

## CHAPTER 5

### SYSTEM ANALYSIS

#### 5.0 Introduction

System analysis is a software-engineering task that bridged the gap between system levels requirements engineering and software design. Figure 5.1 illustrated the analysis as a bridge between system engineering and software design. System analysis provided a representation of information, function, and behavior that can be translated to data, architectural, interface, and component-level design. While system design was an iterative process through which requirements were translated into a ‘blueprint’ for constructing the software (Pressman, 2001).

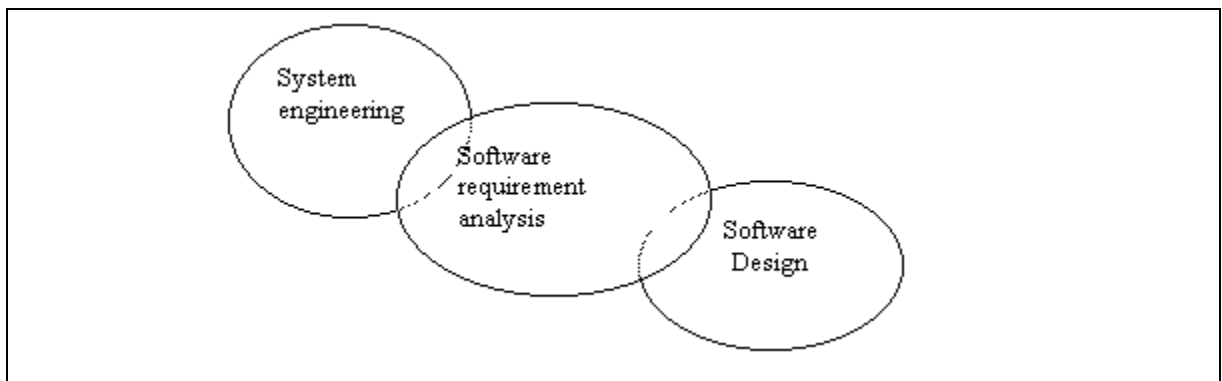


Figure 5.1 Analysis as bridge between engineering and software design

The topics discussed in this chapter included analysis of LOOOP, analysis of survey, functional and non-functional requirements, system requirements and application used. Analysis of LOOOP discussed the ways of LOOOP met the identified features that had discussed in literature review. Analysis of survey discussed the results of survey that had been done. Functional and non-functional requirements discussed the requirements

included in LOOOP. System requirements discussed the needed system specification for executed LOOOP. Application used discussed the software used to develop the system and success this project.

## **5.1 Analysis Of LOOOP**

In section 2.1.10, eight software functions had been selected for analysis with this project. The eight functions were searching, browsing, personal collections, context usage illustrators, accessibility, customized look and feel, multiple collections and media transformation and display. The analysis of LOOOP with those functions and its descriptions were as follow:

### **1. Searching**

LOOOP supported keyword, phrase searching from the contents of Learning Objects and Internet.

### **2. Browsing**

Users may browse the contents of Learning Objects which saved in the database.

### **3. Personal collections**

Every registered users could add their favorite contents of Learning Objects into their personal learning contents from time to time. Besides, the pages found from internet also can also be saved as their personal learning contents.

### **4. Context Usage Illustrators**

Any creation of new contents of Learning Objects can be saved in the database as sharable Learning Objects. The subject of the contents was not only fixed to specific subject.

## 5. Accessibility

LOOOP registered users who saved their learning contents on the server are able to access their learning content through any computer that had internet access and with LOOOP system installed.

## 6. Customized Look and Feel

A simple LOOOP system GUI is designed to let registered or new users easy to perform any feature provided.

## 7. Multiple Collections

LOOOP system supported multiple collection of learning contents, depending on the number of registered user.

## 8. Media Transformation and Display

The system autogenerated media file and picture file to string and stored them in database. The string converted to file again when they are requested.

## **5.2 A Survey On Learning Styles Among Higher Education Students**

Below is the analysis of survey based on the results gathered from questionnaire done.

### **5.2.1 Justification of the survey**

This survey consisted of several questions that asked about the learning style and the learning material used. Besides, respondents learning behaviors and recommendation given to new learning material had also been asked in this survey. The learning style and behavior asked were including information finding, note taking styles and ideal combination of learning resource types. The result of the survey is used for the study and system development.

### **5.2.2 Survey method**

The survey was made on fifty people from Faculty of Computer Science and Information Technology, University of Malaya and eighty people from Systematic College Petaling Jaya Campus. Eighty people had given their complete responds to this survey. The respondents were from both information technology (IT) students and non-information technology (non-IT) students. IT students had been chosen to make the survey a success because they are the people who frequently used the computer in their learning. Non-IT students also had also been chosen because they may have different learning style in learning.

The questionnaires used was a mixed of closed-ended and open-ended types of question. Closed-ended question was used to limit or restrict the responses, while open-ended question was used to encourage spontaneous and unstructured responses. Besides, the range-of-response question was also used to evaluate the results by providing limited answers to specific responses or on a numeric scale. The scales used were ‘most seldom=1’, ‘seldom=2’, ‘moderate=3’, ‘frequent=4’ and ‘most frequent=5’.

### **5.2.3 Learning styles results**

The survey consists of three sections, ‘respondent information’, ‘about the study – Learning Objects’ and ‘recommendation’.

