

CHAPTER 3

THE DEVELOPMENT AND THE APPLICATION OF THE SYSTEM TO THE CASE COMPANY

3.1 The Development of the Software

This chapter is to develop a software for strategic information systems planning of an executive support system (ESS) to guide the executives of small enterprise in developing a strategic plan for using information systems within their business. The application of this software to the subject company is used to illustrate the ESS process.

3.1.1 The Requirements of the ESS

The development of the ESS begins by interviewing with the owners of the company about the requirements for the software to help identify strategic information systems for the company. The interviewing sessions were conducted only with the sales manager of the company due to unavailability of others. The content of interviewing include the nature of the new company, the industry environment, and the role of IS in the industry. Then the manager was asked for the requirements of the software designed specifically for SIS development. After several interviews and discussion with the manager of the company, the requirements for the ESS can be extracted as follows:

- ◆ Easy to use and understand.
- ◆ Include using instructions in each stage.
- ◆ Include the development of the business strategy.
- ◆ Able to help generating ideas and strategic thinking from the given information.
- ◆ Include examples of ideas and results.
- ◆ Able to be operated by software or program pre-installed on regular personal computers.
- ◆ Able to be used by multiple users simultaneously.
- ◆ Able to deliver IS required to create competitive advantage for the company.

The design of the conceptual model was therefore developed correspondingly with these requirements and the concept of the strategic information systems planning. After the sales manager approved the model, it was translated using analysis tools, frameworks, explanations and tables to convey its meanings. The results are therefore the content of the software being developed in the next sections.

3.1.2 The Conceptual Model for an Executive Support System (ESS)

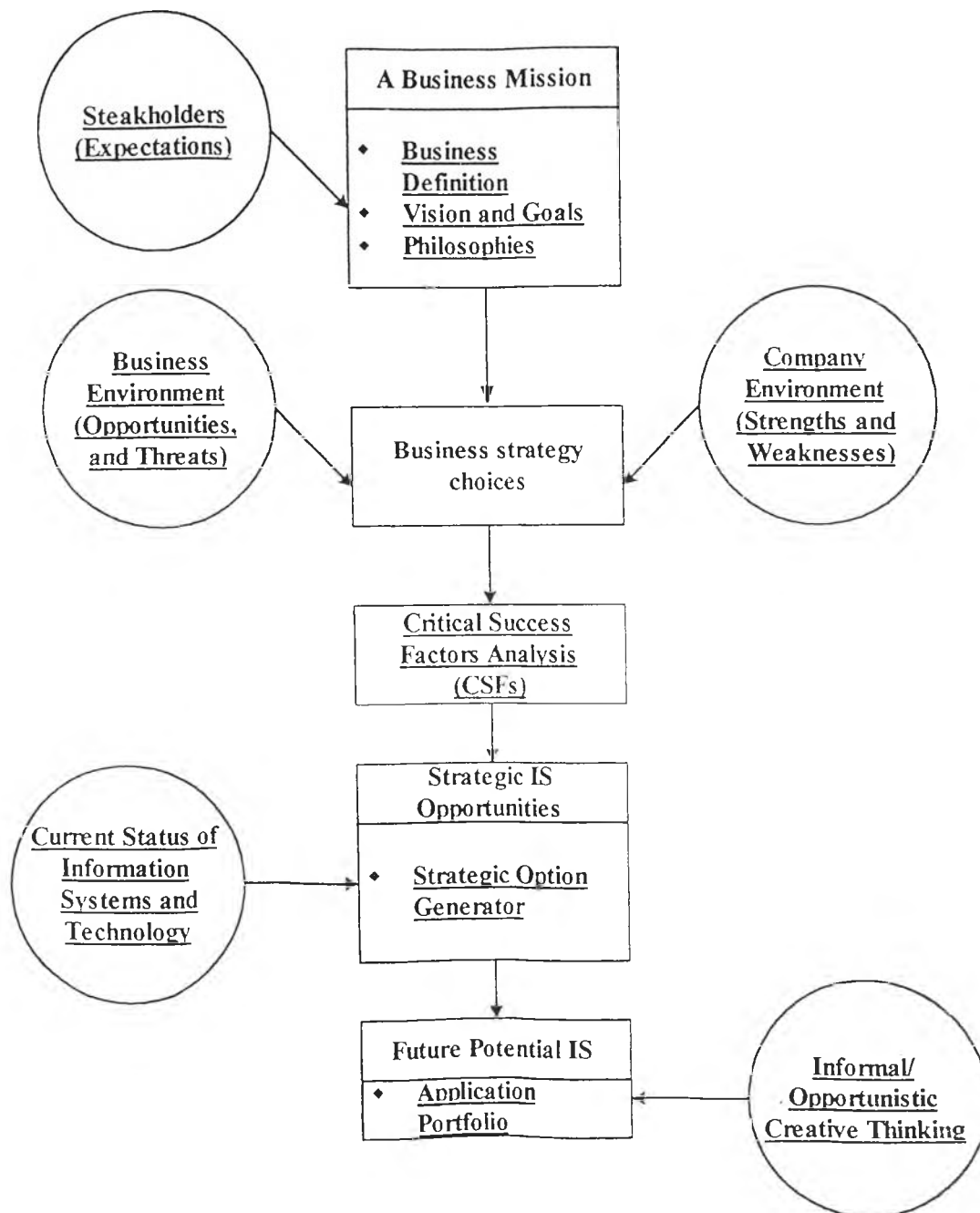


Figure 3-1 The Conceptual Model for an Executive Support System

Capacity Augment in Large Increments

Large additional capacity can periodically affect the industry supply/demand balance. Recurring periods of over capacity and price-cutting can occur, especially in the industry where economies of scale and large incremental capacity are the key factors of cost advantages.

Diverse Competitors

When facing diverse strategies, goals and characteristics from many competitors, the company may find it difficult to compete properly with them. Strategic options right for one competitor may be wrong for others.

High Strategic Stakes

If there are a number of companies having high stakes in achieving success in the industry, rivalry among these companies becomes very intense. Each one will have to fight for its own success since there are not many differences in company's capabilities.

High Exit Barriers

High exit barriers can also keep companies competing in business even they may earning low or even negative returns on investment. High fixed costs of exit and strategic interrelationships between businesses are the examples of these barriers. Government restrictions are also a major factor for companies to abandon their businesses. The concern of job loss and regional economic effects force a government to have regulations with companies in some industries to stay for at least a certain period before exiting the business. The battle of these desperate companies is often violent.

