A Case Study of Unsuccessful EIS Development in Thai Banking Business

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1. INTRODUCTION

In the last decade, Thai economy performance had been growing rapidly. In the late 1980s Thailand's economy growth rate was double-digit and became one of the fastest growing economies in the world. Rapid economic growth leads to structural transformation. Recently, Thailand has to face the financial crisis, increasing trade protection from major importing countries as well as competition from other developing countries keen to promote their manufactured exports. In the near future, banking business in Thailand is forced to be free trading market. Hence the future of further banking business in Thailand is not optimistic.

To protect their business, it is important that Thai banks require an urgent attention in adapting themselves to the new competitive environment and seeking tools to help them manage their business more effectively, otherwise it will result in missed opportunities and possibly economic losses. Investing in information technology is an alternative to support Thai banks to maintain their position in an extremely competitive commercial hemisphere.

An executive information systems (EIS) is a tool that can assist Thai executives to deal with the turbulent environments. The success of EIS in developed countries, such as the US, UK, Canada and Australia, stimulates Thai executives to adapt this IT into their banks in order to compete in an increasingly competitive environment. However, EIS is just in the beginning stage and new knowledge for Thai information systems (IS) professionals. Only a few banks have started developing such systems while some are looking for an effective development process model to implement them.

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Therefore, the aim of this research is to describe how EIS is developed in a leading bank in Thailand in order to share some knowledge about EIS development and why the development such systems is unsuccessful and what factors affect the EIS construction.

In this paper, we focus on the process of EIS development, architecture of the systems, tools and methods used during the development process, and EIS development team. Factors affecting the success of the system are also summarized.

2. RESEARCH METHOD

Data collection for this case study was performed during January and February 1995. Different questionnaires were developed for EIS developers, the EIS coordinator and executive users. The questionnaire for each group was distributed to the subjects by the EIS coordinator. The coordinator determined which executive users would receive the questionnaires. The executives users were asked about the success of the EIS, while the developers were questioned about the development process. The questions for the coordinator focused on system initiation as well as the general nature of the development of the EIS over the life of the system. In most cases the coordinator was also a developer.

The questionnaires were left with the organizations for a week. Once returned the responses were analyzed and detailed follow-up questions were prepared. These questions were answered in structured interviews that ranged in length one to two hours. Published information about the organizations (e.g., annual reports) and system documentation was also consulted. In the case of executive questionnaire, we did not receive any response. This may reflect a Thai cultural bias where managers, no matter how senior, are uncomfortable with criticizing the initiatives of their organizations. This lack of executive user response means that no detailed analysis of system success from a user perspective is possible. Some managers did provide anecdotal comments on system performance.

3. ORGANIZATIONAL BACKGROUND

This bank is a leading commercial bank in the Asia region with 25,000 employees. According to its annual report for 1993, profit after tax totaled $556 million, up 31.9% over the prior year. At the end of 1993, the Bank operated a total of 427

branches, 407 domestic branches and 20 abroad. To achieve the Bank's operational goals, the highest priority continued to be given by the Bank to the development of its personnel to ensure top quality of its staff. This was with a view to providing as much knowledge as possible to staff at all levels in order to broaden their know-how and to improve the operations under their responsibility. On the technological development, the Bank changed its on-line system throughout the country to the most up-to-date one in Asia. The Bank developed and applied the technology to the drawing up and transmitting of daily trial balance sheets to the Head Office. This system can provide operational units at the Head Office and the management with information on accounting details and overall status of all branches throughout the country on the next working day.

4. GENERAL INFORMATION ON THE EIS

The EIS project was initiated by an Executive Vice Chairman (EVC) in September 1991. The executive sponsor was a Senior Executive Vice President (SEVP). This EIS was developed for several significant reasons. First, the financial system is a high competitive market. In particular, the Bank of Thailand has begun its reform of Thailand's financial system by implementing financial liberalization and deregulation measures since 1990. This financial reform has significantly altered the role of the commercial banks. Accordingly, the Bank hoped that the EIS could help executives make better and faster decisions by using computers. Second, although the Bank created several information systems, these systems, with many commands to remember, were not easy to use. Third, the Bank wished to provide a continuity of information during the transition to a new management team.

