Importance-Performance Analysis on Information Technology Applications in Higher Educational Institutions in Thailand

by

Siriwan Kitcharoen

A Doctoral Dissertation

Submitted in Partial Fulfillment
of the Requirements for the Degree of
Doctor of Philosophy
in Computer and Engineering Management Program
Assumption University

June 2007

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ABSTRACT

As technology advances, and information systems become increasingly important business assets, which are also progressively harder to replace. As such, the effective use of information technology and the appropriate applications will cause information technology to become more a comparative rather than a competitive tool.

This research aims at studying the IT applications needs by determining the information technology attributes important to user satisfaction. In this study, it is proposed that the important variables for study are the information attribute, system attribute, and organizational management attribute. The exploratory nature was used to investigate three information technology attributes of IT applications provided by the Higher Educational Institutions.

The research is comprised of 2 phases. The first phase of the research involved a qualitative study by searching some related documentary data to the study and conducting a focus group interview. The second phase of research, a quantitative method was undertaken; one thousand and two hundred questionnaires were distributed to respondents.

This research has developed a unique model of user satisfaction measurement to information technology applications provided by the Higher Educational Institutions. The results from the qualitative survey suggested that the Higher Educational Institutions should be developing MIS quality and put more focus on the needs of users and thereby improve user satisfaction and the findings from a quantitative method point out the strong relationship between management information system (MIS) quality towards user satisfaction as well as perceived importance of the IT attributes of IT applications provided by Higher Educational Institutions. Furthermore, the research has also illustrated practical uses of the model as a comparative tool for the organizational management of user satisfaction measurement.

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Siriwan Kitcharoen

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CHAPTER I
OVERVIEW

1.1 Introduction

Technology is not transformative on its own. Evidence indicates that when used effectively, "technology applications can support higher-order thinking by engaging students in authentic, complex tasks within collaborative learning contexts" (Means, Blando, Olson, Middleton, Morocco, Remz, & Zorfass, 1993). Instead of focusing on isolated, skills-based uses of technology, schools should promote the use of various technologies for sophisticated problem-solving and information-retrieving purposes (Means & Olson, 1995).

In the past, managers focused on producing quality products, hiring and training the best workers, and finding ways to create value for their customers. As competition gets tougher and tougher in the global marketplace, business must look for opportunities to provide the quality goods and services that customer want and need but do it faster, better, and with greater customization than anyone else. To accomplish this feat, they need information and technology.

Advances in technology mean that it can now be an effective tool in learning and development. Many organizations and educational institutions are utilizing technology as an effective tool for monitoring and improving organization's performance. For this reason, whether technology should be used in educational institutions is no longer the issue in education. Instead, the current emphasis is ensuring that technology is used effectively to create new opportunities for learning and to promote student achievement.Development for technology use should be an integral part of the educational institutions technology plan or an overall improvement plan. Most colleges and universities in Thailand currently already offer Internet-based coursework. With a PC connected to the web, the Internet allows user to enable receiving, updating and processing of information immediately worldwide.

Initial inclusion in the technology plan must ensure that organizational development is considered as essential factor in using technology. Because technology

is credited as being a significant factor in increasing productivity in many industries, some people believe that more effective use of technology in educational institutions could do more to improve educational opportunities and quality. Research indicates that while there are poor uses of technology in education, appropriate technology use can be very beneficial in increasing educational productivity (Byrom & Bingham, 2001; Clements & Sarama, 2003; Mann, Shakeshaft, Becker, & Kottkamp, 1999; Valdez, McNabb, Foertsch, Anderson, Hawkes, & Raack, 2000; Wenglinsky, 1998).

Although technology is more prevalent in educational institutions, several factors affect whether and how it is used. Those factors include the allocation of computers for equitable access, technical support, effective goals for technology use, new roles for instructors, time for ongoing professional development, appropriate training for users at different skill levels, user incentives for use, availability of software, and sustained funding for technology. Moreover prospective students searching for the right university expect to be able to register online, find information about academic programs and other services on the web, communicate with faculty and admissions counselors electronically, and even apply for and receive financial aid on line. Once enrolled, this Internet-savvy generation expects to check grades, access a myriad of courses, and monitor their financial and personal records online.

As such, to become a leader in educational arena is not easy. Many administrators of educational institutions may be uncomfortable providing leadership in technology areas. They may be uncertain about implementing effective technology in ways that will improve learning. Of significance here, it is vital for educational institutions to determine that the uses of technology have linkages to important educational learning expectations. The study will highlight the importance and performance of the selected attributes of IT applications in Thai Higher Educational Institutions. In addition, this research will provide more various literatures of information, information technology (IT), information system (IS), management information system (MIS), the relation between system usage and user satisfaction, IT applications in education, and an application of the importance-performance analysis (IPA) technique within Higher Educational Institutions in Thailand

1.2 The Need and Value of the Research

In the past, application of technology to Thai Higher Educational Institutions was often motivated by a desire to implement "teacher proof' instruction. Technology was viewed as a "black box," something that could be bestowed on educational institutions from above. An increasing body of literature on technology implementation efforts suggests that this goal was not only unrealistic but also fundamentally misguided. To be effective, technology, faculty members and students must work together to provide challenging learning opportunities. As the uses of technology have linkages to important education learning expectation, and effective uses of technology has become major themes associated with education. Organization needs to share the change process, encourage and support professional development opportunities related to technology. Lack of appropriate technology infrastructure and support can cause implementation problems.

Understanding of the major factors associated with change in general and the implications for education is one of the critical factors for the achievement of the strategic plans of universities. The findings of this research will be very useful for all administrators of universities in Thailand so that they can apply them to implement the use of technology in their institutions.

As the objective of this study is to develop a valid instrument to measure the impact of IT on QM, with the purpose to understand how IT supports QM. Another reason is to study and discuss more on the concepts and theories of user satisfaction, and the measurement tools applicable to user satisfaction in educational institutions by using previous literatures as a base of discussion to produce the suitable model to measure user satisfaction on IT applications in Thai Higher Educational Institutions. It can make the researcher and other people have more understanding and knowledge concerning user satisfaction on IT applications in education.

Lastly, the tempo of competition among educational institutions in Thailand is quite high so the findings from this research will offer some vital ideas for quality improvement especially in the field of IT application.

1.3 Research Objectives

The objectives of this study are as follows:

- To investigate the importance of the attributes of IT applications provided by Higher Educational Institutions in Thailand, as perceived by faculty members and students.
- To investigate the performance of the attributes of IT applications provided by Higher Educational Institutions in Thailand, as perceived by faculty members and students.
- To compare the perceived importance and performance of the attributes of IT applications by faculty members and students.
- To compare the perceived quality of IT applications in Higher Educational Institutions in Thailand from the faculty members and students 'standpoint.
- To study the relationship between the perceived management quality of IT applications and user satisfaction.

1.4 List of Research Questions

1. How is the selected attribute of IT applications related to the scale of importance?
2. How do faculty members and students evaluate the attributes of IT applications?
3. How is the gap between Importance and Performance of selected attributes of IT applications in Higher Educational Institutions in Thailand?
4. How is the gap in understanding between faculty members and students rated and determined?
5. What are the relationships between the Importance- Performance gap and the management quality of IT applications in Higher Educational Institutions in Thailand?
6. What are the relationships between the management quality of IT applications and user satisfaction?

CHAPTER II
LITERATURE REVIEW

As the research has the objective of determining the IT applications that are important to quality management, some of the relevant literature on information, information technology, information system, system use, IT-based quality, quality management, user satisfaction and important-performance analysis technique are reviewed.

As construed briefly in Chapter 1, much has been written about how information technology (IT) could be and has been used to enhance quality management. The critical role of information, information system (IS), and IT quality in quality management (QM) has also been espoused by Sobkowiak and Le Bleu (1996). On analyzing the application of IT to TQM processes in administrative and business operations in four institution of higher education, Hughes (1994) found that IT was perceived to be a tool that facilitated QM and that the use of IT in a TQM environment required significant changes in organizational culture.

As the world today has become completely dependent on computerized systems for almost everything in life. So, computer-based information systems play an important role in business.

Computer-based information systems rely on computer hardware and software technology to process and disseminate information. From this point, the term information systems will be referring to computer-based information systems. Although computer-based information systems use computer technology to process raw data into meaningful information, there is a sharp distinction between a computer and a computer program on the one hand, and an information system on the other.

Computers provide the equipments for storing and processing information. Computer programs, or software, are sets of operating instructions that direct and control computer processing. Knowing how computers and computer programs work is important in designing solutions to organizational problems, but computers are only part of an information system.

An effective information system can help answer management questions. Laudon and Laudon (2001) stated that the effective information system must fit the needs of the specific organizational level and the business function that it is intended to support. Meanwhile, information systems transform raw data into useful information. IT improves business performance only if combined with competent information management and the right behaviors and values (Merchand et al., 2000)

2.1 Information

In this information era, information plays a key role in the determination of the winners and survivors in the increasingly complex, sophisticated and globalized market. Information is variously defined as knowledge, facts, figures, data, intelligence, ideas, etc., essential for planning and development. Information is much more than news; it is a synthesis of what is known for the purpose of enlightening what is not known.

Braman (1989) summarized the concepts of information developed in the area of information policy studies as *Information as a resource.* "Information, its creators, processors, and users are viewed as discrete and isolated entities. Information comes in pieces unrelated to bodies of knowledge or information glows into which it might be organized" (Braman, 1989, p.236). *Information as a commodity.* Complementary to definitions of information as a commodity is the concept of an information production chain through which information gains in economic value. The notion of information as a commodity incorporates "the exchange of information among people and related activities as well as its use" (Braman, 1989, p 238) and implies buyers, sellers and a market. *Information as perception of pattern.* The concept of information is broadened by the addition of context. Information "has a past and a future, is affected by motive and other environmental and casual factors, and itself has effects" (Braman, 1989, p 238). *Information as a constitutive force in society.* Information has a role in shaping context. "Information is not just affected by its environment, but is itself an actor affecting other elements in the environment" (Braman, 1989, p 239).

As has been discussed, information can make the difference between staying in business and going broke. Organizations today depend on high-quality information to

develop strategic plan, identify problem, and interact with other organization. According to Burch and Grudnitski (1986), they stated that the quality of information rests on three pillars: accuracy, timeliness and relevance. It is the ability of a nation or institution to aggregate and manipulate these three pillars that defines it as either information rich or information poor. Information is as important as an impetus for development that whether it is economic information, technological information, military information, socio-cultural information, or whatever, the nation, institution or company that has access to, or control over information will have enormous advantages over and above those institutions that do not have access or control.

Various studies indicate that poor, incomplete, late or missing information is perceived as a most serious quality problem (English, 1999; Ferguson and Lim, 2001; Crump, 2002). Huang *et al.* (1999) stated that information should not be treated as a mere by-product of various activities but with the same seriousness as products. Quality of information, however, seems to be an elusive concept. As attempting to define the quality of information, one of the obvious approach is to focus on customer requirements. High quality information satisfies application criteria specified by the use (Salaun and Flores, 2001; English, 1999; Strong, 1997). Another approach is to produce lists of conceivable information quality dimensions or attributes (Salmela, 1997; Tozer, 1999), following the well-known framework developed by Garvin (1988). Huang *et al.* (1999) also produced the list of Quality of information by defining into 15 dimensions as intrinsic quality: accuracy, objectivity, believability, and reputation; accessibility quality: access, and security; contextual quality: relevancy, value-added, timeliness, completeness and amount of data; and representational quality: interpretability, ease of understanding, concise representation, and consistent representation.

The attribute-list approach is in many ways problematic. If product quality can be fully described as the sum of several attributes, why use the general term "quality" at all? Attribute lists make no distinction between information itself and context-dependent elements, such as timing and reputation (Lillrank, 2003). Further, the question about information as an output and as a process remains vague. The quality of information is often confused with the quality of information systems (von Hellen,

1997; Anderson and von Hellens, 1997). This leads to a confusion of objectives and processes: the "what" and the "how" are not separated.

Delone and Mclean (1992) mentioned about information quality, which can be described in term of accuracy, timeliness, reliability, format and meaningfulness while James (2002) suggested that information is of high quality if it has characteristics that make it useful for the tasks. He also described the characteristics of high-quality information into three broad categories: Time: Information should be available and provided when needed, up to date, and related to the appropriate time period (i.e. timeliness, currency, frequency and time period). Content: Useful information is error free, suited to the user's needs (i.e. accuracy, relevance, completeness, conciseness, scope and performance). Form: The information should be provided in a form that is easy for the user to understand and that meets the user's needs for the level of detail (i.e. clarity, detail, order, presentation and media)

Drucker (1980) suggested that information is the manager' s main tool, indeed the manager's capital, and it is he who must decide what information he needs and how to use it. This calls for the need of quality information and indicates that there is a logical relationship between information quality and an organization's or an individual's ability to achieve its objectives. The relationship premise is that: individual success is a function of management quality; management quality is a function of decision quality; and decision quality is a function of information quality and quantity and exclusiveness.

2.2 Information Management

There are various efforts to define the framework for information management. The concepts largely depend on the contents put into the words "information management". It is not only the concepts of "information" as such, but the multiple meanings of the phrase, emphasis of its elements, or the word order as well as the scientific perspective. The phrase may mean something different from "information management", i.e. it is used as an abbreviation for: IT management; IS management; Management information; and Information resource management, etc.

Therefore, effective information management needs to address issues at all of these levels. Choo (1998) defined information management as a cycle of processes that support the organization's learning activities: identifying information needs, acquiring information, organizing and storing information, developing information products and services, distributing information, and using information.

Kirk (1999) derived a hierarchy of the definitions of information management as: IT systems, information resource management, information management as aligning information strategy and business strategy, and integrating strategy formation and information.

Since information management plays very crucial role in competitive business environment. Effective information management is one of the important determinants of the success of the organization. Merchand (2000) noted that it is important determinant only if information is accurately and effectively sensed, collected, organized, processed, and maintained.

2.3 Information Technology (IT)

Information technology has been defined as the various technologies, which are used in the creation, acquisition, storage, dissemination, retrieval, manipulation and transmission of information (Moll, 1983). Most information technologies are computer-based and operate on a convergence of electronics and telecommunications devices.

The understanding of information technology has been limited in a number of ways, often by implication rather than by explicit statement. Levinson (1997) and Warner (1998) defined information technology as objectively given or an autonomous development, particularly as implied by the language of discussion. There are also traces of technological determinism, most subtly and pervasively in the limited recognition of information technology as a human construction (Hancock, 1992; Warner, 1993; Kahin, 1997; Warner, 1998).

Giovannetti and Bellamy (1996) state that the roots of the information technology industry are embedded in three industrial sectors: information technology, telecommunications and the media - sectors which are becoming increasingly intertwined. The ability to access required information in real time is now shaping the nature of world business and giving enormous advantages to countries and companies that have such abilities.

Information technology often provides a manufacturing-based competitive advantage. According to Chin (1996), the term information technology (IT) is viewed in a broad sense as it refers to any artifact whose underlying technological base is comprised of computer or communications hardware and software. In many organizational environments, such as manufacturing firms, over half of a firm's capital expenditures involve IT.

IT has been used for development in different aspects of the economy. Recently, computers have been used for financial planning and management, agriculture, transportation planning, water resources management, information systems, utilities, primary health care management, insurance and banking, oil exploration and surveying, as well as in the design and control of machinery (Edet E.1996).

The strong point about information technology in the new business environment is that it provides the information required to access new business frontiers and to expand existing ones. In playing this role, information technology has been identified as an extremely powerful force (Zulu, 1994; Sturges and Neill, 1990). Indeed, it has been identified that throughout history, information and technology have shaped the destinies of nations and mankind as a whole. Those nations that have been quick to adopt and apply new innovations in almost all spheres of life have always had a competitive edge over their rivals. In almost all cases, according to Zulu (1994), where empires prospered or withered away, there is a strong correlation between the possession of a superior technology and the rise of an empire, and the possession of an inferior technology and the fall or collapse of an empire in the face of intervening forces (social, economic, military, etc.). By and large therefore, disparities in wealth and standards of living are a function of available information and the technology to control and propagate it.

As has been discussed in various places throughout, information technology is the means whereby the ends information is produced. By itself, information will be of no value unless it is utilized to bring about certain changes. This points to an important fact that the competitive edge lies not in having information technology or in the information itself but in how to actually use the information forms to derive value to bring about certain change. This capability to utilize the information form will certainly differentiate oneself from the competitor. As such, it is important to determine what information forms should be provided by the organization to service the customer so that in the eyes of the customers, it adds value to them by supporting their purchase decisions or to keep them informed of the organization's service performance or service offer.

The application of IT could ease the boredom of repetitive and tedious work, improve productivity within specific processes, as well as increasing the accuracy and reliability of systems, eliminating duplication and producing consistent internal records. The use of IT can help governments in developing countries with scarce resources to deploy them more effectively, thus contributing to the national economy. It could be used by the private sector to reduce costs and improve product quality and productivity through increased efficiency. It can help improve management of the control of inventories, costs, finance or marketing. In addition to these advantages, developing countries might consider entering the multi-billion dollar worldwide market for IT.

The ability to effectively manage information within the firm has become critically important because it may provide a basis for gaining competitive advantages. It is therefore not surprising that many firms have begun to develop strategies focusing on using information technology as a resource to facilitate the effective collection and utilization of information (Bharadwaj, 2000).

2.4 IT-Based Quality

To provide more information, more quickly than ever before, high-quality information technology can enhance the organization to develop efficiency and effectiveness at each stage of the strategic decision-making process.

A review of the literature indicates that management quality of information technology has direct impact towards organization performance. One of the most cited contributions of IT-based quality is convenience. (Alen, 1997; Baily and Gordon, 1988; Cline, 1997; Milligan, 1997; Reed, 1998). To customer, convenience refers to a generous number of accessible service delivery points that are available when customers need them.

Convenience is a primary benefit sought by customers (Reed, 1998; Milligan, 1997). Lerew (1997) suggested that customer satisfaction would increase when customers enjoy the convenience of accessing their accounts at any time through interactive voice response systems.

Furey (1991) said that high-quality IT can improve the organization performance by increasing convenience, providing extra services, and collecting service performance information for management use. Fitzsimmons and Fitzsimmons (1997) also suggested several competitive roles of IT in service such as the creation of entry barriers, enhancement of productivity, and increase of revenue generation from new service.

There are still more key variables to describe IT-based quality including ease of use, conservation of time, privacy, accuracy, multifunctional capabilities, and use of advanced IT. Dobholkar (1996) and Galbreath (1998) noted that if customers view an IT-based self-service system to be difficult to use, they might not value such a IT-based systems.

Houston (1997) suggested that conservation of time had a significant impact on perceived IT-based systems. Once customers have accessed the service delivery point, they do not like to wait to receive the service. Excessive waiting in a queue for service delivery could negatively affect customers' perceptions of service quality. Some customers would prefer technology-based self-services if such options could reduce service delivery time (Lovelock and Young, 1979). IT-based service options may help improve customer service quality by providing customers with more prompt and efficient service.

Customers are concerned with their privacy when using IT-based services. (Peterson, 1997) concerned about potential invasion of privacy may affect customers' evaluations towards IT-based services.

Accurately performing services and providing information could help improve service reliability (Parasuraman *et al.*, 1988, 1991) and service outcomes (McDougall and Levesque, 1994). It is suggested that customer service includes the people side and the machine side (Gerson, 1998). Timeliness and accessibility of the service may be improved on the machine side by using IT. The literature also suggests that IT can help improve service quality by reducing error rates (Furey, 1991). If customers perceive that IT-based services provide improved service and information, they may place a higher value on such services.

Customers prefer businesses that provide a variety of supplemental services to augment the core service. McDougall and Levesque (1994) indicated that a comprehensive service offering is attractive to customers. Consequently, multifunctional capabilities of an IT-based system may be an important feature in satisfying customer needs.

Chakravarty *et al.* (1997) reported in their survey of customers that the use of the latest technology was a significant indicator of convenience, which, in turn, would affect customer satisfaction. Licata *et al.* (1998) suggested that service providers could use tangible items such as equipment to make a promise to their customers and strengthen customer relationships. Use of advanced IT may help address a promise to serve customers with up-to-date technology.

Jan (2001) indicated that access to technology is an important issue for teachers and students. Although computers may be available, one factor that determines their use is where those computers are located. If computers are connected to the Internet but are not in a convenient location, the availability to students and teachers will be limited. To make the best use of limited connections and equipment, instutitions can explore various strategies for allocating computers.

2.5 Information System (IS)

The information systems (IS) discipline is primarily concerned with the successful implementation of information technology (IT) in organizations. IS are an essential component of the solutions to many of the problems faced by organizations to cope with the current challenges. In this light, it can be argued that successful IS development can be identified by certain characteristics or metrics. An IS may thus be considered successful if it meets criteria such as fulfilling user needs and organizational objectives/goals (which are in themselves both multifaceted, and partial). At the same time, a variety of factors may affect systems during their development and implementation. As a result of these factors, the evaluation of a system in terms of its "success" is an inherently complex phenomenon.

Information systems are a part of organizations. The purpose of introducing IS into an organization is to improve not only individual decision-making performance but overall organizational efficiency and effectiveness. The expected gains in terms of organizational goals through IS implementation and adoption are concerned with the success of the system.

Simon (1992) pointed out that design of information systems must consider in depth business processes of the organization. Hayes and Wheelwright (1979) also indicated that one of the key success factors of Japanese industries is no separation between strategies and operations. However, a limited consideration of the first two roles for IT in Modern Corporation is sub-optimal with potentially dysfunctional consequences.

As far back as 1978, developing countries were being urged to seize on the new technologies and leapfrog to electronic libraries, by-passing the book (Lancaster, 1997). Though this vision of the future has been disputed, certainly the more recent discussions on university education have leaned towards the adoption of IT - whether for the accessing or acquiring of information through the use of CD-ROM or electronic networks. Saint in a 1992 study (Saint, 1992) devoted half the space in which he discussed educational inputs to the advantages of CD-ROM.

The kinds of systems built today are also very important for the overall performance of the organization, especially in today's highly globalized and information-based economy. Effective information systems are driving both daily operations and organizational strategy. Powerful computers, software, and networks have helped organizations become more flexible.

While, as noted earlier, IS success is a multidimensional construct (Delone and McLean, 1992; Saarinen, 1996), so surrogates measures have been developed and are usually in use to measure IS success. Two surrogate measures are system usage (Swanson, 1974; Ein-Dor et al., 1984; Snitkin and King, 1986) and user satisfaction (Bailey and Pearson,1983; Ives et al., 1983; Baroudi and Orlikowski, 1988).

Delone and Mclean (1992) described a number of IS success measures after reviewing 180 studies. According to them research has focused on areas such as systems quality (i.e. IS interface, availability, response time, etc.), system usage, user satisfaction, individual impact and organizational impact.

Delone and Mclean also developed a model of IS success .The model focused on the influence and inter-relationships between these various factors.

Amoroso and Cheney (1991) also noted that system quality and information quality are two major constructs of user satisfaction. Delone and McLean's (1992) model suggests that both system usage and user satisfaction are affected by these two factors. However, the proposed relationships in their model were not tested empirically. Garrity and Sanders (1998) measures IS success at different levels as the organizational level (i.e. how a system contributes to organizational performance), the process level (i.e. efficient use of resources) and, the individual level (i.e. the users' perception of utility and satisfaction).

In IS research, system usage may be defined as "either the amount of effort expended interacting with an information system or, less frequently, as the number of reports or other information products generated by the information system per unit time" (Trice and Treacy, 1988, p. 33). Delone and McLean (2002) suggest that the nature, quality, and appropriateness of the system use are also important and not just to simply measure time spent of system use. They consider system usage as the necessary

condition under which IS/IT can affect organizational performance. Zmud (1979) also advocated three factors related to users (i.e. system usage, user satisfaction and user performance) as measures of systems success.

Davis (1989, 1993) found perceived usefulness to be significantly correlated with system usage and that perceived usefulness positively affects user satisfaction (Mahmood et al., 2000). Such research highlights the importance of system usage and user satisfaction in evaluating a system in terms of its success.

System usage is continuously considered as dependent variable in various empirical studies. A number of different system usage models have been proposed (Schewe, 1976; Robey, 1979; Lucas, 1975a). At the same time, a variety of measures have been developed and used to assess system usage in the IS field. The use of a system depends on the users' evaluation of that system. If the system improves the users' task performance or decision quality, then they tend to use the system otherwise they may avoid using a system unless its use is mandatory.

Delone and McLean (2002) believe that no system use is totally mandatory. It might happen that some time the management requires employees to use the system but continued and adoption of the system itself may be voluntary based on management judgment at higher level. On the other hand, Kim and Lee (1986) caution that the degree of system usage could not be considered as an appropriate measure for IS success if use is mandatory. For this reason, some researchers prefer to use "user satisfaction" as a measure of success.

Preceding research (Fuerst and Cheney, 1982; Igbaria, 1990; Yoon and Guimaraes, 1995; Hendrickson and Collins, 1996) highlights two common measures of system usage – time spent in term of hours and frequency of use. Seddon and Kiew (1994) and Seddon (1997) criticized Delone and McLeans model and also raised model related issues. They suggest "usefulness" as more meaningful as compared to "system use" as an indicator of IS success that may lead to user satisfaction.

The usefulness of the system in terms of benefits that an organization may gain should be observed on its use of course. Delone and McLeans (2003) argue that

systems use is an appropriate measure of IS success in most cases in previous research, so the inclusion of system use in success model is more appropriate than system usefulness suggested by Seddon. This article does not deal with model issues raised by Seddon and Kiew (1994) but focus specifically on the inter-relationship between system usage and user satisfaction (IS success dimensions mentioned in Delone and McLean's model).

In the previous research, different factors are studied that may influence system usage Among these factors are user attitude (Lucas, 1975a, b; Robey, 1979; Kaiser and Srinivasan, 1980), user expectations (Ginzberg, 1981), user involvement (Schewe, 1976; Ives and Olson, 1984; Yoon and Guimaraes, 1995), user experience (Igbaria et al., 1989;Yap et al., 1994; Loh and Ong, 1998) and user satisfaction (Baroudi et al., 1986; Joshi,1992). One of the key challenges emerging from this review of past research is the diversity of inter-related terms and concepts that are employed.

2.6 IT-based model

Over the years, researchers have adopted both inferred and direct disconfirmation techniques, where the inferred approach seeks to estimate the size of any gap between the customer's expectations and the actual performance received. Expectations and perceptions are measured separately, producing a relative measure of how well the service has performed relative to what the consumer expected. Direct disconfirmation measures, on the other hand, provide an absolute measure of performance. It is a measure of how the service has performed on the basis of the customer's absolute level of satisfaction or dissatisfaction with the service encounter.

Owing to the factors like opening up of markets, increase in use of **IT,** increase in customer knowledge and awareness. Parasuraman (1991) proposed a service quality model that links customer perceived IT-based service options to traditional service dimensions. This model highlights the importance of information technology (IT)-based service options and attempts to investigate the relationship between IT-based services and customers' perceptions of service quality. The IT-based service construct is linked to service quality as measured by SERVQUAL

While the SERVQUAL technique has attracted a lot of attention for its conceptualization of quality measurement issues, it has also attracted criticism. Some researchers have debated whether the dimensions of SERVQUAL are consistent across industries; others have suggested better wording for some of the scale items (Babakus and Boller, 1992). In addition, researchers have asked whether the calculated difference scores (the difference between expectations and evaluation) are appropriate from a measurement and theoretical perspective (Brown *et al.*, 1993). From a measurement perspective, there are three psychometric problems associated with the use of difference scores: reliability, discriminant validity and variance restriction problems.

A study by Brown (1993) found evidence that a number of psychometric problems arise with the use of SERVQUAL; they recommend, instead, use of non-difference score measures which display better discriminant and nomological validity. As mentioned above, other researchers have suggested better wording for some of the scale items (Bolton and Drew, 1991). Customers find it hard to differentiate between many of the scale items, particularly when "negative forms of questions are used" (Hope and Muhlemann, 1997).