➤ Threat of Substitute Products or Services

The existence of close substitute products present a strong competitive force for a company and often limits the price the company can profitably charge. Substitute products are the other products that can perform function as the product in the industry. Porter suggests two kinds of substitute products that deserve the most attention: (1) those that are subject to trends improving their price-performance tradeoff with the industry's product or (2) those that are produced by industries

3.1.3 The Selection of Operating Platform and Software

Formulating strategic IS requires ideas and strategic thinking from all related members in the company. Several discussions and meeting are also needed. Therefore, the ideal software should be operated on the platform that is easily available and can be used simultaneously by multiple users from any places and any time. Among the qualified platforms, the author has selected the web browser to be the operating platform for the ESS due to the following benefits:

- ◆ Users can log in and use this software at their homes and open the meeting and discussion through Internet.
- ◆ The operating platform is easily available and usually pre-installed on the Windows 98 or higher.
- ◆ Users can search for more updated information to help analyze their situation through the recommended web sites.

The software selected to develop the ESS is the Microsoft FrontPage 2000. A FrontPage is a program for designing, building and managing homepage or Web site. It has a variety of tools to create a complicated web site and support new technologies of world wide web such as Dynamic HTML, Cascading style sheet 2.0 (CSS), Active server page (ASP), Active X Control, VBScript, and Java applet. In conclusion, FrontPage 2000 is quite suitable for new users who are just beginning to build their homepage for the first time.

3.1.4 The Writing of the Software

For simplicity and ease of use, the software was written using pictures, and diagrams, and tables instead of words. Important explanations, however, are embedded in these pictures to inform or guide users in each step. The arrangement of the software content is based on the model shown in chapter 3. The looks in each page will be like regular web sites and can be viewed using the same tools as searching the web. The steps of software developing include the following items.

- ◆ Transform the research model into understandable steps using analysis tools, frameworks, explanations and tables to deliver the meanings.
- ◆ Arrange the context and set the layout of each page in the software.
- ◆ Write the ESS pages using Microsoft FrontPage 2000.

3.1.5 The Finished Software

Based on the model shown in figure 3-1 and the requirements from the users discussed in the previous section, the ESS is developed by using the Microsoft Frontpage software 2000. It is presented in the form of web pages and can be viewed on the web browser such as Microsoft Internet Explorer version 5.5 or higher. It contains approximately 21 pages of content, including frameworks, models, tables, and information needed in understanding and developing strategic information systems. Users can use this ESS either off or on line (some processes though need web server or personal web server to be done). The examples of some pages in the ESS are displayed in figure 3-2 below.

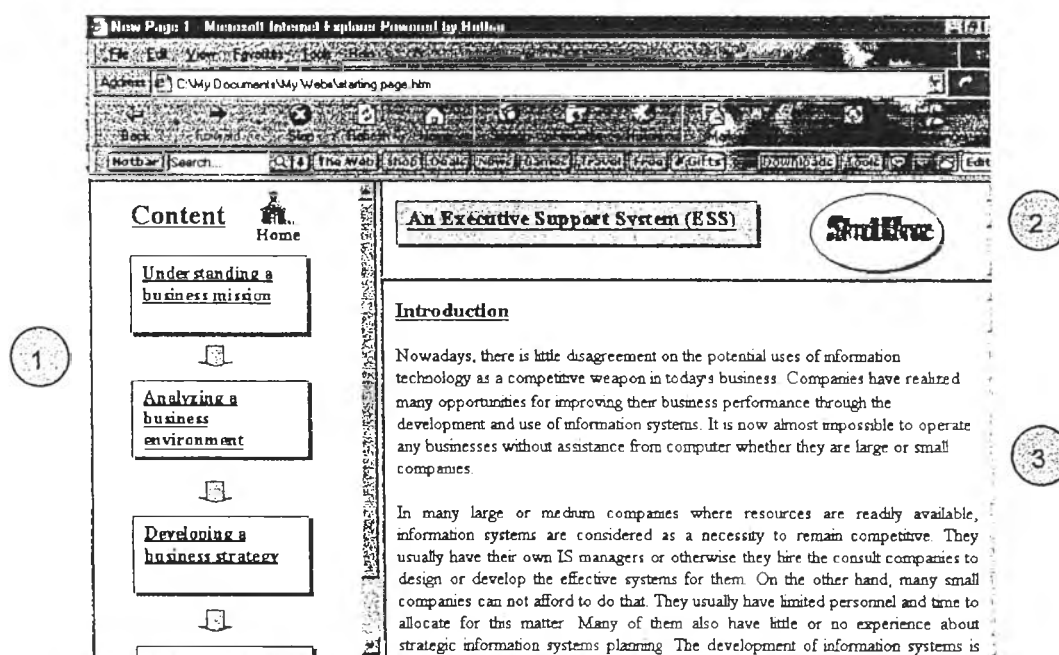


Figure 3-2 The Examples of the ESS pages (see more in Appendix A)

The ESS begins with the introduction of the designed model content, the needs for IS to support and create competitive advantage for the business, and the guideline to use the ESS. The content of the ESS includes 4 important sections of developing SIS: understanding a business mission, analyzing a business environment, developing a business strategy and identifying IS strategy.

3.1.6 The Components of the ESS

From figure 3-2, the ESS is presented including the following components:

1. Content

The content includes the major 4 steps in developing strategic information systems: understanding a business mission, analyzing a business environment, developing a business strategy and identifying IS strategy. Users can move to these pages by simply clicking each label (some pages though are not included in this content but can be reached by clicking forward arrow or backward arrow shown in header section).

2. Header

The header shows the current page's name and forward and backward arrow for moving to the next or previous page.

3. Context

The page's context features pictures, tables, frameworks, and models needed in developing strategic information systems, including explanations embedded in these figures. By simply clicking these figures, an explanation will be demonstrated in the left frame by replacing the content page. More details of each page can be viewed in Appendix A.

3.2 The Verification and the Application of the ESS to the Subject Case Company

To ensure that the design output meets the user requirements, a systematic test is needed. According to ISO 9001 (1994), design input requirements relating to the product shall be clearly identified, documented, and reviewed by the supplier for adequacy and design output shall:

- meet the design input requirements;
- contain or make reference to acceptance criteria;
- identify those characteristics of the design that are crucial to the safe and proper functioning of the product (e.g. operating, storage, handling, maintenance, and disposal requirements).

