

CHAPTER 6

SYSTEM DESIGN

6.0 Introduction

System design creates a blueprint for a new system that satisfies all the documented requirements that include functional requirements and non-functional requirements. During this stage, all necessary outputs, inputs, interfaces and processes are identified. The topics discussed in this chapter include the system architecture, process flow, entity relationship diagram, context diagram, data flow diagram, database design and graphical user interface design.

6.1 System Standard

In Section 2.1.8, there are several learning technology standards that have been discussed, such as SCORM, AICC and IMS. LOOOP system architecture is designed based on one of the described standards, SCORM. SCORM standard is selected because this standard is designed specifically for browser-based delivery of learning content. Figure 6.1 illustrates the LOOOP standard. On LOOOP, the learning content is retrieved on demand. Firstly, LOOOP user chooses a specific learning content from his or her learning contents list. After receiving the command, LOOOP system sends a command line that is written in LOOOP language to LOOOP socket that is placed on the server. The command line contains the instruction on what types of data that should be retrieved from the database and returns the appropriate data to LOOOP client system. Every single record from learning contents database is similar to SCO (Sharable Content Object) in SCORM. The records

will then be sent back in a package that is in LOOOP language to the LOOOP client system according to the command line or instruction that is sent to LOOOP socket earlier. LOOOP client system, which is a learning management system extracts the SCO from the package and displays the learning content to users.

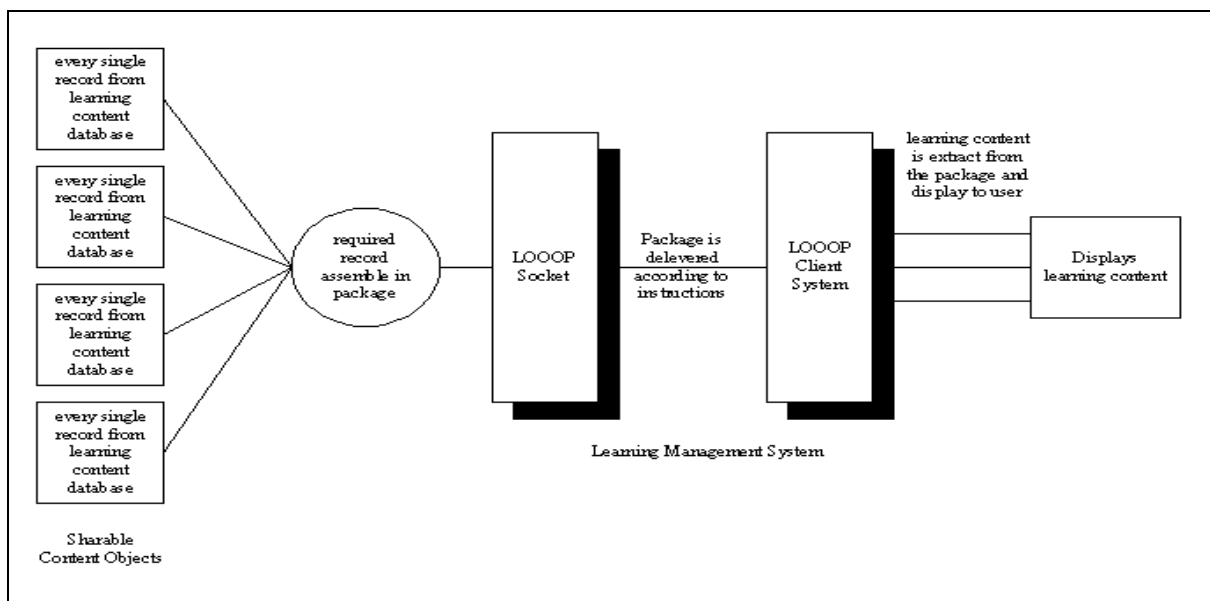


Figure 6.1 System Standard

6.2 System Architecture

Overall LOOOP system can be divided into two parts, the client-side and the server-side. The client-side application is the main operation system for LOOOP. The server-side application is a socket that purposes to receive required information passing from client-side application and then sends back the results to the client-side application. The server-side application is only operated when LOOOP registered users choose to save their learning contents online. Figure 6.2 illustrates the overall system architecture for LOOOP system.

In order to communicate with the online database that is located on the server, the required information that is sent to server-side application is SQL statement with a purposed statement and related data. After the server-side application performs the SQL

statement and retrieved the data from the online database, the results are then sends back to the client-side application. The required information is delivered to the server-side application and the results send back to client-side application are in LOOOP language, a language that is designed based on SCORM concept for used in LOOOP data passing. This language is similar to Extensible Markup Language (XML). The difference between both languages is the tag. For example, XML language use <CHAPTER> and LOOOP language use {|CHAPTER|}. Figure 6.3 illustrates the difference between XML and LOOOP language.