For all these reasons, a more direct approach to the measurement of service quality is now needed. Studies conducted using this performance-based measure found that SERVPERF explained more of the variance in an overall measure of service quality than did SERVQUAL. Cronin and Taylor (1994) acknowledged that it is possible for researchers to infer consumers' disconfirmation through arithmetic means (the P – E gap) but that "consumer perceptions, not calculations, govern behavior". This approach also overcomes some of the problems raised regarding SERVQUAL, namely: raising expectations, administration of the two parts of the questionnaire and the statistical properties of difference scores (Hope and Muhlemann, 1997). Taking a single measure of service performance is seen to circumvent all of these issues.

Another more direct measurement technique is the importance-performance technique, which emerged from the earlier work of Martilla and James (1977). Unlike SERVPERF, which is best described as an absolute performance measure of consumer perceptions of service quality; the importance-performance paradigm also seeks to identify the underlying importance ascribed by consumers to the various quality

criteria being assessed. In other words, importance is viewed as a reflection of the relative value of the various quality attributes to consumers.

2.7 Discussion of the Importance-Performance Analysis (IPA) technique

The Importance—Performance Analysis (IPA) is a technique for prioritizing attributes based on measurements of performance and importance to understand customer satisfaction. This technique emerged from the earlier work of Martina and James (1977). Unlike SERVQUAL model, which is best described as an absolute performance measure of consumer perceptions of service quality, the Importance-Performance paradigm also seeks to identify the underlying importance attributed by consumers to the various quality criteria being assessed (Sampson and Showalter 1999).

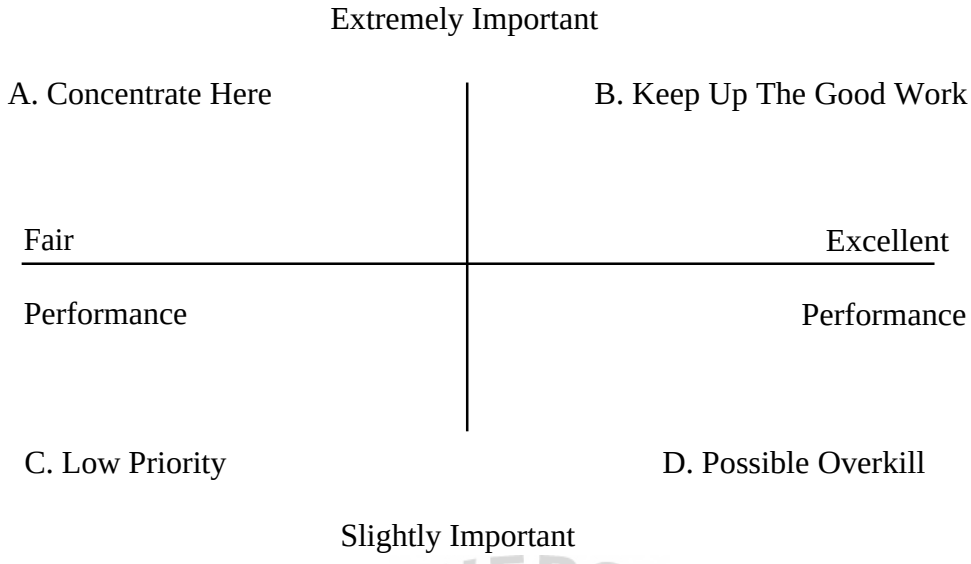
According to Barsky (1995), lower ratings are likely to play a lesser role in affecting overall perceptions, while higher importance ratings are likely to play a more critical role in determining satisfaction. The objective is to identify which attributes, or combinations, are more influential in repeat-purchase behavior and which have less impact. The information derived should prove invaluable in terms of the development of marketing strategies for the organizations that use it (Ford 1999). This view is confirmed by Lovelock (1998), who states that importance-performance analysis is an especially useful management tool helping to "direct scarce resources to areas where performance improvement is likely to have the most effect on overall satisfaction". It also has the benefit of pinpointing which attributes should be maintained at present levels and "those on which significant improvement will have little impact". It is this evaluation technique that this paper now addresses in terms of its suitability.

Slack (1991) presented an IPA model in which the underlying framework was to consider a relationship between importance and performance. Slack (1991) theorized that target levels of performance for particular product attributes should be proportional to the importance of those attributes. Thus, attributes of high importance should have higher performance standards than attributes of lower importance.

The Importance-Performance Analysis conceptually rests on multi-attribute models. This technique identifies strengths and weaknesses of a market offering in terms of two criteria that consumers use in making a choice. One criterion is the relative importance of attributes. The other is consumers' evaluation of the offering in terms of those attributes.

A particular application of the technique starts with an identification of the attributes that are relevant to the choice situation investigated. The list of attributes can be developed after canvassing the relevant literature, conducting focus group interviews, and using managerial judgment. Otherwise, a set of attributes pertaining to a particular service (or goods) are evaluated on the basis of how important each is to the user, and how the IT service or goods is perceived to be performing relative to each attribute (by asking the importance of each attributes and comparing them with performance). This evaluation is typically accomplished by surveying a sample of IT users. After determining those attributes that are worthy of subsequent examination, IT users are asked two questions. One relates to the salience of the attributes and the other to the companies own performance in terms of delivery of these attributes.

By using a central tendency e.g. mean, median or a rank-order measure, the attribute importance and performance scores are ordered and classified into high or low categories; then by pairing these two sets of rankings, each attribute is placed into one of the four quadrants of the importance performance grid (Crompton and Duray, 1985). Mean performance and importance scores are used as coordinates for plotting individual attributes on a two-dimensional matrix as shown in Figure 2.1. This matrix is used to prescribe prioritization of attributes for improvement (Slack, 1991) and can provide guidance for strategy formulation (Burns, 1986)



Source: Martilla, J. and James J. (1977), 'Importance- Performance Analysis', *Journal of Marketing, 14* (January): pp. 77-79.

Figure 2.1: The Original IPA Framework

For better understanding, the 5-point Likert scale is applied with the grid of the original IPA model. Davis (1996) said that Likert scale which is frequently called the method of summated rating, is a widely accepted and adopted technique. While, Zikmund (1994) suggested that Likert scale is a measure of attitudes ranging from very positive to very negative designed to allow respondents to indicate how strongly they agree or disagree with carefully constructed statements relating to attitudinal objects. In this study, the Likert scale is an interval scale that specially uses the five anchors of: very low, low, neutral, high, very high. To apply the 5-point scale, Babakus and Mangold (1992) suggested using five- point Likert scale on the grounds that it would reduce the "frustration level" of respondents; increase response rate and response quality. So the IPA framework in this study is as follows:

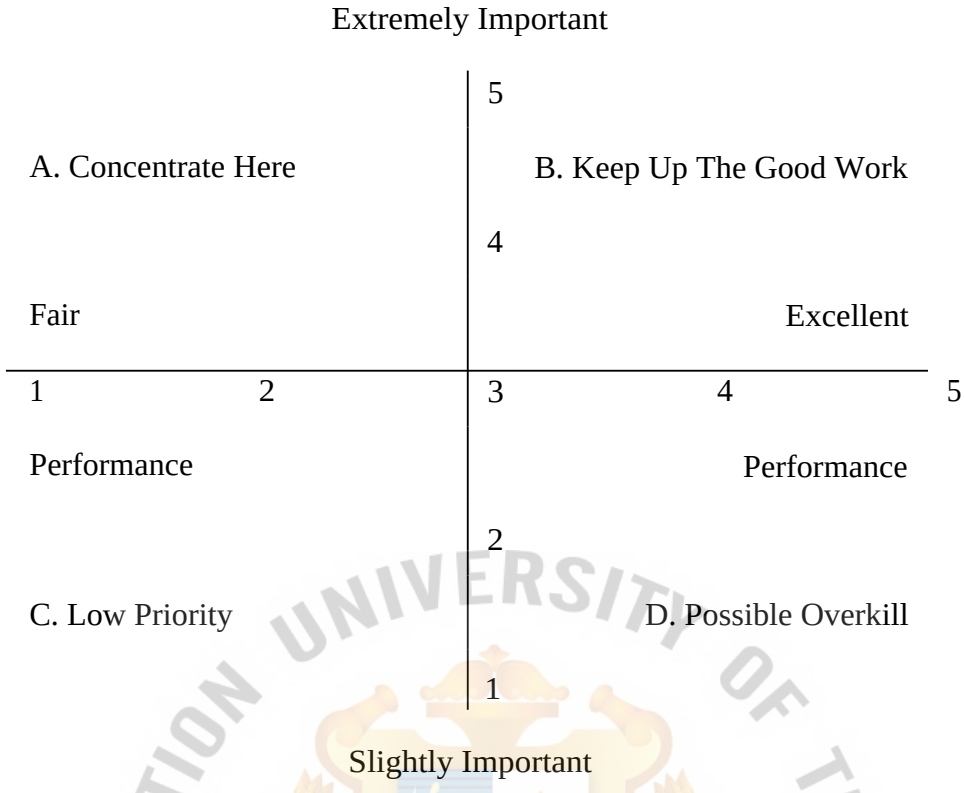


Figure 2.2: The IPA Framework applies in Higher Educational Institutions

The vertical axis of the grid in (figure 2.2) indicates the importance of the attributes from high to low and the horizontal axis represents their perceived performance from high to low. The placements of attributes on this two dimensional graph suggest the suitable strategy for each. Attributes in Quadrant 1 are ranked high both in importance and performance. What is needed here is to "keep up the good work". Quadrant 2 signals those attributes, which need special marketing effort. These attributes are high in importance but rated substandard in performance. The attributes in Quadrant 3 indicate those rated low in both importance and performance. Because of their low salience, these attributes are considered low priority and hence require no additional resources. Attributes in Quadrant 4 are rated high in performance, but low in importance. This implies that overkill has occurred. Perhaps the resources committed to these attributes should be channelled elsewhere. The procedure is very pragmatic, easy to apply and interpret. More importantly, it readily identifies the strategic options and translates the results into action.

The Importance-Performance Analysis (IPA) has been applied in a number of settings with relatively little modification in form. For example; Chon, Weaver, and Kim (1988) applied IPA for the Visitors Bureau of Norfolk, Nitse and Bush (1993) used IPA to compare preconceptions of dental practices.

The Importance-Performance Analysis (IPA), however, has two inherent weaknesses. First, while the technique considers an object's own performance in terms of a particular attribute, the technique ignores the object's performance relative to its competitors (Burns, 1986). In other words, the 'absolute own performance' measures of the traditional IPA needs to be augmented with a 'relative performance' measure.

Second, while the technique takes into account attribute salience (i.e. importance), it does not recognize the determinacy of an attribute. Determinant attributes are those that discriminate well among competing products (Engle, Blackwell, and Miniard 1990) and directly influence consumer's choice.

But these two weaknesses should not in anyway vitiate this study about IT management quality in educational institutions. An aspect that can be construed from the IPA framework is that if the difference in variance is minimal to none in importance and performance assessment dimension, then it could fall in C or B quadrant and a straight line can be drawn to link up the satisfaction level. This can only happen if there is no difference in the variance meaning that if the importance and the performance of the IT management quality is the same and a linear equitability can be established whereby the necessity of placing high priority or in keeping up the good work is negated, as it is deemed that it is meeting the minimal IT management quality leading to an equitable satisfactory level, neither over-performing nor under performing within the median or norm.

If the importance and the performance means has no deviation and it is plotted as a linear graph, it can be construed that the university has achieved a degree of performance in focusing its resources to meet the basic and minimal requirements of the users.

2.8 Modification of the Importance-Performance Analysis with the SERVQUAL model

The operationalization technique of the Importance —Performance Analysis (WA) and the SERVQUAL model is quite similar. The WA technique identifies strengths and weaknesses by comparing of two criteria that consumers use in making a choice. One criterion is the relative importance of attributes. The other is consumers' evaluation of the offering in terms of those attributes while the SERVQUAL technique identifies the customer satisfaction of service attributes by comparing of two criteria that are customer's expectation and customer's perception in the five dimensions.

Though SERVQUAL and IPA model has been extensively researched in the literature. Unfortunately, none of these studies attempted to integrate these two models. Hence, this should be the pioneering initiative to integrate these two models and empirically validated in purely a service setting.

A modified IPA model might therefore be constructed on the basis of comparison between perceived performance and the importance of each service attribute of the five SERVQUAL dimensions.

2.9 IT Applications in Education

Technology can be an appropriate vehicle for promoting meaningful, engaged learning. It allows students to work on authentic, meaningful, and challenging problems, similar to tasks performed by professionals in various disciplines; to interact with data in ways that allow student-directed learning; to build knowledge collaboratively; and to interact with professionals in the field. Technologies also can be used to promote the development of higher-order thinking skills and allow opportunities for teachers to act as facilitators or guides and often as a co-learner with the students.

Technology platforms and the Internet have created tremendous opportunities for new education paradigms, ushering in new economy driven by knowledge and access to information. Perhaps the most dramatic have been those resulting from the provision of CD-ROM facilities, which have enabled users to access current and

archival journal literature rapidly and to become aware of otherwise unknown literature sources.

An educators need quality programs, resources and staff development to fully apply the Internet. The Internet allows for unique instructional techniques, and as its presence grows the benefits will not be limited just to individual students who are learning more and better but should also extend to society at large. The Internet acts as a major enabler, liking people to anytime-anywhere learning and as a catalyst to help revolutionize educational system. It benefits instruction by increasing student motivation, encouraging higher-level thinking, involving parents, giving teachers tools to improve instruction, using the resources of the whole wired world, expanding learning time and preparing them for the future. While all of these expectations are reasonable, the level of IT adoption and the use that is made of the new technologies differs widely between universities. There is no doubt that the introduction and use of Internet has brought demonstrable benefits to all the universities surveyed together with their users.

Although technology is more prevalent in educational institutions, several factors affect whether and how it is used. Those factors include placement of computers or equitable access, technical support, effective goals for technology use, new roles for teachers, time for ongoing professional development, appropriate coaching of users at different skill levels, faculty members and students, incentives for use, availability of educational software, sustained funding for technology, and perceived IT policies measured by institutional encouragement to use IT.

Access to technology is an important issue for user, especially for teachers and students. Although educational institutions may have computer available, one factor that determines their use is where those computers are located. If computers are connected to the Internet but are not in a convenient location, the availability to users will be limited (McKenzie, 1999).

Whatever decisions are made on allocation of equipment, it is imperative that users are included in the decision making and that long-term plans are made for acquisition and upgrading of materials. Such collaborative decision making and

planning helps ensure staff buy-in, equity of access, and effective use of technology in teaching and learning.

Without continuous technical support, technology integration in the educational institutions will never be satisfactorily achieved. Most users have experienced equipment failure, software complexity, data loss, embarrassments, and frustration. Brody (1995) suggested that helping technology users while they are actively engaged with technology at their work location is probably the most meaningful, essential and appreciative support that can be provided. McKenzie (1998) also states that time is everything, particularly when it comes to technology. The best way to win widespread use of new technologies is to provide just-in-time support, assistance, and encouragement when needed. Not tomorrow. Not next week. Now!

Infrastructure repair or upgrades must also be responsive and well timed. Frequent occurrences of a server being down, printers jammed, or insufficient computer memory will not only disrupt instructional and administrative activities but also may undermine the entire technology program. According to Technology and Education Reform, a U.S. Department of Education report by Singh and Means (1994), "If technical problems arise frequently and teachers have to wait hours, days, or weeks to get them resolved, they will abandon their efforts to incorporate technology."

Before technology can be used effectively for engaged learning, however, the educational institutions need to ensure that the technology supports the educational goals for students. The university 's initial task is to develop a clear set of goals, expectations, and criteria for student learning based on national and international educational standards, a profile of the student population, and community concerns. Then the educational institutions can determine the types of technology that will support efforts to meet those goals. In other words, the learning goals should drive the technology use.

Technology integration brings changes to teachers' instructional roles in the classroom. The teacher's roles in a technology-infused classroom often shift to that of a facilitator or coach rather than a lecturer (Henriquez & Riconscente, 1998). Technology use also tends to foster collaboration among students (Tinzmann, 1998).

Scheffler and Logan (1999) document these and other changes in the dynamics of the classroom.

As students become more self-directed, teachers who are not accustomed to acting as facilitators or coaches may not understand how technology can be used as part of activities that are not teacher-directed. This situation may be an excellent opportunity for the teacher not only to learn from the students but also to model being an information seeker, lifelong learner, and risk taker. Kozma and Schank (1998) note, "Teachers must become comfortable letting students move into domains of knowledge where they themselves lack expertise, and they must be able to model their own learning process when they encounter phenomena they do not understand or questions they cannot answer"

Individual tutoring, peer coaching, collaboration, networking, and mentoring have been used successfully over extended periods to help teachers at all levels of technology implementation develop technology applications that promote engaged learning (Ike, 1997; McKenzie, 1994; Miller, 1998; Norton & Gonzales, 1998; Poole & Moran, 1998; Saye, 1998; Tenbusch, 1998; Yocam, 1996). Teachers at the novice stage who need to develop basic computer skills will require more individual attention and should be given ample time to practice their skills. If learning by doing is important for students, it is crucial for teachers (David, 1996).

As teachers begin to regard technology as a tool to accomplish instructional goals, they will learn best when engaged in meaningful projects that relate to their own classrooms. Appropriate individualized support from peers as well as experts encourages teachers to experiment with new strategies for technology use. Teachers should have the option to participate in the type of workshops, seminars, and online professional communities that will help them use technology effectively. Time for independent study, experimentation, and curriculum development also is important.

Teacher technology training that builds upon each teacher's background and experiences is clearly not easy to implement, and it requires two things: time and money. To adequately meet the learning needs of all students, however, every teacher--not just the resident computer guru--must be able to go beyond basic computer functions to use technology as a springboard to engaged learning in every classroom.

Offering incentives is an important aspect of a technology professional development program. Incentives help ensure that teachers who face escalating demands on their limited time receive the training they need to prepare their students for the technological workplace of the future.

Financial incentives are a time-tested method of encouraging teachers to devote their time to professional development. Educational systems can provide compensation for professional development in technology on weekends or during summers (Corcoran, 1995; Monahan, 1996; Speck, 1996). Along with planned professional development, educational institutions can provide financial support for a menu of approved conferences, workshops, and other professional development activities; teachers can make choices to participate in those activities that most correspond to the specific skills they wish to learn (Tenbusch, 1998; Monahan, 1996). Teachers who master a skill, then present it to colleagues in the building and support those colleagues in learning the skill can be compensated at another level (Poole & Moran, 1998).

Another less obvious method of financial support for professional development is providing classroom-embedded mentoring, tutoring, or follow-up activities. This approach is among the most effective methods of technology training--and it completely bypasses the problem of asking teachers for additional time outside of the regular class (Corcoran, 1995). Incentives that require financial support are certainly expensive. But if university doesn't do a better job of allocating resources for professional development--instead of putting all the budget into technology acquisition--university will be left with the tools but not the talent to prepare students for a technological world".

Job security can be as powerful an incentive as money. Incentives related to job security can include adding technological competence to the teacher evaluation instrument, requiring teachers to earn a specified number of technology-related inservice credits to ensure continued employment (Tenbusch, 1998) or requiring technology inservice training for recertification (Corcoran, 1995).

Finally, educational institution can ensure the effective use of educational technology by addressing all these factors: placement of computers for equitable access, technical support, effective goals for information technology use, new roles for

teachers, time for ongoing professional development, appropriate coaching of teachers at different skill levels, teacher incentives for use, availability of educational software, and sustained funding for technology. Through such efforts, university can help students realize their learning goals through the use of technology and also enable them to gain important skills for their future education and careers.

2.10 Information Technology on Quality Management

Quality management is one of the major organizational innovations of the twentieth century. It has contributed a scientifically grounded methodology to deal with defects in production, focused attention on customers, and emphasized participative management practices in industry (Lillrank, 2003).

Growing numbers of strategic information systems that shape or critically support organizational applications of IT are also being reported. Management of the information technology itself is already full of management issues aimed at deriving maximal benefits from the information technology system. The basic issues lie in how to manage such a complex system for effective and efficient use of the information technology. This issues are multiplied in manifolds when the aspects of applying the information technology for the organization's functional use are also considered.

Much has been written about how information technology (IT) could be and has been used to enhance quality management. Hughes (1994) used a qualitative case study methodology to investigate the role of IT in quality management. On his analyzing, he found that IT was perceived to be a tool that facilitated QM. But on his study, he did not attempt to answer how and where IT should be used in QM processes. IT has been identified as one of the critical success factors determining the impact of QM on organizational performance, although how IT could be used to enhance QM was never addressed (Cho, 1994).

The dimension "quality information systems" considers information flows and information technologies, which support managers and workers in their activities in order to improve quality performance. Information technologies are separated from information flows, since information flows can take place even without information

technologies and the presence of information technologies does not necessarily guarantee the achievement of information flows (Forza, 1995). However, Forza approaches the problem of the role of information systems in quality management from a theoretical point of view. He proposes a reference model and the associated measures. He makes the first step of an empirical study towards testing measure validity and reliability and testing the internal consistency and construct univocity of the model dimensions. He stops before considering the relationships between the model dimensions.

Motivated by a scarcity of empirical research on the linkage between IT and performance, Rogers *et al.* (1996) examined the relationship between the utilization of IT and firm performance in the warehouse industry. Although their work provided empirical evidence of the importance of IT in quality performance, the role of IT in QM environments was not investigated.

Quality management literature usually does not consider quality information systems as one dimension of quality management even though it does underline the necessity for certain types of information and information flows for successful quality management (Feigenbaum, 1983; Garvin, 1984). Greater importance has been attributed to information systems by such norms and awards as ISO 9001 and the Malcom Baldrige Award

The review of the QM literature reveals several frameworks of QM (e.g. the Malcolm Baldrige Quality Award, the European Quality Award, the British Quality Award and the Deming Prize). Different approaches have been put forward by its numerous contributors, with disparate sets of concepts, management practices, tools and techniques developed.

The one significant exception is the reference model developed by Forza (1995a) to link QM practices, information systems and quality performance for empirical research. However, using his own model and associated measures, Forza (1995b) only investigated the use of IT in the quality assurance aspect of QM but not the link between QM practices and IT comprehensively. Forza proposed that IT's contribution should be further investigated by developing adequate measures especially with reference to its use.

2.11 User satisfaction

User satisfaction is broadly defined as the "multidimensional attitude towards various aspects of MIS such as output quality, manmachine interface, EDP staff and services, and various user constructs such as feelings of participation and understanding" (Raymond, 1985).

The measurement of users' satisfaction with IT application remains of prime concern to researchers. User satisfaction measures are categorized in terms of three perspectives such as user attitudes towards **IT** application; user satisfaction in terms of information quality; and user satisfaction in terms of perceived IS effectiveness (Kim, 1989).

The concept of user satisfaction can be traced back to several decades (Swanson, 1974; Nolan and Seward, 1974). According to Bailey and Pearson (1983, p. 531) "satisfaction in a given situation is the sum of one's feelings and attitudes toward a variety of factors affecting the situation". As with system usage, a variety of measures have been proposed for the quantification and assessment of user satisfaction (Bailey and Pearson, 1983; Doll and Torkzadeh, 1988; Baroudi and Orlikowski, 1988). Ives et al. (1983) identify staff and service, information product, vendor support, and knowledge and involvement as factors that underlie user satisfaction. They considered user satisfaction as "the extent to which users believe the information system available to them meets their information requirements" (Ives et al., 1983, p. 785). This definition suggests that users perceive the system irrespective of its technical quality, and relates to the fulfilment of user needs by an IS. Kim (1989) describes user satisfaction in terms of information quality, system effectiveness and user attitudes. Doll and Torkzadeh (1988, 1989) considered user satisfaction in term of system quality (i.e. system accuracy, ease of use) and information quality.

Powers and Dickson (1973) studied the factors affecting the success of management information systems. They identified user satisfaction as one of the key factors affecting management information systems success. User participation in the development process was found to be crucial for user satisfaction. Delone and Mclean (1992) included about 33 articles that address the subject of user satisfaction in their

research. They conclude that user satisfaction is widely used as a measure of IS success because reliable instruments have been developed to measure satisfaction, and other measures of IS success are problematic. However, while user satisfaction has been widely used as a surrogate for systems performance and IS success, critics have questioned its general applicability (see, for example, Galletta and Lederer 1989).

2.12 Systems Use and User Satisfaction

Research concerning the relationship between systems use and user satisfaction are varied and indecisive. Mawhinney (1990) says that there is a lack of sufficient research effort to establish a conclusive relationship between these two constructs. Insufficient research is in some ways an easy answer, offering the opportunity for researchers to continue in well-established patterns of work until "good results" emerge.

Some researchers argue that system usage leads to user satisfaction – others that user satisfaction leads to system usage. According to Delone and McLean (1992) research it was found that usage effects satisfaction... the amount of use could affect the degree of user satisfaction – positively or negatively – as well as the reverse being true.

Delone (1988) also noted that duration of computer use is not related with system success. Conrath and Mignen (1990) question the axiomatic assumption that "positive attitudes leads to increased usage", arguing that it is not clear-cut. Their research concludes that usage has more impact on satisfaction than vice versa and both are positively related. On the contrary, Udo (1992) argued that the more a system is used, the less it is found to be effective, and that this may in turn reduce user satisfaction.

Thong and Yap (1996) stated that satisfaction effects usage. They discussed a lower bound to satisfaction below which users may discontinue system use, which gives some direct insight into how user satisfaction influences system usage. Using path analysis, Baroudi (1986) argued that user information satisfaction (UIS) could lead to system usage rather than vice versa (interpreting UIS as an attitude). Their

model assumes that as a system's use fulfils user needs, user satisfaction with the system should increase and lead to greater use.

Conversely, if system usage does not meet user needs, satisfaction will decrease and restrict further use. Lucas (1975b) argued that the use of IS is dependent on user attitudes and perceptions and that both may be influenced by the quality of the system. Positive user attitudes were consistent with high level of system usage. Joshi (1992) argues that user attitudes (as measures of user satisfaction) may influence behavior, and that positive user satisfaction may help in obtaining acceptance and usage of IS. Schewe (1976) found no significant relationship between attitudes and system usage behavior. Some researchers have provided evidence that heavily used systems are positively correlated to user satisfaction (Lucas, 1975b.;Robey, 1979).

In contrast, Schewe (1976) found no significant relationship between system use and user satisfaction, and Lawrence and Low (1993) did not find this relationship to be significant. Likewise, Mawhinney (1990) found no relationship between user satisfaction and system use, and Srinivasan (1985) remarks that the relationship is not always positive. Udo (1992) reviewed studies/laboratory experiments that measured systems effectiveness in terms of user satisfaction and system usage. He mentioned that the respondents who frequently used the system perceived it less effective in terms of increased productivity and cost efficiency.

Other interpretations of the relationship exist. Cheney and Dickson (1982) argue that system "utilization does not necessarily mean that the users are satisfied, the system may be all they have and it's better than nothing". Some argue that dissatisfied users may discontinue system usage and seek alternatives (Ginzberg, 1981; Sauer, 1993; Szajna and Scanmell, 1993).

Some researchers have argued that system usage and user satisfaction are actually negatively correlated (Ang and Soh, 1997; Mawhinney, 1990; Mawhinney and Lederer, 1990), while Liang, 1986; Udo and Guimaraes, 1994; Loh and Ong, 1998) showed a very weak relationship. Others Yoon and Guimaraes, 1995; Choe, 1998; Kivijarvi and Zmud, 1993)) found a positive correlation between system usage and user satisfaction. Researchers also mention a relationship between user attitude and system usage. Such findings are similarly mixed. Schewe (1976) found no significant

relationship between attitude and system usage whereas Lucas (1975b) suggested that a favorable user attitude leads to a high use level. Al-Khadi and Al-Jabri (1998) note that attitudes towards computers are significant determinants of behavior and that they may influence computer use.

While some studies focused on system attributes (Ditsa and MacGregor, 1995), others included the quality of the information products generated from the system (DeLone and McLean, 1992) and the level of support provided (Miller and Doyle, 1987; Raymond, 1987). Results of a meta-analysis indicated that user satisfaction is mainly affected by perceived benefits, user background and organizational support. Perceived benefits are measured by user expectations, ease of use and perceived usefulness. User background is determined by user experience, user skills and user involvement in the system development process. Organizational support, on the other hand, is driven by user attitude towards IS, organizational encouragement and perceived attitude of top management. Zviran and Erlich (2003) provided a comprehensive list of literature on satisfaction measurement.

