

Executive information systems development in Thailand

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Abstract

This paper examines EIS development in Thailand. Thailand is a newly industrialised country, typical of other developing countries. First, the paper discusses the nature of the Thai economic and political systems. Four case studies are explored to examine how EIS are developed and to explore the influence of the economic and political environment on EIS development. Only one of the four systems examined can be considered an unqualified success. The factors behind EIS success and failure in a developing country are discussed. The paper concludes by suggesting that to develop an EIS successfully in a developing country an evolutionary approach with strong user participation should be followed. It is also suggested that outsourcing EIS development to foreign consultants is unlikely to be successful.

Keywords

Executive information systems, developing country, systems development, evolutionary development, outsourcing

1 INTRODUCTION

Executive information systems (EIS) are a class of information systems which support the work of senior management by providing effective access to timely internal and external information (Houdeshel and Watson 1987, Rockart and DeLong 1988, Wallis 1989, Armstrong 1990, O'Leary 1990, Paller and Laska 1990, Volonino 1992).

Most of the studies of EIS development and use have been of organisations in Western industrialised countries. Many developing countries are investing heavily in information technology. In particular, the newly industrialised countries of South-East Asia depend upon information technology to support rapid economic growth and their position in an extremely competitive commercial hemisphere. It follows that many large

organisations in developing countries will have implemented or are considering implementing EIS to support their senior executives. “Are these systems successful? Are they different to Western EIS? Are they developed differently?” are three fundamental questions that have not been addressed by previous studies but are the subject of this paper.

In this paper we describe EIS development in Thailand. Thailand has been used as a representative developing country for this study. Thailand has a population of 60 million with a per-capita income of \$US2040 compared to the USA with US\$24 750. Economic growth is around 8.5% per annum. First, we present the research method used in this study followed by a discussion of the nature of the Thai economic and political systems and summary descriptions of EIS in four large organisations. The EIS development processes are discussed in terms of political and economic pressures, development strategies, EIS teams and technical constraints. Finally, some general observations are made regarding EIS practice in developing countries.

2 RESEARCH METHOD

The research described in this paper is exploratory in nature and is aimed at discovering how EIS are developed in a developing country. A case study method was used for the project with the systems development process being the subject of study. A case study captures greater detail than a survey (Galliers 1992, Yin 1989) especially in terms of identifying the nature and important characteristics of the systems development process (Benbasat et al 1987). This approach is consistent with other studies of EIS development (Sundue 1986, Volonino, Robinson and Watson 1989, Armstrong 1990a and 1990b, Gunter and Frolick 1991, Moynihan 1993, Suvachittanont, Arnott and O’Donnell 1994, Pervan and Meneely 1995, Hasan and Gould 1995).

One of the researchers is a Thai national with many years industry experience in information technology. Personal contacts were used to identify Thai organisations that had implemented EIS for at least one year. Four organisations were identified and formal approaches were made to the chief executive officers; all agreed to take part in the research. The four cases are thought to be representative of EIS in Thailand especially given the early stage of information technology adoption in the country. The Thai researcher performed field data collection during January and February 1995.

Different questionnaires were developed for EIS developers, the EIS co-ordinator and executive users. The questionnaire for each group was distributed to the subjects by the EIS co-ordinator. The co-ordinator determined which executive users would receive the questionnaires. The executive users were asked about the success of the EIS, while the developers were questioned about the development process. The questions for the co-ordinator 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 co-ordinator was also a developer.

The questionnaires were left with the organisations for a week. Once returned the responses were analysed and detailed follow-up questions were prepared. These questions were answered in structured interviews that ranged in length one to two hours. Two organisations did not return the questionnaires by the due date and the respondents were personally interviewed using the questions presented in the questionnaires. Follow-up questions were also asked. Published information about the organisations (eg annual reports) and system documentation was also consulted. Similar methods have been used

to study EIS development in Western organisations (Suvachittanont, Arnott and O'Donnell 1994).

One aspect of the research that is different to Western studies is the reluctance of executive users to answer questions that relate to the impact of the systems on organisations and individuals. Only two executives (from different organisations) answered these questions, despite each CEO having agreed to take part in the research. This may reflect a Thai cultural bias where managers, no matter how senior, are uncomfortable with criticising the initiatives of their organisations. 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 THE ECONOMIC AND POLITICAL ENVIRONMENT

This section provides an overview of Thai economics and politics as well as a description of the industry environment of the organisations that provide the case studies.

3.1 Thai economics and politics

Porter (1990) argues that government influences many, perhaps all, aspects of a nation's industry structure. The most direct affects are the development and enforcement of regulations for entry to the industry, competitive practices, and profitability. Regulations of product quality and safety, and environment quality are less direct forms of a government's influence. Government regulations can influence the behaviour of firms as suppliers or buyers, and can also affect the position of a company in an industry. The industry environment can have a major influence on the nature of information systems that are developed to support senior executives.

The Thai economy is perhaps more influenced by politics than those in the West. Political leaders must be accepted by the military; indeed, most political leaders are senior military officers. If politicians' policies and actions strongly conflict with the Thai military, they are usually removed from office. In the 1991 military coup, the coup leaders, Generals Kraprayoon and Kongsompong asserted that the reason for their action was the corruption of the Chatichai government. Others have argued that the real reason was that the Chatichai government had excluded the top military leaders from the benefits of economic growth (Warr 1993). Although there have been elected governments in Thai history, none have survived for a full term. In addition to direct military intervention this instability is due to the inability of any political party to command a majority of seats in the Thai Representative Parliament and successive governments have been unable to balance the interests of the coalition parties. The collapse of the Chuan government is a recent example.