The project commenced without formal cost-benefit analysis because it was initiated by a top executive, and the Bank emphasized intangible benefits rather than tangible ones. Moreover, the EIS could be used as a medium to promote the image of the Bank. The approximate initial cost of hardware, software and personnel in the development were $300,000, $100,000 and $200,000, respectively. Currently, the Bank spends about $60,000 annually for maintenance and operation of the system. The front end development tool, 4th Dimension, was selected with formal evaluation.

To develop the EIS, the Bank outsourced the EIS project to a consultant company with its parent base in the US, although the Bank is a leading organization in

IT and includes many experienced IS professionals. The reason behind using this strategy was that the Bank believed that the existing IS personnel did not have the experience in designing an information system for top management. The Bank employed this consultancy as they have experience in designing such systems. The Bank was confident of the reputation and ability of the consultant company. The staff of the company were involved in the project from the first stage of the EIS development process until the end.

At present, the EIS of the Bank is in the first version. It covers the areas of marketing, finance and personnel which are significant to the business of the Bank. This version was delivered in 12 months and comprised 60 screens. The average response time was 5 seconds. The initial EIS was delivered to top senior executives and their staff which totaled 15 users as shown in Table 1.

Table 1 Number of Users Classified by Management Level

Management Level	Number
Top management	5
Middle management	5
Operational management	3
Other users	2
Total	15

The general features of the EIS include E-mail, word processing, electronic calendars, tracking of key indicators, drill down, and exception reporting. The information was presented in any of table, graphic, text and color. User interfaces were designed to be as simple as possible by using mouse, icons and menus. Behind these icons and menus were further details of information.

The main menu of the EIS was classified into three main functions: descriptive reports, business performance, and support tools. The descriptive reports provided summaries of relevant information and an overview of the Bank and the banking environment in Thailand. The second function, business performance system, provided information about product and financial performance. The applications included in this

system are listed in Table 2. The final function, the support tools, included electronic mail, a diary for scheduling appointments, an address book for looking up contacts, and a branch manager directory.

Table 2 Applications of Business Performance System

Product Performance	• Monthly Report
	• Loan Analysis
	   - Loan Profitability; Loan Financials; Non-performing Loans; Problem Loans; Loans by Business; Customer Loans; Credit Cards
	• Deposit Analysis
	   - Deposit Mix; Deposit size; Deposit History
	• Credit Cards
	   - Cards; Merchants; Transactions

Financial Performance	• Profit and Loss
	• Balance Sheet
	• Costing and Financial Statements Report
	   - Annual Report; International Report; Net Income Analysis; Return on Assets
	• Treasury Position
	   - Liquidity Report; Money Market

Figure 1 shows the major technical components of the EIS of the Bank. A Client/server-based architecture was selected because it offered compelling price and performance, sharing the workload between a user-friendly client PC and a powerful server database. Consequently, a Sun Sparc station running Unix was purchased as the server. The relational database, namely Sybase, is used as the database management system. The clients are Macintoshes offering a very friendly GUI. The front-end development tool, 4th Dimension, provides a high level language and full support of the Macintosh multimedia capabilities. Data is extracted from the corporate databases on the IBM mainframe into a Sybase-SQL Server. Data providers also used spreadsheets for entering non-computerized data into Sybase.

5. EIS TEAM

The EIS team consisted of the Bank's personnel and the staff of the consultant company. The team reported to the SEVP. The members of the team were classified into two groups: a group of the Bank's staff and a group of staff of the consultant company. To help the EIS team create a working system, a joint technical development group was formed. This technical group was not regarded as a formal part of the EIS team.

The Bank Group

- *Vice President (VP) of the Office of President.* He was the full-time project manager who has MIS and MBA qualifications. With regard to the EIS project, his responsibilities were to manage the project on a daily basis, to record the progress of the project against a workplan and to report the progress to the executive sponsor. It is important to note that he is not a Thai national.

