CHAPTER 2
THEORIES AND LITERATURE REVIEW

2.1 Introduction

The MIS implementation plan is able to support the organization's business information needs in short and long term period. The purpose of this literature review is to theoretically explain the process of developing the MIS system implementation plan so that readers can use this chapter to understand the MIS system design and implementation as a whole.

2.2 The Methodology for MIS Planning

The methodology for MIS planning is divided into 3 stages [1]:

1) MIS strategic planning

2) Organizational information requirement analysis

3) Feasibility studies and resource allocation

The detail of each stage is described in the following sections.

2.2.1 MIS strategic planning

A fundamental concept of MIS strategic planning is that the plan shall be entirely based on the organization's strategic objectives called organizational strategy set. In other word, the MIS strategy plan is devised to support the organization's objective and consequent organization's strategy. An approach to develop strategic planning, that is a strategy set transformation, is defined by the following steps [1]:

1) *Identify one or more information system objectives for each organizational strategy and for each relevant organizational objective and attribute.*

2) *Validate the organizational goals and strategies by asking the management to criticize the statements. The organizational objectives, strategies, and strategic organizational attributes form the organizational strategy set*

3) *Identify information system design strategies based on organizational attributes, information system objectives and information system constraints.*

2.2.2 Organizational information requirement analysis

Once objective and strategy have been analyzed, the next stage of the MIS planning is to obtain organizational information requirements. The requirements are asked for at an organization wide level for information system planning, identifying applications, and planning information architecture. Normally, lower levels need considerable detail, volume, and frequency. Higher levels need summaries, "exception" reporting, and inquiries; still higher levels need cross-functional summaries, special requests, "what if" analyses, and "external" requirement [1].

2.2.2.1 Strategies for Determining Information Requirement

The method of obtaining the information requirements of each organizational module is to determine such requirements by group interviews of those managers who have major decision-making responsibilities for the module. There are four strategies to determine information requirements [1]:

1) Asking

The analyst obtains information requirements from persons that are users of these systems by asking them what their requirements are. The asking strategy

assumes that the users can structure their problem and overcome or compensate for a bias due to concretness, regency, small sample size, and unused data [1].

2) Deriving from an existing information system

Existing information systems that have an operational history can be used to derive requirements of a proposed information system for the same type of organization or application. There are four types of existing information systems that are useful in deriving requirement [1]:

1) Existing systems that will be replaced by the new system

2) Existing systems in another, similar organization

3) Proprietary systems or packages

4) Descriptions in textbooks, handbooks, industry studies, etc.

The information requirement can use more than one method. Some analysts use data analysis of the existing system as a secondary method for deriving requirements after their primary analysis method has provided an initial set of requirements.

3) Synthesizing from characteristics of the utilizing system

The information system requirements are obtained from an analysis of the characteristics of the utilizing system. A questioning or an analysis process begins with needs, structure, objectives, etc., of the utilizing system. When these components are established, they are the basis for deriving the information system requirement [1].

Information requirements are derived from the object system in a top-down fashion by starting with organization objectives and then defining business processes. Business processes are used as the basis for data collection and analysis. In

interviews to clarify processes, executives are asked to specify key success factors and to identify decision and problems. Then related categories of data are identified and related to organization processes.

4) **Discovering from experimentation with an evolving information system**

The procedures for determining information requirements are designed to establish a complete and correct set of requirements before the information system is designed and built. In a significant percentage of cases, users may not be able to formulate information requirements because they have no existing model on which to base requirements. They may find it is difficult to deal with abstract requirements or to visualize new systems. Users may need to anchor on concrete systems from, which they can make adjustments.

Another approach to information requirement determination is to capture an initial set of requirements and implement an information system to provide those requirements. The system is designed for ease of change. After initial requirements establish an anchor, additional requirements are discovered through use of the system [1].

According to the four strategies above, the selection procedure is contingent on characteristics of the environment in which the determination of requirements is conducted such as characteristics of the utilizing system, the information system or application, the users, and the analysts. This thesis selects the synthesizing from characteristics of the utilizing system strategy for determining information requirements.

2.2.2.2 Analysis of the Information Requirements

The step in defining a proposed information requirement in this literature review uses the process, which has been developed by IBM [3]. The processes are summarized as follow:

1) Defining Business Processes

The business processes are used to form the information architecture and data class identifications. The output from defining business process is a list of all the processes, a description of each, and the identification of those that are key to the success of the business.

