

**FACTORS INFLUENCING THE ADOPTION OF INFORMATION
SYSTEM IN PRIVATE HOSPITALS IN MALAYSIA**

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ABSTRAK

Pengambilan dan aplikasi teknologi maklumat adalah sangat penting dalam menangani perubahan pengurusan kesihatan untuk memenuhi keperluan pesakit di masa hadapan. Menerusi aplikasi kemampuan teknologi maklumat di bidang pengurusan kesihatan, kita dapat meningkatkan keberkesanan perkhidmatan yang diberi, mencapai koordinasi khidmat berpusatkan pesakit, berkualiti tinggi dan menjamin keselamatan pesakit. Menyelaras system pembayaran dan pentadbiran, mengurus aset-aset dan sumber dengan berkesan. Oleh itu, tujuan kajian ini ialah untuk menyelidik faktor-faktor yang mempengaruhi penggunaan sistem maklumat di jabatan pentadbiran di hospital-hospital swasta. Model tersebut menghasilkan hipotesis bahawa pentadbiran inovatif, system inovasi, penggunaan system maklumat, sokongan pihak pengurusan atasan, sumber-sumber pengetahuan, tekanan luaran dan kesan daripada tekanan yang dihadapi pesakit telah mempengaruhi adaptasi penggunaan sistem maklumat. Kajian ini dibuat di Malaysia melalui pendekatan kajiselidik. Suatu struktur soalan kajiselidik telah dihantar menerusi pos dan emel kepada 106 kakitangan pihak pengurusan di hospital-hospital swasta. Di antara mereka, sebanyak 54 set soalan telah diberikan maklumbalas. Rumusan hasil daripada kajian ini menunjukkan bahawa sumber pengetahuan berkaitan dengan factor-faktor mempunyai kesan positif ke atas adaptasi penggunaan sistem maklumat. Ia juga mengesahkan TOE (1999) adalah model yang berorientasikan perspektif Malaysia. Bagaimanapun, faktor-faktor lain seperti pentadbiran inovasi, sistem inovasi, aplikasi sistem maklumat, sokongan pihak pengurusan atasan, tekanan luaran dan tekanan yang dihadapi pesakit tidak memainkan peranan yang begitu penting.

ABSTRACT

The adoption and application of information technology is essential to reform healthcare and meet the needs of patients in the coming decades. By harnessing the power of information technology for the health care field, we can enhance the effectiveness of the care we provide patient safety, increase workforce productivity and satisfaction, streamline payment-billing and administrative systems, and meet consumer expectations for service and access to information. Thus, the purpose of this study was to investigate the factors influencing the adoption of information system (IS) at the administration departments in private hospitals. Based on theories from the technology adoption literature, theoretical framework of IS adoption in private hospitals is developed. This study was conducted throughout Malaysia by using survey approach. A structured questionnaire has been sent out by both post mail and electronic mail to 106 managerial levels such as Information Technology managers, Senior Executive of Information Technology and Administrative Officers at private hospitals in Malaysia, among which 54 usable sets of questionnaire were responded. The result of this study revealed that knowledge sources-related factors have a positive effect on the adoption of information system. Besides that, control variable of the size of hospital was found to be significant. It is also validate TOE (1999) model in Malaysian perspective. However, the study indicated that all other factors such as administrative innovation, system innovation, information system usage, top management support, external pressure, and patients' pressure remain insignificant. The implications of these findings and the limitations of this study are further discussed for the benefit of researchers and practitioners.

CHAPTER 1

INTRODUCTION

1.0 Introduction

Malaysia, today, has one of the best healthcare systems in the region, which is both accessible (WHO stated that 90% of the population is within 5 km of a primary healthcare facility) and affordable. This is largely due to a comprehensive network of public healthcare facilities, which is supplemented by a growing network of private hospitals and clinics (Malaysian Medical Association, 13th September 2002).

The rapid growth of corporate investment in Malaysian private hospital sector has had a considerable impact on the healthcare system. The Malaysia private hospital sector is highly dynamic, with new ventures continually being announced. Actually the Government has been the major player in the healthcare system. In the 1980s the Government contributed about 76% of the total health expenditure. The Ministry of Health (MOH) accounted for 53% of the Government's health expenditure while the contribution to private health sector was estimated at 24% of the total health care expenditure. On top of that, Malaysia spent about 3% of its GDP on health services (Ministry of Health, 2002).