- *Vice President of Accounting and Costing, and Vice President of Operation Planning.* Both VPs were business system analysts to work as part-time members of the project. Their responsibilities were to provide copies of current reports, to identify sources of required data, to review prototype screens, to define data requirements for the complete system, to update design and information regularly, and finally to provide commentary on the system.
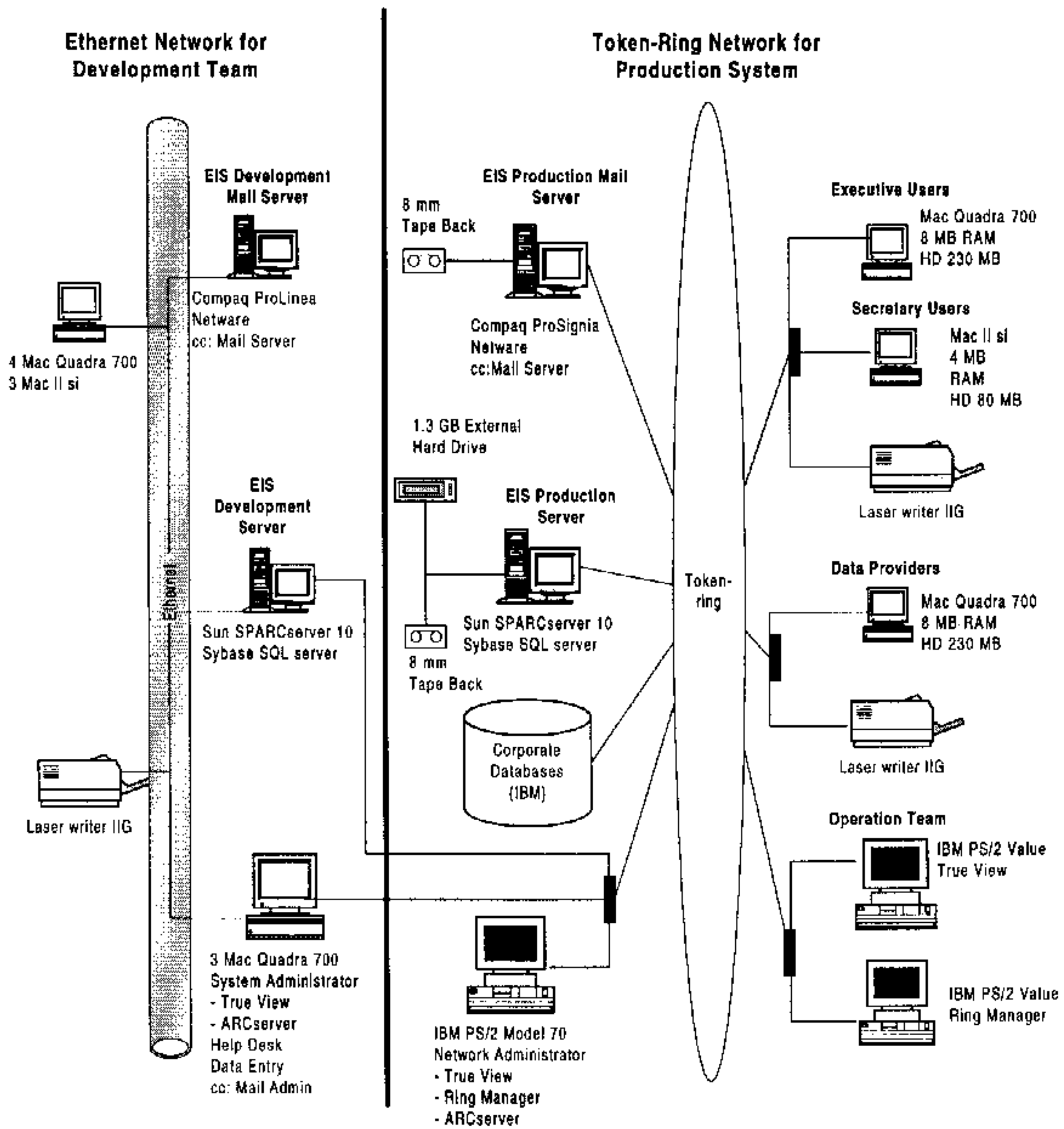
Figure 1: *The Overall Architecture of the EIS (Bank B)*

The Consultant Group

- *Conceptual Design Coordinator.* This person was responsible for reviewing the design of prototypes with executives, specifying requirements for the complete system, identifying data sources, and coordinating design work with the business system analysts of the Bank.

- *Technical Architecture Expert.* The responsibilities of this person were to prepare a technical architecture solution for the EIS, to confirm the technical architecture and to supervise network installation.

