakeholders has been used because for creating new e-Learning environment for the organization, a correct of information has to be gathered for enhancing the learning effectiveness. According to Rahardja (1999), from the stakeholders' requirements, the web can be designed to volunteer significant information to the users to facilitate their decision making process.

Another issue for designing the e-Learning, the web tools for designing the online delivery applications should also take into consideration. Some factors that has been highlighted in "Online educational delivery applications: a web tool for comparative analysis" (http://www.ctt.bc.ca/landonline) are the learner tools and support tools for the applications.

With the strength available in the Web tool application for developing the e-Learning, it shall always help the e-Learning developer for creating an effective e-Learning system. Other issue that has to be considered during the e-Learning development is whether the e-Learning is successful in creating a quality learning environment. This issue is regarding whether the course content has met the standard required for a quality learning environment.

For SMART PACE e-Learning, the standard of the module available in the system should be monitor and evaluate from time-to-time. A regular updating process must always perform regularly. The main cores for the effective e-Learning are effective self-paced, flexibility, cost-benefit and increased interaction.

6.2 E-PACE PROTOTYPE

A prototype of Electronic PACE or e-PACE has been planned by PACE centre in order to fulfil the PACEs' vision to be a centre of excellence for providing professional and continuing education programs in Asia. e-PACE is web-based application, which consists of all information about PACE including office management and administration. The e-PACE prototype is actually the initial step for PACE to create a SMART PACE. That e-PACE prototype has been developed by a group of practical students.

Basically, e-PACE consists a variety of PACE administrative services such as electronic form for staff and administration, student registration and records, course registration, online module for the course offered by PACE, and financial transaction such as billing and payments.

LearningSpace is a sub-set of e-PACE application and it was located under Learning Center section. For a complete e-Learning application in e-PACE, the system has included the Students Section, Academic Section and Forms Section.

Under Students Section, there are the Student Registration sub-section and Student Page sub-section. In the Student Registration, is a section for a new application to enroll programmes offered by PACE centre, while in the Student Page sub-section, students can view all e-Learning facilities available in PACE. The

facilities provided consist of Student Personal Resume, examination result, e-mail section, Learning Center and Forms section.

In the Forms section, students are required to fill in the specific form available at the beginning of each semester, such as the Courses Add and Drop Form, Courses Registration form , Transfer of Credit form, Postponing Studies form, Re-examining courses Paper form and Dropping From PACE Program form. In the e-mail section, students can send e-mail to anyone in the e-PACE environment such as course instructor, course colleagues or the e-PACE administration.

The e-PACE LearningSpace in Learning Center has been developed by Lotus LearningSpace 3.01 software released by Lotus Notes. The architecture of the LearningSpace module in e-PACE is based on the Lotus LearningSpace architecture available in the software packages. Lotus and IBM have built the architecture for providing a complete solution in learning and business environment.

There are five modules available in the Lotus LearningSpace architecture software for example Schedule Module, Media Centre Module, Assessment Manager Module, Profile Module and CourseRoom Module. In developing the e-PACE LearningSpace, all modules available except the Assessment Manager Module in Lotus LearningSpace has been used.

