Factors Related to Information Technology Implementation in the Malaysian Ministry of Education Polytechnics

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(ABSTRACT)

The purpose of this study was to examine factors related to information technology (IT) implementation in the curriculum. The focus was on Malaysian Ministry of Education Polytechnic (MoEP) faculty members' attitudes toward IT, as well as IT availability and IT use in teaching. The response rate from the 332 surveys sent to the MoEP was 75.9%.

Faculty members as a whole appeared to have readiness for adoption of changes related to IT use in teaching despite the lack of IT use in general. The use of selected IT items was skewed greatly in the direction of non-use. Faculty attitudes toward the use of IT in their teaching were very positive.

The overall professional development experiences in IT that respondents had were greatly skewed toward non-participation. Results for items associated with supports services showed that they were available for faculty use. Sixty-nine percent of the respondents reported to face barriers to the use IT in their teaching.

The extent of IT use in general for male respondents and female respondents showed a significant difference among gender. ANOVA revealed no difference between MoEP membership and IT use in general. Analysis of department membership and IT use in general revealed no difference between the two. Highest level of education had a low significant correlation with extent of IT use in general. A low negative correlation was shown between highest level of education and other demographic variables. Age had a moderate positive correlation with years served for the MoEP and a high correlation with years served for the MoE. Years served for the MoEP also has a moderate correlation with years served for the MoE. There were no significant correlations among variables except for online discussion and teaching load. Highest level of education showed a low correlation with email, WWW, and scanner.

Multiple regression analysis was conducted to determine what variables were the best predictors of IT use. Results revealed an R^2 of 0.04. Highest level of education contributed significantly to the variance. Adoption proneness proved to be a predictor for IT use in teaching, while other selected demographic variables were not significant predictors.

Dedication

Bismillahirahmanirahim

This dissertation is dedicated to

my parents,

Zakaria Othman (passed) and Rohani Ismail

my wife, Norzaini Yang,

my four children

Anwarul Hidayah, Anwarul Ridhwan, Anwarul Firdhaus, and Anwarul Amirah.

And Family Members.

Without their love and support, this journey has not been successful.

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TABLE OF CONTENTS

LISTS OF TABLES

LIST OF FIGURES

CHAPTER 1

Introduction

Information technologies (IT) are significantly affecting society by resulting in widespread use of these emerging technologies at both work and home. The impacts of IT on the society, economy, and workforce include extensive changes in the nature of work, commerce, education and training, entertainment, and quality of life. In common use today are e-mail, the World Wide Web, and all its resources, as well as multimedia systems that allow users easy access to rich content directly from their computers.

The principal driving force behind these changes is the mushrooming development and deployment of new technologies into almost every sector of the economy. These new technologies are making the world much more interdependent by accelerating the movement of goods, services, ideas, and capital across national boundaries (Cutter, Spero & Tyson, 2000). The globalization of IT is drawing the attention of governments, corporations, academia and the public at large. IT use is critical to improved productivity and competitiveness at all levels of society, and facilitates development of high quality information infrastructure. Yusuf (2000) noted that Information Technology, an extraordinary phenomena changing and challenging every known field of human endeavor is at the heart of today's world.

The widespread of emerging technologies both at work and at home demands flexible workers who are able to keep in pace with technology, self-directed, and knowledgeable about the world, and cross-cultural communications. The education of new knowledge workers requires emphasis on information access, problem solving, analysis, evaluation, and decision-making. According to Sherrit & Basom (1996), employers are seeking employees who are technology and information literate. The growth of knowledge in most fields is rapidly outstripping any individual's ability to remain current. Knowing how to access information rather than memorizing information is central to coping with this rapid change. As Mann (1994) commented, it is important that the students of today learn how to evaluate, manage, and use information, not merely regurgitate it. These future employees are to be able to go right away to take on problems and assignments and do them effectively, regardless of what their major is.

As IT is becoming a natural part of our daily lives, its use in educational institutions is becoming a necessity. Whether they realize it or not educational institutions are experiencing an increase in the use of a variety of IT. McNeil (1996) found that access to computers, laboratories, and good facilities are important to student success. Information technology should be viewed as tools, which are an integral part of a student's learning experience.

Mustapha (1999) asserted that the role of vocational and technical education in the economic development of Malaysia has never been more critical. The Malaysian Ministry of Education Polytechnics (MoEP) has the task to fulfill the adoption of a national strategic plan by the government to remake Malaysian corporations and reinvent the Malaysian society (Hong, 2000). The national quest is to be an industrialized and a fully developed nation by the year 2020.

Challenged by rapid changes in IT, and the globalization of the economy, the MoEP have been working harder to prepare Malaysia’s future mid-level technical workforce that is competent and has the required higher levels of academic and technical skills needed by future employers. As part of the commitments to economic growth and development that demands

graduates of MoEP to be up-to-date in IT regardless of what their major is, the MoEP have to respond “to the changing client needs"(Dirin, 1995, p. 66).

"Much emphasis and attention have been given to the importance of the availability of technologically advanced equipment and instructor competencies in polytechnics" (Sipon, 1996, p. 15-16). Schlechty (1997), noted that many business leaders feel schools are not preparing students for the workplace. There is fear that post-secondary institutions lack the basic network as well as the hardware and software needed by faculty, students and staff. The findings of a research study by Mustapha (1999) revealed that Malaysian vocational educators were uncertain regarding the provision of adequate facilities and resources for vocational and technical programs.

Faculties need access to modern curricula and instructional materials that provide a strong foundation for future work or further study. Faculties need to adapt to changes in society and make sure that students leave their program with not only skills but also the knowledge to apply these skills. To better reflect societal changes, more must be known about how faculties can effectively utilize the power of information technologies.

The extent to which IT implementation is successful in educational programs depends largely on managerial and organizational factors. The role of users, mainly the faculty, the degrees of management support from the MoEP itself and the Ministry of Education (MoE), all have profound impact on the outcome of IT implementation. Implementing these practices becomes a challenge when an effective support system is not in place. Faculties cannot develop the necessary levels of expertise in any application or at least acquire the basic knowledge needed to apply learning principles to a certain application without ample training.

Institutions like the MoEP need to provide sufficient faculty training or an incentive system that encourage adoption. If a faculty member is not comfortable with a certain technology, the students will not be comfortable either. Dirin (1995) was concerned that any drastic attempt to individualize instruction for all students in the MoEP and maximize the IT potential will result in chaos if faculty members do not possess the relevant competencies. This does not mean that faculties must be technology experts or hold degrees in information systems. According to Rea, Hoger, & Rooney (1999), encouraging faculty mentoring programs, providing computer-based training over networks and CD-ROMs, and attending local technology workshops are just a few of the ways in which faculty can acquire the basic knowledge and skills necessary to incorporate technology and communications in teaching.

Rationale for the study

The future of education is linked to how we deal with the process of complex change. According to Bowman (1999), futurists contend that primarily demographics, technology, and knowledge drive change. More people, more tools, and more knowledge mean more change. As a result, " orchestrating change will be the greatest organizational challenge in the foreseeable future" (Bowman, 1999, p. 295). However, the downside of change is inevitable " whenever human communities are forced to adjust to shifting conditions, pain is ever present" (Kotter, 1996, p.4).

The rapid introduction of technology-related changes in almost all parts of human lives poses a challenge to the education system. The power of IT to enhance people's lives in so many ways creates a context in which traditional methods of teaching and learning fare badly in comparison. Education has been able to adapt to technological change in the past. The radio, the

television, the tape recorder, the video recorder, and others have been introduced successfully into learning processes. What the new technologies offer is of a different order from these devices. Sendov (1986) claims that the basic problem now is not how to introduce computers in education, but how to build education in the presence of the computer. For technology to serve the purposes of change, it must be tied to a coherent, school-wide instructional agenda (Means, Olson, & Singh, 1995).

This study addressed a subset of the innovation-decision process posited by Rogers (1995). Its purpose was to examine factors related IT implementation in the curriculum. The focus was Malaysian MoEP faculty members' attitudes toward IT as well as IT availability and IT use in teaching. Change and innovation in educational thought and practice needs educational technologies and modes of delivery to respond effectively to the changes and opportunities in the 21st century. These changes include recent developments in the workplace, changes in student demographics, and an information based environment. With changing technology and work organizations, educational institutions need to do more to equip students with the more sophisticated and higher-level skills that today's workplace requires (Grubb, 1995).

The results of this study should contribute to the general knowledge base of research on change by providing information about the diffusion of an important innovation in a Malaysian polytechnic context. Knowledge of faculty attitudes about using IT in the curriculum and the availability of adequate support for IT are important considerations in the effort to incorporate IT into the college curriculum. Understanding the adoption and use of IT, and the support needed to incorporate them into the curriculum could help faculty and students in using them most effectively.

It is important for MoEP faculty members to be receptive to changes in their programs, as well as to be able to adopt innovations in their instructional methods, so they can make the changes more permanent. The study will also identify barriers that faculty face in their attempts to implement IT in the curriculum. An awareness of any barrier that faculty members face could lead to the development of solutions for overcoming these barriers, develop useful training programs, and encourage the use of IT where they have found to be most effective. It will also help the MoEP to meet the needs of national commitment to adoption of IT as aspired by the National Education Policy (NEP), the Multimedia Super Corridor (MSC), and to accomplish the national agenda to be a developed nation by the year 2020.

The following research questions related to MoEP faculty members guided this study:

1. To what extent are faculties adoption-prone?
2. To what extent do faculties use IT in their teaching?
3. What attitudes do faculties have toward using IT in their teaching?
4. What professional development experiences in IT have faculty had?
5. To what extent do faculties perceive IT support services are available to incorporate IT use in their teaching?
6. To what extent do faculties perceive that barriers exist to IT use in their teaching?
7. What relationships exist between selected faculty demographics (i.e., teaching load, years served as teacher/ instructor, years served in MoEP, gender, age, level of education, and MoEP membership) and IT use in their teaching?
8. Collectively, to what extent do the above variables predict IT use in teaching?

Benefits of the study

It was anticipated that the results of this study would provide the Malaysian Ministry of Education (MoE) with current data that aid the MoE in making better policy decisions and applying educational strategies with greater certainty. Results were also aimed at providing the Malaysian Ministry of Education Polytechnics (MoEP) with current data on MoEP faculty use of information technology (IT), to facilitate change more effectively for the benefit of the faculty and students. Finally, the study results could serve as a foundation for the research community to proceed with further research on the use of IT and teaching effectiveness.

Assumption

This study was based on the assumption that respondents were truthful in their answers to the survey.

Limitation

This study had a limitation that the faculty dispositions, opinions and perceptions of change were assessed through self-reported assessment of changes in behavior. Change in attitudes was not measured directly. Further, no effort was made to view the changes first hand.

Definitions of terms

Some of the terms used in this study have other, more common, generic meanings. For this study they are described as follows:

Information Technology (IT) "Is any computer-based tool that people use to work with information and support the information processing needs of an organization" (Haag, 2000). IT includes the hardware and software used.

Faculty denotes full-time instructional staff appointed by the Malaysian Education Service Commission and employed at the Malaysian Ministry of Education Polytechnics. Faculty members may mean, or be used interchangeably with the word teacher, educator, or instructor.

Ministry of Education Polytechnics (MoEP) refers to Malaysian post-secondary government run educational institutions that offer full-time non-baccalaureate certificate (2-year) and diploma (3-year) programs in engineering and business.

Change is as defined in The New Merriam-Webster Dictionary (Mish, Ed., 1989), to make or become different; to replace with another; the act, process, or result of changing.

Course(s) can be used interchangeability with subjects taught by faculty.

Period(s) can be used interchangeability with teaching loads of faculty per week.

Resistance to Change is traditionally used as not to become different, replace, changing, altering, transforming or converting.

Receptivity to Change is traditionally used as the willingness to change, alter, transform or convert, become different. In this study, receptivity to change is operationally defined as a readiness to adapt information technology into their courses.

Attitude toward Change is traditionally defined as the willingness to accept or reject implementation of something new. In this study, attitude toward change is operationally defined as receptivity or resistance to the adoption to information technology into their courses.

Attitude refers to the predisposition of individuals to act and can be positive or negative.

Summary

This study addressed a subset of the innovation-decision process posited by Rogers (1995). Its purpose was to examine factors related to information technology (IT) implementation in the curriculum. The focus was Malaysian MoEP faculty members' attitudes toward IT as well as IT availability and IT use in teaching. The results of this study is hoped to contribute to the general knowledge base of research on change by providing information about the diffusion of an important innovation in a Malaysian polytechnic context. Knowledge of faculty attitudes about using IT in the curriculum and the availability of adequate support for IT is important considerations in the effort to incorporate IT into the college curriculum.

CHAPTER 2

Context of Study

Basic Information

Malaysia is situated seven degrees north of the Equator in the heart of Southeast Asia. It is eight hours ahead of GMT and 16 hours ahead of the U.S. Pacific Standard Time. Covering an area of 330,400-sq. km., Malaysia is made up of two landmasses is separated by the South China Sea. Peninsular Malaysia has Thailand to the north and Singapore to the south. East Malaysia made up of Sabah and Sarawak on the island of Borneo has Indonesia and Brunei Darussalam as their neighbors.

Malaysia is a multi-racial country with a population of more than 22 million people. This consists of the main racial groups of Malays, Chinese and Indians and a very diverse group of indigenous people in Sabah and Sarawak. *Bahasa Melayu* (Malay language) is the national language but English is widely spoken. Islam is the official religion but Buddhism, Hinduism, Christianity and other religions are free to practice.

Malaysia comprises 13 states and two federal territories, Kuala Lumpur and Labuan (an island off the coast of Sabah). Nine of the states have hereditary rulers, from which the Supreme Head of State, the Yang Di-Pertuan Agong (King), a constitutional monarchy elected every five years. The government is a parliamentary democracy. The Prime Minister heads the Cabinet of Ministers.

Historical background

The course of Malaysian history has been determined by its strategic position at one of the world's major crossroads, its tropical climate, the surrounding environment, and the regime of the northeast and southwest monsoon. Its position and other geographical circumstances made the country a natural meeting place for traders from the East and the West. Malaysia's (then Malaya) development has come from the sea. Its inhabitants acquired a skill and reputation as sailors and navigators. Subsequent trading contacts have been responsible for the waves of outside influence, which have modified their way of life.

Early Settlement

The earliest of the present-day inhabitants of Malaysia, who probably dates back over 5000 years, are the *Orang Asli* (indigenous people) of the Peninsula. The next arrivals to the country were the Malays, represented the second and third wave of this movement. The first Malay settlers (the Proto-Malays) had probably established themselves here by 1000 BC. The Deutero-Malays followed over the next few centuries. The Malays spread out into the islands of the archipelago, giving rise to the complex and variegated ethnic pattern of Malaysia and Indonesia today. The Malays of the Peninsula had their closest affinities with the Malays of Sumatra, and for centuries, the Straits of Melaka did not form a dividing line between two nations but served as a corridor linking different parts of the same family. Together with the *Orang Asli*, the Malays make up the indigenous people of Malaysia today, and are classified as "sons of the soil" or *Bumiputera*.

Hindu-Buddhist Influences

A new phase in the historical development of the inhabitants of Malaysia began around the first century BC with the establishment of regular trading contacts with the world beyond Southeast Asia, specifically China and the sub-continent of India. It was during this time when Hinduism and Buddhism had a great impact in the region.

Islamization and the Melaka Sultanate

The Hindu-Buddhist period of Malaysia's history began to end with the introduction of Islam into the area. Brought primarily by Gujerati (Indian) and Arab traders, there is evidence of the presence of the religion in the region as early as the 13th century. After 1400, Islam became a major influence with the conversion of the Malay-Hindu rulers of Melaka. From Melaka, Islam spread to other parts of the Malay Peninsula and to the Malay states in Sumatra and along the trade routes throughout the Indonesian archipelago. The Malay kingdom of Melaka, which dominated both sides of the Straits of Melaka for hundreds of years, marked the classical age of Malay culture.

European Assault and Colonialism

Melaka fell to the Portuguese in 1511. The Dutch later took control of Melaka in 1641. European power in the region remained restricted until the British intrusion at the end of the 18th century that brought with it the resources and organization of the Industrial Revolution. From their new bases of Pulau Pinang (1786), Singapore (1819) and Melaka (1824), which became collectively called the Straits Settlements, British influence and power spread into the Malay Peninsula, and the process of political integration of the Malay States of the Peninsula into a modern nation-state began.

In 1824, the Anglo-Dutch treaty divided the Malay world into British and Dutch spheres of influence. In 1874, the British took the first steps towards bringing the peninsula States under their direct supervision when they imposed the Pangkor Treaty on the rulers of Perak and made similar arrangements in Selangor. Meanwhile in Kalimantan, the States of Sarawak and Sabah were beginning to take shape as British adventurers acquired the territories at the expense of the Brunei sultanate. By 1914 the political organization of the present-day states of Malaysia was as follows:

1. The Straits Settlements: British crown colony headed by a British governor, consisting of Singapore, Melaka, Pulau Pinang, Labuan, the Cocos Isles, and Christmas Isle with the capital in Singapore.
2. The Federated Malay States: British protectorate headed by a British High Commissioner (Governor of the Straits Settlements) consisting of the States of Negeri Sembilan, Pahang, Perak, and Selangor.
3. The Unfederated Malay States: British protectorate under the tutelage of a British Adviser in each state responsible to the British Commissioner, consisting of Johor, Kedah, Kelantan, Perlis, and Terengganu.
4. Sarawak: British protectorate ruled by the Brooke family with the capital in Kuching.
5. Sabah: British protectorate, ruled by the Chartered Company of the British North Borneo with the capital in Jesselton (Kota Kinabalu).

The Japanese Conquest

The Japanese invasion of Malaya and British Borneo in late 1941, culminated in the humiliating British surrender in Singapore. The British were able to resume their authority in the region after the collapse of Japan in 1945, but faced an entirely new political situation. This shattered Western colonial supremacy and unleashed the forces of incipient nationalism.

Malayan Independence

By the Agreement of 1948, the British prepared the way for the Federation's independence. Under the twin pressures of a communist rebellion (the Emergency) and the development of a strong Malay nationalist movement (represented by United Malay National Organization), the British introduced elections, starting at the local level in 1951.

An alliance between UMNO, the Malayan Chinese Association (MCA), and the Malayan Indian Congress (MIC) resolved the problem of obtaining political cooperation among the main ethnic groups in the country to fight for independence. The UMNO-MCA-MIC Alliance won an overwhelming victory (51 of 52 seats contested), during the first federal elections held in 1955, and pressured the British to relinquish their sovereignty on August 31, 1957.

Towards Malaysia

Tunku Abdul Rahman, the Chief Minister of the Federation of Malaya, initiated the first move towards the formation of Malaysia. The official promulgation of Malaysia consisting of Peninsula Malaya, Singapore, Sabah, and Sarawak was on September 16,1963.

Malaysia 1963 to the present

The first few years of Malaysia's existence saw a serious challenge from Indonesia. Confrontation between the two neighboring countries ended by an agreement signed in Bangkok in 1966. In the meantime, Singapore ceased to be a member of the Malaysian Federation in 1965 and became a republic.

Except for 1969, the ruling coalition of political parties the Barisan Nasional (National Front) - formerly the Alliance, won in every general election, and retained its majority in parliament. Communal tensions resulted in the May 13, 1969 incident in Kuala Lumpur, leading to the establishment of an emergency government - the National Operations Council. Parliamentary rule resumed in 1971. Since then the broad aim of the administration has been fulfillment of the New Economic Policy, which was designed to eradicate poverty regardless of race, and to eliminate the identification of occupation with race.

The 1980s brought with it new political directions and economic challenges. Since 1981, Malaysia has focused on the search for new sources of support and development including the Look East Policy, the initiation of heavy industrialization (a national car, steel industry and oil refineries), and an aggressive foreign policy.

National Goal - Vision 2020

On February 28 1991, the Prime Minister of Malaysia presented a working paper, *The Way Forward* at the Malaysian Business Council. The ultimate objective was a Malaysia that " is a fully developed country by the year 2020"(Mohamad, 1991, p.1). Malaysia must develop fully along all dimensions: economically, politically, socially, spiritually, psychologically, and culturally. The nation had to meet nine central strategic challenges. The challenges among those included…

- "The sixth is the challenge of establishing a scientific and progressive society, a society that is innovative and forward-looking, one that is not only a consumer of technology but also a contributor to the scientific technological civilization of the future…
- The ninth challenge is the challenge of establishing a prosperous society, … that is fully competitive, dynamic, robust and resilient" (Mohamad, 1991, p. 2-3).

The Malaysian government's hope is for a competitive economy, which includes an economy that is technological proficient, fully able to adapt, innovative and inventive, that is increasingly technology intensive. The country should be moving in the direction of higher and higher levels of technology. The government had adopted a National Plan of Action for Industrial Technology Development, and the nation had to proceed to the "enormously difficult task of implementation" (Mohamad, 1991, p.11). The Prime Minister continued his statement that Malaysians are among the biggest users of computers in the region. Computer literacy was necessary if Malaysians want to progress and developed. "No effort must be spared in the creation of an information rich Malaysian society"(Mohamad, 1991, p.12).

Multimedia Super Corridor (MSC)

Malaysia has responded to the Prime Minister's challenge to become a fully developed, matured and knowledge-rich society by year 2020. This has required investing in an environment that encourages innovation, helps Malaysian and international companies to reach new technology frontiers, partnering with global information technology (IT) players, and providing opportunities for mutual enrichment and success. As a first step, Malaysia created and launched the Multimedia Super Corridor (MSC) on June 27,1998 to help multinationals test the limits of technology and prepare them for the future. Physically, the MSC is a 15 by 50 km corridor which includes Technology Park Malaysia, the Petronas Twin Towers, the Kuala Lumpur International Airport (KLIA), and two of the world's first smart cities: Putrajaya and Cyberjaya. The Multimedia Development Corporation (MDC), a government-appointed, government-backed corporation, envisioned a 20-year period for the full implementation and execution of the MSC.

The Malaysian Education System

During the pre-independence period, education in what was then Malaya was subjected to the general objectives of the colonial authorities to minimize changes and maintain the status quo of the different communities in the country. Therefore, no attempt was made to develop a national policy or system of education. There were separate school systems for the Malays, Chinese, and Indians at all levels. It was only in the English schools that children of all races came together. The educational program in these schools followed the British model.

By the early 1950s, there was a drive toward more integration among the various ethnic groups. In 1956, a special committee under the leadership of Tun Abdul Razak, who later became the Minister of Education and the second Prime Minister of Malaysia, was set up to review education policies. The report of the Committee, popularly known as the Razak Report 1958, aimed at molding national identity and unity in a plural society. The main recommendations of the Report became the basis of the education system as stated in the Education Ordinance of 1957.

In 1960, a Review Committee was set up to monitor the progress of the implementation of the National Education Policy. One important recommendation of the Review Committee was to raise the school leaving age to 15 years through the abolition of the Malayan Secondary School Entrance Examination (MSSEE). This permitted automatic promotion throughout the primary and lower secondary levels. The recommendations of the Review Committee became the basis for the Education Act of 1961, which characterized the features of the present education system. The National Education Philosophy (Falsafah Pendidikan Negara) emphasizes life long education, good citizenship, and the overall development of the individual based on belief in God, and the knowledge and skills necessary for effective contribution to the social and economic well being of the nation.

The National Education Philosophy states:

> "Education in Malaysia is an on-going effort towards further developing the potentials of individuals in a holistic and integrated manner, so as to produce individuals who are intellectually, spiritually, emotionally, and physically balanced and harmonious, based on a firm belief in and devotion to God. Such effort is designed to produce Malaysian citizens who are knowledgeable and competent, who possess high moral standards, and who are responsible and capable of achieving a high level of personal well-being as well as being able to contribute to the betterment of the society and the nation at large." (Ministry of Education Malaysia)

Since 1995, the Ministry of Education (MoE) had successfully secured the passage of six pieces of legislation to position Malaysia as a regional education hub. The Education Act 1996; the National Council on Higher Education Institution Act 1996; the Private Higher Education Institutions Act 1996; the National Accreditation Board Act 1996; the Universities and University Colleges (Amendment) Act 1996, and the National Higher Education Fund Board Act 1997 facilitated a more market-centered education system. The government is facilitating change and seeking innovative approaches to expand the education base. The MoE primed their education structure to enable the building of a pool of well educated, highly skilled, and strongly motivated professionals.

According to the MoE, Malaysian schools and universities were taking up the challenge of globalization by changing not only the content of curriculum and programs but also more importantly the delivery systems. The MoE was sure that IT-enhanced teaching and learning were already making computers in schools, distance learning, video conferencing, and Internet links a commonplace.