The Malaysian healthcare system is divided into two sectors: the public and the private healthcare sectors. Both healthcare sectors are still being expanded and bear a high potential for growth. Malaysia's public healthcare system, despite a few glitches, is in excellent health. From the biggest cities to the smallest villages, no Malaysian is deprived of access to healthcare. The private health industry, on the other hand, is concentrated mainly in certain urban parts of the country although its rapid growth has begun to reach rural areas. The public healthcare programme, accessible for

everyone as subsidized by the government, is used heavily by the majority of the Malaysian population. The private, commercial health care sector is only targeting the rather well-off members of the population.

In comparison to the public sector, the private and commercial healthcare sector is at a similar level as in most Western European countries. Most of the registered doctors in Malaysia are trained and educated in abroad. The equipment of private hospitals and clinics is often luxurious and is consistent with western standards. From the review of Market Watch Malaysia 2005, the table shows clearly the increment in the number of private hospitals and beds from 1980 to 2004 as shown in Table 1.1.

Table 1.1
Hospitals and number of beds in Malaysia

Year	Number of public hospitals	Beds	Number of private hospitals	Beds	Number of registered med. Personnel (doctors and dentists)
1980	96	27,839	50	1,171	Not available
1985	94	25,201	133	3,666	Not available
1995	118*	33,588	197	7,192	11,358
1996	117*	33,818	203	7,471	11,996
1997	117*	33,918	219	8,963	16,113
1998	117*	33,338	216	9,060	17,607
1999	121*	34,455	225	9,498	17,412
2000	120*	34,573	224	9,547	17,763
2001	121*	34,522	224	9,949	18,371
2002	122*	34,524	211	9,849	19,739
2003	124*	34,089	219	10,405	20,609
2004	125*	34,414	218	10,542	20,796

Source: *Ministry of Health (Market Watch Malaysia 2005 – The Healthcare Sector)*

Note: *number of public hospitals include MOH (Ministry of Health) special Institutions

Steady and high economic growth in the early 90's increased the pace of private hospital development in Malaysia. Ministry of Health (2005) mentioned that between 1980 and 1995, the number of beds in the private sector had increased more than six times from 1,171 to 7,192, comprising almost 30% of the total hospital beds. By 1995, 5200 doctors in the private sector (55% of all doctors) were looking after an

estimated 7,192 private hospital beds (21% of all hospital beds) while 4400 doctors in public service (45% of doctors) were looking after 26,896 hospital beds (79%). Most of these private facilities are located in the large towns and provide mainly secondary and tertiary care. The specialization of the private sector is characterized by illness management and supply of services to urban-based people, while the public sector is distinguished by its emphasis on providing preventive services and basic health aimed at the poor in rural and urban areas.

Beside that, the number of foreign patients seeking healthcare service in Malaysia is increasing day to day. On top of that, the number of foreign patient admissions in private and public hospital also increased where it was around 14,747 in 2001, growing at an average annual rate of 27 percent over the last three years (Malaysian Medical Association, 2002). According to Central Bank in Malaysia, the inflow of foreign exchange earnings from health care service was RM 11.2 Million in 2001 (Education and Health Research Conference, 2003). Majority of foreign patients choose Malaysia for healthcare information system due to the fact that Malaysia is better than other developing countries in focus of location, quality, competitive price, sophisticated healthcare service, expertise of medical staff and physicians.

In addition, Malaysia has frequently promoted the health tourism and it was initiated in 1998 with the establishment of Committee for the Promotion of National Health Tourism. The objective was to formulate a strategic plan for the promotion and the development of Health Tourism in Malaysia (Ministry of Health, Malaysia, 1997). Though Malaysia's foreign market is relatively small, it has been expanding in rapid pace in recent years. As a consequence, Malaysia government has extended the role and function of the healthcare sector in Malaysia and offers a wide range of specialist

and is equipped with state of the art medical facilities and equipment. Thus, business visitors or ordinary tourists from Asian countries can take advantage of their time in Malaysia to receive dental treatment, health screening, and cosmetic surgery or visit the health spa. Malaysia healthcare competitive advantages include relatively low cost for fairly high quality service, political stability, and proximity to large markets. However in order to harness the growth potential of healthcare industry, Malaysia needs to ensure adequate supply of skilled personnel and to implement the quality assurance by exercising up-to-date information technology in order to meet international standards.