At appropriate stage of design, design verification is needed to ensure that the design stage output meets the design stage input requirements. Design verification may include activities such as performing alternative calculations, comparing the new design with a similar proven design, undertaking tests and demonstrations and reviewing the design stage document before release. After successful design verification, design validation should be performed to ensure that product conforms to defined user needs and/or requirements. Validation is normally performed on the final product under defined operating conditions. Multiple validations may be needed if there are different intended uses.

Therefore, while the ESS is developing, it has been verified regularly against other proven or well-known design models such as:

- ◆ The strategic development model from David, F. R. (1997).
- ◆ The strategic management process from Hill and Jones (1995).
- ◆ 20 steps required to develop a SISP from Remenyi (1991).
- ◆ IS and Business Strategy: An integrated Planning Methodology Andreu et al. (1992).
- ◆ Strategic information system planning from Ward and Griffiths (1996).

In this ESS model, many well-known analysis tools and conceptual frameworks for SIS such as competitive five forces, SWOT, PEST, TOWS matrix, critical success factor analysis, strategic option generator, and the application portfolio are selected correspondingly to each step of strategic development.

At the end of the each stage of the design, there is also the simple design verification conducted. Users are asked to use the selected tools and frameworks in the given situation to see whether they are capable of understanding and using them to provide results as expected.

The verification begins by providing 2 different situations to the users. The first is that one entertainment company wants to increase their sales but they are having difficulty finding a low-cost location to establish more distribution shops. Every competitive location is mostly located in very expensive areas. The second case is that one manufacturing company needs to improve its business efficiency. Its business activities are mostly paper-based. Important information sometimes delay or even loss before reaching the intended department. This problem also causes many complaints from customers for the delay of their order handling.

Users were asked to use the selected tools and frameworks mention earlier to identify possible strategic information systems for both cases. The following application portfolios are the final results extracted from this verification:

Case 1

Strategic	High Potential
Web-based ordering systems	Online Download systems
Order-tracking systems	Online Demo
On-line auction and trading systems	
On-line payment systems	
Computer-integrated systems	Office automation
EDI	
Database management systems	
Inventory control systems	
Key Operational	Support

Case 2

Strategic	High Potential
Database management	EDI
Computer-integrated systems	Management Decision Support Systems
Production planning and control systems	
Product quality control systems	
Order processing systems	Office automation
Inventory control systems	
Purchasing systems	
Key Operational	Support

In case 1, users have decided to launch a Web-based ordering system as an alternative channel to reach customers in stead of finding competitive location. This new system will enable customers to search, auction and even trade for interested products online, thus getting rid of costs to establish a shop in renowned department stores.

In strategic section, users determined 4 systems: Web-based ordering systems, Order-tracking systems, On-line auction and trading systems, and On-line payment systems. These IS applications are intended to serve and facilitate as an alternative channel without establishing a shop in an expensive location to reach customers. For key operational, Computer-integrated systems, EDI, Database management systems, and Inventory control systems were identified. These systems will be used to enhance the business operations and information management in the company to support the new distribution channel.

Users also determined Online Download systems and Online Demo as high potential systems to use in the future as extra services for customers. Office automation was also identified as a support system to facilitate business activities.

From the given information in case 2, users decided to improve internal business operations by incorporating Computer-integrated systems, Production planning and control systems, Product quality control systems, and Database management as strategic IS applications. Order processing systems, Inventory control systems, and Purchasing systems were also identified as key operational applications. These 3 IS applications are intended to be the foundation of the company to be ready for the up-coming systems in the strategic section. EDI and Management Decision Support Systems were determined as high potential applications for future improvement, while Office automation was identified as a support system.

Given very limited information, the results shown during this verification demonstrate that users are capable of understanding and using these tools and frameworks quite well. The analysis of each part provide by users are reasonably made considering the given information. Therefore, in the author point of view, this system is deemed as valid and meets the purpose of its requirements.

After the software is completed, the application of this model to the case company is therefore conducted to ensure this software conforms to defined user needs. However, given the time constraint, the test of certain features of the ESS model could not be established. The evaluation of the strategic action resulted from this ESS model, for example, could not be tested due to the delay of the investment decision from the company.

To test this software, the users, sales manager and marketing manager, were asked to use it under the observation of the author. After the users have used this software, the test for whether it meets the user's requirements is done by interviewing the owners with the questionnaires. The following information is the users' profile, which includes some background, personal information, and prior experience in strategic development.

◆ User's Profile

Sales manager: Graduated in science, he is now working at the computer company. He has some knowledge about strategic development at a certain degree from work experience. Some development tools such as SWOT are quite familiar to him. He is the founder of this company. He has in-depth knowledge about computer industry and what is required in this business. He works closely to both suppliers and customers. Therefore, he is quite comfortable identifying important issues involving both sides in an analysis part of SIS development. His knowledge is also extended to other areas such as financial, marketing, sales, and technology.

Marketing manager: The marketing manager graduated in social. He has extensive experience involving selling and marketing. He used to work with one plastic company as a marketing manager for about 6 years. Currently, he is working at one company as a marketing manager. He also has some knowledge about strategic development.

The selection of these 2 users is based on knowledge in crucial areas that are important to strategic information systems planning. Areas such as customers, suppliers, competitors, sales, and production are under the responsibility of the sales managers to provide ideas and information due to his knowledge and experience relating to the requirements to serve, work, or compete in these areas. Marketing and overall industry situations are the marketing manager's responsibilities to analyze. Information about current IS applications widely used in the industry is also supplied by the author as examples to help generating ideas. Therefore, combining knowledge from both users can reasonably cover most crucial areas needed to consider during the application of the ESS.



3.2.1 The Results from the application

The Following sections have been extracted from the results developed by the users during the use of the ESS:

1. A business mission.
2. PEST analysis.
3. Competitive five forces analysis.
4. SWOT analysis.
5. Prioritizing SWOT factors.
6. Generating a business strategy.
7. Identifying CSFs.
8. Identifying IS applications.
9. Creating the application portfolio.

Each section contains results and brief description of the process. More details of each section can also be viewed in appendix A and C. Necessary information has also been supplied to users for decision-making and analysis.

1. A Business Mission

Firstly, the users have identified a business mission that includes business definition, vision, goals, and philosophies. This mission will be used as a direction throughout the development of SIS for this company.