Malaysia currently provides 11 years of free schooling with more than 20% of the annual National Budget for education. The MoE reported that over 99% of all six-year-olds were enrolled in schools with more than 92% of all students going on to the upper secondary level.

During the primary school years, students sit for assessment examinations at years (U.S. equivalent to grade) three and six. Upon the completion of primary school education, students move to the secondary school. The curriculum in the secondary school includes a wide range of subjects from the arts and sciences to vocational and technical subjects.

Following the Lower Secondary Assessment (PMR) at year three (i.e., equivalent to Grade 9 in the United States), students move into more specialized fields of study at the upper secondary level, based on their choice and test scores. During the upper secondary level, apart from general education, students have the choice to go to technical and vocational schools to

learn technically biased academic education and pre-employment skills. Students are reevaluated at form five ((i.e., equivalent to Grade 11 in the United States) through the Malaysian Certificate of Education (SPM). After SPM, qualified students can either sit for the Malaysian Higher School Certificate (STPM) for entry into the national universities, colleges and teacher training institutions. They can also opt not to take STPM, and instead go for post-secondary education at polytechnics and technical colleges offering two-year and three-year programs.

The Technical Education Department

The Malaysian Ministry of Education (MoE) formed the Technical Education Department in 1964 to conceptualize the policy and direction of technical and vocational education development. It is aimed to comply with the needs of industrial and national modernization. The department is divided into five main divisions, all operating under the same roof. They are the Vocational Technical Planning & Research; Polytechnic Management; Vocational Technical Curriculum; Vocational Technical Management, and the Staff Training & Development Divisions.

The Ministry of Education Polytechnics (MoEP)

The Malaysian Ministry of Education established its polytechnic system with technical assistance from the United Nations Educational, Scientific and Cultural Organization. In 1969, the first polytechnic Ungku Omar Polytechnic was formed. The MoEP provided post-secondary vocational and technical education, equivalent to an associate degree in U.S. community colleges and Further Education (FE) in Britain. Positioned educationally between secondary schools and universities, the 12 established MoEP during year-end 1999 are government-run post-secondary non-baccalaureate granting institutions. As a highly centralized education system, the MoEP educate mid-level technical professionals in Engineering and Business through its two and three year Polytechnic programs.

The Malaysian Ministry of Education (MoE) and IT

The MoE had responded to the powerful currents of the information evolution and the national goal of Vision 2020 and MSC. It implemented wide-ranging reforms to give students in schools, universities and other higher education institutions the skills and competence to ride the crest of the information technology wave. The education system is putting interactive IT at the core of the teaching-learning and management processes. Smart schools were set up where learning was hoped to be very dynamic, lively and brimming with interaction through the use of multimedia technology and worldwide networking. Most of the universities in the country have a digital optic fiber backbone, and several had incorporated distance-learning programs for professional and technical degrees.

Summary

A basic description on Malaysia including its geographical, and historical background introduced the context of the study. Peninsular Malaya achieved its independence on 31 August 1957 after successfully pressuring the British to relinquish their sovereignty. The official promulgation of Malaysia consisting of Peninsula Malaya, Singapore, Sabah, and Sarawak was on September 16,1963. Singapore ceased to be a member of the Malaysian federation in 1965 and became a republic.

The 1980s brought with it new political directions and economic challenges. Since 1981, Malaysia has focused on the search for new sources of support and development, the initiation of heavy industrialization, and an aggressive foreign policy. The ultimate objective was a Malaysia that is a fully developed country by the year 2020. Malaysia created and launched the Multimedia Super Corridor (MSC) on June 27,1998 to help multinationals test the limits of technology and prepare them for the future. The Ministry of Education (MoE) had responded to the powerful currents of the information evolution and the national goal of Vision 2020 and MSC. It implemented wide-ranging reforms to give students in schools, universities and other higher education institutions the skills and competence to ride the crest of the IT wave.

CHAPTER 3

Literature Review

This chapter reviews information technology, attitude toward change theory, the diffusion of innovation, diffusion and adoption, the innovation-decision process, theoretical framework, variables related to change, accessibility and change, professional development and change, IT and teaching, IT and learning, and barriers to effective use of IT.

Information Technology

Technology to many educators means the use of equipment or devices, especially computer equipment. Muffoletto (as cited in Roblyer, 1997) stated that most educators associate technology as computers. Roblyer (1997) also refer technology as a combination of media, instructional systems, and computer-based support systems. His arguments are computer as media are more capable than other media (e.g., films or overheads) simplify to operate needs relating to technical knowledge. Furthermore, computer systems are rapidly moving toward taking over other media within their own resources. Films and slides are now stored in the form of CD-ROMs and videodiscs. Overhead transparencies can be generated by presentation software.

According to Roblyer (1997), many educators, parents, and students already believe that IT should be an important part of education. Educational institutions cannot deliver high quality education without using IT. According to Pachler (1999), IT applications relate to the fact that they obey specific conventions and rules that are different significantly from those of tools that are more traditional. IT uses a wide range of semiotic systems in that they combine the written word and, the spoken word, as well as images.

IT in recent years has increased the scholarly powers of educators. E-mail, fax machines, the World Wide Web, and CD-ROMs have enhanced access to information sources, and increased the speed of information retrieval. Long hours that educators and scholars used to spend plowing to get information has dramatically changed. Information retrieval and analyses can be done in seconds as early as in the 1990s. Most people enjoy the convenience of accessing library catalogs from offices and homes as compared to going through library card catalogs. Advanced technologies enable educators to work more quickly, to increase their level of research productivity, and to address research questions. Faculties will have more time for direct student contact and individual feedback and play a supportive role. They will be able to create conditions conducive to learning, to engage students actively in the learning process, and to monitor behaviors and adjust strategies as needed to facilitate subject mastery and personal growth.

Attitude Toward Change Theory

Kiesler, Collins, and Miller (1968) when discussing theories concerning the development and change in attitudes stated that there is no single definition of attitude acceptable to all attitude researchers. Heneson, Morris, and Fitz-Gibbon (1978) indicated that unlike the heart rate, attitude infers through words and actions. They further described attitude as… a tool that serves the human need to see order and consistency in what people say, think and do, so that given certain behaviors, predictions can be made about future behaviors" (p. 11).

Several factors influence the formation of attitudes. How well individuals respond to change depends on factors such as the individual's personalities, the groups they interact, and how changes are presented to them. Trumbo, (1958); Trumbo, (1961); Halloran, (1967); Dohmann, (1970); Kirton & Mulligan, (1973); Rogers, (1995) asserted that some of the factors that contribute to acceptance or resistance to change among other things include age, gender, and education.

The Diffusion of Innovations

When the use or nonuse of IT among MoEP is examined, it is important to study the diffusion of innovation research. Harris (1994) mentioned three elements in Everett M. Rogers' work that apply to teachers' adoption of telecomputing tools. They include:

- A critical mass -- a group of adopters who are able to diffuse the information about the innovation and thereby encourage others to adopt;
- The degree of use -- the level of use which offers more information than just the adopter or non-adopter status;
- The adopter will change tools for re-invention -- an innovation during implementation to serve the adopter's needs more fully.

Diffusion and Adoption

Rogers (1995) defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). However, there are many occurrences where the adoption of good ideas, worthy scientific advancements and other technological advancements failed. There has been much research trying to find out why some innovations succeed and others do not.

Based from educational innovations from the 1930s, Mort (1964) came to conclude that a 50-year time lag was typical from perception of need for change to the introduction and diffusion of innovations. Rogers (1995) found that 25 years was the typical time interval, enforcing that "a considerable time lag was required for the widespread adoption of new educational ideas" (p. 64). Research in educational change has increased considerably since then (Anderson, 1966; Carlson, 1965; Finch & McGough, 1982; Hall, George, & Rutherford, 1986; Hall & Hord, 1987; Halpern & Associates, 1994; Havelock, 1972-1973; Hultman, 1979; Miles, 1964; Owens & Steinhoff, 1976; Rich, 1978; Roberts, 1975). In 1994, education diffusion studies numbered 359 or 9% of the overall diffusion research (Rogers, 1995). Engel, Blackwell & Minniard (1993) mentioned, "over 3,000 studies and discussions of diffusion processes have been published in at least 12 identifiable disciplines" (p. 728). These and other studies made "the field of innovation diffusion research one of the most multidisciplinary research topics in the social sciences today" (Frambach, 1993, p. 22).

Rogers (1995) pointed out that although there is an increase in publications on diffusion of educational innovations, "an exciting potential contribution could be made by the education research tradition, stemming from the fact that organizations are involved, in one way or another, in the adoption of educational innovations…involved in collective and/ or authority innovation decisions" (p. 63).

The Innovation-Decision Process

There are several stages to the innovation-decision process (figure 1). It involves a series of actions and choices where an individual or group evaluates the innovation and decides whether or not to incorporate the innovation into ongoing practice. Rogers (1995) conceptualized the model of the innovation-decision process into five stages: Knowledge Stage, Persuasion Stage, Decision Stage, Implementation Stage, and Confirmation Stage.

Knowledge Stage

In this stage, "an individual is exposed to an innovation's existence and gains some understanding of how it functions" (Rogers, 1995, p. 162). This knowledge may be created by mere existence of innovation, which created a need and vice-versa. There is a tendency that the discovery of innovation was by accident, but the important criterion is that the individual becomes aware of the innovation through initiation, existing attitudes toward innovation, interest or needs. Hassinger (as cited in Rogers, 1995) argued " individuals will seldom expose themselves to messages about an innovation unless they first feel a need for the innovation…as consistent with the individual's attitudes and beliefs" (p. 164). Many times, attitudes towards innovation are intervened by the knowledge and decision functions.

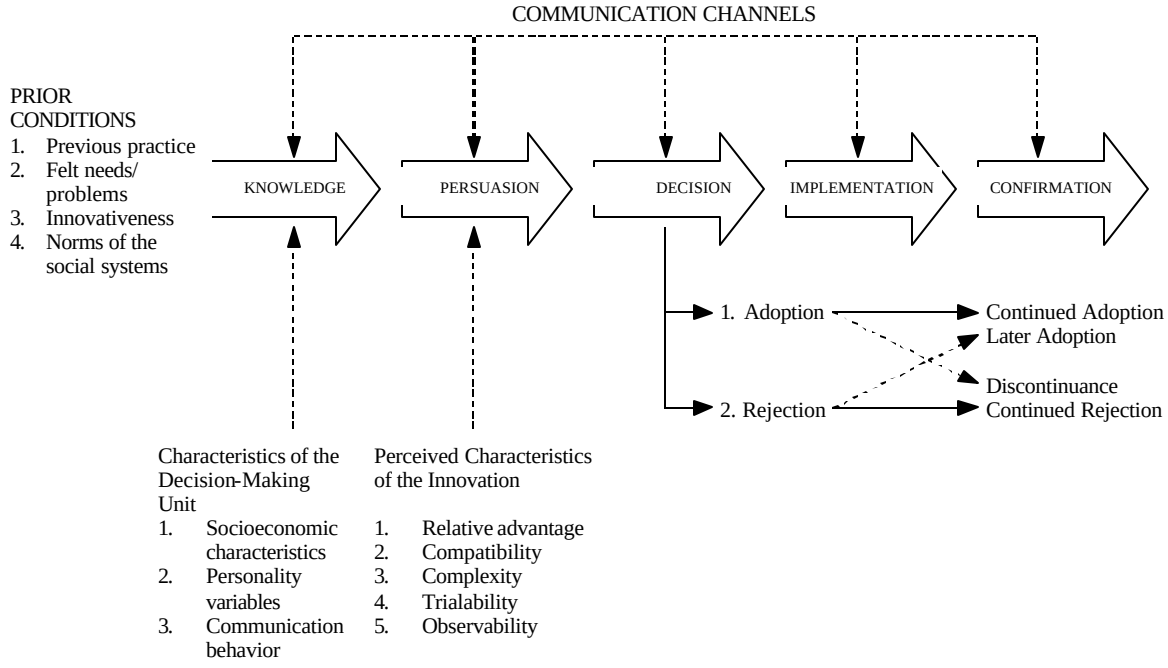

Figure 1. The Innovation Decision Process

Persuasion Stage

During the persuasion stage, the individual forms a pro or contra attitude towards the innovation sometimes by having clouds in the head about innovation. Individuals began to perceive the innovation as having relative advantage, compatibility, and complexity, which is vital at this point. The result of the persuasion stage will decide "either a favorable or

unfavorable attitude toward the innovation" (Rogers, 1995, p. 169), and lead to either adoption or rejection of the innovation.

Decision Stage

At this point, the individual or group either adopts or rejects the innovation. Adoption is to maximize the use of innovation while rejection is the decision not to adopt. Each stage in the decision process is a potential rejection point where it could happen after an earlier decision to adopt. Eveland (as cited in Rogers, 1995) divided rejection into two types: active rejection where the individual or group decided not to adopt after considering adopting the innovation; and passive rejection where an individual or group never really consider using the innovation.

Implementation Stage

The implementation stage is when the individual or organization puts the innovation into use. Putting innovation into use is different from adopting a new idea. According to Rogers (1995), unless it is held up by a logistical problem, the implementation stage directly follows the decision stage. The implementation stage may continue for quite sometime "depending on the nature of the innovation" (p. 173). According to Nord & Tucker (1987), the implementation stage is where the decision to adopt is put into concrete form.

Confirmation Stage

"At the confirmation stage, the individual seeks reinforcement of the innovation-decision already made or reverses a previous decision to adopt or reject the innovation if exposed to conflicting messages about the innovation" (Rogers, 1995, p. 181). Rejection of an innovation can occur at any time. It is very difficult to have an innovation adopted. It needs positive implications throughout the complete adoption decision process; otherwise, a negative implication may result in delay or total rejection of adoption.

Theoretical Framework

Rogers Innovation Decision Process Model provided a theoretical framework for this study. The researcher adapted and developed an Information Technology (IT) Adoption Model (Figure 2) based on the Innovation Decision Process (Rogers, 1995) to investigate why MoEP faculty use or do not use IT in their teaching. Rogers's model had been used in several studies on diffusion and innovation. It was used at the level of adoption, i.e., utilization of the technological innovation (Songan & Noor, 1999). Cuban (1986) found that a positive relationship existed between acceptance of innovation, compatible with values, norms, procedure, and facility.

The area of expertise, teaching experience with the MoE, teaching experience with MoEP, gender, age, level of education, department where faculties are in, and MoEP membership makes up the characteristics of the decision making unit which comprises the knowledge stage of the IT adoption process. The persuasion stage is denoted by perceived characteristics of the innovation, which include usefulness, ease of use, attitude toward use, and availability of IT in the MoEP. Davis et al. (1989) defined perceived usefulness as the prospective user's subjective probability that using a specific application system will increase one's job performance within an organizational context. Perceived ease of use refers to the degree to which the prospective user expects the target system to be free of effort. According to Hauser & Shugan 1980, Larcker & Lessig 1980; Swanson 1987 (as cited in Davis, Bogozzi &

Warshaw, 1989), factor analyses suggest that perceived usefulness and perceived ease of use are statistically distinct dimensions. In the decision stage, adoption proneness of the faculty may contribute to whether the faculty member adopts or rejects an innovation which in this case impacts the implementation stage of actual IT use.

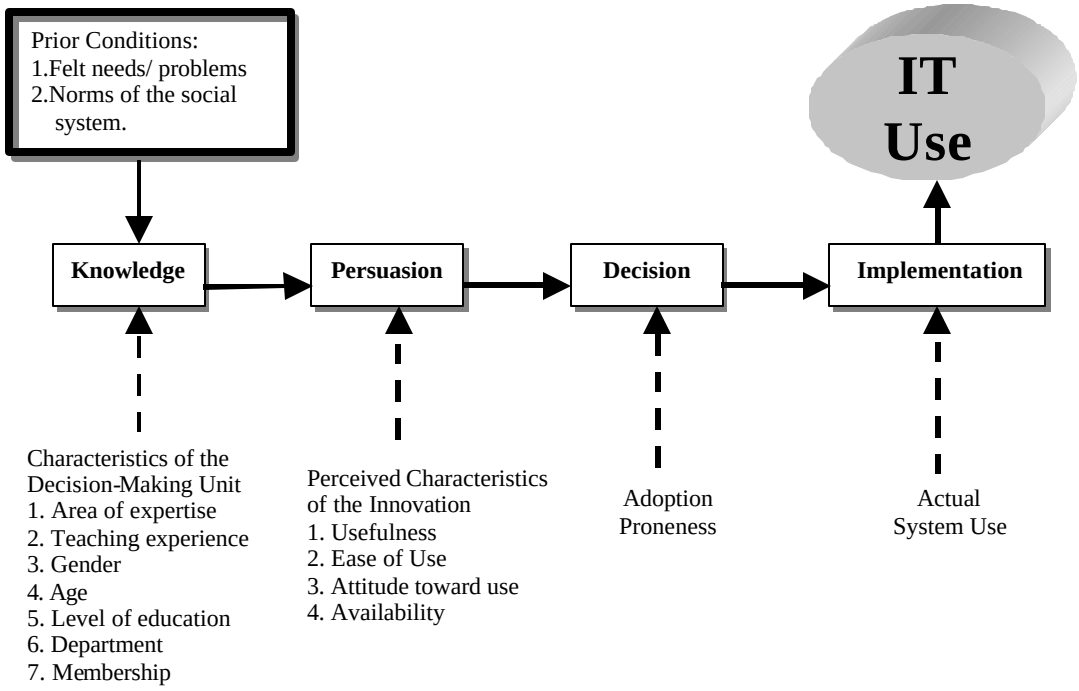

Figure 2. Information Technology Adoption Model

Variables Related to Change

Age and Gender

In an analysis of 228 earlier studies on age as a factor in acceptance of change, Rogers and Shoemaker (1971, p.354) found that 19% indicated earlier adoption of innovations by younger individuals, 33% showed older individuals as earlier adopters, and 48% showed no relationship between age and adoption of innovations. Oscarson (1976) found that age is positively related to adoption-proneness, where older vocational teachers were more adoption-prone than younger vocational teachers. He also found that those who had been in their positions longer tended to be less adoption-prone than those who had not been long in their position.

Researchers agreed on receptivity of change by gender. Trumbo (1958), Halloran (1967), and Dohmann (1970) discovered that women were less receptive to change than men. Trumbo found that women were more resistant to change, and would be moved out of their social reference groups if they accepted change. Studies by Perry (1997), Aneke (1996), and Lewis (1994) included gender in the demographic data collected, but no discussion on any similarities or differences between genders.

In a study by Perry (1997), she found diverse perceptions towards change among faculty members. Many faculty members felt a strong need for change in research and publication while others were satisfied and see not need for any changes to be made, or at most with minor

changes. Age and gender did not significantly contribute to the explanation of the variance in the Instruction Change Scale scores. This indicates that age and gender do not make a difference in regards to whether changes to their program are adopted. Reliability was established through a Cronbach's alpha on the study data of .91. Perry concluded that the Predisposition to Change Scale and the Adoption-Proneness Scale used to determine which faculty members were more accepting of change. Those faculty members served as models for other faculty to observe changes in instruction. By observing the faculty member who is predisposed to change and is adoption-prone, the other faculty members can determine the complexity of the new program to determine how much effort it will take to adopt into the curriculum.

In a study by Dohmann (1970) that conducted a study of 316 junior and senior high school teachers found a non-significant difference between younger and older teachers in acceptance of change. Dohmann stressed that "…individuals engaged in the changes must understand the reason for change, recognize and appreciate how the change is going to affect them individually and collectively, and recognize that their behavior must change" (p. 68).

In another study, Oscarson (1976) developed an Adoption-Proneness Scale to study the factors that led to adoption of innovation in vocational education. Using a sample of 310 vocational education teachers, Oscarson used the Openness to Change Scale developed by Dohmann (1970) as a predictor variable to measure adoption proneness.

Accessibility and Change

Higher education was seen as a pessimistic picture of a system that is not capable of adapting to change. The challenges of the rapid expansion of information, and the need to integrate technology in the instruction require that academia look into the matter with great thought. According to Bates (2000), the basic university teaching paradigm for most subjects has not changed a great deal for seven hundred years. The basic method of instruction is still unchanged despite the introduction of technology in the past. Even though many more educators have access to computers, schools have been slow to use technology as a tool to enhance students learning (Lieberman & Miller, 2000). The reasons are "complex and have to do with the unequal distribution of technology" (p. 48).

Professional Development and Change

Advances in IT have the potential to enlarge academic life by diversifying the work of faculty and expanding professional growth opportunities. IT has provided a range of opportunities for enhancing the teaching aspect of faculty life. According to Boser & Daugherty (1994), the process of implementing IT in the curriculum is a complex undertaking. It requires an adoption of philosophy, curriculum, and instructional practices. An effective in-service professional development programs are important in disseminating these new educational ideas and practices (Boser, 1991; Cordeiro, 1986; Wilkinson, 1990). Guskey (1986) reviewed research on effective schools and singled out quality professional development as an important component of effective instruction. It was asserted by Lambert (1988) that in-service courses must do more than just give instructors information, provide guided practice, or demonstrate innovations. Instructors need opportunities to practice, receive feedback, and training in the field. Baldwin (1998) commented that technology has transformed the research and scholarship component of faculty life by simplifying the process of collegial communication and

collaboration. IT is providing "new venues for collaboration, including electronic journals, discussion lists and conferences, database application packages…and a variety of new forms of multimedia" (Batson & Bass, 1996, p. 47) are now routine aspects of faculty life. It makes faculties designing or modifying a course to find, develop, select, and acquire combinations of books, shorter printed excerpts, and non-print media from published information resources. While the impact of IT is still being sorted out, "there is no dispute that new technologies have become part of our reality in higher education" (Baldwin, 1998, p. 8).

IT and Instruction

Green (1996) reported that the 1995 Campus Computing survey found great changes in the use of IT in instruction. According to Green (1996), there has been a steady move of IT into instruction since the early 1980s despite the observation of low-tech technology being used in college during the study. This supports the entry of IT into the instructional mainstream, but Green (1996) believes that IT "has not radically transformed classrooms or the instructional activities of most faculty" (p. 28).

Adam (1996) in his study concluded that post-secondary instructors in Australia were not using current computer technology in the classroom to aid instruction or as academic material, even though 95% of them were using computers. In another study by Boulware (1994) the identification of factors in the diffusion and implementation of the Florida Information Resource Network, an analysis of 192 samples revealed early adopters of innovation does not exist in the population of his study. Green (1996) argues that the use of IT on campuses has reached the critical mass, which Rogers (1995) believes necessary for the adoption of an innovation to become self-sufficient.

IT and Learning

Kirshstein, Matheson, & Jing, (1997) stated that they and one million colleagues teaching in colleges and universities must try to understand changes that are revolutionizing their daily lives and raising fundamental questions about their primary function as educator. IT is influencing the work lives and careers of faculty in post secondary education through an examination of the increasingly close relationship between technology and profession in academia. IT has the capability to enhance individual classes, transform the curriculum, and improve student learning. IT and faculty can work hand in hand enhancing the potential of the other as an added value.

There seems to be a widespread consensus in post secondary education that technology has the potential to revolutionize the teaching-learning process but with no clear evidence. A study conducted by University of Southern California showed less than five percent of college and university faculty use computing to aid classroom instruction or enrich student learning (DeSieno, 1995). In all too many cases, students and teachers are either not using the technology available to them or are using IT to accomplish things that could be done offline more quickly and with less effort extraneous to the learning content (Healy, 1998). Instructional techniques of having educators and students together in time and space on a regular basis are no longer a limitation. IT frees faculty and students to engage in teaching in a much wider area, may it be through cyberspace as well as in the classroom.

Bates (2000) emphasized a number of factors leading many post-secondary institutions to use IT for teaching. The most frequent reasons given for using IT are to improve the quality of learning, provide students with the everyday IT skills they will need in their work and life, and widen access to education and training. They also respond to the technological imperative, reduce the cost of education, and to improve the cost-effectiveness of education.

Impact of IT on Academic Life

The impact of IT on academic life is not uniform. Some faculties have been affected by IT more than others. The transformation of IT in post-secondary education may have progressed further in certain academic areas than in others. Some academic fields, especially in professional areas, natural sciences and mathematics have been using high-tech tools longer than those working in the arts and humanities (Baldwin, 1998). When considering the selective impact of IT, it is good to apply Rogers's (1995) model on the diffusion of innovations. The framework, which identifies innovators, early adopters, laggards, change agents, and opinion leaders, recognizes individuals and organizations adopt innovations at different rates and play different roles in the adoption process. Based on Rogers (1995), innovators and early adopters are quick to accept and experiment with novel resources, and the majority who accept an innovation much later in the process, or even those who resist adopting new tools in their daily practices.