1.1 Background of the Study

Information Technology -based Information System is defined as a set of interrelated components working together to collect, process, store and disseminate information to support decision making, coordination, control, analysis, and visualization in an organization (Laudan, 1989). Organization means the whole company or a specific unit in such a company and may also refer to a governmental body or a business unit. Information technology is making it possible for the communities to enhance the quality of healthcare and expand the range of healthcare services available to residents (Novack, 2003). The acceptance and implementation of information technology had improved efficiency, lowered cost, and improved customer satisfaction. The hospital service which is a part of the service section did not escape the influence of information technology.

In fact, proper realization and implementation of health information technology is a key to transforming healthcare system. Tens of thousands of deaths and injuries were caused by medical errors and inaccurate medical patients' records

every year. To significantly reduce those problems, healthcare organizations should adopt information technology systems that are capable of collecting and sharing essential health information on patients and their care. One of the simple examples of internet-based technologies for hospitals is electronic patient record (EPR) which provides healthcare providers with immediate access to a patient's medication history and laboratory test results, regardless of where they are in the province, or where the patient's drugs or other treatments were ordered. Moreover, EPR can also improve access to medical record information and improve work flow in hospital management system.

Prabhu (1995) mentioned that the hospital information systems include from large batch data processing systems for payroll and billing operations to management information systems that support decision making at the middle and upper management levels. The hospital information system not only supports the office automation functions but also is used for managing routine hospital data management operations such as maintaining records on patient admission and registration information, patient accounting data, medical records management, patient care management, and general financial management. The integrated health information system can offer technical benefits such as validation of data across the system, parameterization of application software, multilevel security, and multilevel authorization. Such technical benefits improve the efficiency of processing, since data is entered only once, and no duplicate or redundant data should exist. The system also gives the real user such related benefits as reduction in patients' waiting time, ready access to information by doctors at different locations, better coordination between different department, etc.

Hospitals around the world are searching for ways to implement the system to improve quality of care. Andaleeb (2000) have studied on the Bangladeshi healthcare system and concluded that even with the increased allocation for healthcare, public hospitals are still facing some problems such as lack of critical staff, generally unavailable essential supplies, inadequate facilities, and the poor quality of staffing. Even if all of the above problems were solved, it would still not guarantee full utilization of the healthcare system, provided that the hospital service delivery systems do not meet the patients' perception.

Andaleeb (2000) also gave an example in Vietnam, poor service in the public sector led to increased use of private providers. This example suggests that the role of quality must be understood better and given greater attention. In addition it is also important to specify who will assess quality and on what criteria. From the empirical research, Andaleeb concluded that private hospitals obtained better ratings than public hospitals on most of the measures of responsiveness, communication, and discipline. Private hospitals are playing a meaningful role in society, justifying their existence, continuation, and growth.

Hospitals need to monitor the processes of the whole operation in order to increase the quality level of the care (Duff, 2004). They should assess specific internal factors and external pressures that drive quality. Developing the right culture for quality to flourish will include the administrators coming in on weekends to help out on patient floors; a CEO who stresses the importance of quality improvement at every orientation for new employees; and performance indicators for every department with specific targets related to quality, service, people, and finances. According to Jack (2005), high quality physicians, nurses, administrators, and ancillary staff are critical to producing high-quality outcomes and effective quality improvement. Thus,

attracting and retaining the right peoples are playing the vital role to success good quality.