Diagram 1: Overview of the e-PACE prototype

```
                              ┌──────────┐
                              │  e-PACE  │
                              └────┬─────┘
                                   │
        ┌──────────────┐           │           ┌───────────────┐
        │  e-Learning  ├───────────┴───────────┤ e-Management  │
        └──────────────┘                       └───────┬───────┘
                                                        │
 ┌───────────┐  ┌──────────┐  ┌──────────┐   ┌────────────────────┐
 │ Students  │  │  Form    │  │ Academic │   │  Automated Form    │
 │ Section   │  │ Section  │  │  Centre  │   │  processing –      │
 └───────────┘  └──────────┘  └──────────┘   │ Annual-leave form  │
                                             └────────────────────┘

                                         ┌─────────────────┐
                                         │ Learning Centre │
                                         └─────────────────┘

                  ┌──────────────┐              ┌──────────┐
                  │ Student Page │              │  Media   │
                  └──────────────┘  ┌─────────┐ │  Centre  │
                                    │Schedule │ └──────────┘
 ┌──────────────┐                   │ Module  │
 │ New student  │                   └─────────┘ ┌──────────┐
 │ application  │                               │ Profile  │
 └──────────────┘                               │ Module   │
                                                └──────────┘
 ┌──────────┐  ┌─────────────┐  ┌──────────┐  ┌─────────────┐
 │ Student  │  │ Examination │  │ E-mail   │  │ CourseRoom  │
 │ Resume   │  │ Result      │  │facilities│  │ Schedule    │
 └──────────┘  └─────────────┘  └──────────┘  └─────────────┘
```
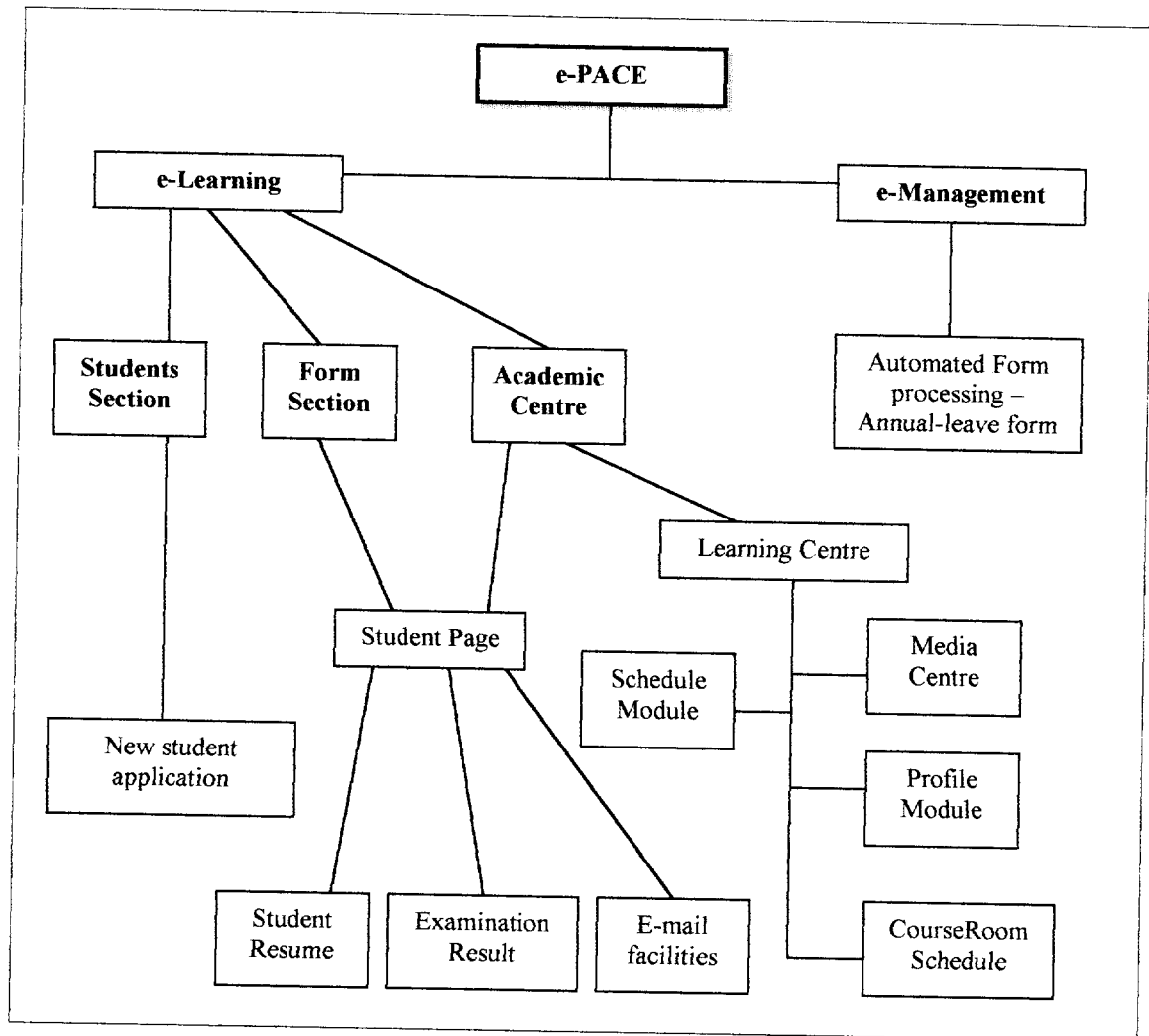
Basically, the prototype system has supported the asynchronous learning network system. The CourseRoom module incorporate e-mail facilities and 'newsgroup' function for a group discussion. While in the MediaCentre, students are able to view the course sources such as lecture notes.

6.3 SUGGESTION

From the research done by Jones (1999), for online learning approaches for successes e-Learning include: online lectures, online assignment submission, CD-ROM mirror of web-sites and increased interaction. In the prototype system, the online assignment submission has been included. Jones (1999) research showed that 55% of students prefer Web-based assignments submission better than paper-based submission.

Other facility that has been included in the prototype is the online lectures. In the prototype, online lecturer is a courseware module that has been properly design for students to learn the course materials. But the main issue here is, the students must always be online to review the materials. This is always a problem for students that have to pay for the Internet by the hour or not a good connection to the Internet.

