RESEARCH REPORT

EVALUATION OF EXISTING ICT INFRASTRUCTURE IN KUIM

CODE: PPPP (F) / 2006

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جامعة العلوم الإسلامية الماليزية
ISLAMIC SCIENCE UNIVERSITY OF MALAYSIA

Research Report

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UNIVERSITI SAINS ISLAM MALAYSIA
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CODE: PPPP (F) / 2006

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DECLARATION

We hereby declare that the work in this research is our own except for quotations and summaries which have been duly acknowledged.

Date: 28th February 2007

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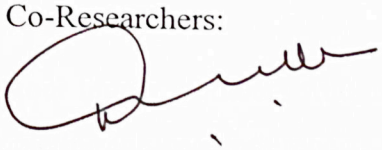

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Alhamdulillah Ya Hayyu Ya Qayyum

Regards,
ICT Infra Research Members

ABSTRACT

Information and Communication Technology (ICT) has been created to fasten and easier the human tasks. Nowadays, the ICT is becoming more widely used by academic institutions to support the academic activities particularly in teaching and research. Kolej Universiti Islam Malaysia (KUIM) is being established to uphold and enhance Islamic Studies in education with the usage of information and communication technology (ICT) in its academic activities. KUIM provides the ICT infrastructure to the staffs to effectively integrate the facilities in performing their job tasks. The evaluation of the existing ICT infrastructure at KUIM is in need to identify the strength and availability of the facilities. Therefore this research highlights the ICT infrastructures available at KUIM in terms of hardware, software, services and maintenance. The other aspect this research will look will be the users' satisfaction towards the availability and performance of the infrastructure. At the end of this study, we identified the existing computer hardware, software used in KUIM. This is including the whereabouts and specifications details of those items. Secondly, this research understood the process of administration of the ICT infrastructure. This includes the performance, services, network and security management. Finally, this study recognized the satisfaction and IT literacy among the staffs. The evaluation of current ICT infrastructure is in need so that it can benefit the user and organization as a whole. The user can take full advantage of the available facilities in order to provide the best performance and the organization can plan for future ICT uses for the development purposes. The outcome of this research is expected to provide the information needed for the growth of the university.

ABSTRAK

Teknologi komunikasi dan maklumat (ICT) telah dicipta untuk mempercepat dan mempermudahkan tugas-tugas manusia. Masakini, institusi-institusi akademik telah menggunakan kemudahan ICT secara meluas dalam menyokong aktiviti-aktiviti akademik terutama dalam pengajaran dan penyelidikan. Kolej Universiti Islam Malaysia (KUIM) telah diwujudkan dengan tujuan memartabatkan dan menambahbaik pembelajaran dan pengajaran dalam bidang Pengajian Islam dengan menggunakan kemudahan ICT dalam aktiviti-aktiviti akademiknya. KUIM juga menyediakan infrastruktur ICT kepada kakitangannya agar dapat menjalankan tugas-tugas harian dengan lebih efektif. Penilaian terhadap infrastruktur ICT sedia ada di KUIM menjadi sesuatu yang perlu dalam mengenalpasti kekuatan dan kesediaan kemudahan yang disediakan. Penyelidikan ini akan melihat kepada perkakasan, perisian, servis dan penyenggaraan yang terdapat dalam infrastruktur sedia ada di KUIM. Kepuasan pengguna terhadap kesediaan dan perlaksanaan infrastruktur ICT juga akan dikaji. Penyelidikan ini telah dapat mengenalpasti perkakasan komputer, perisian sedia ada yang digunakan di KUIM yang meliputi tempat dan spesifikasinya. Kedua, penyelidikan ini dapat memahami proses pentadbiran berkaitan infrastruktur ICT termasuk kesediaan, servis, rangkaian dan pengurusan keselamatannya. Akhir sekali, penyelidikan ini dapat mengenalpasti kepuasan dan kebolehan ICT di kalangan kakitangan KUIM. Penilaian terhadap infrastruktur ICT sedia ada sangat perlu kerana ia bukan hanya berfaedah kepada pengguna tetapi juga kepada organisasi. Pengguna boleh memanfaatkan kelebihan kemudahan yang disediakan dalam memberikan sumbangan yang terbaik sementara organisasi pula boleh merancang pembangunan ICT di masa hadapan. Hasil dari penyelidikan ini dijangka dapat memberikan maklumat yang diperlukan dalam perkembangan Universiti.

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CHAPTER 1

INTRODUCTION

Information and Communication Technology or simply ICT has been created to speed up the task. With the continuous development and emergence of the latest version, human task become much easier. Many people can benefits from the emergence but there are some hindrances that fail the aim of using and implementing the ICT. Some issues raised in the areas of ICT infrastructure included availability of networked computers, ease of access for staff and students, specifications of hardware and software, robustness of the infrastructure, compatibility of systems and human support to maintain the infrastructure (Broumley, 2001). Addressing the issues, some evaluating or assessment of ICT infrastructures has to be carried out.