2) Defining Business Data

The defining of business data involves the identification of entities (thing that are significant to the business) and the grouping of data about these entities into logically related categories called data classes. This classification helps the business to develop databases with a minimum of redundancy.

3) Defining Information Architecture

The defining information architecture involves the relating of processes to data classes. This architecture can present the data sharing within the organization.

4) Analyzing Current Systems Support

The purpose of this task is to show how data processing current supports the business. The currently existing organizations, business processes, information systems (applications), and data files are analyzed to identify voids and redundancies, help clarify responsibilities, and further the understanding of the business processes.

The analysis tool is the matrix, and various matrices are developed using combinations of process, organization, and data classes. The matrix for the executive interviews is the process/organization matrix, and its intercepts denote the decision makers, major and minor organizational responsibility for a process, and current data processing support.

An example of the process/organization matrix is shown in Figure 4-2 and an example of relationship between data and process is shown in Figure 4-3.

5) Interviewing Executives

The purpose of interviewing executives is to validate the gathered as described above, determine the objectives, problems, and information needs, and gain executive rapport and involvement.

6) Determining Architecture Priorities

Since total information system (applications) cannot be developed and implemented at one time, it is necessary to establish priorities for the development of applications and databases. Priorities are determined by developing a list of projects from the applications that make up the information architecture, then establishing a set of criteria and rating the prospective projects against them.

2.2.3 Feasibility Studies and Resource Allocation

The last stage of the model of MIS planning is to determine which applications shall be implemented and in what order. Information system resources are limited, and not all projects can be done at once. Each project should be analyzed in terms of feasibility and cost and benefits analysis.

2.2.3.1 Feasibility Studies

The objective of feasibility assessment is to determine whether or not the MIS system makes sense. If the system is infeasible, it is better to find out earlier than later. There are four feasibility assessments, which is summarized as follow [2]:

1) **Cost feasibility** addresses the question: Is the MIS within the appropriate realm of cost? At this stage, precise measures of costs and values of benefits are impossible to obtain, so the question has to be answered by estimating. The goal here is to determine whether the project makes reasonable sense from a financial standpoint.

2) **Schedule feasibility** concerns whether or not the system will be available in time. Schedule feasibility problems often involve external agencies.

3) **Technical feasibility** is the third dimension of feasibility assessment. Here the question is: Can existing technology provide a solution to the system requirement?

4) **Organizational feasibility**, the final component of feasibility, concerns the political environment. Does the MIS system fit within the cultural, social, and policy constraints of the organization?

When the MIS system's feasibility has been assessed, the next task is to lay out a project plan. The plan is considered in several topics such as: How will the project be conducted? What personnel will be required? What tasks will be necessary? Who will carry out those tasks? What schedule will be followed? How much money will be needed? When will the money be needed? [2]

2.2.3.2 Cost and Benefit Analysis

The *cost and benefit analysis* uses the three popular approaches which consist of Break-even Analysis, Payback Analysis, and Net Present Value [4].

1) **Break-even Analysis** compares the cost of the new system to that of the current system and identifies the break-even point. That is the point in time at which the two costs are the same.

2) **Payback Analysis** compares the cumulative costs of the new system with its cumulative benefits. The payback formula determines the point in time when the cumulative benefits turn positive. This point is called the payback point, and time that is required to reach the payback point is the payback period.

3) Since the returns from a project can run well into the future, management will often want returns to be expressed in current money. Such a request can be met by computing the **Net Present Value** of the future return.

Net Present Value is the discounted current value of money that will be received in the future, taking into account a particular interest rate.

2.2.3.3 Resource Allocation

Information system resources are limited, and not all projects can be done at once. Since data is now being treated as a business resource, management should be able to evaluate information systems projects in the same way that other business resource projects are evaluated. Some of the questions to be answered in determining application priorities are [3]:

1) Will the application provide a significant near-term saving and a substantial long-term return on investment?

2) Whom will it impact, and how many people will be involved?

3) Will it lay the groundwork for initial database architecture?

A method of determining priorities is to group the major criteria into four categories: potential benefits, impact upon the business, probability of success, and demand. The applications can be analyzed and ranked on a scale of 1 to 10 for the categories to help determine the implementation sequence. Figure 6-3 shows an example of application ranking. After the implementation of the first application has been completed, the priorities for the remaining applications should be reassessed.