Another important process involved team-based care management in which physicians and other caregivers take the case manager's or team leader's role in coordinating and facilitating the care. The best hospitals also give their physicians, nurses, and other staff the tools and support they need to practice high-quality medicine on daily basis and to identify and investigate quality problems when they do surface. This includes investments in information system as well as quality improvement/performance (Cheryl, 2002). The departments must also be provided with qualified staff that abstract medical records, analyze data, and facilitate the quality improvement process. Successful IT strategies employed by the top-performing hospitals involve a willingness to invest in IT; working with physicians and others to customize an information system to meet specific needs and culture of the institution; nurturing and encouraging buy-in so that new systems will be utilized and their benefits realized; and devising IT systems that provide real-time feedback to providers (including access to patient history, test results, computerized reminders/alerts, etc) as they are caring for patients (Jack, 2005).

In order to fully utilize the resources in the hospitals, attention should be paid to adopt more efficient technologies to provide better services for patients. Roa (1995) explained how computers have become indispensable to most business including the healthcare industry, where investment in information technology is made to address financial, clinical, and marketing issues. The purpose might be to reduce office expenses, to improve service quality, to raise patient satisfaction and compliance, to make more legible and accessible patient records, to improve response time, and to

meet the pressure from patients/customers. Thus information technology can improve both aspects – medical care and the underlying administrative infrastructure.

1.2 Problem Statement

Malaysia is preparing to be part of the information Age in the new millennium and organizations have realized that the importance of the adoption of information system as a strategic weapon and a competitive advantage. The effective use of information system becomes a key component of organizational success. Furthermore economic affluence is acting as a major driver to improve healthcare facilities in Malaysia, thus creating demand for hospital information systems. In fact, the implementation of IT applications and new technologies in medical care delivery is being emphasized in constructing of new hospitals in Malaysia (Varynani, 2006). For instance, the construction of the Selayang Hospital was completed with the latest telemedicine facilities to provide more sophisticated and quality healthcare.

Thus, this study investigates the important factors influencing the adoption of the information system at the administration department in private hospitals. Even though there are many factors which can be related to the information system adoption in private hospitals, this research emphasized only on the four factors, namely technological characteristics, environmental characteristics, organizational characteristics, and size of hospitals (control variable). The research outcome could be applied in the private hospitals to increase managerial performance and effective implementation of information systems in the future.

1.3 Objectives of the study

The study will focus on the information system adoption at the administration department in private hospitals in Malaysia. Therefore, the objectives of study are:

1. To examine the purpose of information system adoption at the administration department in private hospitals in Malaysia.
2. To explore the level of adoption of information system at the administration department in private hospitals in Malaysia.
3. To investigate the factors influencing the adoption of information system at the administration department in private hospital in Malaysia.

1.4 Research Questions

The above objectives will raise a few questions related to adoption of information system in private hospital:

1. What are the purposes of the adoption of information system at the administration departments in private hospitals of Malaysia?
2. Do the private hospitals adopt the information system at the administration departments in Malaysia?
3. What are the factors influencing the adoption of information system at the administration department in private hospitals in Malaysia?

1.5 Scope of the study

This research investigates the factors influencing the adoption of information system at the administrative department in private hospital in Malaysia. Even though there are several departments in the hospitals, research study have limited only on administration department in order to examine the adoption of information system

such as electronic registration, electronic patient record, electronic pharmacy, electronic billing and electronic discharging at the administration department in private hospitals. This study also stressed on the purpose of the adoption of information system in private hospital. Research has limited only on 106 private hospitals among 224 private hospitals in Malaysia.

The factors that might influence the information system adoption include three components such as technological, environmental, and organizational characteristics. Size of hospital can also influence the information system adoption in private hospitals. Technological characteristics represent the pool of technologies available for adoption by an organization such as innovations, relative advantage. Organizational characteristics are a source of structures and processes that constrain or facilitate adoption. In this research, the attention was on the information system knowledge of employees and the support from the top management to adopt information system adoption in private hospitals. Environmental characteristics such as competitive edge and patients/customer's pressure should be taken into account to survive in the highly competitive healthcare industry. In this research, size of the hospitals is tested as a control variable.

1.6 Significance of the study

This study contribute to the adoption of information system(IS) in private hospital in Malaysia by providing quality of relationship between the technological, organizational, environmental characteristics. For the empirical aspect, it is expected that this study can prevent the potential of hospital information system problem due to the lack of adoption new technology. Finding will help all of the private hospitals in Malaysia by providing important factors in terms of technological, environmental,

organizational characteristics and size of hospitals issues and how to improve the relationship between these factors on the adoption of information system.