In summary, the findings about user satisfaction and Management Information System Success interrelationship are mixed and inconclusive, with proponents on each side drawing empirical evidence in support of their argument. Such uncertainty, coupled with the weight of conventional wisdom, has led to an uneasy position in analysis of the interaction between user satisfaction and Management Information System Success. In order to move from anecdotes and case studies to testable models and hypotheses, it is vital to develop a valid instrument to measure the use of IT in QM. This paper reports on such a development.

CHAPTER III
CONCEPTUAL FRAMEWORK

As broached in the previous section, the measure of MIS success has achieved prime importance among researchers. Measures of success include assessment of satisfaction and the evaluation of the management information success, described in various terms such as information quality, system performance, organizational encouragement, effective information technology, and user satisfaction

3.1 Proposed Conceptual Framework

To cover the full spectrum of MIS success on IT Applications that meets user satisfaction, this research will broadly categorize the information technology management that is deemed critical in meeting user satisfaction into 3 major categories with their respective dimensions to studied into:

- ***"Information"*** with the dimension of:
  - ***Time:*** timeliness, currency, frequency
  - ***Content:*** accuracy, relevance, completeness, conciseness,
  - ***Form:*** clarity and detail.
- ***"System"*** with the dimension of:
  - Accessibility, availability, response time, ease of use, conservation of time, convenience, privacy, accuracy, multifunctional capabilities, interface and use of advanced IT.
- ***"Organization"*** with the dimension of:
  - Management system, technical support, financial incentive, IT policies.

The key dimensions of each of the attributes to be studied are illustrated in Figures 3.1. Even though there is a variety of different dimensions that are not considered in each of the categories as discussed above, it is believed that the above staged dimensions are more critical and have priorities over other dimensions (which though can affect MIS success on IT Applications and user satisfaction, but are not included in the study as including them will make the study more complex due to the

numerous performance attributes or variables to research, and as such their effects are down played as having impacts but are not researched due to their lower and more negligible effects as compared to those selected for study) .In this study, the Importance-Performance Analysis (IPA) technique will be applied to find out the MIS success on IT applications in Thai Higher Educational Institutions. This technique identifies strengths and weaknesses of IT applications in Thai Higher Educational Institutions in terms of two criteria that users use in making a choice. One criterion is the relative importance of the selected IT attributes. The other is users' evaluation of the offering in terms of those attributes.

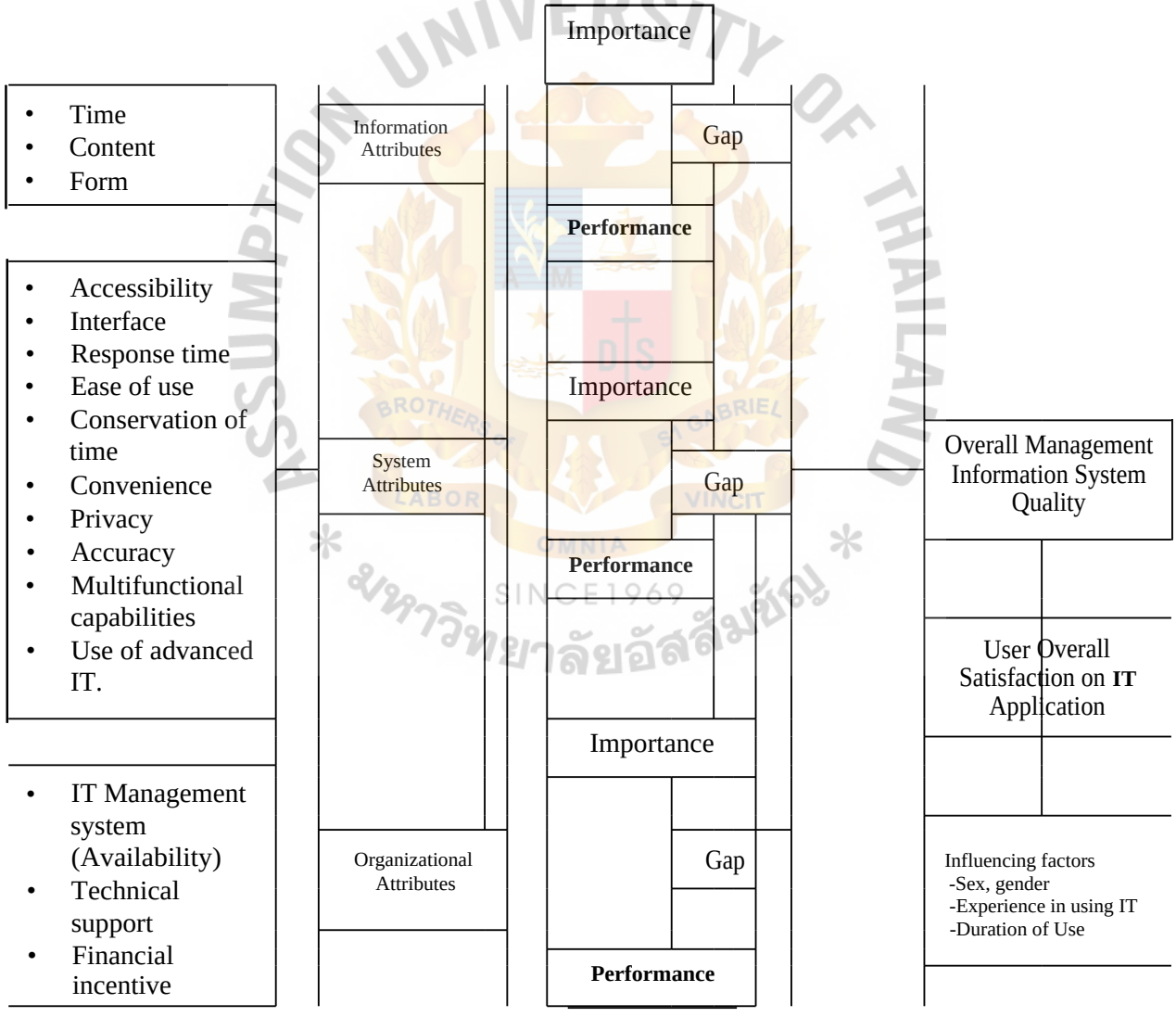


Figure 3.1: Conceptual Dimensions of the Different IT Applications

The framework as shown in Figure 3.2, focuses on the users' perspectives. To investigate the relationship between the importance aspect and performance aspect, the gap of the importance and performance among faculty members' and students' perspectives are evaluated, in the following model.

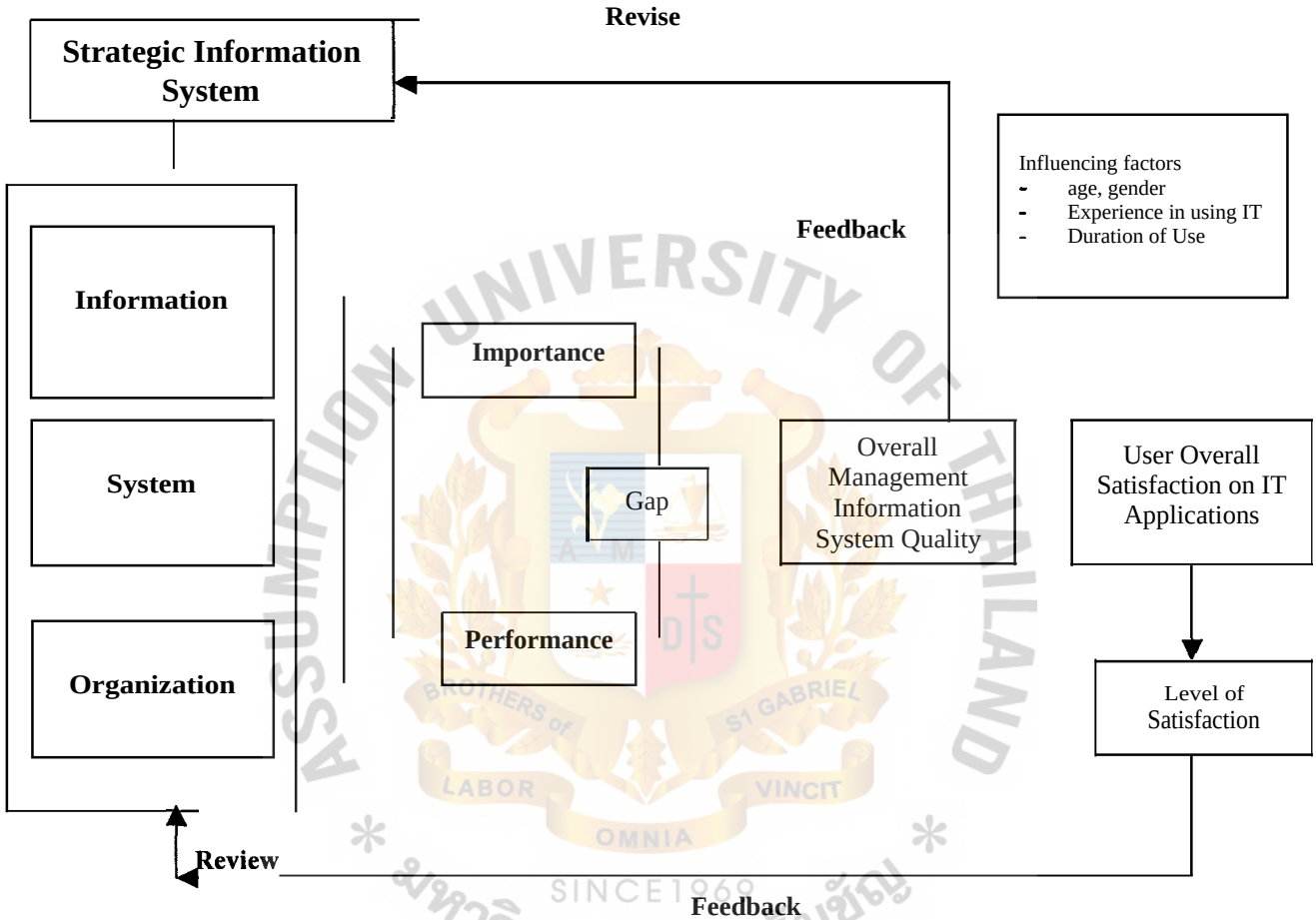


Figure 3.2 The Proposed Conceptual Framework

In the proposed conceptual framework as shown in Figure 3.2, the user overall satisfaction on IT applications might be hypothesized to depend not only on the attributes of information, system, or organization but also on gender, age, personal attributes, experience in using IT, and duration of use. Thus the problem requires identification of a linear relationship with multiple regression analysis.

$$Y = \beta_0 \beta_1 X_1 + \beta_2 X_2 \ldots\ldots + fl,,X,,, + e,$$

The multiple regression method will be utilized to generate the coefficient values in each component in the equation below:

$$\text{Prediction Model } \hat{y} = b_0 + b_1 x_1 + b_2 x_2 + \ldots\ldots + b$$

$$\textit{Overall MIS Quality} = b_0 + b_1 \textit{Gap (Information Aspect)} + b_2 \textit{Gap (System Aspect)} + b_3 \textit{ Gap (Organizational Aspect)}$$

$$\textit{User Overall Satisfaction} = b_0 + b_1 \textit{Sex} + b_2 \textit{Age} + b_3 \textit{Personal Attributes} + b_4 \textit{Experience in using IT} + b_5 \textit{Duration of Use} + b_6 \textit{ Overall MIS Quality}$$

In the proposed conceptual framework as shown in Figure 3.2, the key factors will be synthesized and determined from the results of focus group interviews. In this proposed study, these variables will be the main factors to be operationalized to determine its importance and performance to the Information Technology. The importance aspect tries to find out what factor is important to the Information Technology or it represents the minimal expectation of that factor determinant of MIS success on IT applications. The performance aspect will look at the actual performance of the IT applications or the perception of that factor determinant of management quality of IT application in Thai Higher Educational Institutions. The influencing factors as reported by the demographic characteristics will be further investigated through a correlation analysis of the demographic characteristics with each of the factor determinants. This will substantiate whether sex, age and personal attributes will have a contributing effect on the level of user satisfaction.

The result will be also displayed on the matrix shown in Figure 3.3, which is divided into four quadrants to indicate the priority to be given to each attribute. Based on the importance and performance differential of its means difference or its variance, the gap will indicate whether the IT applications on each attribute meets the requirements. As such, the gap analysis will be an indicator of the level of satisfaction on the MIS success on IT applications. If the means difference of importance dimension is greater than the performance, it will lead to a lower degree of satisfaction to the IT applications. This will provide an indicator of the degree of satisfaction of the IT applications that can be constituted as the satisfaction indicator of that factor determinant. It can also be determined that the higher the means difference, the greater

the degree of dissatisfaction on the quality of IT applications. The vice versa rationale also holds true.

This proposed conceptual framework will be used for further development as the supporting framework to determine "the Importance Performance Analysis and Users Satisfaction on IT applications in Thai Higher Educational Institutions" in the follow-up research study.

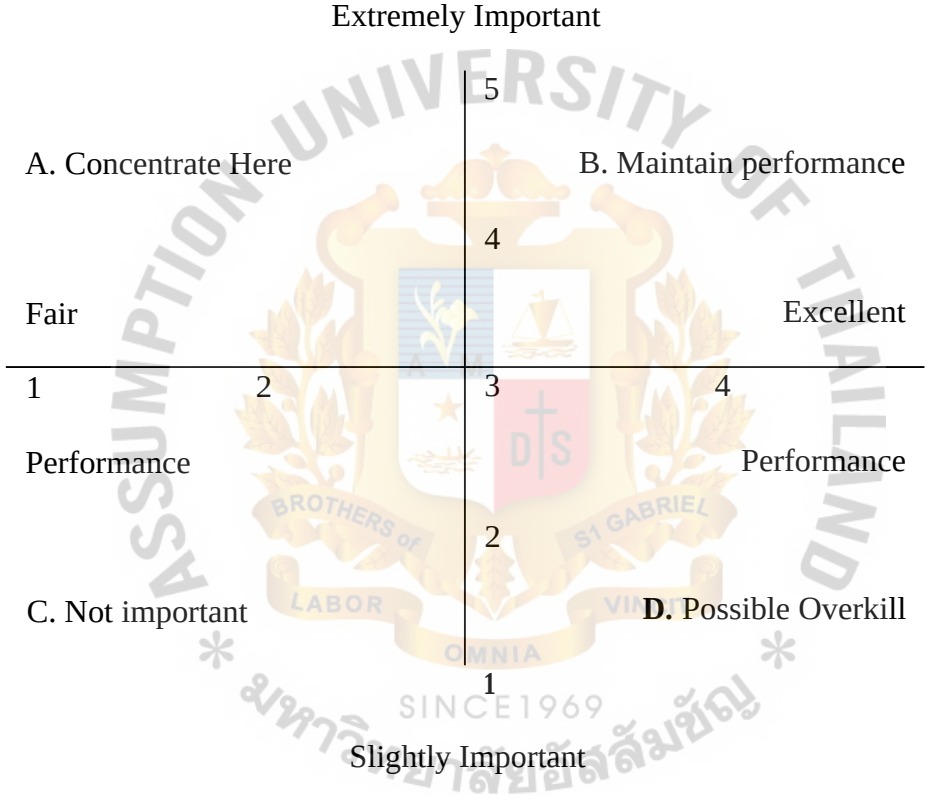


Figure 3.3: The IPA Matrix applies in Higher Educational Institutions

3.2 Hypotheses

Based on the above conceptual framework, the hypothesis statements are set as follows:

H_a1: There is a difference between users' perception about the importance and performance of Information quality attributes.

H_a 2: There is a difference between users' perception about the importance and performance of system quality attributes.

H_ai There is a difference between users 'perception about the importance and performance of organizational management attributes.

HA There is a different between users' perception about the overall management information system quality.

H_a5 There is a different between users' perception about the overall satisfaction on IT applications.

H_a6 There is a relationship between users' perception about information technology attributes and the overall management information system quality.

H_a1 There is a relationship among users' perception about the overall management information system quality and users' satisfaction.

H_a8 There is a relationship among users' perception about the overall management information system quality and users' satisfaction with information technology attributes.

H_a9 There is a relationship among users' demographic characteristics, the overall management information system quality and users' satisfaction with IT applications with information technology attributes.

CHAPTER IV
RESEARCH METHODOLOGY

This section describes a research technique, research design, target populations, sample size, sampling technique, questionnaire design, pre-test of questionnaire, mode of data collection, and data analysis.

4.1 Research Technique

Hussey & Hussey (1997) mentioned that a survey is a positivistic methodology whereby a sample of subjects is drawn from a population and studied to make inferences about the population.

Zikmund (1994) suggested that survey is a research technique in which information is gathered from a sample of people by use of a questionnaire; a method of data collection based on communication with a representative sample of individuals. Davis (1996) said that surveys differ from observation studies in that they require interaction with the respondent. He also mentioned that surveys have been used successfully to help test hypotheses, evaluate programs, describe populations, build models of human behavior, develop useful measurement scales, and make other methodological improvements in business research.

Another advantage of the survey method is that it can help the researcher to save cost and time. Hussey & Hussey (1997) said that it would be too time consuming and expensive to collect data about every member and therefore only a sample of the whole population is used.

Using a survey technique, as a research method in this study is suitable, as the researcher would like to investigate faculty members, and students' perceptions on technology.

Hussey & Hussey (1997) mentioned that a questionnaire must have a substantial amount of understanding and knowledge about the subject, so that the author can decide what the most appropriate questions will be. The knowledge may

have come from the literature and other studies that have used questionnaires. Cooper & Schindler (2001) suggested that short questionnaires should obtain higher response rates than longer questionnaires. They also mentioned that a pilot test should be conducted to detect weaknesses in design of the questionnaire.

The researcher will follow the suggestions above on questionnaire and pilot study.

4.2 Research Design

In this study, both qualitative and quantitative methods will be used for achieving the research objectives. A nationwide cross-sectional survey will be conducted for measuring the perception of faculty members and students about the importance-performance analysis and user satisfactions on IT applications in Thai Higher Educational Institutions. The statistical analysis will be conducted based on the quantitative data from the survey.

The qualitative method will be used to search some related documentary data to the study and conduct a focus group interview. These qualitative approaches will help the research to gather information and formulate hypotheses. The documentary data will be accessed via the following information sources:

- Government information centers (e.g., Office of Commission on Higher Education, Ministry of Education)
- Non-government information centers (e.g., Association of Private Higher Education Institutions of Thailand)
- Research papers from academic institutes (e.g., Both public and private universities in Thailand)

Another qualitative method was a focus group discussion, which a number of university faculty members and students will be asked and probed related issues to the selected attributes of IT applications in Thai Higher Educational Institutions. In each group, there should be eight participants. The participants will be selected from different universities.

4.3 Target Populations

The target population in this study is the faculty members and students of Thai Higher Educational Institutions who have participated or experienced in using IT applications offered by institutions.

4.4 Sample Size and Sampling Technique

According to the 2006, Annual Report of Office of Commission on Higher Education, Ministry of Education, the total number of Thai Higher Educational Institutions in Thailand is 157, which can be categorized into 4 categories.

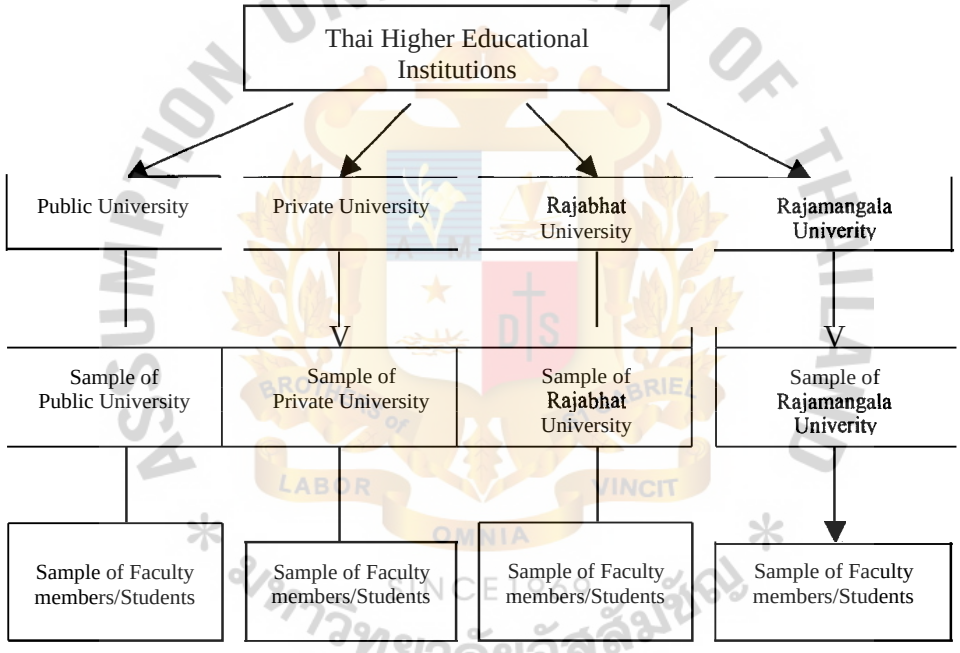


Figure 4.1 Sampling Chart

Since the list of population or the population frame was obtained by Office of Commission on Higher Education, Ministry of Education in the year of 2006. As shown in Figure 4.1, the sample population is sorted through the stratified two-stage sampling technique. In this approach, the population is partitioned into subpopulations called strata so that every population element would be assigned to one and only one stratum and that no population elements would be omitted. Then, systematic with proportionate to size was applied to the sample. Finally, sampling elements were selected from each stratum by simple random sampling (SRS).

To determine sample size for a proportion, the researcher wished to estimate with 95 percents confidence ($Z_{\alpha/2} = 1.96$) that the allowance for sampling error with a 5 percents level of error. However, this research was applied the stratified two-stage sampling technique which was a complex design. As such, in order to increase more precision and the efficiency of a sampling plan (Kish, 1995), the design effect (deff) must be used for estimating the sample size needed for a survey. Therefore, the amount of the sample size for this research would need to be 1,048.

4.5 Questionnaire Design

The questionnaire was divided into two parts. The part I of the questionnaire consists of respondents' demographic data (e.g., gender, age, and status). Personal attributes, experience perception in using IT and duration of use were also included in this part.

In the part 2 of the questionnaire, the three attributes of Management Information System Quality were operationalized by 24 items (see table 1 and Appendix 2). These items were developed based on the focus group interview with faculty members and students in Higher Educational Institutions in Thailand.

Table 4.1: Operationalization of Management Information System Quality

Variables	Operationalization Items	Items
Information	Updated and related to the appropriate time period.	Info 1
	Error free.	Info 2
	Relevant, concise, and clear.	Info 3
	Available and provided when needed.	Info 4
	Suited to the user's needs.	Info 5
	Provided in a form that is easy for user to understand	Info 6
	Meet the user's needs for the level of details needed	Info 7
	Effective in helping user complete the tasks.	Info 8

System	Advanced.	System 1
	Easy to access.	System 2
	Accurately performed and reduce error rates.	System 3
	Enable user to accomplish task more quickly.	System 4
	Provide high security such as invasion of privacy.	System 5
	Give error message that clearly tell user how to fix problems.	System 6
	Have all the functions and capabilities in helping user complete the tasks.	System 7
	Prompt and efficient (provided when needed.).	System 8
	Designed for all levels of users.	System 9
	Easy for user to find the needed information.	System 10
	Pleasant interface (e.g., easy reading characters, clear sequence of screens, highlighting simplified task)	System 11
	Clear organization of information on the system	System 12
Organization	Computers allocation (e.g., the availability of equipments in a convenient location).	Org 1
	Just-in-time support, assistance and encouragement in problem solving when needed.	Org 2
	Training on the IT applications for user at different skill levels.	Org 3
	Incentives for professional development in technology (e.g., money, benefit, or reward).	Org 4

To rate the scale of the selected IT attributes, the 5-point scale (i.e., Likert Scale) with multiple items will be applied on each item. The faculty members and students were asked about their perceived importance and performance of each attribute of IT applications.

Importance and performance will be rated on a 5-point scale, where

1 = Very low

2 = Low

3 = Neutral

4 = High

5 = Very high

The average of the items under one attribute will be calculated as the score for this attribute. A "gap score" will be also computed from the difference between the ratings respondents assign to the paired importance and performance statements. The results will be displayed on the matrix shown in Figure 3.4, which is divided into four quadrants to indicate the priority to be given to each attribute.

The instrument will also apply for measuring the key variables in the framework shown in Figure 3.2 including the perception of quality of IT applications and overall satisfaction. The faculty members and students were asked about their

perceptions with a 5-point rating scale ranging from "Very Low" to "Very High" on two questions in the questionnaire (see table 2).

Table 4.2: Operationalization of Dependent Variables

Variables	Operationalization Items	Items
Overall Management Information System Quality	Describe the overall management information system quality in your institution	Quality
Overall Satisfaction	Rate the overall satisfaction level on IT application provided by institution.	Satisfy

Due to a sample group in this study is primarily Thai native speakers and Non-Thai native speakers. The actual survey instrument will be translated into both Thai and English version. To ensure minimal semantic or interpretation errors, the translation will be done separately an individual who is well-versed in linguistic for the English/Thai translation of the questionnaires, and the questionnaires will be re-checked by a expert in order to get the statements that best retain the original meaning and semantic in the English version.

4.6 Pretest of Questionnaire

After constructing the questionnaire, the researcher will test its validity and reliability with the appropriated number of students. The reliability test will be conducted to examine the internal consistency of multi-item constructs. The format and understandability of question wordings will be examined too.

4.7 Mode of Data Collection

After getting the reliable and valid questionnaires, the researcher will determine a mode of data collection. Two major methods will be utilized to collect the data required and to determine the basic set of attributes of IT applications that are important to user satisfaction. The two major methods are:

- *Questionnaire survey:* A closed ended questions structured, as attributes based on IT applications that are important to user satisfaction will be used to collect the data. The mailed self-administered questionnaires were sent to all respondents who were randomly selected from the selected higher education institutions.

- *Individual and focus group survey:* In the case of respondents who are faculty members, they will answer the close-ended structured questionnaire followed by an interview. For the case of respondents who are students, a few focus groups will be set up to answer the close-ended structured questionnaire.

These selected respondents also will be informed about the purposes of the study by an advance letter. Meanwhile, for sampled faculty members and students, the researcher will go to each selected university and distribute the questionnaires directly to faculty members and students both undergraduate and graduate levels who are willing to participate in the survey request.

4.8 The Treatment of Collected Data.

In this study, descriptive and inferential statistics methods are used. Descriptive statistics are used in describing parameters of the faculty members and students' personal data. The aims of descriptive statistics are to describe the differential of one situation to another and to diagnose the events by using frequency and percentages.

The objective of this research study is to test users' attitude towards IT applications in Thai Higher Educational Institutions. Results will be processed using the AMOS structural equation-modeling program. The researcher uses Structure Equation Modeling (SEM) to present causal effect of a set of variables such as timeliness, currency, frequency, time period, accuracy relevance, completeness, conciseness and clarity as well as the effect of a set of variables such as availability, access, response time, ease of use, conservation of time, convenience, privacy, accuracy multifunctional capabilities, and use of advanced IT. After that the relationship between information aspect, system aspect, organizational aspect and

overall management information system quality will be tested, then the relationship between overall management information system quality and user overall satisfaction on IT application will be investigated. Moreover, influencing factor will be tested to check the effect on level of satisfaction in this study.

SEM estimates a series of separate, but interdependent, multiple regression equations simultaneously by specifying the structure model used by the statistic program. The data gathered from the respondents were analyzed and summarized in a readable and easily interpretable form after the required data are collected. The questionnaire is processed using SPSS to find out the descriptive statistics used in describing parameters of the respondents' personal data. In addition, SPSS is used to conduct factor analysis. However, the Analysis of Moment Structures (AMOS) utilized to analyze multiple regression has a unique graphical interface and is specifically designed to make fitting SEM easier.

CHAPTER V
DATA ANALYSIS

This chapter presents the analyses of the collected primary data from the target respondents. The result and analysis part is divided into two major sections as follows:

Descriptive Statistics: To summarize the research, the analysis of descriptive statistics is segmented as Frequency Tables of Personal Data, Frequency and Percentage summary for performance attributes, Users Satisfaction, and Test of Difference.