Barriers to Effective Use of IT

There are many factors associated with failure to utilize IT fully in the work lives of college and university faculty. According to Baldwin (1998), among these are insufficient or obsolete hardware and software, inadequate facilities and support services, lack of time and money, an appropriate reward system, lack of information about good practice, and underestimation of the difficulty in adopting new information technologies. Means (2000) argued that although so much has been done to increase the technological infrastructure in schools, institutions are "far short of providing a seamless, convenient, robust, and reliable technology support structure for all students and teachers" (p. 186).

Gilbert & Green (1997) identified no stability, mismatched rates of change, unrealistic expectations, faculty attitude, and mismatch of resources as part of the obstacles to full-scale academic integration of IT. No stability is associated with unpredictable changes in the kinds of IT applications for educational uses; a mismatched rate of change is the difference between times taken for arrivals of new IT applications. This was compared to new experiments in approaches to teaching and textbook publishing. Unrealistic expectations that technology is about to transform education happens every now and then with the support of the media. Faculty attitude is central where they feel vulnerable, disempowered, and frustrated when confronted with new technologies that may not be easy to use or reliable. These include mismatches of resources that made students caught in a bind due to insufficient knowledge of student-owned technology resources and insufficient coordination among faculty and technology resource managers.

Carter (1998) found that the lack of computer availability in the classroom and lack of time to learn how to incorporate the computer into the curriculum as the two common barriers faced by faculties. "All faculty interviewed contended some released time from teaching assignments and committee obligations would be the most beneficial incentive they could be offered for attempting to incorporate computer-based technology into the curriculum" (p. 56). She also

found that only large lecture halls and classrooms dedicated to specific purpose have computer equipment ready. All other classes have no computer facilities. Scheduling classes in computer labs were also difficult because of competing classes, and time conflicts with scheduling equipment and classrooms.

The findings of a study by Hirschbuhl & Faseyitan (1994) showed that the technical orientation of the faculty's discipline, their computer self-efficacy, belief in the usefulness of the computer, and general attitude toward computers are the significant predictors of adoption. The results showed no significant difference between computer adopters and non-adopters in their personal attributes of age, gender, rank, length of service, and research commitment.

DeSieno (1995) views that many faculty do not incorporate IT into key aspects of their work because for them "digital technology requires too much time and effort, supplies too many distractions, and produces minimal value for the investment. Geoghehan (as cited in Baldwin, 1995) sees non-adoption as a matter of social and psychological factors that hinders the use of technology and believes it is not an aversion to technology itself that hinders adoption. It is considered the avoidance to risk a low tolerance for discontinuous change, and insufficient administrative support. The adoption of IT-based innovation is a function of available resources, accepted value the person places on the innovation, and communication with other adopters.

Summary

Educational institutions cannot deliver high quality education without using Information Technology (IT). The drive towards the use of IT involves the change in attitude and practice among educators. Attitude infers through words and actions. How well individuals respond to change depends on factors including on how changes are presented to them. Challenges arise in the use of IT in the Malaysian Ministry of Education Polytechnics (MoEP). As a government-run post-secondary non-baccalaureate granting institution, the MoEP educate mid-level technical professionals through its two and three year Polytechnic programs. When the use or nonuse of IT among MoEP is examined, it is important to study the diffusion of innovation research. Rogers (1995) defined diffusion as "the process by which an innovation is communicated through certain channels over time among the members of a social system" (p. 5). However, there are many occurrences where good ideas, worthy scientific advancements and other technological advancements failed to be adopted. Rogers (1995) pointed out "an exciting potential contribution could be made by the education research tradition, stemming from the fact that organizations are involved, in one way or another, in the adoption of educational innovations…involved in collective and/ or authority innovation decisions" (p. 63).

Rogers (1995) conceptualized the model of the innovation-decision process into five stages: Knowledge Stage, Persuasion Stage, Decision Stage, Implementation Stage, and Confirmation Stage. Rogers Innovation Decision Process Model provides a theoretical framework for this study. The researcher adapted and developed an Information Technology (IT) Adoption Model based on the Innovation Decision Process (Rogers, 1995) to investigate why MoEP faculty use or do not use IT in their teaching.

CHAPTER 4

Methodology

The purpose of this study was to examine factors related to information technology (IT) implementation in the curriculum. The focus was on Malaysian Ministry of Education Polytechnics (MoEP) faculty members' attitudes toward IT as well as IT barrier, and IT use in teaching. The researcher sought to understand the dispositions, opinions, and perceptions of the MoEP faculty about the use of IT, the support, and resources needed to use these technologies effectively.

Through survey research, an administration of a MoEP Faculty Information Technology Survey, and the score on the Adoption Proneness Scale was done to a random sampling of MoEP faculty from all MoEP as of April 1, 2000. The survey was used to determine:

1. To what extent are faculties adoption-prone?
2. To what extent do faculties use IT in their teaching?
3. What attitudes do faculties have toward using IT in their teaching?
4. What professional development experiences in IT have faculty had?
5. To what extent do faculties perceive IT support services are available to incorporate IT use in their teaching?
6. To what extent do faculties perceive that barriers exist to IT use in their teaching?
7. What relationships exist between selected faculty demographics (i.e., teaching load, years served as teacher/ instructor, years served in MoEP, gender, age, level of education and MoEP membership) and IT use in their teaching?
8. Collectively, to what extent do the above variables predict IT use in teaching?

Population

The population for this study was 2027 full-time faculties (Table 1) employed in 12 MoEP as of April 1, 2000. The figure was supplied by the Polytechnic Management Division through the Technical & Vocational Curriculum Division Director of the Technical Education Department of MoE Malaysia via email. The population was stratified according to the MoEP served.

The researcher derived a sample of 323 by using the formula created by Krejcie and Morgan (as cited in Isaac & Michael, 1981) for estimating the sample size. The sample size was increased to 332 full-time MoEP faculty members to be selected to receive the survey to have exact sampling of one each to represent all MoEP (the increment of 1 is denoted by * in table 2). Random sampling was performed after stratifying the population.

The numbers of survey materials distributed to faculty members at MoEP A, B, C, D, E, F, G, H, I, J, K, and L were 38, 36, 31, 38, 14, 7, 28, 27, 39, 19, 7, and 48 respectively. Table 2 shows the number of survey materials distributed to each MoEP. The researcher applied for Certification of Exemption of Projects Involving Human Subjects from the Virginia Polytechnic Institute and State University Institutional Review Board for Research Involving Human Subjects before mailing the survey materials.

Table 1

Total number of MoEP faculties as of April 01, 2000

	Department												
Names of MoEP	Civil Engineering	Electrical Engineering	Mechanical Engineering	Marine Engineering	Electronics	Food Technology	Commerce	Design	Hospitality & Fashion	Mathematics, Science & Computer	General Studies	Others	Total
A	65	56	65	0	0	0	29	0	0	3	21	0	239
B	43	51	40	0	0	19	32	0	0	20	24	0	229
C	0	41	44	0	0	0	0	27	40	17	27	0	196
D	49	24	57	0	24	0	38	0	0	22	20	0	234
E	12	16	23	0	0	0	13	0	0	0	11	0	75
F	3	1	3	0	7	0	4	0	0	1	2	0	21
G	35	38	41	0	0	0	29	0	0	10	19	0	172
H	32	33	41	0	0	0	30	0	0	12	14	14	176
I	51	52	36	0	0	0	54	0	0	9	32	0	234
J	0	25	33	0	0	0	27	0	0	16	18	0	119
K	2	12	3	0	4	0	0	0	0	0	2	0	23
L	64	59	79	23	8	0	43	0	0	8	25	0	309
Total faculty	356	408	465	23	43	19	299	27	40	118	215	14	2027

Note: Zero indicates departments not available in the polytechnic concerned.

Instrumentation

IT use in instruction (score on scale based on amount and level of IT use) was the dependent variable. Independent variables included adoption proneness, attitude toward IT, faculty professional development, support services, IT barriers, teaching loads per week, department faculties were in, years served as teacher/ instructor with the MoE, years served in MoEP system, gender, age, highest level of education, and MoEP membership.

The Scale to Measure Adoption Proneness

The Scale to Measure Adoption-Proneness was used to assess Malaysian MoEP faculties' willingness to adopt innovations in curriculum and instruction. The scale is appropriate in this study because it was developed to determine an individual's predisposition for considering new ideas and practice (Oscarson, 1976). Each item in the scale had an accompanying 6-point Likert-Type Scale ranging from no, never to yes, always. According to Oscarson (1976), the items selected were ideal for the adoption-proneness scale because majority of them did not concentrate "on any specific educational innovations" (p. 50).

Table 2

Frequencies of Survey Materials Distributed to MoEP According to Departments

Names of MoEP	Civil Engineering	Electrical Engineering	Mechanical Engineering	Marine Engineering	Electronics	Food Technology	Commerce	Design	Hospitality & Fashion	Mathematics, Science & Computer	General Studies	Others	Total
	Department												
A	10	9	10	0	0	0	5	0	0	*1	3	0	38
B	7	8	6	0	0	3	5	0	0	3	4	0	36
C	0	7	7	0	0	0	0	4	6	3	4	0	31
D	8	4	9	0	4	0	6	0	0	4	3	0	38
E	3	3	4	0	0	0	2	0	0	0	2	0	14
F	*1	*1	1	0	1	0	*1	0	0	*1	*1	0	7
G	6	6	6	0	0	0	5	0	0	2	3	0	28
H	5	5	6	0	0	0	5	0	0	2	2	2	27
I	8	8	6	0	0	0	9	0	0	2	6	0	39
J	0	4	5	0	0	0	4	0	0	3	3	0	19
K	*1	2	1	0	1	0	0	0	0	0	2	0	7
L	10	9	13	4	1	0	7	0	0	1	3	0	48
Total	59	66	74	4	7	3	49	4	6	22	36	2	332

Note: Zero indicates departments not available in the polytechnic concerned.
Asterisks (*) indicate the increment of 1 to have exact sampling of one each to represent all MoEP.

In earlier studies, Perry (1997) used regression analysis to determine validity of the scale in measuring innovation acceptance while Aneke (1996) and Oscarson (1976) used correlational analysis. Based on a sample of 40 vocational education teachers enrolled in in-service classes at Virginia Polytechnic Institute and State University, Oscarson also used the split-half method at .95 to establish the scale reliability. To obtain a reliability estimate of .95 for the whole instrument, Oscarson used the Spearman-Brown Formula. Perry (1997) performed a best subsets regression to determine the extent of prediction of score contributed by the Adoption Proneness-Scale with R^2 of 24.7.

The Oscarson (1976) Adoption to Proneness Scale measurement was adopted for this study with minimal modification. The modifications made were in terminology only. In item 10 the words “schools and/ or school systems” were changed to “institutions” since MoEP are post-secondary institution of learning. The words “administrative personnel” in item 11 was changed to “department heads”. The term “principal” was changed to “department heads” in item 13. In item 14 the words “superintendent and the central office” was changed to “institution’s

administration". Finally, the term "American education" in item 17 was changed to "Malaysian education" to suit the population.

MoEP Faculty Information Technology Survey

The purpose of this survey was to find out how much the faculty use information technology directly in their teaching, as well as how an individual faculty view information technology, and its availability for their use in their teaching. For this survey, information technology (IT) included the various computer and communication-related items that can be used to directly improve teaching in Malaysian Ministry of Education Polytechnics. Examples of information technology include, but are not limited to the following:

World Wide Web, Internet resources such as E-mail, Listserv, newsgroup and online discussion groups, telnet, ftp, presentation software (e.g., PowerPoint, database, spreadsheet), CD-ROM, scanner, video camera, Hyperstudio, HyperCard, other multimedia authoring program, computer-based simulations (e.g., Sim, Cad), NetWare, overhead projector, slide projector, and VCR.

The Demographic Data

The demographic items of birth year, gender, number of years served in the MoE, number of years served in the MoEP, highest level of education, and polytechnic membership were included. They were predictors to receptability to change as found in earlier studies (Aneke, 1996; Dohmann, 1970; Oscarson, 1976; Perry, 1997; Rogers, 1995; Rogers & Shoemaker, 1971; & Trumbo, 1958).

Data Collection Procedures

The researcher requested assistance from one of the senior officers at the Technical Education Department (TED) Ministry of Education Malaysia (MoE) to sample the population. The researcher also requested that the sample list not be kept in any retrievable form. Once sampling was done according to each of the MoEP, the officer sealed the lists in separate envelopes addressed to the principal of each MoEP. The officer then gave the sealed envelopes to the researcher to be mailed with the survey materials.

The survey materials were number coded to be certain the exact amount were sent to each MoEP. The numbers were for counting purposes, and they did not refer to nor could they be traced to any respondents. Survey materials were stuffed into12 main envelopes to be distributed to the 332 stratified full-time faculties employed in MoEP as of April 1, 2000 through the college administration. The researcher mailed the survey packets containing the sealed sample list to all MoEP using the Malaysian Postal Express Mail Service (EMS) on January 4, 2001.

The Vice-Principal or a senior faculty authorized by each MoEP Principals as proposed by the researcher to act as coordinator distributed the survey by hand to each selected faculties, based on a sample list provided by the officer representing the Technical Education Department. Instruction letters to coordinators accompanied on how the survey will be administered. Instruction clearly stated each package was for those MoEP faculties whose name was in the provided list. The samples were full-time MoEP faculties consisting both male and female between 20 - 55 years of age. Coordinators were reminded not to imply or suggest to the respondents that they were expected or required to complete the survey. Respondents were to be told that they were allowed to withdraw from the survey without penalty.

The researcher wrote a cover letter addressed to participants together with the survey instrument that explained the purpose of the survey. The letter assured participants of confidentiality, and that the researcher was the only person allowed to keep, see, and analyze the data in its original form. A copy of the approval letter to conduct the survey written by Dr. Amir Mohd Salleh from the Educational Planning and Research Department, MoE was also attached to the survey materials. Informed consent forms were given to each of the participants for them to sign before responding to the survey.

The survey took approximately 15 minutes. After completing the survey each participant was required to glue the completed form and survey in a provided envelope, and return them to the coordinator representing each MoEP within seven days. To assure anonymity, coordinators delivered the first reminder letters to all respondents a week after they distributed the survey materials. A second reminder letter stressing the importance of response, and returning the survey materials was distributed to all respondents reminding those faculties who still failed to return their responses. Non-response was caused by the inaccessibility of faculties when the survey was conducted. These faculty members were either on study-leave, non-pay-leave, attending workshops or courses locally or overseas, on maternity leave, transferred to a different unit, departments, MoEP, had permanently left the MoE, refused to complete the survey, or not returning the survey. The coordinators from each MoEP gathered the completed surveys in a main envelope to be returned to the researcher by mail on or before January 18, 2001.

Data Analysis

Descriptive analyses, t-test, one-way Analysis of Variance (ANOVA), correlational and regression analyses were used. Descriptive analyses were employed to determine the frequencies, means, and standard deviation of the dependent and independent variables. T-test was employed to determine if the means of two sets of scores were significantly different from each other. One-way ANOVA were employed to determine whether several sets of scores have different means. Correlational and multiple regression analysis were employed to determine the relationships among the dependent variable and the independent variables. The probability level for all tests of statistical significance for the study was set at $p < .05$.

Gender, highest level of education, polytechnic served, and department faculty were in were treated as categorical variables. All other responses to items on demographics were treated as continuous variables. For the construction of frequency distribution tables involving continuous variables; teaching loads (number of teaching periods), subject area of expertise, years of teaching experience, years teaching at MoEP and respondents' age were each divided into several categories.

Summary

Through survey research, an administration of a MoEP Faculty Information Technology Survey, and the score on the Adoption Proneness Scale was done. The population for this study was 2027 full-time faculties employed in 12 MoEP as of April 1, 2000. The population was stratified according to the MoEP served. Random sampling of 332 full-time MoEP faculty members was performed after stratifying the population.

IT use in instruction (score on scale based on amount and level of IT use) was the dependent variable. Independent variables included adoption proneness, attitude toward IT,

faculty professional development, support services, IT barriers, teaching load per week, department faculties were in, years served as teacher/ instructor with the MoE, years served in MoEP system, gender, age, highest level of education, and MoEP membership.

The Scale to Measure Adoption-Proneness was used to assess Malaysian MoEP faculties' willingness to adopt innovations in curriculum and instruction. The MoEP Faculty Information Technology Survey was to find out how much the faculties use information technology directly in their teaching, as well as how individual faculties view information technology, and its availability for their use in their teaching.

CHAPTER 5

Findings

This chapter presents the study findings in the following order: (1) the survey response rate, (2) general and demographic data, (3) each research question will be presented with results, and discussions. The data analysis will briefly describe the statistical analyses used. A general summary will close the chapter.

Survey Response Rate

Eight of 12 Malaysian Ministry of Education Polytechnics (MoEP) returned the completed survey from the period January 12 – 27, 2001. The researcher made several telephone calls to the remaining four MoEP requesting them to return any completed survey. Attempts to obtain all completed surveys included email communication and telephone calls to a senior officer at the Malaysian Technical Education Department. The four MoEP finally returned their responses by the end of February 2001.

Of the 332 surveys sent to the MoEP, 252 were completed, 67 respondents were inaccessible and did not complete the survey. Thirteen additional surveys distributed to respondents failed to return their surveys (Table 3). These respondents were either on study-leave, non-pay-leave, attending workshops or courses locally or overseas, on maternity leave, transferred to a different unit, departments, MoEP, had permanently left the MoE, refused to complete the survey, or did not return the survey. Another factor that led to undistributed survey materials was the inaccessibility of the latest updated MoEP faculty directory during the sampling process. The response rate was 75.9%.

General and Demographic Data

Respondents gender, ages, teaching load per week, department distribution, years of teaching experience, years of MoEP teaching experience, highest education level, and MoEP membership were tabulated by frequency and percentage.

Respondents' Gender

One hundred thirty four (53.2%) of the respondents were male. The remaining 118 (46.8%) were female full-time faculty members employed by the MoEP.

Respondents' Ages

Presented in Table G1 (refer to Appendix G) are the distribution and summary statistics for respondents' ages. The respondents' ages ranged from 25 to +54 years old with a mean of 36.6 and SD 6.28. Findings revealed that 71.9% of the respondents were between 25 and 39 years old. Respondents in the 35 to 39 age categories (88 of 252 or 34.9%) formed the largest group, followed by respondents in the 30 to 34 age categories (54 of 252 or 21.5%). The oldest respondent was over 54 years old, just months before reaching mandated retirement at age 55, while the youngest were age 25. Four of the respondents did not report their age.

Table 3

Survey Response Rate

	Responses		No Responses				Total	
			Inaccessible subjects		Failed to return			
Polytechnic	n	%	n	%	n	%	n	%
A	23	60.5	15	39.5	0	0.0	38	100
B	25	69.4	11	30.6	0	0.0	36	100
C	20	64.5	11	35.5	0	0.0	31	100
D	37	97.4	1	2.6	0	0.0	38	100
E	10	71.4	4	28.6	0	0.0	14	100
F	6	85.7	1	14.3	0	0.0	7	100
G	20	71.4	8	28.6	0	0.0	28	100
H	21	77.8	6	22.2	0	0.0	27	100
I	36	92.3	3	7.7	0	0.0	39	100
J	18	94.7	1	5.33	0	0.0	19	100
K	7	100.0	0	0.0	0	0.0	7	100
L	29	60.4	6	12.5	13	27.08	48	100
Total	252	75.9	67	20.2	13	3.92	332	100

Teaching Load

Presented in Table G2 (refer to Appendix G) are the distribution and summary statistics for respondents' teaching loads per week. Teaching load had a mean of 17.7 and SD 5.9. Each teaching period consumed 45 minutes. A majority of the respondents (62.8%) had a teaching load of between 16 to 25 periods (12 – 18.75 contact hours) a week. Ninety-four (37.4%) respondents had a teaching load of 16 to 20 periods (12 to 15 contact hours), and 64 (25.4%) had 21 to 25 periods (15.75 to 18.75 contact hours) per week. Twenty-six (11.7%) of the respondents reported having teaching loads of between 0 to 10 periods (0 minute to 7.50 contact hours), while 15 respondents taught between 26 to 30 periods (19.5 to 22.5 contact hours) a week. Four of the respondents failed to report their teaching loads.

Respondents' Department Distribution

Presented in Table G3 (refer to Appendix G) are the distribution and summary statistics for respondents' department distribution. The distribution had a mean of 4.3 and SD 3.45. As mentioned in the methodology chapter, the population was stratified according to the MoEP served as of April 01, 2000. The smaller number of responses does not indicate a low feedback from the MoEP, but merely shows the number of survey distributed. The MoEP departments represented in the survey (with faculty members in these departments) were Commerce (48), Civil Engineering (45), Electrical Engineering (51), Mechanical Engineering (44), Marine Engineering (3), Food Technology (3), Electronics (4), Design (4), Hospitality and Fashion (4), Computer (13), General Studies (30), and other departments (3). In the other departments' category, two respondents were from Petroleum Technology, and one from Land Survey. There was one less response from the commerce category, but replaced by a response from the general studies category, because a respondent changed from one unit to another.

Respondents' Years of Teaching Experience

The distribution and summary statistics for respondents' years of teaching experience are presented in Table G4 (refer to Appendix G). Years of teaching experience had a mean of 10.3 and SD 6.88. The respondents' years of teaching experience ranged from 0 to 29 years. Teaching experience was characterized by the number of years the respondents received a letter of appointment by the Malaysian Education Service Commission (MESC). In cases where respondents reported teaching experience as 0, it meant they had not been appointed by MESC even though they have been serving as faculty members of the MoEP.

Respondents' Years of MoEP Teaching Experience

Table G5 (refer to Appendix G) presents the distribution and summary statistics for respondents' years of MoEP teaching experience. Years of MoEP teaching experience had a mean of 7.5 and SD 5.33. Years of teaching experience did not denote the same number of years teaching at the MoEP. Respondents may have been teaching for more than 20 years, but had just joined the MoEP teaching force. In this study, findings showed 62.7% respondents had between 0 to 9 years of teaching experience at the MoEP, and only 37.3% had served the MoEP for more than 10 years.

Respondents' Highest Level of Education

Table G6 (refer to Appendix G) presents the distribution and summary statistics for respondents' highest education level (M= 2.4, SD = 1.08). Respondents with bachelors' degrees numbered 118 (46.8%), 65 (25.8%) had masters' degrees, and 46 (18.3%) without baccalaureate degrees. One respondent reported to having a masters' degree working on a doctoral degree.

MoEP Membership

Table G7 (refer to Appendix G) presents the distribution and summary for respondent MoEP membership with a mean of 6.4 and SD 3.58. MoEP membership (with faculty members as respondents) consist of MoEP A (23), MoEP B (25), MoEP C (20), MoEP D (37), MoEP E (10), MoEP F (6), MoEP G (20), MoEP H (21), MoEP I (36), MoEP J (18), MoEP K (7), and MoEP L (29).

Analysis and Interpretation of the Data

Research Question 1:

To what extent are faculties adoption-prone?

Presented in Appendix H are the frequencies, percentages, levels of adoption-proneness, total responses, means, standard deviations, rank orders, and overall means and standard deviations for items included in the adoption-proneness scale. The level of response choices for the items in the adoption-proneness scale were weighted as follows:

1	=	no, never
2	=	no, almost never
3	=	usually not, infrequently
4	=	usually yes, frequently
5	=	yes, almost always
6	=	yes, always

The total instrument score had a mean of 4.3 and SD 1.09. The item on persistence and diplomacy in sticking with an innovation that respondents would like to try, believing "powers that be" can be brought around from what may be an initial coolness (M = 4.1) had the highest level score. One hundred twenty seven faculty members (54%) responded "usually yes, frequently". The next highest score was item 8 with 111 (44%) respondents with a mean of 4.2. In the rank order, item 10 attained the highest standard deviation of 1.25, while the lowest was item 2 with SD 0.88.

Research Question 2:

To what extent do faculties use IT in their teaching?

The level of response choices for the items in the variable IT use were weighted as follows:

1	=	no, never
2	=	no, almost never
3	=	usually not, infrequently
4	=	usually yes, frequently
5	=	yes, almost always
6	=	yes, always

In response to the question on the extent of IT use in general (M = 2.78, SD = 1.25) 186 respondents (73.8%) reported "no, never" use to "usually not, infrequently" use IT in their teaching (Table 4). Only 6 (2.4%) respondents reported "yes, always" use IT in their teaching. The general or broad question on the extent of IT use was introduced to the respondents after asking for information about their use of various computer and communication-related items to investigate where they stood in the use of IT in their teaching. Other than marking "no, never" to "yes, always" there were respondents who took the initiative to make extra comments on the general use of IT in teaching. A respondent in MoEP A reported "no, never" use IT in teaching and another faculty member from the same institution reported very limited use of IT due to the scarcity of resources. Five faculty members from MoEP H reported no IT facilities provided; "almost always" using PC for word-processing, taking notes from websites to assist in teaching, and the use of chalk and talk.