The process of assessment may be a bit similar to the IT audit process which are planning, studies and evaluating then reporting. The concept of IT auditing was formed in the mid- 1960's and has gone through numerous changes due to advances in technology and the incorporation of technology into business.

Assessment of technology infrastructure is necessary in preparing an effective and conducive working environment. Highly capability and sufficient ICT infrastructures in holding up continuous access and information delivery are said to be the main factor in supporting knowledge based economy. The task of assessment includes activities of understanding the existing hardware and software, understanding software development tools and application system used, determine system usage of ICT infrastructure, facilities capabilities and issues. The assessment is one of recommended task in an ICT Strategic Plan by Malaysian Administrative Modernisation and Management Planning Unit (MAMPU) in which to help an organization to apply ICT creatively, moreover the investment on ICT is cost effective. In addition to that, the plan ensures the benefits are being measured against plan goals or budgets, control ICT expenditures and resolve conflicting demands for limited ICT resources.

1.1 DEFINITION IN TERMS

1.1.1 Information and Communication Technology

The term 'information technology' (IT) was adopted some years ago as a global term designed to include all matters relating to computers and the software that was utilized by these computers. The term was sufficient when each computer was essentially a stand alone entity. More recently, increasing numbers of computers are interconnected in order that communication can take place between them. Initially, this interconnection was

limited to local networks within organizations, but nowadays it has become the norm for communications to reach out world wide using the international network referred to variously as the Internet, the World Wide Web or simply the Web or Net. In recognition of the addition of communications technologies, the term IT has evolved into ICT (information and communication technologies) (Fallows, Stephan & R. Bhanot, 2002).

1.1.2 Islamic University College of Malaysia

Currently there are twenty public universities in Malaysia and, Islamic University College of Malaysia (KUIM), the twelfth public university, was approved by the Cabinet on 11th June 1997. KUIM has been established to raise the quality of Islamic education in the country. The University aims to produce outstanding and holistically educated Muslim scholars to lead the development of this multicultural nation.

1.1.3 ICT Infrastructure

An information infrastructure is defined by (Hanseth, 2002) as a shared, evolving, open, standardized, and heterogeneous installed base; and as all of the people, processes, procedures, tools, facilities, and technology which supports the creation, use, transport, storage, destruction of information (Pironti, 2006) addition to that for the communication means. Thus for this research the ICT infrastructure include the hardware, software and system application that are use for information and communication purposes.

1.2 STATEMENT OF PROBLEM

KUM has offered few infrastructures and services such as office automation, application systems, e-mail, Internet connection and more. In KUIM the usage of Information and Communication Technology is being incorporated in its academic activities particularly in teaching and research. This is parallel to the objective of KUIM is to foster Islamic essence in education. Furthermore, the ICT is also being employed in all departments in KUIM to amplify the efficiency in executing and completing the daily jobs.

After few years operating and now moved to new and wider campus in Bandar Baru Nilai, Negeri Sembilan, KUIM has expanded in the ICT infrastructures and services to enhance and facilitate the users' task. The effectiveness of the existing computing infrastructure and technologies need to be studied to identify whether it can meet the current and future infrastructures needed. It is important to assess the stability and performance of the current infrastructure and the ability to extend the reach to users.

1.3 RESEARCH AIM

The main aim of this research is to identify ICT infrastructures that existed in KUIM. This is to state the number of the existing infrastructures and are they in a satisfactory manner. In addition to that, it is the research is aim to evaluate the service offered to the computer user at KUIM. The result of this research should enable the management to plan

the effective budgeting and investment for ICT infrastructures and justify the needs of the user.

1.4 OBJECTIVES OF RESEARCH

The objectives of this research are as follows:

1.4.1 To identify the existing computer hardware and software.

1.4.2 To understand the operation and management process to administer the ICT infrastructures that includes performance, services, network and security management.

1.4.3 To evaluate the satisfaction of services and maintenance provided to the user.

1.5 SIGNIFICANCE OF RESEARCH

This research will be carried out as realize to the importance of ICT to enables the organization to operate more effectively. It is a technology that allows organization to do things that they would not otherwise be able to do. This research will highlight the following issues:

1.5.1 The ICT infrastructures available at KUIM in terms of hardware, software, application system, services and maintenance.

1.5.2 The users' satisfaction towards the availability and performance of the infrastructure

1.6 SCOPE OF RESEARCH

This research will focus on users at KUIM. The aim is to identify the availability of the ICT infrastructure, the usage, service, maintenance, performance, and problems faced by the user. The infrastructures that are going to be the sample of this research are the infrastructures that reach KUIM until 31st July 2006. Other than this date will not be considered.

1.7 EXPECTED FINDING

At the end of this research the following results are expected to achieve:

1.7.1 Number of existing hardware, software, and utilization capacity.

1.7.2 Type of application system in use and degree to which they are used.

1.7.3 Current operation management process to administer the ability and welfare of ICT infrastructure.

1.7.4 Level of user satisfaction of ICT services and maintenance in KUIM.

1.8 RESEARCH DESIGN

Based on the Figure 1.1: Research Design below, the research will gather information from the IT department, and user. The users satisfaction will be consider based on the hardware and software and application system that are available and compatible to be utilized by users.