A business mission can be extracted as follows:

◆ Business Definition

“ Our business seeks to satisfy customer’s needs for personal computers, accessories, and services related to computer, software applications, and Internet. ”

◆ Vision

“ Our vision is to be the most customer-focused, competitive, efficient, and innovative computer business in Bangkok by the year 2008. ”

◆ Goals

- ◆ **Customer satisfaction:** Our goal is to achieve the highest level of customer satisfaction. The target for 2001 is for 95 % of the respondents to rate their level of satisfaction as “ completely satisfied ”.
- ◆ **Process innovation:** Our goal is to establish a completely computer-integrated system for our business activities. The target for 2001 is to integrate computer systems to our selling, invoicing, accounting, and inventory processes.
- ◆ **Product quality:** Our goal is to maintain the highest level of product quality. The target for 2001 is for 95 % of the respondents to rate their level of satisfaction of product quality as “ completely satisfied ”.
- ◆ **Create strategic alliance:** Our goal is to create strategic alliances to better share information and cooperate more efficiently in order to reach more customers and new markets.

◆ Philosophies

- ◆ **Customer always comes first:** Our priority is to serve our customers’ needs, provide services, quality, and reliability, at an affordable price, in the way that exceeds their expectations.

2. PEST Analysis

Following the development of a business mission, the business environment has been analyzed. There are three layers of levels to be investigated: macroenvironment, industry environment, and company environment. For macroenvironment, there are 4 areas to consider: economic, social, political, and technology.

Political Issues

1. Information Technology Agreement: ITA (0% tax for IT products in the year 2000). In Thailand, 0% tax for 153 items in 2000 and 37% for 37 items in 2006.
2. Deregulation to support IT products and e-commerce.

Economic Issues

1. GDP at 5.2 for the first half and estimate GDP at 4.3 for the second half of the year 2000. Growth rate of over all economic currently at 6.6 and estimate at 5.0 for the second half of 2000. Growth rate of Computer business is estimated at 20% this year.
2. Interest rates at 8.00-8.50 baht.
3. Estimate exchange rates at 38.00/US \$ for the second half of the year 2000, currently at about 42 baht/US \$.
4. Estimate average inflation rates at 3.0 for the second half of the year 2000.

Social Issues

1. Increased Internet popularity following information-demanding age.
2. Increased academic institute, government sector, company needs for computer due to price reduction.
3. Increased e-commerce popularity.
4. Increased local brand popularity.

Technological Issues

1. Rapidly changing technology.
2. Shorter product life cycles.
3. Expansion of product ranges and applications.

Figure 3-3 PEST analysis (results from the subject case company)

3. Competitive Five Forces Analysis

Industry structure has a strong impact on the rules of competition and the potential strategies available to a company. Formulating a competitive strategy is therefore relating a company to its industry environment and finding a position where it can best compete. Using Porter's fiveforces analysis, the users have identified the following results:

<u>Customers</u>	<u>Users' Comment</u>
<ol style="list-style-type: none"> 1. Consumers in Bangkok. 2. Government sectors. 3. Companies and small shops. 	<ol style="list-style-type: none"> 1. Oversupply makes buyer more powerful. 2. Switching costs are few. 3. Customers are more demanding. 4. Customers become capable of discerning the comparative advantages and disadvantages of available products.
<u>Suppliers</u>	<u>Users' Comment</u>
<ol style="list-style-type: none"> 1. Authorized dealers. 2. Intermediates. 	<ol style="list-style-type: none"> 1. Switching suppliers incurs many problems. 2. Sufficient suppliers.
<u>New Entrants</u>	<u>Users' Comment</u>
<ol style="list-style-type: none"> 1. New established retailers. 2. Small dealers. 	<ol style="list-style-type: none"> 1. Not much capital requirements. 2. No expected retaliation.
<u>Substitute Products or services</u>	<u>Users' Comment</u>
<ol style="list-style-type: none"> 1. Direct sales between consumers through Internet. 2. Internet ordering. 	<ol style="list-style-type: none"> 1. Not critical now but may be in the future. 2. Still not popular due to the lacking payment and delivery credibility.
<u>Rivalry</u>	<u>Users' Comment</u>
<ol style="list-style-type: none"> 1. Established dealers. 2. Authorized dealers. 3. Retailers. 	<ol style="list-style-type: none"> 1. Growth rate increases. 2. High competition. 3. Numerous competitors. 4. Lack of differentiation. 5. Oversupply. 6. Low exit barriers.

Figure 3-4 Five Forces Analysis (results from the subject case company)

4. SWOT Analysis

After assessment of external environment of the business, it is equally important to perform an internal audit to be able to identify the resources and strategic capability of the organization. All organizations have strengths and weaknesses in their business. Understanding of these issues is very critical to the formulation of the business strategy. Using the SWOT analysis, the users have determined the following results:

Opportunities

1. The market is growing.
2. The new registration (ITA) is favorable to the growth of industry.
3. The needs for computer are increasing and creating opportunities for many new relating products.
4. Social trends for computer, Internet, and e-commerce are favorable to the business.
5. Shorter product life cycles make the needs for new products higher.
6. Lowest interest rates compared to the past 10 years.

Threats

1. Overall economic is still not recovered yet. There is also a chance for the second economic recession.
2. Increasing exchange rates make product costs higher.
3. Rapidly changing technology shortens product life cycles and increases risks of holding inventories for a long time.
4. Possibility for other means of product sales such as Internet or direct trade.
5. Uncertainty of the strictness of rules and regulations due to changing in government policy (depending on new election in January 2001).

Strengths

1. Good connections to suppliers
2. Higher service quality.
3. Good knowledge in this business.
4. Good strategic management.
5. Efficient business process.

Weaknesses

1. Limited financial resources.
2. Lack of business experience.
3. Lack of company reputation.
4. Disadvantage location.
5. High pressure of needs for liquidity.

Figure 3-5 SWOT analysis (results from the subject case company)

5. Prioritizing the SWOT factors

After the conclusion of all the SWOT factors, the next step is to prioritize them. The result is the priority list to be considered as key factors of the company success. For both internal and external factors, Each one is weighted and ranked according to its importance shown as follows:

Internal Factors	Weight	Rating	Weighted Scored
<u>Strengths</u>			
1. Knowledge in this business.	0.05	3	0.15
2. Good connection with suppliers.	0.10	3	0.30
3. Good strategic management.	0.10	4	0.40
4. Higher service quality.	0.15	3	0.45
5. Efficient business process.	0.10	4	0.40
<u>Weaknesses</u>			
1. Limited financial resources.	0.15	1	0.15
2. Lack of company reputation.	0.05	2	0.10
3. Lack of business experience	0.10	1	0.10
4. Disadvantage location.	0.10	1	0.10
5. High pressure of needs for liquidity.	0.10	1	0.10
Total	1.00		2.25

Weight: the relative importance of that factor to being successful in the company 's industry (range from 0.0 (not important) to 1.0 (very important))

Rating: whether the factor represents a major weakness (1), a minor weakness (2), a minor strength (3), or a major strength (4).