Regardless of the reason for political change (military coup or election) government policy can change rapidly. Thai business analysts attempt to anticipate the economic future by analysing the background and affiliation of members of the new cabinet. Government administration tends to favour firms which support the coalition parties or firms in which leaders of the government parties are involved. In Porter's terms (1990), this is the most direct political influence on the economy possible.

Thai government industry policy is implemented through the Board of Investment which uses a combination of investment promotion schemes, tariff and tax policies, and trade and price controls to direct the pattern of private investment. The trade regime in Thailand also includes a number of restrictive measures, for instance, quantitative import and export controls (Warr 1993). These government intervention and protection policies may change radically with a change in government.

Throughout Thai history, economic activity has been dominated by the Royal Family and other wealthy families. In the past, commerce was considered a low status occupation in Thailand. As a result many commercial activities were conducted by Chinese immigrants. Today, many companies are operated by people of Chinese descent. It is common for Chinese companies to invite members of the Royal Family and other wealthy families, politicians and the military to be on their board of directors. The political power of these non-executive directors acts to provide privilege and protection for these companies. In turn, the Chinese businesses provide politicians with the funds to win elections in an environment where extensive vote-buying exists (Loathamatas 1994).

3.2 Commercial banking in Thailand

Many Thai commercial banks are owned by Chinese-Thai who belong to the same dialect group (Chaiyasoot 1993). The Sophonpanich family is the largest shareholder in the Bangkok Bank, while the Lamsam and Ratanarak families control the Thai Farmers Bank and the Bank of Ayudhya, respectively. Among the 16 commercial banks incorporated in Thailand, the government is a major shareholder of the Krung Thai Bank and the Siam Bank, while the largest share of the Siam Commercial Bank, the first bank established in Thailand, is owned by the Royal Family. This concentration of bank ownership is uncommon or illegal in Western countries.

To reduce the concentration of ownership in the banking industry, the Thai monetary authorities adopted policies to encourage the entry of more finance companies and introduced capital divestiture requirements for existing shareholders. The first policy failed because Thai banks were the major shareholders of many of the new finance companies; nine of ten largest finance companies are associated with the four major banking groups and the Siam Commercial Bank. The second policy also did not achieve its goals. There are now more individual shareholders but the patterns of control within each bank have not substantially changed. Small shareholders have been unable to unify in order to exert influence on the company and large shareholders have used other people and related companies to buy new shares.

Although Thai bankers dictate the cost and the allocation of domestic credit, the government does influence the operation of the banks through the regulations of the Bank of Thailand, the central bank. The main features of these regulations include the specification of interest rate ceilings for loans and deposits, control of new entry, agricultural credit policy, compulsory bond holding for branch expansion, and specification of minimum capital funds to risky assets ratio. These measures are designed to prevent excessive expansion of credit and to ensure that the banking system is reliable. They are similar to Western central banking practices.

3.3 State enterprises

State enterprises are involved in many areas of business including infrastructure, manufacturing, transport, tourism, services, trade and finance. Most state enterprises are monopolies. These state enterprises are the major sources of income for many military officials and civilian politicians. The management of a state enterprise comes under the authority of a parent ministry and according to state enterprise regulations, only the supervising minister, with the approval of the cabinet, can appoint the state enterprise's chairman, CEO and deputies. The appointment of a CEO to a state enterprise by the supervising ministry is often decided on the basis of requests and pressure from politicians and the military and most appointees are former bureaucrats and military officers. As a result, they lack the background needed to manage an efficient commercial business (Dhiratayakinant 1993). This system of patronage means that the political parties strongly influence economic decision making through their indirect control of state enterprises.

State enterprise management lack flexibility and autonomy in developing strategic and operational plans. State enterprises are responsible not only to their supervising ministries, but also to a number of boards and committees. If a state enterprise develops new projects, they must be reviewed by the National Economic and Social Development Board (NESDB). Capital budgets and annual investment plans are screened by the Capital Budget Committee, while the National Debt Policy Committee reviews all investment projects which require loan financing. Any significant changes to the mission and operation of a state enterprise must be approved by the National State Enterprise Committee. All subsidy requests made by state enterprises are reviewed by the Budget Bureau and their annual operating reports must be submitted for examination. The Auditor General's Office audits the financial statements of the enterprises. Standard methods and procedures of accounting are set up by the Comptroller General's Office principally to supervise the legality of expenditure disbursement. The recommendations of these regulatory organisations are finally decided on by the Cabinet, which may overrule any lower decision (Dhiratayakinant 1993).

In summary, the Thai political system is extremely volatile as compared to most Western democracies. Further, Thai governments are more interventionist with respect to the economy than in the West and many senior managerial positions change frequently in response to changes in government. As a result of these political and economic forces the organisational environment of EIS development is also volatile. To the extent that Thailand is representative of developing countries it follows *ceteris paribus* that the development of EIS in a developing country is likely to be significantly more difficult than in an industrialised country.