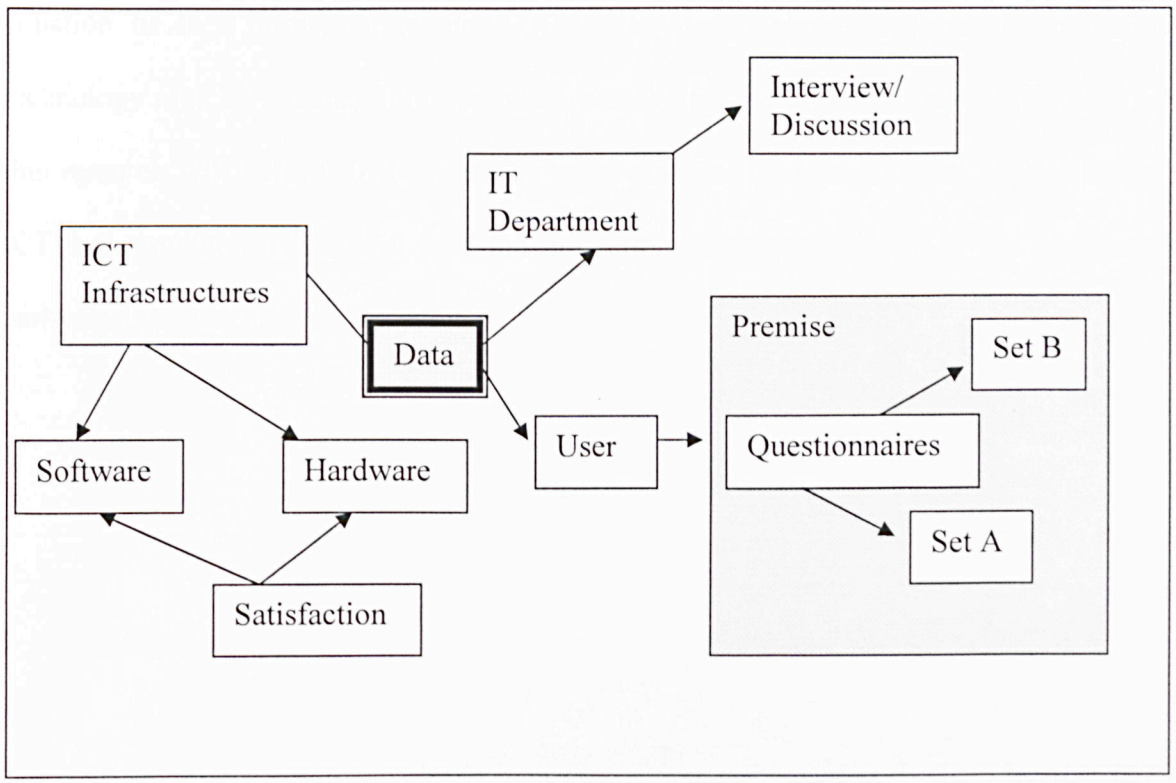

Figure 1.1: Overview Design Research

This research will be conducted as a quantitative research where all related information would be gather using survey and library research. The questionnaires consist of two sets were used to gathered information about the current status on some target variables such as number of hardware and software, specifications, and user satisfactions. The respondents will be the whole population of KUIM.

1.9 CONCLUSION

As a conclusion for this chapter, this research is vital to get a deep view about the current situation of ICT infrastructures in KUIM. Knowledge about the potential of using technology may be translated into practical benefits for the organization. The findings of this research will help KUIM in making good planning and decision on expanding the ICT infrastructure. These will lead the utilization of the technology to the maximum particularly in teaching and research.

CHAPTER 2

LITERATURE REVIEW

Information and Communication Technology (ICT) is the combination of computer and telecommunication technology. ICT has been created to rapidly accomplish tasks and able to make human task become much easier. ICT has become common tools in all areas of human life. The emergence of ICT also creates new forms of learning and ways of communication have been developed to ease our life (O'Leary & O'Leary, 2006).

ICT is still believed as important factor of success in many areas. In year 2006 budget, Malaysian government allocated RM5 billion for education sector (Bernama, 2005). Thus, indicating that the government also set focus towards continuous ICT improvement for education.

2.1 INFORMATION AND COMMUNICATION TECHNOLOGY

The term 'information technology' (IT) was adopted some years ago as a global term designed to include all matters relating to computers and the software that was utilized by these computers. The term was sufficient when each computer was essentially a stand

alone entity. More recently, increasing numbers of computers are interconnected in order communication can take place between them. Initially, this interconnection was limited to local networks within organizations, but nowadays it has become the norm for communications to reach out world wide using the international network referred to variously as the Internet, the World Wide Web or simply the Web or Net.