2.3 System Design

System design is the determination of the process and data that are required by a MIS system. The purpose of system design is to develop specifications for components of the MIS. The design begins with the detailed analysis of system design, using structured techniques and tools that document both processes and data, such as Dataflow Diagram. An example of a Dataflow Diagram is shown in Fgure 4-3. The activities during the design of a MIS are listed in Figure 2-1 [2].

From the information system requirement, it is necessary to identify the major modules of the organization, the top management should make decision whether the application software will be self-developed or whether existing software will be bought. If the application is to be developed, there are several consideration resources, which are required for the implementation. The quickest way to implement MIS is to purchase existing software that requires little or no modification for the particular application. If the application does exist, a preliminary review of the application's functions should be conducted.

However, the system will not operate free from constraint such as the environment: for example, the requirement of using existing hardware or to have the system up and running on a certain date. It is important that these constraints shall be identified before work on the system actually begins. Therefore, both the system design and the project activity have to consider resources within the constraints.

In design stage of the required five components of the information system shown in Figure 2-1 [2], it is necessary to develop specifications for each component.

2.3.1 Management Approach

As mention above, the purpose of the design stage is to develop specifications for the following five components . Normally information system professionals have the expertise to design systems as complex as most workgroup or even enterprise systems. There are so many aspects of design that an implementation team needs not even understand. Therefore, the management should proceed activities in this design stage as it manages the activity of any other technical effort. The management should also assess the ability of the staff who have skill and knowledge about the specification of the said five components. If the suspected problems occur, the management has to use intuition and should involve someone who deeply knows of technical details.

2.3.2 Hardware Specifications

Usually, design of hardware components is far from the real activity of this purpose, only few applications necessitate the design of new hardware. In many cases, selection of on-shelf hardware is simply refined. Thus hardware design task is done by the vendor, finally a project team is able to get more detailed specification.

2.3.3 Program Specifications

The tasks of program design are similar to hardware specifications. The developer needs to determine the specifications of the programs to be licensed. He should avoid taking any lengthy period of time in this stage. In case the requirement of custom-developed program, visible results shall be promised.

2.3.4 Data Design

For database applications, the examination of forms, reports, and menus shall be done. The next step is to produce a data model that will then be transformed into a database design. The time that will be spent in this phase should not be too long, the tasks should let vendors take care of instead of organization manager or users. The developer should be given an opportunity to review and approve the final design. This includes menus, data-entry forms, report layouts, and command sequences. While some of these components will have been established during requirements definitions.

It is important to verify that the developer has understood and incorporated these requirements.

2.3.5 Procedure Design

There are four types of information systems procedures: user procedures for normal processing, user procedures for failure recovery, operator procedures for normal processing, and operator procedures for failure recovery.