Jones (1999) found out that distributing the Web materials on a CD-ROM, is the solution for those problems. The advantages distributing it through CD-ROM include a high speed delivery of graphics and other large files, no online connection charges and materials can be used even when there are no Internet connection (Cardnell et al as cited in Jones, 1999).

Another issue regarding the online lectures, recorded and digitized lectures given by the lecturer for the e-Learning are another latest online learning approaches. The online lectures can be distributed either via the Web or CD-ROM mirror. Jones (1999) point out that this approaches offers a number of advantages including:

- Increased flexibility for students to listen and revising the lectures anytime and anywhere.

- Previously, lectures were only available to on-campus students but now it can be extended to the distance students.

- Increasing the variety of learning, instead of reading they can also listen for more clear explanation from the lecturer.

To improve the prototype, the system must not only supporting the asynchronous learning but also can support the synchronous learning such as a chat room for students to discuss online regarding courses taken by them. Appointments or discussion schedule can be done in the Schedule Module in LearningSpace.

The prototype e-Learning has been developed with Lotus LearningSpace 3.0, but since IBM and Lotus Development Corp. have introduced the new version of the Lotus LearningSpace 4.0.

Lotus LearningSpace 4.0 capable to delivers content in different learning modes for ensuring effective learning by flexible course delivery either through self-paced materials, through collaboration with others independent of time and place, or via live interaction with others virtual classroom. The software also is designed to support the Aviation Industry CBT Committee (AICC) specification and support AICC guideline for Computer Managed Instruction (CMI).

For the e-Learning developed in SMART PACE, the system should not only cater for the PACE Distance Learning unit, but also must consider other unit that is the Franchising and Twinning unit (FTU) together with Extension Studies unit (ESU). Programmes under those two units can also be included in the SMART PACE.

Online training for private sector also can be incorporate in the proposed SMART PACE system. This will open a more opportunities for PACE to expand their services not only for educational training but also in corporate training.

CHAPTER SEVEN

E-MANAGEMENT

7.0 INTRODUCTION

SMART PACE in this blueprint, will not only cover for e-Learning system but will incorporate also the e-Management system.

Office automation is the using of technology for helping people do their jobs better and faster (Capron, 1996). Generally, SMART PACE e-Management is a process to automate the PACE office. The process for developing e-Management has involves in the Business Process Reengineering (BPR).

Some of basic definitions for transforming traditional office to office automation by "Government Business" are:

Process is a specific ordering of work activities across time and place, with a beginning, an end, and clearly defined inputs and outputs that deliver value to customers.

Business Process Reengineering (BPR) is the fundamental rethinking and radical redesign of business core processes to bring about dramatic improvements in performance.

Government Reengineering is the fundamental rethinking and radical redesign of core processes to bring about dramatic improvements in performance under political conditions characteristic of the public sector environment.

Process, should drive reengineering but not information technology (IT). However, the full range of possible reengineering scenarios cannot be explored without factoring in an increasingly online, interactive, Internet-enabled world that has permeated today's work environment. IT does play a key role in enabling BPR ("Government Business").

Workflow is the term applied to business process management. Workflow refers to software that organizes and controls the tasks, resources, and rules required for complete a business process.

Workflow software provides a data and document container for each unit of work, called a work item, and automatically routes and tracks them, according to business rules, to users or "roles" as dictated by the process definition (Lotus, 2000).

For creating an effective management, a reengineering process in the office workflow has to be done. Process, not information technology (IT), should drive reengineering, but IT does play a key role in enabling BPR ("Government Business").

Lotus (2000) points that the benefits of workflow automation are diverse, and depend on the type of business process involved. They include:

i)   Cycle Time Reduction

The most dramatic benefit of workflow is usually a significant reduction in the time required to complete the process. By eliminating the time spent moving work around the organization, using business rules to catch problems at the source, and automating tasks that do not require human interaction, the cycle time can be greatly compressed. Cycle time reduction is most extreme in processes that formerly were paper-based.

ii)   Productivity Gain Through Work Management

Workflow allows individual users to save valuable time by filtering, prioritizing, and organizing their daily work. Work items arriving in the user's inbox are ready to work on. They contain all the documents and data and requisite approvals needed, thus eliminating a major source of inefficiency in the office. Users can organize their own work in views sorted by priority or due date, so they can work on the most important or time-sensitive matters first.

By assigning workers to roles and supporting delegation of work, workloads can be balanced and optimized, improving productivity of the workgroup as a whole. Through work tracking and statistics, workflow also allows better management visibility into business processes, allowing improved allocation of resources.

iii)   Improved Customer Service

Cycle time reduction and improved process control are even more valuable when a customer initiates the work item. The faster an account can be opened or updated, or a support request completed, the more satisfied the customer.

iv)   Improved Process Control

Maintaining quality and consistency is critical to organizational effectiveness, but it can be difficult when business rules live only inside the heads of workers.