According to Webopedia Computer Dictionary, Information and Communications Technology (ICT) is the study or business of developing and using technology to process information and aid communications. ICT is actually the computer and communication technologies that help and understanding to the end user (O'Leary & O'Leary, 2006). ICT includes any communication device or application such as radio, television, cellular phones, computer and network hardware and software, satellite systems and so on, as well as the various services and applications associated with them, such as videoconferencing and distance learning (SearchWebServices.com, 2007).

2.2 ICT INFRASTRUCTURE AND ACCESS

The Information and Communication Technology (ICT) in Malaysia is improving. The government of Malaysia has spent millions of Ringgit Malaysia to improve the ICT infrastructure. The Malaysia government expected many foreign investors would come and invest in Malaysia if our ICT infrastructure is excellence. We could see this effort through the introduction of the Multimedia Super Corridor (MSC). MSC has built up not only a good reputation on Malaysia but also increase in ICT technical skills and

infrastructure. The improvement of technical skills and infrastructure in the ICT sector is so important because it could help move up the economy up.

2.2.1 Telephone Mainlines and Mobile Phones

UNESCO and World Bank reported the ICT infrastructure and access for Malaysia in 2001 was higher compared to other East Asia and Pacific countries. The telephone mainlines in Malaysia covers 196 for every 1,000 people. The totals of 314 per 1,000 Malaysians own mobile phone in 2001. This number is large compares to 97 per 1,000 people in other East Asia and Pacific countries. Access to radio was larger compared to television. This can be seen through the number of Malaysians having a radio set (420 per 1,000) and a television sets (201 per 1,000). Refer to Figure: 2.1 for the statistics from year 1996 to year 2001.

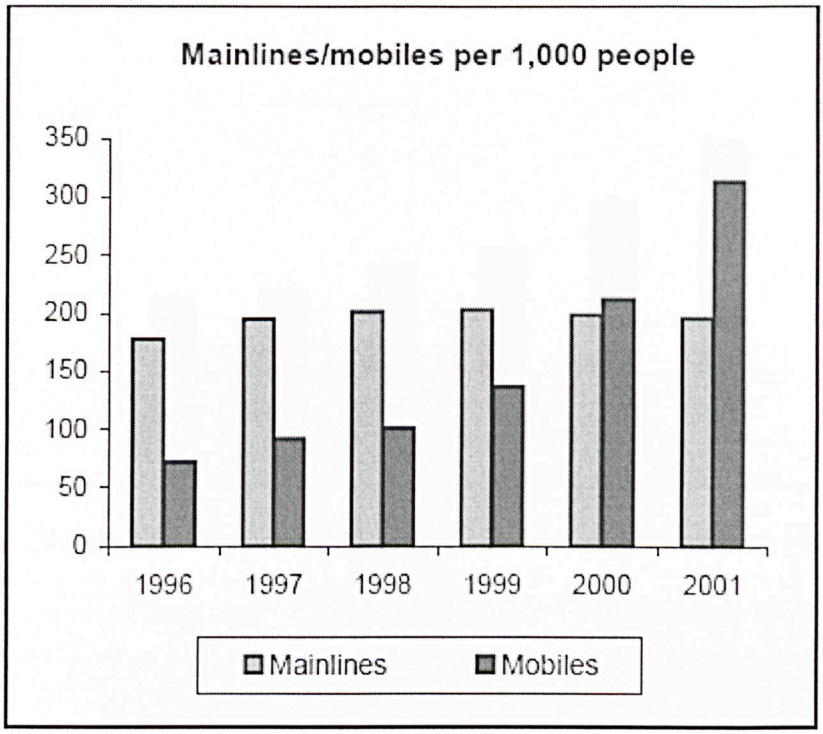

Figure 2.1: Statistics for telephone mainlines and mobile phones in Malaysia.

Source: UNESCO and World Bank, 2001.

2.2.2 Personal Computers

UNESCO and World Bank also reported the number of Malaysians owning personal computers in year 2001 was far bigger compared to other East Asia and Pacific countries. The number of personal computer (PC) was 126.1 per 1,000 Malaysians compared to 19.1 per 1,000 people in other East Asia and Pacific countries. The number of PCs per 1,000 people in Malaysia was nearly constant increased since year 1996 until 2001. Figure 2.2: shows the graph for the number of PCs per 1,000 people in Malaysia for the year 1996 to 2001.

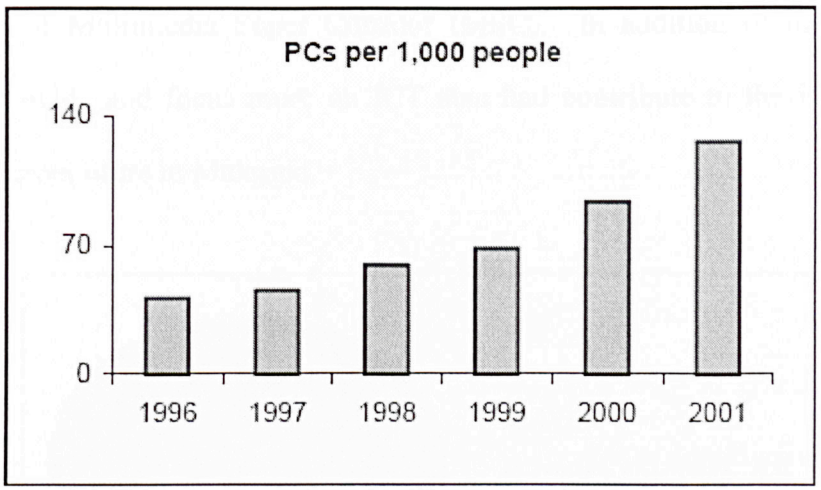

Figure 2.2: Number of PCs per 1,000 people in Malaysia for the year 1996 to 2001.