#### **5.2.3.1 Respondent information**

‘Respondent information’ section purposed to collect the information about respondents age range and gender. From that survey, forty-five percent respondents were from age eighteen to twenty, forty-four percent were from twenty to twenty-two, five percent were from twenty-two to twenty-four, four percent were from twenty-four to

twenty-six and two percent respondents were from over twenty-six years of age. Most of the respondents were from age ranging from eighteen to twenty-two because they were frequently used the computer in study. Among eighty respondents, forty-six percent of them were male and fifty-four percent were female. Figure 5.2 illustrated the respondents' age range in column chart and figure 5.3 illustrated the respondents gender in pie chart.

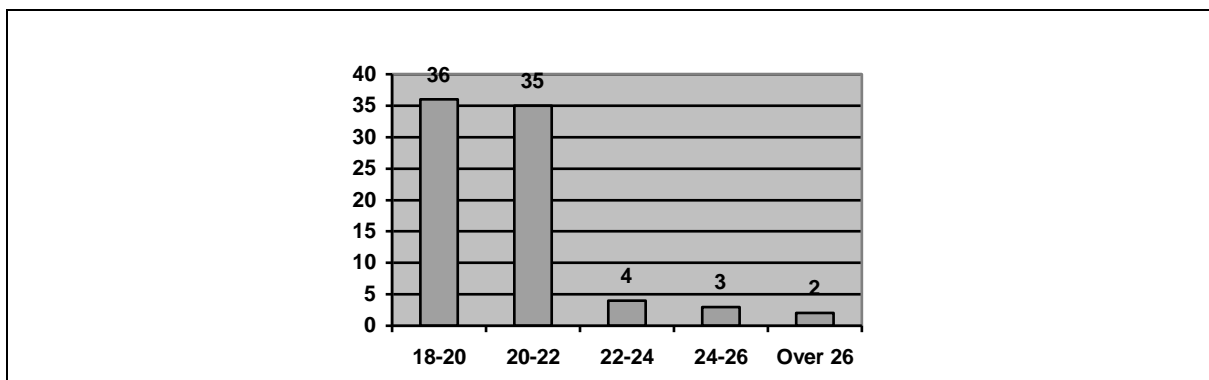


Figure 5.2 Respondents' age range

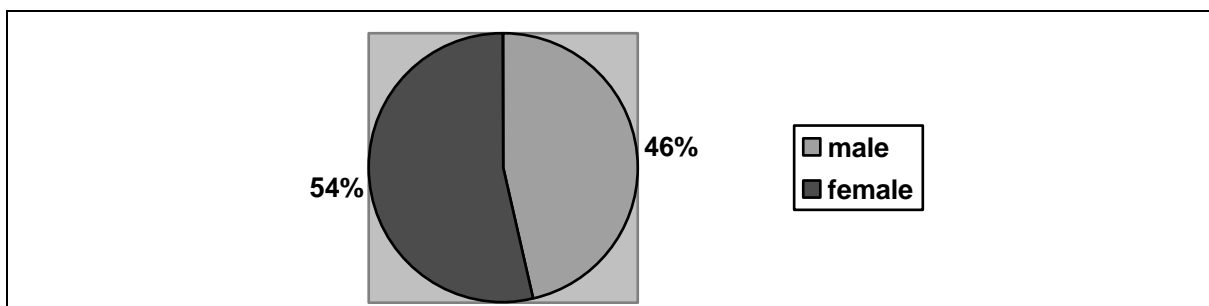


Figure 5.3 Respondents' gender

### 5.2.3.2 About the study

'About the study' section proposes to collect the learning behavior and the efficiency of existing learning materials used.

#### 5.2.3.2.1 Concentration on study

From the survey, it was found that more than half of total respondents could often concentrate on their study (sixty-one percent), twenty-one percent frequently and eighteen

percent seldom concentrate on study. Figure 5.4 illustrated the pie chart for respondent's concentration on study.

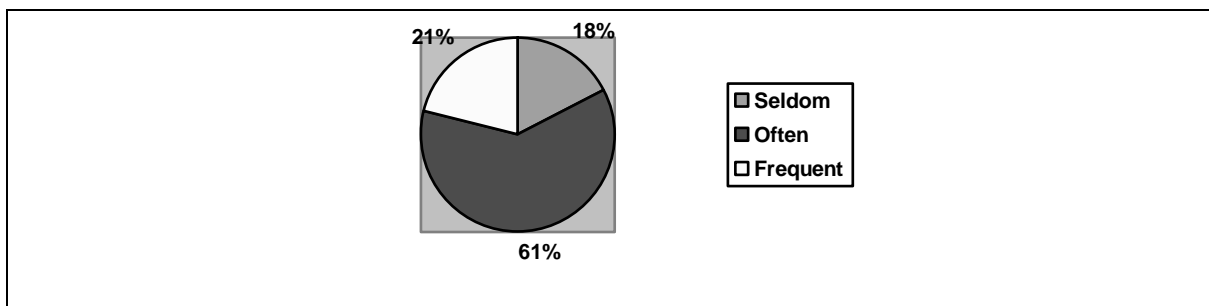


Figure 5.4 Respondents' concentration on study

### 5.2.3.2.2 Material used on study

Question four was related to the learning material usage. This question was a range of response question. The results showed that the respondents most frequently used the notes on what they study and most seldom used media such as video on what they studied. Using note was the first selection among the respondents because the contents of the notes were easier to understand and memorize than using other material. Figure 5.5 showed the learning material usage.