For example, by putting the business rules inside the computer items that needs special processing or approvals, or which supplementary documents need to be attached can be automate by workflow quality and rule compliance across the entire organization.

v)   More Effective Collaboration and Knowledge Sharing

Even relatively unstructured processes benefit from workflow features such as work tracking, reminders, and automation of common tasks. Also, like the process control improvement brought about by putting business rules inside the computer, workflow can put *best practices* regarding business processes inside the computer, so they can be shared across the enterprise.

A more practical way to categorize workflow is in terms of the types of applications it enables. Today, the most significant categories of workflow applications are Production, Enterprise, Collaborative, and Customer-Focused (Lotus, 2000).

Collaborative technology or Groupware is software that provides services to support group activities including scheduling and holding meetings, communicating, collaborating ideas, sharing documents, knowledge, and information (O'Leary & O'Leary, 1999).

7.1   E-MANAGEMENT PROTOTYPE

The prototype of e-PACE also incorporates the e-Management for PACE office management. In order to increase productivity, PACE is trying to change the working paradigm by changing the organizational structures into computer-network structure.

Basically, in the e-PACE prototype to automate the form handling has been identified for creating an effective office management. The Annual-leave Application form has been identified and been developed in the e-PACE for the e-Management application.

The main reason for automating the form usage in PACE office, is due to manual form handling that may take more than two weeks to be completing a circle. The circle for the form handling is normally taking more time because the movement of the forms always involves several departments.

In each of the department, an approval has to be done before it can be proceed to the next department. The cycle will sometimes have to go through a lot of procedure until the final approval.

The e-Management in e-PACE prototype has been developed with Lotus Domino WorkFlow 2.0. Domino was identified as a suitable application for e-Management because it offers the easiest, most intuitive rules and roles based workflow management system to the Lotus Domino environment. While in delivering an intuitive visual workflow model, it enables companies to develop and deploy flexible and robust workflow applications faster and more efficient.

7.2 SMART PACE E-MANAGEMENT

The process for developing e-Management for SMART PACE shall not only for automating the form but also office daily task done in PACE office. e-Management sub-systems application that have been identified to develop in SMART PACE system are as follow:

7.2.1 Automating forms used in PACE office.

Forms that has been identified for automation are:

- Annual Leave Application form

- Mileage claim form

- Lecture Claim form

- Application form for leaving Office during office hour.

7.2.2 E-Office Communication

In a paper-based system, a memo circulation is not quite efficient enough for distributing among the staff in the office. For example, if the director intend to call for urgent meeting, the memo has to be typed and then printed. If there are many people involved, so the memo has to be prepared based on the number of people involve.

For solving this problem, a Bulletin Board System in SMART PACE may be able to broadcast the messages of instruction given to a group of personal involves. As for individual messages, the e-mail facility may be able to do the task efficiently.

7.2.3 Filling system

In daily office activities, letters coming in and out are undeniable. An efficient filing may help to solve problems in tracing a specific letters. In this case, an automation filling system can also incorporate in e-Management system.

For making more efficient, the letters may be scanned with a digital imaging equipment and stored them electronically. In this case, the filling system will be more efficient and organized especially when dealing with a professional organization.

7.2.4 Inventory System

At the present time, there is no computerized system available for stock inventory in PACE office. In order for managing the PACE stock more efficient, a computerized stock inventory may be incorporate in the SMART PACE e-Management system.

7.2.5 Billing System

Implementing automated billing system for PACE has to be done with a proper planning and meticulous designed. Transaction involving digital money is not an easy task. A detail issue regarding security and effectiveness of this system must be take into consideration seriously.

In SMART PACE, this system will guarantee PACE in capable to have an efficient and convenience e-Learning system available in Malaysia.

7.3 SUMMARY

In order to develop a fully paperless office environment in PACE office, the daily office task in PACE must be computerized. Basically, the proposed system application discussed previously may create the e-Management environment that automate key business activities and streamline the decision making process. The application significantly reduces compensation cycle planning times by enabling top management to make informed decisions at the desktop paperless.

From the e-Management application, some benefits that has been identified to PACE office are:

1. PACE capable to move from the paper-based application to electronic application. The impact from this, PACE is moving toward the paperless office as what our government planned under the Multimedia Super Corridor application.

2. Fully organized the workflow process, since all activities will be done electronically. This will lead PACE to be an efficient centre.