This study consist of four factors which are technological characteristic, environmental characteristic, organization characteristic whereas size of hospital as a control variable of the adoption of IS in private hospital. These four components measure the level of adoption of information system at the administration department in private hospital in Malaysia. It is expecting that finding will improve the management process in private hospital in Malaysia.

1.7 Definition of Key Variables

Innovation

West and Farr (1990) defined innovation as the level of intentional introduction and application within a role, group or organization of ideas, processes, products or procedures, new to the relevant unit of adoption, designed to significantly benefit the individual the group, the organization or wider society.

Relative Advantages (Perceive usefulness)

This study defines relative advantage as the degree to which an innovation is perceived as being better than the idea it supersedes. Rogers (1995) viewed relative advantage as the degree to which an innovation is perceived to bring added benefits to the user.

Competitive edge

This study defines the competitive edge as a need for the firm to gain a competitive edge over other firms, there is a need for the firm to compete with other firm in terms of service quality and there is a need for the firm to improve its financial growth relative to other firms, Banerjee and Golhar (1994), Cragg and King (1993).

Patients/Customers pressure

Patients/Customers pressure is defined as the level of perceived pressure exerted from the patients and customers to adopt information system (Iacouvou, et al., 1995; Premkumar & Roberts, 1999).

Employees' IS knowledge

Employees' information system (IS) knowledge is defined as the level of employees' broad knowledge, understanding of information technology based applications, Cragg and King (1993).

Top management support

Top management support is define as the level of senior management acts as an executive support for the project and keeps their commitment. Support can take various forms: helping the team to surmount obstacles, providing encouragement to a team (McDonough, 2000), providing adequate money and human resources for new products (Cooper & Kleinschmidt, 1995).

Adoption of information system (IS)

Adoption of information system defined as the decision to make full use of a technology innovation as the best course of action (Rogers, 1995).

1.8 Organization of the Report

This report is structured with the following chapters; chapter 1 gives the introduction on background and overview on the primary focus of the study by highlighting the objective and significance of the study with the recitation of the research problem and questions. Chapter 2 presents literature review on adoption of information system, which draws on theory and observations of recent practices in adoption of information system to identify the technological characteristics, environmental characteristics, organization characteristics and the size of hospitals along which, success and failure of adoption information system. Theoretical framework as the model of the study and relevant hypotheses are proposed to test the model. Chapter 3 discusses about the research method used to develop measures and collect the data on which the research findings are based and also the data analysis method used to validate the hypothesis and test the model. Chapter 4 presents a summary of the findings, statistical results, and relationship between variables. Chapter 5 concludes the research with the discussion of the results, implications, limitations, and suggestion for future research.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter presents the literature review on the factors influencing the adoption of information system. It draws on theory and observations of recent practices in adoption of information system in private hospitals. The theoretical framework as the model of the study is formulated and relevant hypotheses are proposed to test the model.

2.1 Overview of the Adoption of Information System

As noted by Rogers (1995), adoption is conceived as a social change process, in which an innovation is communicated over time among members of a social system. Adoption includes the evaluation of an innovation to determine if it will best satisfy the needs of the prospective adopting organization, as well as the sustained use of the innovation (commonly referred to as full implementation). In addition, Allen (2000) defined the information systems (IS) as a technology-based innovation that is created and used by individuals, organizations, and societies. Over the past three decades, computer-based information systems in business organizations have developed in unique and special ways. As far as computers are concerned, the manner of hardware and software development resulted in unique architectures evolving over time. At the same time, organization structures developed into special forms to fit their specific environmental and strategic requirements.

From the point of view of Burch (1985), computer-based information systems are categorized by their architecture or topology which is a set of interconnections or

nodes in a network. According to Julien (1994), information technology adoption has been a facet of technological innovation adoption in organizations. By the middle of the twenty-first century, patient care in hospitals will be highly computerized (Griffith, 1987). The doctor will guide an electronic system which suggests a plan of care for each patient based on analysis of both the patient's history and detailed data about specific treatment options. Forecasts of all needs of patient will be available to each patient service unit. Then the systems will optimize schedules, order supplies, and prompt completion of the original assignment and follow-up of any unexpected occurrences. Complete records will be available to establish expectations and to monitor performance of the doctors and the nurse (Kovner, 1990).