Source: UNESCO and World Bank, 2001.

2.2.3 Internet Users

As 11th January 2007, the Internet users in Asia are 36% as in Figure 2.3. This shows the use growth of 240.7% between the year 2000 and 2007. Malaysia was ranks 17th in the top 25 countries of Internet users in 2001. UNESCO and World Bank reported the Internet users in Malaysia had increased dramatically from 40,000 users in 1995 to 6.5 millions users in 2001. The percentage of the total number of Internet users to the total population (23,396,700 people) is around 28 per cent. This is much higher than Internet penetration in other ASEAN countries such as Indonesia (two per cent) that ranks 21st and Thailand (5.7 per cent) that ranks 25th (Internet World Stats. , 2007). One likely factor that contributes to the greater Internet use in Malaysia is the high fixed telephone connection with 66 per cent of Malaysian households having phones (International Telecommunication Union (ITU). 2002). This tremendous increase could be the result of

the existence of Multimedia Super Corridor (MSC). In addition of the government decision to provide and focus more on ICT also had contribute to the increase in the number of Internet users in Malaysia.

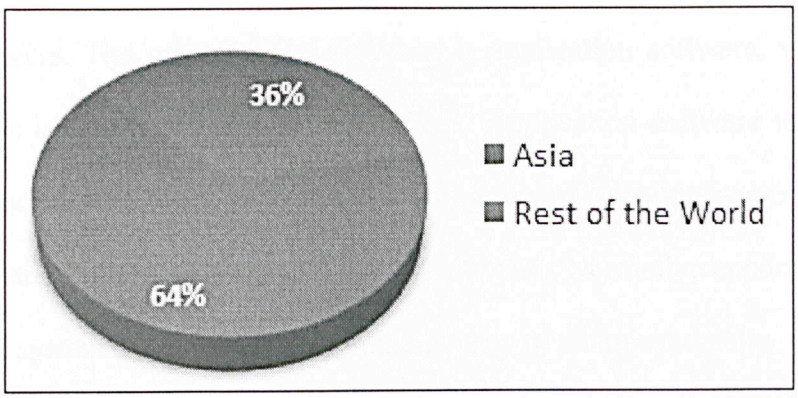

Figure 2.3: Internet Users in Asia 2007.

Source: Internet World Stats, 2007.

As of 2001, Malaysia had the second-lowest dial-up Internet cost among the ASEAN countries: Singapore ranked first without any charge for an Internet service provider (ISP) subscription. According to the International Telecommunication Union (ITU), the average cost for accessing 30 hours of Internet in Malaysia was less than US$ 20 (including costs for ISP subscription, telephone usage and rental) (Minges, 2001).

2.3 SOFTWARE

Software is defined as computer program consisting of step-by-step instructions, directing the computer on each task it will perform (O'Leary & O'Leary, 2006). Without software,

a computer is just an expensive collection of wires and components. Software divided into two parts namely as system software and application software. O'Leary & O'Leary define system software as the background software that enables the application software to interact with the computer. System software consists of the operating system, utilities and device drivers. The other part of software is application software, which includes general-purpose and special-purpose applications. Application software is software that can perform useful work such as word processing, cost estimating or accounting tasks. The user primarily interacts with application software. Normally, application software works with the system software to handle the majority of technical details.

2.3.1 System Software

System software consists of the operating system, system utilities and device. Each of these components has its purpose and function as will be discuss in this chapter.

2.3.1.1 Operating System

An operating system is considered as the background software that enables the application software to interact with the computer. Operating system works at the intersection of application software, the user and the computer's hardware. There exist many operating systems such as Microsoft Windows, Macintosh, UNIX and LINUX. Five basic functions of operating system are (Daley, 2006):

- Start the computer
- Manage applications
- Manage memory
- Handle internal messages from input and output devices
- Provide a communication between the computer and user.

Microsoft Windows are the most famous operating system among the personal computer users. Microsoft Corporation started the Windows operating system family in 1985 with Windows 1.0. In 1987, the next operating system, Windows 2.0, was introduced to upgrade Windows 1.0. Microsoft Corporation keeps improving their operating systems and has produced many versions of operating systems since the introduction of Windows 1.0. The improvement of Windows operating system family continue in 1990 (Windows 3.0), 1992 (Windows 3.1), 1993 (Windows NT), 1995 (Windows 95), 1998 (Windows 98), 2000 (Windows 2000/ME), 2001 (Windows XP) and recently in 2006 Microsoft Corporation has launched a new operating system namely Windows Vista. Most of the Microsoft operating systems are in both client and servers versions.