Survey results for this question revealed a skewed result toward non-use. However, there were respondents who reported they "usually yes, frequently" used, "almost always" used, and "always" used IT in their teaching. The discussion that follows uses headings categorized as computer and communication-related items (Table 5).

Email to Communicate with Students and other Instructors

In response to the question on the extent of email use to communicate with students and other instructors (M = 2.21, SD = 1.4), the survey revealed 16 (46.0%) respondents reported,

"no, never" use. It was followed by 36 (14.3%) who reported "no, almost never" use, and 50 (20%) respondents reported "usually not, infrequently" use of email as a means of communicating with students and other instructors. Only 6 (2.4%) respondents reported to "yes, almost always", and 7 (2.8%) reported "yes, always" use email to communicate with students and other instructors. Item 18.1 on Table 5 shows the frequency of use of email by MoEP respondents as a means of communication with students and other instructors.

Table 4

Respondents' Extent of IT Use in General

Levels of IT Use	*f*	%
1. No, Never	50	19.8
2. No, Almost Never	48	19.0
3. Usually not, infrequently	88	34.9
4. Usually Yes, Frequently	45	17.9
5. Yes, Almost Always	15	6.0
6. Yes, Always	6	2.4
Total	252	100

Summary Statistics							
Mean	=	2.8	Median	=	3	Mode =	3
Std. Deviation	=	1.25	Range	=	5		
Max	=	6	Min	=	1		

Online Student Discussions Group on the Internet

In response to the question on the extent of online student discussion groups on the Internet (M = 1.7, SD = 1.10), the survey revealed that 164 (65.1%) respondents reported "no, never" use. It was followed by (14.7%) who reported "no, almost never" use. Twenty-nine (11.5%) reported "usually not, infrequently" use of online student discussions group on the Internet. Only 5 (2.0%) respondents reported to "yes, almost always", and 2 (0.8%) "yes, always" use online student discussion groups on the Internet. Item 18.2 on Table 5 shows the exact frequency of use of online student discussion groups on the Internet.

Accessing WWW for Instructional Purposes and Learning

In response to the extent of accessing the World Wide Web (WWW) for instructional purposes and learning (M = 3.1, SD = 1.63), the survey revealed that 70 respondents (27.8%) reported "no, never" access. This was followed by 22 (8.7%) who reported "almost never" access, and 43 (17.1%) reported "usually not, infrequently" access to the WWW on the Internet for instructional purposes and learning. Sixty-eight (27.0%) of the respondents reported to "usually yes, frequently" access the WWW on the Internet for instructional purposes and learning. Only 28 (11.1%) respondents reported to "yes, almost always", and 21 (8.3%) reported "yes, always" access the WWW on the Internet for instructional purposes and learning. Item 18.3 on Table 5 shows the frequency of WWW access on the Internet for instructional purposes and learning.

Presentation Software

In response to the question on the extent of using presentation software (M = 3.0, SD = 1.65), it was revealed that 74 (29.4%) respondents reported "no, never" use. This was followed by 29 (11.5%) who reported as "no, almost never" use, and 41 (16.3%) reported as "usually not, infrequently" use of presentation software (e.g., PowerPoint, spreadsheet, or database) in their teaching. Fifty-five (21.8%) of the faculty members reported to "usually yes, frequently" use presentation software in their teaching. Thirty-four (13.5%) respondents reported to "yes, almost always", while 19 (7.5%) reported as "yes, always" use presentation software in their teaching. Item 18.4 on Table 5 shows the frequency of presentation software use in teaching.

Table 5

Rank Orders and Descriptive Statistics for Items Included in the Variable IT Use

Items	Levels of IT Use												n Total	M	SD	RO
	1		2		3		4		5		6					
	n	%	n	%	n	%	n	%	n	%	n	%				
#18.1	116	46.0	36	14.3	50	19.8	37	14.7	6	2.4	7	2.8	252	2.2	1.37	11
#18.2	164	65.1	37	14.7	29	11.5	15	6.0	5	2.0	2	0.8	252	1.7	1.10	12
#18.3	70	27.8	22	8.7	43	17.1	68	27.0	28	11.1	21	8.3	252	3.1	1.63	3
#18.4	73	29.0	29	11.5	41	16.3	56	22.2	34	13.5	19	7.5	252	3.0	1.65	1
#18.5	118	46.8	37	14.7	32	12.7	35	13.9	17	6.8	13	5.2	252	2.4	1.57	4
#18.6	111	44.1	44	17.5	45	17.9	34	13.5	9	3.6	9	3.6	252	2.3	1.41	9
#18.7	107	42.5	38	15.1	38	15.1	40	15.9	20	7.9	9	3.6	252	2.4	1.52	7
#18.8	124	49.2	36	14.3	32	12.7	36	14.3	15	6.0	9	3.6	252	2.2	1.50	8
#18.9	23	9.1	21	8.3	37	14.7	65	25.8	54	21.4	52	20.6	252	4.0	1.53	6
#18.10	115	45.6	27	10.7	38	15.1	33	13.1	25	9.9	14	5.6	252	2.5	1.64	2
#18.11	107	42.5	30	11.9	43	17.1	40	15.9	23	9.1	9	3.6	252	2.5	1.55	5
#18.12	0	0.0	4	17.4	2	8.7	3	13.0	9	39.1	5	21.7	23	4.4	1.41	9

Overall Mean = 2.72 SD = 1.49

Note

1 for no, never; 3 for usually not, infrequently; 5 for yes, almost always;
2 for no, almost never; 4 for usually yes, frequently; 6 for yes, always.
M for Mean SD for Standard Deviation RO for Rank Order

#18.1 Email to communicate with students and other instructors
#18.2 Online student discussion groups on the Internet (e.g., listserv, newsgroup)
#18.3 Accessing WWW for instructional purposes and learning
#18.4 Presentation software (e.g., PowerPoint, spreadsheet, database)
#18.5 Simulations of exploratory environments (e.g., CAD, SIM, GIS)
#18.6 Information on CD-ROMs in teaching
#18.7 Scanner (e.g., for digitizing photos & graphics) for teaching
#18.8 Multimedia-authoring program for teaching
#18.9 Overhead projector (OHP)
#18.10 Slide projector
#18.11 Video recorder (VCR)
#18.12 Other_____

Simulations of Exploratory Environments

In response to the question on the extent of the use of simulations of exploratory environments (M = 2.3, SD = 1.57), the survey revealed that 118 (46.8%) respondents reported "no, never" use. It was followed by 37 (14.7%) who reported "no, almost never" use, and 32 (12.7%) reported as "usually not, infrequently" use of simulations of exploratory environments software in their teaching. Thirty-five (13.9%) of the faculty members reported to "usually yes, frequently" use simulations of exploratory environments software in their teaching. Only 17 respondents (6.7%) reported to "yes, almost always", and 13 (5.2%) "yes, always" use simulations of exploratory environments software in their teaching. Item 18.5 on Table 5 shows the frequency of use of simulations of exploratory environments software in teaching.

Information on CD-ROMs in Teaching

In response to the question on the extent of using information on CD-ROMs in teaching (M = 2.3, SD = 1.41), the survey revealed that 110 (43.7%) respondents reported as "no, never" use. It was followed by 44 (17.5%) respondents who reported as "no, almost never" use, and (17.86%) reported as "usually not, infrequently" use of information on CD-ROMs in their teaching. Thirty-five (13.9%) of the respondents reported to "usually yes, frequently" use information on CD-ROMs in their teaching. Only 9 (3.6%) each who reported to "yes, almost always", and "yes, always" use information on CD-ROMs in their teaching. Item 18.6 on Table 5 shows the frequency of use of information on CD-ROMs in teaching.

Scanner for Teaching

In response to the question on the extent of using the scanner (e.g., for optical character recognition, or scanner for graphic reproduction) for teaching (M = 2.4, SD = 1.54), the survey revealed that 107 (42.5%) respondents reported as "no, never" use. This was followed by 37 (14.7%) each who reported as "no, almost never" use, and "usually not, infrequently" use of the scanner in their teaching. Forty-one (16.3%) of the faculty members reported to "usually yes, frequently" use the scanner in their teaching. Only 21 (8.3%) respondents reported to "yes, almost always", and 9 (3.6%) reported "yes, always" use of scanner in their teaching. Item 18.7 on Table 5 shows the frequency of use of scanner in their teaching.

Multimedia-Authoring Program for Teaching

In response to the question on the extent of using multimedia-authoring program for teaching (M = 2.2, SD = 1.50), the survey revealed 125 (49.6%) respondents reported as "no, never" use. This was followed by 35 (13.9%) who reported as "no, almost never" use, and 32 (12.7%) "usually not, infrequently" use of multimedia-authoring program in their teaching. Thirty-six (14.3%) of the respondents reported to "usually yes, frequently" use multimedia-authoring program in their teaching. Only 15 (6.0%) respondents reported to "yes, almost always", and 9 (3.6%) reported "yes, always" use of multimedia-authoring program in their teaching. Item 18.8 on Table 5 shows the frequency of use of multimedia-authoring program in their teaching.

Overhead Projector (OHP)

In response to the question on the extent of using the overhead projector (OHP) for teaching (M = 4.0, SD = 1.53), 66 (26.2%) respondents reported as "usually yes, frequently" use, 54 (21.4%) " yes, almost always" use, and 52 (20.6%) "yes, always" use the OHP in their teaching. Twenty-three (9.1%) reported "no, never" use, followed by 21 (8.3%) who reported "almost never" use, and 36 (14.3%) "usually not, infrequently" use of the OHP in their teaching. Item 18.9 on Table 5 shows the frequency of use of the OHP in their teaching.

Slide Projector

In response to the question on the extent of using the slide projector for teaching (M = 2.5, SD = 1.65), the survey revealed that 115 (45.6%) respondents reported "no, never" use. This was followed by 30 (11.9%) who reported as "almost never" use, and 38 (15.1%) "usually not, infrequently" use of slide projector in their teaching. Thirty-two (12.7%) of the respondents reported to "usually yes, frequently" use slide projector in their teaching. Only 26 (10.3%) respondents reported to "yes, almost always", and 14 (5.6%) reported "yes, always" use of slide

projector in their teaching. Item 18.10 on Table 5 shows the frequency of use of slide projector in their teaching.

Video Recorder (VCR)

In response to the question on the extent of using the video recorder (VCR) in their teaching, (M = 2.5, SD = 1.55), the survey revealed that 107 (42.5%) respondents reported as "no, never" use. This was followed by 30 (11.9%) each who reported as "no, almost never" use, and 43 (17.1%) "usually not, infrequently" use of VCR in their teaching. Forty (15.9%) of respondents reported to "usually yes, frequently" use VCR in their teaching. Only 23 (9.1%) respondents reported to "yes, almost always", and 9 (3.6%) respondents "yes, always" use of VCR in their teaching. Item 18.11 on Table 5 shows the frequency of use of VCR in their teaching.

Other

Twenty-three (9.1%) of the respondents reported to use other devices for teaching (M = 4.4, SD = 1.41). Seven (2.8%) respondents reported the use of audiocassette; and 2 (0.8%) each used word processing, and video imager. One (0.4%) each used multimedia projector; digital camera; models (e.g., practical circuits); computer printed notes; visual presentation; actual objects; handouts, photo, and pamphlets; visits; project presentation; and the use of chalk and talk. Item 18.12 on Table 5 shows the frequency of use of other devices in their teaching.

Research Question 3:

What attitudes do faculties have toward using IT in their teaching?

Appendix I presents the frequencies, percentages, levels of attitude toward the use of IT in teaching among MoEP faculty, total responses, for items included in the attitude toward IT scale. Attitudes of faculty members toward using IT in their teaching was measured using a scale characterized by several bi-polar adjectives presumed to measure the faculty's overall evaluation of IT use. The level of response choices for the items in the attitude toward IT scale were weighted as follows:

1 = Extremely
2 = Quite
3 = Slightly
4 = Neutral
5 = Slightly
6 = Quite
7 = Extremely

There was a greatly skewed distribution (M = 2.1, SD = 1.14) variation in response to the MoEP faculty's best judgment of their feelings regarding the use of IT in their teaching. The discussion that follows is categorized under the headings of each attitude toward the use of IT in their teaching.

Good - Bad

It was revealed that for the good-bad scale (M = 2.0, SD = 1.18), 122 respondents (48.4%) reported their feelings toward the use of IT in their teaching as "extremely good". Fifty-eight respondents (23.0%) reported "quite good", while 38 (15.1%) reported "slightly good".

Twenty-seven (10.7%) were neutral. Only four respondents (1.6%) reported their feelings toward the use of IT in their teaching as "slightly bad", three (1.2%) as "quite bad", and none reported as "extremely bad".

Meaningful – Meaningless

It was revealed that for the meaningful-meaningless (M = 1.8, SD = 0.90), 123 respondents (48.8%) reported their feelings toward the use of IT in their teaching as "extremely meaningful". Sixty-nine respondents (27.4%) reported "quite meaningful", while 50 (19.8%) reported as "slightly meaningful". Ten (4.0%) were neutral. None reported their feelings toward the use of IT in their teaching from the range "slight meaningless" to "extremely meaningless".

Pleasant – Unpleasant

It was revealed that for the pleasant-unpleasant scale (M = 2.1, SD = 1.2), 105 respondents (41.7%) reported their feelings toward the use of IT in their teaching as "extremely pleasant". Sixty-six respondents (26.2%) reported "quite pleasant", while 42 (16.7%) reported as "slightly pleasant". Thirty-one (12.3%) were neutral. Only seven respondents (2.8%) reported as "slightly unpleasant", one (0.4%) as "quite unpleasant", and none reported their feelings toward the use of IT in their teaching as "extremely unpleasant".

Fair – Unfair

It was revealed that for the fair-unfair scale (M = 2.3, SD = 1.30) 97 respondents (38.5%) reported their feelings toward the use of IT in their teaching as "extremely fair". Fifty-two respondents (20.6%) reported "quite fair", while 54 (21.4%) reported as "slightly fair". Thirty-six (14.3%) were neutral. Ten respondents (4.0%) reported as "slightly unfair", three (1.2%) "quite unfair", and none reported their feelings toward the use of IT in their teaching as "extremely unfair".

Research Question 4:

What professional development experiences in IT have faculty had?

Table J1 (refer to Appendix J) presents the frequencies, percentages, of courses or workshops related to using IT in education that the respondents attended during a five-year period from the year 1996 to 2000. In this survey, the overall professional development experiences in IT that respondents attended had a mean of 13.6 and SD 58.62. There was tremendous skewed distribution variation in response to the MoEP faculties' non-participation in courses or workshops related to using IT in education. The discussion that follows is categorized under the headings of courses or workshops sponsored by the different bodies.

Courses Offered by Local/ Foreign Universities

Results on Table J2 (M = 30.4, SD = 137.53) revealed that 183 (72.6%) of the respondents never attended any courses or workshops related to using IT in education offered by either local or foreign universities for the years 1996-2000 (refer to Appendix J). A further breakdown of courses attended by respondents was as follows: Seventeen (6.7%) reported to have attended between 2 – 10 contact hours; 16 (6.3%) attended 11 – 20 contact hours; 4 (1.6%) each reported to having attended 24 – 30, 32 – 40, and 45 – 50 contact hours respectively. Two (0.8%) reported to have attended 52 – 60 contact hours, and 4 (1.6%) attended 72 – 80 contact

hours. Nine (3.6%) respondents reported to have attended between 100 – 200 contact hours, and 4 each (1.6%) reported to have attended between 300 – 360 contact hours, 450 – 600 contact hours of courses respectively. One respondent, a masters degree holder in electrical engineering (electrical and electronics) reported to have attended 1800 contact hours of courses or workshops related to using IT in education at local / foreign universities.

Courses Offered by the National Institute of Public Administration (INTAN)

It was revealed in Table J3 that 221 (87.7%) of the participants never attended any courses or workshops related to using IT in education (M = 7.3, SD = 56.07) offered by the National Institute of Public Administration (INTAN) for the years 1996-2000 (refer to Appendix J). A further breakdown of courses attended by respondents was as follows: Thirteen (5.2%) reported to have attended between 1 – 10 contact hours; 5 (2.0%) attended 15 – 18 contact hours; 2 (0.8%) each reported to have attended 20 – 24, and 30 – 36 contact hours respectively. Four (1.6%) reported to have attended between 40 – 48 contact hours, while 1 each (0.4%) reported to have attended 60, 80, 100, 360, and 800 contact hours of courses or workshops related to the use of IT in education offered by the National Institute of Public Administration.

Courses Offered by the Malaysian Ministry of Education (MoE)

Results in Table J4 (M = 5.7, SD = 46.48) revealed that 215 (85.3%) respondents never attended any courses or workshops related to using IT in education offered by the Malaysian Ministry of Education (MoE) for the years 1996-2000 (refer to Appendix J). A further breakdown of courses attended by respondents was as follows: Nineteen (7.5%) reported to have attended between 1 – 10 contact hours; 3 (1.2%) attended between 16 – 17 contact hours, 2 (0.8%) each reported to have attended 36, 40 – 48, and 50 contact hours. Only one each (0.4%) reported to have attended 80, 100, and 720 contact hours courses or workshops related to the use of IT in education offered by the Malaysian Ministry of Education.

Courses Offered by the Technical Education Department, MoE

It was revealed in Table J5 that 196 (77.8%) of the respondents never attended any courses or workshops related to using IT in education (M = 11.0, SD = 44.58) offered by the Malaysian Technical Education Department (TED), MoE for the years 1996-2000 (refer to Appendix J). A further breakdown of courses attended by participants was as follows: Eighteen (7.1%) reported to have attended between 1 – 10 contact hours; 5 (2.0%) 12 – 18 contact hours; and 10 (4.0%) 20 –24 contact hours. Five (2.0%) reported to have attended 30 contact hours; 6 (2.4%) 40 – 48 contact hours; 2 (0.8%) 50 contact hours; and 1 (0.4%) attended 60 contact hours. Only five (2.0%) reported to have attended 100 – 150 contact hours; 2 (0.8%) 200 – 224 attended contact hours; and one (0.4%) each reported to have attended 320 and 480 contact hours respectively.

Courses Offered by Each of the Malaysian Ministry of Education Polytechnics (MoEP)

Results on Table J6 (M = 16.4, SD = 43.47) revealed that 115 (45.6%) of the respondents never attended any courses or workshops related to using IT in education offered by each of the MoEP for the years 1996-2000 (refer to Appendix J). A further breakdown of courses attended by respondents were as follows: Fifty-seven (22.6%) attended between 1 – 10 contact hours; 17 (6.7%) attended 12 – 18 contact hours; and 34 (13.5%) attended 20 –24 contact hours. Nine (3.6%) reported to have attended 30 – 36 contact hours; 2 (0.8%) attended 40 –48 hours; 5

(2.0%) each attended between 60 –64, and 80 –100 contact hours respectively. Four (1.6%) attended between 120 – 160 contact hours; 2 (0.85) attended 200 contact hours, while 1 (0.4%) each reported to have attended 300, and 450 contact hours of courses or workshops respectively.

Courses Offered Through Department In-House Training

It was revealed on Table J7 that 136 (54.0%) respondents never attended any courses or workshops related to using IT in education (M = 10.5, SD = 23.62) through department in-house training for the years 1996-2000 (refer to Appendix J). A further breakdown of courses attended by respondents was as follows: 55 (21.8%) of the respondents reported to have attended between 1 – 10 contact hours; 14 (5.6%) 12 – 18 contact hours; and 18 (7.1%) 20 – 25 contact hours. Eight (3.2%) attended 30 – 32 contact hours; 4 (1.6%) each attended 60 and 64 contact hours respectively; 1 (0.4%) 80 contact hours; and 5 (2.0%) attended 100 – 180 contact hours of courses or workshops through department in-house training.

Research Question 5:

To what extent do faculties perceive IT support services are available to incorporate IT use in their teaching?

Appendix K (Table K1 and K2) present the frequencies, percentages, levels of IT support services available for faculties to incorporate IT use in teaching, means, standard deviations, for items included in the variable IT support services available. The response choices for the items in the variable IT support services (M = 4.1, = SD 1.22) available were weighted as follows:

1 = no, never
2 = no, almost never
3 = usually not, infrequently
4 = usually yes, frequently
5 = yes, almost always
6 = yes, always

The discussion that follows is categorized under the headings of the availability of support services (i.e., technical and instructional support) when the respondents needed them, how often respondents needed support services, and how much would respondents use IT in their teaching if they always received adequate support.

Availability of Support Services when Needed

1. Technical Support

   Technical support services (M = 3.7, SD = 1.36) availability was reported by 64 (25.4%) of the respondents as "usually yes" available 43 (17.1%) "yes, almost always" and 29 reported (11.5%) "yes, always" available. Seventy-three (29.0%) reported that the technical support was "usually not, infrequently", 27 (10.7%) "no, almost never" and 16 (6.3%) "no, never" available when needed.

2. Instructional Support
   Instructional support services (M = 3.3, = SD 1.30) availability was reported by a tie of 74 (29.4%) each for "usually not; infrequently", and "usually yes, frequently". Twenty-six (10.3%) of the respondents reported as "no, never", 37 (14.7%) as "no, almost never" available when needed.

Frequency of Support Services Needed

1. Technical Support
   The frequency of technical support services needed (M = 4.4, = SD 1.12) was reported by 79 (31.3%) of the respondents that they frequently needed technical support services, followed by 76 (30.2%) as "yes, almost always", and 43 (17.1%) each as "yes, always" and "usually not, infrequently". Eight respondents reported "no, almost never" and three reported "no, never " needed technical support services.
2. Instructional Support
   The frequency of instructional support services needed (M = 4.2, SD = 1.14) was reported by 97 (38.5%) respondents that they frequently needed instructional support services, followed by 68 (27.0%) as "almost always", and 28 (11.1%) always needed. Forty-one (16.3%) reported as "usually not, infrequently", 10 (4.0%) "no, almost never", and 8 (3.2%) as "no, never" needed.

Extent of IT Use with Adequate Support Services

1. Technical Support
   The extent of IT use by respondents with an adequate technical support services provided (M = 4.4, SD = 1.18) was reported by 78 (31.0%) of the respondents that they would frequently use IT if the needed technical support service was adequate. It was followed by 77 (30.6%) as "yes, almost always", and 49 (19.4%) as "yes, always" will use more of IT if the needed technical support services was adequate.
3. Instructional Support
   The extent of IT use by respondents with an adequate instructional support services provided (M = 4.3, SD = 1.20) was reported by 80 (31.7%) of the respondents that they will frequently use IT with adequate instructional support service, followed by 73 (29.0%) as "yes, almost always", and 43 (17.1%) as "yes, always" would incorporate more IT into their instruction. Thirty-two respondents (12.7%) reported they "usually not, infrequently", 11 (4.4%) "no, almost never" and 5 (2.0%) will never incorporate IT into their instruction.

Research Question 6:
To what extent do faculty perceive that barriers exist to IT use in their teaching?

Appendix L presents the frequencies, percentages, levels of barriers that exist to IT use in teaching, total responses, means, standard deviations, rank orders, overall means and standard deviations for items included in the variable barriers to IT use in teaching. The level of response choices for the items in the variable barriers to IT use in teaching were weighted as follows:

1 = no, never

2 = no, almost never
3 = usually not, infrequently
4 = usually yes, frequently
5 = yes, almost always
6 = yes, always

In response to the general question (refer to table L1) about how often barriers were encountered to use IT in their teaching (M = 4.0, SD = 1.21), 173 of 252 (68.7%) respondents reported "usually yes, frequently" to "yes, always" face barriers to use IT in their teaching. Eighty-three (32.9%) reported "usually yes, frequently", 60 (23.8%) reported "yes, almost always", and 30 (11.90%) reported "yes, always" face barriers to use IT in their teaching. Fifty-four (21.4%) reported they "usually not, infrequently" faced barriers, 18 (7.1%) reported "no, almost never", and 7 (2.8%) reported to "no, never". The discussion that follows (refer to Table L2) is categorized under the headings of barriers encountered by faculty members to using IT in their teaching (M = 3.9, SD = 1.51).

Access to Computers in Laboratories

Results (M = 3.7, SD = 1.50) revealed that 135 of 252 (53.6%) faculty members responded to the statements "usually yes, frequently" to "yes always" encountered barriers to access computers in laboratories. Fifty-six (22.2%) respondents reported "usually yes, frequently" encountered barriers to access computers in laboratories. Forty-two (16.7%) reported "yes, almost always" and 37 (14.7%) "yes, always" encountered barriers. Fifty-nine (23.4%) reported "usually not, infrequently", 36 (14.3%) "no, almost never", while 22 (8.7%) reported never faced any barriers in accessing computers in laboratories.