Based on the study of Johns (1997), hospital information system are fall into three categories; core hospital information systems; full service health care information technology; and, most recently, the computerized patient record vendors. The core hospital information system categories include community health computing (CHC), Compucare, Meditech, and Management Systems Associates (MSA). The core hospital information system is a low-cost system and covers account payable, human resources, patient accounting, quality assurance/risk management, and utilization review. Full service health care information system provides organization user flexibility in making system changes and effective integrated design with distributed database. But full service health care information systems are costlier than core hospital information systems.

In the last era, most of the researchers focus on computerized record system in healthcare area. Adopting the computerized record system can help reduce paper work of patient's medical record, enhance the ability of the doctor and other treating personnel, and have a clear picture of the patient's current health status. With the

patient's permission, physician would have online access to the patient's history of illness and to the care given by other providers. Because the information on diagnosis, treatment, and results would be transmitted through the system, purchasers would be able, over time, to analyze provider performance, as well as other data covering costs, utilization, and public health.

However, Grafton (1996) pointed that there has been more failure and disappointment than success in the history of information system in business. All relevant perspectives on the problem need to be considered in order to achieve a proper balance. Three perspectives which may be important in order to make IS successful in the business are: the *product* which is delivered to the users (for example the software and hardware system, user documentation and training courses): the *process* that creates the system (traditionally including systems analysis, technical design, program coding, testing and final handover); and the *service* which deals with the softer issues (answering questions, dealing with problems, and generally addressing the concerns and aspirations of users). Most of the previous study of information systems focused on the product viewpoint, but Grafton (1996) suggested that the determinants of success and failure should be based on the more observable, tangible attributes and characteristics of systems products – for example, system response time, data volumes, and the extent of system usage.

On the other hand, Clegg et, al., (1997) investigated the IT performance in healthcare industries and concluded that “The health sector is still seen as performing rather poorly in the field of information technology”. Previous information systems literature suggested the following as being the main causes of hospitals difficulty: over-optimistic estimates that subsequently lead to the system being delivered late and over-budget (Brooks ,1995); ill-defined project objectives, mostly arising from

uncertainty regarding the business needs to be satisfied (Keen et. al, 1987); poor communications between users and the development staff (Illes et. al, 1990) and lack of user commitment to the project and system (Keen et. al, 1987); the technical limitations of a system and systems which are unfriendly and inflexible (Galloway et. al, 1989); and the use of inexperienced staff to develop systems (Illes, 1990). Moreover, paper based information is inadequate in providing support for clinical decision making. According to Wilson et. al, (1995), inadequate information management is one of the causes of poor treatment decisions in hospitals and can lead to adverse consequences for patients.

2.1.1 Success of Information System in hospitals

Hospitals across the country are searching for ways to ensure patient safety and improve the quality of care. Jack (2005) described that a few important successful information system in the hospital which include a culture of safety, attract and retain key personnel, devise and continually update quality improvement processes, and give staff tools to excel. Success factors of information system in hospitals which included an internal environment that constantly focuses on quality and a set of practical tools that promote good outcomes and quality improvement on a daily basis. Elements of these factors include strong leadership, high-quality nursing and physician staff, leading-edge technology and information systems, and sophisticated data analysis and performance monitoring systems.

Besides that, hospitals Information Systems also play a significant role in providing quality healthcare services. Vincent (1998) suggested that hospitals should engage continuous improvement in HIS quality influences the quality of care by capturing, transferring, storing, managing and displaying medical information. In

improving the quality of these processes, the system should provide higher quality (i.e., accurate, complete, timely) information which in turn can increase the quality, effectiveness and efficiency of medical decision making, resulting in improved customer satisfaction while reducing health related risks.