Inferential Statistics: The analysis of inferential statistics involves the analysis and verification for hypothesis statements in the population, the item analysis including Principal Components Analysis (PCA), Confirmatory Factor Analysis (CFA), and Test of Structural Equation Model (SEM).

5.1 Descriptive Analysis

Distribution is the most significant theoretical distribution in statistics. It is a Standard of comparison for describing distribution of sample data is used with inferential statistics that assume normally distributed variables. The characteristics of location, spread and shape describe distributions. Their definitions, applications, and formulas fall under the heading of "descriptive statistics" (Cooper, 2001).

Descriptive statistics is an efficient means of summarizing the characteristics of large set of data, which can be presented in frequency tables, bar charts, pie charts, cross tabulation, histogram and percentages. For the purpose of analyzing the data, the analysis of descriptive statistics is segmented as follows:

A. Summary For Personal Data
B. Mean Summary For Importance And Performance Attributes

5.2 Summary For Personal Data

Table 5.1: Summary of Respondents by Gender, Age, and Status

Characteristics	Percentage (%)
Sex	
Male •	42.7
Female	57.3
Total	**100.0**
Age	
Under 25 years	86.7
25-30 years	9.3
31-35 years	2.0
36-40 years	0.6
Over 40 years	1.4
Total	**100.0**
Status in University	
Faculty member	4.9
Student	95.1
Total	**100.0**

Table 5.2: Summary of Respondent's Behavior in Regarding Access to the Institution's Website.

	Percentage (%)
Access Frequency	
Less than once a week	22.6
1-2 time a week	36.9
3-4 times a week	21.8
5-6 times a week	7.1
Over 6 times a week	11.6
Total	**100.0**
Duration of use	
Less than 30 minutes / day	43.4
30 minutes -1 hour	37.1
1-2 hours / day	15.0
3-4 hours / day	2.9
More than 5 hours / day	1.6
Total	**100.0**
Place	
On-campus	44.9
At home/ Apartment off campus	50.6
Other	4.5
Total	**100.0**

Table 5.1 has shown that 454 respondents of the sample size were male and 609 respondents were female, representing 42.7% and 47.3% respectively. During the survey, it was noticed that most of the male respondents were unwilling to cooperate and answer the questionnaires. The most of respondents are student representing 93.9% and 51 respondents are faculty member; representing 4.8 % and also 14 questionnaires have no response for this question. Majority of the sample size is in age group under 25 years, representing 86.6% in combine.

Table 5.1 has also shown that 99 respondents are in the age group between 25-30 years, representing 9.3%, 21 respondents are in age between 31-35 years or 2.0%, 6 respondents are in age group between 36-40 years and, 15 respondents are in age group over 40, representing 1.4% respectively. The researcher found that one questionnaire has no response for all personal data question.

Table 5.2 has shown that most respondents spent their time from 1 to 2 times a week on accessing into the institution's website which accounted for 36.9%. About 22.6% of all respondents spent less than once a week while the respondents spent 3-4 times a week accounted for 21.7%. Only 11.6% of all respondents spent more than 6 times a week. Most respondents spent their time less than 30 minutes a day on the institution's website which accounted for 43.3%. About 37.1% spent their time from 30 minutes to 1 hour, 15% spent 1-2 hours and 2.9% spent 3-4 hours a day. Only 1.6% spent more than 5 hours. Table 5.3 has also shown that most respondents spent their time at home or off campus in order to access to the institution's website which accounted for 50.6%.

Table 5.3: Summary of Respondent's Purpose in Using Internet provided by the Institution

Purpose	Percentage (%)
Reading or sending email	25.5
Updating information (e.g. reading announcements)	62.0
Checking a schedule for courses or registration	68.8
Surfing the internet for research or coursework purposes	66.4
Linking other websites of interest	117.2
Other purposes	3.0
Total	**100.0**

Table 5.3 has shown that most respondents spent their time for checking a schedule for courses or registration a day on the institution's website which accounted for 68.8%. About 66.4% spent their time for surfing the Internet for research or coursework purposes, 62% spent their time for updating information (e.g. reading announcements) and 25.5% spent their time for reading or sending email. Only 17.2% spent their time for linking other websites of interest.

Table5.4: Summary of Respondent's Opinion of their skill level when using the following IT applications and Time Spending

Applications	Skill Level					Time Spending				
	Very skilled	Skilled	Neutral	Unskilled	Very Unskilled	Less than 30 mins	30 mins to one hour	1-2 hours	3-4 hours	More than 5 hours
Word Processing (Word, Excel, Power Point, etc)	15.0	50.2	31.3	3.2	0.3	19.7	38.4	31.9	7.6	2.4
Surfing the internet	21.7	53.3	23.6	1.3	0.1	9.0	29.1	37.0	18.2	6.7
Receiving, sending email	21.2	47.1	25.0	5.5	1.2	31.3	36.7	25.3	4.6	2.1
Other	**25.4**	**39.9**	**29.7**	**3.6**	**1.4**	**19.0**	**23.0**	**26.2**	**19.8**	**12.0**

Table 5.4 has shown that the highest score of 50.2% are skilled respondents who spent their time between 30 minutes to one hour for using word processing (Word, Excel, Power Point, etc) a day on the institution's website which accounted for 38.4%. About 53.3% are skilled respondents who spent their time for surfing the Internet for 1-2 hours by 37%, another 47.1% are skilled respondents who spent their time for receiving, sending e-mail between 30 minutes to one hour by 36.7%.

Table 5.5: Summary of Respondent's Descriptions of Previous Experiences in Accessing Websites Provided by Other Institutions

Description	Percentage (%)
Very Positive	6.8
Positive	49.5
Neutral	42.8
Negative	0.6
Very Negative	0.3
Total	**100.0**

Table 5.5 has shown that most respondents were satisfied with their previous experiences in accessing websites provided by other institutions, which accounted for 49.5%. Only 0.9% was not satisfied.

5.3 Mean Summary for Importance and Performance Attributes

This section explores how users perceive the importance and performance of each attribute of IT applications. To better understand the frequency results, the variable is divided into 3 major attributes whose response are evinced by comparing frequency from importance section and performance perception section, which can be summarized in the table below:

Table 5.6: Mean of Respondent's Rate of the Importance and Performance Levels for Information Attribute on Website Provided by the Educational Institutions

Item	Importance					7	S.D.	Performance					$\bar{x}$	S.D.
	5	4	3	2	1			5	4	3	2	1		
Updated and related to the appropriate time period	35.0	43.7	19.6	1.4	0.3	4.12	0.78	8.7	56.7	28.1	5.6	0.9	3.67	0.74
Error free	43.7	37.6	17.3	1.1	0.3	4.24	0.79	14.9	51.9	28.8	3.9	0.5	3.77	0.77
Relevant, concise, and clear	25.2	48.2	24.5	1.9	0.2	3.96	0.77	10.9	49.2	35.5	3.8	0.6	3.66	0.75
Available and provided when needed	37.8	41.1	18.1	2.6	0.4	4.13	0.83	14.9	44.1	32.7	7.4	0.9	3.65	0.85
Suited to the user's needs	31.8	46.0	19.0	2.8	0.4	4.06	0.81	13.4	49.9	31.4	4.5	0.8	3.7	0.79
Provided in a form that is easy for the user to understand	31.4	47.0	18.7	2.4	0.5	4.07	0.8	12.5	48.7	33.0	4.9	0.9	3.67	0.79
Meets the user's needs for the level of details needed	31.1	42.9	23.1	2.5	0.4	4.02	0.82	9.6	42.9	38.8	7.5	1.2	3.52	0.82
Effective in helping the user complete tasks	33.8	44.1	19.8	2.0	0.3	4.09	0.8	12.0	43.5	36.3	6.7	1.5	3.58	0.84

As shown in table 5.6, Information aspect was composed of three dimensions: time, content, and forth, and the results with regard to the importance of information attribute on website show that users have the highest mean of the indicated importance of item no.2 ($\bar{x}$ = 4.24) followed by the item no.4 ($\bar{x}$ =4.13), item no.1 (x = 4.12), item no.8 ($\bar{x}$ = 4.09), item no.6 ($\bar{x}$ =4.07), item no.5 ($\bar{x}$ =4.06), item no.7 ($\bar{x}$ =4.02), and the lowest mean of the item no.3 ($\bar{x}$ =3.96), respectively. However, the respondents indicate that the highest mean of the performance regarding to information attribute is item no.2 (x = 3.77) and the lowest ($\bar{x}$ = 3.52) of item no.7.

Table 5.7: Mean for Respondents' Rate of the Importance and Performance Levels for System Attribute Provided by the Educational Institutions

Item	Importance					$\bar{x}$	S.D.	Performance					.	S.D.
	5	4	3	2	1			5	4	3	2	1		
Advanced	34.2	44.9	19.2	1.1	0.6	4.11	0.79	14.3	49.8	30.4	3.7	1.8	3.71	0.82
Easy to access	37.9	44.0	16.1	1.6	0.4	4.17	0.78	14.5	48.0	30.0	5.7	1.8	3.68	0.86
Accurately performed and reduced error rates	33.5	46.1	18.3	1.7	0.4	4.11	0.78	9.6	47.3	36.5	5.4	1.2	3.59	0.78
Enables user to accomplish tasks more quickly	34.2	42.9	20.3	1.7	0.9	4.08	0.83	12.3	44.9	34.1	7.0	1.7	3.59	0.85
Provides high security against invasion of privacy_	42.1	35.3	19.8	2.1	0.7	4.16	0.86	17.7	40.3	34.2	6.1	1.7	3.66	0.9
Gives error messages that clearly tell the user how to fix _problems	28.3	45.0	22.4	3.6	0.7	3.97	0.85	9.9	35.5	40.5	11.6	2.5	3.38	0.91
Has all the functions and capabilities in helping the user complete tasks	28.7	46.3	21.2	3.4	0.4	3.99	0.82	8.9	42.7	39.0	8.3	1.1	3.5	0.81
Prompt and efficient (provided when needed)	30.4	46.8	19.1	3.2	0.5	4.03	0.82	11.6	44.7	35.2	7.1	1.4	3.58	0.84
Designed for all levels of users	29.6	42.4	24.7	2.2	1.1	3.97	0.85	13.4	44.5	35.4	5.8	0.9	3.63	0.82
Easy for the user to find the information when needed	31.8	46.0	19.4	2.3	0.5	4.06	0.81	13.3	47.1	33.7	4.8	1.1	3.67	0.81
Pleasant interface (e.g. decipherable characters, clear sequence of screens, highlighting simplified tasks)	31.8	43.6	21.4	2.7	0.5	4.03	0.83	15.1	47.2	30.5	6.1	1.1	3.69	0.84
Clear organization of information on the system	30.8	46.2	19.8	2.6	0.6	4.04	0.82	14.1	48.7	32.4	3.5	1.3	3.71	0.8

Table 5.8: Mean of Respondents' Rate of the Importance and Performance Levels for IT Management Provided by the Educational Institution

Item	Importance					$\bar{x}$	S.D.	Performance					$\bar{X}$	S.D.
	5	4	3	2	1			5	4	3	2	1		
Computers allocation (e.g. the availability of equipment in a convenient location)	26.8	50.1	21.0	1.8	0.3	4.01	0.76	13.5	49.8	30.3	5.4	1.0	3.69	0.81
Timely support, assistance and encouragement in problem solving when needed	28.9	46.2	22.7	2.1	0.1	4.02	0.78	8.1	41.7	37.5	10.1	2.6	3.43	0.88
Training on the IT applications for the user at various skill levels	27.8	44.8	23.7	3.5	0.2	3.97	0.82	10.9	38.4	41.2	8.2	1.3	3.49	0.84
Incentives for professional development in technology (e.g., money benefit, or reward)	22.6	41.2	29.9	5.3	1.0	3.79	0.89	10.0	34.2	44.2	9.6	2.0	3.41	0.87

Table 5.7 has shown that the item associated with system aspect deal with use of advance IT, accessibility, accuracy, privacy, response time, privacy, response time, multifunctional capabilities, conservation, convenience, and interface, with regard to the importance of system aspect, the results show that users have the highest mean of the indicated importance of item no.2 ($\bar{x}$ = 4.17) followed by the item no.5 ($\bar{x}$ =4.16), item no.1 & 3 ($\bar{x}$ =4.11), item no.4 ($\bar{x}$ =4.08), item no.10 ($\bar{x}$ =4.06), item no.7 ($\bar{x}$ =4.04), item no.8 & 11 ($\bar{x}$ =4.03), item no.7 ($\bar{x}$ = 3.99), and item no. 6 ($\bar{x}$ = 3.97), respectively. Meanwhile the respondents indicate that the highest mean of the performance regarding system attribute is item no.12 = 3.71) and the lowest ($\bar{x}$ = 3.38) of item no.6.

As shown in Table 5.8, organization aspect was measured by four items, which were IT management (item no.1); Technical support (item no.2); financial incentive (items no. 3); and IT policy (items no.4). After conducting the survey, the result has shown that the respondents have the highest mean of the indicated importance of item no. 2($\bar{x}$ = 4.02), followed by item no. 1($\bar{x}$ = 4.01), item no. 3 ($\bar{x}$ = 3.97), and item no. 4($\bar{x}$ = 3.79), respectively. The respondent also indicated that the highest mean of the performance regarding to organization attribute is item no.1 = 3.69) and the lowest ($\bar{x}$ = 3.41) of item no.4.

Table 5. 9: Mean differences between the Importance-Performance of IT Application Attributes

Elements of IT' Attributes	Importance mean	Performance mean	Quadrant	P-I
Updated and related to the appropriate time period	4.12	3.67	B	-.45
Error free	4.24	3.77	B	-.47
Relevant, concise, and clear	3.96	3.66	B	-.30
Available and provided when needed	4.13	3.65	B	-.49
Suited to the user's needs	4.06	3.7	B	-.36
Provided in a form that is easy for the user to understand	4.07	3.67	B	-.39
Meets the user's needs for the level of details needed	4.02	3.52	B	-.50
Effective in helping the user complete tasks	4.09	3.58	B	-.51
Advanced	4.11	3.71	B	-.40
Easy to access	4.17	3.68	B	-.50
Accurately performed and reduced error rates	4.11	3.59	B	-.52
Enables user to accomplish tasks more quickly	4.08	3.59	B	-.49
Provides high security against invasion of privacy	4.16	3.66	B	-.50
Gives error messages that clearly tell the user how to fix problems	3.97	3.38	B	-.58
Has all the functions and capabilities in helping the user complete tasks	3.99	3.5	B	-.49
Prompt and efficient (provided when needed)	4.03	3.58	B	-.45
Designed for **all** levels of users	3.97	3.63	B	-.34
Easy for the user to find the information when needed	4.06	3.67	B	-.40
Pleasant interface (e.g. decipherable characters, clear sequence of screens, highlighting simplified tasks)	4.03	3.69	B	-.34
Clear organization of information on the system	4.04	3.71	B	-.33
Computers allocation (e.g. the availability of equipment **in** a convenient location)	4.01	3.69	B	-.32
Timely support, assistance and encouragement in problem solving when needed	4.02	3.43	B	-.59
Training on the IT applications for the user at various skill levels	3.97	3.49	B	-.47
Incentives for professional development in technology (e.g., money benefit, or reward)	3.79	3.41	B	-.38

Table 5.10: Key Statistics of the Importance-Performance of IT Applications in Higher Educational Institutions

IT applications	Importance mean	SD.	Performance mean	SD.	Quadrant	P-I
Information	4.08	0.60	3.65	0.57	B	-.43
System	4.06	0.63	3.61	0.62	B	-.45
IT Management	3.94	0.65	3.50	0.67	B	-.44

To identify a set of critical success factors, the importance-performance analysis produces a graphical display on separate measures of importance versus performance on individual factors and attributes. Importance scores were either above or below the performance mean. This combination resulted in four classification possibilities. These include: quadrant I (high importance/low performance) — "concentrate here"; quadrant II (high importance/high performance) — "keep up the good work"; quadrant III (low importance/low performance) — "low priority"; and quadrant IV (low importance/high performance) — "possible overkill" (see Figure. 5.1 and 5.2).

By using a central tendency of mean, the attribute importance and performance scores are ordered and classified into high or low categories; then by pairing these two sets of rankings, each attribute is placed into one of the four quadrants of the importance performance grid as shown in Figure. 5.1 And 5.2.

As shown in Table 5.9 and 5.10, when applying the Importance-Performance Grid in this study, the quadrants of the grid provide information regarding the level of importance and performance for each key success factors. The results for IT application attributes fell into the "keep up the good work" area (quadrant II). Factors in quadrant 2 were rated as important with high level of performance, the finding indicates that users were satisfied with these attributes that they considered to be of high importance, and the management has to maintain the performance level in these areas to sustain the resultant competitive advantages.

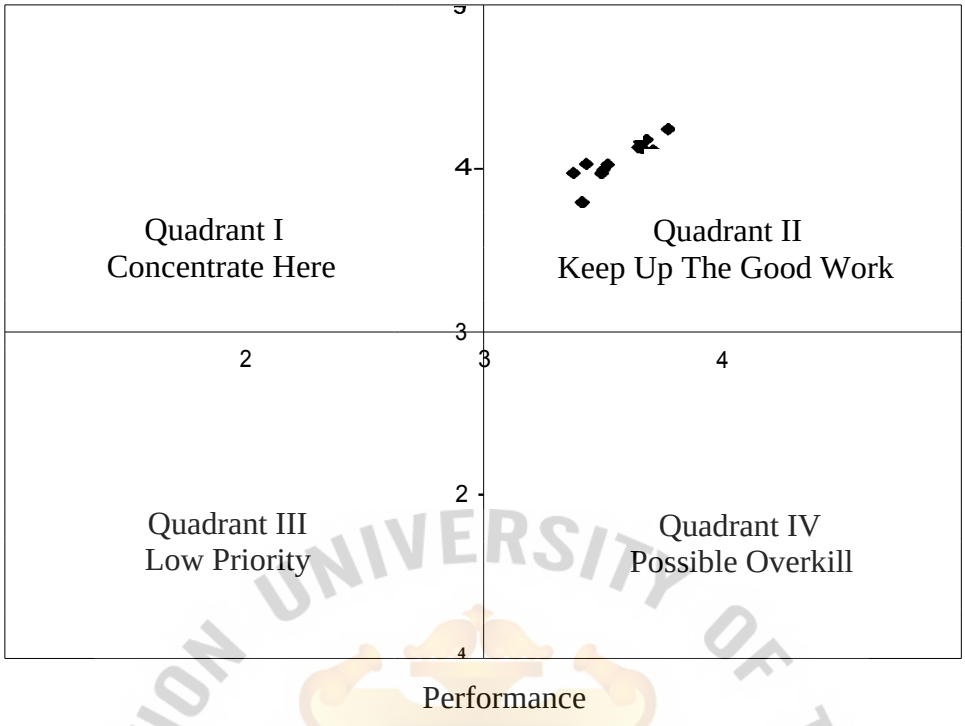


Figure 5.1: Importance-Performance Grid for All Items.

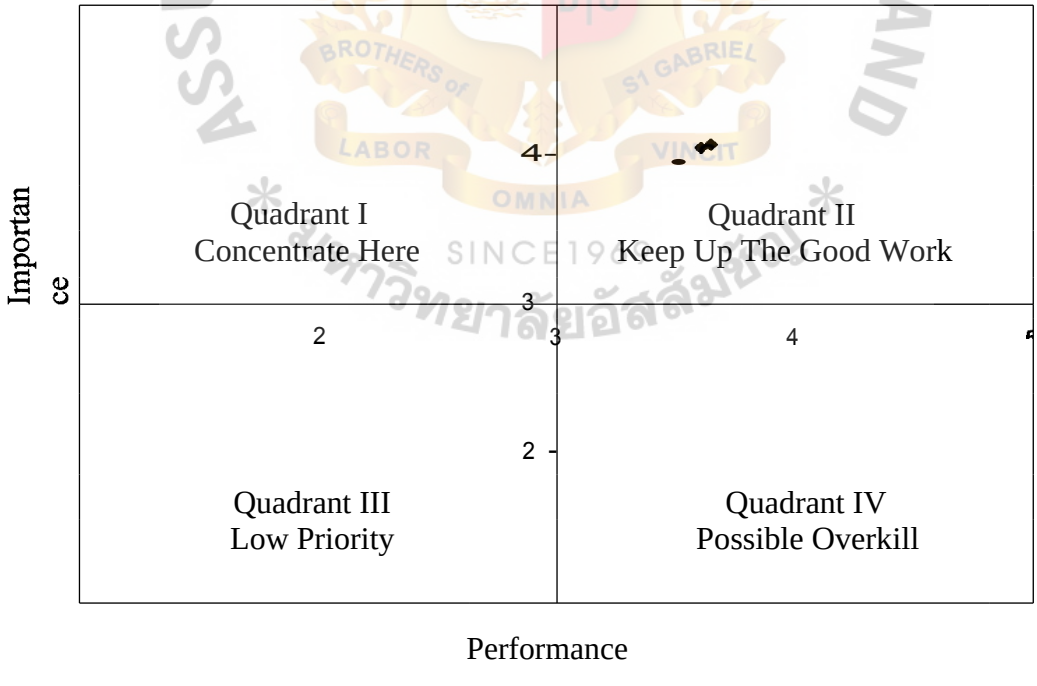


Figure 5.2: Importance-Performance Grid for Key Statistics of IT Applications in Higher Educational Institutions

Table 5.11: The Percentage of Respondents' Descriptions of the Overall Quality of Management Information System

Description	Percentage °A
Very High	13.0
	59.5
Neutral	16.8
Low	7.9
Very Low	2.8
Total	100.0

Table 5.11 and figure 5.3 show the respondents' evaluation percentage on overall MIS quality of Higher Educational Institutions. The results reveal that 16.8% of total respondents were neither high nor low for the overall MIS quality of Higher Educational Institutions, followed by 7.9% for low, and 2.8% for very low. Meanwhile, the majority of 59% indicated high quality for overall MIS.

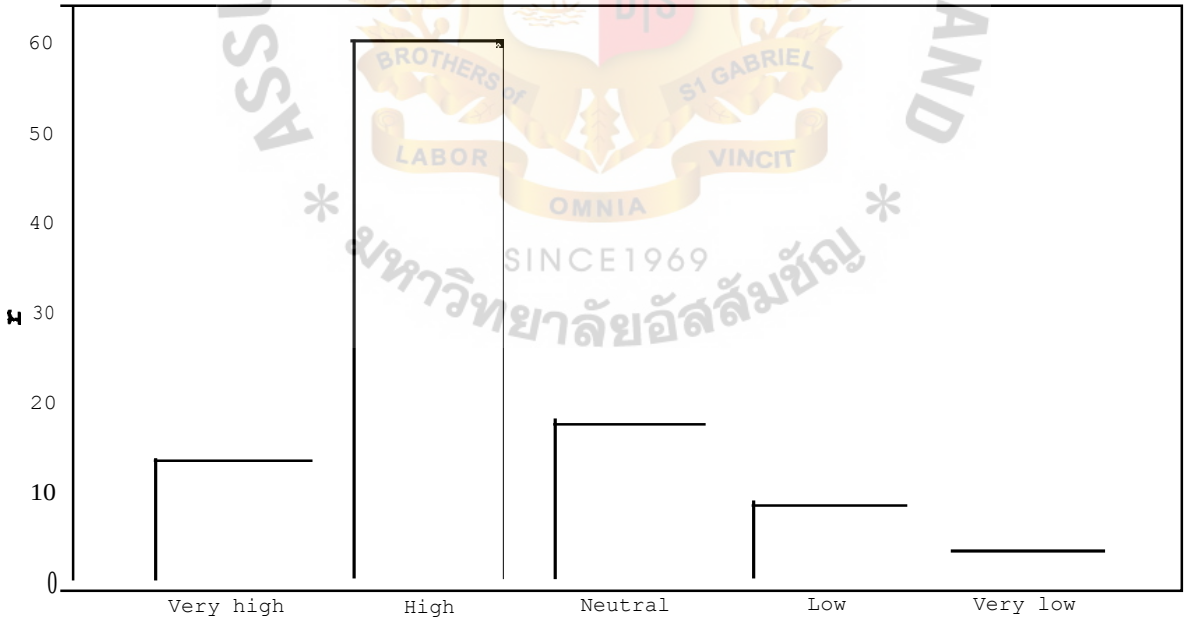


Figure 5.3 Overall MIS Quality

Table 5.12: The Percentage of Respondents' Descriptions of the Overall Satisfaction Level with the IT Application provided by Higher Educational Institutions

Description	Percentage °A
Very Satisfied	12.7
Satisfied	58.1
Neutral	19.1
Dissatisfied	8.1
Very Dissatisfied	2.0
Total	**100.0**

Regarding the overall satisfaction level with the IT application provided by Higher Educational Institutions, as shown in table 5.12 and figure 5.4, the results show that although 12.7% of respondents were very satisfied, most respondents which accounted for 58.1% were satisfied with the IT application provided by Higher Educational Institutions. About 19.1% were neither high nor low, 8.1% were dissatisfied nor only 2 % were very dissatisfied.

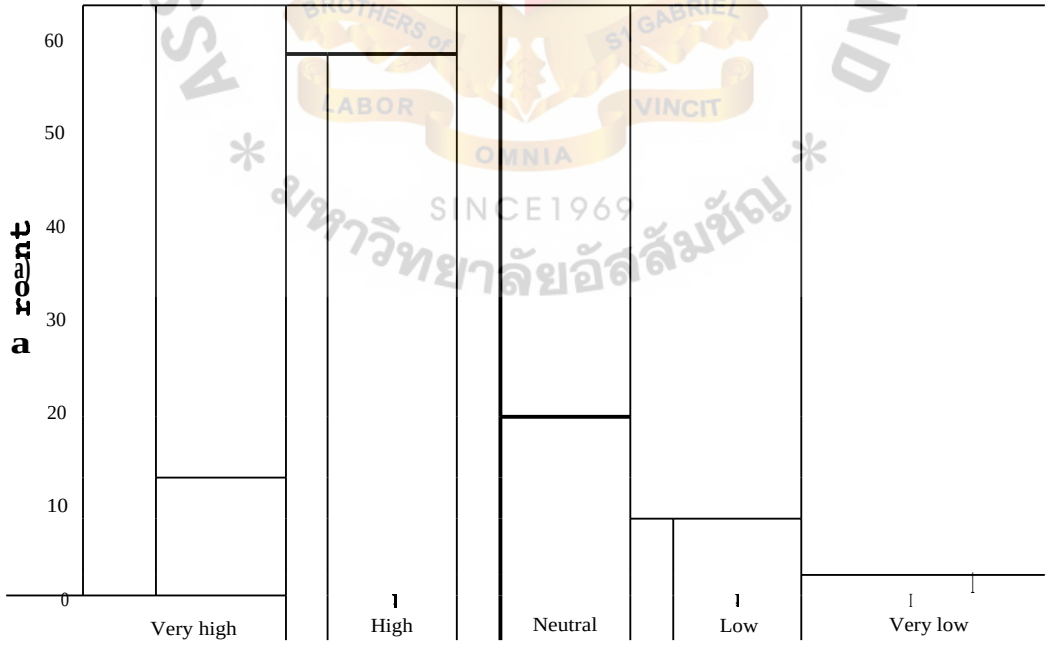


Figure 5.4 Overall Satisfactions

This part will present the results of Hypotheses 1 to 5 which aimed to test the different perception about importance and performance of IT attributes and the relationship between all antecedents, MIS quality, and users' satisfaction. The results are shown in table 5.13 to table 5.17 as follows.

To compare the level of users' perception about the importance and performance of information attributes, system attributes, and organization attributes, the t-test will be used to test a hypothesis stating that the means scores on some variable will be significant different for two independent samples or groups.