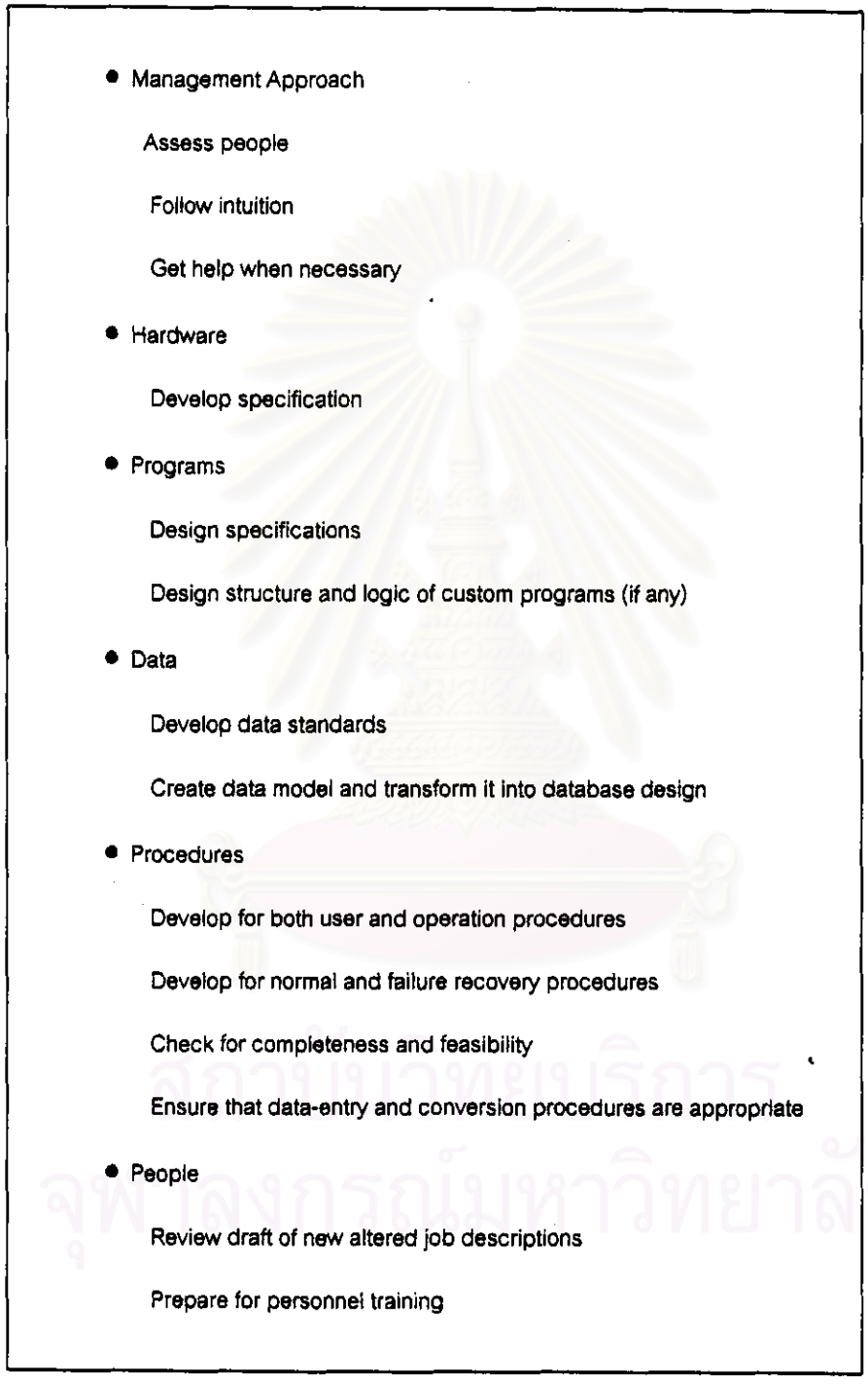

Figure 2-1. Design Stage [2]

Users need procedures for starting the applications, enter and edit data, and produce reports. For failure recovery, users need to know what to do when the system fails such as: What activities can they continue to perform? What data should be saved? How should the data be saved? Once the system is repaired, how are the users to proceed? How can users determine if any of their prior work was lost?

Operators need to design for starting and stopping the system, adding new users to and removing users from the system. Backup procedures need to be documented. Routine maintenance procedure (e.g., printer cleaning) also need to be documented. For failure recovery, the operators need procedures for identifying and correcting the problem. Data-recovery procedures need to be documented.

2.3.6 People

The last design task concerns the development of job descriptions for the users or operating the application. During the design stage, the specific skills and proficiency levels for all users need to be determined. This information is used to establish their training requirements and to modify their job descriptions (redesign business process). The design components may be developed by asking for an outline of procedures, review a draft of the user job descriptions and plan for personnel training. This activity may be developed by the vendor.

2.4 MIS Implementation Activities

MIS implementation is the process of installation hardware and software and getting the system up and running. Figure 2-2 shows tasks of MIS implementation.

The managers and project team who have a good understanding of the work necessary to implement the system design. They can use this knowledge to develop a very detailed implementation plan.