4 THE CASES

In this section, the general background of each case is described, together with an overview of each EIS. Table 1 illustrates the characteristics of these organisations and their systems. The organisations are all large by international standards. All have successfully computerised their operational data processing systems. They have used a variety of development approaches for their EIS and the systems vary widely in terms of success.

Case 1: The Transportation Company

The “Transportation Company” is a state enterprise which employs almost 20 000 staff. In its 1994 annual report, profits before tax were US\$168.49 million. Its stated strategies for maintaining its market share and profitability are total quality, cost advantage and external competence. The Transportation Company aims to support these strategies with motivated and unified staff, financial strength, strong information systems and a simplified fleet.

Developing an EIS was part of the overall Management Information Systems Plan. The objective of the EIS is to provide top executives with rich management information to monitor organisational activities, and to provide support for planning and decision making. The EIS project was initiated by the President of the company in January 1994 immediately after he was appointed. The non-information system executive sponsors were the Vice President of Corporate Planning and the Vice President of Accounting.

The EIS development commenced without formal cost-benefit analysis and was approved by the Executive Management Committee. The initial cost of hardware, software and personnel in the EIS development were US\$130 370, \$92 592 and \$74 074 respectively. The company spends around US\$74 000 annually for maintenance and operation of the system. The technical environment is client/server in nature with Pilot’s Lightship as the main software.

Currently, the implemented EIS is the first production version and covers production, finance and accounting, marketing, and human resources. Its general features include key indicator tracking, exception reporting and drill down. The information is presented in tabular, graphic, and text formats on request. The EIS also provides personal tools to support executive work including e-mail, diary, calculator, and staff directory. The first version was delivered within 12 months and comprised 181 screens. Fifteen senior executives, including the CEO, were the initial users. The EIS is considered successful by both developers and users.

Case 2: Bank A

“Bank A” is a major commercial bank with 12,000 employees and significant state shareholding. Net profit was US\$119 million for the first half of 1994. The bank has 331 branches in Thailand and 6 branches abroad. The Bank aims to expand its branch network, both within Thailand and throughout the Asian region.

The EIS project was initiated by the President and Chief Executive Officer in 1992. Instead of receiving hard copy management reports, he wanted an interactive system which could provide both an overview of the bank and detailed information about the performance of the branches. The executive sponsor was the Executive Vice President, Technology Group. The EIS project was approved by the Board of Directors. No formal

Table 1 An overview of the systems

<i>Issues</i>	<i>Case 1 Transport -ation Company</i>	<i>Case 2 Bank A</i>	<i>Case 3 Bank B</i>	<i>Case 4 Energy Company</i>
<i>Characteristics of the organisation</i>				
Strong international focus	4	6	6	6
State enterprise	4	6	6	4
Controlled by one family	6	4	4	6
<i>Initiation of the EIS</i>				
Year	1994	1992	1991	1986
Initiated by top management	4	4	4	6
Sponsored by top management	4	4	4	4
Sponsor involved in systems development	6	6	6	6
Development time took more than 6 months	4	4	4	4
Cost-benefit analysis before development	6	6	6	6
# of initial executive users	15	18	15	16
# of screens of the initial system	181	10	60	12
# of current executive users	15	18	15	16
# of screens of the current system	181	80	60	20
<i>Technical features of the EIS</i>				
E-mail	4	4	4	4
News service	4	6	6	4
Word processing	6	6	4	4
Electronic calendars	4	6	4	4
Key indicators tracking	4	6	4	6
Drill down	4	6	4	4
Exception reporting	4	4	4	4
Graphical presentation	4	4	4	4
Tabular presentation	4	4	4	4
Textual presentation	4	4	4	4
Colour presentation	4	6	4	4
External data accessibility	4	4	4	4
Easy to learn and use	4	46	4	4
<i>Applications Supported</i>				
Marketing	4	4	4	4
Finance	4	4	4	4
Manufacturing	4			4
Personnel	4	4	4	4
Distribution	4			4
Corporate planning	4			

cost-benefit analysis was performed.

The EIS was developed on an existing IBM mainframe and personal computer network using the Personnel Assistance Systems (PAS) software package and general purpose software such as COBOL. Existing hardware and software was used because the developers were both comfortable and experienced in the use of the technology. The first EIS application, finance, was delivered within eight months and was based on existing reports; it comprised 10 screens. The initial users were three Senior Vice Presidents. The number of screens and executive users has increased to 80 and 18, respectively. The completed system provides support for finance, personnel and marketing.

The design of the personnel and other EIS applications are totally different. The personnel application was developed on a personal computer using the PAS software package. This allowed the analyst/programmers to develop "user friendly" interfaces. The other applications were written in COBOL and have a non-graphical interface.

Bank A's EIS project can be regarded as relatively unsuccessful. The poor user interface of most applications has led to a low usage rate among executives. The system has not been updated due to internal regulatory constraints and an inflexible technical architecture.

Case 3: Bank B

The third case, "Bank B" is a leading commercial bank in the South East Asian region. The bank employs 25,000 employees and according to its 1993 annual report, profit after tax was US\$556 million. The Bank operates 427 branches: 407 domestic and 20 foreign. The board and senior management of the bank is dominated by one family. Prior to the development of the EIS, Bank B had attempted to use information technology to support management. This proto-EIS involved the creation and transmission of daily trial balance sheets to Head Office, in order to provide both operational units and senior management with detailed accounting information and the overall status of all branches on the next working day.