According to Roa (1995), Information Systems and Information Technology Solutions claimed that the hospitals' staff IS & IT skills require strong communication and project planning skills. It is important to evaluate the current skills of information services staff with a focus on their ability to learn and support new applications and technologies. It may be required to develop a human resource development plan to support the training existing information services staff on new technologies, or recruit additional staff with the specific skill sets in the new technologies. Employees should have knowledge of rapid application development tools and knowledge of networking and interface standards. Moreover, if the information system is easy to use and require less effort on the part of employees, it will increase the adoption and usage of information system (Teo, 1999). In addition, Davis (1989) defined perceived ease of use as the degree to which a person expects the use of the target system to be free of effort. Thus, employees' intention to use information systems can be depending on their perception towards the ease of use of the system.

On top of that, information and data tools also play a critical role. Overview from Jack (2005) found that some of the successful information system strategies for the hospital performance involves a willingness to invest in information technology; working with physicians and others to customize an information system to meet specific needs and culture of the institution For example, some of the hospitals had information system directors who were physicians themselves as well as information system experts; nurturing and encouraging buy-in so that new systems will be utilized

and their benefits realized; and devising information system systems that provide real-time feedback to providers which include access to patient history, test, results, computerized reminders/ alerts, etc as they are caring for patients.

2.1.2 Failure of Information System in hospitals

Despite cases of successful information system development projects, it is widely accepted in the field that an unacceptable number of projects fail. Lyntinen and Hirschheim's (1987) comprehensive study has mapped the following concepts of information system (IS) failure found in the empirical literature:

1. *Correspondence failure.* The IS fails to meet its design objectives.
2. *Interaction failure.* The users maintain low or non-interaction with the IS.
3. *Process failure.* The IS overruns its budgets or time constraints.
4. *Expectation failure.* The IS does not meet stakeholders' expectations

Two important elements in systems failing - relative to the research contemplated are first, that the failing is generally not acknowledged until a manager or leader declares it to have failed and second, that a major problem with studying information system failure is that most organizations are not likely to publicly disclose information about failures (Rocheleau, 1997).

Computer system is a significant factor in hospital information system. If a computerized medical clinic loses its system and is unable to track billable procedures, many patients and much revenue will be lost. Direct consequence of a computer information system failure is, obviously, that the organization has to get along without the computer for a while. If the computer is central to the organization's purpose, the failure can result in a substantial cost. In general this cost can be categorized as

immediate lost productivity, emergency service cost, cost of restoring data and delay processing.

According to Stewart and Katherine (2000), there has tended to be a low level of support in general for information technology expenditure within the health industry, leaving information needs insufficiently addressed. On top of that, Vincent (1998) explained the factors such as lack of training and other human factors have been contributing to failure in hospital information system. Many strategies for providing clinical decision support have failed because employees have not provided timely and easy access to information that is current and relevant to specific clinical situations (Sintcheko, 2001). In addition, users or operators resistance to change may lead to the cause of the technological implementation failure. Based on Ramayah and Arokiasamy (2004), human factors (operators/users) are important for the implementation of technology changes in the companies in Malaysia. Thus, management should encourage or support the users/operators to adopt new technologies as well as by training to become intelligent workers and educate them about the benefits of the new systems.

Users/operators perception towards the new system also important factors and users' negative perception can lead to the failure of information system adoption in the organization. Karahanna (1999) suggested that the users will perceive the new technology as useful when the users believe the existence of a positive user-performance relationship. Moreover, (Dahlan et al., 2005) studied attitudinal belief on adoption of E-MBA program in Malaysia and found that perceive usefulness, trial ability, result demonstrability, image and enjoyment were significant influencing attitude towards the adoption of E-MBA program. Thus, if the employees at the administration department in private hospitals perceive the adoption of information

system will be more helpful to their work performance, the employees will have positive attitude towards the system.

2.2 The Determinant factors for Information System (IS) adoption

Many researches have studied on technology adoption and Kwon and Zmud (1987) classified variables affecting technology adoption into individual, task-related, innovation-related, organizational, and environmental characteristics. According to the Tornatzky and Fleischer (1990), adoption of new technologies is affected by technological, organizational, and environmental context. In addition, Patterson (2003) described that technology adoption is affected by organizational size, structure, and performance, supply chain strategy, transaction climate, supply chain member pressure, and environmental uncertainty. Firm size is one of the most commonly studied factors in the adoption literature. Large firm tend to be less agile than small firms. On the other hand, large firms often possess more resources that can facilitate innovation implementation, so called resource advantages, (Schumpeter, 1950).