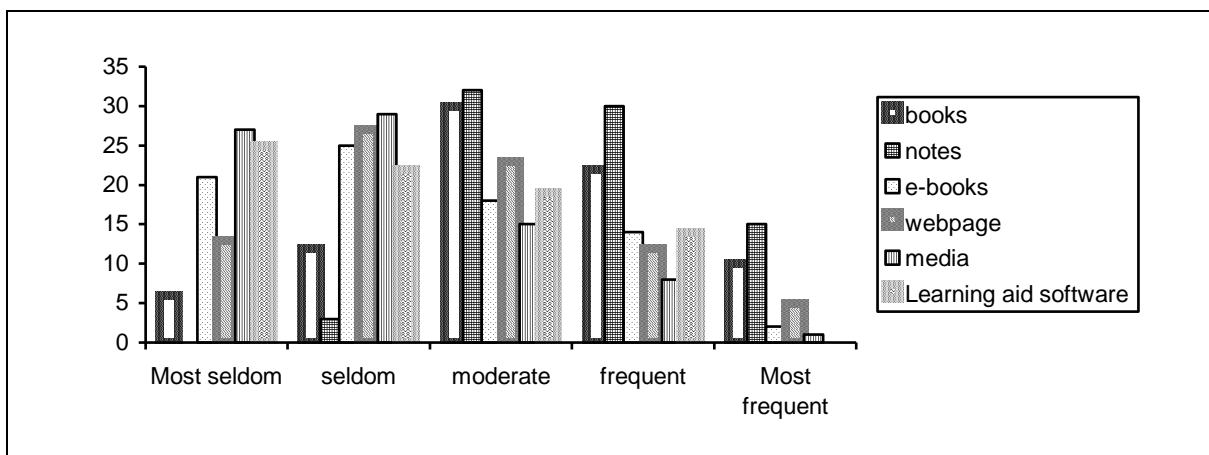


Figure 5.5 Learning material usage

Questions five were related to respondents taking notes during study. Question five was a multi selection question, respondents could select more than one answer from the

answers given. This question purposes to know the materials used to write down their important notes. As a result, sixty-two people answered they used blank paper to take notes, four answers notebook, twenty-five answers textbook, sixteen answer using softcopy and two people used the notes given by lecturers. Figure 5.6 illustrated the column chart for the materials used to write down the important notes.

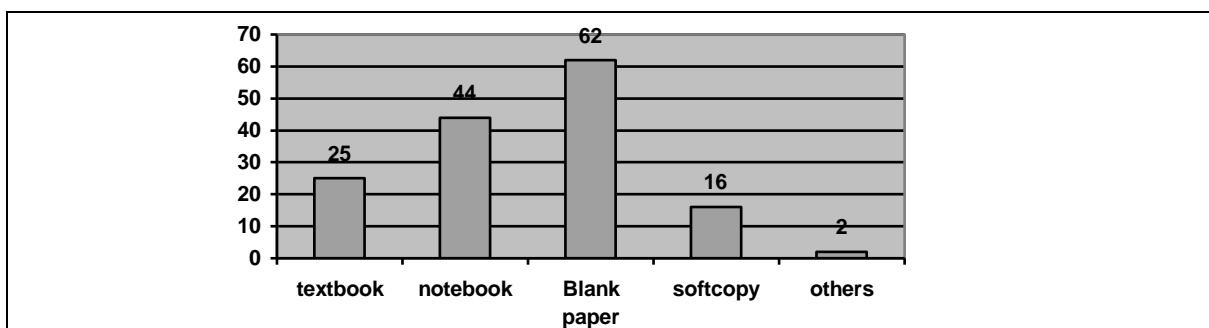


Figure 5.6 Materials used to write down the important notes

Questions twelve to fourteen relate to the ‘learning aid software’ that respondents currently used. Fifty-two percent of them currently used ‘learning aid software’ in their study while forty-eight percent did not. Seventy-four percent of them who currently used ‘learning aid software’ were moderately like to use it in their study and twenty-four percent liked to use it. The main reason of why the respondents did not prefer to use ‘learning aid software’ in their study was because there was a lack of learning aid software that is compatible to use in their study. Figure 5.7 illustrated the percentages of ‘learning aid software’ used. Figure 5.8 illustrated the percentages of respondents like to use ‘learning aid software’.