Apple Computer introduce Macintosh operating system in 1984 and by late 1980s, it was the most technologically advanced in personal computing. Mac OS was the first to introduce the graphical user interface (GUI) to the world. Unfortunately, Apple computer was unable to capitalize on its lead and lost to Microsoft Windows. AT&T Bell Laboratories developed UNIX operating system. UNIX was the first operating system with preemptive multitasking. UNIX was unable to take over the computer world

because UNIX is lack of compatibility among the many different versions of UNIX. The other reason is UNIX is difficult to use compare to Microsoft Windows. Linux was introduced by Linus Torvalds, a student at Finnish University (Daley, 2006). Linux is open-source software where its source code is available for all to see and use. Linux is so attractive and has become popular nowadays because Linux is powerful and free.

2.3.1.2 System Utilities

System utilities are used to keep the computer system running smoothly. System utilities are essential to the effective management of a computer system by backing up system and application files, providing antivirus protection, searching for and managing files, scanning and defragmenting disks and files, and compressing files. Nowadays, the antivirus protection software has become so important to protect the computer from computer viruses and other threats. Norton Antivirus and McAfee VirusScan are examples of antivirus protection software.

2.3.1.3 Device Drivers

The last component of system software is the device driver. A device driver, or a software driver is a specific type of computer software, typically developed to allow interaction with hardware devices. Device driver is specialized programs to allow particular input or output devices to communicate with the rest of the computer system. This usually constitutes an interface for communicating with the device, through the

specific computer bus or communications subsystem that the hardware is connected to, providing commands to and/or receiving data from the device, and on the other end, the requisite interfaces to the operating system and software applications.

Nowadays, most operating systems already include the famous and familiar device drivers in its packages. The emergence of universal serial bus (USB) has made the communication between the new device and the computer system easier.

2.3.2 Application Software

Application software consists of two (2) categories:

- General-purpose applications
- Special-purpose applications

2.3.2.1 General-Purpose Applications

General-purpose applications are also known as basic applications. This type of software is used by many people to accomplish frequently performed tasks. Writing, working with numbers and keeping track of information are some of the tasks. These applications are likely to be found on home and business user's personal computers. General-purpose applications include personal productivity, multimedia and graphics, Internet, and home

Table 2.1: The general-purpose application programs.

Source: Daley, 2006

Personal Productivity	**Multimedia and Graphics**	**Internet**	**Home and Education**
Word processing	Desktop publishing and multimedia authoring programs	E-mail programs	Personal finance software
Spreadsheet	Paint, drawing and animation programs	Web browsers	Tax preparation software
Database	Image-editing programs	Instant messaging software	Home design and landscaping software
Presentation graphics	3-D rendering programs	Video conferencing software	Computer-assisted tutorials
Personal information management	Audio software		Computerized reference information
	Video-editing software		Games

and education programs. There are many general-purpose applications in the market such as Microsoft Office, WordPerfect Office, Lotus SmartSuite, Adobe Photoshop, Adobe

PageMaker and many more. Table 2.1 provides the general-purpose application programs.

2.3.2.2 Special-Purpose Applications

Special-purpose applications are designed for specialized fields or the customer market. Specialized applications include thousands of other programs that are more narrowly focused on specific disciplines and occupations. Some of the best known are graphics, audio, video, multimedia, web authoring and artificial intelligence programs. Normally, this type of software is designed for professional and business use often cost much more than general-purpose applications. The high price is due to the costs of developing the programs and the small size of most markets.

2.4 HARDWARE

O'Leary & O'Leary define hardware as equipment that includes a keyboard, monitor, printer, the computer itself, and other devices that are controlled by software programming. In other words, hardware is the physical components that make up a computer system (Daley, 2006). Supercomputers, mainframe computers, minicomputers and microcomputers are the four types of computers. This chapter will discuss mainly on microcomputers or also known as desktop computers or personal computers. Hardware in microcomputer system consists of a variety of different devices. The four basic

categories of the microcomputer physical equipment are system unit, input/output, secondary storage and communication (O'Leary & O'Leary, 2006).