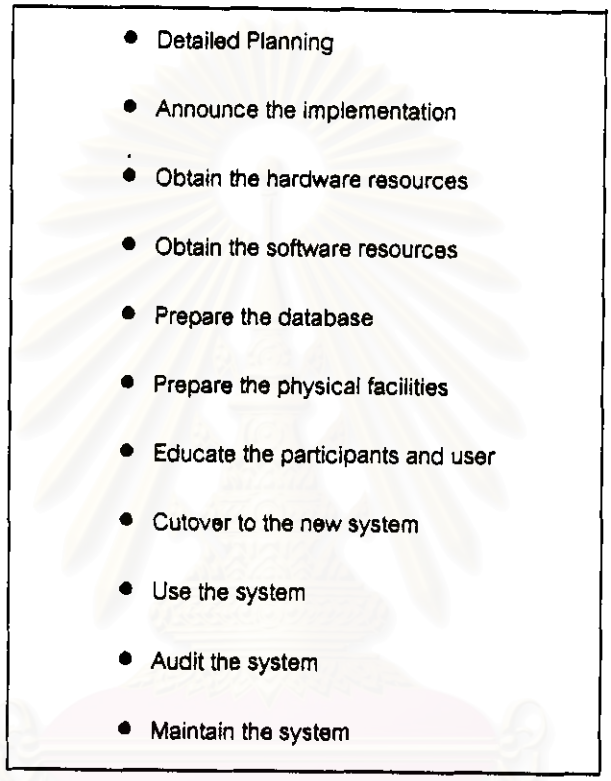

Figure 2-2. Implementation Phase

In Figure 2-2, the purpose of the announcement is to inform the employees of the decision to implement the new system and to ask for the employees' cooperation.

After hardware and software have been obtained, the database is created. If the new system hardware cannot fit into existing facilities, it is necessary to engage in new construction or remodeling.

When the physical facilities are ready and the necessary education has been conducted. The new system will affect many people, therefore all of these people must be educated according to their role in the system.

The process of halting use of the old system and starting use of the new system is called cutover. It has four basic approaches: pilot, immediate, phased, and parallel which is shown in Figure 2-3 [4].

1) A pilot is a trial system implemented in a subset of the overall operation, such as an office or geographic area. If the pilot succeeds, the system is implemented in the remainder of the operation, using one of the three other cutover approaches.

2) The immediate simply is the approach to cutover from the old system to the new one on a given day. However, this approach is feasible only for small organizations or small systems, since the timing problems become greater as the scale of operation increases.

3) In a phased cutover, the new system is put into use one part at a time. For example, the organization can cutover to the order entry system, followed by the inventory system, and so on. Or, cutover for all of the systems can be accomplished at one geographic location, followed by another location, and so on. Phased cutover is popular for large-scale systems.

4) A parallel cutover requires the old system to be maintained until the new one is fully checked out. This approach offers the greatest security against failure but is the most expensive, as two sets of resources must be maintained.

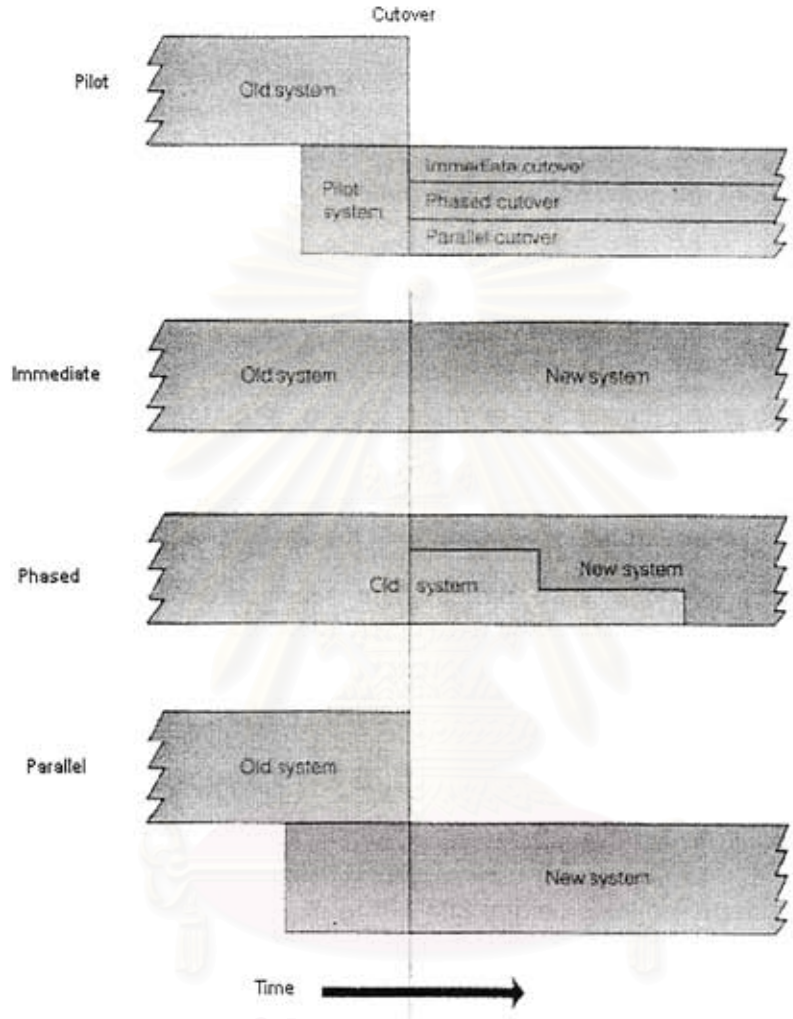

Figure 2-3. Cutover Approaches [4]

After the new system has had a chance to settle down, a formal study is conducted to determine how well it is satisfying the performance criteria. Such a study is called a post-implementation review. The systems analyst and internal auditor conduct post-implementation reviews, which are repeated on a periodic basis throughout the life of the system.