Weighted score: the total weighted score ranges from 1.0 to 4.0 regardless of how many factors are included in the external analysis. The average score is 2.5. Therefore, total weighted scores below 2.5 indicate that the company internally weak, whereas the total weighted scores above 2.5 suggest that the company have strong internal capabilities and resources.

External Factors	Weight	Rating	Weighted Scored
Opportunities			
1. Large and growing market.	0.20	4	0.80
2. Shorter product life cycles.	0.10	3	0.30
3. Increasing needs for computers.	0.10	3	0.30
4. Increasing buying power.	0.10	3	0.30
5. The reduction of imported tax.	0.10	2	0.20
Threats			
1. High competition.	0.15	3	0.45
2. Shorter product life cycles.	0.05	3	0.15
3. Increased exchange rates.	0.10	2	0.20
4. Possibility of substitute services.	0.05	2	0.10
5. Possibility of 2 nd economic crisis.	0.05	1	0.05
Total	1.00		2.85



Weight: the relative importance of that factor to being successful in the company 's industry(range from 0.0 (not important) to 1.0 (very important).

Rating: how effectively the company can respond to the factor (range from 1(poor), 2 (average), 3 (above average) to 4 (superior)).

Weighted score: the total weighted score ranges from 1.0 to 4.0 regardless of how many factors are included in the external analysis. The average score is 2.5. Therefore, total weighted scores 1.0 indicate that the company is responding to the existing opportunities and threats not effectively. Conversely, the company is capitalizing on opportunities and avoiding threats effectively if total weighted scores are 4.0.

Figure 3-6 Prioritizing SWOT Factors (results from the subject case company)

6. Generating a business strategy

After a company has identified its business mission statement, analyzed its external environment, and internal environment, the next step of strategy formulation is to generate feasible alternative strategies. Using TOWS matrix the users have used these factors to generate a set of business strategies that match with the company's external opportunities and threats and its internal resources. The steps in using TOWS matrix are as follows:

- List external opportunities available in the company's current and future environment and external threats facing the company now and in the future.
- List the areas that the company has strengths and weaknesses now and in the future.
- Generate a series of possible strategies based on the considerations of the four combinations of the matrix (SO, WO, ST, and WT strategies).

Figure 3-7 shows the strategies derived from using the TOWS matrix.

Internal Factors	Strengths		Score	Weaknesses	Score
	1. Knowledge in this business.	0.15	1. Limited financial resources.	0.15	
External Factors	2. Good connection with suppliers.	0.30	2. Lack of company reputation.	0.10	
	3. Good strategic management.	0.40	3. Lack of business experience	0.10	
	4. Higher service quality.	0.45	4. Disadvantage location.	0.10	
	5. Efficient business process.	0.40	5. High pressure of needs for liquidity.	0.10	
Opportunities	Score	SO Strategies	WO Strategies		
1. Large and growing market.	0.80	1. Target the most growing market.	6. Plan the product introduction considering its life cycle and credit allows.		
2. Shorter product life cycles.	0.30	2. Emphasize on providing better services than competitors.	7. Develop alternative channels to reach customers.		
3. Increasing needs for computers.	0.30	3. Seek alliances to form a group of small companies to compete with large companies more effectively.			
4. Increasing buying power.	0.30				
5. The reduction of imported tax.	0.20				
Threats	Score	ST Strategies	WT Strategies		
1. High competition.	0.45	4. Form a joint venture with suppliers to efficiently control inventory.	8. Secure financial status by acquiring long-term loan.		
2. Shorter product life cycles.	0.15	5. Improve business activities to operate more efficiently.	9. Acquire certificate for standard quality systems.		
3. Increased exchange rates.	0.20				
4. Possibility of substitute services.	0.10				
5. Possibility of 2 nd economic crisis.	0.05				

Figure 3-7 TOWS matrix (results from the subject case company)

The results obtained by this matrix are the lists of feasible alternative strategies. Not all of these strategies will be selected for implementation. The selection of these strategies is therefore needed. The selected method that will be used in this research is the Quantitative Strategic Planning Matrix (QSPM). This matrix uses input from the previous section to decide objectively among the given alternative strategies. The steps in using an QSPM matrix are shown as follows:

- List the four external and internal key factors in the left column. These factors should be taken directly from the selection of strategic factor priority.
- Assign weights to each factor. These weights are identical to those in the selection of strategic factor priority.
- Identify strategic alternatives that the organization should consider implementing.
- Define the attractiveness score of each strategy relative to each external and internal strategic factor by examining the effect of each factor on a given strategy
- Compute the total attractiveness scores.
- Compute the sum of total attractiveness scores.

Figure 3-8 shows the evaluation of the strategies obtained from the previous section by using a QSPM. Figure 3-9 shows the strategy list categorized by their total scores.

7. Identifying the CSFs

After the business strategies have been established, the next step is to identify the information that is critical to the success of these strategic goals. Therefore, the organization can identify what information systems are needed. There are a number of techniques proposed to develop a picture of an organization's strategic information requirements. Among them, Critical Success Factor analysis, one of the most widely used techniques, will be used in this research. Steps in identifying the CSFs are as follows:

➤ Interpret the business strategy

Interpreting the business strategy will result in specific objectives for parts of the organization. These objectives are usually the strategic objectives or tactical objectives, which the company wants to achieve in medium and short term.

➤ Identify CSFs against each objective

The second step is to identify which factors are critical for accomplishing these objectives. In this stage, a number of CSFs may occur. Therefore, prioritizing is needed. Between 5-8 CSFs for each objective is a reasonable number to be analyzed.

➤ **Determine key performance indicator**

Key performance indicators serve as a bridge between what is important and the IS applications essential to support it (the information requirement). These indicators refer to measurements that can be used to identify whether things are going right or not.

Figure 3-10 shows the CSFs and key performance indicators listed according to the strategies obtained from the previous section.