Table 5.13: t-Test of Difference between Importance-Performance Elements of Information Aspect

Item	Importance Mean	Performance Mean	t-value	Sig. (2 tailed)
Updated and related to the appropriate time period	4.12	3.67	-15.998	-.45 *(O. 000)***
Error free	4.24	3.77	-18.036	.47 *(0.000)***
Relevant, concise, and clear	3.96	3.66	-11.273	**-.30 *(0.000)*** **
Available and provided when needed	4.13	3.65	-16.043	**-.49** *(0.000)***
Suited to the user's needs	4.06	3.7	-13.565	**-.36** *(0.000)***
Provided in a form that is easy for the user to understand	4.07	3.67	-14.591	**-.39** *(0.000)***
Meets the user's needs for the level of details needed	4.02	3.52	-16.078	-.50 *(0.000)***
Effective in helping the user complete tasks	4.09	3.58	-17.111	**-.51** *(0.000)***

Notes: [a] Each item is measured based on 5-point Likert scale (1=Very low/5=Very high).
Mean Differences were tested by independent t-test; t-value is illustrated in italic parentheses
** Significant at the 0.05 level

Table 5.13 has shown that the comparison of the users' perception indicated a significantly higher value for the importance of updated and related to the appropriate time period than the performance (t=15.998, p<.001). The users also perceived the benefit factors e.g., effective in helping the user complete tasks, provided in a form that is easy for the user to understand. Significantly higher means of *(t* = 17.111, p<.001), and *(t* =14.591, p<.001) were illustrated. On the other hand, significantly lowest means of relevant, concise, and clear factors *(t* =11.273, p<.001) was also found. So there is a

significant difference between users' perception about the importance and performance of information attributes.

Table 5.14: t-Test of difference between Importance-Performance Elements of System Aspect

Item	Importance Mean	Performance Mean	t-value	Sig. (2 tailed)
Advanced	4.11	3.71	-14.247	**-.40** *(0.000)***
Easy to access	'4.17	3.68	-16.557	**-.50** *(0.000)***
Accurately performed and reduced error rates	4.11	3.59	-18.691	.52 *(0.000)***
Enables user to accomplish tasks more quickly	4.08	3.59	-15.517	**-.49** *(0.000)***
Provides high security against invasion of privacy	4.16	3.66	-15.944	**-.50** *(0.000)***
Gives error messages that clearly tell the user how to fix problems	3.97	3.38	-17.453	.58 *(0.000)***
Has all the functions and capabilities in helping the user complete tasks	3.99	3.50	-16.535	**-.49** *(0.000)***
Prompt and efficient (provided when needed)	4.03	3.58	-14.610	**-.45** *(0.000)***
Designed for all levels of users	3.97	3.63	-11.804	**-.34** *(0.000)***
Easy for the user to find the information when needed	4.06	3.67	-13.332	-.40 *(0.000)***
Pleasant interface (e.g. decipherable characters, clear sequence of screens, highlighting **simplified** tasks)	4.03	3.69	-11.595	-.34 *(0.000)***
Clear organization of information on the system	4.04	3.71	-11.346	**-.33** *(0.000)***

Notes: [a] Each item is measured based on 5-point Likert scale (1=Very low/5=Very high).
[b] Mean Differences were tested by independent *t*-test; t-value is illustrated in italic parentheses
** Significant at the 0.05 level

Table 5.14 has shown that users' perception indicated a significantly higher value for the importance of accurately performed and reduced error rates (t =18.691, p<.001). The users also perceived the high importance of response time, accessibility and multifunctional capabilities. Significantly higher means of (t = 17.453, p<.001); (t =16.557, p<.001); and (t =16.535, p<.001) were illustrated. The significant differences of the other major constructs were also exhibited i.e., privacy (t = 15.944, p<.001); conservation of time (t = 15.517, p<.001); and significantly lowest means of interface (t =11.346, p<.001).

Table 5.15: t-Test of difference between the Importance-Performance Elements of Organization Aspect

Item	Importance Mean	Performance Mean	t-value	Sig. (2 tailed)
Computers allocation (e.g. the availability of equipment in a convenient location)	4.01	3.69	-10.572	-.32 *(0.000)***
Timely support, assistance and encouragement in problem solving when needed	4.02	3.43	-17.012	-.59 *(0.000)***
Training on the IT applications for the user at various skill levels	3.97	3.49	-15.688	-.47 *(0.000)***
Incentives for professional development in technology (e.g., money benefit, or reward)	3.79	3.41	-12.367	-.38 *(0.000)***

Notes: Each item is measured based on 5-point Likert scale (1=Very low/5=Very high).

b Mean Differences were tested by independent *t*-test; t-value is illustrated in italic parentheses

** Significant at the 0.05 level

Table 5.15 has shown the comparison of the users' perception about the importance and performance of organization aspect, users perceived the high significant value of technical support (*t* =17.012, p<.001) and IT policy (*t* =15.688, p<.001). However, significantly lower means of IT Management system (Availability) (*t* =10.572, p<.001) and financial incentives (*t* =12.367, p<.001) were also found. As such, there is a significant difference between users' perception about the importance and performance of system attributes.

To determine whether the two variables are associated, the x^2 (chi-square) statistical analysis of the data was carried out. The result has shown in the following table.

Table 5.16: Chi-Square-Based Measures of Association of Overall MIS Quality

Variables	Pearson Chi-square			Likelihood Ration			Contingency Coefficient	
	Value	df	Asymp.Sig. (2-sided)	Value	df	Asymp.Sig. (2-sided)	Value	Approx.Sig.
Overall MIS Quality by Gender	12.317	4	.015**	12.250	4	.016**	.107	.015**
Overall MIS quality by Age	16.558	4	.002**	17.397	4	.002**	.124	.002**
Overall MIS quality by Access Frequency	16.849	12	.155	16.524	12	.168	.125	.155
Overall MIS Quality by Place	6.998	4	.136	7.011	4	.135	.083	.136
Overall MIS Quality by Prior Experience	5.017	4	.286	5.040	4	.283	.069	.286

** Significant at the 0.05 level

Table 5.17: Chi-Square-Based Measures of Association Overall Satisfaction

Variables	Pearson Chi-square			Likelihood Ration			Contingency Coefficient	
	Value	df	Asymp.Sig. (2-sided)	Value	df	Asymp.Sig. (2-sided)	Value	Approx.Sig.
Overall Satisfaction by Gender	9.922	4	.042**	9.867	4	.043**	.096	.042**
Overall Satisfaction by Age	17.819	4	.001**	15.887	4	.003**	.128	.001**
Overall Satisfaction by Access Frequency	16.669	12	.162	16.481	12	.170	.124	.162
Overall Satisfaction by Place	17.230	4	.002**	17.471	4	.002**	.130	.002**
Overall Satisfaction by Prior Experience	7.387	4	.117	7.439	4	.114	.083	.117

****** Significant at the 0.05 level

As shown in table 5.16, the result has also shown that Pearson chi-square is significant on (4 df = 12.317, p = .015) with G-square (likelihood-ratio chi-square) value of 12.250 on (4 df, p =.016) for the tests of independence for overall MIS quality by gender and (4 df = 16.558, p = .002) with G-square (likelihood-ratio chi-square) value of 17.397 on (4 df, p =.002) for independence for overall MIS quality by age. The result has shown that two variables are associated. In other words, the null hypothesis should be rejected.

However, to assess the strength of relationship between pairs of variable, a correlation coefficient must be taken into account. As shown in table 5.16, the result of contingency coefficient value is (.107, .124) or (10.7%, 12.4%), these values indicate that the strength of relationship between overall MIS quality/age and overall MIS quality/gender are weak positive.

Regarding the overall MIS quality with access frequency, place, and prior experience, the results of which are shown in table 5.16 that the Pearson chi-square is not significant on (12 df = 16.849, p = .155), (4 df = 6.998, p = .136), (4 df = 5.017, p = .286), with G-square (likelihood-ratio chi-square) value of 16.524 on (12 df, p =. 168), 7.011 on (4 df, p =. 135), and 5.040 on (4 df, p =. 283), respectively. This indicates that there is no significant relationship between two variables. As such, the null hypothesis of independence was rejected.

As shown in table 5.17, tests of independence of the categories are the chi-square test and the G-square (likelihood-ratio chi-square) test. For the tests of independence for overall satisfaction by age, the result has shown that the Pearson chi-square is significant, on (4 df = 9.92, p = .042) with G-square (likelihood-ratio chi-square) value of 9.867 on (4 df, p =.043). The result has shown that two variables are associated. In other words, the null hypothesis should be rejected. However, due to the result of contingency coefficient value (.096) or then (9.6%) of the variance of overall satisfaction can be accounted for by changes in gender, this value indicates weak association between these two variables.

The result has also shown that Pearson chi-square is significant, on (4 df = 17.819, p = .001) with G-square (likelihood-ratio chi-square) value of 15.887 on (4 df, p =.003) for the tests of independence for overall satisfaction by age and (4 df 17.230, p = .002) with G-square (likelihood-ratio chi-square) value of 17.471 on (4 df, p =.002) for the tests of independence for overall satisfaction by place.

Recall that calculated x^2 for the data in table 5.17 was 17.819 and 17.230 and that since the calculated value was larger than critical tabled value, the null hypothesis of independence was rejected. This means that the overall satisfaction varied as a function of the age and place. Although the variable is dependent, with the result of contingency coefficient value (.128) or (12.8 %) for the tests of independence for overall satisfaction by age and contingency coefficient value (.130) or (13 %), this indicates that the variables are slightly dependent or correlated. In other word, there is weak association between age and overall users' satisfaction. However, as shown in table 5.17, the result indicates the Pearson chi-square value is not statistically significant, x^2 (df = 12) = 16.669, p =.162 with G-square (likelihood-ratio chi-square) value of 16.481 on (12 df, p =.170) and the contingency coefficient value of (.124) or (12.4 %) for the tests of independence for overall satisfaction by access frequency and the x^2 value of 7.387 on (4 df, p =.117) with G-square (likelihood-ratio chi-square) value of 7.439 on (4 df, p =.114). This indicated that there is no significant relationship between two variables. As such, the null hypothesis of independence was rejected.

The result of Hypotheses 6 and Hypotheses 9 are presented in this part. In the proposed conceptual framework as shown in Chapter 3(figure 3.2), the user overall satisfaction on IT applications might be hypothesized to depend not only on the attributes of information, system, or organization but also on gender, age, personal attributes, experience in using IT, and duration of use. Thus the problem requires identification of a linear relationship with multiple regression analysis. In order to enable the researcher to examine the contribution of each independent variable to the regression model, stepwise regression analysis was applied in this study.

Table 5.18: Regression Results for IT Applications Attributes and MIS Quality

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.253a	.064	.063	.860	.064	72.290	1	1061	.000
2	.332b	.110	.109	.839	.047	55.432	1	1060	.000
3	.379c	.143	.141	.824	.033	41.022	1	1059	.000

a. Predictors: (Constant), fac1_1

b. Predictors: (Constant), fac1_1, fac2_1

c. Predictors: (Constant), fac1_1, fac2_1, fac3_1

Table 5.19: Regression ANOVA Statistics

ANOVA [d]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	53.511	1	53.511	72.290	.000 a
	Residual	785.386	1061	.740		
	Total	838.897	1062			
2	Regression	92.542	2	46.271	65.716	.000 [b]
	Residual	746.356	1060	.704		
	Total	838.897	1062			
3	Regression	120.375	3	40.125	59.138	.000 [c]
	Residual	718.523	1059	.678		
	Total	838.897	1062			

a. Predictors: (Constant), fac1_1

b. Predictors: (Constant), fac1_1, fac2_1

c. Predictors: (Constant), fac1_1, fac2_1, fac3_1

d. Dependent Variable: rqual

Table 5.20: Coefficients

Coefficients

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.	5% Confidence Interval for I		Collinearity Statistics	
		B	Std. Error	Beta			Lower Bound	Upper Bound	Tolerance	VIF
1	(Constant)	3.719	.026		140.921	.000	3.667	3.771		
	fac1_1	.224	.026	.253	8.502	.000	.173	.276	1.000	1.000
2	(Constant)	3.719	.026		144.491	.000	3.668	3.769		
	fac1_1	.224	.026	.253	8.718	.000	.174	.275	1.000	1.000
	fac2_1	.192	.026	.216	7.445	.000	.141	.242	1.000	1.000
3	(Constant)	3.719	.025		147.193	.000	3.669	3.768		
	fac1_1	.224	.025	.253	8.881	.000	.175	.274	1.000	1.000
	fac2_1	.192	.025	.216	7.585	.000	.142	.241	1.000	1.000
	fac3_1	.162	.025	.182	6.405	.000	.112	.211	1.000	1.000

a. Dependent Variable: rqual

Table 5.21: Excluded Variables

Excluded[b]

Model		Beta	t	Sig	Partial Correlation	Collinearity		
						Tolerance	VIF	Minimum Tolerance
1	fac2_	.216[a]	7.44	.000	.223	1.00	1.00	1.00
	fac3_	.182[a]	6.24	.000	.188	1.00	1.00	1.00
2	fac3_	.182[b]	6.40	.000	.193	1.00	1.00	1.00

a. Predictors in the Model: (Constant),

b. Predictors in the Model: (Constant),

c. Dependent Variable:

In the regression model, R-square is the square of the correlation coefficient between Y, and Y'. Thus, if R-square is 1 (perfect linear relationship between the predictor and dependent variables. The results from the ANOVA table (table 5.19) show that F statistic is 59.14, with an observed significance level of less than 0.001. It indicated that all three predictor variables are significant predictors of the overall MIS quality. Thus, the hypothesis that there is no linear relationship between the predictor and dependent variables is rejected.

In identifying independent relationships, it is inappropriate to interpret the unstandardized regression coefficients as indicators of the relative importance of the predictor variables. This is because the **B** values are based on the actual units of measurement, which may differ from variable to variable. One way to make regression

coefficients more comparable is to calculate Beta weights (standardized regression coefficients) for all three IT applications attributes as shown in the table 5.20. From the table, it can be seen that fac1_1 (information attribute) has the strongest relationship with MIS quality whereas the other two fac2_1 (system attribute) and fac3_1(organizational management attribute) are weaker (fac1_1: Beta = .253, t = 8.881, $p <$. 001; fac2_1: Beta = .216, t = 7.585, $p <$. 001; fac3_1: Beta = .182, t = 6.405, $p <$. 001, respectively). The positive coefficient associated with all three IT applications attributes show that the higher quality of IT applications attributes, the higher level of MIS quality.

Table 5.22: Regression Results for Demographic Variables, MIS Quality, and User Satisfaction

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.190'	.036	.027	.878	.036	4.018	5	538	.001
2	.796b	.633	.629	.542	.597	872.853	1	537	.000

a. Predictors: (Constant), experience, age, gender, duration of use, access frequency

b. Predictors: (Constant), experience, age, gender, duration of use, access frequency, rqual

Table 5.23: Regression ANOVA Statistics

ANOVA[c]

Model		Sum Square	df	Mean	F	Sig
1	Regression	15.484	5	3.097	4.018	.001 [a]
	Residual	414.634	538	.771		
	Total	430.118	543			
2	Regression	272.188	6	45.365	154.250	.000 [b]
	Residual	157.930	537	.294		
	Total	430.118	543			

a. Predictors: (Constant), experience, age, gender, duration of use, access

b. Predictors: (Constant), experience, age, gender, duration of use, access rqual

c. Dependent Variable:

Table 5.24: Coefficients

Coefficients'

Mode		Unstandardized Coefficients		Standardized Coefficients			Collinearity Statistics	
1		B	Std. Error	Beta	t	Sig.	Tolerance	VIF
1	(Constant)	3.829	.227		16.864	.000		
	gender	.080	.076	.045	1.052	.293	.991	1.009
	age	-.130	.053	-.104	-2.426	.016	.967	1.034
	access frequency	.087	.030	.125	2.851	.005	.928	1.078
	duration of use	.001	.041	.001	.033	.974	.941	1.063
	experience	-.141	.059	-.101	-2.371	.018	.991	1.009
2	(Constant)	1.046	.169		6.194	.000		
	gender	-.064	.047	-.036	-1.352	.177	.981	1.020
	age	-.039	.033	-.032	-1.191	.234	.959	1.043
	access frequency	.009	.019	.012	.454	.650	.910	1.099
	duration of use	-.012	.026	-.013	-.474	.635	.941	1.063
	experience	-.027	.037	-.019	-.729	.466	.981	1.020
	rqual	.777	.026	.792	29.544	.000	.951	1.052

a. Dependent Variable: rsatis

Table 5.25: Excluded Variables

Excluded

Mode 1		Beta	t	Sig	Partia Correlatio	Collinearity Toleranc	VI	Minimu Toleranc
1	rqua	.792a	29.54	.000	.787	.951	1.05	.910

a. Predictors in the Model: (Constant), experience, age, gender, duration of use,

b. Dependent Variable:

For this model, the researcher determines the order of entry for the two sets of predictor variables. The researcher believes that the subjects' demographics would be less strongly related to the dependent variable than the overall MIS quality. On the basis of this assumption, the researcher accords priority of entry into the prediction equation to the set of demographic variables, followed by the overall MIS quality. This order of entry assessed the importance of the demographic variables in predicting the dependent variable of user satisfaction, and the amount of unique information in the dependent variable that is accounted for by the overall MIS quality.

In the model summary table 5.22, Model 1 represents entry of the first set of demographic variables, and Model 2 represents entry of the overall MIS quality variable. The results show that Model 1 (demographics) accounted for 3.6% of the

variance (R Square) in the user satisfaction attribution. Entry of the overall MIS quality variable (Model 2) resulted in an R Square Change of 0.597. This means that entry of the overall MIS quality variable increased the explained variance in the level of user satisfaction attribution by 59.7% to a total of 63.3%. This increase is significant by the F Change test, F (1, 537) = 872.853, $p < .001$. These results suggest that the overall MIS quality variable represent a significantly more powerful variable of predictors than the set of demographic variables.

In the ANOVA table, the results show that entry of the set of demographic variables alone (Model 1) yielded a significant prediction equation, F (5, 538) = 4.02, $p <. 001$. Addition of the overall MIS quality variables (Model 2) resulted in an overall significant prediction equation, F (6, 537) = 154.3,p < .001.

In examining the Beta weights, it can also be seen that the overall MIS quality variables is significant predictors of level of user satisfaction attribution ($p<0.05$), where as subjects' age, access frequency, and experience are demographic variables that were found to be significant. Thus, the higher level of user satisfaction was due to the overall MIS quality ($\beta = .792$, $t = 29.544$, $p<0.05$). The finding that subjects' age, access frequency, and experience were a significant predictor ($\beta = -.104$, $t = -2.426$, $p<0.05$; $= .125$, $t = 2.8514$, $p<0.05$; $= -.101$, $t = -2.371$, $p<0.05$, respectively), indicated that user whose age less than 25 years old, and access into institution 's website less than once a week along with positive attitude on experience of using the website provided by other institutions attributed greater level of satisfaction.

5.4 Inferential Statistical Analysis

This section presents the analysis of inferential statistics, which involves the analysis and verification for hypothesis statements in the population, the item analysis including an in-dept analysis used to test the reliability of the data, Principal Components Analysis (PCA), Confirmatory Factor Analysis (CFA), and Structural Equation Model (SEM).

5.5 Reliability and Validity

In the case of multiple regression or partial correlation, effect sizes of other variables can be overestimated if the covariate is not reliably measured because the full effect of the covariate(s) would not be removed. This is a significant concern if the goal of research is to accurately model the "real" relationships evident in the population. Although most authors assume that reliability estimates (Cronbach alphas) of .7 to .8 are acceptable (Nunnally, 1978), and Osborne, Christensen, and Gunter (2001) report that the average alpha reported in top educational psychology journals is .83, measurement of this quality still contains enough measurement error to make correction worthwhile. In this research, the reliability analysis against these scales yielded favorable results. The constructs exhibited a high degree of reliability in terms of coefficient alpha.

The results from reliability analyses were satisfactory since all values of reliability exceeded the recommended valued of 0.80 (Nunnally, 1978). The composite reliability for internal consistency demonstrated for all constructs, was a =. 944; hence, the internal consistency reliability of the measures used in this study can be considered to be excellent data.

In order to find a way to condense the information contained in a number of original variables into a smaller set of new with a minimum loss of information, factor analysis is integrated in structural equation modeling (SEM), to confirm the latent variables modeled by SEM.

5.6 Factor Analysis

To assess constructs validity of the measurement items, the exploratory factor analysis with principal component analysis and Varimax rotation was performed. Unlike factor analysis, which analyzes the common variance, the original matrix in a principal component analysis analyzes the total variance. Also, principal components analysis assumes that each original measure is collected without measurement error. As this technique is based on the correlation matrix of the variables involved and correlations usually need a large sample size before they stabilize. As such, this technique requires a large sample size. Tabachnick and Fide11 (2001) cited Comrey and Lee's (1992) suggested that regarding sample size: 50 is very poor, 100 is poor, 200 is fair, 300 is good, 500 is very good, and 1000 or more is excellent.

Table 5.26 Descriptive Statistics of Different Dimensions of IT Applications

	Mean	Std. Deviation	Analysis N
Info!	3.5532	.91067	1063
Info 2	3.5306	.84859	1063
Info 3	3.6980	.87337	1063
Info 4	3.5136	.98842	1063
Info 5	3.6435	.85694	1063
Info 6	3.6058	.88077	1063
Info 7	3.5005	1.01298	1063
Info 8	3.4873	.97694	1063
System 1	3.5983	.91928	1063
System 2	3.5014	.98183	1063
System 3	3.4807	.90581	1063
System 4	3.5118	1.02584	1063
System 5	3.5024	1.01762	1063
System 6	3.4186	1.08608	1063
System 7	3.5089	.96827	1063
System 8	3.5466	1.01191	1063
System 9	3.6604	.93800	1063
System 10	3.6040	.96856	1063
System 11	3.6604	.95492	1063
System 12	3.6707	.94618	1063
Org 1	3.6802	.98637	1063
Org 2	3.4102	1.13046	1063
Org 3	3.5278	.98143	1063
Org 4	3.6162	1.01189	1063

As the sample size of this research is 1063; therefore to achieve data reduction, a principal component analysis is the most appropriate technique for this research. As shown in the table 5.26, there are 1063 cases with different means and standard deviations of the variables used in the factor analysis.

The next item from the output is the Kaiser-Meyer-Olkin (KMO) and Bartlett's test. The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy provides an index (between 0 and 1). Kaiser (1974) suggested that KMO near 1.0 supports a factor analysis and less than 0.5 is probably not amenable to useful factor analysis. In addition, Bartlett's test of Sphericity was applied to test the significance of the corresponding correlation matrix together with the KMO test. The p-value of less than .05 illustrates a significant correlation among all items indicating that the factor analysis is suitable for the analysis of that particular dataset Tabachnick (1996).

Table 5.27: KMO and Bartlett's Test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.965
Bartlett's Test of Sphericity	Approx. Chi-Square	12452.559
	df	276
	Sig.	.000

As depicted in the table 5.27, the KMO measure is 0.965, which indicates marvelous in term of sampling adequacy. From the same table, the Bartlett's test of sphericity was used to test for the adequacy of the correlation and the result for the Bartlett's test of sphericity yielded a value of 12452.559 and an associated level of signigicance is 0.000 which indicates a high probability that there are significant relationship between the variables and the appropriate data for factor analysis.

As shown in table 5.28, the correlation Matrix reveals fairly high correlation between the twenty four variables written to measure IT application in higher educational institution. The result indicates that the hypothesized factor model appears to be appropriate.

Inter-Item Correlation Matrix for IT Application in Higher Educational Institution

	info1	nfo2	fo3	n	nfo5	fo6	nf 2	nfo8	sys1
o o	.00								
o b	.525	000							
n o	.443	462	00						
n o4	.449	415	.4 4	1.000					
fo	413	347	.323	[illegible]	000				
nfo	387	320	425	445	[illegible]	1 00			
n o	486	450	.416	.503	429	451	1.000		
n o	432	451	.468	.509	142	402	.608	.000	
sys1	402	393	386	[illegible]	361	300	424	.335	.000
sys2	.390	405	.405	460	.105	328	436	172	62
sys3	.390	424	.328	410	376	.369	441	[illegible]	534
sys	350	352	347	419	.364	.351	.450	.173	.456
sys5	.332	.319	341	.360	345	.345	374	376	149
sy 6	.323	.325	365	423	.389	.342	.418	148	441
sys7	.356	.348	322	.404	344	.339	.413	111	.128
sys	.390	.385	342	.380	.332	.325	405	455	.725
sys	.342	.344	.353	.321	348	.355	.360	135	.164
sy 1	.390	.402	.350	[illegible]	.364	.382	420	.25	.168
sv.1	.289	.312	.327	.320	.280	.362	.383	.359	.140
sv 1	.334	.327	.325	.341	.214	.397	.360	.388	.438
0 g1	.290	.331	.325	.334	.285	.315	.344	.372	.411
0 g2	.352	.328	.315	356	.299	.351	.376	130	.440
0 g3	.225	.283	.282	312	298	.302	.324	.399	.408
0 g	296	.380	.335	323	.223	.33	.359	397	.4 9

	sys2	sys3	sys4	sv	sy	sys7	sys8	ys9	10	sys11	sys1	org	org2	og3	org4
sys2	.00														
sys3	564	.000													
sys	544	562	.000												
sys5	382	41	42	000											
sy 6	429	420	53	48	00										
sys7	439	505	42	.418	5 5	. 0									
sys	.503	532	507	413	516	58	.000								
sys	.454	402	490	.454	.42	42	519	00							
sy 1	.529	400	.501	300	.488	530	6	89	00						
sv.1	. 11	.355	.411	357	.362	414	4 2	00	0	.000					
sv 1	.423	402	.40	40	.432	42	4 5	05	9	603	1.000				
0 g1	.398	349	.307	38	.32	32	4 6	04	9	407	3 9	.080			
0 g2	4 2	400	.40	406	.517	.43	4 8	00	1	.348	382	24	000		
0 g3	.341	.326	42	405	480	.39	4, 2	88	0	.382	412	.496	538	1 000	
0 g	.3 8	359	403	.349	401	.413	4. 1	1	0	.396	397	517	513	.5 6	.000

Table 5.29: Communalities of Different Dimensions of IT Applications

	Initial	Extraction
Info1	1.000	.512
Info 2	1.000	.487
Info 3	1.000	.512
Info 4	1.000	.565
Info 5	1.000	.468
Info 6	1.000	.442
Info 7	1.000	.567
Info 8	1.000	.583
System 1	1.000	.534
System 2	1.000	.578
System 3	1.000	.547
System 4	1.000	.552
System 5	1.000	.405
System 6	1.000	.511
System 7	1.000	.539
System 8	1.000	.596
System 9	1.000	.546
System 10	1.000	.619
System 11	1.000	.460
System 12	1.000	.524
Org 1	1.000	.622
Org 2	1.000	.614
Org 3	1.000	.643
Org 4	1.000	.626

***** The initial value of the communality in PCA is 1.**
Extraction Method: Principal Component Analysis.

Table 5.29 has shown the communalities which indicate how much of the variance in the variables has been accounted for by the extracted factors. As the values in the extraction column indicate the proportion of each variable's variance that can be explained by the principal component. As such, the variables with high values are well represented in the common factor space, while variables with low values are not well represented. As shown in above Table 5.29, over 60% of the variance in *organization dimension* is accounted for while 50.5% of the variance in *Information Dimension* is accounted for, and 55.5% of the variance in *System Dimension* is accounted for. Since the average values of the indicator variables are between .405 and .626, which indicate well-defining factor and interpreted as the reliable indicators.

Table 5.30: Total Variance Explained Different Dimensions of IT Applications

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%	Total	% of Variance	Cumulative%
	[illegible]22	3.8[illegible]3	42.843	10.522	[illegible] 843	3.843	5. [illegible]4	2.[illegible]9	22.84[illegible]
2	[illegible]85	[illegible]07	50.030	1.4[illegible]	[illegible]00	0.030	[illegible] [illegible]3	[illegible] 13[illegible]	41 9[illegible]7
3	.044	[illegible] 3[illegible]9	54.3[illegible]9	1 0	3	[illegible] 379	2. 74	12 3[illegible]2	54.3[illegible]9
4	9[illegible]	3.96[illegible]	58.345						
5	791	[illegible].[illegible]95	61 640						
[illegible]	[illegible]0[illegible]	[illegible] 95[illegible]	[illegible] 591						
7	6[illegible]5	[illegible] [illegible]10	6[illegible] 402						
[illegible]	63[illegible]	[illegible] 6[illegible]5	70.037						
9	6[illegible]6	[illegible] 610	72.647						
[illegible]0	5[illegible]	2.450	75.09[illegible]						
[illegible]	541	[illegible] [illegible]56	[illegible]7 353						
[illegible]	5[illegible]4	[illegible] 1[illegible]2	79 535						
3	503	[illegible] 095	[illegible]1 630						
[illegible]	4[illegible]	[illegible]033	[illegible]3.663						
5	4[illegible]1	[illegible] 96[illegible]	[illegible]5.62[illegible]						
6	465	[illegible]3[illegible]	[illegible]7 566						
[illegible]	.446	.[illegible]Z	[illegible]0 422						
[illegible]	.431	.796	9[illegible].21[illegible]						
9	.39[illegible]	.633	92.[illegible]51						
[illegible]0	.3[illegible]6	.566	9[illegible] 417						
[illegible]1	.[illegible]64	.516	9[illegible] 93[illegible]						
[illegible][illegible]	.[illegible]53	.4[illegible]9	97.4[illegible]2						
[illegible]3	.330	.3[illegible]4	9[illegible] [illegible]76						
2[illegible]	.[illegible]04	.[illegible]24	10 1.000						

Extraction Method: Principal Component Analysis.