While the manager uses the system, modifications may be made in order to continue providing support to the need. These modifications are called systems maintenance. The purpose for system maintenance is correcting errors, keeping systems current, and improving the systems. It is recommended that the organization should have Information Specialists to take care of system maintenance when the MIS is operated [4].

2.5 Human Resource for MIS Implementation

o set up a good MIS a project team is necessarily considered for getting successful implementation. The team shall depend largely on the person selected by the top management to lead the MIS project team that is the MIS manager. The MIS manager should have knowledge in business matters and have a broad perspective of the business. He can save the project team valuable time with his first-hand knowledge of how the various departments of the business interactions, and where detailed information about the operation of the business can be obtained. He should be a functional vice-president or equivalent [3].

Figure 7-1 shows an example of the MIS implementation organization chart. The job descriptions and responsibilities, which are individually assigned of each major position, should be determined. To enable a smooth implementation, the project team members should understand the method of implementation by educating the team and understand the nature of the output that can be expected.

2.6 Mechanisms for Successful Implementation

The keys to success in planning, developing, and implementing the MIS system which effectively supports the business goals are [3]:

1) Top-down planning with bottom-up implementation

2) Managing data as a corporate resource

3) Orientation around business processes

4) Use of a proven, comprehensive methodology

2.7 Research Literature Survey

Research literatures surveys of this thesis study from abstract on CD-ROM of DAO document and are summarized as follow:

1) Strategic management of information technology for service quality: a study of the electric utility industry [9].

Recently, service quality has become increasingly important in the electric utility industry and information technology (IT) has become more integral to a firm. Therefore, one of the challenges is to manage IT to enhance service quality. The objective of this research was to understand the relationship between information technology and service quality. Concepts from management information systems, communications and, strategy have been integrated in a conceptual model, which describes the management of IT for service quality.

The conceptual model was partially based on DeLone and McLean's (1992) taxonomy of information system success. The model elucidates the relationship between the various factors that comprise information technology and organizational service quality. The research was conducted in the electric utility industry. A case study of an electric utility i.e. Duquesne Light helped in the development of the research model. A survey, which had been customized according to information technologies and services in the electric utilities, was conducted in the electric utility industry.

The quantitative data is based on the perceptions and opinions of IT professionals and not on a measurable output. The correlation analysis results show that the variables in the hypotheses are correlated and the result is highly significant. The

multiple regression and path analysis of quantitative data has also supported the hypotheses of the research study.

The results have shown that system quality, information quality and employee IT characteristics influence employee IT performance, which in turn influences the service quality at the organizational level. Technical support directly impacts service quality.

This research study is the first study that we know of which investigates the relationship between information technology and service quality in any industry. The study uses theoretical and empirical evidence to propose an integrative and parsimonious framework and, then, validate it using quantitative data from the electric utility industry.

2) Information systems for strategic intelligence support [10].

Strategic intelligence has attracted increasing attention in business circles and in the media of IT industry. This is driven by two factors: (1) as the business environment becomes increasingly turbulent, decision makers need more meaningful information rather than mass data with which to minimise uncertainty. (2) computing technology has become more sophisticated and more affordable. Research into Executive Information Systems' application (Rokart and De Long, 1988; Holtham, 1992; Watson, et al. 1995) and Environmental Scanning (Aguilar, 1967; Duncan, 1972; Daft, et al. 1988; Stoffels, 1994; Xu and Kaye, 1995) suggest that information systems failed to provide managers with strategic-oriented information. The reason for this is that the nature of strategic intelligence and manager's strategic information acquisition behaviour have not been adequately understood in the context of systems design.