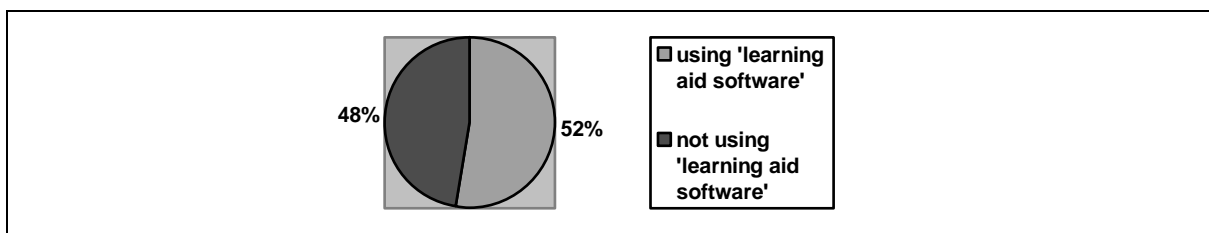


Figure 5.7 Percentages of ‘learning aid software’ used

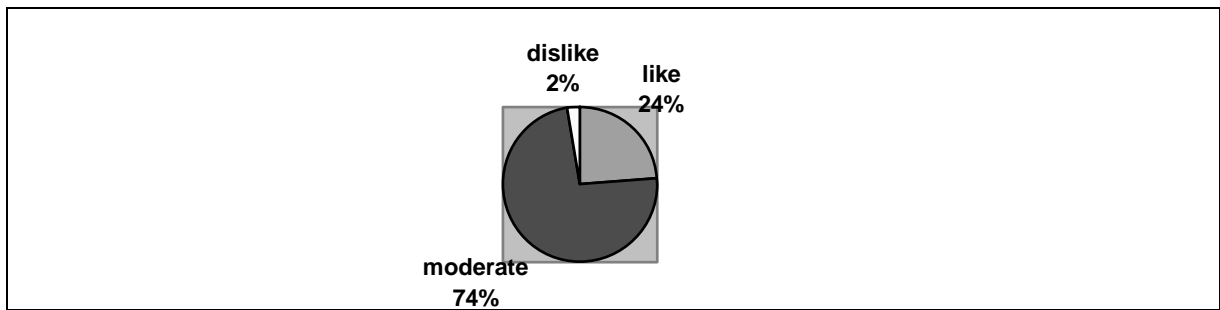


Figure 5.8 Percentages of respondents like to use 'learning aid software'

Question fifteen relates to the types of learning resource combinations that can cause respondents to study well. This was also a multi-selection question and respondents may select to answer one or more than one answer. Six selections of resources were provided for them to select, such as text, image, animation, sound, video and others. Fifteen people preferred to have the combinations of text, image, animation, sound and video. Ten people preferred to have the combinations of image, animation, sound and video. Nine people preferred to have the combinations of text, image and animation. Figure 5.9 illustrated the types of learning resource combinations and the numbers of respondents.

	Text - T	Image - I	Animation - A	Sound - S	Video - V	Others - O
1	T					
2	T,I					
3	T,I,A					
4	T,I,S					
5	T,I,A,S					
6	T,I,A,S,V					
7	T,I,A,V					
8	T,I,S,V					
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Figure 5.9 Types of learning resource combinations and the numbers of respondents



### 5.2.3.2.3 Learning behavior

Question six to seven relate to the behavior of taking notes among the respondent. Sixty-nine of eighty respondents highlighted the important text during study and sixty-six people of sixty-nine respondents answered that they highlighted the text because the text was important. Figure 5.10 illustrated the pie chart for the percentages of respondents highlighted important text. Figure 5.11 illustrated the part chart for the reasons of respondents highlighting the important text.

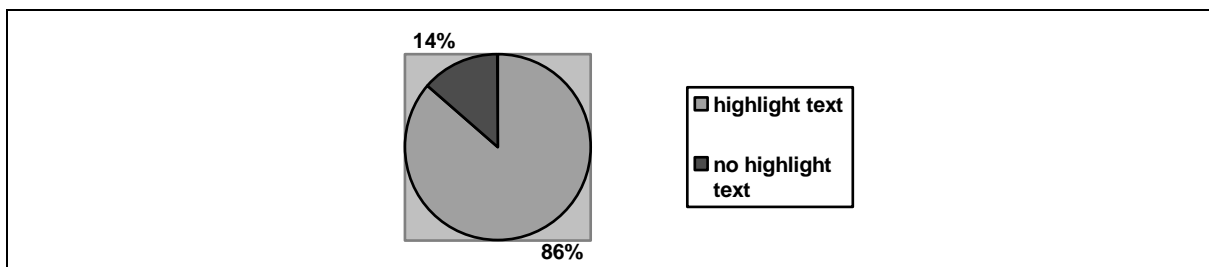


Figure 5.10 Percentages of respondents highlighting important text

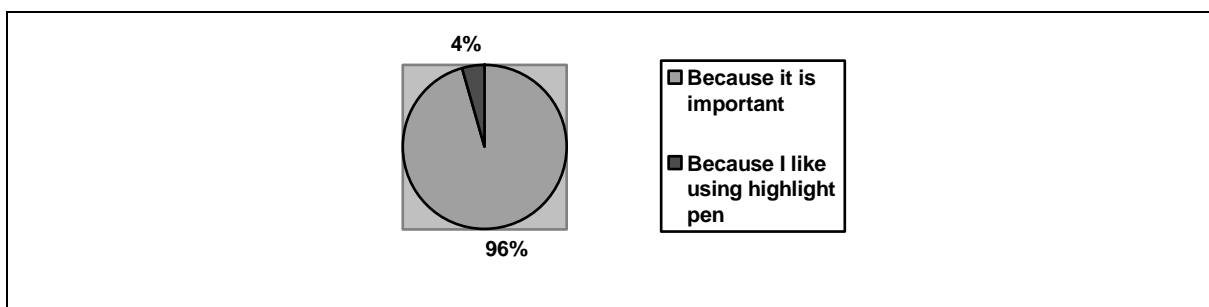


Figure 5.11 Reasons of respondents highlighting the important text

Question eight to nine relate to respondents understanding level during study. Thirty percent of them answered they definitely did not understand the text studied and all of them used memorized method to remember the important text. Figure 5.12 illustrated the percentages of respondents that understand what had studied. Figure 5.13 illustrated the percentages of respondents who did not understand the text and used memorized method in study.