The EIS development project commenced in September 1991 under the sponsorship of a Senior Vice Executive President. The aim of the EIS was to provide information to top executives to help them make better and faster decisions. Moreover, the Bank also wished to provide a continuity of information during the transition to a new management team. The project proceeded without cost-benefit analysis and the approximate initial cost of hardware, software and personnel was US\$300 000, \$100 000 and \$200 000, respectively. Annually, the Bank spends about US\$60 000 for maintenance and operation of the system. The technical environment was client/server with high-end Apple Macintosh computers used as the executive workstations. The data-base product 4th Dimension was the primary development tool.

The first EIS was delivered after 12 months and comprised 60 screens. The current EIS supports 15 senior executives and their staff and covers the marketing, finance and personnel areas. The system comprises three main functions: executive summary reports, business performance analysis, and support tools. The information is presented in tables, graphics, and text. Colour is used to highlight information and to produce attractive screens.

The EIS of Bank B 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.

Case 4: The Energy Company

The final case, the "Energy Company" is a state enterprise whose mission is to create a fully integrated business to support the energy, and therefore economic, stability of the country. The main business units are downstream oil, natural gas, central services and petrochemical. In 1993 the organisation generated a net profit of US\$309 million on income of \$3.43 billion.

The Energy Company's EIS has evolved to its third version. The first version was created in 1986 on the initiative of the Head of Information Systems Department at Head Office. He hoped that senior executives could receive information faster if management reports were provided electronically. His concept was approved by senior management. The Head of Information Systems also acted as the project manager while the Deputy Governor, Policy and Planning was the executive sponsor. The first version comprised 12 screens and was used by 16 senior executives. It was developed on networked personal computers using the C language.

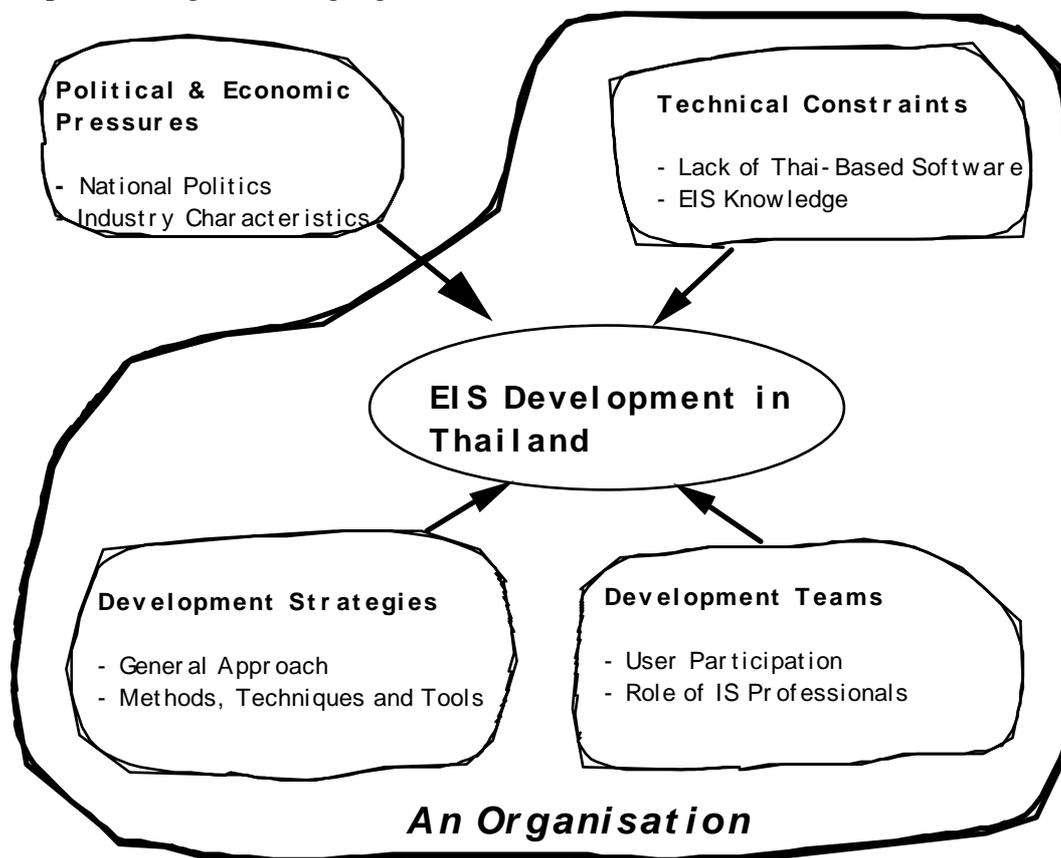


Figure 1 Major factors affecting EIS development in Thailand

The second version of the EIS commenced in 1990 due to significant changes in the business of the corporation. This version was not based on the first EIS; it was a new development using a client/server architecture, programmed in Visual Basic and a relational database management system, INGRES. Currently, 16 executives use the second version of the EIS while the third version is being developed.

The current, second version of the EIS has two major modules: applications and office automation. The EIS provides information related to the petroleum business, personnel, subsidiaries and joint ventures. It covers the marketing, finance, manufacturing, personnel and distribution departments. Management information is presented as exception reports in the forms of text, graphs and tables. These reports were designed by the staff of the IS Department and they are not customisable. When they want to retrieve information, executives click the icon which represents the required report. The other module of the system, office automation, includes word processing, e-mail, and electronic scheduling.