Key Factors	Weigh	Strategy 1		Strategy 2		Strategy 3		Strategy 4		Strategy 5		Strategy 6		Strategy 7		Strategy 8		Strategy 9	
		AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS	AS	TAS
Strengths																			
1. Knowledge in this business.	0.05	3	0.15	3	0.15	3	0.15	3	0.15	2	0.10	3	0.15	3	0.15	0	0.00	2	0.10
2. Good connection with suppliers.	0.10	0	0.00	2	0.20	4	0.40	4	0.40	2	0.20	3	0.30	2	0.20	0	0.00	3	0.30
3. Good strategic management.	0.10	2	0.20	3	0.30	3	0.30	3	0.30	2	0.20	3	0.30	0	0.00	2	0.20	2	0.20
4. Higher service quality.	0.15	2	0.30	4	0.60	3	0.45	3	0.45	3	0.45	0	0.00	3	0.45	0	0.00	3	0.45
5. Efficient business process.	0.10	2	0.20	3	0.30	3	0.30	3	0.30	4	0.40	2	0.20	3	0.30	0	0.00	3	0.30
Weaknesses																			
1. Limited financial resources.	0.15	0	0.00	2	0.30	3	0.45	3	0.45	1	0.15	3	0.45	1	0.15	4	0.60	2	0.30
2. Lack of company reputation.	0.05	0	0.00	3	0.15	3	0.15	3	0.15	2	0.10	0	0.00	2	0.10	2	0.10	4	0.20
3. Lack of business experience	0.10	0	0.00	2	0.20	3	0.30	3	0.30	0	0.00	0	0.00	2	0.20	2	0.20	3	0.30
4. Disadvantage location.	0.10	3	0.30	3	0.30	3	0.30	3	0.30	3	0.30	0	0.00	4	0.40	0	0.00	3	0.30
5. High pressure of needs for liquidity.	0.10	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.40	2	0.20	4	0.40	0	0.00
Opportunities																			
1. Large and growing market.	0.20	4	0.80	3	0.60	3	0.60	2	0.40	0	0.00	2	0.40	3	0.60	0	0.00	0	0.00
2. Shorter product life cycles.	0.10	0	0.00	0	0.00	2	0.20	4	0.40	2	0.20	4	0.40	0	0.00	2	0.20	0	0.00
3. Increasing needs for computers.	0.10	3	0.30	3	0.30	3	0.30	0	0.00	2	0.20	2	0.20	3	0.30	0	0.00	0	0.00
4. Increasing buying power.	0.10	3	0.30	3	0.30	3	0.30	0	0.00	2	0.20	2	0.20	3	0.30	0	0.00	0	0.00
5. The reduction of imported tax.	0.10	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.40	0	0.00	0	0.00	0	0.00
Threats																			
1. High competition.	0.15	3	0.45	4	0.60	3	0.45	2	0.30	4	0.60	3	0.45	3	0.45	3	0.45	3	0.45
2. Shorter product life cycles.	0.05	0	0.00	0	0.00	2	0.10	4	0.20	2	0.10	4	0.20	0	0.00	2	0.10	0	0.00
3. Increased exchange rates.	0.10	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	3	0.30	0	0.00	3	0.30	0	0.00
4. Possibility of substitute services.	0.05	0	0.00	2	0.10	0	0.00	0	0.00	3	0.15	2	0.10	3	0.15	0	0.00	0	0.00
5. Possibility of 2 nd economic crisis.	0.05	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	0	0.00	4	0.20	0	0.00
Total			3.00		4.40		4.75		4.10		3.35		4.45		3.95		2.75		2.90

Weight: the relative importance of that factor to being successful in the company 's industry (range from 0.0 (not important) to 1.0 (very important)).

Attractiveness: the effect of each factor to the choices of strategies being made (range from 1 (not attractive), 2 (somewhat attractive), 3 (reasonably attractive), to 4 (highly attractive)).

Total Attractiveness Scores (TAS): TAS reveals which strategy is the most attractive compared to others. The higher the TAS, the more attractive the strategies.

Figure 3-8 A QSPM (results from the subject case company)

Strategies listing according to their attractiveness scores	TAS
Seek alliances to form a group of small companies to compete with large companies more effectively.	4.75
Plan the product introduction considering its life cycle and credit allows.	4.45
Emphasize on providing better services than competitors.	4.40
Form a joint venture with suppliers to efficiently control inventory.	4.10
Develop alternative channels to reach customers.	3.95
Improve business activities to operate more efficiently.	3.35
Target the most growing market.	3.00
Acquire certificate for standard quality systems.	2.90
Secure financial status by acquiring long-term loan.	2.75

Figure 3-9 Strategy listing (results from the subject case company)

<u>Strategies</u>	<u>Critical Success Factors</u>	<u>Key performance Indicators</u>
Seek alliances to form a group of small companies to compete with large companies more effectively.	<ol style="list-style-type: none"> 1. Select appropriate alliances. 2. Develop consensus agreement in cooperation conditions. 	<ol style="list-style-type: none"> 1. Level of alliances' satisfaction. 2. Level of company satisfaction.
Plan the product introduction considering its life cycle and credit allows. Emphasize on providing better services than competitors.	<ol style="list-style-type: none"> 1. Develop product introduction planning systems. 1. Reduce service time. 2. Handle customers' orders quickly 3. Reduce delivery lead-time 4. Develop customer information service support systems. 	<ol style="list-style-type: none"> 1. Rate of inventory turnover 1. Average service time per order. 2. Average handling time per order. 3. Average delivery lead-time per order. 4. Level of customers' satisfaction.
Form a joint venture with suppliers to efficiently control inventory.	<ol style="list-style-type: none"> 1. select appropriate suppliers. 2. Develop consensus agreement in cooperation conditions. 	<ol style="list-style-type: none"> 1. Level of suppliers' satisfaction. 2. Level of company satisfaction.
Develop alternative channels to reach customers.	<ol style="list-style-type: none"> 1. Provide easily accessible channels. 2. Develop marketing research. 	<ol style="list-style-type: none"> 1. Number of customers using new channel. 2. Level of information usefulness.
Improve business activities to operate more efficiently.	<ol style="list-style-type: none"> 1. Increase the quickness of operations. 2. Improve the accuracy of operations. 3. Introduce innovative ways to operate business. 	<ol style="list-style-type: none"> 1. Average time per operation. 2. Number of mistakes. 3. Level of improvement.
Target the most growing market.	<ol style="list-style-type: none"> 1. Enter new markets. 2. Develop marketing research. 	<ol style="list-style-type: none"> 1. Number of customers. 2. Level of information usefulness.
Acquire certificate for standard quality systems.	<ol style="list-style-type: none"> 1. Standardize production process. 2. Improve product quality. 	<ol style="list-style-type: none"> 1. Level of employee working according to work instructions. 2. Number of defective products. 3. Number of customer complaints.
Secure financial status by acquiring long-term loan	<ol style="list-style-type: none"> 1. Develop a financial decision system. 2. Develop an accounting system. 	<ol style="list-style-type: none"> 1. Revenue (profit/loss). 2. Level of account accuracy.