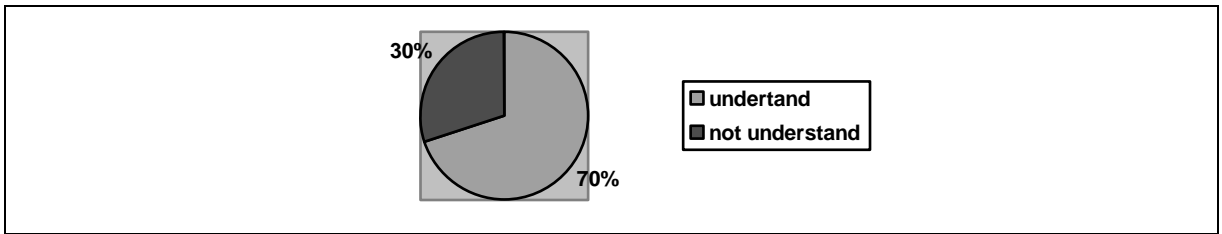


Figure 5.12 Percentages of respondents understand what had studied

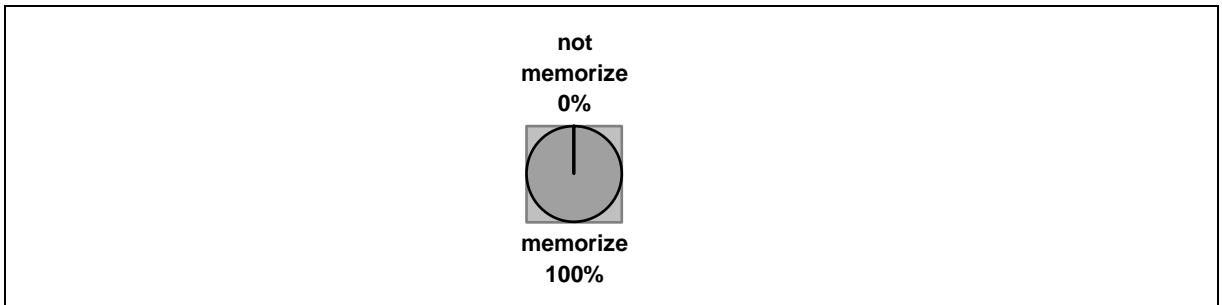


Figure 5.13 Percentages of respondents who did not understand the text and used memorized method in study

Question ten to eleven relate to file sharing or notes sharing within respondents and their friends. Fifty-nine percent of them prefer to share the notes using softcopy and forty-one percent prefer shared notes using hardcopy. Fifty-five percent respondents often shared notes using softcopy, thirty-two percent seldom and thirteen percent frequently. Figure 5.14 illustrated the percentages of notes sharing using softcopy and hardcopy. Figure 5.15 illustrated the frequency of notes sharing using softcopy.

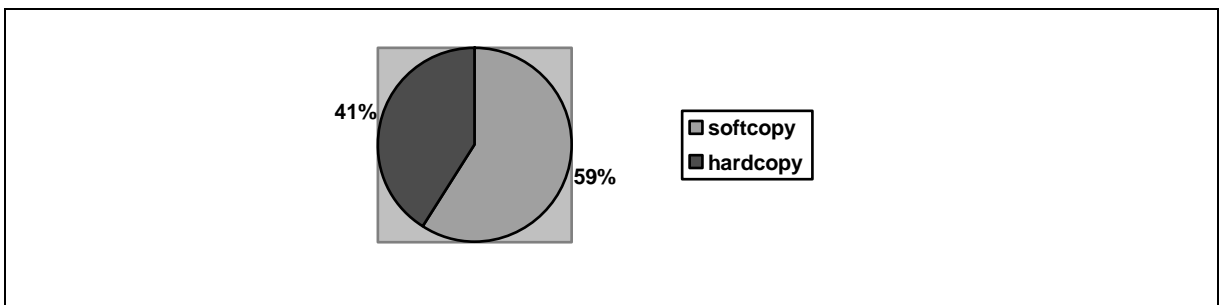


Figure 5.14 Percentages of notes sharing using softcopy and hardcopy

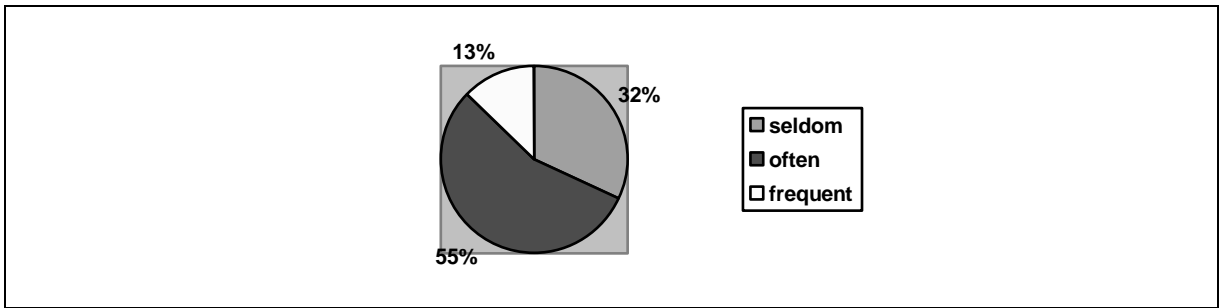


Figure 5.15 Frequency of notes sharing using softcopy

#### 5.2.3.2.4 Recommendation

‘Recommendation’ section purposes to collect the ideal features that respondents hope to include in the new system. This section only contained one multi-selection question that allowed respondents to select one or more than one answer. Fifty-six people hope that future ‘learning aid software’ shall allow user to take note. Fifty-two people wanted the learning contents could be updated from time to time.