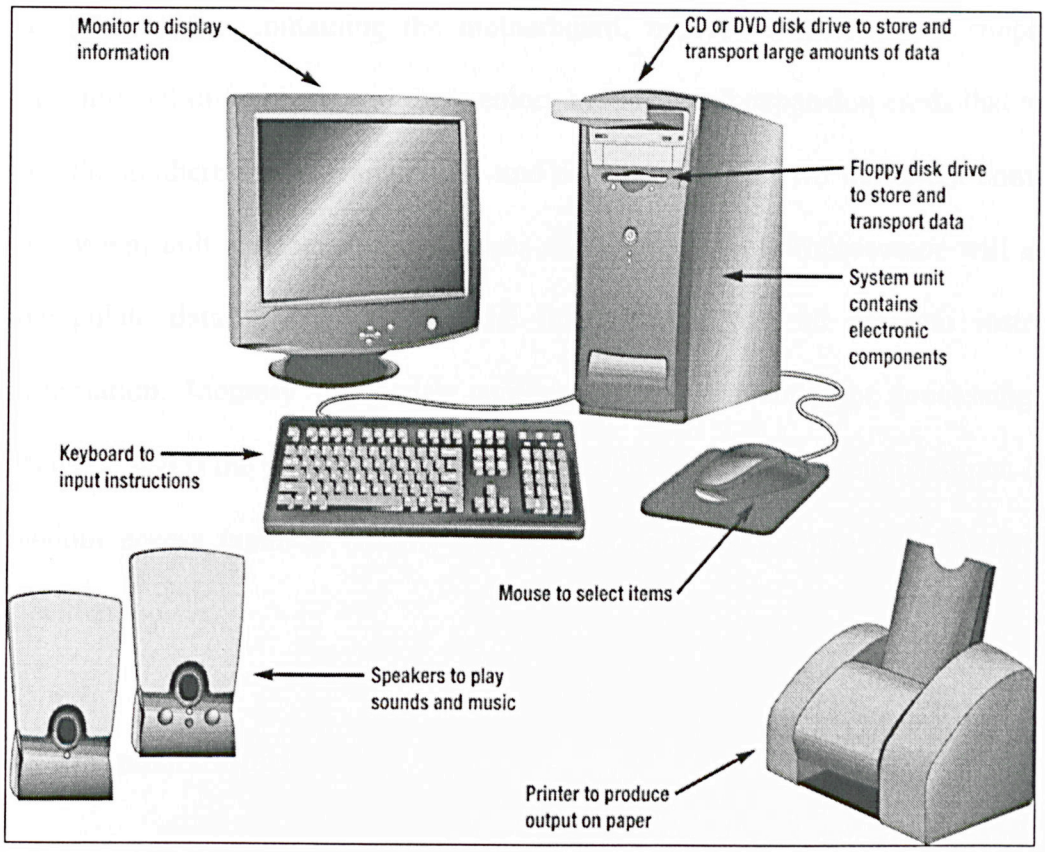

Figure 2.4: Sample hardware for microcomputer.

Source: O'Leary & O'Leary, 2006.

2.4.1 System Unit

The term system unit was the original term used by IBM when it introduced the IBM Personal Computer in 1981. However, the system unit is often and incorrectly referred to

as the CPU, the hard disk, or the case by non-specialists, even though each of these things is actually only a component of the system unit. A system unit, also known as a base unit, is the main body of a microcomputer, typically consisting of a metal or (rarely) plastic enclosure containing the motherboard, microprocessor, power supply, cooling fans, internal disk drives, and the memory modules and expansion cards that are plugged into the motherboard, such as video and network cards. Two important components of the system unit are the microprocessor and memory. Microprocessor will control and manipulate data. The result of the manipulation will be program instructions or information. Memory holds data and program instructions for processing the data. Memory also is the place to hold the processed information before it is output. Memory or random access memory (ROM) will lost its contents if there is a disruption in the electrical power.

2.4.2 Input / Output

Input / output, or I/O, is the collection of interfaces that different functional units (sub-systems) of an information processing system use to communicate with each other, or the signals (information) sent through those interfaces. Inputs are the signals received by the unit, and outputs are the signals sent from it. I/O devices are used by a person (or other system) to communicate with a computer. Output devices translate the processed information from the computer into a form that human can understand. For instance, keyboards and mouses are considered input devices of a computer and monitors and printers are considered output devices of a computer

2.4.3 Secondary Storage

Secondary storage, also known as computer storage or external memory, is computer memory that is not directly accessible to the central processing unit (CPU) of a computer, requiring the use of computer's input / output channels. Secondary storage is used to store data that is not in active use. Secondary storage is usually slower than computer memory or internal memory, but also almost always has higher storage capacity and is non-volatile, which makes it perfect for the preservation of stored information in an event of power loss. Some of the secondary storage devices include CD, CD-R, CD-RW, DVD, flash memory, floppy disk, zip drive, magnetic tape and punch card.

2.4.4 Communications

Using communication devices, a microcomputer can communicate with other computer systems. Location of the other computer systems does not a matter because it can be located as near as the next desk or as far away as halfway around the world using the Internet. The emergences of the Internet have made the communication easier. Typical devices for communication between computers are for both input and output, such as modems and network cards.

2.5 THE NEED FOR STUDY OF EXISTING INFRASTRUCTURE AND TECHNOLOGY

The study of existing infrastructure and technology used in one organization is necessary in order to identify all existing and potential problems, weaknesses, and bad practices within the existing infrastructure and organization (University of Paisley, 2007). This will include the peripheral and network problems and weaknesses

The aim of the existing infrastructure and technology studies should be improving current performance, advising the organization on how best to accommodate future growth, offering both short and long term recommendations and providing concrete proposals to solve problems and weaknesses (Data Integration Ltd, 2007).

User satisfaction with the existing infrastructure and technology is an excellent metric to use as part of an effectiveness measurement process (Chapple, 2007). Calculate the satisfaction results to determine the level of service we are providing to the organization.