3. With the e-Management application, work management can be improved and managed efficiently.

CHAPTER EIGHT

SMART PACE

8.0   INTRODUCTION

The main purpose of this blueprint is to list the guidelines for PACE centre in developing the SMART PACE. In order to be a center of excellence for providing professional and continuing education programmes in Asia, PACE is planning a fully computerized system name as SMART PACE to fulfil those visions. SMART PACE will not only concentrate on improving the distance learning environment but also incorporate the target for automates office environment in order to move to the paperless office.

8.1   OVERVIEW OF THE SMART PACE

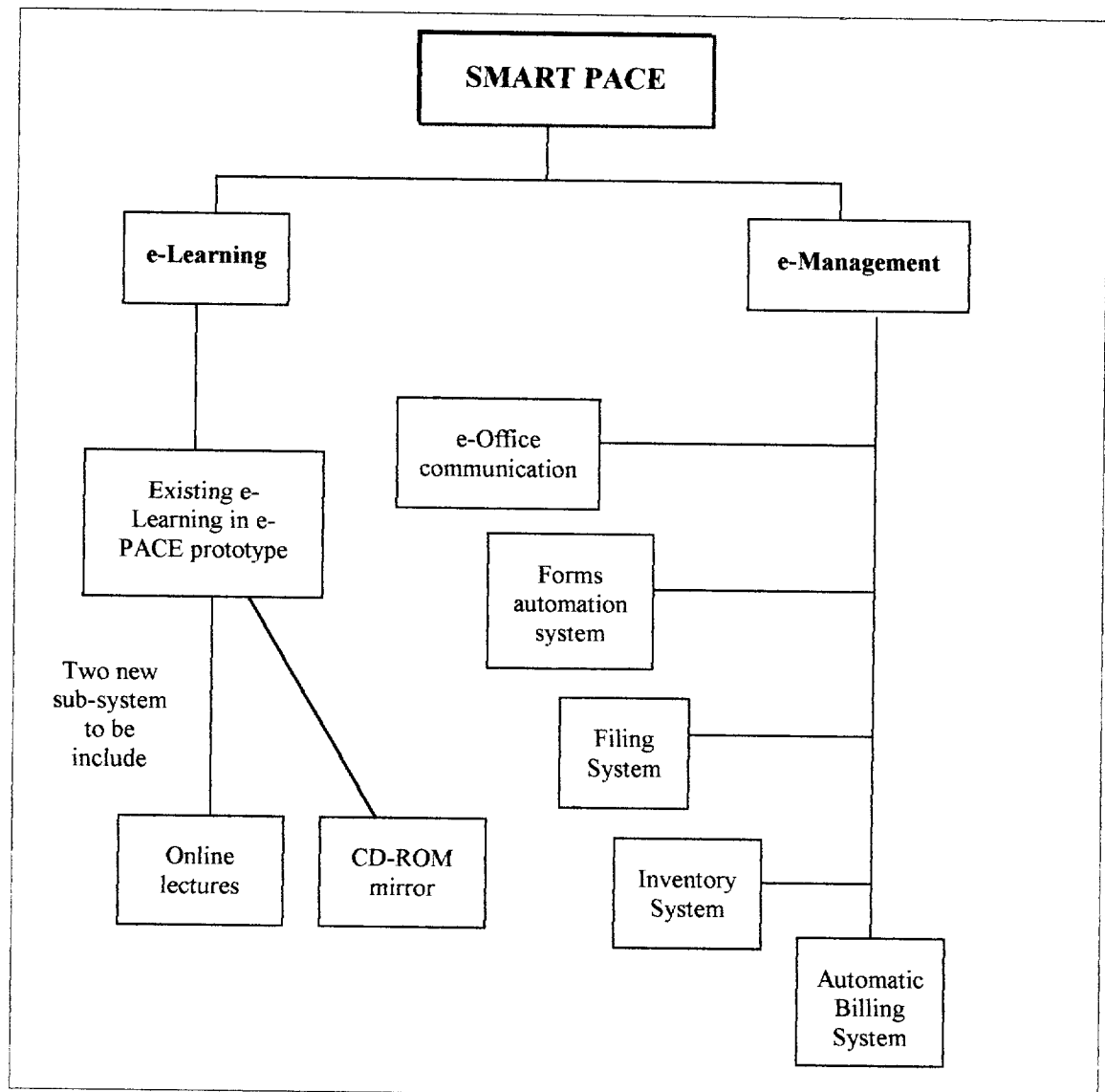Basically, the SMART PACE system consist e-Learning and e-Management application as shown in Diagram 1. The existing e-Learning system in the e-PACE prototype has been included and will be improved by adding with two other facilities, which are online lectures and CD-ROM mirrors. As for the e-Management, the four applications that will be developed are:

- E-Office communication;

- Forms automation;

- Paperless Filling System;

- Inventory System; and

- Automatic billing system

The detail of the proposed sub-systems that have to be developed under e-Management has been discussed in detail in e-Management chapter.