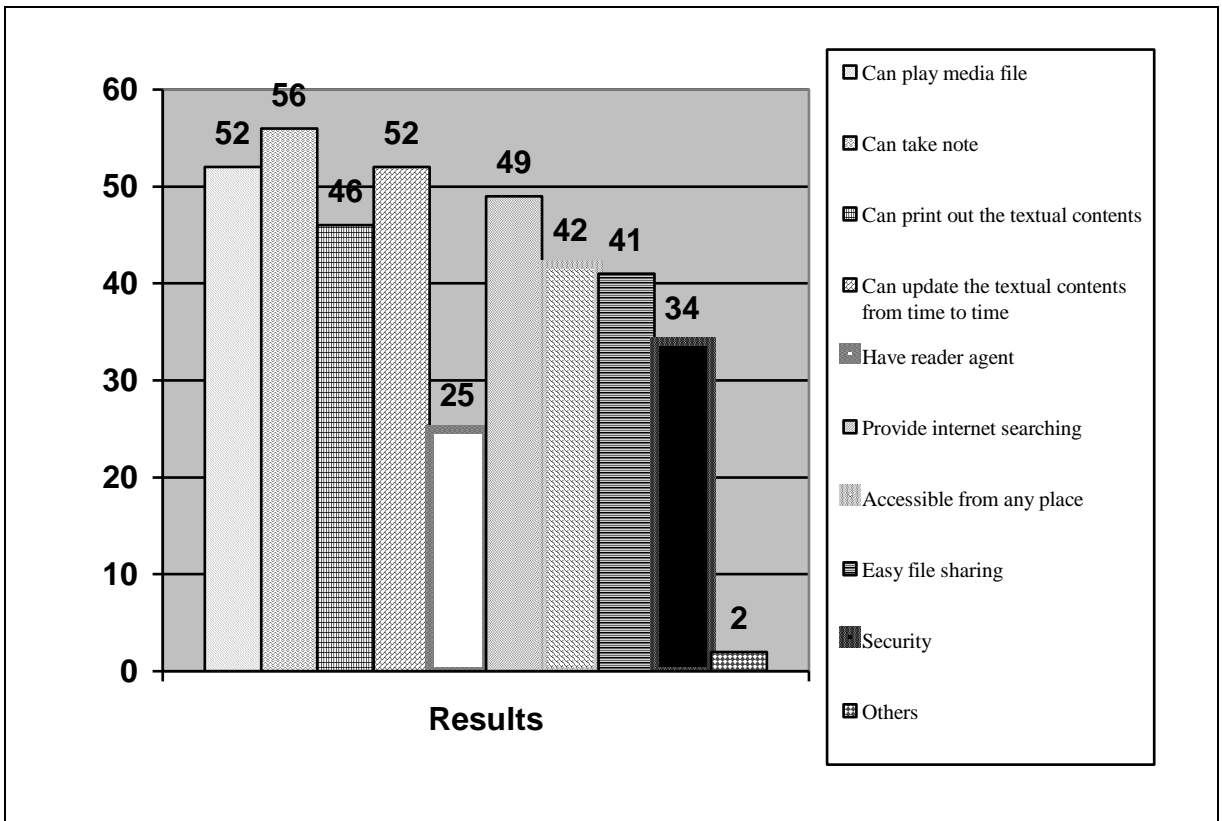


Figure 5.16 Suggested features and the numbers of people suggested

Fifty-two people suggested that the system could play media file and print out the textual text. Forty-nine suggested that the system shall provide Internet searching for keyword and others. Forty-one people suggested that the system could share the contents of learning easily. Forty-two people suggested that the system could access from any place. Twenty-five people suggested that the system had reader agent and Thirty-four people suggested that the system had its own security to avoid others people modifying their personal learning contents. Figure 5.16 illustrated the column chart for suggested features and the numbers of people suggested.

#### **5.2.4 Survey Conclusion**

As a conclusion to the survey, the results showed that the usage of learning aid software was lower than the usage rate of paper notes and books in study. Lack of learning aid software suitable for the certain subject was the main reason for this problem. Besides, notes and books it is easier for them to take down the important text by highlighting the text or writing down the extra notes. Base on the analysis results of the survey, learners prefer to study with a learning resource that includes text, images, animation, sound and video, which is a type of Learning Objects, integrated Learning Objects. Thus, learners also prefer the learning aid software that can take note, play media file and also update the contents from time to time.

### **5.3 Functional And Non-functional Requirements**

In order to meet the requirements of Learning Objects approach, LOOOP system has a list of functional requirements and non-functional requirements. Both requirements specified the needs of LOOOP to be completed by the end of the project.