This EIS can be regarded as a qualified success. The third version of the system is under-development and the previous versions have been used by executives and their staff. There is some anecdotal evidence that the project has been dominated by the information systems department and that the system requirements and designs have not been determined or confirmed by the executive users.

5 FACTORS IN EIS DEVELOPMENT

Figure 1 illustrates some of the major factors involved in EIS development in Thailand. These factors are grouped into four broad classes: political and economic pressures, constraints, development strategies, and development teams. The following sections discuss these factors in detail.

5.1 Political and economic pressures

As outlined in Section 3, the Thai political environment is much more volatile than in most Western countries. Also mentioned in Section 3 are the processes whereby the Thai Government intervenes and influences commerce to a much greater extent than in industrialised countries. The combination of a volatile political system and greater direct influence on industry means that the environment for EIS development is much more uncertain and complex than is assumed in most EIS research. One result of this development environment is that Thai executives strongly focus on very short term planning.

Senior executives of private corporations pay close attention to any kind of formal and informal information delivered from the Cabinet or Government agencies. The greater the rate of political change, the greater is the need for anecdotal information by Thai executives. It is difficult for EIS to serve this need. Where data is available the monitoring functions of EIS are particularly relevant. A similar focus exists in state enterprises. The political environment affects state enterprises to a much greater extent than private corporations. The tight controls on management and operations and the frequent change of Board membership, as well as CEOs and other senior executive appointments means that EIS development is even more uncertain. EIS for Thai state enterprises need to address frequent changes of user population and frequent changes in policy direction.

5.2 System development strategies

The four Thai cases exhibit major differences in the approaches adopted for the development of EIS. Table 2 compares these differences in the categories of requirements elicitation, analysis and design techniques, and development tools. Three distinct development approaches were used: evolutionary, traditional or linear systems development life cycle (SDLC) and outsourcing. The use of systems analysis techniques and the selection of hardware and software was strongly influenced by the development approach. The organisation which used the traditional SDLC approach applied large scale information systems methods and tools while the one which employed the evolutionary approach used methods and tools common to Western EIS cases. Two cases used outsourcing to some degree; the methods and tools which they used varied according to which vendors were used and which parts of the development process were outsourced.

5.2.1 *Evolutionary development*

The Transportation Company is the only case which clearly applied an evolutionary approach to EIS development (Suvachittanont, Arnott and O'Donnell 1994). By using this approach, the EIS development team started with a small system which offered enough substantial information to gain top executives' attention. This initial system involved management information about traffic, production, finance, marketing, competitive position and customer service quality. It was also a vehicle for EIS developers to understand the way that the executives managed the business. At the same time the executives learnt about the nature and possibilities of EIS. Meanwhile, the team continued the development of applications for every management information group including operations and performance, technical, human resources and corporate overview.

The development process of this company involved the iterative non-linear performance of the following processes: planning and research, requirements analysis and logical design, physical design, construction and testing, implementation, and maintenance. Planning and research involved the identification of organisational mission and objectives and the assessment of executive needs. The second phase involved requirements analysis and logical design, including the specification of critical success factors (CSF), key performance indicators (KPI), required management information and information presentation standards. The availability of hardware and software was assessed, and the resources required for the project were proposed, approved and acquired. Technical staff were trained to use new EIS software especially in relation to the multi dimensional database concept. After design standards were developed, databases and screens were designed. Finally, construction, testing, implementation and maintenance took place.

Table 2 Comparison of EIS development

<i>Features</i>	<i>Case 1 Transportation Company</i>	<i>Case 2 Bank A</i>	<i>Case 3 Bank B</i>	<i>Case 4 Energy Company</i>
Development approach	Evolution	SDLC	Outsourcing	Outsourcing
Hardware platform	LAN-PC- Mainframe	LAN-PC- Mainframe	LAN-PC- Mainframe	LAN-PC
<i>Requirements identification methods</i>				
Critical Success Factors /KPI	4	4	4	4
Strategic Business Functions	4	6	6	6
Synthesising from the existing systems/reports	4	4	4	4
Discussion with support personnel	4	4	4	4
Interview with executives	4	6	4	4
Informal discussion with executives	4	6	4	6
Examination of strategic plan	4	6	6	6
Consultation	4	6	4	6
Prototyping	4	6	4	6
Questionnaire	4	6	6	4
Matrix and affinity analysis	4	6	6	6
Brian storming (Group discussion)	4	4	4	4
<i>Analysis & design techniques</i>				
Data dictionary	4	6	6	6
Normalisation	6	4	4	4
Modular design	4	4	4	4
Structured flow chart	6	4	4	4
Structured walkthrough	4	4	4	4
Structured English	6	4	4	4
Pseudocode	6	6	4	4
Decision trees	6	4	6	4
Data flow diagrams	6	4	4	4
Functional decomposition	4	6	6	6
Rapid application development	4	6	6	6
<i>Tools</i>				
EIS software	Lightship	6	6	6
Image capture and scanning	4	4	4	6
Disk backup and recovery	4	4	4	
DBMS	Lightship	DB2	Sybase	INGRES
4GL	dBase, Excel	PAS	4th- Dimension	Super- NOVA, Lotus, Excel
Desktop publishing	6	6	4	6
Query languages	Focus	SQL		MS Access
Traditional programming languages	COBOL, PL1	COBOL		C Language
<i>Other</i>				
One-to-one training	4	4	4	4
Training material	4	4	4	4

The operation or application of these phases was not isolated. Phases overlapped in time and where conducted in different sequences. For some tasks the development phases were repeated several times and the cycles only slowed when the task was relatively well understood. The major forces behind the general iterative process were the difficulty of identifying the requirements of executives and a lack of knowledge about this relatively new information technology. Put simply, the users could not articulate what they wanted and the systems analysts were uncertain about how to proceed.