Diagram 2: Overview of the proposed SMART PACE

SMART PACE

e-Learning

e-Management

Existing e-Learning in e-PACE prototype

e-Office communication

Forms automation system

Two new sub-system to be include

Filing System

Online lectures

CD-ROM mirror

Inventory System

Automatic Billing System

8.2 SMART PACE DEVELOPMENT

In order to develop the SMART PACE, a proper planning must be prepared. During the initial phase, a prototype of each sub-system must be develop separately and should be tested thoroughly.

For example, in the e-Learning development, a full module for one course must be develop completely and must be fully tested by maybe with the existing full-time students for the same course. In this case, the comments, critics or suggestion given by the tested students may help PACE to develop better e-Learning facilities. The testing must not only test on the LearningSpace facilities, but also the other facilities available in e-Learning. For example, early semester registration such as registration for papers to be taken in that semester, course add or drop registration and all related forms in order for students to complete their semester studies.

As suggested, a set of CD-ROM contain the web-based e-Learning mirror should be provided along with the online web-based module. The CD-ROM shall include not only the course module but also the recorded lecture given by the respective lecturer. This will give students the experience on listening for a lecture that it will not possible for them to experience it if they are distant learning students.

After the end of the trial semester, students should be able to give their feedback regarding the effectiveness of the e-Learning facilities available. Any suggestion, comments or critics should be listed and be able to help PACE improving services or facilities in their e-Learning system. The suggestion, comments or critics should not only be taken during the trial version, but also must always be collect during the real time e-Learning been use in future.

SMART PACE e-Management system has many proposed sub-systems. For implementing the e-Management in PACE, the first step to be taken is to make sure the proposed networking configuration will be set up. This will help PACE to make sure the development of the e-Management a success. Once all staff in PACE centre are being able to access to the computer system, PACE can start implementing the e-Management that has been developed in the prototype e-PACE.

Then other types of forms that needs for automation will be next step of the process of Forms automation. The PACE e-Office communication system is the most important sub-system in SMART PACE. The sub-system allows all staff in PACE to be able to communicate electronically for example, calling for meeting or job assignments through electronic memo.

Filling system and the inventory system can be developed separately and can be added to SMART PACE once it has been completes successfully. The last sub-system that need a lot of planning and properly designed is the electronic billing system. Since this system is dealing with money, a lot of consideration regarding the authority, security and effectiveness must be taken seriously.

8.3   SUMMARY

SMART PACE is not a small system that can be implemented in a short time. A proper planning and proper management, are required to make sure the system will be developed successfully. PACE is moving towards improving their centre and it will not only improve facilities or services available, but also to ensure that the staff is ready to accept the challenge and to adapt their work style with the new environment in SMART PACE.

During the system development, PACE staff must be capable to utilize the proposed system. Training must be given to all staff regarding the usage of the proposed system. Without full cooperation, the system cannot be implemented successfully.

CHAPTER NINE

CONCLUSION

Although the blueprint is outlining the guideline for implementing a SMART PACE system, the implementation will not function successfully without the co-operation from PACE staff and other department in UUM.

SMART PACE e-Management system will help PACE in moving towards e-office as the sub-system available in e-government as planned by our government. The effectiveness of e-office in creating a quality-of-service for office is undeniable. In order to be competitive advantage, PACE must be able to fully utilize the advantage through the use of electronic technologies available nowadays.

A major point that PACE has to take into consideration while developing SMART PACE system is the system security. A good network management system and network administration in the SMART PACE server must be planned properly for the system to be fully secured.

The e-Management application in SMART PACE must have a multi level security, so that only the authorized user may access the appropriate data. In the Web-based application, the user authorization must be planned carefully to avoid hacking problem from the Internet user. A suggestion to solve this problem is that some application in e-Management may be categorized and can be identified whether it can be accessed only within internal access or globally through the Internet.

In order to build a reputation as one of a world status university, PACE must be capable to help the University by providing a new concept of learning, which is more effective and more efficient. e-Learning in SMART PACE has been identified as a solution for creating a long-life-learner that can be done anywhere anytime. With e-Learning, PACE may be successful in their choice for using the technology advantage for competitive advantage in the world of education technology.