### 5.3.1 Functional requirements

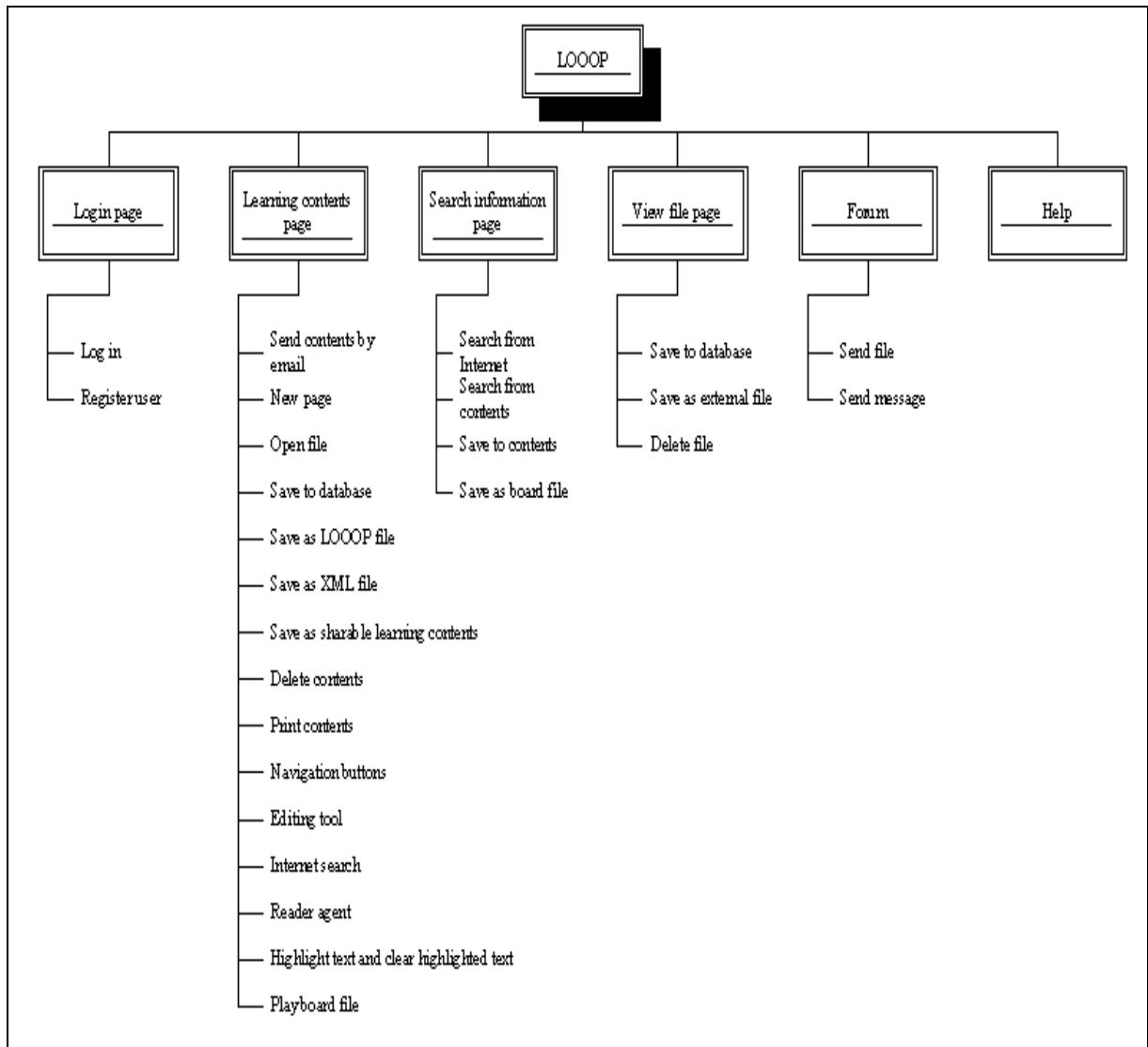


Figure 5.17 System design for LOOOP

Functional requirements is a requirement that specify a function that a system or system component performed. Figure 5.17 illustrated the system design for LOOOP. The system design described the features needed for LOOOP in a hierarchy chart. The overall LOOOP system has four main pages and two windows. The four main pages are login page, learning contents page, search information page and view file page. The two windows are forum window and help window.

The functions or features that include in login page are ‘log in user’ and ‘register user’. These two features are the main requirements for the system to recognize the users.

'Log in user' is the function for registered accessed again to the system. 'Register user' is the function for new user registering him or her to the system and enabling him or her to use the system in future.

Most of the required functions are included in learning contents page because this page deals with the learning contents editing. The 'search contents by email' is the function that write content into LOOOP language and sending it to other user using client mailing system, such as Microsoft Outlook. The 'new page' feature is the feature that allows user to add a blank page or a content of Learning Objects to his or her personal learning contents. The 'open page' feature allows user to open LOOOP language file, web page, XML file, supported picture file or supported multimedia file. Besides, learning content page also include four types of saving content function, such as save to database, save as LOOOP language file, save as XML file and save to sharable learning contents.

The page not only provides saved function, but also 'delete content' function. User is only able to delete the current viewed content in his or her personal learning contents. The 'print content' function also provides user to print out the hardcopy of the currently viewed content. 'Navigation buttons' is the function that provides user to navigate the content in his or her personal learning contents, including browse to first content, browse to previous content, browse to next content and browse to last content. 'Editing tool' provides user some content editing features such as cut, copy, paste, underline, bold, italic, hyperlink, find, undo and redo. 'Internet search' is a function that direct user to search information page and searched the result of selected text from the Internet. Reader agent is a function that provides a system reading on the currently view content. 'Highlight text' and 'clear highlighted text' are the functions that provide user highlighting the important text on currently viewed content or clearing the highlighted text to normal view. Lastly, the 'play board file' is the function that plays the associated file to each content.