Several existing methods, techniques and tools were used to help the EIS developers elicit executive requirements and create a working system. The requirement identification methods included critical success factors (CSF), strategic business functions (SBF), synthesis from existing systems, discussion with support personnel, informal discussion and interviews with executives, prototyping, examination of the strategic plan, and consultation with an EIS expert from the United Kingdom. Other development techniques included functional decomposition, modular design, structured walkthroughs, matrix analysis and rapid application development.

The development tools used were the EIS package Lightship from Pilot Inc, image capturing and scanning and in-house software, such as COBOL, PL1, FOCUS and Lotus 1-2-3. While Lightship was used for presenting information to executive users and managing the EIS database, in-house software was used for capturing data from the corporate database, converting it into text files and then transferring it to the Lightship Server. External data was also keyed into the EIS via a simple data entry system developed using in-house software.

5.2.2. A traditional information systems approach

Bank A employed a traditional waterfall development approach to direct and manage the EIS development project. The development process involved a largely linear execution of requirements analysis, system development, user acceptance, system installation, use and maintenance. Requirements analysis was conducted with each executive's support personnel. An initial definition was provided in written form. The systems analysts reviewed these reports and sought clarification in interviews with the support staff. They identified the possible sources of the required information. The system analysts also examined the existing key performance indicators and management reports. They proposed additional or alternative reports which they thought would be of interest to the executives.

Following requirements definition, the database was designed and created and application programs coded and tested. The developers used a variety of techniques including normalisation, modular design, structured flow charts, structured walkthroughs, structured English, data flow diagrams and decision trees. The EIS was implemented using image scanning, DB2, SQL, COBOL, and IBM programming languages.

When system construction was completed, it was demonstrated to the executive users. The system was refined after comments from the executives particularly regarding the user interface. The system was tested by internal auditors before release to the users in order to ensure the system worked properly and was secure.

5.2.3 Outsourcing

Lacity and Hirschhiem (1993) define information systems outsourcing as applying to a wide range of contractual arrangements from contract programmers to third party facilities management. They argue that the three most meaningful classification of these

contracts are: body shop, project management and total outsourcing. Body shop is the use of contract programmers/personnel who are managed by company employees. Project management is outsourcing for a specific project or portion of the information development work while total outsourcing is the total provision by a vendor of a significant information system. Fitzgerald (1994) further categorised the reasons for outsourcing by an organisation under three broad factors: technical, financial, and strategic and organisational. The development of EIS in Bank B and the Energy Company were to some extent outsourced. However the activities that were outsourced and the rationale behind the adoption of outsourcing differ between the two cases.

In case of the Bank B, a major US-based consulting company was contracted to provide requirements identification, general system design, system architecture design and construction by working closely with the internal project manager and business system analysts of the Bank. This is close to total outsourcing according to Lacity and Hirschheim. The formal reason for employing the consultant was that the internal staff lacked experience in the conceptual design of data presentation for executives. Even though the Bank has strongly invested in information technology, the installed systems are focused on the operational services rather than management support. It is surprising that such a large bank by world standards did not recruit staff with management support skills. Two programmers from the Bank's IS department were involved in the construction phase under the supervision of the consultant. We believe that internal political conflict rather than professional inexperience was the major reason for the outsourcing of this particular EIS development.

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. The process of the initial EIS development life cycle covered planning, business requirements definition, prototyping and system development, system installation, and maintenance.

The planning phase involved hardware and software selection, preliminary business requirements review and project organisation. During requirements identification, the EIS team examined existing reports, talked with support personnel, and interviewed the senior executives. KPI were identified and a prototype was developed. This prototype was reviewed by management. Further modules were audited by the auditor of the Bank before delivery to the executive users. The techniques used in systems development included data modelling, normalisation, structured flow charts, modular design, pseudocode, structured testing and walkthroughs. The 4th Dimension package was the major software tool used to develop applications and user interfaces. Once the system was installed, one-to-one training was conducted. A "quick reference" brochure was produced.

In the Energy Company, outsourcing is the standard development policy of the Information Systems Department. The department believes that this is the way to increase its productivity with limited personnel. Rather than allocating all to one development project, the department can allocate professional IS staff to manage and co-ordinate several projects with different vendors. However, the department requires that requirements analysis, and the specification of input, process and output formats are the responsibility of its own staff. This is "bodyshop" outsourcing for strategic reasons.