The Joint Technical Development Group

The joint technical development group was comprised of two programmers from the Bank and three programmers from the consultant company. This technical development team coded screens by using 4th Dimension, constructed databases, and incorporated communications. These programmers worked full-time on the EIS project.

6. EIS DEVELOPMENT

The overall development of this EIS followed the waterfall traditional approach by integrating the prototyping technique. The EIS development process started from planning, business requirements definition, iterative prototyping, system development, system installation and maintenance as shown in Figure 2. Table 3 presents a summary of the characteristics of the EIS development process.
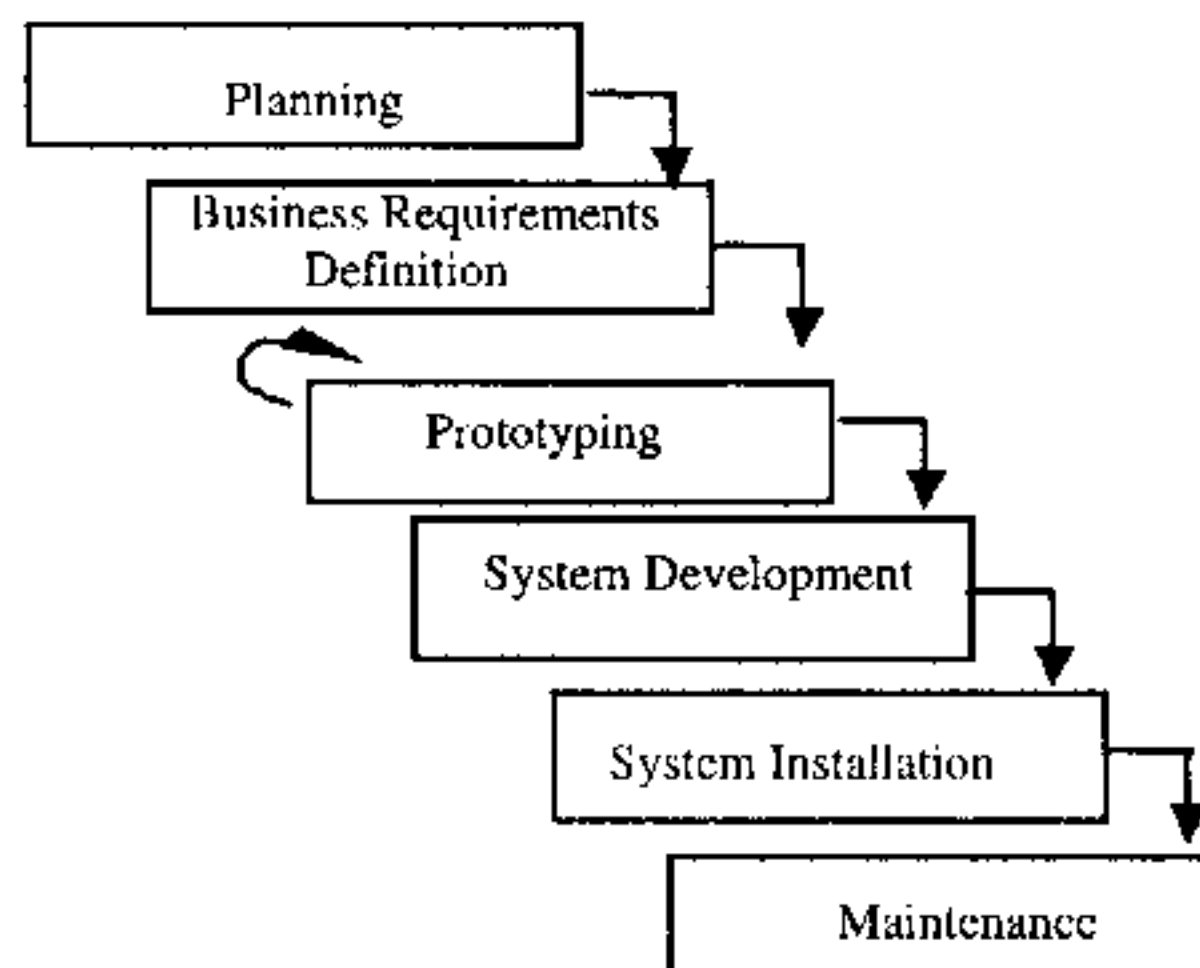