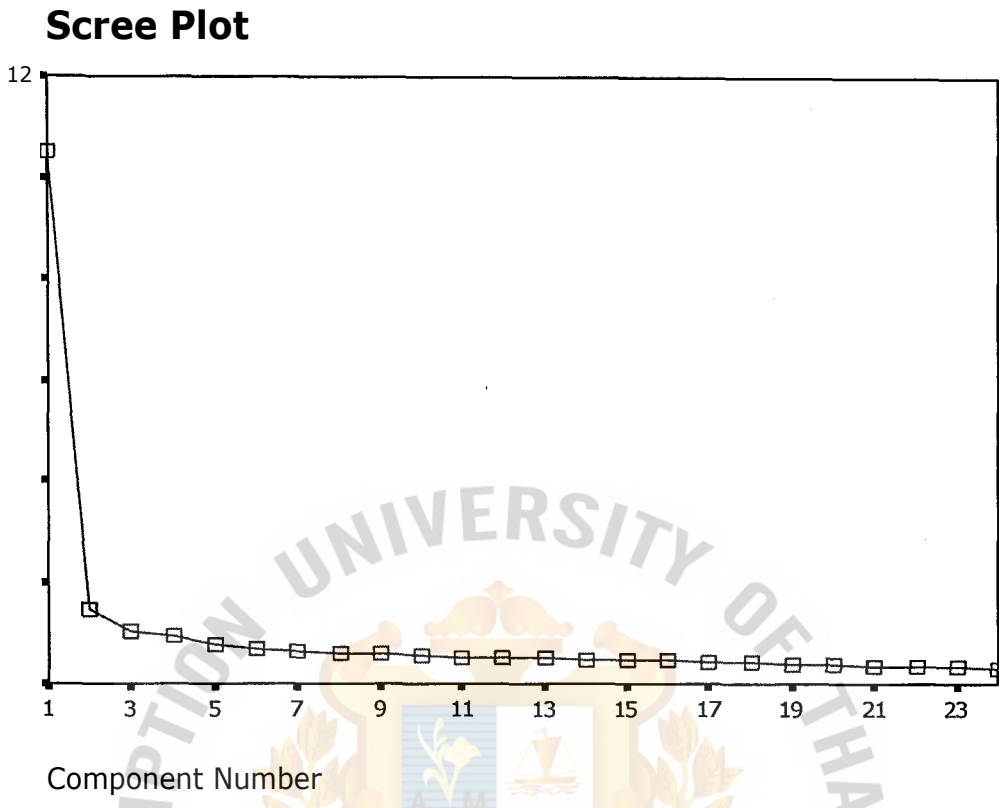


Figure 5.5 Scree Plots of Different Dimensions of IT Applications

Table 5.30 has shown all the factors extractable from the analysis along with their eigenvalues, also called *characteristic roots,* the percent of variance attributable to each factor, and the cumulative variance of the factor and the previous factors. The result has shown that there are 24 components extracted during a principal components analysis. The first component is accounted for the most variance, which is equal to 10.522. As Eigenvalues represent the variances of the principal components, the first column of Initial Eigenvalues will always account for the most variance and the next component will account for as much of the left over variance as it can. Hence, the first three factors will be retained for rotation. These three factors account for 43.843%, 6.187%, and 4.349% of the total variance, respectively. That is, almost 54% of the total variance is attributable to these three factors. The remaining twenty-one factors together account for only approximately 46% of the variance. Thus, a model with three factors may be adequate to represent the data. From the Scree plot, as shown in figure 5.5, it again appears that a three-factor model should be sufficient to represent the data set.

Table 5.31: Component Matrix of Different Dimensions of IT Applications

	Component		
	1	2	3
System10	.733		-.236
System8	.724		-.203
System2	.720		-.242
System4	.719		
System1	.706		
Info8	.702	.269	
System6	.701		
System3	.697		-.241
System7	.694		-.205
System9	.690	-.212	
Info 7	.672	.320	
Org2	.664	-.241	.340
System12	.663	-.241	
Info 4	.649	.376	
Otg4	.630	-.266	.398
System5	.629		
System11	.625	-.237	
Org3	.623	-.321	.390
Org1	.617	-.273	.408
Info2	.607	.333	
Info1	.607	.379	
Info3	.602	.368	
Info6	.599	.261	
Info5	.576	.367	

Extraction Method: Principal Component Analysis.
3 components extracted.

Table 5.31 the component matrix represents the unrotated component analysis factor matrix, and component loadings, which are the correlations between the variable and the component. The table also shows the loadings of the twenty four variables on the three extracted factors. However, as the factors are unrotated, significant cross-loading have occurred, such as the variable Info 7 has loaded highly on Factor 1 and Factor 2; the variable Org2 has loaded highly on Factor 1 and Factor 3; the variable info 4 has loaded highly on Factor 1 and Factor 2. These high cross-loadings make interpretation of the factors difficult and theoretically less meaningful.

Table 5.32: Rotated Component Matrix

	Component		
	1	2	3
Sys 10	.708		
System8	.685		
System?	.648		
System9	.648		
Sys12	.643		
System2	.628		
System4	.624		
System1	.616		
System3	.605		
Sys11	.584		
System6	.569		
System5	.474		
Info4		.687	
Info?		.667	
Info3		.665	
Info 1		.660	
Info8		.647	
Info5		.635	
Info2		.634	
Info6		.578	
Org3			.724
Org1			.712
Org4			.707
Org2			.666

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.
a Rotation converged in 6 iterations.

To facilitate the interpretation and make the output more understandable, rotation method was used in analysis. The sum of eigenvalues is not affected by rotation, but rotation will alter the eigenvalues of particular factors and will change the factor loadings. To make the output as easy as possible to identify each variable with a single factor, Varimax rotation, the most common rotation option, was applied in this analysis. The results were shown on Table 5.32 and Figure 5.6.

As shown in Table 5.32, the rotated component matrix presents the three factors after varimax rotation. Twelve items loaded on Factor 1. An inspection of these items clearl shows that the majority of these items reflect system attribute. Factor 2 contains eight items that clearly reflect information attribute and Factor 3 contains four

items that appear to reflect organization attribute. Given that the present factor structure appears to be represented by three dimensions.

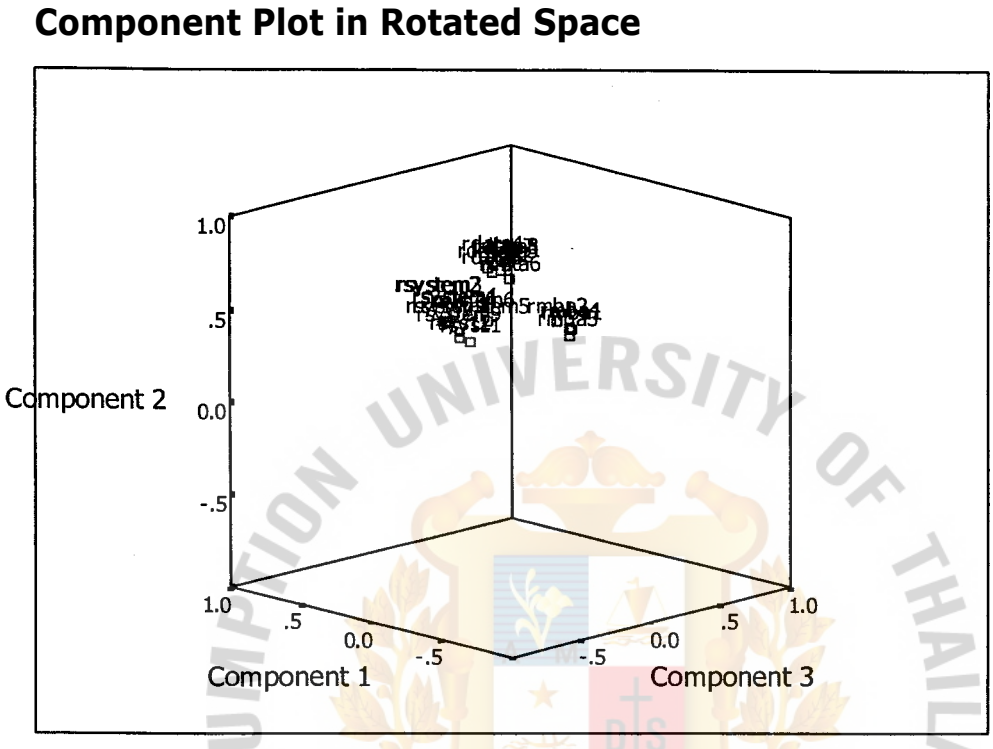


Figure 5.6 **Component Plot in Rotated Space**

After performing exploratory factor analyses, confirmatory factor analyses (CFAs) were conducted with AMOS 6.0. With AMOS program, the analysis of confirmatory factor analytic (CFA) and full structural equation models (SEM) can be analyzed.

5.7 Confirmatory Factor Analysis

Confirmatory factor analysis is a theory-testing model as opposed to a theory-generating method like exploratory factor analysis. In confirmatory factor analysis, the researcher begins with a hypothesis prior to the analysis. This model, or hypothesis, specifies which variables will be correlated with which factors and which factors are correlated. The hypothesis is based on a strong theoretical and/or empirical foundation (Stevens, 1996).

5.8 Model Fit Indices

Goodness of fit tests determines if the model being tested should be accepted or rejected. Although distribution assumptions were not met, the GFI can be considered as general evidence of the final model's quality as it corresponds to the R^2 in the regression analysis (Holzmuller and Stottinger 1996). The value of GFI ranges from 0 to 1 and the value close to 1 indicate a good fit (Byrne 2001).

Normed Fit Index, NFI, also known as the Bentler-Bonett normed fit index. NFI was developed as an alternative to CFI, bur one which did not require making chi-square assumptions. NFI represents the proportion of total variance among observed variables explained by a target model when using the null model as a base line model (Hu and Bentler 1995).

The Non-Normed Fit Index (NNFI) also known as The Tucker-Lewis Index, TLI, (this is the label in AMOS), NNFI is similar to NFI, but penalizes for model complexity. TLI takes degree of freedom into account and parsimony (Styles 1998). It has the major advantage of reflecting model fit very well at all sample sizes (Bentler 1990). TLI close to 1 indicates a good fit. By convention, TLI values below .90 indicate a need to respecify the model. However, more recently, Hu and Bentler (1999) have suggested TLI>=. 95 as the cutoff for a good model fit.

Similarly, the Comparative Fit Index (CFI) is the best index as it has small sampling variability and estimates the relative difference in non-centrality with small bias (Bentler 1990). The Normed Fit Index (NFI) is interpreted in the same way as CFI

but may be less affected by sample size (Kline 1998). All the above-mentioned values range from 0 to 1 (Byrne 2001) and value of 1 indicates a perfect fit (Arbuckle and Wothke 1999).

The Root Mean Square Error of Approximation (RMSEA) takes into account the error of approximation and gives the error per degree of freedom of the fit of the population covariance matrix implied by the model to the population covariance matrix itself. It was evaluated that a value less than 0.05 is a good fit, while values ranging from 0.1 to 0.8 indicates a mediocre fit and those greater than 0.1 indicate a poor fit (Byrne 2001).

Kline (1998) recommends to report , GFI, NFI, CFI and NNFI (TLI). χ^2, p-value, CFI, RMSEA and TLI were used in the export literature (Styles 1998; Styles and Ambler 2000). The CFI and RMSEA are the most frequently reported fit indices (Hair et al. 1998). Jaccard and Wan (1996) recommend use of at least three fit tests. Another list of which-to-publish lists chi-square, AGFI, TLI, and RMSEA. Hence, GFI, TLI, CFI, NFI and RMSEA will be used as goodness of fit indices in this study.

Table 5.33 and 5.34 have shown the number of variables in each category, the lists of variables names used through out the model, as well as the total number of variables in the model.

Table 5.33: Observed, endogenous variables

Variable Names	*Descriptions*
Item8	Effective in helping user complete the tasks
Item?	Meet the user's needs for the level of details needed
Item6	Provided in a form that is easy for user to understand
Item5	Suited to the user's needs
Item4	Available and provided when needed.
Item3	Relevant, concise, and clear.
Item2	Error free.
Item 1	Updated and related to the appropriate time period.
System12	Clear organization of information on the system
System 11	Pleasant interface (e.g., easy reading characters, clear sequence of screens, highlighting simplified task)
System10	Easy for user to find the needed information.
System9	Designed for all levels of users.

System8	Prompt and efficient (provided when needed.).
System?	Have all the functions and capabilities in helping user complete the tasks.
System6	Give error message that clearly tell user how to fix problems.
System5	Provide high security such as invasion of privacy.
System4	Enable user to accomplish task more quickly.
System3	Accurately performed and reduce error rates.
System2	Easy to access.
System 1	Advanced.
Org4	Incentives for professional development in technology (e.g., money, benefit, or reward).
Org3	Training on the IT applications for user at different skill levels.
Org2	Just-in-time support, assistance and encouragement in problem solving when needed.
Org1	Computers allocation (e.g., the availability of equipments in a convenient location).
Satisfy	Overall satisfaction level on IT application
Quality	Overall management information system quality

Table 5.34: Unobserved, exogenous variables

e8	Error of Content
e7	Error of Form
e6	Error of Form
e5	Error of Form
e4	Error of Time
e3	Error of Content
e2	Error of Content
e 1	Error of Time
e20	Error of Interface
e19	Error of Interface
e 18	Error of Convenience
e 17	Error of Convenience
e 16	Error of Conservation of time
e15	Error of Multifunctional capabilities
e14	Error of Response time
e 13	Error of Privacy
e 12	Error of Conservation of time
e 11	Error of Accuracy
e10	Error of Accessibility
e9	Error of Use of advance IT
e24	Error of Financial incentive
e23	Error of IT policy
e22	Error of Technical support
e21	Error of IT Management
z2	Error of Satisfy
z1	Error of Quality

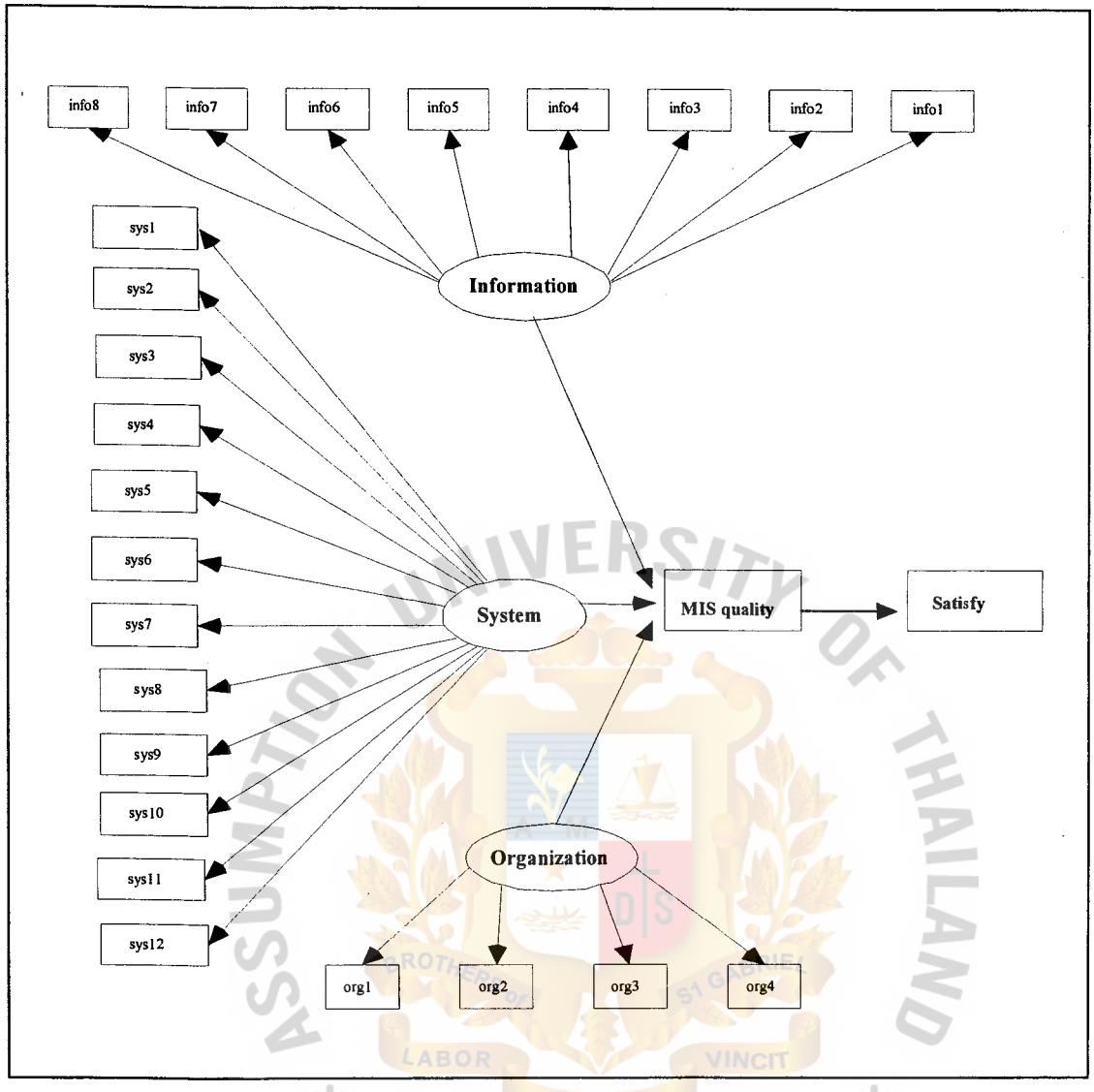


Figure 5.7: The Proposed Model with AMOS

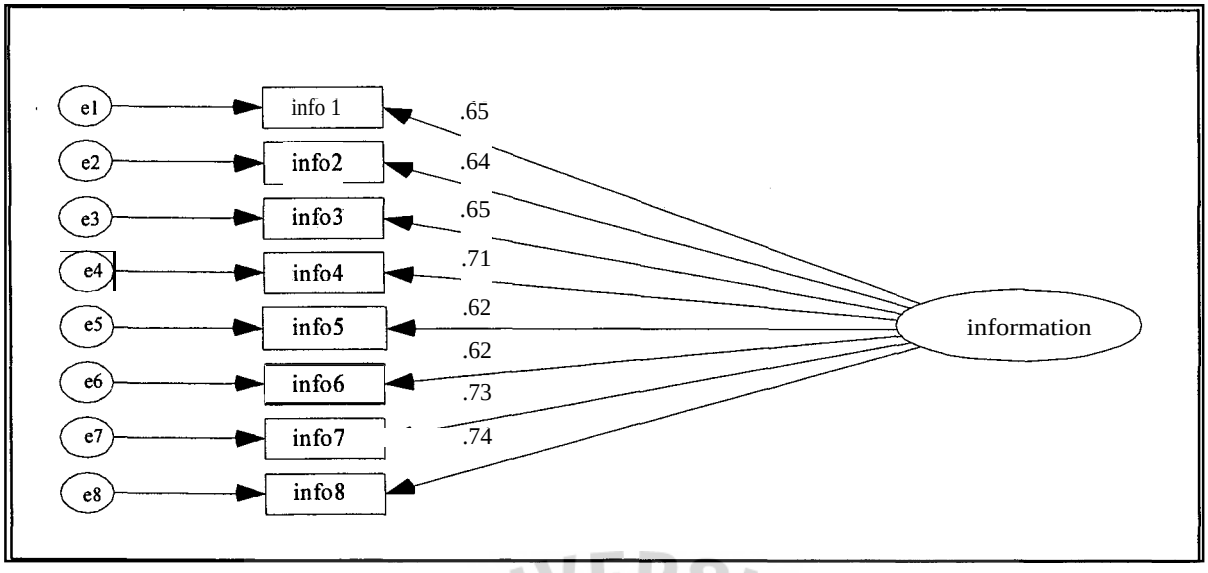
Figure 5.7 illustrates the relationship of all variables including independent variables, dependent variable, and latent variables using Structural Equation Modeling with AMOS 6.0.

CFA tests were also used to test convergent validity of the constructs. Convergent validity assesses the degree to which two measures of the same construct are correlated (Hair et al. 1998). It can be assessed from the measurement model by determining whether each item's estimated maximum likelihood loading on its assigned construct factor is significant (Anderson and Gerbing, 1988). The results of CFA for each measurement set are shown in table 5.35.

Table 5.35: Relationship Estimated for IT Applications Attributes

			Estimated Relationship Coefficients	P
Effective in helping user complete the tasks.	<---	Information	.737	***
Meet the user's needs for the level of details needed	<---	Information	.729	***
Provided in a form that is easy for user to understand	<---	Information	.621	***
Suited to the user's needs.	<---	Information	.621	***
Available and provided when needed.	<---	Information	.705	***
Relevant, concise, and clear.	<---	Information	.653	***
Error free.	<---	Information	.637	***
Updated and related to the appropriate time period.	<---	Information	.648	***
Clear organization of information on the system	<---	System	.668	***
Pleasant interface (e.g., easy reading characters, clear sequence of screens, highlighting simplified task)	<---	System	.618	***
Easy for user to find the needed information.	<---	System	.751	***
Designed for all levels of users.	<---	System	.698	***
Prompt and efficient (provided when needed.).	<---	System	.743	***
Have all the functions and capabilities in helping user complete the tasks.	<---	System	.703	***
Give error message that clearly tell user how to fix problems.	<---	System	.689	***
Provide high security such as invasion of privacy.	<---	System	.602	***
Enable user to accomplish task more quickly.	<---	System	.718	***
Accurately performed and reduce error rates.	<---	System	.690	***
Easy to access.	<---	System	.716	***
Advanced.	<---	System	.702	***
Incentives for professional development in technology (e.g., money, benefit, or reward).	<---	Organization	.714	***
Training on the IT applications for user at different skill levels.	<---	Organization	.719	***
Just-in-time support, assistance and encouragement in problem solving when needed.	<---	Organization	.736	***
Computers allocation (e.g., the availability of equipments in a convenient location).	<---	Organization	.708	***

*** Significant at the 0.05 level

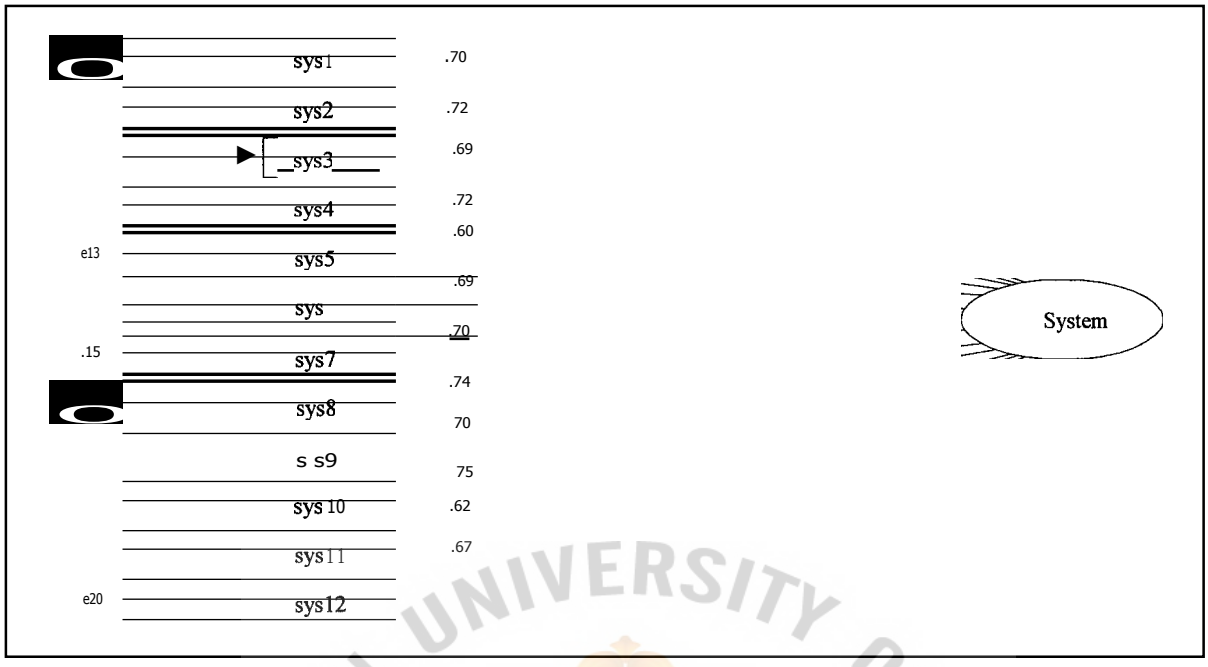


Notes: χ^2/df = 128.922/20; GFI=. 970; TLI=. 950; CFI=. 964; RMSEA=. 072; NFI = .958;
Construct Reliability (a) = .867

Figure 5.8: Measurement Model for Information Aspect

Information Aspect

This factor contains eight measurement items. Information aspect was composed of three dimensions: time, content, and form. The item associated with time dimension was measured by three observed variables: info1, info4, and info5. Content dimension was measured with three observed variables: info2, info3, and info8. Form dimension was measured with two observed variables: info6 and info7. As shown in figure 5.8, NFI = .958 means the researcher's model improves fit by 96% compared to the null mode. By convention, CFI = .964 indicates that 96% of the covariation in the data can be reproduced by the given model. The measurement model was fitted well to the data since all fit indices exceeded .90 (χ^2/df = 128.922/20; GFI=. 970; TLI=. 950; RMSEA=. 072), and construct validity were satisfactory at .867.

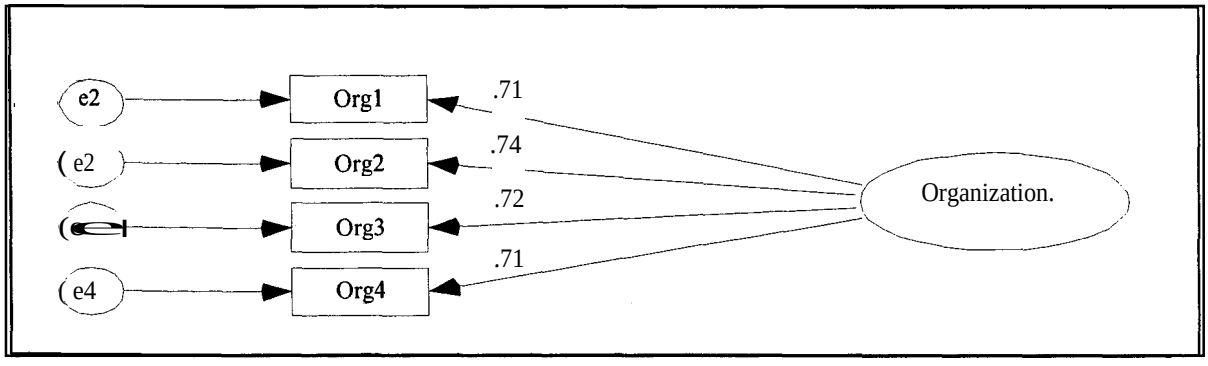


Notes: χ /df = 545.722/54; GFI=. 915; TLI=. 903; CFI=. 921; RMSEA=. 093; NFI= .913;
Construct Reliability (a) = .916

Figure 5.9: Measurement Model for System Aspect

System Aspect

This factor contains twelve measurement items. The item associated with this factor deal with use of advance IT, accessibility, accuracy, privacy, response time, privacy, response time, multifunctional capabilities, conservation, convenience, and interface. The items associated with use of advance IT, accessibility, accuracy, privacy, response time, privacy, response time, multifunctional capabilities, conservation were measured by observed variables: Sys1, Sys2, Sys3, Sys5, Sys6, Sys7, and Sys8, respectively. Conservation dimension was measured by two observed variables: Sys4, and Sys8. Convenience and interface dimension were measure by observed variables: Sys9, Sys10, Sys11, and Sys12. As shown in Figure 5.9, the measurement model is fitted well to the data since all fit indices exceeded .90 (χ^2/df = 545.722/54; GFI=. 915; TLI=. 903; CFI=. 921; RMSEA=. 093; NFI= .913), and construct validity were satisfactory at .916.