This research attempts to ascertain senior managers' behaviour in acquiring strategic information, and to identify the critical factors that would affect the design of strategic information systems. Case studies and questionnaire survey are used to conduct the study. It concludes that strategic information is derived only from senior

managers individual strategic vision, knowledge and judgement. The content and the meaning of the information are of greatest interest to senior managers. An external vision is of most strategic importance, but it should be balanced with internal monitoring. Vision illumination and knowledge creating are critical to organisation-wide intelligence Scanning-Refining-Supporting. Knowledge-based intelligence function or systems will enhance senior managers' strategic information acquisition as well as organisations' intelligence capability and sensibility.

3) MIS structure, business strategy, and the structure of organizations: Effects on MIS performance (organizational structure) [11]

Whether to centralize or decentralize their management information systems (MIS) is an important decision facing many managers. With respect to this decision, the importance of considering organizational variables such as competitive strategy and organizational structure in designing MIS structures has been evaluated in this study. Why are certain MIS structures more effective in certain organizational situations? Theory suggests that the proper MIS structure is one which corresponds with an organization's structure and/or competitive strategy. Previous researchers have provide frameworks defining well-matched and poorly-matched MIS structures. The first part of this study is to investigate whether well-matched MIS structures to organizational structure or strategy will have better performance than poorly-matched ones.

Overall, the findings of this study showed that matched MIS structures perform better than poorly matched MIS structures. These findings emphasize that designers of MIS must consider organizational structure and competitive strategy in order to ensure effective MIS structures. In addition (and perhaps most noteworthy), findings suggest that competitive strategy should be considered as a relatively more important variable than organizational structure in the MIS development process.

4) Managing MIS implementation: identifying and removing barriers to use [12].

This study examines the challenges of managing an MIS implementation project, using three models for analysis that represent alternative perspectives found in the implementation literature. The research is focused on illuminating the problems of implementing systems that require mutual adaptation of technology and organization over time. The purpose of the research is twofold: (1) To gain some understanding of how an organization can successfully identify and remove barriers to use, and (2) To highlight some of the strengths and limitations of alternative analytical perspectives on implementation.

The results of this study suggest that barriers relating to implementation infrastructure can be overshadowed by other barriers that may exist. The findings also suggest that the most frequently cited barriers to use may not be the most critical barriers and that a holistic understanding of task/technology fit is important for successful implementation. Evidence from this study indicates that an effective problem-solving process is needed to enable the organization to make critical adaptations to both the organization and the technology. If the problem-solving process is not carefully managed, the organization may not be able to remove barriers to use effectively. Finally, the data suggest that inappropriate initial scoping of the problem can create dysfunctional behavior due to path dependency and that design issues cannot be separated from implementation.

5) Employee participation: Effects on MIS issues [13].

Conflicts between style of management and the needs and expectations of employees are causes of negative attitudes in an organization. The purpose of this study was to determine if there was any difference in attitudes between two groups toward participation in automation processes and its effect on other MIS issues in an organization. The employees of the organization who used a computer in their work

were given a survey. One group was considered to have participated in automating their work. The other was not.

The results indicated there was no significant difference in the mean scores of the two groups on attitudes toward management, satisfaction, communication, use, cooperation, and participation. Participation appears to have had little or no effect on the automation processes for this organization. However, the literature shows that employees should be involved in the process if they will be affected in any way. More research is needed in this area.

6) Implementation information systems in organizations: A study of technical and social influences (technical influences) [14].

As organizations confront new information systems and technologies, they are often forced to make very expensive decisions on the basis of little information about the product's benefits and potential acceptance within the organization. This dissertation examines the implementation process of an information system by asking the following research questions: What kind of organizational elements can we identify as influencing an information system's implementation? How do these elements combine to influence the decision to implement an information system? How are technology adoption decisions accepted organization-wide?.

This case study shows that implementation of an information system cannot be viewed solely in instrumental terms—that is, organizations do not simply "decide" on technological objectives and then match the available technology to those objectives. Instead, this case study suggests that the activities of selecting and implementing new technologies at the same time serve to elaborate (and contest) existing organizational values. Institutional theorists have described such activities as a "mythmaking" process. In that context, the "new" information system and its implementation become the medium for (re-)constructing or (re-)constituting the organization's values.

This dissertation uses a mixed-method approach for data collection and analysis. The qualitative data collection methods are interviews, participant observation and document analysis. The quantitative data analysis identified themes invoked in describing the information system and explored the relationships among the variables through crosstabulation techniques.

The following chapters use the theories, literature review and literature survey processes as a guideline on the process to produce the MIS implementation plan. The Wang Noi power Plant used as a study case.