Figure 2 The Overall EIS Development Process

Table 3 Summary of the Characteristics of the EIS Development Process

Characteristics Phases	Major Activities	Required Information	Methods/ Techniques/ Tools	Deliverables	People Involved
Initiation	• Software selection and evaluation • Hardware and software installation • Reviewing preliminary business requirements • Organizing and planning the project	• Capabilities of software packages • Existing reports • File layouts • Field definitions	• Survey • Attending software demonstration • Interview	• Evaluation criteria • Software analysis results • Preliminary KPIs and areas	• Vendors • Project managers • SEVP • Functional personnel • Consultants
Business Requirements Definition	• Confirming KPIs • Defining prototype • Defining all levels of screens for prototype • Preparing data model for the prototype	• Preliminary KPIs and areas		• KPIs • Screen layouts • Data model	• Business system analysts • Project manager • Consultants
Prototyping	• Training development team • Designing prototype • Constructing prototype I • Constructing prototype II • Reviewing by management • Proposing preliminary plan and recommendation	• KPIs • Screens flow chart • Data model	• Normalization • Structured flow chart • Modular design • Psuedocode • Structured testing and walk-through • 4th Dimension • Sybase • Macromind • Disk scan tool • Excel • Pagemaker • Demonstration	• A prototype	• Vendors • Business system analysts • Project manager • Consultants • Programmers • SEVP
System Development	• Developing whole system and technical architecture schema • System testing • System auditing	• The prototype	• As in the prototyping phase	• A working system	• Business system analysts • Project manager • Consultants • Programmers • Auditor
System Installation	• Converting data • Installing a working system • Training		• One-on-one	• A quick reference	• Project Manager • Consultants • SEVP • Business system analysts
Maintenance	• Correcting errors • Improving the system	• Feedback		• A refined system	• Programmers

6.1 Planning

The process of planning focused on selecting a software package, identifying preliminary business requirements, and planning the project. The following major activities were undertaken during this phase:

- *Selecting and Evaluating Software.* The EIS project manager and the consultants surveyed and prepared a short list of software packages. Sources of the potential software solutions were researched. Meanwhile, they attended demonstrations of the listed software packages. The advantages and disadvantages of each option were identified. The package 4th Dimension was selected because it provided a high-level language and full support for the Macintosh multimedia capabilities. Moreover, it was less expensive than other packages when compared with their capabilities.

- *Installing Hardware and Software.* Sun Sparc was selected for the server and installed for the technical development team. Macintoshes multimedia and PCs were clients. Macintoshes were used by the executive users, the data providers, and the programmers while PCs were used as mail servers, and for the network administrator. Also, 4th Dimension and Sybase software package were installed for the development team.

- *Reviewing Preliminary Business Requirements.* This task was performed by cooperation of the project manager, the business system analysts and the consultants. They gathered examples of reports which were provided to the top executives and the team listed a set of initial KPI and information areas. This first list was verified with the Head of Planning by interviewing him, before conducting a preliminary interview with two EVCs. Some of the KPIs could be specified by the business system analysts because they were requested from the top management. Then, file layouts and a document of field definitions for the required data were obtained. External data were also acquired for critical areas.

- *Organizing and Planning the Project.* The objectives and scope of the EIS were defined in order to notify which functional areas were involved in the project. A work plan was developed. This included detail about the

activities, manpower and people involved. Finally, the joint technical development group was formed.

6.2 *Business Requirements Definition*

This phase concentrated on the specification of requirements and screens for the prototype. A requirements specification was produced in order to deliver to the joint technical development group for developing the system. The process of defining the business requirements started from the following activities:

- *Confirming KPIs.* After interviewing the EVCs, their responses enabled the EIS team to verify which KPIs and information were needed and which one should be added. Eventually, the KPIs were confirmed for developing a prototype.

- *Defining the Prototype.* Once KPIs for the prototype were specified, the team examined which KPIs could be supported by the available data. Then, only KPIs for which data already existed were included in this prototype.

- *Defining Levels of Screens.* When KPIs and required data were determined, the team defined every screen for the prototype. This included details of information to be displayed.

- *Preparing Data Model.* The required data from the existing system, including external data, were obtained to prepare for development of the prototype.