The EIS development approach of the Energy Company is best classified as waterfall development rather than evolutionary even though the EIS is approaching its third

version. Each version has been a completely different system with different technical and application environments. Development followed the stages of requirements analysis and design, physical system development, system testing, system installation, training, and system evaluation. The internal IS staff prepared the formal requirements and design specification and database design and construction were performed by a contractor. In requirement and design specification, system flow charts and data flow diagrams were used to improve the understanding of the consultant about the organisation and data flows. Questionnaires and interviews were used to identify executive's requirements. However, the IS staff were not able to access all the executives. The Head of the IS Department reported that "the executives could not sacrifice their time". As a result the requirements specification was prepared from an IS rather than an executive's perspective.

In addition to data flow diagrams and system flow charts, modular design, normalisation, structured walkthroughs were cited as useful techniques. BASIC, Microsoft Windows, C, Lotus 1-2-3, Microsoft Excel and Microsoft Access were used to develop the applications. To maintain the EIS database, IS staff gather data from business units, enter it to Lotus 1-2-3 or Microsoft Excel on a diskette, and use the diskette to update the data stored in the executive LAN. This process was not automated as only consolidated data was required and the hardware platform of each business unit differs from the one provided to executives. After the contractor delivered the system, the IS staff tested every screen using walkthroughs. To train the executives, a one-to-one training strategy was used where two IS staff were assigned to explain how to operate the system when the executives requested. An summary document of the user manual provided by the contractor was prepared. When the system was used for six months, system evaluation via a was conducted in order to get feedback and problems.

The experiences of these organisations calls into question the use of outsourcing for EIS development. EIS, especially in a developing country, need frequent revision to accommodate changes in the organisation's environment and the wishes of individual executives. In both cases, system evolution has been seriously constrained by the absence of the primary developer after initial development. In both cases there has been no transfer of skills and knowledge to the host organisation. For outsourcing to be effective for EIS we hypothesise that client IS personnel must be trained and motivated to provide on-going support and system development.

5.3 Technical constraints

5.3.1 Lack of Thai language software

Unlike other South East Asian countries such as Malaysia, Singapore and Hong Kong, which use English as an official language, Thai is the only official language in Thailand. Only highly educated Thais read and understand the English. Virtually all corporate and government data is kept in Thai text. The only exceptions are data collected for international organisations (eg UN) and where a company has a significant foreign shareholding or performs most of its work outside Thailand. The Transportation Company is the only such organisation in this study.

This dependence on the Thai language could be a major obstacle for EIS development as all major computer software is English-based. If an EIS software vendor wants to promote its product in Thailand, it must modify the software to manage the Thai language data. Not many companies have developed Thai versions because of

complicated structure of the language, the cost of development relative to the market size and until recently the lack of any intellectual property law. At present most EIS data must be translated from Thai to English on input and English to Thai on output. This can reduce the currency of information; it definitely adds to costs and could be the reason that some organisations in this study used non-EIS specific software which was able to manage Thai characters and grammar.

By using non-EIS specific software Thai organisations lose the major benefit of EIS software, the ability to create multi-dimensional data bases that more accurately reflect the structure of the organisation than a relational data-base. The ability to quickly consolidate data across time periods, business units and other data categories and to “drill down” through a data aggregation hierarchy are perhaps EIS’s greatest contribution to information systems practice. The use of conventional software for language reasons means that Thai organisations cannot exploit these processing features.

5.3.2 EIS development knowledge

EIS is a relatively new information technology for Thailand. Few IS professionals understand the concept and there is a lack of experience in developing such systems. Most senior management lack IT knowledge and are not as aware of EIS as their Western counterparts. The EIS team of the Transportation Company addressed executive EIS knowledge by asking vendors to demonstrate a prototype of a mini-specification and informed the executives that their system could look similar to this prototype. This gave the executives a clear idea of the potential of EIS.

Many Thai IS professionals are also unaware of EIS theory and practice, especially client focused evolutionary development. Bank A and the Energy Company used traditional large-scale methods of IS development. However, in the Transportation Company the EIS developers understood that EIS is an evolutionary system and they improved their knowledge about EIS by studying international research. Additionally, the Transportation Company allowed the team to consult an international expert who had experience in developing EIS in the same industry.

5.4 Development teams

The structure of EIS teams in Thai organisations is very different to that reported in Western studies (Rockart and DeLong 1988, Armstrong 1990, Watson *et. al* 1990, Barrow 1988, Paller *et. al* 1990). Whereas Western EIS teams are responsible for the actual development of the system and often include users and IS professionals, in the Thai cases the teams acted more like steering committees and the actual developers were removed from their user constituency. This may account for the (reported) strong technical focus of EIS development.

Table 3 presents the organisation of the formal EIS team of the four cases. With the exception of the Energy Company, technical staff were excluded from formal membership of the team. These technical staff (programmers, system analysts, and technical support staff) were assigned to working groups under the supervision of members of the EIS development team.

The EIS project of the Transportation Company was announced as a major policy by the President and he personally appointed the members of the EIS team. The team reported progress of the project to the President and Executive Management Committee.

This EIS team incorporated a project manager, a group of IS managers and a group of functional managers. The project manager was the Deputy Vice President of Corporate Planning, a very senior appointment for an EIS project. The functional group involved managers of the Finance and Accounting Information Services Department, and the Revenue Analysis Department. These managers normally provide statistical data, including some external data, to top management and directors every month. The IS group included the Deputy Director of Data Services and managers of Information Systems Development, and Information Systems Planning. This group was responsible but not personally involved in technical development having several technical working groups to perform the actual system development.