Access to Computers in Classrooms

It was (M = 4.1, SD = 1.81) revealed that 163 of 252 (64.7%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers to access to computers in classrooms. Forty (15.9%) respondents reported "usually yes, frequently", and 43 (17.1%) "yes, almost always" encountered barriers to access computers in classrooms. Eighty (31.7%) reported that they always faced barriers to access computers in classrooms. Twenty-eight (11.1%) reported "usually not, infrequently", 23 (9.1%) "no, almost never", while 38 (15.1%) never faced any barriers in accessing computers in classrooms.

Access to Computers with WWW Access in Classrooms

Results (M = 4.0, SD = 1.94) revealed that 155 of 252 (61.5%) of the faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers to access to computers with WWW in classrooms. Twenty-nine (11.5%) of the respondents reported "usually yes, frequently", 30 (11.9%) "yes, almost always", and 96 (38.1%) "yes, always" faced barriers to access computers with WWW in classrooms. Twenty-nine (11.5%) reported to "usually not, infrequently" faced barriers, 22 (8.7%) "no, almost never", while 46 (18.3%) never faced any barriers in accessing computers with WWW in classrooms.

Obsolete Technology

It was (M = 3.6, SD = 1.57) revealed that 134 of 252 (53.2%) of the faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers in the form of obsolete technology in their teaching. Fifty-seven (22.6%) of the respondents

indicated “usually yes, frequently”, 41 (16.3%) “yes, almost always”, and 36 (14.3%) “yes, always” encountered barriers in the form of obsolete technology in their teaching. Fifty-eight (23.0%) reported they “usually not, infrequently” faced barriers, 24 (9.5%) reported “no, almost never”, while 36 (14.3%) reported they never faced any barriers in the form of obsolete technology in their teaching.

Insufficient Software

The survey (M =3.9, SD = 1.50) revealed that 160 of 252 (63.5%) of the faculty members responded to the statements “usually yes, frequently” to “yes, always” encountered barriers in the form of insufficient software in their teaching. Sixty-five (25.8%) respondents reported “usually yes, frequently”, 54 (21.4%) “yes, almost always”, and 41 (16.3%) always encountered barriers in the form of insufficient software in their teaching. Forty-nine (19.4%) reported they “usually not, infrequently” faced barriers, 17 (6.7%) reported “no, almost never”, while 26 (10.3%) reported never facing any barriers in the form of insufficient software in their teaching.

Access to Photocopying (cost-free-use)

Results (M = 3.6, SD = 1.60) revealed that 126 of 252 (50%) of the faculty members responded to the statements “usually yes, frequently” to “yes, always” encountered barriers and “usually not, infrequently” to “no, never” faced barriers to access photocopying (cost-free-use) in their teaching. Forty-three (17.5%) respondents reported they frequently faced problem in accessing photocopy (cost-free-use) in their teaching, 44 (17.5%) “yes, almost always”, and 39 (15.5%) always. Fifty-eight (23.0%) reported “usually not, infrequently”, 38 (15.1%) “no, almost never”, while 30 (11.9%) reported they never faced any barriers to access photocopying (cost-free-use) in their teaching.

Access to Computers in the Staff Room or Office

The survey (M = 3.6, SD = 1.48) revealed that 138 of 252 (54.8%) faculty members responded to the statements “usually yes, frequently” to “yes, always” encountered barriers to access computers in the staff room or office. Thirty-two (12.7%) each reported “almost always” and “always” respectively. Fifty-six (22.2%) reported “usually not, infrequently” faced barriers, 29 (11.5%) each reported “no, almost never” to “never” facing any barriers accessing computers in the staff room or office.

Access to WWW from the Staff Room or Office

The survey (M = 4.0, SD = 1.81) revealed that 151 of 252 (60.0%) faculty members responded to the statements “usually yes, frequently” to “yes, always” encountered barriers to access computers with WWW in the staff room or office. Seventy-nine (31.3%) reported that they always faced barriers, while 36 (14.3%) each reported “usually yes, frequently” and “yes, almost always” respectively. Forty-two (16.7%) reported “usually not, infrequently”, 21 (8.3%) “ no, almost never”, while 38 (15.1%) never faced any barriers in accessing computers with WWW in the staff room or office.

Access to Telephone in the Classroom

The survey (M = 4.0, SD = 2.05) revealed that 151 of 252 (60.0%) faculty members responded to the statements “usually yes, frequently” to “yes, always” encountered barriers to access telephone in the classroom. One hundred two (40.5%) reported that they always faced

barriers. Twenty-two (8.7%) each responded "usually not, infrequently" to "no, almost never", while 57 (22.6%) reported they never faced any barriers in accessing telephone in the classroom.

Access to Technical Support

The survey (M = 3.7, SD = 1.54) revealed that 153 of 252 (60.7%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers to access technical support in their teaching. Thirty-four (13.5%) reported that they always faced barriers. Forty-two (16.7%) each reported "usually not, infrequently" to "no, almost never" respectively, while 34 (13.5%) reported they never faced any barriers in accessing technical support in their teaching.

Access to Instructional Support

The survey (M = 3.7, SD = 1.52) revealed that 155 of 252 (61.5%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers to access instructional support in their teaching. Thirty-one (13.5%) reported that they always faced barriers, 54 (21.4%) "almost always", while 70 (27.8%) "usually yes, frequently" faced barriers to access instructional support in their teaching. Forty-four (17.5%) reported "usually not, infrequently", 21 (8.3%) "no, almost never", while 32 (12.7%) never faced any barriers in accessing instructional support in their teaching.

Lack of Necessary IT Skills

Results (M = 3.8, SD = 1.32) revealed that 154 of 252 (61.1%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers by a lack of necessary IT skills in their teaching. Twenty-five (9.9%) reported that they always faced barriers, 49 (19.4%) " almost always", while 80 (31.7%) "usually yes, frequently" faced barriers by a lack of necessary IT skills in their teaching. Fifty-nine (23.4%) reported "usually not, infrequently", 22 (8.7%) "no, almost never", while 17 (6.7%) reported they never faced any barriers by a lack of necessary IT skills in their teaching.

Lack of Time to Gain IT Skills

It was (M = 3.8, SD = 1.31) revealed that 158 of 252 (62.7%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers by a lack of time to gain IT skills in their teaching. Twenty-six (10.3%) reported that they always faced barriers, 53 (21.0%) " almost always", while 79 (31.3%) "usually yes, frequently" faced barriers by a lack of time to gain IT skills in their teaching. Fifty-eight (23.0%) reported "usually not, infrequently", 20 (7.9%) as "no, almost never", while 16 of 252 (6.3%) reported as never face any barriers by a lack of time to gain IT skills in their teaching.

Lack of Experience with IT Oriented Pedagogy

The survey (M = 3.9, SD = 1.40) revealed that 170 of 252 (67.5%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers by a lack of experience with IT oriented pedagogy in their teaching. Thirty-one (12.3%) reported that they always faced barriers, 55 (21.8%) "almost always", while 84 (33.3%) reported "usually yes, frequently" faced barriers by a lack of experience with IT oriented pedagogy in their teaching. Thirty-eight (15.1%) reported "usually not, infrequently", 24 (9.5%) "no, almost never", while

20 (7.9%) reported never faced any barriers by a lack experience with IT oriented pedagogy in their teaching.

Lack of IT Training Opportunities

The survey (M = 4.1, SD = 1.40) revealed that 170 of 252 (67.5%) faculty members responded to the statements "usually yes, frequently" to "yes, always" encountered barriers by a lack of IT training opportunities. Forty-eight (19.0%) reported that they always faced barriers, 65 (25.8%) " almost always", while 57 (22.6%) "usually yes, frequently" faced barriers by a lack of IT training opportunities. Fifty (19.8%) reported "usually not, infrequently", 19 (7.5%) "no, almost never", while 13 (5.2%) reported never faced any barriers by a lack of IT training opportunities.

Other Barriers

The survey (M = 5.8, SD = 0.46) revealed that 8 of 252 (3.2%) faculty members responded to the statements "almost always" to "always" faced barriers in using IT in their teaching. Barriers included unrelated work that respondents had to perform, lack of time to implement IT since faculty members had to do all kinds of clerical work, and always encountered problems with no IT related courses offered by the MoE. One respondent reported lack of facilities, and heavy academic work reduced the concentration in using IT in teaching. The respondent was teaching 28 periods (21 contact hours) a week. Another respondent reported no barriers existed because IT facilities never existed in the institution in the first place.

Research Question 7:

What relationships exist between selected faculty demographics (i.e., teaching load, years served as teacher/ instructor, years served in MoEP, gender, age, level of education, and MoEP membership) and IT use in their teaching?

The relationship between selected faculty members demographic and IT use in teaching variables with two categories (gender) was examined by t-test. Variables with several categories (department and MoEP membership) were examined using One-Way ANOVA. Correlation was used to identify relationship for continuous variables (highest level of education, age, years served for the MoE, years served for the MoEP, and teaching load per week).

The t-test was used to determine differences between male and female faculty members' general use of IT. The mean extent of IT use in general for male (n = 134) respondents (M = 2.8, SD = 1.28) and female (n = 118) respondents (M = 2.7, SD = 1.23) showed a significant difference ($p < .887$) between the responses of male and female (t 0.427; df 250 $p<.05$, 2-tailed).

A one-way analysis of variance (Table M1) revealed no difference between MoEP membership and IT use in general ($F_{11, 240} = 2.613$, $p< .05$). For department and IT use in general ($F_{11, 240} = 1.792$, $p< .05$), the one-way analysis of variance (Table M2) revealed no difference between the two. However by looking at the means plot (Figure 3) it can be seen that there were variations between MoEP membership and between department and IT use in general. No further discussions will be made regarding the means plot, as this would be in violation of requirement set forth by the Institutional Review Board for Research Involving Human Subjects at Virginia Polytechnic Institute and State University.

Table M3 presents the correlation coefficients between demographic variables and the extent of IT use in general. Highest level of education had a significant ($p< .05$, 2-tailed) low correlation (.162). According to the guideline given by Glassnap and Poggio (1985) (Figure 4)

and the correlation coefficients in Table M3, a low negative coefficient was shown between highest level of education and other demographic variables (p< .05, 2-tailed). As anticipated, age had a moderate (.576) correlation with years served for the MoEP and a high (.903) correlation with years served for the MoE (p< .05, 2-tailed). Years served for the MoEP also has a moderate (.629) correlation with years served for the MoE (p< .05, 2-tailed).

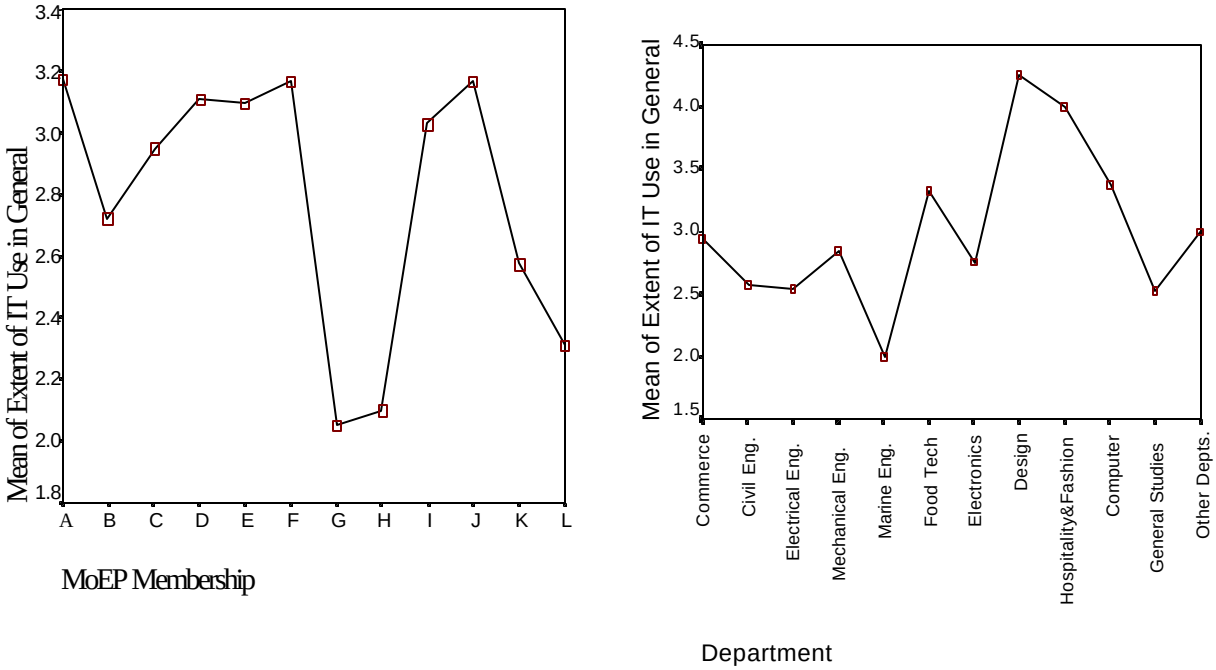

Figure 3: Means Plots of MoEP Membership, Department and Extent of IT Use in General

Correlations (Table M4) were also performed for all variables in IT use (email, online discussion, WWW, presentation software, CD-ROM, simulations, scanner, OHP, slide projector, and VCR) except for other category, and selected demographics (teaching load per week, years served for MoE, years served for MoEP, age, and highest level of education with the exception of one respondent). There were no significant correlations among variables except for online discussion and teaching load, which had a negative (-0.138) correlation (p< .05, 2-tailed). Highest level of education with the exception of one respondent showed a low correlation with email (.135), WWW (.162), and scanner (.140) (p< .05, 2-tailed).

Range of Positive Coefficient	Type of Relationship	Range of Negative Coefficient
1.00 - .80	High	-.80 - (-1.00)
.80 - .60	Moderate to High	-.60 - (-.80)
.60 - .40	Moderate	-.40 - (-.60)
.40 - .20	Low to Moderate	-.20 - (-.40)
.20 - .00	Low	-.00 - (-.20)

Figure 4: Guidelines for Interpreting Correlation Coefficients (Glasnapp & Poggio, 1985, p. 185

Research Question 8:
Collectively, to what extent do the above variables predict IT use in teaching?

To determine the extent to which the variables predict IT use in teaching, multiple regression analysis was performed. A multiple regression analysis with the dependent variable extent of IT use in general score revealed an R^2 of 0.04, indicating that only 0.4% of the variance could be explained by the variables in the model. Variables included in the first regression model were: highest level of education, gender, teaching load per week, years served for the MoE, years served for the MoEP, and age. The only variable that contributed significantly to the variance explained at the 0.05 level was highest level of education. An F-ratio of 1.63 was significant at the 0.05 level. Table N1 contains outcomes of the regression analysis on demographic variables and IT use in general.

Multiple regression was performed using adoption proneness (Table N14), attitude (Table N15) and support services (Table N16) as independent variables, and IT use in general as dependent variable. Results of the regression included: adoption proneness (R^2 1.04, F 1.594), attitude (R^2 0.02, F –1.311), and support services (R^2 0.03, F 1.214). Adoption proneness proved to be a predictor for IT use in teaching.

Multiple regression was also performed using selected demographic variables (i.e., highest level of education, gender, teaching load per week, years served for the MoE, years served for the MoEP, and age) as independent variables. Results of the regression included: Table N2 email (R^2 0.02, F 0.890), Table N3 online discussion (R^2 0.04, F 1.648), Table N4 WWW (R^2 0.03, F 2.072), Table N5 presentation software (R^2 0.05, F 1.808), Table N6 simulations (R^2 0.01, F 0.541), Table N7 CD-ROM (R^2 0.03, F 1.123), Table N8 scanner (R^2 0.04, F 1.778), Table N9 multimedia authoring program (R^2 0.03, F 1.321), Table N10 Overhead Projector (R^2 0.02, F 0.841), Table N11 slide projector (R^2 0.01, F 0.441), Table N12 VCR (R^2 0.02, F 0.913), and Table N13 for other items(R^2 0.21, F 0.660) . Together they had an R^2 of 0.31 with no significant difference.

Summary

Of the 332 survey materials sent to the 12 MoEP, 252 (75.9%) were completed. Respondents consisted of 134 male and 118 female full-time faculty members employed by the MoEP. The average respondent was 37 years old, had a teaching load of 18 periods (13.5 contact hours) a week, 10 years of teaching experience with the MoE, and 7 years of MoEP teaching experience.

The scale on adoption-proneness had an overall mean of 4.3 with a SD 1.09 while the extent of IT use in general had a mean of 2.78 with a SD 1.25. Survey results on the extent of IT use with 12 variables (M = 2.73, SD = 1.49) revealed a skewed result toward non-use. Responding to the attitudes of respondents toward the use of IT in their teaching (M = 2.05, SD = 1.14) however were heavily skewed toward use.

From the year 1996 – 2000, the overall professional development experiences in IT that MoEP respondents had through courses/ workshops offered by local/ foreign universities, the National Institute of Public Administration (INTAN), the Malaysian Ministry of Education (MoE), the Technical Education Department, the individual MoEP, and department in-house training was a mean of 13.6 contact hours and SD 58.62. The result showed a greatly skewed

distribution variation toward non-participation in courses or workshops related to using IT in education.

Respondents perceived IT support services as available to incorporate IT use in teaching. Support services were in the form of technical (e.g., computer and software fixes) and instructional support (e.g., to incorporate technology into instruction). Measurement through a 6-point Likert-Type Scale showed 68% ($\underline{M}$ = 4.0, $\underline{SD}$ = 1.21) respondents reported as frequently to usually faced barriers to use IT in their teaching. The overall mean and standard deviation for 16-item barriers of IT use in teaching were 3.7 and 1.79 respectively.

A t-test performed to determine differences between male and female faculty's general use of IT did not show any significance. A one-way ANOVA revealed no significant difference between MoEP membership and IT use except for the test between department and IT use which showed significant of 0.06 at the .05 level.

Correlations between selected demographic variables and the extent of IT use in general did show some significance. Highest level of education had a significant correlation (.162) with IT use. Other variables had correlations within groups. Correlations performed on all predictor variables in IT use showed no significance except for online discussion and teaching load.

Multiple regressions were conducted between selected demographic variables and IT use in general as dependent variable, and between all 12-item predictor variables on IT use and selected demographic variables. The only variable that contributed significantly to the variable explained at the .05 level was highest level of education.

CHAPTER 6

Summary, Conclusions, and Recommendations

This chapter summarizes the research study including the problem, purpose, research questions, method, and findings. Conclusions and recommendations are also presented.

Summary

Introduction

The impact of Information Technology (IT) on society, the economy, and the workforce include extensive changes in the nature of work, commerce, education and training, entertainment, and quality of life. Yusuf (2000) noted that Information Technology, an extraordinary phenomenon changing and challenging every known field of human endeavor, is at the heart of today's world. A principal driving force behind these changes is the mushrooming development and deployment of new technologies into almost every sector of the economy. These new technologies are making the world much more interdependent by accelerating the movement of goods, services, ideas, and capital across national boundaries (Cutter, Spero & Tyson, 2000). Globalization of IT is drawing the attention of governments, corporations, academia, and the public at large. IT use is critical to improved productivity and competitiveness at all levels of society, and facilitates development of a high quality information infrastructure.

Widespread application of emerging technologies both at work and at home demands flexible workers who are able to keep in pace with technology, be self-directed, and be knowledgeable about the world and cross-cultural communications. The education of new knowledge workers requires emphasis on information access, problem solving, analysis, evaluation, and decision-making. Sherrit & Basom (1996)reported that employers are seeking employees who are technology and information literate. As IT becomes an integral part of our daily lives, its use in educational institutions is becoming a necessity. As Mann (1994) commented, it is important that the students of today learn how to evaluate, manage, and use information. McNeil (1996) shows that access to computers, laboratories, and good facilities is important to student success. Information technology should be viewed as tools, which are an integral part of a student's learning experience.

Problem

Challenged by rapid changes in IT and the globalization of the economy, the Malaysian Ministry of Education Polytechnics (MoEP) has been working hard to prepare a future mid-level technical workforce that is competent and has the required higher levels of academic and technical skills needed by future employers. The extent to which IT implementation is successful in educational programs depends largely on managerial and organizational factors. The role of users, mainly the faculty, the degree of management support from the MoEP itself and the Ministry of Education (MoE), all have profound impact on the outcome of IT implementation.

Theoretical Framework

Rogers Innovation Decision Process Model served as the theoretical framework for this study. The researcher adapted and developed an Information Technology (IT) Adoption Model based on the Innovation Decision Process (Rogers, 1995) to determine why MoEP faculty use or do not use IT in their teaching. Rogers model has been used in a number of studies on diffusion and innovation.

Purpose

The purpose of this study was to examine factors related to information technology (IT) implementation in the curriculum. The focus was on Malaysian MoEP faculty members' attitudes toward IT, as well as IT availability and IT use in teaching.

Research Questions

The following research questions related to MoEP faculty members guided this study:

1. To what extent are faculties adoption-prone?
2. To what extent do faculties use IT in their teaching?
3. What attitudes do faculties have toward using IT in their teaching?
4. What professional development experiences in IT have faculty had?
5. To what extent do faculties perceive IT support services are available to incorporate IT use in their teaching?
6. To what extent do faculties perceive that barriers exist to IT use in their teaching?
7. What relationships exist between selected faculty demographics (i.e., teaching load, years served as teacher/ instructor, years served in MoEP, gender, age, level of education and MoEP membership) and IT use in their teaching?
8. Collectively, to what extent do the above variables predict IT use in teaching?

Method

A sample of 332 faculty members was randomly and proportionally selected from the population of 2027 full-time faculty members employed at the Malaysian Ministry of Education Polytechnics (MoEP) as of April 1, 2000. The sample was stratified according to the MoEP served.

For the survey, information technology (IT) included the various computer and communication-related items that can be used to directly improve teaching in Malaysian Ministry of Education Polytechnics. IT use in instruction (i.e., score on a scale based on amount and level of IT use) was the dependent variable. Independent variables included adoption proneness, attitude toward IT, faculty professional development, support services, IT barriers, teaching load per week, department faculties were in, years served as teacher/ instructor with the MoE, years served in MoEP system, gender, age, highest level of education, and specific MoEP membership.

The Scale to Measure Adoption-Proneness (Oscarson, 1976) was used to assess Malaysian MoEP faculty members' willingness to adopt innovations in curriculum and instruction. Each item on the scale had an accompanying 6-point Likert-Type Scale: (1) no, never, (2) no, almost never, (3) usually not, infrequently, (4) usually yes, frequently, (5) yes, almost always and (6) yes, always.

At each MoEP, the survey materials were distributed to and collected from the faculty members by a senior officer had been appointed as the research coordinator for this study by his/

her principal. Each MoEP coordinator mailed the completed survey materials to the researcher via Malaysian Postal Express Mail Service. Two hundred fifty two MoEP faculty members completed and returned the survey materials. The survey response rate was 75.9%.

Descriptive analyses, t-test, one-way Analysis of Variance (ANOVA), and correlational and regression analyses were used. Descriptive analyses were used to determine the frequencies, means, and standard deviations of the dependent and independent variables. The t-test was employed to determine if the means of two sets of scores were significantly different from each other. One-way ANOVA was used to determine whether several sets of scores had different means. Correlation and multiple regression analysis were employed to determine the relationships among the dependent variable and the independent variables. The probability level for all tests of statistical significance for the study was set at $p < .05$.

Findings

Research Question 1: To what extent are faculties adoption-prone?

The 17-item Scale to Measure Adoption-Proneness was used to assess MoEP faculty members' willingness to adopt innovations in curriculum and instruction, particularly in the use of information technology. The overall adoption-proneness instrument score with a mean of 4.3 showed that the respondents were "frequently" to "almost always" willing to accept something new at their workplaces. This result indicated that the faculty members as a whole appeared to have readiness for adoption of changes related to IT use in teaching.

For the item on general disposition toward new ideas and programs ($M = 4.5$, $SD = 1.00$) 89% of the respondents reported that, they were "frequently to always" one of open-minded optimism. One hundred seventy eight (72%) reported their willingness to try something new, ($M = 4.8$, $SD = 0.88$) something that will require extra initial effort on their part. The faculty members (75%) were willing to try something new even if it may fail ($M = 4.2$, $SD = 1.09$). About 84.5% ($M = 4.4$, $SD = 1.15$) of the respondents reported that their selection of innovations "frequently to always" reflected careful thoughts about the overall needs and priorities of their situation.