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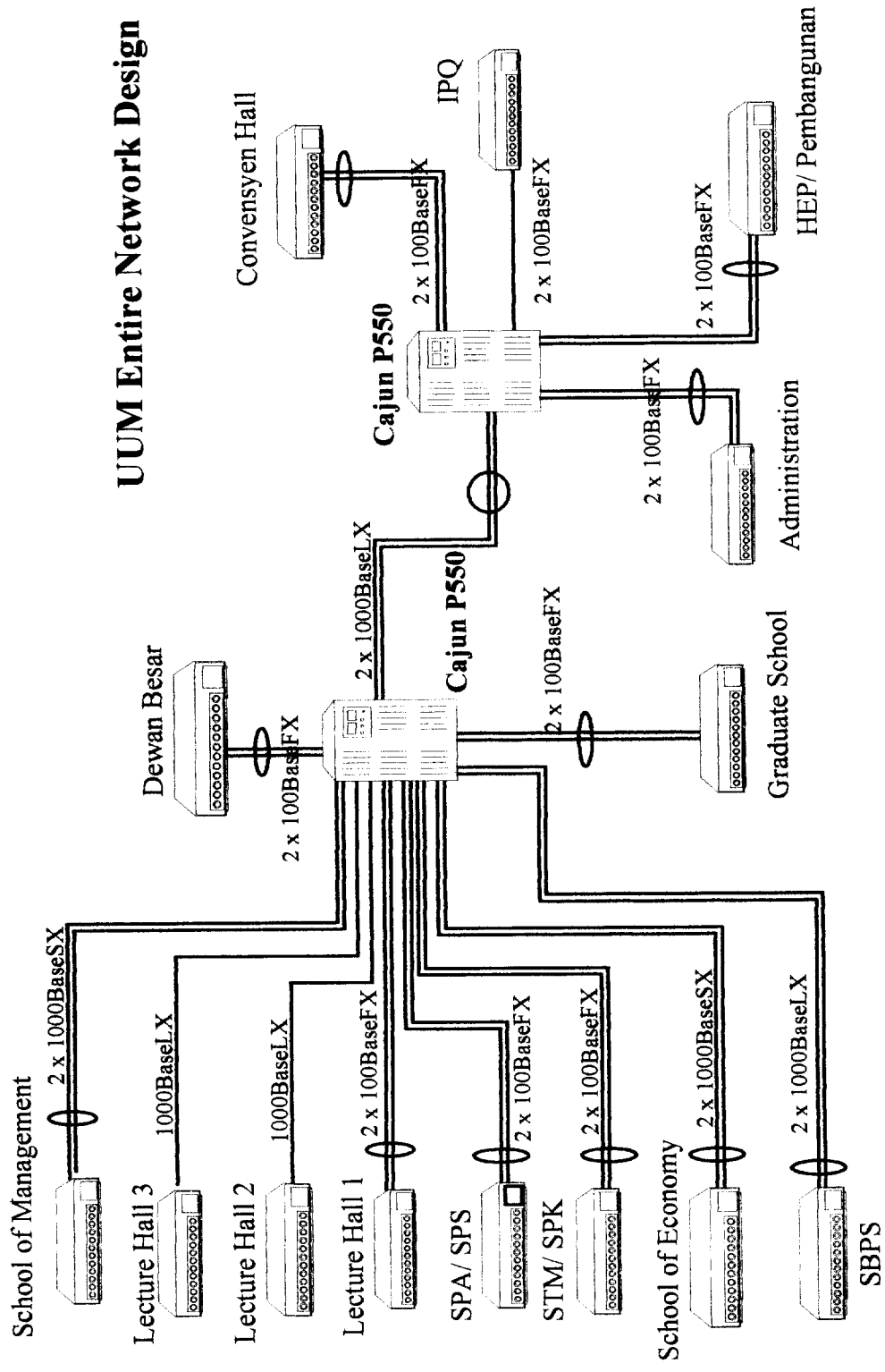
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APPENDICES