2.3 Adoption of information system at the administration department in private hospitals

The widespread adoption of hospital information systems harbors the potential to transform health care services and to change the traditional roles and responsibilities of physicians and other health care practitioners. Moreover Goldschmidt (2005) researched on the implications of accelerating the adoption and widespread use of hospital information systems through the 15-year period from the present to 2020. He defined the hospital information system as “The application of information processing involving both computer hardware and software that deals with the storage, retrieval,

sharing, and use of health care information, data, and knowledge for communication and decision making”. This definition includes such applications as: electronic health record, personal health record, electronic billing, electronic discharging and telemedicine. By implementing the electronic health record, hospitals can save expense associated with record keeping, improved workflows, practice management and billing including one-time electronic order entry and the elimination of transcription.

Beside that, Goldschmidt also described the adoption of information system in hospitals can transform the health care system—thereby simultaneously improving quality and productivity. Desires motivating the adoption of information technology in hospitals include achieving productivity growth evident in other industries that have made extensive use of information technology.

Information system in hospital is actually playing a major role for hospitals to sustain the better quality of service in a competitive healthcare sector. Many researchers have studied in the adoption of information system. However, they have concluded the findings differently since the context of study are different. Thus, in this research examined the factors such as technological characteristics, organization characteristics, environmental characteristics and size of hospital influence the adoption of information system at the administration department in private hospitals in Malaysia. Moreover, the adoption of information system at the administration department in private hospitals in Malaysia was tested as a dependent variable of the study.

2.4 Size of hospital

Gardner et al., (2003) suggested that large organization may have more resources to invest in information technology than small organization. Information systems are less likely to succeed in small organizations than in large organization, (Haines & Petit, 1997). In this research, size of hospital was used as a control variable based on previous literature. Number of beds was measured as the size of hospital in this study because larger hospital may practice more information system at the administration department than the smaller hospitals.

2.5 Theoretical Foundation

After carefully reviewing the literature, the study found that the technology-organization-environment (TOE) framework developed by Tornatzky and Fleischer (1990) is a suitable framework for the study of factors influence the adoption of information system. The TOE framework has been examined by the number of empirical studies in various information system adoptions. In addition, Scupola (2003) used TOE to explain the adoption of Internet commerce. Moreover, Ramamurthy et. al., (1999) tested the impact of electronic data interchange (EDI) on firm performance as the consequence of technological factors characteristics (compatibility of EDI with existing infrastructure), organizational characteristics (internal management support and EDI resources), and environmental characteristics (customer expertise and competitive pressure). Based on several literature reviews, the study decided to use TOE framework. These studies provided consistent empirical support for the TOE framework, although specific identified within the three contexts may vary across different studies. Drawing upon the empirical combined with the

literature review and theoretical perspectives; we adopted this framework and extended it to the area of the adoption of information system at the private hospitals.

The TOE framework identifies three aspects of a firm's context that influence the process by which it adopts and implements a technological innovation such as technological characteristics, environmental characteristics and organizational characteristics. In this study, the independent variables are technological characteristics, environmental characteristics and organizational characteristics. The dependent variable is the adoption of information system at the administration department in private hospital in Malaysia. All these variables explained in the next section (2.5). Technological characteristics describe both the internal and external technologies relevant to the firm. These include existing technologies inside the firm, as well as the pool of available technologies in the market. Environmental characteristics are the area in which a firm conducts its business – its industry, competitors, access to resources supplied by others and customers' pressure (Tornatzky & Fleischer, 1990). Organizational characteristics are defined in terms of several descriptive measures, for example: management support, human resources; and the amount of slack resources available internally.

2.6 Research Model and Hypotheses

Base on the TOE framework, a research model consisted of two TOE factors under each variable which is reflecting the adoption of the information system at the private hospital. The study hypothesizes how these factors influencing the adoption of information system at the private hospitals.