6.3 *Prototyping*

The purpose of the prototyping phase was to ensure that the final system met the requirements of the top executives and that it was easy to use from their point of view. Prototyping was repeated twice, and then a whole system was developed. During the prototyping phase, the team rarely accessed the top executives even though the system was requested by them, due to limitations of executive's time. The following activities were performed during this phase:

- *Training the Joint Technical Development Group.* The 4th Dimension was a new high-level language for the members of the joint technical development group so that language training was necessary.

- *Designing a Prototype.* The consultants defined user interfaces of a prototype such as the menu of the prototype, the drilldown approach and the flow of

screens.   Naming and screen standards were specified.   For instance, standard of buttons, colors, displayed names in buttons and names of columns were set up.   Then, the consultants classified common screens and skeleton formats in order to produce them for sharing among programmers.   A logical database was designed using the technique of normalization.   Each table represented an entity.   Also, fields and key fields were identified.   Data sources of each variable, extraction processing and rules were defined.   These technical standards and rules were documented for communication with the programmers.

- *Constructing the First Prototype.*   Programmers started coding screens and data extraction programs.   A physical database and processes were developed.   Each programmer was assigned to code a set of screens. Conditions and file layouts were determined by the consultants.   When programmers finished coding, they tested their own programs by checking with hard copies.   Once programs were integrated, system testing and reviewing were also performed.   As well, a system document was prepared.   It included, for example, screen flowcharts, module design and file design and description.

- *Constructing the Second Prototype.*   The EIS team reviewed the first prototype.   The team identified areas in the initial prototype that were duplicated and added to other EIS features, for instance multimedia capabilities (e.g., voice system).   Then, the processes of coding programs and database construction were repeated.   After finishing coding the second prototype, it was linked with other EIS elements, such as diary, e-mail and scheduler.   Reviewing and testing of the system was repeated.

- *Reviewing by Management.*   The project manager, the consultants and business analysts presented the prototype to the top executives.   Comments and feedback were documented.   For example, there was no sign to indicate that the executives could drill down.

- *Proposing Preliminary Plan and Recommendation.*   The EIS team defined and evaluated hardware and software alternatives for the EIS production.   The timetable, estimated cost and required manpower for developing a working

system were specified. These recommendations and plans were proposed to the top executives for approval of the production version.

6.4 *System Development*

This phase focused on creation of the whole system. Once the top executives approved the plan and budget for further stage of EIS development, the production version was continued from the second prototype which comprised 40 screens. When the EIS team analyzed the comments and feedback of the executives, 20 additional screens were added. At this phase, the following activities were performed:

- *Further Development of the Applications of the System and Technical Architecture Schema.* To create the whole system, the development team continued their work from the second prototype by changing screen design with regard to the comments of executives. Additional screens requested were created. To develop technical architecture of the EIS production, there was an argument in terms of local network technology. The EIS project manager anticipated that the Bank will change network topology from Token-Ring to Ethernet. By contrast, the Senior Vice President of System Development did not agree because he has used this topology for a long time and thought that a new one would be too expensive. This argument affected the development timetable. Eventually, the production system was implemented with Token-Ring whilst the development team used Ethernet as shown in Figure 1.

- *System Testing.* After applications of the whole system were constructed and integrated, system testing was performed to verify that the applications worked harmoniously and that the finalized applications met the executive requirements.

- *System Auditing.* It is a regulation of the Bank that the system must be tested by a computer auditor before installing and paying money to the consultants. What the auditor tested was related to system security (eg. who could access this system), and the correctness of outputs and processes.

6.5 *System Installation*

The objective of this phase is to allow the top executives to utilize the EIS in their own environments after it passed the system testing and auditing. During this phase,

the final system was installed and data were loaded to the EIS database. Then informal training was started. The following activities were concluded as follows:

- *Data Conversion and System Installation.* If the required data resided on the mainframe, they were automatically extracted and put into the EIS database. However, not all data could directly be retrieved from the existing information systems. Functional personnel manipulated the ways that they managed data, including translating from Thai to English. Normally, the functional personnel used Excel. Otherwise, the data providers could directly enter the required data into the database via a Macintosh and PC. Importantly, each piece of data in the EIS must be included the name, department, and telephone number of the data provider in order for the executives to be able to contact him or her. When data was ready, the EIS was installed. Then, all the computer equipment was tested. Additionally, every function and application of the EIS were verified in order to ensure that there were no technical problems.