There are four functions for search information page, including ‘search from Internet’, ‘search from contents’, ‘save to contents’ and ‘save as board file’. ‘Search from Internet’ is the function that search information from the Internet and ‘search from contents’ is the function that search information from the sharable learning contents. ‘Save to contents’ function is the function that saved the currently viewed web page to personal learning contents. ‘Save as board file’ is the function that saved non-web page file to personal learning contents.

View file page has three features, ‘save to database’, ‘save as external file’ and ‘delete file’. ‘Save to database’ is the function that saved currently viewed and modified file to database. ‘Save as external file’ is the function that saved the currently viewed file in their original format at user defined file location. ‘Delete file’ is the function that allows user to delete the currently viewed file. Finally is the forum window. The forum window contains two features, ‘send file’ and ‘send message’. ‘Send file’ is a function that allows user to send file to another online LOOOP registered user. ‘Send message’ is the function that allows user to leave a message to the forum.

### **5.3.2 Non-functional requirements**

Besides functional requirements, LOOOP system also has non-functional requirements. A non-functional requirement is a requirement that constrained design of a system, but did not describe the service provided. There are four main LOOOP non-functional requirements that are like the functional requirements for Learning Objects approach.

The first main LOOOP non-functional requirement is reusability. The learning contents are modularized into small chunks of instruction and saved into the database. The learning contents saved can be assemble and reassemble into other instructional context.

For example, the content with title 'Constants' for learning C programming subject can be used in learning VB programming subject.

The second main LOOOP non-functional requirement is interoperability. The Learning Objects that are placed in the database as records can be retrieved independently without LOOOP system. The Learning Objects can be retrieved either from the database or using other learning system that merged with LOOOP DLL file.

The third requirement is durability. The content of Learning Objects in LOOOP can always be modified to enable the content to be up to date and not unusable. Besides, the Learning Objects are saved into a database and can be retrieved by other system that develop in other programming languages. Because of the interopebility, the durability of the Learning Objects is increased.

The last main LOOOP non-functional requirement is accessibility. In LOOOP system, the database is placed on the client machine and also the server. For the database that is placed on the server, the Learning Objects can be retrieved and accessible with any client machine that had an Internet connection.

Besides the four main non-functional requirements, LOOOP system also needs other non-functional requirements, such as maintainability, reliability and efficiency. The ways of LOOOP needing the another three non-functional requirements are described as follow:

1. Maintainability

The maintenance of LOOOP refers to the learning content maintenance by user. User can modify, add or remove the personal learning contents from time to time.

2. Reliability

The sharable learning contents can be used in LOOOP on other client's computer. Besides, learning contents that are recorded in specific table on the database can ensure no mixed contents within multiple registered users learning contents.



### 3. Efficiency

The results of Internet searching are retrieved from Google.com. Google.com is known as a Internet leading search engine on Internet (THES, 2004).

## 5.4 System Requirements

System requirements are important in developing an application because it described the best environments for the application to run. A short list is shown in table 5.1. The following system requirements are best fitted for both server and client machine, unless server system requirement needs to have at least Internet Information Server to process.

Table 5.1 System requirements

<b>System</b>	<b>Description</b>
<b>OS</b>	Microsoft Windows 2000 or above
<b>CPU</b>	Intel 486, Pentium, or 100% compatible
<b>Memory</b>	8 MB RAM
<b>Disk Space</b>	At least 10 MB
<b>Monitor</b>	800x600 or higher resolution; 256 colors or above
<b>CD-ROM</b>	2x or faster for program installation using CD
<b>Internet</b>	Available.
<b>ActiveX</b>	Support
<b>Web Server (Server only)</b>	Internet Information Server (IIS 4.0) or higher

For best performance, users need to run this application under Microsoft Windows 2000 or above OS. The requirement for CPU is using an Intel 486 or 100% compatible CPU. LOOOP needs at least 8 MB RAM of memory and at least 10 MB hard disk space. A CD-ROM is required for LOOOP system installation using CD. Internet access is a must for users in order to get connected to the LOOOP socket for online version. Just because LOOOP itself is an ActiveX control and using several of ActiveX controls in development,

an operating system that can support various ActiveX controls is a must for running the application.

## **5.5 Application Used**

In LOOOP development, there are many applications used. Some are used for case study and some are used for software developments. The applications and its description are as follow:

1. Adobe Reader 5.0

This application is used for reading the Adobe PDF format file.

2. IconEdit32

This application is used for creating and modifying the icon file.

3. Microsoft Visual Basic 6.0

This application is used for developing ActiveX control and DLL file for LOOOP.

4. Microsoft Access 97

This application is used for creating and managing the database file.

5. Microsoft Internet Explorer

This application is used for reading the HTML file.

6. Microsoft Word 97

This application is used for creating, reading and managing relative information for LOOOP.

7. Microsoft Visio 2000

This application is used for drawing the ERD, DFD, contest diagram, process flow and Gantt Chart.

8. MindVision Installer VISE

This application is used for packaging LOOOP related files to installer.

## 9. Nero Burning Enterprise Edition

This application is used for installation CD creation.

### **5.6 Summary**

From the analysis, the Learning Objects technology is applied in LOOOP on the functions related with contents of Learning Objects modification and sharing including 'new page', 'open file', 'save to database', 'save as LOOOP file', 'save as XML file', 'save as sharable learning contents', 'search from contents', 'play board file', 'editing tool', 'send contents by email' and the function regards to learning style including 'highlight and clear highlighted text' and 'internet search'. On non-functional requirements, the Learning Objects technology is applied in reusability, interoperability, durability, accessibility, maintainability, reliability and efficiency.