The faculty members (81%) reported they "frequently to always" developed or helped develop a strategy or plan of action ($M = 4.4$, $SD = 1.16$) when considering an educational innovation. The score on sufficient freedom to initiate new programs/ ideas ($M = 3.9$, $SD = 1.13$) fell between "frequently" and "infrequently". This meant the respondents were unsure whether they had sufficient freedom to initiate something new. However, 78.6% of the respondents were persistent and diplomatic in sticking with an innovation ($M = 4.0$, $SD = 1.02$). Eighty one percent of the faculty members reported "frequently to always" willing to have an innovation brought under careful scrutiny ($M = 4.2$, $SD = 1.02$).

About 83% of the respondents ($M = 4.4$, $SD = 1.03$) reported to make special effort to read about innovations and changes in their field. Initiatives taken in contacting other institutions that are trying an idea or program ($M = 3.8$, $SD = 1.25$) showed a lower favorable response (62.3%), but 72.6% of the respondents were willing to bring new ideas and developments to colleagues and department heads ($M = 4.1$, $SD = 1.12$). For the item focusing on asking oneself "why" about teaching methods and materials are used, 88.5% ($M = 4.7$, $SD = 1.05$) of the respondents indicated they were "frequently to always". Eighteen percent of the respondents reported they "always" receive encouragement by department heads to innovate and try new

ideas and programs (M = 4.3, SD = 1.21), but slightly less encouragement was received (10%) by the institution's administration (M = 4.0, SD = 1.22).

Seventy-seven percent of the respondents (M = 4.1, SD = 1.08) reported they "frequently to always" took time to consider and seek insight into the processes of educational change. For 73.4% of the faculty, coffee breaks or informal conversations "frequently to always" include new ideas and developments in curriculum and instruction (M = 4.1, SD = 1.12). Finally, 86.1% of the faculty members were "frequently to almost always" aware of the growing importance of research, experimentation, and innovation in Malaysian education (M = 4.5, SD = 1.09).

Research Question 2: To what extent do faculties use IT in their teaching?

The mean score on respondents' IT use in general as measured by a 6-point Likert-Type Scale was 2.8. This was slightly below a mid-point score of three. There was variability across the mean score for the items used by the respondents in their teaching. Some of the items measured were quite traditional instructional resources and some focused on IT-related resources. As a group, respondents were more likely to use traditional resources such as the overhead projector, than IT-related resources that were focused on computers and communication.

A small number of respondents took the initiative to provide extra comments about the general use of IT. These comments came from individuals. One respondent indicated limited use of IT was due to the scarcity of resources, while another reported that the institution provided no IT facilities. A third person said that he used the computer, but only for word-processing. A fourth person reported that he browsed the Internet to take notes from websites, while a fifth person reported he just used the chalk and talk teaching method.

Questions about the use of IT via various computer and-communication-related items revealed a mean score of 2.7 where respondents reported "infrequently to never" use the facilities. Results that followed indicated that faculty members "infrequently to never" use IT in their teaching. The scores for email to communicate with students and other instructors (M = 2.2, SD = 1.37) showed 80.2% of the respondents "infrequent to never" use this technology. Data for online student discussion groups on the Internet (M = 1.7, SD = 1.09) skewed, with 91.7% indicating they "almost never to never" use the technology. Data related to accessing WWW for instructional purposes and learning (M = 3.1, SD = 1.63) showed that 53.6% of the respondents "infrequently to never" use the facilities, and 57.1% responded "infrequently to never" use presentation software (M = 3.0, SD = 1.65) in their teaching. Seventy-four percent of the respondents indicated that they "infrequently to never" use simulations of exploratory environments (M = 2.3, SD = 1.57) while 79% reported "infrequently to never" use information on CD-ROMs (M = 2.3, SD = 1.41) in teaching. For the use of the overhead projector (M = 4.0, SD = 1.53), 68.2% of the respondents reported "frequently to always" use. Meanwhile, a scanner (M = 2.4, SD = 1.54), multimedia-authoring program (M = 2.2, SD = 1.50), slide projector (M = 2.5, SD = 1.65), and video recorder (M = 2.5, SD = 1.55) had a reported "infrequently to never" use for teaching by 71-76% of the respondents.

Research Question 3: What attitudes do faculty members have toward using IT in their teaching?

Attitude of faculty members toward using IT in their teaching was measured using a scale characterized by several bi-polar adjectives presumed to measure faculty overall evaluation of IT use. Results showed a greatly skewed distribution (M = 2.1, SD = 1.14) in response to the MoEP respondents' best judgment of their feelings regarding the use of IT in their teaching. A majority of the respondents (86.5%) felt "slightly good to extremely good" (M = 2.0, SD = 1.18), 96% felt "slightly meaningful to extreme meaningful" (M = 1.8, SD = 0.90), 84.5% felt slightly "pleasant to extreme pleasant" (M = 2.1, SD = 1.18), and 80.6% felt it was "slightly fair to extremely fair" (M = 2.3, SD = 1.28) to use IT in their teaching.

Research Question 4: What professional development experiences in IT have faculty had?

Overall, the professional development experience in IT that respondents had was an average of 13.6 and 0 median and mode contact hours respectively. There was tremendous skewed distribution towards non-participation in IT courses or workshops. Results of individual variables were as follows: 72.6% (M = 30.4, SD = 137.53) of the respondents had not attended any courses offered by local/ foreign universities. Outliers who attended between 100 and 1800 contact hours served to inflate the mean. The mean for courses offered by the National Institute of Public Administration (M = 7.3, SD = 56.07) was also inflated by outliers despite the fact that 88% of the faculty members never attended any courses offered. Over 85% of the respondents did not attend any courses offered by the Malaysian Ministry of Education (M = 5.7, SD = 46.48), while IT courses offered by the Technical Education Department (M = 11.0, SD = 44.58) were not attended by 77.8% of the faculty members. Courses offered by each MoEP (M = 16.4, SD = 43.47) were not overwhelmingly attended. Forty-six percent of the respondents failed to attend any IT related courses offered by MoEP. More than half of the faculty members (54%) never attended any courses offered through department in-house training (M = 10.5, SD = 23.62). The means for courses attended looked high because some people took quite a number of contact hours, while the majority had zero contact hours.

Research Question 5: To what extent do faculties perceive IT support services are available to incorporate IT use in their teaching?

The extent to which respondents perceived IT support services were available to incorporate IT in their teaching were divided into three categories. They were availability of support services (i.e., technical and instructional support) when the respondents needed them, how often respondents needed support services, and how much would respondents use IT in teaching if they always received adequate support.

The means and standard deviations for support services availability were M = 3.7, SD = 1.36 for technical support, and M = 3.3, SD 1.30 for instructional support. Fifty-four percent of the respondents evaluated the availability of technical support as being in the range of "usually yes, frequently to yes, always" available, while 45.7% reported instructional support in their teaching as "usually yes, frequently to yes, always" available. Seventy-nine percent (M = 4.4, SD 1.12) of the respondents reported that they "frequently to always" needed support services for

technical support, and 76.6% (M = 4.2, SD 1.14) reported "frequently to always" needing instructional support in their teaching. Eighty-one percent of the respondents (M = 4.4, SD 1.18) reported they "frequently to always" will use IT in teaching with adequate support services for technical support, while 77.8% (M = 4.3, SD 1.20) reported they "frequently to always" will use IT in teaching with adequate support services for instructional support.

Research Question 6: To what extent do faculties perceive that barriers exist to IT use in their teaching?

Fifty percent of the respondents generally perceived that barriers frequently exist to IT use in their teaching. For specific perceived barriers to IT use in teaching, each item on the scale had an accompanying 6-point Likert-Type Scale: (1) no, never, (2) no, almost never, (3) usually not, infrequently, (4) usually yes, frequently, (5) yes, almost always and (6) yes, always.

The means and standard deviations for perceived barriers to use IT in teaching were as follows: access to computers in laboratories (M = 3.7 SD = 1.50), access to computers in classrooms (M = 4.1, SD = 1.81), access to computers with WWW access in classrooms (M = 4.0, SD = 1.94), obsolete technology (M = 3.6, SD = 1.57), insufficient software (M = 3.9, SD = 1.50), access to photocopying i.e., cost free use (M = 3.6, SD = 1.60), access to computers in the staff room or office (M = 3.6, SD = 1.48), access to WWW from the staff room or office (M = 4.0, SD = 1.81), access to telephone in the classroom (M = 4.0, SD = 2.05), access to technical support (M = 3.7, SD = 1.54), access to instructional support (M = 3.7, SD = 1.52), lack of necessary IT skills (M = 3.8, SD = 1.32), lack of time to gain IT skills (M = 3.8, SD = 1.31), lack of experience with IT oriented pedagogy (M = 3.9, SD = 1.40), lack of IT training opportunities (M = 4.1, SD = 1.40), and other barriers (M = 5.8, SD = 0.46). Results reflected that 50 to 68% of the faculties reported barriers ranged from "usually not, infrequently" to "yes, always" exist in their effort to incorporate IT in their teaching.

Research Question 7: What relationships exist between selected faculty demographics (i.e., teaching load, years served as teacher/ instructor, years served in MoEP, gender, age, level of education, and MoEP membership) and IT use in their teaching?

For this question, a t-test was used to determine differences between male and female faculty members' general use of IT. Overall they had a mean and standard deviation of 2.7 and 1.23 respectively. The test showed a significant difference ($p < .887$) between the responses of male and female.

A one-way analysis of variance revealed no difference between MoEP membership and IT use in general ($F_{11, 240} = 2.613$, $p < .05$). No difference was found between department and IT use in general ($F_{11, 240} = 1.792$, $p < .05$). A correlation between the extent of IT use in general and highest level of education was significant ($p < .05$) but low (.162). A low negative coefficient was found between highest level of education and other demographic variables ($p < .05$, 2-tailed). As anticipated, age had a moderate (.576) correlation with years served for the MoEP and a high (.903) correlation with years served for the MoE ($p < .05$, 2-tailed). Years served for the MoEP also has a moderate (.629) correlation with years served for the MoE ($p < .05$, 2-tailed).

Correlations were also performed for all variables related to IT use (i.e., email, online discussion, WWW, presentation software, CD-ROM, simulations, scanner, OHP, slide projector, and VCR) and selected demographics (i.e., teaching load per week, years served for MoE, years

served for MoEP, age, and highest level of education with the exception of one respondent). The one respondent excluded in the correlation (i.e., who had a masters degree and was working on a doctoral degree) was an outlier. There were no significant correlations among variables except for online discussion and teaching load, which had a negative (-0.138) correlation ($p < .05$, 2-tailed). Highest level of education showed a low correlation with email (.135), WWW (.162), and scanner (.140) ($p < .05$, 2-tailed).

Research Question 8: Collectively, to what extent do the above variables predict IT use in teaching?

A multiple regression analysis with the dependent variable extent of IT use in general score revealed an R^2 of 0.04, indicating that only 4% of the variance could be explained by the variables in the model. Variables included in the first regression model were: highest level of education, gender, teaching load per week, years served for the MoE, years served for the MoEP, and age. The only variable that contributed significantly to the variance explained at the 0.05 level was highest level of education. An F-ratio of 1.63 was significant at the 0.05 level.

Multiple regression was performed using adoption proneness, attitude, and support services as independent variables, and IT use in general as dependent variable. Results of the regression included: adoption proneness (R^2 1.04, F 1.594), attitude (R^2 0.02, F –1.311), and support services (R^2 0.03, F 1.214). Adoption proneness proved to be a predictor of IT use in teaching.

The regression performed using IT barriers (i.e., access to computers in lab, access to computers in classrooms, access to computer with WWW access in classrooms, obsolete technology, insufficient software, access to photocopying, access to computers in the staff room or office, access to the WWW from the staff room or office, access to telephone in the classroom, access to instructional support, lack of necessary IT skills, lack of time to gain IT skills, lack of experience with IT oriented pedagogy, lack of IT training opportunities and other barriers) were not useful in explaining the relationship between IT use in general and selected variables.

Multiple regression was also performed using selected demographic variables (i.e., highest level of education, gender, teaching load per week, years served for the MoE, years served for the MoEP, and age) as independent variables. Each of the itemized IT sources was treated as an dependent variable. Results of the regression included: email (R^2 0.02, F 0.890), online discussion (R^2 0.04, F 1.648), WWW (R^2 0.03, F 2.072), presentation software (R^2 0.05, F 1.808), simulations (R^2 0.01, F 0.541), CD-ROM (R^2 0.03, F 1.123), scanner (R^2 0.04, F 1.778), multimedia authoring program (R^2 0.03, F 1.321), OHP (R^2 0.02, F 0.841), slide projector (R^2 0.01, F 0.441), and VCR (R^2 0.02, F 0.913). Together they had an R^2 of 0.31. Results of the regression models were not useful in explaining the relationship between IT use and selected (itemized sources) variables.

Conclusions

Applicability of Rogers Innovation Decision Process

Rogers Innovation Decision Process model provided a theoretical framework for this study. Rogers (1995) pointed out that organizations were involved in one way or another in the adoption of educational innovation; actions that might be taken by organizations include

collective action on and/ or authority over an innovation decision. Contrary to Rogers' theory, the results indicated that only adoption proneness and level of education correlated with IT use in teaching. The lack of support for Rogers' Innovation Decision Process might be due to the bureaucratic administrative system in place within the MoEP. Rogers may have overlooked the factor of top-down delegation of duties where subordinates accept whatever facilities are provided. The lack of other predictors of IT use may have been due to the fact that, collectively, MoEP faculties were not part of the innovation decision process. In effect, they may not have felt ownership of the change to incorporate IT into their teaching.

The five stages of the innovation-decision process may have not accurately represented the MoEP institution context at the time of the study. Findings of the present study lend support to the view that Rogers Innovation Decision Process may not be applicable to Malaysian Ministry of Education Polytechnics.

Relationships Among Variables

A majority of the respondents reported they "frequently or almost always" supported efforts toward innovation. Of the 17 items in the adoption-proneness scale, all except sufficient freedom to initiate new programs/ ideas ($\underline{M}$ = 3.9) had means of over 4.0. This meant respondents were positive about innovation. They rated sufficient freedom to initiate new programs or ideas between "infrequent and frequent". Faculties were willing to try new ideas and programs. However, their willingness may be restricted because of inaccessibility to various IT resources in their institutions.

Results related to faculty members' IT use in general and the use of various computer and communication related items were skewed greatly in the direction of non-use. At first glance, one might conclude that faculty members chose to not adopt the use of IT. However, an examination of results related to IT use barriers may help to explain why non-use occurred. Since respondents had restrictions in the form very little or no accessibility to IT in their institutions, little or no IT use in teaching was unavoidable.

Results of faculty attitudes regarding use of IT in their teaching were skewed toward extreme attitudes of "good, meaningful, pleasant, and fair". Thus, it seemed unusual that IT use in general skewed toward non-use but attitudes toward IT use were skewed toward the positive extreme. Based on the personal observations while recently serving the MoEP for three years it was noted that only minimal IT facilities were available for faculty use. For example, newer, up-to-date computers could only be accessed in the computer laboratories. If computers were available in the staff room, they were old and in some cases obsolete (e.g., 286 and 486 processors). Therefore, attitudes toward IT may be only one of several factors that contribute to IT use in teaching.

There are some possible reasons for the lack of involvement in faculty professional development that were not examined in this research. Even though a great majority of the respondents did not attend courses or workshops organized by different entities, some might have taken their own initiative by attending classes offered by businesses off-campus. Some faculty members might have read books and journals about computers, asked friends for assistance, or used a trial and error approach to learn about computer and communication-related items. Other faculty members may have computer and communication-related items at their homes. The above may be possible reasons why respondents felt "good, meaningful, pleasant, and fair" about IT use in their teaching.

One approach to affecting change is where an institution contacts other institutions to find what innovation practices that they may have. Unfortunately, there are no clear channels within the government establishment to accomplish this directly and easily. Lack of support from superiors might be another reason for shortcomings for faculty members to try new ideas and programs. Perhaps many good ideas and suggestions never go beyond the department head's desk. Sipon (1996) noted that "there were limited opportunities for instructors to grow professionally, to be promoted, to have increased responsibility, and to be given recognition for their work…never be promoted, no matter how excellent their performances were" (p. 226).

Recommendations for Practice

Results of this study indicated that as a group, MoEP faculty members were comfortable using low-tech instructional resources, whereas, computer and communication-related hardware and software had low usage by faculty. These results were in sharp contrast with other institutions of higher learning in Malaysia where universities have a digital optic fiber backbone, and several have incorporated distance-learning programs for professional and technical degrees. Universities throughout Malaysia have established environments where learning is designed to be very dynamic, lively, and brimming with interaction using multimedia technology and worldwide networking. The MoEP, including post-secondary institutions that educate mid-level technical professionals in engineering and business through two and three-year programs have not been provided with these opportunities. It is recommended that MoEP be at least on par if not more advanced than universities in the use of IT in student learning.

Faculty members came from diverse academic backgrounds. They represented different departments and areas and included persons who are experts in computer technology. As a way of helping faculty to use IT in their teaching, more experienced faculty might be used to identify appropriate hardware and software that allows other faculty and staff members to best accomplish their work. Faculty with IT experience might play the roles of trainers, to conduct workshops on IT use and application to teaching. Their skills should be explored further to develop a form of networking between the MoEPs and the Technical Education Department (TED). The TED and MoEP might consider becoming connected to the same type of network medium where the TED as a central authority manages all systems connected to the network. Each MoEP should be able to dedicate at least one computer that has an Internet connection to be part of the system so the latest updates from the MoE, TED, or Polytechnic Management Division PMD) may be accessed on a regular basis.

Inaccessibility to the latest updated MoEP faculty directory at the TED, MoE during the sampling process was an indication that communication between the PMD and the MoEP may need to be clearer. The MoEP had been sending paper copies of monthly updated lists of personnel despite instructions by the PMD to send them on floppy disks. This hindered PMD in making regular updates to the MoEP personnel list. The PMD and MoEP should utilize computer technology to provide accurate and timely information through the Internet (e.g., the WWW and electronic mail). Without this capability in place, decisions may be based on inaccurate, obsolete data. The TED and MoEP should consider utilizing the Intranet set up by the MoE to expand its database management capability. This would benefit the TED in its ability to manage documents, inventory, facilities, staffing, and student management.

Finally, the results of this research can be utilized to help the MoE and the TED in directing efforts to support for IT in MoEP teaching. The extent to which IT is accessible to

faculty, and its support for faculty and ultimately used by faculty in their teaching will most certainly affect whether or not future MoEP graduates function as world class workers in the workplace.

Recommendations for Further Research

Results of this research could serve as baseline data to plot the future progress efforts to improve IT use in teaching at MoEPs. The study might be repeated every year or two to determine what progress has been made in this direction. These follow-up studies could include a qualitative component to aid in targeting specific areas where IT availability, attitude, and use are more problematic.

Results of barriers that faculty perceived to exist in their institutions could lead to further investigation on how to develop solutions for overcoming these barriers. Barriers that exist need to be minimized, if not eliminated. It is suggested that the administrators in each of the MoEP use the barriers mentioned in this research as a checklist or a set of guidelines to see whether the barriers do exist in their institution. In addition, if they do find that barriers exist, each MoEP offer suggestions to the Ministry of Education to help minimize or overcome them.

It was also noted in the study results that a large majority of the faculty members never attended any faculty professional development associated with IT for a period of five years (i.e., from 1996 – 2000). Faculty members who took their own initiatives to learn to use IT and communication related skills were fortunate. For the faculty members who had no opportunity for self-development, and still do not have essential knowledge to use IT are technologically challenged. The study can serve as a research benchmark to design useful training programs and encourage the use of IT where it has found to be effective. Perhaps each MoEP or the PMD can conduct a study to design individualized professional development plan for the use by each MoEP faculty members. The individualized professional development plan can serve as guidelines for faculty members, so they can select training programs that meet specific needs (i.e., to incorporate the knowledge into teaching after completing the course or workshop attended).

The study as a whole provides useful information that could be used for further investigation on what consensus faculty members have about IT, their attitudes, as well as research focusing on what IT availability and support are necessary to achieve acceptable use of IT in teaching and IT use. It would also help the MoEP and TED to meet the needs of a national commitment to adopt IT as aspired by the National Education Policy, the Multimedia Super Corridor, and to accomplish the national agenda to be a developed nation by the year 2020.

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APPENDICES

APPENDIX A

MoE Polytechnic
Faculty Information Technology Survey

MoE POLYTECHNIC FACULTY INFORMATION TECHNOLOGY SURVEY

The purpose of this survey is to find out your adoption proneness, what information technology (IT) you use, how much you use IT in your teaching, as well as how you view IT, and barriers for use in your teaching. For this survey, IT includes the various computer- and communication-related items that can be used to improve teaching in Malaysian Ministry of Education Polytechnics.

Please answer ALL the items as clearly and accurately as you can.
Your responses will be of great value to future planning of instruction in Malaysian Ministry of Education Polytechnics.

Please be assured that your responses **WILL** be kept confidential at all times.
The researcher is the only person allowed to keep, examine, and analyze the data in its original form.

Part I: Adoption-Proneness Scale

Instructions: For each question please mark
1 for **no, never**; **3** for **usually not, infrequently**; **5** for **yes, almost always**;
2 for **no, almost never**; **4** for **usually yes, frequently**; **6** for **yes, always**.

1. Is your general disposition toward new ideas and programs one of open-minded optimism? [___]
2. Are you willing to try something new -- something that will require extra initial effort on your part? [___]
3. Are you willing to try something new even if it may fail? (Your answer should not apply to fragmented or poorly planned and structured ideas and programs.) [___]
4. Does your selection of innovations reflect careful thought about the overall needs and priorities of your situation? [___]
5. When an educational innovation is considered, do you develop or help develop a strategy or plan of action for bringing about its successful implementation? [___]
6. Do you feel that you have sufficient freedom to initiate new programs and/ or new ideas? [___]
7. Do you exercise persistence and diplomacy in sticking with an innovation you would like to try, believing "powers that be" can be brought around from what may be an initial coolness? [___]
8. Are you willing to have your innovation brought under careful scrutiny by your colleagues and others with inherent possibilities of conflicting points of view -- personal as well as professional? [___]
9. Do you make a special effort to read about innovations and changes in your field? [___]
10. Do you take the initiative in contacting other institutions that are trying an idea or program that is of interest to you? [___]
11. Do you bring new ideas and developments to the attention of colleagues as well as appropriate department heads? [___]
12. Are you willing to ask yourself "why" about your teaching methods and the materials used? [___]
13. Do you feel that your department head encourages you to innovate and to try new ideas and programs? [___]
14. Do you feel that your institution's administration encourages you to innovate and to try new ideas and programs? [___]
15. Do you take time to consider and seek to gain greater insight into the processes of educational change? [___]
16. Do coffee breaks or informal conversations include new ideas and developments in curriculum and [___]

instruction?

17. Are you aware (in terms of knowing some details) of the growing importance of research, experimentation, and innovation in Malaysian education? [___]

Part II: Information Technology (IT) Use

18. For the period January to December 2000, to what extent do you use the different types of IT in your teaching? For each statement on questions 18.1 – 18.12 and 19 please mark

1 for **no, never**; **3** for **usually not, infrequently**; **5** for **yes, almost always**;
2 for **no, almost never**; **4** for **usually yes, frequently**; **6** for **yes, always**.

18.1	Email to communicate with students and other instructors…….	[____]
18.2	Online student discussion groups on the Internet (e.g., listserv, newsgroup)….	[____]
18.3	Accessing WWW for instructional purposes and learning…….	[____]
18.4	Presentation software (e.g., PowerPoint, spreadsheet, database)……	[____]
18.5	Simulations of exploratory environments (e.g., CAD, SIM, GIS)…….	[____]
18.6	Information on CD-ROMs in teaching …….	[____]
18.7	Scanner (e.g., for digitizing photos & graphics) for teaching ……..	[____]
18.8	Multimedia-authoring program for teaching……..	[____]
18.9	Overhead projector (OHP)…….	[____]
18.10	Slide projector……	[____]
18.11	Video recorder (VCR)……..	[____]
18.12	Other. Please Describe: _____	[____]

19. In general, to what extent do you use IT in your teaching? …… [____]

Part III: Information Technology

Instruction: For questions 20.1 - 20.4 place an **X** at the point on the scale that agrees with your best judgment about the use of IT in your teaching.