- *Training.* A one-on-one training approach was employed depending on the time of each executive. The project manager described how to use the system with a quick reference. The training took about 30 minutes. The quick reference provided information about what information was included in the EIS, how to start and exit from the system, and standard buttons.

6.6 *Maintenance*

Maintenance commenced immediately after the detection of any errors that were not found during the system development and testing. These errors included data conversion errors and programming errors. Currently, the system is in the official stage of improvement. The IS department is refining the system. However, unofficial information was reported that IS department was reluctant to maintain the system. As a consequence, there was no any progress in the improvement of the system.

7. THE DEGREE OF DIFFICULTY OF THE EIS DEVELOPMENT

Because there was only one programmer who was involved in the system development left in the Bank, Table 4 presents the response of one subject. For this research "1" means not too difficult while "5" means very difficult.

Table 4 The Degree of Difficulty of the EIS Development

Statement	Score
Identify the executive requirements	2
Identify the data	3
Get the data	4
Design the system	1
Construct the system	4
Effect of users' feedback on the system	4

The developer indicated that there was less difficulty in identifying the executive requirements and designing the system because they were performed by the consultant staff; this programmer was not involved in this process. By contrast, she faced the difficulties related to the rest of the statements. These difficulties were:

- lack of cooperation from other business units to provide data;

- requirement of data translation from Thai to English;

- lack of experience in the new software;

- unstable requirements.

8. CONCLUSION

The EIS of this bank can be considered to be a relative failure. According to anecdotal evidence the system has not been used by executives for some time. Executives continue to receive verbal reports on business unit performance from their support staff each morning. The EIS was largely developed by a foreign consultant who did not adapt his design strategies to Asian management styles. The failure of this EIS result from the following factors:

- *Outsourcing Approach.* The EIS project was outsourced to a US-based consulting firm. The system was created under the western EIS concept and style, not under the Thai environment. According to anecdotal information, the EIS has not been used by the executives. If this anecdotal information is true, the EIS development of this Bank indicates that using an outsourcing approach does not guarantee the success of the EIS. Moreover, it implies that the

outsource vendor did not produce a better system than the one that the IS Department could create and the consultants did not adapt their experiences to local management style. Also, this finding is consistent with of Lacity and Hirschheim (1993) observations.

- *Employing Inappropriate EIS Development Model.* A proprietary development methodology supplied by the consultant was used for the EIS development. Although the methodology used terms like prototyping and module delivery, it can best be termed a variant of the waterfall model. This reflects its development from the consulting firm's large scale operational systems methodology and also reflects the one-shot nature of many consulting interventions.

- *Lack of Executive Involvement.* Unable to access executive was the major obstacle of the development of the EIS, even though the system was requested by them. This is due to limitations of executive's time. In fact, users should be genuinely involved in development especially in requirement specification.

- *Lack of IS Department Involvement.* The organization of the EIS development team did not include the IS staff of the Bank to be key members of the project. This may create difficulty of system maintenance after the consultant has left the Bank. The structure of the team also indicates that the top management was not confident in the ability of the IS Department. In addition, there were political conflicts between the project manager and the IS Department.

- *Lack of Cooperation.* This case study also indicates that even though the EIS was user-friendly and was developed on an advanced level of technology, it was not successful. The implementation of the EIS lacked cooperation from other business units to provide the data for the EIS.

Previous researches and experiences from this case study provide the following implications for IS professional to consider when they need to create such systems

- An evolutionary development approach should be used. An EIS is likely to be more successful if an evolutionary development approach is used. In such a volatile environment traditional operational development approaches are not relevant. Further, they are antithetical to system success.

- EIS should not be created if the executives do not want to be involved. Lack of the user involvement is a serious problem and will lead to an unsuccessful system. If this problem cannot be overcome for EIS implementation, then there is little benefit in pursuing the development. However, EIS is not the only information systems approach to supporting management activities. If EIS is inappropriate then the decision support systems (DSS) approach may have merits. In DSS the focus is normally on supporting one manager to perform one task. The systems are much smaller and user involvement is often easier to achieve. It may also be a much easier technology and methods to transfer especially in terms of staff training. DSS is a much cheaper and less risky management support strategy than EIS. It may be more successful.