Notes: χ /df = 2.531/2; GFI=. 999; TLI=. 999; CFI=1.000; RMSEA=. 016; NFI=. 998;
Construct Reliability (a) = .810

Figure 5.10: Measurement Model for Organization Aspect

Organization Aspect

This factor contains four measurement items. Organization aspect was measured by four observed variables: IT management (Org1); Technical support (Org2); Financial incentive (Org3); and IT policy (Org4). As shown in figure 5.10, TLI (.999) value close to 1 indicates a good fit, while values of CFI (1.000) and NFI (.998) indicates a perfect fit. A value of RMSEA (.016) was less than 0.05, which indicated a good fit. Moreover, GFI value was greater than 0.95 indicated an excellent fit of the data. In addition, construct validity were satisfactory at .810.

Standardized regression weights ([3) are standardized coefficient estimates, and are independent of the units in which all variables are measured. These standardized coefficients allow the researcher to compare directly the relative relationship between each independent variable and the dependent variable. From table 5.27, it can be seen that each item of independent variables are all significantly and positively related to the dependent variable. For example, in figure 5.11 shown below info 1 increases .74 for each 1.00 increase in MIS quality, sys 10 increases .75 for each 1.00 in MIS quality, and org 2 increases .72 for each 1.00 in MIS quality Thus, it can be concluded that the greater the quality of information, system and organizational management, the higher quality of MIS.

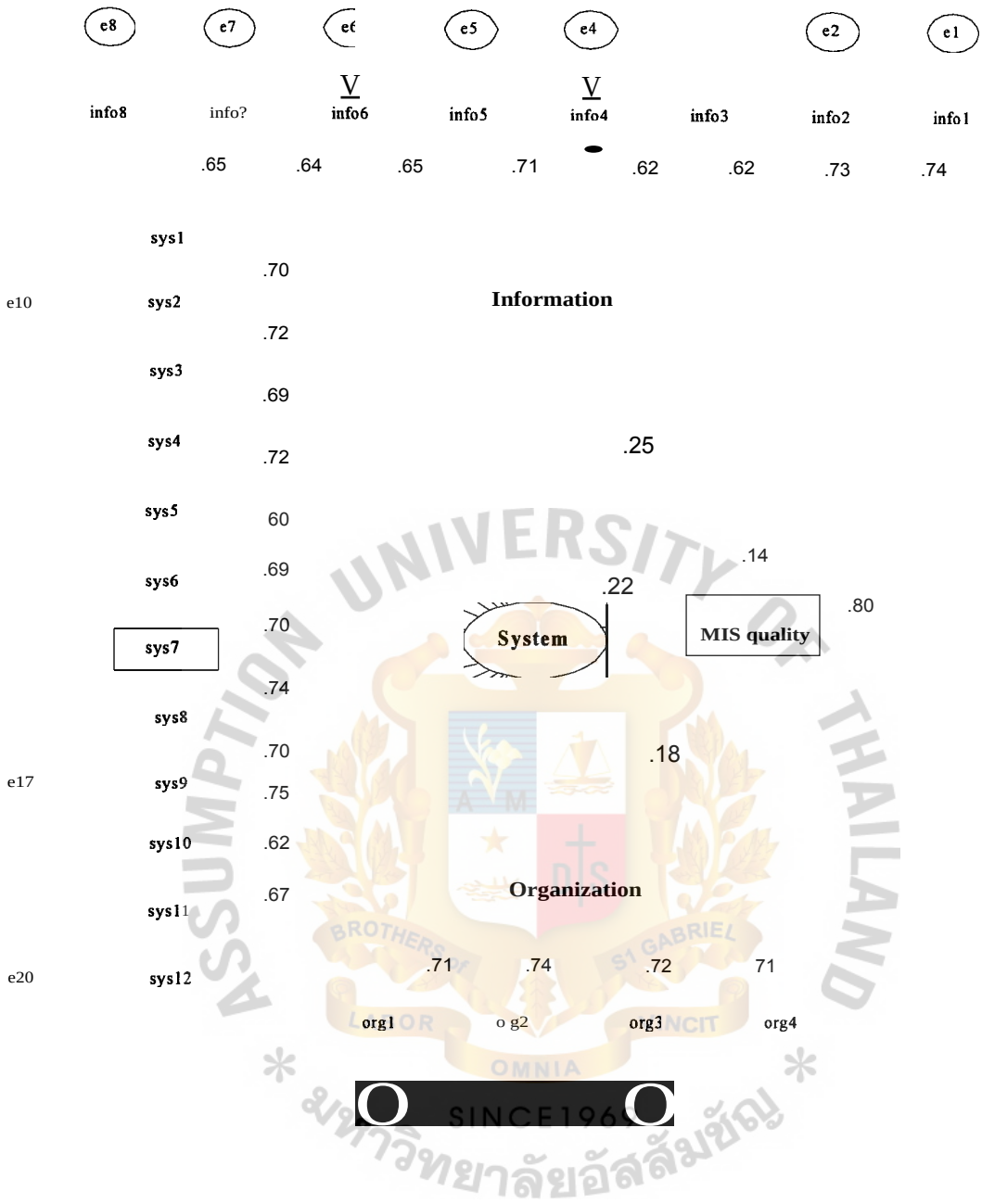


Figure 5.11: The IT Applications Model with AMOS

5.9 Structural Equation Model with Latent Variables

Structural equation modeling (SEM) is a statistical technique for building and testing statistical models, which are sometimes called causal models. It is a hybrid technique that encompasses aspects of confirmatory factor analysis, path analysis and regression, which can be seen as special cases of SEM. SEM is known by many names: covariance structure analysis, latent variable analysis, and is referred to by the name of the specialized software package used (e.g., AMOS model).

The term structural equation modeling conveys two important aspects of the procedure: (a) that the casual processes under study are represented by a series of structural (e.g., regression) equation, and (b) that these structural relations can be modeled pictorially to enable a clearer conceptualization of the theory under study. The hypothesized model can then be tested statistically in a simultaneous analysis of the entire system of variables to determine the extent to which it is consistent with the data. If the goodness of fit is adequate, the model argues for the plausibility of postulated relations among variables; if it is inadequate, the tenability of such relations is rejected.

Bacon (1997) mentioned that SEM offer more benefits including an effective way to deal with multicollinearity and methods for taking into account the unreliability of response data. Advantages of SEM compared to multiple regression include more flexible assumptions (particularly allowing interpretation even in the face of multicollinearity), use of confirmatory factor analysis to reduce measurement error by having multiple indicators per latent variable, the attraction of SEM's graphical modeling interface, the desirability of testing models overall rather than coefficients individually, the ability to test models with multiple dependents, the ability to model mediating variables, the ability to model error terms, the ability to test coefficients across multiple between-subjects groups, and ability to handle difficult data (time series with auto correlated error, non-normal data, incomplete data).

However, researchers are often interested in studying theoretical constructs that cannot be observed directly. These abstract phenomena are termed latent variables, or factors. Because latent variables are not observed directly, it follows that they cannot be measured directly. Thus, the researcher must define the latent variable is linked to one that is observable, thereby making its measurement possible. It is helpful in working with SEM models to distinguish between latent variables that are exogenous and those that are endogenous. According to Pedhazur (1997), an exogenous variable is one whose variability is assumed to be determined by causes outside the casual model under consideration. An endogenous variable, on the other hand, is one whose variation is to be explained by exogenous and other endogenous variables in the casual model.

The result of Hypotheses 7 and Hypotheses 8 are presented in this part. Hypotheses 7 and Hypotheses 8 aimed to the relationship between all antecedents, users' satisfaction, and the relationship quality, which was proposed as the mediator of the model. The results of the structural relationships between constructs are shown as follows.

5.10 Model Assessment

As the goal in building structural equation model, is to find a model that fits the data well enough to serve as a useful representation of reality and a parsimonious explanation of the data. For this stage of the analysis, CFA is carried out to determine the degree of model fit, the adequacy of the factor loadings, and the standardized residuals and explained variances for the measurement variables. Figure 5.11 presents the measurement model for this issue.

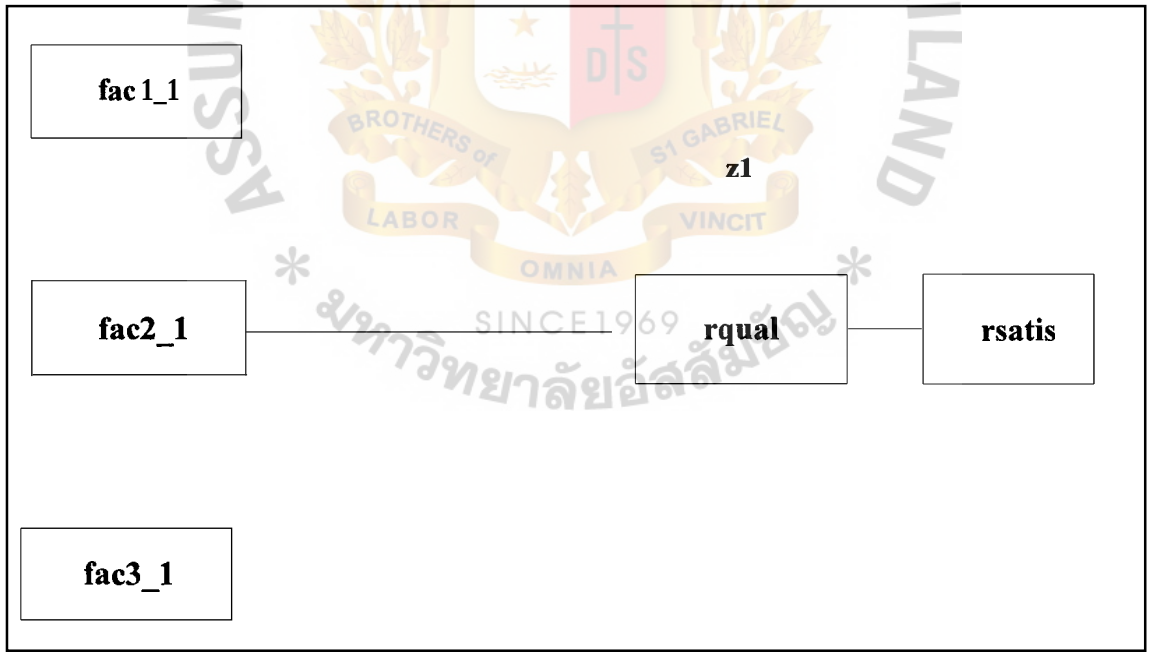


Figure 5.12: Measurement Model for IT Applications Attributes, MIS Quality And Users' Satisfaction

After the data were analyzed, the details of all data analyses are discussed in the following part.

Table 5.36: Variable Counts for the Model

Number of variables in the model:	7
Number of observed variables:	5
Number of unobserved variables:	2
Number of exogenous variables:	5
Number of endogenous variables:	2

Table 5.36 illustrates the information that is followed by 5 observed variables that can be observed directly and is measurable and 2 variables that cannot be observed directly and must be inferred from measured variables. All the observed variables operate as dependent variables in the model; all factors and error terms are unobserved, and operate as independent variables in the model.

Variables in a model may be upstream or downstream depending on whether they are being considered as causes or effects respectively. As shows on the Table 5.36, there are 5 exogenous variables, which are independents with no prior casual and 2 endogenous variables, which are both effects of other exogenous or mediating variables, and are causes of other mediating and dependent variables. However, it is not likely that the dependent variables are perfectly explained by the independent variables specified in the model. There are many other influencing factors that the model does not take into account. Therefore, error variables are added.

Table 5.37: Parameter summary

	Weights	Covariances	Variances	Means	Intercepts	Total
Fixed	2	0	0	0	0	2
Labeled	0	0	0	0	0	0
Unlabeled	4	3	5	0	0	12
Total	6	3	5	0	0	14

Table 5.37 focuses on a summary of the parameters in the model. Moving form left to right, there are 6 regression weights, 5 of which are fixed and 4 of which are

estimated; the 2 fixed regression weights include the first of each set of 3 factors loadings. There are 3 covariances and 5 variances, all of which are estimated.

5.11 Model Identification

This part concerns whether a unique values for each and every free parameter can be obtained form the observed data. It depends on the mode choice and the specification of fixed, and constrained and free parameters. The model cannot be identified if there is any unknown parameter that is not specified. This is called a problem of identification.

Table 5.38: Model Summary

The model is recursive.	
Sample size:	1063
Computation of degrees of freedom	
Number of distinct sample moments:	15
Number of distinct parameters to be estimated:	12
Degrees of freedom (15-12):	
Minimum was achieved	
Chi-square =	26.241
Degrees of freedom =	3
Probability level =	0.000

As SEM programs require an adequate number of known correlations or covariances as inputs in order to generate a sensible set of results. Thus, models for which there are an infinite number of possible parameter estimate values and the degree of freedom is less than zero are said to be *underidentified* and models that have more than one possible solution (but one best or optimal solution) for each parameter estimate and positive degrees of freedom are considered *overidentified,* while recursive models are never underidentified (that is, they are never models which are not solvable because they have more parameters than observations).

Table 5.38 provides an overall summary of the model to be tested and the data to be used. As such, the hypothesized model is of a recursive type that is one in which no variable in the model has an effect on itself, and that the sample size is 1063. In determining the identification status of the model, as shown on the table, there are 15 pieces of information from which to compute the estimates of the model, and 12 parameters to be estimated, leaving with 3 degrees of freedom, together with its chi-square (x2) value (26.241), and probability value (0.000).

Table 5.39: Model Fit Summary CMIN

Model	NPAR	CMIN	DF	P	CMIN/DF
Estimated parameters	12	26.241	3	1 .OOO	8.747
No. of Information	15	.000	0		

Focusing on the first set of fit statistics as depicted in the table 5.39, the labels NPAR (number of parameters), CMIN (minimum discrepancy), DF (degrees of freedom), P (probability value), and CMIN/DF. The value of 26.241, under CMIN, represents the discrepancy between the unrestricted sample covariance matrix *S* and the restricted covariance matrix $\Sigma(\theta)$ and, in essence, represents the likelihood ratio test statistic, most commonly expressed as a chi-square (x2) statistic.

Model chi-square, also called discrepancy or the discrepancy function, is the most common fit test, printed by all computer programs. AMOS outputs are as CMIN. CMIN value approximates the degree of freedom indicate fitting hypothesized model. A non-significant chi-square value indicates a good model fit. If model chi-square is less than 0.05, the hypothesized model will be rejected (Byrne 2001). However, Chi-square is sensitive to sample size. In large samples, it may be found to be significant, whereas in small samples it may test as non-significant. As such, its values are not interpretable in a standardized way because x2 has no upper bound theoretically and its lower bound is always zero (Kline 1998). Moreover, when the data are non-normal, results of significance tests tend to be significant too often and true models are likely to be rejected (Kline 1998).

Another way to describe the chi-square goodness of fit statistic is to say that it tests the null hypothesis that there is no statistically significant difference in the observed and theoretical covariance structure matrices. The chi-square statistic has bee referred to as a "lack of index fit" (Mulaik, James, Van Alstine, Bennet, Lind & Stilwell, 1989) because a statistically significant results yields a rejection of the fit of a give model.

Based on the results in table 5.39, the chi-square (x2) value of 26.241, with 3 degree of freedom and a probability of less than .0001 *(p*<. 0001), thereby suggesting that the fit of the data to the hypothesized model in not entirely adequate. Although the hypothesized model did not fit the observed variance-covariance matrix well by the chi-square test, the baseline comparisons fit indices of GFI, NFI, CFI, and TLI are all above 0.9 (range: 0.938 to 0.990). A model is considered to have a better fit when "it has a lower ratio computed as the noncentrality parameter divided by degree of freedom" (Thomas & Thompson, 1994). The closer the GFI is to 1.00; the better is the fit of the model to the data. The parsimony ratio is therefore important. This statistic takes into consideration the number of parameters estimated in the model. The fewer number of parameters necessary to specify the model, the more parsimonious is the model (Gillaspy, 1996).

Table 5.40: Model Summary of Goodness of Fit Index, Baseline Comparisons Fit Indices and Model Comparison Statistics

Indices	Value
CMIN/DF	8.747
Goodness-of-fit (GFI)	.990
Normed Fit Index (NFI)	.979
Comparative Fit Index (CFI)	.981
Tucker-Lewis Index (TLI)	.938
Root Mean Square Error of Approximation (RMSEA)	085

Focus on the first set of fit statistics, based on the goodness-of-fit (GFI) reported in table 5.40, it can conclude that with the GFI values of .990, the hypothesized model fits the sample data well. Turn to the next group of statistics, to measure if model fits very well at all sample sizes, values for both the NFI and CFI range from zero to 1.00 (Byrne 2001), a value >.90 was originally considered representative of a well-fitting model (Bentler, 1992), and value of 1 indicates a perfect fit (Arbuckle and Wothke 1999). As shown in Table 5.40, NFI = .979 means the researcher's model improves fit by 98% compared to the null mode. By convention, CFI = .981 indicates that 98% of the covariation in the data can be reproduced by the given model. As such, it can conclude that both the NFI (.979) and CFI (.982) were consistent in suggesting that the hypothesized model represented a well fit to the data.

The Tucker-Lewis index (TLI; Tucker & Lewis, 1973), consistent with the other indexes noted here, yields values ranging from zero to 1.00, with values close to .95 (for large samples) being indicative of good fit (Hu & Bentler, 1999). As shown in table 5.40 the finding of a TLI value of .938 is consistent with that of the CFI in reflecting an adequate-fitting model.

The next set of fit statistics focus on the root mean square error of approximation (RMSEA) and the use of confidence intervals to assess the precision of RMSEA estimates, AMOS report a 90% interval around the RMSEA value (Steigers's, 1990). Hu and Bentler (1999) have suggested RMSEA<= .06 as cutoff for a good model fit. Another have suggested that there is good model fit if RMSEA less than or equal to .05. There is adequate fit if RMSEA is than or equal to .08. Turning to table 5.40, the finding of a RMSEA value for hypothesized model is .085, with 90% confidence interval ranging from .057 to .117 and the *p* value for the test of closeness of fit equal to 0.21. Interpretation of the confidence interval fell within the bounds of .057 to .117, which represents an adequate degree of precision, the given that the RMSEA point estimate is .05, the upper bound of the 90% interval is .057, which is less that the value suggested by Browne and Cudeck (1993), and the probability value associated with this test of close fit is .021. Thus, it can conclude that the initially hypothesized model fits the data fairly well.

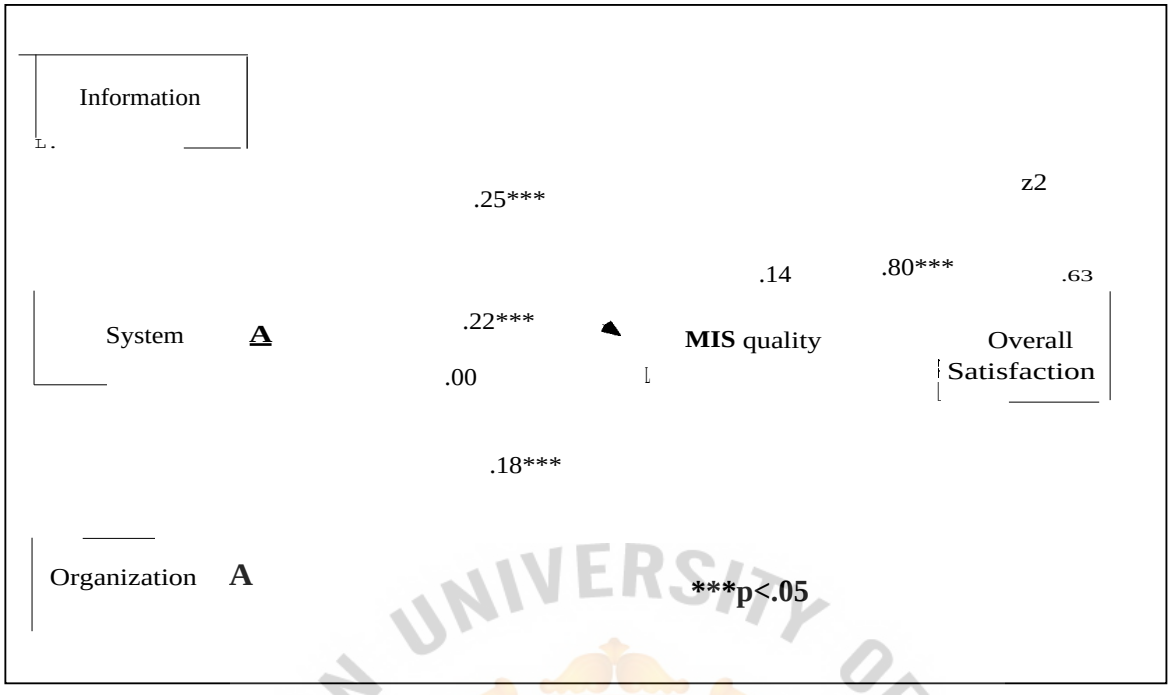


Figure 5.13: Measurement Model with Standardized path coefficients for IT Applications Attributes, MIS Quality And Users' Satisfaction

Table 5.41: Relationship Estimated for IT Applications Attributes, MIS Quality and Users' Satisfaction

		Critical Ration (C.R.)	Standardized Regression Weights (β)		Squared Multiple Correlation (SMC)
MIS quality	Information	7.595	.253 (.025)	***	.143[a]
MIS quality	System	8.893	.216 (.025)	***	
MIS quality	Organization	6.414	.182 (.025)	***	
Overall Satisfaction	MIS quality	42.850	.796 (.018)	***	.634[b]

Notes: Figure in the brackets indicates the standard error (S.E.)
SMC stands for Squared Multiple Correlations as follows:
[a] Represents the SMC (r^2) of MIS quality
[b] Represents the SMC (r^2) of Overall Satisfaction

Associated with each estimated unstandardized regression coefficient is a standard error (S.E.) and a critical ratio (C.R.) value. As shown in the table 5.41, the results indicate that the unstandardized regression weights are all significant by the critical ratio test ($> \pm 1.96$, $p < .05$). It can be seen that the variable of system is highly significant predictors of MIS quality (C.R. =8.893, $p < .05$; C.R. =7.595,$p < .05$; C.R.

=6.414, $p < .05$, respectively). Moreover, to compare directly the relative relationship between each independent variable and the dependent variable, it can be seen that rating on the variable of information, system, and organization are all significantly and positively related to MIS quality ($\beta = .216$; $\beta = .253$; $13 = .182$, respectively). Based on this criterion, it can be seen that the variable fac1_1 (information) is highly significant predictors of RQUAL. Thus, it can be concluded that the greater quality of information, system, and organizational management, the greater MIS quality is. This indicates that there is significant relationship among overall MIS quality and IT attributes. As such the null hypothesis of independence was rejected. In addition, the result has shown the high-standardized loadings on MIS quality (C.R. = 42.820, $p < .05$, $\beta = .796$), suggesting that it is a reliable indicator of users' satisfaction which overall satisfaction increases .796 for each 1.00 increase in MIS quality. This also indicates that the greater MIS quality, the higher level of users' satisfaction.

To measure the strength of linear relationship, the squared multiple correlation (SMC) for each relationship in the model was examined. The result has shown that an index of the proportion of the variance of the endogenous variable MIS quality and overall satisfaction are accounted for by the exogenous or predictor variables. It can be assumed that the higher the value of the squared multiple correlations, the greater the explanatory power of the regression model, and therefore the better the prediction of the dependent variable. Despite receiving a path from latent variables, the standardized coefficients reveal a strong relationship between MIS quality and users' satisfaction with IT applications provided by the educational institution. As shown in the table 5.41, RSATIS has a high R^2 of .634 or the predictor of variable MIS quality accounted for 63.4% of the variance of overall satisfaction, and RQUAL has a low R^2 of only .143 or 14.3% of the variance of MIS quality. As such, the residual or the amount of unexplained variable (RQUAL; RSATIS) for the model is .857 or 85.7%; .357 or 35.7%, respectively). In other word, the remaining value of the variance of MIS quality and overall satisfaction cannot be explained by the model. So the null hypothesis of independence was rejected. In conclusion, there appear to be three dimensions which underline MIS quality and users' satisfaction on IT applications provided by the higher educational institutions in Thailand: one representing information aspect and the other representing system aspect and organizational management aspect.

CHAPTER VI
CONCLUSIONS AND RECOMMENDATONS

6.1 Conclusions

Advances in technology mean that it can now be an effective tool in learning and development. Many organizations and educational institutions are utilizing technology for a variety of reasons. Learning technology can be an attractive option. (Landen, 1997).

Kundu (2004) stated that information management plays very crucial role in competitive environment. Effective information management is one of the important determinants of the success of the organization; while Delone and McLean (1992) suggested that introducing information system (IS) into an organization can improve not only individual decision-making performance but also overall organizational efficiency and effectiveness.

Although quality management and information technology have been extensively researched over recent years. However, there has not been found on the relationship among information technology applications, management information system (MIS) quality and user satisfaction.

As the objective of this study is to develop a valid instrument to measure the impact of information technology (IT) on management information system (MIS) quality, and produce the suitable model to measure user satisfaction on IT applications in Thai Higher Educational Institutions. As such, the faculty members and students of Thai Higher Educational Institutions who have participated or experienced in using IT applications offered by institutions are asked to fill out the self-administered questionnaires.

In this study, the Importance-Performance Analysis (IPA) technique was tested to find out the MIS success on IT applications in Thai Higher Educational Institutions. The application of IPA technique in studying represents a good step towards the

development of IT satisfaction theory. This technique enables a better understanding of IT user perception, which is important in explaining the dynamic nature satisfaction and the variability of its determinants over time. Moreover, the technique also identifies strengths and weaknesses of IT applications in Thai Higher Educational Institutions in terms of two criteria that users use in making a choice and presents pictorially and graphically all results into the right areas.

The outcome of analytic approaches are investigated and evaluated including the relationship of key variables (e.g., the importance and performance (I-P) of IT application attributes. The analysis of inferential statistics involves the analysis and verification for hypothesis statements in the population, the item analysis including Principal Components Analysis (PCA), Confirmatory Factor Analysis (CFA), and Test of Structural Equation Model (SEM).

This research reports on a successfully developed construct that can be applied to measure the IT applications - MIS quality - user satisfaction relationships. The measures proposed were tested to be reliable and valid. Detailed item analysis confirmed that all the items were appropriately assigned to their respective measures. Moreover, the all-embracing literature review and qualitative pretesting helped to ensure that the measures have content validity.

This research offers a set of 3 major categories with their respective dimensions to study into. The dimensions of information, system, and organizational management of IT applications form the measure of MIS quality and user satisfaction. Even though there is a variety of different dimensions that are not considered in each of the categories as discussed, it is believed that the offered dimensions are more critical and have priorities over other dimensions.

However, different points of view, for example, "whether system usage leads to user satisfaction" exist in the several researches. It may be argued that whilst system usage may lead to user satisfaction and user satisfaction may influence users to engage in more or further use of the system. The findings of the research indicate a significant positive relationship between system usage, in term of accessibility, availability, response time, ease of use, conservation of time, convenience, privacy, accuracy,

multifunctional capabilities, interface and use of advanced IT and user satisfaction. It is believed that the better quality of system usage dimensions, the high level of user satisfaction. The outcome of this research is very educational, though not necessarily as expected.

The research also contributes to our knowledge by providing support the contention that user satisfaction depends on MIS quality that means the quality of management information system has an influence on user satisfaction. A user who has perceived better MIS quality is more satisfied with IT applications provided by his or her institution.