Figure 3-10 Critical Success Factors and Key Performance Indicators (results from the subject case company)

8. Identifying IS Applications

After identifying key information needs from a CSF analysis, the company can then consider strategic information system opportunities to provide information required. There are several IS strategic planning models to be considered such as Porter and Millar's model, McFarlan's framework or Wiseman's strategic option generator. In this research, the author uses Wiseman's strategic option generator to identify some possible IS specific opportunities in the decision support system.

The strategic option generator approach requires a thorough understanding of the industry, the company's competitive position, and a clearly understood of business strategy. Therefore, the results of several analyses from the beginning plus key information requirements derived from the CSF analysis adequately provide information needed to help identifying the potential strategic IS opportunities by using this model. Figure 3-11 shows the brief description of possible IS applications derived from using the strategic option generator. Figure 3-12 shows the relationship between CSFs and IS applications.

9. Creating the Application Portfolio

After refining the strategic information systems applications from the previous part, the company needs to bring those strategic and high potential applications derived from various routes, assess them, and then classify them in terms of their contribution to the business now and in the future order to ensure that they are managed success fully. The application portfolio is a simple model providing an analysis of existing, planned, and potential applications into four quadrants based on as assessment of the current and future business importance of applications. An application can be classified as strategic, high potential, key operational, and support, depending on its current business contribution to the company. Figure 3-13 shows the result of the application portfolio categorized by the users.

What is the strategic thrust?	What is the strategic target?		
	Supplier	Customer	Competitor
Differentiation		Customer information systems Market forecasting systems Database management systems Performance management systems Production planning and control systems Customer tracking systems Product quality control systems Ordering & Purchasing systems	Customer information systems Market forecasting systems Financial decision systems
Cost	Inventory management systems EDI Link ordering & purchasing systems		
Innovation		Internet ordering systems Order-tracking systems	Internet ordering systems Order-tracking systems
Growth			
Alliance	Networking		Networking

Figure 3-11 The Strategic Option Generator (results from the subject case company)

CSFs	IS Applications
Alliance	Networking
Cost	Inventory management systems
	EDI
	Financial decision systems
	Link ordering & purchasing systems
Customer satisfaction	Customer information systems
	Market forecasting systems
	Customer tracking systems
	Ordering & Purchasing systems
Innovative	Internet ordering systems
	Order-tracking systems
Operation efficiency	Database management systems
	Performance management systems
	Production planning and control systems
	Product quality control systems
	Financial decision systems

Figure 3-12 The relationship of CSFs and IS applications (results from the subject case company)

Strategic	High Potential
<ol style="list-style-type: none"> 1. Internet ordering 2. Financial decision systems. 3. Market forecasting systems. 4. Network ordering & purchasing systems. 5. Production planning and control systems. 6. Product quality control systems. 7. Database management systems. 	<ol style="list-style-type: none"> 1. Automated warehousing 2. Market analysis systems. 3. Management decision systems. 4. Order-tracking systems. 5. EDI
<ol style="list-style-type: none"> 1. Ordering and purchasing systems. 2. Product and pricing systems. 3. Inventory management systems 4. Customer information systems. 5. Customer tracking systems. 	<ol style="list-style-type: none"> 1. Accounting systems. 2. Payroll systems. 3. Budgeting systems. 4. Invoicing systems. 5. Office automation.
Key Operational	Support

Figure 3-13 The Application Portfolio of the Case Study Company (results from the subject case company)

The final result of the ESS, as shown in figure 3-13, is the application portfolio, which is the IS applications classified into 4 quadrants: strategic, key operation, high potential, and support. Each quadrant includes IS applications according to their business contribution. These possible IS applications are considered to be used creating competitive edge for the case company.

In strategic section, there are 7 items classified as IS applications that the company is dependent upon for future success in a competitive market. These applications include Internet ordering, financial decision systems, marketing forecasting systems, Network ordering and purchasing systems, production planning and control systems, product quality control systems, and database management systems.

High potential applications refer to those that have possibility to be important in achieving future success. However, these applications are also subject to a high degree of uncertainty of success as well. Users have categorized automated housing, marketing analysis systems, management decision systems, order-tracking systems, and EDI into this quadrant.

For the third quadrant that is vital to the current success of the organization, users have selected ordering and purchasing systems, product and pricing systems, inventory management systems, customer information systems, and customer tracking systems to be the key operational applications.

Finally, the last quadrant is categorized as support applications. These applications include those that are valuable but not critical to the success of the company. Such applications include accounting systems, payroll systems, budgeting systems, invoicing systems, and office automation.

3.2.2 Analysis of the results

Throughout the process of developing SIS by using the ESS, it is noticeable that the users have developed an understanding of strategic information systems at a certain level. The IS applications shown in figure 3-13 are derived correspondingly with a business mission and business strategy, thus ensuring that these applications are developed properly to respond both opportunities and threats based on the company resources, reasonably.

Figure 3-14 also clearly demonstrates that most of the IS applications can be linked back to the business goals and business strategies. The business goals already established from the beginning are supported by the business strategies developed from the later stage. The possible IS applications created also back up each strategy in order to be successfully achieved. Discussions in details are as follow.

Business Goals	Business Strategy	IS applications
Create strategic alliances	1. Seek alliances to form a group of small companies.	1. Networking
Customer satisfaction	1. Emphasize on providing better service than competitors.	1. Customer information systems. 2. Market forecasting systems. 3. Customer-tracking systems. 4. Financial decision systems.
Process Innovation	1. Develop alternative channels to reach customer. 2. Improve business activities to operate more efficiently. 3. Form a joint venture with suppliers to efficiently control inventory.	1. Internet ordering systems. 2. Order-tracking systems. 3. EDI. 4. Inventory management systems. 5. Ordering and purchasing systems. 6. Link ordering & purchasing systems. 7. Production planning and control systems. 8. Database management systems.
Product quality	1. Acquire certificate for standard quality systems	1. Product quality control systems. 2. Performance management systems.

Figure 3-14 The Comparative of business goals, business strategies and possible IS applications derived from the Subject Case Company

Creating strategic alliances is one of the increasing trends in competing with large companies. The users have decided to seek alliances to form a group of related business. In doing so, networking is the selected possible IS application to share important information or exchange of products or customers.