UUM Entire Network Design

UUM Computer Centre Networking Design
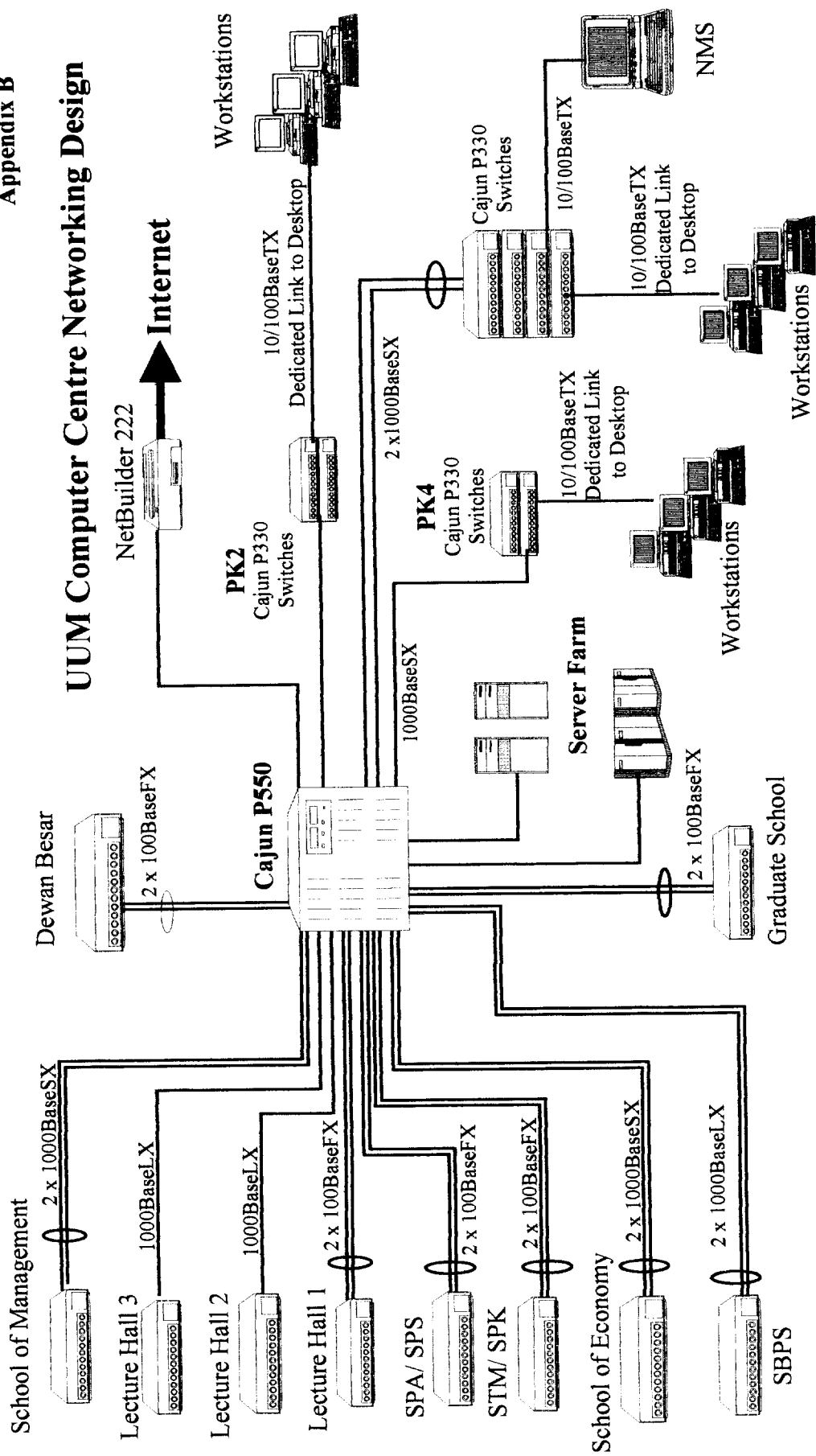
Appendix C

UUM School of Economic
Computer Networking Layout

Cajun P330 Switches

Cajun P330 Switches

Cajun P330 Switches

2 x 100BaseFX

SE-2 LAB
Cajun P330 Switches

1000BaseSX

Rack-C

1000BaseSX

2 x 100BaseFX

SE-1 LAB
Cajun P330 Switches

Rack-B

Cajun P330
Switches

10/100BaseTX

PACE Computer
Network

2 x 100BaseFX

Rack-D

2x1000BaseSX

Cajun P330 Switches

Rack-A

LIU

2x1000BaseSX

24 Core Fiber from Computer Centre

Existing Computer Networking In PACE Office.

Receptionist

PACE Director's Personal Assistant

PACE Director

PACE Director office

UPJJ Deputy Director

Deputy Director of UFB

Executive Meeting Room

Bilik kaca

Hub

UPP Deputy Director

BPM Coordinator

Designer Officer

Contract Editor

UKB Coordinator

UKB Coordinator

Editor

Main Meeting Room

Editor

BBA Coordinator

Assistant Registrar

Store Room

PACE General Office

Proposed Computer Networking
in PACE Office Centre

PACE General Office

Store
Room

PACE
Assistant
Registrar

Editors

2x100 BaseTX

New proposed
Switch for
PACE centre

PACE
new server

Printing
Room

Computer Room

Meeting Room

Cajun P330
Switches in
Rack-A
School of
Economic

100 BaseFX

UFB Deputy
Director

UPJJ Deputy
Director

UPP Deputy
Director

UKB
Coordinator

BPM
Coordinator

BBA
Coordinator

PACE
Director

PACE
Director's
PA

Receptionist

PACE Director Office