In addition this study found that the demographic variables such as age, access frequency, and experience were found to be significant predictors of level of user satisfaction attribution. An explanation for this might be that gender and duration of use are not a function of the overall user satisfaction. A user who rates higher levels of overall satisfaction with IT applications provided by the institution might not spend more time on institution website. Conversely, a user who rates lower levels of overall satisfaction might be male or female.

As we know, today the world has become completely dependent on computerized systems for almost everything. Managing information and related information technology (IT) is critically important to the survival and success of organization and advances in technology mean that it can now be an effective tool in learning and development. Many educational institutions are utilizing technology as an effective tool for monitoring and improving organization's performance. For this reason, whether technology should be used in educational institutions is no longer the issue in education.

6.2 Recommendations

As effective information technology is one of the important determinants of the success of the organization. Recognition of the various elements, besides MIS quality and system usage, that contributes to overall user satisfaction become critical. Similarly, it is just as critical to identify other elements, in addition to system usage, that has a direct impact on MIS quality. Importantly, a high quality of information in term of time, content, and form dimension and good organizational management including management system, technical support, financial incentive, IT policies can also help ensure better MIS quality. This strongly supports that the management support needed for IT applications implementation, along with the consolidation of the system and the technical support necessary to keep the technology operational must be taken into consideration of the management.

Since this research reports on a successfully developed construct which is created by using structural equation modeling (SEM) that can be applied to measure the IT applications-MIS-user satisfaction relationships. With regard to the modified IPA model in this study, the results show that the IT attributes of MIS quality fall in the Quadrant **B** (i.e., Keep up with the good work). This implies that the MIS quality of the Thai Higher Educational Institutions is good in the users' perception. However, the ongoing implementation is still required.

To remain competitive, the organization should develop the technology plan that includes professional development for technology use as an essential component, create strategies for IT learning that utilize learning cultures and just-in-time support, clearly specify the intended outcomes of the IT development, pursue strategies for obtaining and sustaining funding to provide the necessary equipment upgrades, and equipment maintenance to achieve the goals.

Another important component of effective use of technology is access to on-site technical support personnel. It was suggested that technology that was not simply accessed and implemented would not be used. Timing is everything when it comes to technology. The results were revealed that when faculty members were trying to use technology in their classrooms and they came across difficulties, the immediate

assistance and support were required and they would return to more traditional ways of teaching if the problems they encountered could not be solved promptly and efficiently. However, only providing the technical support would not promote the implementation, it is essential for management to have a technical specialist in the building whose responsibility is to provide technical support on a full-time basis. This specialist would be described as a technology coordinator or a fearless soul who can find the answers to hundreds of questions and must be able to response for troubleshooting and assistance after the technology and lessons are in place.

In addition, organization needs to proactively integrate information, system, and organizational management into their efforts in order to improve MIS quality as well as higher level of use satisfaction. Moreover, to ensure that technology is used effectively, the ongoing improvement of information technology and management information system should be taken as a major vision. Organization should remain in close contact with the IT industry to keep updated on the latest IT developments.

The overall information technology plan and its development cannot exit without a significant commitment of applicable resources by the organization. It was recommended that the information technology application, which is implemented today, must consent to increased capabilities in the future, rather than the threat of total replacement of the system. Moreover, the IT applications used for faculty members should be similar to the IT applications used in classroom in order to meet the learning goals.

To ensure that the information technology will be used effectively, one factor that determines the use is where those computers are located. Although computers are connected to the Internet but they are not available in a convenient location, the availability to user, (faculty members and students), will be limited. To make the best use of limited connections and equipment, it was suggested that the organization should explore the strategies for allocating computers.

Although IT capabilities are limited by the management's attitude, training, skill, and financial factor rather than by the technical limitations of hardware and software, it is suggested that organization should develop a process for selecting and

using appropriate software to support organizational goals and ensure the technology purchases are considered to be supplies.

Monahan (1996) and Saye (1998) stated that in many schools, not all teachers are motivated to use information technology and they may resist for many reasons. As the questions if technology is suitable for all types of users still need to be investigated.

6.3 Further Studies

The researcher suggested that in future studies the IT applications attributes such information, system, and organizational management could be used to research in school level in supporting quality management practices in order to promote teachers' use of information technology and achieve better quality performance with higher level of satisfaction. These attributes have been proven to be a nonthreatening means of quantifying the efficiency and effectiveness of newly implemented IT applications. Furthermore, the instrument provides not only an overall assessment of user satisfaction, but also the capability to analyze which aspects of IT application attribute are most problematic.

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Appendix A: Questionnaire

(English Version)

Questionnaire for Respondents

IT APPLICATIONS AND USER SATISFACTION IN HIGHER EDUCATIONAL INSTITUTIONS IN THAILAND

Part I: Profile of Respondents.

Directions: This part seeks information regarding your personal background. For each question, please indicate (√) the response that applies to you.

1. Gender

❑ Male ❑ Female

2. Age

☐ Under 25 ❑ 25-30 ❑ 31-35
❑ 36-40 ❑ Over 40

3. Are you a faculty member or student?

❑ Faculty member ☐ Student

4. How often do you access into your institution's website?

__ Less than once a week 1-2 time a week ❑ 3-4 times a week
5-6 times a week ☐ Over 6 times a week

5. When do you normally access into your institution's website?
(Select only one answer)

n Every day (Monday-Sunday) ☐ Monday-Friday ❑ Saturday-Sunday

6. Which part of a day do you normally access into your institution's website?
(Select only one answer)

n Morning (Before 12:00) ☐ Afternoon (12:00-16:00)
☐ Evening (16:00-19:00) ☐ At night (After 19:00)
❑ All the time of the day

7. How many hours a day on the average do you normally spend on your institution website?

— Less than 30 minutes ☐ 30minutes-1 hour ☐ 1-2 hours
❑ 3-4 hours ☐ More than 5 hours

8. Where do you most often access into your institution's website?

On-campus
At home/Apartment off campus
Other, please specify_____

Through..... ***(Please Select only one answer)***

❑ Modem 56 kbps ☐ Hi-speed Internet
❑ Other, please specify _____☐ Do not know

9. What is your purpose of using an Internet that is provided by your institution? You may answer more than one.

- ❑ Reading, sending e-mail
  Updating information e.g., announcement.
- ❑ Checking a schedule of courses, subjects for registration.
- n Surfing the Internet for information to support your research, coursework or complete an assignment
- ❑ Linking to the other interesting website
- ❑ Other purpose, please specify_____

10. How would you rate your skill level in using the following IT applications?

	Skill Level				
	Very skilled	**Skilled**	**Neutral**	**Unskilled**	**Very unskilled**
1. Word processing (Word, Excel, Power Point etc.)					
2. Internet					
3. Receiving, sending e-mail					
4. Other, please specify					

11. How many hours per day do you normally spend on the following IT applications?

	Less than 30 mins.	**30 mins. - 1 hour**	**1-2 hours**	**3-4 hours**	**More than 5 hours**
1. Word processing (Word, Excel, Power Point etc.)					
2. Internet					
3. Receiving, sending e-mail					
4. Other, please specify					

12. Have you ever accessed into other institution website?

- ❑ Yes, please provide the name of institution_____
- ❑ No ***(Go to Part II)***

13. How would you describe your own previous experiences of using the website provided by other institutions?

❑ Very positive ☐ Positive ❑ Neutral ❑ Negative ❑ Very negative

14. How would you describe the overall management information system quality of the institution that you have mentioned in question no. 12?

❑ Very high ☐ High ☐ Neutral ☐ Low ☐ Very low
☐ Do not know/ No comments

Part II: **Questionnaire on the Importance - Performance Analysis of IT Applications in Thai Higher Education Institutions**

This section asks your opinion of how you perceive the importance and performance of each attribute of IT applications. Please indicate the extent to which you think that it is important to the quality of IT applications and how well the actual performance is.

Please indicate (f) for your perception toward the quality of IT applications provided by your institution.

Importance					*Information on Website provided by your educational institution*	Performance				
Very high	High	Neutral	Low	Very low		Very high	High	Neutral	Low	Very low
5	4	3	2	1	Updated and related to the appropriate time period.	5	4	3	2	1
5	4	3	2	1	Error free.	5	4	3	2	1
5	4	3	2	1	Relevant, concise, and clear.	5	4	3	2	1
5	4	3	2	1	Available and provided when needed.	5	4	3	2	1
5	4	3	2	1	Suited to the user's needs.	5	4	3	2	1
5	4	3	2	1	Provided in a form that is easy for user to understand	5	4	3	2	1
5	4	3	2	1	Meet the user's needs for the level of details needed	5	4	3	2	1
5	4	3	2	1	Effective in helping user complete the tasks.	5	4	3	2	1

Importance					*Information System (Website) provided by your educational institution*	Performance				
Very high	High	Neutral	Low	Very low		Very high	High	Neutral	Low	Very low
5	4	3	2	1	Advanced.	5	4	3	2	1
5	4	3	2	1	Easy to access.	5	4	3	2	1
5	4	3	2	1	Accurately performed and reduce error rates.	5	4	3	2	1
5	4	3	2	1	Enable user to accomplish task more quickly.	5	4	3	2	1
5	4	3	2	1	Provide high security such as invasion of privacy.	5	4	3	2	1
5	4	3	2	1	Give error message that clearly tell user how to fix problems.	5	4	3	2	1
5	4	3	2	1	Have all the functions and capabilities in helping user complete the tasks.	5	4	3	2	1
5	4	3	2	1	Prompt and efficient (provided when needed.).	5	4	3	2	1
5	4	3	2	1	Designed for all levels of users.	5	4	3	2	1
5	4	3	2	1	Easy for user to find the needed information.	5	4	3	2	1
5	4	3	2	1	Pleasant interface (e.g., easy reading characters, clear sequence of screens, highlighting simplified task)	5	4	3	2	1
5	4	3	2	1	Clear organization of information on the system	5	4	3	2	1

Importance					*IT Management by your educational institution*	Performance				
Very high	High	Neutral	Low	Very low		Very high	High	Neutral	Low	Very low
5	4	3	2	1	Computers allocation (e.g., the availability of equipments in a convenient location).	5	4	3	2	1
5	4	3	2	1	Just-in-time support, assistance and encouragement in problem solving when needed.	5	4	3	2	1
5	**4**	3	2	1	Training on the IT applications for user at different skill levels.	5	4	3	2	1
5	4	3	2	1	Incentives for professional development in technology (e.g., money, benefit, or reward).	5	4	3	2	1

Measurement of Overall Management Information System Quality and Satisfaction

1. **How would you describe the overall management information system quality in your institution?**

☐ Very high 0 High 0 Neutral O Low 0 Very low

2. **How would you rate your overall satisfaction level on IT application provided by your institution?**

☐ Very high ☐ High 0 Neutral ☐ Low ☐ Very low

Thank your very much for your time

Appendix B: Questionnaire

(Thai Version)

แบบสอบถาม

เรอง การประยุกต์ใช้ระบบเทคโนโลยีสารสนเทศ
ประเทศไทย

แบบสอบถามนี้เป็นส่วนหนึ่งของการศึกษาวิจัยในหลักสูตรปรัญญาดุษฎีบัณฑิต สาขาวิชาการจัดการงานคอมพิวเตอร์และวิศวกรรม ของมหาวิทยาลัยอัสสัมชัญ ซึ่งงานวิจัยชิ้นนี้พยายามที่จะศึกษาค้นคว้าโดยสอบถามจากนักศึกษา และอาจารย์ของสถาบันอุดมศึกษาต่าง ในประเทศไทย ซึ่งเป็นผู้รับบริการโดยตรง เกี่ยวกับระดับความสำคัญ และการปฏิบัติจริงของลักษณะการให้บริการทางด้านระบบเทคโนโลยี ารสนเทศ ในมิติต่างๆ ซึ่งให้บริการโดยหน่วยงานต่างๆ ของสถาบันอุดมศึกษาในประเทศไทย ท่านเป็นบุคค หนึ่งซึ่งมีความสำคัญในการตอบแบบสอบถามนี้ เนื่องจากท่านมีความเกี่ยวข้องโดยตรงกับการได้รับบริการจากหน่วยงานดังกล่าวข้างต้น ซึ่งได้เข้าร่วมการทำวิจัยในครังนี

ความร่วมมือและข้อมูลในการตอบแบบสอบถามของท่าน มีความสำคัญเป็นอย่างมากในการทำวิจัยครั้งนี้ เพราะเกี่ยวข้องกับข้อมูล 2 ด้าน อันได้แก่

1. ความสำคัญของลักษณะการให้บริการในแต่ละมิติ
2. ในการปภิบัติจริงของการให้บริการในมิตินั้นๆ เป็นอย่างไร

แบบสอบถามนี จะใช้เวลาในการตอบ ประมาณ 10-15 นาที ท่านไม่จำเป็นต้องใส่ชื่อของท่านในแบบสอบถาม ดงนนข้อมูลที่ท นให้ จะถูกเก็บเป็นความลับ

ผู้วิจัยขอแสดงความขอบคุณที่ท่านกรุณาเสียสละเวลาอันมีค่า ในการตอบแบบสอบถามซงผลของการศึกษาวิจัยในครั้งนี้ จะเป็นประโยชน์อย่างมากกับสถาบันอุดมศึกษาต่าง ในประเทศไทย โดยเฉพาะอย่างยิงกับนักศึกษา และอาจารย์

ผลของการศึกษา เนครั้งนี้ จะถูกส่งมอบให้ไปยังสถาบันของท่าน เพื่อที่จะสามารถใช้เป็นแนวทางในการปรับปรุงคุณภาพของการบริการทางด้านระบบเทคโนโลยีสารสนเทศต่อไป หากท่านตองการทราบผลของการศึกษาวิจัยเป็นการส่วนตัว ท่านสามารถติดต่อมายังผู้วิจัยได้โดยตรง ที่ติดต อด้านล่างนี้

ขอแสดงความนับถือ

นางศิริวรรณ

โทรศัพท์ 02-7191515 ต่อ 1125
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แบบสำรวจความพึงพอใจต่อการใช้ระบบเทคโนโลยีสารสนเทศของสถาบันอุดมศึกษาในประเทศไทย

กรุณาทำเครื่องหมาย ลงในช่อง และกรอกข้อความตามความคิดเห็นของท่านลงในช่องว่าง

ส่วนที่ I ข้อมูลทั่วไปของผู้ตอบแบบสอบถาม

ชาย 2. หญิง

2 อายุ 1 น้อยกว่า 25 2. 25 30 3. 31 35 4. 36 40 5 มากกว่า 40

3 สถานะของท่านในสถาบันการศึกษา อาจารย์ 2.

โดยปกติท่านเข้าเว็บไซต์ของสถาบันที่ท่านเรียน/สอน บ่อยเพียงใดต่อสัปดาห์

น้อยกว่า 9 ครั้ง/สัปดาห์ 2. ครั้ง/สัปดาห์ 3 3-4 ครั้ง/สัปดาห์ 5-6 ครั้ง/สัปดาห์

5. มากกว่า 6 ครั้ง/สัปดาห์ ขึ้นไป

5 โดยปกติท่านเข้าเว็บไซต์ของสถาบันที่ท่านเรียน/สอน **(ตอบเพียงข้อเดียว)**

1. ทุกวัน 2. วันจันทร์-วันศุกร์ 3. เฉพาะวันเสาร์-อาทิตย์ 4. ไม่แน่นอน

6. ช่วงเวลาใดที่ท่านเข้าเว็บไซต์ของสถาบันที่ท่านเรียน/สอน เป็นประจำ **(ตอบเพียงข้อเดียว)**

1. ช่วงเช้า (ก่อนเที่ยง) 2. ช่วงบ่าย (หลังเที่ยง จนถึง 5 โมงเย็น)

3. ช่วงเย็น (หลัง 5 โมงเย็น จนถึง 2 ทุ่ม) 4. ช่วงค่ำ (2 ทุ่มเป็นต้นไป)

5. ทุกช่วงเวลา

จำนวนชั่วโมงที่เข้าเว็บไซต์ของสถาบันที่ท่านเรียน/สอน โดยเฉลี่ยต่อวัน

1 น้อยกว่า 30 นาที/วัน 2. 30 นาที ถึง 1 ชั่วโมง/วัน 3. 2-3 ชั่วโมง/วัน

4 4-5 ชั่วโมง/วัน 5 มากกว่า 6 ชั่วโมง/วัน ขึ้นไป

6. ท่านมักจะใช้คอมพิวเตอร์จากที่ไหน ในการเข้าเว็บไซต์ของสถาบันที่ท่านเรียน/สอน **(ตอบเพียงข้อเดียว)**

1. สถาบันการศึกษาของท่าน (มหาวิทยาลัย/วิทยาลัยที่ศึกษาอยู่)

2. หอพัก **(ถามต่อ)** โดยมีความเร็วในการเชื่อมต่ออินเตอร์เน็ต (ตอบเพียงข้อเดียว)

โมเด็ม 56 kbps 2. ISDN 3. Hi Speed 4.ไม่ทราบ

3 โปรดระบุ

9. ในการเข้าเว็บไซต์ของสถาบันที่ท่านเรียน/สอน ท่านมีวัตถุประสงค์ในการเข้าเว็บเพื่ออะไรบ้าง **(ตอบได้มากกว่า 1 ข้อ)**

เช็ค เมล์จากหน้าเว็บไซต์ของสถาบัน

หรือประกาศต่าง เกี่ยวกับทางสถาบันเพื่อให้ทันสมัย

เช็คข้อมูลเกี่ยวกับตารางเรียน/สอน หรือรายละเอียดรายวิชา

ใช้บริการผ่านทางเว็บไซต์ที่ทางสถาบันจัดไว้ เช่น ลงทะเบียน สืบค้นข้อมูลของห้องสมุด ค้นหาข้อมูลสำหรับทำ /

การเรียนการสอน แลกเปลี่ยนทัศนะผ่านทาง วิบบอร์ด เป็นต้น

ใช้เป็นลิงค์ไปยังเว็บไซต์อื่นๆ

โปรดระบุ

ท่านมี **ทกษะ** ทีเกียวข้องกับคอมพิวเตอร์ในประเด็นต่าง อไปนี้อยู่ในระดับใด

ประเด็น	ระดับของทักษะ				
	เมาก	ดี	พอใช้	ไม่ค่อยดี	ควรปรับปรุ
1. การใช้คอมพิวเตอร์ในโปรแกรมต่างๆ เช่น Microsoft Word, Excel, Power Point เป็นต้น					
2. การใช้อินเตอร์เน็ตในการสืบค้นข้อมูล					
3. การรับ-ส่งข้อมูลผ่านทางอีเมล์ (E-Mail)					
4. อื่นๆ โปรดระบุ					

'1.1. ท่านใช้เวลาโดยเฉลี่ยกีชั่วโมงต่อวัน ในการใช้งานทีเกียวข้องกับคอมพิวเตอร์ในประเด็นต่าง ต่อไปนี้

ประเด็น	จำนวนชั่วโมงต่อวัน				
	น้อยกว่า ∃O นาที	30 นาที ถึง 1 ชั่วโมง	1-2 ชั่วโมง	-4 ชั่วโมง	มากกว่า 5 ชั่วโมงขึ้นไป
1. การใช้คอมพิวเตอร์ในโปรแกรมต่าง 6) เช่น Microsoft Word, Excel, Power Point เป็นต้น					
2 การใช้อินเตอร์เน็ตในการสืบค้นข้อมูล					
3. การรับ-ส่งข้อมูลผ่านทางอีเมล์ (E-Mail)					
4. อื่นๆ โปรดระบุ					

ท่านเคยมีประสบการณ์ในการใช้เว็บไซต์ของสถาบันการศึกษาอื่น หรือไม่ (ที่เป็นระดับมหาวิทยาลัย หรือวิทยาลัย)

☐ เคยมีประสบการณ์ โปรดระบุชื่อสถาบันการศึกษาอื่น ที่ท่านเคยเข้าเว็บไซต์เป็นประจำ

uiw มหาวิทยาลัย / วิทยาลัย _____

☐ 2. ไม่เคยมีประสบการณ์ **(ข้ามไปตอบตอนที่ z)**

กรณีที่ท่านเคยมีประสบการณ์ในการเข้าเว็บไซต์ของสถาบันการศึกษาอืนที่ท่านระบุในข้อ ท่านรู้สึกอย่างไรกับประสบการณ์ในการใช้เว็บไซต์ดังกล่าว

1. รู้สึกดีอย่างมาก 2. รู้สึกดี 3. รู้สึกเฉย ☐ pnw ☐ 5. รู้สึกไม่ดีอย่างมาก

14. โดยภาพรวมแล้ว ท่านคิดว่า "คุณภาพการจัดการระบบเทคโนโลยีสารสนเทศ" ของสถาบันการศึกษาอื่นที่ท่านระบุในข้อ 12 เป็นอย่า เร

☐ 2 ดี 3 เฉย 4 ไม่ค่อยดี 5 ไม่ดีเลย/ควรปรับปรุง

6. ไม่ทราบ/ไม่มีความเห็น

ตอนที Z ความพึงพอใจต่อการใช้ระบบเทคโนโลยีสารสนเทศของสถาบันการศึกษาที่ท่านเรียน/สอน

ต่อไปนี้ให้ท่านนึกถึง **"เว็บไซต์ของสถาบันการศึกษาที่ท่านเรียน/สอน"** และโปรดประเมินการให้ "ระดับความสำคัญ" ต่อประเด็นต่าง (ทางด้านซ้าย) และประเมิน "ระดับการปฏิบัติจ ง" ต่อประเด็นต่าง (ทางด้านขวา) ซึ่งคะแนนสูงสุดคือ 6 คะแนน และต่ำสุดคือ ๊ คะแนน

ระดับการให้ความสำ ญ					ข้อมูลภายในเว็บไซต์ของสถาบันการศึกษาที่ท่านเรียน/สอน	ระดับผลการปฏิบัติจริง				
สำค ญมาก	สำคัญ	เฉย	เม ำ	ไม่สำคัญมาก		่ มาก	ดี	เฉย	ไม่ดี	ไม่ดีเลย
(6)	(5)	(4)	(2)	(1)	1. ความสม่ำเสมอในการอัพเดทข้อมูลภายในเว็บไซต์ / ข้อมูลมีความทันสมัย ทันสถานการณ์	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	2 ความน่าเชื่อถือ และความถูกต้องของข้อมูล / ข้อมูลไม่มีข้อผิดพลาด	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	3 ความชัดเจน รวบรัด และกระชับของข้อมูลภายในเว็บไซต์	(6)	(5)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	4 สามารถค้นหาข้อมูลได้ง่าย เมื่อมีความต้องการที่จะใช้	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	5 ข้อมูลในเว็บไซต์มีความเหมาะสม / ตรงกับความต้องการของผู้ใช้	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	6. การจดหมวดหมู่ / การ ดเรียงข้อมูลในเว็บไซต์ มีความง่ายต่อการทำความเข้าใจของผ้ใช้	(5)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	7. ข้อมูลในเว็บไซต์สามารถตอบสนองต่อ วามต้องการของผู้ใช้ในทุกรายละเอียด	(6)	(4)	(3)	(2)	(1)
(6)	(5)	(3)	(2)	(1)	8. ข้อมูลที่มีอยู่ในเว็บไซต์สามารถช่วยให้ผู้ใช้บรรลุงานได้อย่างมีประสิทธิภาพ	(6)	(4)	(3)	(2)	(1)

ระดับการให้ความสำ ญ					ระบบของทางสถาบันฯ ที่ได้จัดเตรียมไว้สำหรับนักศึกษา / อาจารย์ (ผ่านทางเว็บไซต์ของสถาบันท่าน)	ระดับผลการปฏิบัติจริง				
สำ ญมาก	สำคัญ	เฉยๆ	ไม่สำคัญ	ไม่สำคัญมาก		ดีมาก	ดี	เฉย	ไม่ดี	IA เลย
(6)	(4)	(3)	(2)	(1)	1. มีระบบที่ทันสมัย และล้ำหน้า	(6)	(5)	(3)	(2)	(1)
(6)	(5)	(3)	(2)	(1)	2. มีระบบที่ทำให้เข้าถึงข้อมูลได้ง่าย	(6)	(4)	(3)	(2)	(1)
					3. มีระบบทีทำให้การปฏิบัติงานเป็นไปอย่างถูกต้อง และช่วยลดข้อผิดพลาด	(6)	(5)	(3)	(2)	(1)
(5)	(4)	(3)	(2)	(1)	4 มีระบบ ่ทำให้ผู้ใช้งาน สามารถทำงานได้รวดเร็วขึ้น/เสร็จงานได้เร็วขึ้น	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	5. มีระบบที่สามารถป้องกันการละเมิดสิทธิส่วนบุคคล	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	6. ในระบบมีข้อความบอกวิธีการแก้ปัญหาที่ชัดเจน กรณีที่เกิดปัญหาจากการใช้	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	7. ในระบบมีฟังก์ชันการทำงานที่ครบ และสามารถช่วยให้ผู้ใช้บรรลุงานได้เป็นอย่างดี	(6)	(4)	(3)	(2)	(1)
(6)	(5)	(3)	(2)	(1)	8. มีระบบที่พร้อมต่อการใช้งาน และเป็นไปอย่างมีประสิทธิภาพ	(6)	(5)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	9. เป็นระบบที่ออกแบบมาสำหรับผ้ใช้งานทกระดับ	(5)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	10 เป็นระบบทีมีความง่ายต่อการใช้หาข้อมลทีต้องการ	(5)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	11. ลักษณะ รูปร่างหน้าตาของระบบ มีความง่ายต่อการทำงาน เช่น มีจอภาพที่ดูแล้วสบายตา ง่ายต่อการอ่านตัวอักษร เน้นการท ำนที่ง่ายขึ้น	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	12. มีการจัดเรียงข้อมูล /จัดระเบียบข้อมูลบนระบบที่ชัดเ น	(6)	(5)	(3)	(2)	(1)

ระดับการให้ความสำคัญ					การจัดการทางด้านต่าง ๆ (เกี่ยวกับ IT) ของสถาบันการศึกษาที่ท่านเรียน/สอน	ระดับผลการปฏิบัติจริง				
สำคัญมาก	สำคัญ	เฉยๆ	สำคัญ	ไม่สำคัญมาก		ดีมาก	ดี	เฉยๆ		ไม่ดีเลย
(6)	(4)	(3)	(2)	(1)	1. การ ดวางอุปกรณ์ เครื่องใช้คอมพิวเตอ ไว้ในสถานที่ที่เหมาะสม	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	2. การให้ความช่วยเหลือ และใส่ใจในการแก้ปัญหาอย่างทันท่วงที เมื่อผู้ใช้เกิดปัญหาจากการใช้	(6)	(4)	(3)	(2)	(1)
(5)	(4)	(3)	(2)	(1)	3. การฝึกอบรม และพัฒนาทักษะการใช้ระบบเทคโนโลยีสารสนเทศแก่ผู้ใช้ในระดับต่างๆ	(6)	(4)	(3)	(2)	(1)
(6)	(4)	(3)	(2)	(1)	4 การจัดเตรียมสิ่งจูงใจเพื่อเป็นการตอบแทน หรือเพื่อกระตุ้น การพัฒนาระบบเทคโนโลยีสารสนเทศ อย่างมืออาชีพ เช่น เงินตอบแทน สวัสดิการ หรือรางวัล	(6)	(4)	(3)	(2)	(1)

โปรดประเมินคุณภาพการจดการ และระดับของความพึงพอใจต่อการใช้ระบบเทคโนโลยีสารสนเทศโดยภาพรวม

โดยภาพรวมแล้ว "คุณภาพการ การระบบเทคโนโลยีสารสนเทศ" ของสถาบันการศึกษาของท่านเป็นอย่างไร

☐ 1. ดีมาก ☐ 2. ☐ 3. เฉยๆ

2. <u>โดยภาพรวมแล้ว</u> ท่านมี "ความพึงพอ อการใช้ระบบเทคโนโลยีสารสนเทศ" ที่ทางสถาบันการศึกษาของท่านจัดไว้ให้

☐ 1. พอใจมาก ☐ 2. พอใจ 3. เฉยๆ ไม่ค่อยพอใจ 5. ไม่พอใจเล

ขอขอบคุณที่ท่านให้ความร่วมมือในการตอบแบบสอบถามครงน