The organisation of the EIS team of the Bank A indicates that the Technology Group dominated the project. Even though its team structure was similar to the Transportation

Table 3 Organisation of EIS team

<i>Characteristics</i>	<i>Case 1 Transportation Company</i>	<i>Case 2 Bank A</i>	<i>Case 3 Bank B</i>	<i>Case 4 Energy Company</i>
Number of key members	• 6	• 4	• 5	• 3
Team leader (skills)	• Deputy Vice President of Corporate Planning (Corporate vision and objectives)	• Chief of Business Information Services (Correctness and completeness of information)	• Vice President of office of president (MIS and MBA)	• Head of IS Department (Computer and management)
Other members (skills)	• Deputy Director of Data Services • Mgr of the Dpt. of IS Devel. • Mgr of the Dpt. of IS Planning (Analysis of mgt. info.; Facilitation skills; Hardware & software evaluation; System analysis, design & devel.) • Mgr of the Dpt. of Revenue Analysis (Mgt. info. analysis & research) • Mgr of the Dpt. of Finance & Accounting Info. Services (Mgt. Info. Services)	• Chief of the Corporate Business IS Section (System construction) • Vice President of Research & Planning Dpt. (Data provider) • Vice President of Accounts Dpt. (Data provider)	• Vice President of Accounting and Costing Dpt. (Business Analysts) • Vice President of Operation and Planning Dpt. (Business Analysts) • 2 External consultants (MIS design; Technical architecture)	• Systems Analyst (System analysis and info. providers) • Contractor (System development)

Company, the project manager held a much lower position. The project manager was the Chief of Business Information Services which is a section of Retail Banking Information Systems Department while other two members were Vice President of Accounts Department, and Vice President of Research and Planning Department. Interestingly, the project manager was much more junior than the other members of his own team.

The EIS team of the Energy Company consisted only of Head Office IS staff. There were no users involved in this level of the project. This is because the Head of the IS Department believed that he knew what information executive needed. He related "if any one wants to know what the requirements of executives are, I can identify. It is unnecessary to interview executives; just ask me" (*sic*). Because of the outsourcing strategy used the EIS has not been able to evolve to meet executive requirements and executive have no voice on the EIS team.

Although the EIS team of Bank B involved three Vice Presidents and two international consultants, the evolution of its EIS has also been constrained. The foreign project manager resigned after the initial EIS was installed. As the IS Department was not involved in the project they are both unable and not motivated to provide ongoing support. Staff have been made available to maintain the data in the system. However, no one is actually responsible for the ongoing development of the project.

The nature of the Thai EIS teams may be responsible for some of the differences in development patterns to Western EIS that have been observed in this study. In particular there appears to be a separation of the EIS "team" from actual development. User participation seems largely confined to steering committee meetings. Thai executives play a passive role in ongoing system development.

6 CONCLUDING COMMENTS

This paper has examined the development of four EIS in Thailand. The Transportation Company's system can be regarded as a success; the Energy Company, a qualified success; Bank A, relatively unsuccessful and Bank B, a failure. To the extent that Thailand is representative of developing countries and the cases are representative of large organisations in such countries some general observations on the nature of EIS development in developing countries can be made.

EIS development is likely to be more difficult in a developing country than in the West. The relatively volatile political environment and a greater degree of both direct and indirect government intervention in the economy act together to produce an extremely difficult systems development environment. Systems are likely to require fundamental revision more frequently than in the West. System development methods must be able to cope with rapid evolution at both the applications level and of functionality within applications.

In this study only one organisation used an evolutionary development approach that is favoured by Western organisations. It was also the most successful. In such a volatile environment we suggest that traditional operational development approaches are not relevant. Further, they are antithetic to system success and the standing of IT within the organisation. The first step in transferring EIS technology to organisations in developing countries should be an education program for both IS professionals and management.

A special concern raised by this study is the relative failure of two outsourcing strategies to deliver successful systems. In both cases the provider was a foreign

consulting firm. These consultants did little to adapt their practice to the customs and management processes of the client organisations. We believe that the system would have been more successful if a transfer of skill had been part of the contract as once the initial system was developed the local IS personnel were unable to further develop or maintain the system.

Another problem for EIS development in developing countries is the tendency for the project to be driven by the IS department with relatively low level of user participation in design and development. The initial education program recommended above may help overcome this problem. However, if the local culture of management means that involvement in system development is “beneath” a manager then EIS may not be an effective information technology for that organisation. Further, if language and other constraints mean that EIS-specific software cannot be used then many of the potential benefits of EIS may not be realised.

If the above mentioned problems with EIS development cannot be overcome for a particular implementation then we see little benefit in pursuing the development. The results of this study should enable this decision to be made early in the life of the project. 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 merit. 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 to transfer to developing countries especially in terms of staff training. DSS is a much cheaper and less risky management support strategy than EIS. It may also be more successful.

Despite the problems identified in some of the cases in this study it is possible to develop effective EIS in large organisations in developing countries. The prescription is clear and similar to early cases in the West. Organisations in developing countries should be able to benefit from Western experience of failure and success. An EIS is likely to be more successful if an evolutionary development approach is used. Systems are subject to great change than in the West and the design should cater for this volatility. Users should be genuinely involved in development especially in requirements specification. Development should be performed by local information systems professionals who understand the local management culture and customs.

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8 BIOGRAPHY

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