To improve customer satisfaction, the company has decided to emphasize on providing better service than do competitors. Several IS applications can be very useful for this strategy such as customer information systems that provide important

information relating customers, thus ensuring that the company can provide what they really want. Market forecasting systems provide rough estimates of what could happen next so that the company can be prepared to respond to changes.

For process innovation, there are three business strategies identified: develop alternative channels, improve business activities, and form a joint venture with suppliers. This shows that the users have realized the importance of three crucial areas: customer, the company itself, and the supplier in order to effectively develop a new process innovation. Improving business activities leads to more efficient in operation to support new process. Forming a joint venture with suppliers also provides alternative options to create new ideas and improves efficiency of many activities involving suppliers. Ultimately, if these two strategies were successfully implemented, the company would be ready to develop alternative channels or other new process innovation in order to achieve this business goal.

There are 8 possible IS applications generated that can be classified into this goal. Each has its contribution to support these three strategies. EDI, for example, can significantly improve efficiency and reduce cost involving suppliers, including inventory management, link ordering and purchasing systems. Production planning and control systems, order-tracking and database management also can be very useful to improve business activities in the company. Internet ordering system is also a good alternative channel to reach customers considering the nature of this business.

For productivity, acquiring certificate for standard quality can be very helpful in assuring acceptable quality to customers. Product quality and control systems and performance management therefore serve as a monitoring tool to control and sustain the quality of products at the acceptable level.

Given the necessary information, the users have generated quite impressive results. There is also a clear evidence of relationship between each step, hence assuring that most of the important concepts are not loss during each step of SIS development. There is also an obvious relationship showing that possible IS applications identified are derived correspondingly with business strategies and business goals. The classification of these IS applications in the application portfolio also provides a priority for the company to manage each one according to its contribution now and in the future more efficiently.

However, there are several important points that have been noticed while observing the use of the ESS by the user. The following section includes some issues noticed from the observation by the author.

3.2.3 Comment from the Observation

From the observation, it is noticeable that users still need advice and explanation of each step of using the ESS. The lack of adequate experience in strategic development causes many difficulties, especially in analysis and decision-making situation. Users are not certain that the ideas or decisions they made are valid or not. They still need advice and assistance from the author for ideas and examples. Sometimes encouragement is needed to give users a confidence to share and speak their ideas.

In the analysis part, information support has to be provided due to lack of experience in terms of searching for information sources of users. Inadequate information support and helping systems from the software also cause some difficulties for users. Therefore, it is still necessary to use the ESS under the attention of a person who has experience in SIS or strategic development for the first or second time.

Even though there are some difficulties at the beginning, users have shown significant improvement in the later stage. Overall, the ESS has achieved its purpose at a certain level. However, there are some features that have to be added in order to facilitate users and more useful in terms of support systems.

3.2.4 The Questionnaire results

The questionnaire is constructed to ensure that the designed DSS meets the users' requirements (full questionnaire can be viewed in appendix B). The main parts of this questionnaire include:

- ◆ user' s satisfaction in this software
- ◆ rating for each feature in this software
- ◆ user's comment
- ◆ user's personal information

The questionnaire was sent to the sales manager and marketing manager to fill it. The results from this questionnaire can be concluded in the following sections.

◆ User's satisfaction

Overall, the users are mostly satisfied with this software and they feel that it helps organizing their ideas more systematically. It also significantly improves the knowledge about strategic information systems of the users. However, from the observation during the use of this software, users still need more information supports and choices for decision-making.

◆ Rating of each feature in this software

Items	Score
Ease of use	3
Understandability of operating instructions	2
Sufficiency of Information provided	1
Arrangement of order of context	3
Usefulness in terms of Executive support system	3
Style of presentation	3
Ability to help understanding of strategic information system development	4

User 1: Sales manager

Items	Score
Ease of use	3
Understandability of operating instructions	3
Sufficiency of Information provided	2
Arrangement of order of context	3
Usefulness in terms of Executive support system	3
Style of presentation	3
Ability to help understanding of strategic information system development	4

User 2: Marketing manager

Note: Users' rating ranges from 1 to 5 (1 = poor, 2 = fair, 3 = average, 4 = good, and 5 = excellent)

Figure 3-15 The Users' rating (result from the questionnaire)

Item rated less than 2 is considered “not pass” in this case. Overall, the users rate this software as quite satisfactory. However, information supported is deemed as not sufficient. Therefore, improvements need to be done for further research. Ability to improve understanding of strategic information system development and usefulness in terms of support systems are considered as “good”. Other features are considered as “average”. From this result, there are several points needed to be improved in this version of ESS.

◆ **The Comments of Expected Improvements from Users**

From the questionnaire, the following items are the expected improvements from users to be included in the ESS.

- ◆ **Information support sources:** Users need the information support sources to be included in the ESS such as institute address or web site, more study or analysis issues relating to SIS and the industry in which the company is operating.
- ◆ **Helping choices in decision-making:** When running out of ideas, the users demand helping choices to consider. These choices may be in the form of possible decisions or recommended options.

3.2.5 The Strengths and Weaknesses of the ESS

After the application of the ESS to the subject case company, the following strengths and weaknesses can be concluded:

The strengths of the ESS are as follows:

Convenience and Time-saving

- ◆ Several users can use it simultaneously at any places and any time where Internet is available.
- ◆ Users can open the meeting at their home by connecting to Internet and using communication software such as MSN messenger service, ICQ or other voice mails programs to begin discussion.

Help Users to Organize Ideas and Systematically Develop the Strategy

- ◆ Users will be systematically guided throughout the strategic development process based on the research model, which is designed correspondingly with the academic viewpoint and the needs of the users and the business.
- ◆ Users can reasonably make a decision based on both quantitative and qualitative methods.

The weaknesses of the ESS are as follows:

Require Understanding of the Overall Concept of SIS

- ◆ Users need to be well informed about the overall concept of strategic information systems before using the ESS.
- ◆ For the first few uses, the assistance from a strategist is needed to provide ideas or examples of the business or industry analysis for users who are not familiar with strategic development.

Still need assistance from the Strategist

- ◆ Due to insufficient helping systems of the ESS, the user that has inadequate experience in strategy development still needs assistance from the strategist while using it.

3.3 Summary

This chapter has described the development path of the executive support system (ESS). Firstly, the user's requirements have been identified. Secondly, once the ESS model has been concluded, the selection of software and operating system was then decided. The ESS software was therefore written by Microsoft FrontPage 2000. To ensure that the design output meets the user requirements, test and observation have been conducted. Finally, after the test result was concluded, the strengths and weaknesses of the ESS have been identified.