The results of this kind of study should be able to provide the ground work for future projects in design, management and maintenance. It also is able to rectify the problems highlighted by the study. The study should be the first step to achieving managed and better infrastructures. It is important to ensure that our ICT infrastructure keeps up with our main purposes of business which are academics activities particularly in teaching and research.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

The acquisition of information is vital in the research process. Therefore this chapter discusses in detail all the processes involved to complete this research. It comprises the processes of how the research was carried out especially regarding on collecting and analyzing data. The research methodology will be presented in six segments which involved research design, population and sample, research instruments, variables, data collections and analysis procedures. Descriptive research is used to obtain information concerning the current status of the phenomena to describe "what exists" with respect to variables or conditions in a situation (Key, 1997). Consequently this research executed as a quantitative research and classified as a descriptive where a field work is carry out to collect data.

BIBLIOGRAPHY

Broumley, Liz. 23rd February 2001. "Comparative Institutional". *ToolCIT Audit.* <http://en.wikipedia.org/wiki/Information_Infrastructure>.

Chapple, M. 2007. "Four Ways to Measure Security Success". <http://searchsecurity.techtarget.com/tip/1,289483,sid14_gci1070102,00.html>.

Daley, Bill. 2005. *Computers Are Your Future 2005.* Complete Ed. New Jersey, USA: Prentice-Hall.

Daley, Bill. 2006. *Computers Are Your Future 2006.* Complete International Ed. New Jersey: Pearson Prentice Hall.

J. O'Leary, Timothy & L. I. O'Leary. 2005. *Computing Essentials 200.* Complete Ed. New York: McGraw-Hill.

J. O'Leary, Timothy & L. I. O'Leary. 2006. *Computing Essentials 2006* Complete Ed. New York: Mc Graw Hill.

J. Salkind, Neil. 2000. *Exploring Research.* 4th Ed. New Jersey, USA: Prentice-Hall.

MAMPU. August 2003. *Standards, Policies and Guidelines - ICT Strategic Plan (ISP) Guideline.* Version 1.

Minges, M. 2001. "Measuring the Internet in South East Asia". <http://www.itu.int/ITU-D/ict/cs/Malaysia>.

n.a. 2001. "ICT At A Glance: Malaysia". *UNESCO and World Bank.* <http://www.msc.com.my/xtras/fact_figures/Facts&Figures2.pdf>.

n.a. 2002. "Multimedia Malaysia: Internet Case Study". *International Telecommunication Union (ITU).* <http://www.itu.int/ITU-D/ict/cs/malaysia/material/mys%20cs.pdf>.

n.a. 2004. "ICT in Schools Survey 2004". *Department for Education and Skills.* <http://uic.edu/depts/accc/workshops/index.html>.

n.a 2005. "Abdullah Bentang Bajet Penyayang Untuk Rakyat". *Bernama.* <http://webevents.bernama.com/events/budget2006/newsbm.php?id=158195&lan

g=en>.

n.a 2006 "Portal Kommuniti E-Wadi"
<http://ewadi.kuim.edu.my/portalsmu1850/ver3/login.htm?ralat=%20Sila%20Log in>

n.a. 17 January 2007. "ICT". *SearchWebServices.com.*
<http://searchwebservices.techtarget.com/gDefinition/0,294236,sid26_gci928405, 00.html>.

n.a. 17 January 2007. "What is ICT?". *The Webopedia Computer Dictionary.*
<http://www.webopedia.com/TERM/I/ICT.html>.

n.a. 2007. "Asia Internet Usage Stats and Population Statistics". *Internet World Stats.*
<http://www.internetworldstats.com/asia.htm>.

n.a. 2007. "Descriptive Research".
<http://www.ryerson.ca/~mjoppe/ResearchProcess/DescriptiveResearch.htm>.

n.a. 2007. "Network Audit". *Data Integration Ltd.*
<http://www.dataintegration.com/services/network.asp>.

n.a. 2007. "Network Audit Requirements". *University of Paisley.*
<http://nism.paisley.ac.uk/jtap562/refdocs/auditreq.pdf>.

n.a 2007. "Research Method Knowledge".
<http://www.socialresearchmethods.net/kb/statdesc.php>.

Najwa Hayaati Mohd Alwi & Nurdiana Azizan. 2005. *The Usage of ICT in Fatwa Management In Malaysia.* (Research Report). Kolej Universiti Islam Malaysia.

P. Key, James. 1997. "Research Design in Occupational Education". *Oklahoma State University.*
<http://www.okstate.edu/ag/agedcm4h/academic/aged5980a/5980/newpage110.htm>.

Sekaran, Uma. 2003. *Research Methods For Business: A Skill Building Approach.* 4th Ed. New Jersey, USA: John Wiley & Sons, Inc.

Swansea University. 2004. "University Computing Survey". *Swansea University, Library & Information Services.*
<http://www.swan.ac.uk/lis/reports_and_policy/docs/computing%202004%report.doc>.