20. What are your feelings about using IT in your teaching?

20.1 **Using IT in your teaching**
Good ____: ____: ____: ____: ____: ____: ____ Bad

20.2 **Using IT in your teaching**
Meaningful ____: ____: ____: ____: ____: ____: ____ Meaningless

20.3 **Using IT in your teaching**
Pleasant ____: ____: ____: ____: ____: ____: ____ Unpleasant

20.4 **Using IT in your teaching**
Fair ____: ____: ____: ____: ____: ____: ____ Unfair

Part IV. Faculty Professional Development

21. Please indicate the total number of contact hours of courses or workshops related to using IT in education that you attended from 1996 – 2000.

21.1 Courses offered by local/ foreign universities	_____ Hours
21.2 Courses offered by National Institute of Public Admin.	_____ Hours
21.3 Courses offered by the Ministry of Education	_____ Hours
21.4 Courses offered by the Technical Education Department	_____ Hours
21.5 Courses organized by the Polytechnics	_____ Hours
21.6 Department In-house training	_____ Hours

Part V. Support Services

For each statement on numbers 22 – 24 please mark

1 for **no, never**; **3** for **usually not, infrequently**; **5** for **yes, almost always**;
2 for **no, almost never**; **4** for **usually yes, frequently**; **6** for **yes, always**.

22. How available is each type of support when you need it?

    22.1 Technical support (e.g., computer and software fixes)……..…. [____]

    22.2 Instructional Support (e.g., to incorporate technology into instruction) ……. [____]

23. How often do you need each type of support?

    23.1 Technical support (e.g., computer and software fixes)…… [____]

    23.2 Instructional Support (e.g., to incorporate technology into instruction)…… [____]

24. How much would you use IT in your teaching if you always received adequate support?

    24.1 Technical support (e.g., computer and software fixes)……... [____]

    24.2 Instructional Support (e.g., to incorporate technology into instruction) …… [____]

Part VI. Information Technology Barriers

For each statement on numbers 25 – 26 please mark

1 for **no, never**; **3** for **usually not, infrequently**; **5** for **yes, almost always**;
2 for **no, almost never**; **4** for **usually yes, frequently**; **6** for **yes, always**.

25. In general, how often do you encounter barriers to IT use in your teaching? …… [____]

26. How often do you encounter the following as barriers to IT use in your teaching?

    26.1 Access to comp uters in laboratories…… [____]

    26.2 Access to computers in classrooms……. [____]

    26.3 Access to computer with WWW access in classrooms……... [____]

    26.4 Obsolete technology……. [____]

    26.5 Insufficient software……. [____]

    26.6 Access to photocopying (cost-free-use)…….……. [____]

    26.7 Access to computers in the staff room or office…….……. [____]

    26.8 Access to the WWW from the staff room or office……. [____]

    26.9 Access to telephone in the classroom……. [____]

    26.10 Access to technical support (e.g., computer and software fixes)…… [____]

    26.11 Access to instructional support (e.g., to incorporate technology into teaching)……. [____]

    26.12 Lack of necessary IT skills……. [____]

    26.13 Lack of time to gain IT skills……. [____]

    26.14 Lack of experience with IT oriented pedagogy……..…… [____]

    26.15 Lack of IT training opportunities…….. [____]

    26.16 Other. Please describe_____ [____]

Part VII: Demographics

27. How many periods did you teach per week from June – December 2000? _____Periods.

28. Which of the following describes the department you are in? Check ( ) the one that applies.

1.	Commerce [___]	7.	Electronics [___]
2.	Civil Engineering [___]	8.	Design [___]
3.	Electrical Engineering [___]	9.	Hospitality & fashion [___]
4.	Mechanical Engineering [___]	10.	Computer [___]
5.	Marine Engineering [___]	11.	General Studies [___]
6.	Food Technology [___]	12.	Other_____

29. How many years have you served the Ministry of Education as teacher/ instructor? _____ Years.

30. How many years have you been serving in the MoE Polytechnic system? _____ Years.

31. What is your gender? Check ( ) the one that applies. Male [___] Female [___]

32. In what year were you born? 19_____

33. What is your highest level of education? Check ( ) the one that applies.

1. Certificate/ Diploma	[___]	4. Masters degree	[___]
2. Bachelors degree	[___]	5. Masters working on doctorate	[___]
3. Bachelors working on Masters	[___]	6. Doctoral degree	[___]

34. Please enter the name of your polytechnic _____

APPENDIX B

Instructions to Coordinators

Date: 13th December 2000

Principal
Polytechnic …….

Dear Sir or Madam:

Instructions to Coordinators

All coordinators to the survey are to adhere to the following instruction at all times.

1. Enclosed are the following materials:
    a. A list of instructors at your polytechnic who have been randomly selected to participate in this study. There should be _____names in the list.
    b. _____ packages of survey materials. Each package consists of:
        i. Informed Consent Form (Page 1)
        ii. MoE Polytechnic Faculty Information Technology Survey (Questions 1 through 34 – Page 2 through 4)
2. Each package is meant for the faculty whose name is in the list.
3. To preserve confidentiality and anonymity, please DO NOT write faculty's name on any of the survey materials.
4. DO NOT distribute survey materials to any faculty who is not in the list.
5. Coordinators are reminded NOT to imply or suggest to the respondents that they are expected or required to complete the survey. Respondents are at any time allowed to withdraw from the survey without penalty.
6. Remind each respondent to seal the completed form in a provided envelope, and return to the coordinator within seven days.
7. Coordinators are reminded to only check the numbers of completed survey forms returned to you. DO NOT record respondent's names in any form.
8. To preserve confidentiality and anonymity, coordinators are to deliver the first reminder letter to all respondents after seven days, and the second reminder letter ten days after the initial distribution of the survey materials in the event of non-response.
9. Please call Zulkifli Zakaria at 540-951-4372 (home) or 540-231-4831 (office) if you have any questions.
10. Coordinators are to mail all responses to the researcher at the given address below, not later than 18 January, 2001:

    Zulkifli Zakaria
    Cranwell International Center
    Virginia Polytechnic Institute & State University
    Blacksburg, VA 24061 - 0509

Thank You.

Yours truly,

ZULKIFLI ZAKARIA

APPENDIX C

Cover Letter to Faculty Members

To: Malaysian Ministry of Education Polytechnics Faculties
From: Zulkifli Zakaria
Re: Factors Related to Information Technology Implementation in Malaysian Ministry of Education Polytechnics
Date: January 3, 2001

I am a Malaysian education officer attached to one of the Polytechnics on an approved study leave by the National Institute of Public Administration (without pay nor scholarship) from the Malaysian Government. As a Vocational Technical Education PhD candidate in the process of doing my dissertation research at Virginia Polytechnic Institute and State University, I am interested in examining the implementation of IT in the curriculum, and to identify barriers faculty face in their attempts to use IT in the college setting. By understanding the adoption and use of IT, and support needed to incorporate them into the curriculum could help faculty and students in using them more effectively. The awareness of barriers faced to use IT will enable steps to overcome these barriers.

You have been randomly selected to participate in this study. This study is confidential. No individual responses will be revealed. The Educational Planning and Research Department, and the Technical Education Department, Ministry of Education Malaysia has given me permission to conduct this survey.

This survey is not translated into the Malay Language because I am confident of your English Language skills. Attached is Informed Consent for Participants of Investigative Projects for you to sign before taking part in the survey.

Thank your for your cooperation and help.

Sincerely,

Zulkifli Zakaria

Office:
Cranwell International Center
Virginia Polytechnic Inst. & State Univ.
Blacksburg, VA 24061-0509
Phone: 540-231-4831

Kepada: Fakulti Politeknik-Politeknik Kementerian Pendidikan Malaysia

Daripada: Zulkifli bin Zakaria
Re: Kajiselidik "Factors Related to Information Technology Implementation in Malaysian Ministry of Education Polytechnics
Tarikh: 3 Januari, 2001

Sebagai mukadimah, saya adalah fakulti di salah sebuah Politeknik Kementerian Pendidikan Malaysia kini diluluskan oleh Jabatan Perkkhidmatan Awam bercuti belajar tanpa gaji tanpa biasiswa di peringkat Doktor Falsafah di Virginia Polytechnic Institute & State University (Virginia Tech) dalam bidang Pendidikan Vokasional & Teknik. Sebagai calon PhD, saya berminat untuk mengkaji implimentasi teknologi maklumat (IT) dalam kurikulum, dan mengenalpasti halangan yang dihadapi oleh para fakulti untuk menggunakan IT di politeknik. Dengan memahami penerimaan serta penggunaan IT, serta khidmat sokongan yang diperlukan untuk melaksanakannya dalam kurikulum, dapat membantu fakulti dan pelajar untuk menggunakannya dengan lebih efektif. Kesedaran tentang halangan yang dihadapi untuk menggunakan IT akan membolehkan tindakan diambil untuk mengatasi halangan-halangan ini.

Saudara/ i telah dipilih secara rambang untuk mengambil bahagian dalam kajian ini. Kajian ini adalah rahsia dan tiada respon individu akan disebar umum. Bahagian Perancangan dan Penyelidikan, Jabatan Pendidikan Teknikal, Kementerian Pendidikan Malaysia telah memberi izin bagi saya menjalankan kajiselidik ini.

Kajiselidik ini tidak saya terjemahkan ke dalam Bahasa Melayu kerana saya yakin kemampuan Bahasa Inggeris saudara/i adalah baik. Bersama ini disertakan borang persetujuan yang ditetapkan oleh pihak universiti, "Informed Consent for Participants of Investigative Projects" untuk saudara/ i tandatangani sebelum mengisi borang kajiselidik berkenaan.

Terima kasih atas kerjasama dan bantuan saudara/ i dalam menjayakan kajian saya ini.

Yang benar,

Zulkifli Zakaria

Pejabat:
Cranwell International Center
Virginia Polytechnic Inst. & State Univ.
Blacksburg, VA 24061-0509
Telefon: 540-231-4831

APPENDIX D

First Reminder Letter to Faculties

To: Malaysian Ministry of Education Polytechnics Faculties
From: Zulkifli Zakaria
Re: Factors Related to Information Technology Implementation in Malaysian Ministry of Education Polytechnics
Date: January 25, 2001

A few weeks ago Mr./ Mrs. ……. coordinating on my behalf delivered you a MoE Polytechnic Faculty Information Technology survey. If you have not completed the survey or lost the first survey, please take 30 minutes of your time to fill out the enclosed survey, and return it to appointed coordinator within three days upon receiving this letter.

As I have stated in my initial letter, you have been randomly selected to participate in this study. This study is confidential. No individual responses will be revealed. The Educational Planning and Research Department, and the Technical Education Department, Ministry of Education Malaysia has given me permission to conduct this survey.

This survey is not translated into the Malay Language because I am confident of your English Language skills. Attached is Informed Consent for Participants of Investigative Projects for you to sign before taking part in the survey.

Thank your for your participation in this study.

Sincerely,

Zulkifli Zakaria

Office:
Cranwell International Center
Virginia Polytechnic Inst. & State Univ.
Blacksburg, VA 24061-0509
Phone: 540-231-4831

APPENDIX E

Second and Final Reminder Letter

To: Malaysian Ministry of Education Polytechnics Faculties
From: Zulkifli Zakaria
Re: Factors Related to Information Technology Implementation in Malaysian Ministry of Education Polytechnics
Date: February, 2001

A few days ago Mr./ Mrs. ……. coordinating on my behalf delivered you a MoE Polytechnic Faculty Information Technology survey. If you have not completed the survey or lost the first survey, please take 30 minutes of your time to fill out the enclosed survey, and return it to appointed coordinator within right away.

As I have stated in my initial letter, you have been randomly selected to participate in this study. This study is confidential. No individual responses will be revealed. The Educational Planning and Research Department, and the Technical Education Department, Ministry of Education Malaysia has given me permission to conduct this survey.

This survey is not translated into the Malay Language because I am confident of your English Language skills. Attached is Informed Consent for Participants of Investigative Projects for you to sign before taking part in the survey.

Thank your for your participation in this study.

Sincerely,

Zulkifli Zakaria

Office:
Cranwell International Center
Virginia Polytechnic Inst. & State Univ.
Blacksburg, VA 24061-0509
Phone: 540-231-4831

APPENDIX F

Letter from the Educational Planning and Research Department
Ministry of Education, Malaysia

Ministry of Education Malaysia
Educational Planning and Research Department
Level 2, 3 & 5, Block J
Pusat Bandar Damansara
50604 KUALA LUMPUR

Telephone: 03-2586900
Fax: 03-2554960
Web: http://eprd.kpm.my

Our Ref: KP (BPPDP) 13/15 (1177)
Date: 22 December 2000

Mr Zulkifli Zakaria
Cranwell International Center
Virginia Tech
Blacksburg, VA 24061-0509
USA

Dear Sir
Permission to Conduct Study at Schools, Teacher Training Colleges,
Education Departments, and Divisions Under the Ministry of Education Malaysia

This is to inform you that your application to conduct a study on:

"Factors Related to Information Technologies Implementation in Malaysian Ministry of Education Polytechnics"

has been approved.

2. This approval is based on your proposal submitted to our department. Permission to use the samples should be received from the Department Head/ State Education Director. Please submit a copy of your findings.

Thank You.

"SERVING THE NATION"

Yours Sincerely

(DR. AMIR MOHD. SALLEH)
for the Director
Educational Planning and Research Department
Ministry of Education Malaysia

KEMENTERIAN PENDIDIKAN MALAYSIA
BAHAGIAN PERANCANGAN DAN
PENYELIDIKAN DASAR PENDIDIKAN
PARAS 2,3 DAN 5,BLOK J
PUSAT BANDAR DAMANSARA
50604 KUALA LUMPUR

Telefon : 03-2586900
Fax : 03-2554960
Laman Web : http://eprd.kpm.my

Ruj. Kami : KP(BPPDP) 13/15 (1177)
Tarikh : 22 Disember 2000.

En. Zulkifli bin Zakaria,
Granwell International Center,
Virginia Tech, Blacksburg,
V4 24061-0509,
USA.

Tuan,

Kebenaran Untuk Menjalankan Kajian Di Sekolah-Sekolah, Maktab-Maktab Perguruan, Jabatan-Jabatan Pendidikan Dan Bahagian-Bahagian Di Bawah Kementerian Pendidikan Malaysia

Adalah saya dengan hormatnya diarah memaklumkan bahawa permohonan tuan untuk menjalankan kajian bertajuk:

"Factors Related To Information Technologies Implementation In Malaysian Ministry Of Education Polytechnics"

telah diluluskan.

2. Kelulusan ini adalah berdasarkan kepada apa yang terkandung di dalam cadangan penyelidikan yang tuan kemukakan ke Bahagian ini. **Kebenaran bagi menggunakan sampel kajian perlu diperolehi daripada Ketua Bahagian/Pengarah Pendidikan Negeri yang berkenaan.** Sila kemukakan ke Bahagian ini senaskhah laporan kajian tuan setelah ia selesai kelak.

Sekian untuk makluman dan tindakan tuan selanjutnya. Terima kasih.

"BERKHIDMAT UNTUK NEGARA"

Saya yang menurut perintah,

(DR. AMIR BIN MOHD. SALLEH)
b.p. Pengarah,
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Appendix G

Distribution and Summary Statistics for Demographic Variables

Table G1

Distribution and Summary Statistics for Respondents' Ages

Age Categories	n	%	Valid %
25	2	0.8	0.8
26	3	1.2	1.2
27	7	2.8	2.8
28	11	4.4	4.5
29	15	6.0	6.1
30	12	4.8	4.9
31	7	2.8	2.8
32	9	3.6	3.6
33	9	3.6	3.6
34	17	6.7	6.9
35	21	8.3	8.5
36	14	5.6	5.7
37	19	7.5	7.7
38	12	4.8	4.9
39	21	8.3	8.5
40	10	4.0	4.0
41	6	2.4	2.4
42	7	2.8	2.8
43	8	3.2	3.2
44	9	3.6	3.6
45	4	1.6	1.6
46	6	2.4	2.4
47	4	1.6	1.6
48	3	1.2	1.2
49	4	1.6	1.6
50	2	0.8	0.8
51	2	0.8	0.8
52	2	0.8	0.8
55	1	0.4	0.4
No response	5	2.0	Missing
Total	252	100.0	100

Summary Statistics						
Mean	=	36.6	Median=	36	Mode =	35
Std. Deviation	=	6.18	Max =	55	Min =	25

Note: For the calculation of valid percentages, non-responses or missing values were not included in the denominator.

Table G2

Distribution and Summary Statistics for Teaching Load per Week

No. of Teaching Periods	n	%	Valid %
0	4	1.6	1.6
1	1	0.4	0.4
2	1	0.4	0.4
3	3	1.2	1.2
4	2	0.8	0.8
5	2	0.8	0.8
6	3	1.2	1.2
7	3	1.2	1.2
8	3	1.2	1.2
9	1	0.4	0.4
10	3	1.2	1.2
11	1	0.4	0.4
12	15	6.0	6.0
13	8	3.2	3.2
14	8	3.2	3.2
15	17	6.7	6.9
16	9	3.6	3.6
17	7	2.8	2.8
18	36	14.3	14.5
19	5	2.0	2.0
20	37	14.7	14.9
21	19	7.5	7.7
22	15	6.0	6.0
23	8	3.2	3.2
24	17	6.7	6.9
25	5	2.0	2.0
26	8	3.2	3.2
27	2	0.8	0.8
28	2	0.8	0.8
29	2	0.8	0.8
30	1	0.4	0.4
No Response	4	1.6	Missing
Total	252	100.0	100.0

Summary Statistics					
Mean	= 17.7	Median=	18	Mode =	20
Std. Deviation	= 5.90	Max =	30	Min =	0

Note: For the calculation of valid percentages, non-responses or missing values were not included in the denominator.

Table G3
Distribution and Summary Statistics for Respondents' Department

Department	n	%	Valid %
Commerce	48	19.0	19.0
Civil Engineering	45	17.9	17.9
Electrical Engineering	51	20.2	20.2
Mechanical Engineering	44	17.5	17.5
Marine Engineering	3	1.2	1.2
Food Technology	3	1.2	1.2
Electronics	4	1.6	1.6
Design	4	1.6	1.6
Hospitality & Fashion	4	1.6	1.6
Computer	13	5.2	5.2
General Studies	30	11.9	11.9
Other Departments	3	1.2	1.2
Total	252	100.0	100.0

Summary Statistics:

Mean	= 4.3	Median=	3	Mode =	3
Std. Deviation	= 3.45	Max =	12	Min =	1

Table G 4

Distribution and Summary Statistics for Respondents' Years Served for the Ministry of Education

Years Served	n	%	Valid %
< 1 year	1	.4	.4
1	11	4.4	4.4
2	27	10.7	10.7
3	18	7.1	7.1
4	4	1.6	1.6
5	11	4.4	4.4
6	7	2.8	2.8
7	12	4.8	4.8
8	12	4.8	4.8
9	16	6.3	6.3
10	30	11.9	11.9
11	16	6.3	6.3
12	11	4.4	4.4
13	7	2.8	2.8
14	10	4.0	4.0
15	6	2.4	2.4
16	5	2.0	2.0
17	2	.8	.8
18	4	1.6	1.6
19	2	.8	.8
20	14	5.6	5.6
21	5	2.0	2.0
22	3	1.2	1.2
23	3	1.2	1.2
24	8	3.2	3.2
25	2	.8	.8
26	2	.8	.8
27	2	.8	.8
28	1	.4	.4
Total	252	100.0	100.0

Summary Statistics						
Mean	=	10.3	Median=	10	Mode =	10
Std. Deviation	=	6.88	Max =	29	Min =	0

Table G 5

Distribution and Summary Statistics for Respondents'
Years Served for the Ministry of Education Polytechnics (MoEP)

Years Served	n	%	Valid %
1	18	7.1	7.1
2	42	16.7	16.7
3	29	11.5	11.5
4	11	4.4	4.4
5	8	3.2	3.2
6	14	5.6	5.6
7	12	4.8	4.8
8	12	4.8	4.8
9	12	4.8	4.8
10	29	11.5	11.5
11	10	4.0	4.0
12	11	4.4	4.4
13	11	4.4	4.4
14	7	2.8	2.8
15	7	2.8	2.8
16	3	1.2	1.2
17	3	1.2	1.2
18	2	.8	.8
20	7	2.8	2.8
21	2	.8	.8
24	2	.8	.8
Total	252	100.0	100.0

Summary Statistics							
Mean	=	7.5	Median=	7	Mode	=	2
Std. Deviation	=	5.33	Max	= 24	Min	=	1

Table G 6

Distribution and Summary Statistics for Respondents' Highest Level of Education

Level of Education	n	%	Valid %
Teachers' Certificate/ Diploma	46	18.3	18.6
Bachelors' Degree	118	46.8	47.8
Bachelors' Working on Masters	17	6.7	6.9
Masters' Degree	65	25.8	26.3
Masters Working on Doctorate	1	.4	.4
No Response	5	2.0	Missing
Total	252	100.0	100.0

Summary Statistics							
Mean	=	2.4	Median=	2	Mode	=	2
Std. Deviation	=	1.08	Max	= 5	Min	=	1

Note: For the calculation of valid percentages, non-responses or missing values were not included in the denominator.

Table G 7

Distribution and Summary Statistics for Respondents' MoEP Membership

Names of MoEP	n	%	Valid %
A	23	9.1	9.1
B	25	9.9	9.9
C	20	7.9	7.9
D	37	14.7	14.7
E	10	4.0	4.0
F	6	2.4	2.4
G	20	7.9	7.9
H	21	8.3	8.3
I	36	14.3	14.3
J	18	7.1	7.1
K	7	2.8	2.8
L	29	11.5	11.5
Total	252	100.0	100.0

Summary Statistics							
Mean	=	6.4	Median=	7	Mode	=	4
Std. Deviation	=	3.58	Max	= 12	Min	=	1

Appendix H

Research Question 1: Rank Order and Descriptive Statistics
for Items Included in the Adoption – Proneness Scale

Rank Orders and Descriptive Statistics for items included in the adoption-proneness scale

Items	Levels of adoption-proneness												M	SD	RO
	1		2		3		4		5		6				
	n	%	n	%	n	%	n	%	n	%	n	%			
#1	2	0.8	7	2.8	19	7.5	105	41.7	77	30.6	42	16.7	4.5	1.01	16
#2	0	0.0	1	0.4	12	4.8	88	34.9	90	35.7	61	24.2	4.8	.88	17
#3	3	1.2	8	3.57	52	20.6	93	36.9	62	24.6	34	13.5	4.2	1.09	9
#4	3	1.2	6	2.4	30	11.9	91	36.1	85	33.7	37	14.7	4.4	1.04	13
#5	5	2.0	11	4.4	32	12.7	76	30.2	85	33.7	43	17.1	4.4	1.16	4
#6	4	1.6	23	9.1	71	28.2	79	31.3	57	22.6	18	7.1	3.9	1.15	5
#7	8	3.2	10	4.0	36	14.3	127	50.4	57	22.6	14	5.6	4.0	1.02	15
#8	4	1.6	10	4.0	35	13.9	111	44.0	70	27.8	22	8.7	4.2	1.03	14
#9	1	0.4	7	2.8	34	13.5	94	37.3	74	29.4	42	16.7	4.4	1.04	13
#10	13	5.2	22	8.7	60	23.8	77	30.6	61	24.2	19	7.5	3.8	1.25	1
#11	5	2.0	12	4.8	52	20.6	89	35.3	68	27.0	26	10.3	4.1	1.12	6
#12	4	1.6	3	1.2	22	8.7	75	29.8	92	36.5	56	22.2	4.7	1.06	11
#13	8	3.2	9	3.6	39	15.5	81	32.1	71	28.2	44	17.5	4.3	1.21	2
#14	8	3.2	20	7.9	53	21.0	76	30.2	69	27.4	26	10.3	4.0	1.23	3
#15	5	2.0	15	6.0	39	15.5	105	41.7	66	26.2	22	8.7	4.1	1.08	10
#16	6	2.4	12	4.8	49	19.4	87	34.5	74	29.4	24	9.5	4.1	1.12	6
#17	3	1.2	8	3.2	24	9.5	90	35.7	73	29.0	54	21.4	4.5	1.10	8

Overall Mean= 4.26 SD= 1.0935

Note:

1 for no, never; 3 for usually not, infrequently; 5 for yes, almost always;
2 for no, almost never; 4 for usually yes, frequently 6 for yes, always

#1. General disposition toward new ideas and programs
#2. Willingness to try something new
#3. Willingness to try something new even if it may fail
#4. Selection of innovations reflected careful thought about the overall needs and priorities
#5. Develop or help develop a strategy or plan of action for bringing about its successful implementation
#6. Sufficient freedom to initiate new programs and/ or new ideas
#7. Persistence and diplomacy in sticking with an innovation you would like to try, believing "powers that be" can be brought around from what may be an initial coolness
#8. Willingness to have innovation brought under careful scrutiny
#9. Effort to read about innovations and changes faculty field of expertise
#10. Initiative in contacting other institutions that are trying an idea or program.
#11. Bringing new ideas and developments to the attention of colleagues as well as appropriate department heads
#12. Willingness to ask "why" about your teaching methods and the materials used?
#13. Encouragement of department heads to innovate and to try new ideas and programs
#14. Encouragement of institution's administration to innovate and to try new ideas and programs
#15. Time to consider and seek to gain greater insight into the processes of educational change
#16. New ideas and developments in curriculum and instruction during coffee break/ informal discussions
#17. Awareness of the growing importance of research, experimentation, and innovation in Malaysian education.