- EIS should support information requirements at the organizational level and individual level. Focusing on only common information can cause serious problems in the long term as individual executive users have their own preferred information sources and presentations.

- Technology transfer from outsourcing vendors is required. The experiences of using the outsourcing approach from Thai organization showed that there was no transfer of skills and knowledge to the host organizations. This causes a serious problem on providing on-going support and system development. The system would have been more successful if a transfer of skill had been part of the contract.

- Organizations should use local consultants. EIS development should be performed by local information systems professionals who understand the local management culture and customs if an organization decided to outsource the development or exploit EIS expertise from consultant companies.

- Education programs for management and IS staff should be arranged. The program for management should include the role of EIS in managerial work, the role of management in the EIS development, and factors affecting the success of the system. The IS professionals not only need to develop an understanding of the nature of managerial work and human decision making, but also need to have foundations of the methodologies, tools and techniques which can be applied to the nature of the organization, the nature of the decisions and the individual decisions.

REFERENCES

Armstrong, D. 1990a. *"How Rockwell Launched Its EIS."* **Datamation,** 30:8, 69-72 (Mar.).

Armstrong, D. 1990b. *"The People Factor in EIS Success."* **Datamation,** 30:7, 73-79 (Apr.).

Barrow, C. 1990. *"Implementing an Executive Information System: Seven Steps for Success."* **Journal of Information Systems Management,** 7:2, 41-46 (Spring).

Byun, D. and Suh, E. 1994. *"A Builder's Introduction to Executive Information Systems."* **International Journal of Information Management,** 14:5, 357-368.

Fitzgerald, G. 1994. *"Outsourcing of IT in the United Kingdom: A Legitimate Strategic Option?"* **Proceedings: 5th Australasian Conference on Information Systems,** (eds.) Graeme Shanks and David Arnott. VIC.: Monash University Printing Services. 27-40.

Houdeshel, G. and Watson, H.J. 1987. *"The Management Information and Decision Support (MIDS) System at Lockheed-Georgia."* **Executive Information Systems: Emergence • Development • Impact,** (eds.) Watson, J. Hugh; Rainer, Kelly R.; Houdeshel, George. New York: John Wiley & Sons. 13-31.

Jirachiefpattana, W. 1996. **An Examination of Some Methodological Issues in Executive Information Systems Development in Australia and Thailand,** Unpublished Ph.D. Thesis. Department of Information Systems, Monash University, Melbourne, Australia.

Jirachiefpattana, W.; Arnott, D.R. and O'Donnell, P.A. 1996. *"Executive Information Systems Development in Thailand."* In P. Humphreys, L. Bannon, A. McCosh, P. Milgliarese & J-C. Pomerol (Eds.) **Implementing Systems for Supporting Management Decisions: Concepts, Methods, and Experiences.** London: Chapman & Hall. 203-224.

Jirachiefpattana, W. 1997. *"The Impact of Thai Culture on Executive Information Systems Development."* **International Journal of Computer and Engineering Management,** 5:2, 40-55.

Lacity, M. and Hirschheim R. 1993. **Information Systems Outsourcing.** Chichester: Wiley.

O'Donnell, P.A., Arnott, D.R. and Jirachiefpattana, W. 1996. *"A Case Study of EIS Development by An Experienced Developer."* In P. Humphreys, L. Bannon, A. McCosh, P. Milgliarese & J-C. Pomerol (Eds.) **Implementing Systems for Supporting Management Decisions: Concepts, Methods, and Experiences.** London: Chapman & Hall. 326-340.

Paller, A. and Laska, R. 1990. **The EIS Book: Information Systems for Top Managers.** Illinois: Dow Jones-Irwin.

Suvachittanont, W. Arnott, D.R. and O'Donnell, P.A. 1994. *"Adaptive Development in Executive Information Systems : A Manufacturing Case Study."* **Journal of Decision Systems,** 3:4

Watson, H.J. Rainer Jr., R.K. and Koh E. Chang 1991. *"Executive Information Systems: A Framework for Development and a Survey of Current Practices."* **MIS Quarterly,** 15:1, 13-30 (March).