Appendix I

Research Question 3: Rank Order and Descriptive Statistics
for Bi-Polar Adjectives Included in
Attitude toward Information Technology

Rank Orders and Descriptive Statistics for Bi-Polar Adjectives Included in Attitude Toward IT

Items	f	Attitude toward IT							Total	M	SD	RO
		1	2	3	4	5	6	7				
Good - Bad	n	122	58	38	27	4	3	0	252	2.0	1.18	3
	%	48.4	23.0	15.1	10.7	1.6	1.2	0.0	100			
Meaningful-Meaningless	n	123	69	50	9	1	0	0	252	1.8	.91	4
	%	48.8	27.4	19.8	3.6	0.4	0.0	0.0	100			
Pleasant - Unpleasant	n	105	66	42	31	7	1	0	252	2.1	1.18	2
	%	41.7	26.2	16.7	12.3	2.8	0.4	0.0	100			
Fair - Unfair	n	97	52	54	36	9	4	0	252	2.3	1.29	1
	%	38.5	20.6	21.4	14.3	3.6	1.6	0.0	100			
Overall Mean =		2.04			SD=	1.14						

Note:
Attitude: **1.** Extremely **2.** Quite **3.** Slightly **4.** Neutral **5.** Slightly **6.** Quite **7.** Extremely

Appendix J

Research Question 4: Faculty Professional Development Experiences

Table J1

Faculty Professional Development Attended for the years 1996 - 2000 (N = 252)

	Courses by Local/ Foreign Universities	Courses by NIPA	Courses by MoE	Courses by TED	Courses by MoEP	Department-in-house Training
M	30.4	7.3	5.7	11.0	16.4	10.5
Med	.0	.0	.0	.0	3.0	.0
Mode	.0	.0	.0	.0	.0	.0
SD	137.53	56.07	46.48	44.58	43.47	23.62
Range	1800	800	720	480	450	180
Min	.00	.00	.00	.00	.00	.00
Max	1800	800	720	480	450	180

Table J2

Courses/ Workshops Sponsored by Local/ Foreign Universities for the years 1996 - 2000

Contact Hours Attended	n	%
0	183	72.6
2	6	2.4
3	1	0.4
4	1	0.4
5	1	0.4
6	1	0.4
7	1	0.4
8	3	1.2
10	3	1.2
11	2	0.8
12	1	0.4
16	2	0.8
18	1	0.4
20	10	4.0
24	1	0.4
30	3	1.2
32	1	0.4
40	3	1.2
45	2	0.8
48	1	0.4
50	1	0.4
52	1	0.4
60	1	0.4
72	1	0.4
75	1	0.4
80	2	0.8
100	3	1.2
120	2	0.8
160	2	0.8
200	2	0.8
300	2	0.8
320	1	0.4
360	1	0.4
450	1	0.4
480	1	0.4
540	1	0.4
600	1	0.4
1800	1	0.4

Note. N = 252.

Table J3

Courses/ Workshops Sponsored by National Institute of Public Administration for the years 1996-2000

Contact Hours Attended	n	%
0	221	87.7
1	2	0.8
2	3	1.2
4	1	0.4
5	1	0.4
6	1	0.4
8	2	0.8
10	3	1.2
15	4	1.6
18	1	0.4
20	1	0.4
24	1	0.4
30	1	0.4
36	1	0.4
40	2	0.8
48	2	0.8
60	1	0.4
80	1	0.4
100	1	0.4
360	1	0.4
800	1	0.4

Note. N = 252.

Table J4

Courses/ Workshops Sponsored by the Ministry of Education for the years 1996-2000

Contact Hours Attended	n	%
0	215	85.3
1	1	0.4
2	5	2.0
3	1	0.4
4	3	1.2
5	3	1.2
7	1	0.4
8	1	0.4
10	4	1.6
16	2	0.8
17	1	0.4
20	5	2.0
24	1	0.4
36	2	0.8
40	1	0.4
48	1	0.4
50	2	0.8
80	1	0.4
100	1	0.4
720	1	0.4

Note. N = 252.

Table J5

Courses/ Workshops Sponsored by the Technical Education Department for the years 1996-2000

Contact Hours Attended	n	%
0	196	77.8
1	1	0.4
2	7	2.8
3	1	0.4
4	2	0.8
5	2	0.8
6	1	0.4
10	4	1.6
12	1	0.4
15	3	1.2
18	1	0.4
20	4	1.6
24	6	2.4
30	5	2.0
40	4	1.6
48	2	0.8
50	2	0.8
60	1	0.4
100	1	0.4
120	3	1.2
150	1	0.4
200	1	0.4
224	1	0.4
320	1	0.4
480	1	0.4

Note. N = 252.

Table J6

Courses/ Workshops Sponsored by each individual MoEP for the years 1996-2000

Contact Hours Attended	n	%
0	115	45.6
1	1	0.4
2	8	3.2
3	9	3.6
4	3	1.2
5	8	3.2
6	6	2.4
8	10	4.0
10	12	4.8
12	4	1.6
14	1	0.4
16	9	3.6
18	3	1.2
20	20	7.9
24	14	5.6
30	5	2.0
32	3	1.2
36	1	0.4
40	1	0.4
48	1	0.4
60	4	1.6
64	1	0.4
80	3	1.2
100	2	0.8
120	2	0.8
150	1	0.4
160	1	0.4
200	2	0.8
300	1	0.4
450	1	0.4

Note. N = 252.

Table J7

Courses/ Workshops through Department-in-house training the for the years 1996-2000

Contact Hours Attended	n	%
0	136	54.0
1	3	1.2
2	12	4.8
3	6	2.4
4	7	2.8
5	5	2.0
6	5	2.0
8	5	2.0
10	12	4.8
12	5	2.0
15	3	1.2
16	4	1.6
18	2	0.8
20	12	4.8
24	4	1.6
25	2	0.8
30	6	2.4
32	2	0.8
40	3	1.2
42	1	0.4
45	1	0.4
48	2	0.8
50	2	0.8
52	1	0.4
56	1	0.4
60	3	1.2
64	1	0.4
80	1	0.4
100	1	0.4
120	1	0.4
150	2	0.8
180	1	0.4

Note. N = 252.

Appendix K

Research Question 5: Availability of Support Services
to Incorporate Information Technology into Teaching

Table K1

Perception of Respondents' on IT Support Services Available at Each MoEP

Support Services	M	SD
SS Availability (Technical)	3.7	1.36
SS Availability (Instructional)	3.3	1.30
SS Needed (Technical)	4.4	1.12
SS Needed (Instructional)	4.2	1.14
IT Use with SS (Technical)	4.4	1.18
IT Use with SS (Instructional)	4.3	1.20

Table K2

Extent Respondents Perceive IT Support Services Available to Incorporate in Teaching

	Levels of Support Services											
	1		2		3		4		5		6	
Characteristics	n	%	n	%	n	%	n	%	n	%	n	%
Availability-Technical	16	6.3	27	10.7	73	29.0	64	25.4	43	17.1	29	11.5
Availability-Instructional	26	10.3	37	14.7	74	29.4	74	29.4	27	10.7	14	5.6
Needed-Technical	3	1.2	8	3.2	43	17.1	79	31.3	76	30.2	43	17.1
Needed-Instructional	8	3.2	10	4.0	41	16.3	97	38.5	68	27.0	28	11.1
IT Use with SS-Technical	5	2.0	11	4.4	32	12.7	78	31.0	77	30.6	49	19.4
IT Use with SS-Instructional	6	2.4	12	4.8	38	15.1	80	31.7	73	29.0	43	17.1

Note:

1 for no, never; 3 for usually not, infrequently; 5 for yes, almost always;
2 for no, almost never; 4 for usually yes, frequently; 6 for yes, always.

Appendix L

Research Question 6: Barriers that Exist to IT Use in Teaching

Table L1

Frequency of IT Use Barrier in General

Characteristics	n	%
No, Never	7	2.8
No, Almost Never	18	7.1
Usually Not, Infrequently	54	21.4
Usually Yes, Frequently	83	32.9
Yes, Almost Always	60	23.8
Yes, Always	30	11.9
Total	252	100.0

Summary Statistics							
Mean	=	4.0	Median=	4	Mode	=	4
Std. Deviation	=	1.21	Max	= 6	Min	=	1

Table L2

Rank Orders and Descriptive Statistics for Items Included in IT Barrier

	Levels of Barriers Encountered in Teaching														
	1		2		3		4		5		6				
Item	n	%	n	%	n	%	n	%	n	%	n	%	M	SD	RO
#26.1	22	8.7	36	14.3	59	23.4	56	22.2	42	16.7	37	14.7	3.7	1.50	10
#26.2	38	15.1	23	9.1	28	11.1	40	15.9	43	17.1	80	31.7	4.1	1.81	4
#26.3	46	18.3	22	8.7	29	11.5	29	11.5	30	11.9	96	38.1	4.0	1.94	2
#26.4	36	14.3	24	9.5	58	23.0	57	22.6	41	16.3	36	14.3	3.6	1.57	6
#26.5	26	10.3	17	6.7	49	19.4	65	25.8	54	21.4	41	16.3	3.9	1.50	10
#26.6	30	11.9	38	15.1	58	23.0	43	17.1	44	17.5	39	15.5	3.6	1.60	5
#26.7	29	11.5	29	11.5	56	22.2	74	29.4	32	12.7	32	12.7	3.6	1.48	11
#26.8	38	15.1	21	8.3	42	16.7	36	14.3	36	14.3	79	31.3	4.0	1.81	4
#26.9	57	22.6	22	8.7	22	8.7	23	9.1	26	10.3	102	40.5	4.0	2.05	1
#26.10	34	13.5	23	9.1	42	16.7	74	29.4	45	17.9	34	13.5	3.7	1.54	7
#26.11	32	12.7	21	8.3	44	17.5	70	27.8	54	21.4	31	12.3	3.7	1.52	8
#26.12	17	6.7	22	8.7	59	23.4	80	31.7	49	19.4	25	9.9	3.8	1.32	14
#26.13	16	6.3	20	7.9	58	23.0	79	31.3	53	21.0	26	10.3	3.8	1.31	15
#26.14	20	7.9	24	9.5	38	15.1	84	33.3	55	21.8	31	12.3	3.9	1.40	13
#26.15	13	5.2	19	7.5	50	19.8	57	22.6	65	25.8	48	19.0	4.1	1.40	13
#26.16	0	0.0	0	0.0	0	0.0	0	0.0	2	.8	6	2.4	5.6	.46	16
				Overall Mean = 3.9						Standard Deviation = 1.51					

Note:

1 for no, never; 3 for usually not, infrequently; 5 for yes, almost always;
2 for no, almost never; 4 for usually yes, frequently; 6 for yes, always.

#26.1 Access to Computer in Lab
#26. 2 Access to Computer in class
#26. 3 Access to Computer with WWW in Class
#26. 4 Obsolete Technology
#26. 5 Insufficient Software
#26. 6 Access to Photocopy (cost-free-use)
#26. 7 Access to Computer in Staff room/ Office
#26. 8 Access to WWW in Staff room/ Office
#26. 9 Access to Telephone in Class
#26. 10 Access to Technical Support
#26. 11 Access to Instructional Support
#26. 12 Lack of Necessary IT Skills
#26. 13 Lack of Time to Gain IT Skills
#26. 14 Lack of Experience with IT Oriented Pedagogy
#26. 15 Lack of IT Training Opportunities
#26. 16 Other

Appendix M

Research Question 7: Relationship between Selected Faculty Demographic and IT use in Teaching

Table M1

One-Way Analysis of Variance Summary by Extent of IT Use in General and MoEP Membership

Source	SS	df	MS	F
Between Groups	42.2	11	3.84	2.6
Within Groups	352.7	240	1.50	
Total	395	251		

*p< .05

Table M2

One-Way Analysis of Variance Summary by Extent of IT Use in General and Department

Source	SS	df	MS	F
Between Groups	30.0	11	2.73	1.8
Within Groups	365.0	240	1.52	
Total	395.0	251		

*p< .05

Table M 3

Pearson Correlation Coefficients Among Demographics and Extent of IT Use in General

	1	2	3	4	5	6
1. Extent of IT Use in General	1.00	.16	.03	.04	.05	-.07
2. Highest Level of Education (with exception of 1)		1.00	-.19	-.20	-.21	-.10
3. Age			1.00	.58	.90	-.02
4. Years Served for the MoEP				1.00	.63	.03
5. Years Served for the Ministry of Education (MoE)					1.00	-.00
6.Teaching Load per Week						1.00

Note: All correlation at or above .138 are significant at .05 level.

Table M 4

Pearson Correlation Coefficients Among Variables in IT Use and Extent of IT Use in General

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1. Email	1.00	.60	.45	.39	.43	.46	.39	.46	.31	.37	.33	-.04	.01	-.01	.02	.14
2. Online Discussion		1.00	.42	.33	.40	.47	.38	.50	.21	.43	.37	-.14	-.06	-.01	-.03	.11
3. WWW			1.00	.34	.34	.44	.39	.36	.20	.22	.19	-.08	.01	.01	.00	.16
4. Presentation Software				1.00	.59	.54	.53	.59	.39	.48	.35	-.08	.01	.07	-.04	.12
5. Simulations					1.00	.58	.45	.58	.31	.45	.36	-.01	.01	.04	-.02	.07
6. CD-ROMs						1.00	.62	.73	.32	.50	.48	-.07	.05	.05	.01	.07
7. Scanner							1.00	.66	.36	.43	.33	.00	.10	.07	.07	.14
8. M'media Authoring Program								1.00	.37	.49	.45	-.06	.09	.07	.04	.07
9. Overhead Projector									1.00	.47	.47	-.09	.03	-.03	.01	.08
10. Slide Projector										1.00	.57	-.07	.03	.07	.05	.01
11. Video Recorder											1.00	-.08	.11	.04	.10	.05
12. Teaching Load per Week												1.00	-.00	.03	-.02	-.10
13. Years Served for the MoE													1.00	.63	.90	-.21
14. Years Served for the MoEP														1.00	.58	-.20
15. Age															1.00	-.19
16. Highest Level of Education																1.00

Note: All correlation at or above .138 are significant at .05 level.

Appendix N

Research Question 8: Prediction of IT Use in Teaching

Table N 1

Multiple Regression Analysis of IT Use in General Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-1.234E-02	.01	-.06	-.89
Years Served for the Ministry of Education	3.165E-02	.03	.17	1.11
Years Served for the MoEP	1.334E-02	.02	.06	.67
Gender	-8.686E-03	.17	-.00	-.05
Age	-2.998E-02	.03	-.15	-.99
Highest Level of Education	.20	.08	.17	2.57

Note: R^2 = .04, F = 1.63
p< . 05

Table N 2
Multiple Regression Analysis of Email Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-6.498E-03	.02	-.03	-.43
Years Served for the Ministry of Education (MoE)	1.992E-03	.03	.01	.06
Years Served for the MoEP	-4.257E-03	.02	-.02	-.20
Gender	-1.838E-02	.19	-.01	-.10
Age	5.877E-03	.03	.03	.18
Highest Level of Education with exception of 1	.188	.09	.15	2.16

Note: R^2 = .02, F = .89
p< . 05

Table N 3
Multiple Regression Analysis of Online Discussion Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-2.634E-02	.01	-.14	-2.20
Years Served for the Ministry of Education (MoE)	-2.105E-02	.03	-.13	-.85
Years Served for the MoEP	1.060E-02	.02	.05	.62
Gender	-5.422E-02	.15	-.03	-.37
Age	9.429E-03	.03	.05	.36
Highest Level of Education with exception of 1	.108	.07	.11	1.59

Note: R^2 = .04, F = 1.65
p< . 05

Table N 4

Multiple Regression Analysis of WWW Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-2.636E-02	.02	-.10	-1.49
Years Served for the Ministry of Education (MoE)	2.627E-02	.04	.11	.72
Years Served for the MoEP	-7.825E-03	.03	-.03	-.31
Gender	-.466	.22	-.14	-2.15
Age	-2.880E-02	.04	-.11	-.75
Highest Level of Education with exception of 1	.206	.10	.14	2.04

Note: R^2 = .05, F = 2.07
p< . 05

Table N 5

Multiple Regression Analysis of Presentation Software Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-2.243E-02	.02	-.08	-1.24
Years Served for the Ministry of Education (MoE)	3.388E-02	.04	.14	.91
Years Served for the MoEP	3.285E-02	.03	.11	1.27
Gender	-.201	.22	-.06	-.91
Age	-6.719E-02	.04	-.26	-1.70
Highest Level of Education with exception of 1	.187	.10	.12	1.81

Note: R^2 = .05, F = 1.81
p< . 05

Table N 6

Multiple Regression Analysis of Simulations Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-4.056E-03	.02	-.02	-.23
Years Served for the Ministry of Education (MoE)	1.828E-02	.04	.08	.51
Years Served for the MoEP	2.375E-02	.03	.08	.95
Gender	-.125	.21	-.04	-.59
Age	-4.053E-02	.04	-.16	-1.07
Highest Level of Education with exception of 1	7.794E-02	.10	.05	.79

Note: R^2 = .01, F = 0.54
p< . 05

Table N 7

Multiple Regression Analysis of CD-ROM Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-1.977E-02	.02	-.08	-1.26
Years Served for the Ministry of Education (MoE)	3.880E-02	.03	.19	1.20
Years Served for the MoEP	1.129E-03	.02	.00	.05
Gender	-.295	.19	-.10	-1.54
Age	-4.391E-02	.03	-.20	-1.29
Highest Level of Education with exception of 1	8.668E-02	.09	.07	.97

Note: R^2 = .03, F = 1.12
p< . 05

Table N 8

Multiple Regression Analysis of Scanner Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	1.004E-04	.02	.00	.01
Years Served for the Ministry of Education (MoE)	4.549E-02	.03	.21	1.33
Years Served for the MoEP	8.356E-03	.02	.03	.35
Gender	-.327	.20	-.11	-1.61
Age	-3.662E-02	.04	-.15	-1.01
Highest Level of Education with exception of 1	.207	.10	.15	2.19

Note: R^2 = .04, F = 1.78
p< . 05

Table N 9

Multiple Regression Analysis of Multimedia Authoring Program Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-1.914E-02	.02	-.08	-1.16
Years Served for the Ministry of Education (MoE)	5.749E-02	.03	.26	1.69
Years Served for the MoEP	7.333E-04	.02	.00	.03
Gender	-.282	.20	-.094	-1.40
Age	-5.282E-02	.04	-.22	-1.47
Highest Level of Education with exception of 1	.103	.09	.07	1.09

Note: R^2 = .03, F = 1.32
p< . 05

Table N 10

Multiple Regression Analysis of Overhead Projector Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-2.037E-02	.02	-.08	-1.19
Years Served for the Ministry of Education (MoE)	3.081E-02	.04	.14	.87
Years Served for the MoEP	-1.330E-02	.02	-.05	-.54
Gender	.185	.21	.06	.89
Age	-1.858E-02	.04	-.08	-.50
Highest Level of Education with exception of 1	.113	.10	.08	1.16

Note: R^2 = .02, F = 0.84
p< . 05

Table N 11

Multiple Regression Analysis of Slide Projector Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-2.234E-02	.02	-.08	-1.22
Years Served for the Ministry of Education (MoE)	-2.193E-02	.04	-.09	-.58
Years Served for the MoEP	2.471E-02	.03	.08	.94
Gender	1.799E-02	.22	.01	.08
Age	1.570E-02	.04	.06	.39
Highest Level of Education with exception of 1	2.763E-03	.10	.00	.03

Note: R^2 = .01, F = 0.44
p< . 05

Table N 12

Multiple Regression Analysis of VCR Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-2.106E-02	.02	-.08	-1.23
Years Served for the Ministry of Education (MoE)	2.883E-02	.04	.13	.82
Years Served for the MoEP	-1.309E-02	.03	-.05	-.53
Gender	.152	.21	.05	.73
Age	1.789E-03	.04	.01	.05
Highest Level of Education with exception of 1	8.180E-02	.10	.06	.84

Note: R^2 = .02, F = 0.91
p< . 05

Table N13

Multiple Regression Analysis of Other IT Use Among Demographic Variables

Variable	B	SE	ß	t
Teaching Load per Week	-4.066E-02	.06	-.19	-.70
Years Served for the Ministry of Education (MoE)	-7.961E-02	.16	-.33	-.49
Years Served for the MoEP	-7.837E-02	.13	-.28	-.63
Gender	-.517	.70	-.20	-.73
Age	9.731E-02	.16	.37	.60
Highest Level of Education with exception of 1	-.560	.45	-.37	-1.24

Note: R^2 = .21, F = 0.66
p< . 05

Table N 14

Multiple Regression Analysis of IT Use in General Among Adoption-Proneness

Variable	B	SE	ß	t
ITEM 1	-4.768E-02	.10	-.04	-.50
ITEM 2	-.242	.12	-.17	-2.02
ITEM 3	.186	.10	.16	1.96
ITEM 4	-7.147E-02	.10	-.06	-.74
ITEM 5	5.600E-02	.09	.05	.61
ITEM 6	-6.191E-02	.09	-.06	-.73
ITEM 7	2.054E-02	.11	.02	.19
ITEM 8	-3.441E-02	.10	-.03	-.36
ITEM 9	8.668E-02	.10	.07	.87
ITEM 10	.111	.09	.11	1.29
ITEM 11	1.492E-02	.11	.01	.14
ITEM 12	5.035E-02	.09	.04	.55
ITEM 13	.154	.11	.15	1.47
ITEM 14	-.129	.10	-.13	-1.29
ITEM 15	-7.135E-02	.09	-.06	-.78
ITEM 16	.188	.08	.17	2.24
ITEM 17	1.420E-02	.10	.01	.15

Note: R^2 = .10, F = 1.59
p< . 05

Table N 15

Multiple Regression Analysis of IT Use in General Among Attitudes

Variable	B	SE	ß	t
Good-Bad Feelings	-.116	.11	-.11	-1.10
Meaningful-Meaningless Feelings	-.128	.15	-.09	-.87
Pleasant-Unpleasant Feelings	3.003E-02	.11	.03	.27
Fair-Unfair Feelings	3.649E-02	.10	.04	.37

Note: R^2 = .02, F = 1.31
p< . 05

Table N 16

Multiple Regression Analysis of IT Use in General Among Support Services

Variable	B	SE	ß	t
SS Availability (Technical)	5.245E-02	.10	.06	.51
SS Availability (Instructional)	4.382E-02	.11	.05	.41
SS Needed (Technical)	-8.385E-02	.13	-.08	-.65
SS Needed (Instructional)	8.844E-02	.13	.08	.69
IT Use with SS (Technical)	.239	.17	.23	1.41
IT Use with SS (Instructional)	-.117	.17	-.11	-.70

Note: R^2 = .03, F = 1.21
p< . 05

Vita

Zulkifli Zakaria was born in Perlis, Malaysia. His parents Zakaria and Rohani were both educators. Zulkifli is married to Norzaini Yang (alumni from Virginia Polytechnic Institute & State University). They are blessed with four children; Anwarul Hidayah, Anwarul Ridhwan, Anwarul Firdhaus, and Anwarul Amirah. Zulkifli graduated from Sultan Idris Teachers' College, Malaysia in 1980. He received his Diploma in Business Studies from MARA Institute of Technology in 1989, and a Bachelor in Business Administration degree – Business Insurance in May 1994 from the University of Central Oklahoma. He enrolled at Virginia Polytechnic Institute & State University in spring 1998, and received his Master of Science degree in Vocational and Technical Education in summer 1999. He completed his doctoral program in Vocational and Technical Education in May 2001.

Throughout his career as educator with the Malaysian Ministry of Education, he had taught in five secondary schools, and in an elementary school (as assistant principal). He also served in a polytechnic, where he was given the task to initiate the Diploma in Insurance program. His experiences other than teaching include elementary school administration, career officer, college chief librarian, resource center coordinator, and examiner. At Virginia Polytechnic Institute & State University, he served the Cranwell International Center (International Students and Scholar Office) as office manager, and graduate assistant. He was active in PTA movement with experience as committee member, secretary, and president. Zulkifli was also a member of Omicron Tau Theta.