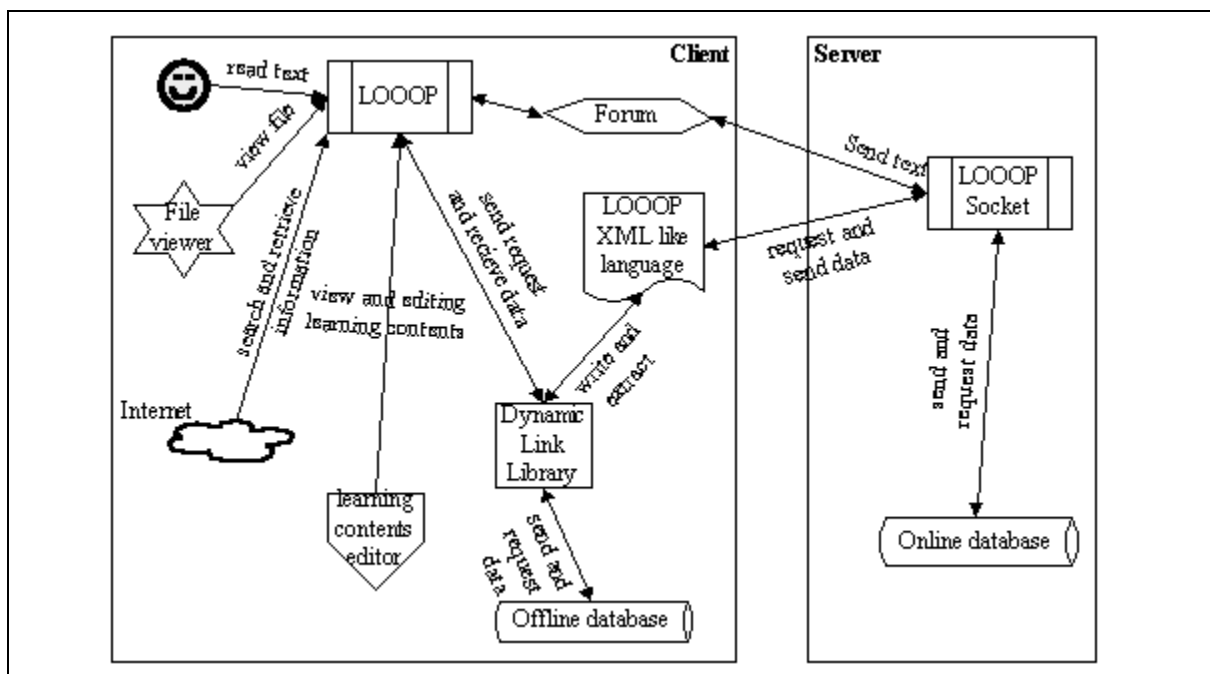


Figure 6.2 System Architecture

<u>XML</u>	<u>LOOOP language</u>
<?xml version='1.0' encoding='utf-8'?>	{ LOOOP }
<LOOOP>	{ LTITLE } Title { /LTITLE }
<LTITLE> Title </LTITLE>	{ LCONTENT } Learning content { /LCONTENT }
<LCONTENT> Learning Content </LCONTENT>	{ LNOTE } NOTE { /LNOTE }
<LNOTE> NOTE </LNOTE>	{ /LOOOP }
</LOOOP>	

Figure 6.3 Differential Between XML And LOOOP Language

As mentioned in earlier paragraph, client-side application is the main operation system for LOOOP. Besides performing as a client-server application, client-side

application also performs as a standalone application when LOOOP registered users choose not to save their learning contents online. An offline database that has the same data structure with the database on the server is installed in the client-side machine. The client-side application communicates with the offline database through a self-created DLL file. This DLL not only creates for communicate with LOOOP database only, but also for reusability and interoperability purpose. Learning Objects developers can communicate with the contents of Learning Objects place inside the database using this DLL file.

Besides DLL file, the system is developed as an ActiveX control. This has increased the reusability, interoperability and durability for the system. The ActiveX control can be merged and used with other applications or web pages. The accessibility of the system can also increase while the control is merged with the web page. In this project, the control is merged with the client-side application.

There are five main features tools in the client-side application. The five main features tools are learning contents editor, information searching agent, file viewing tool, reader agent and communication tool. Learning contents editor is a tool for viewing or editing the learning contents. This tool is developed using DHTML editing control. This ActiveX control is selected because this control allows HTML page editing where the learning contents are saved in HTML format.

Information searching agent is another feature tool for LOOOP, this agent extracts the search result page from GOOGLE.com and list out the records found on a tree view control. Besides searching information from Internet, this agent also searches keyword from the sharable contents of Learning Objects. File viewing tool is a simple tool that plays files. Currently, this tool is able to open six format types of files that include picture files (GIF, JPEG, BMP), multimedia files (WAV, AVI) and shockwave flash files (SWF). Two

ActiveX control has been used to play the files, included Shockwave Flash control and Windows Media Player control.

Reader agent is an agent used together with learning contents editor. This agent is used to read the text on learning contents. This agent is developed using another ActiveX control, Microsoft Voice Text control. Communication tool is a forum that is similar to chatting application found on the market, such as ICQ, mIRC and MSN Messenger. This tool is developed using Microsoft Winsock control. This communication tool is not designed for one-to-one conversation, every online users can read the sender message.

6.3 Process Flow

Although LOOOP system is a client-side application that needs a server for data processing, it can also be used without a server as a standalone application. There is a selection for user to choose either online database or offline database. Figure 6.4 illustrates the process flow for LOOOP. At the beginning, user is shown with LOOOP system login and register page. User is required to enter his or her registered user name and password for verification. If the details match with the records found in the database, the system retrieves the learning contents from his or her personal table on database. If the data entering does not match with any records in the database, the system informs and requests user to enter the correct user name and password or requests user to register again to the system.

For these new users, they are required to register themselves to the system. Registering of a new user is a must because the system needs to create a new table for him or her to record his or her personal learning contents. First, the system records the new user name and password that have been entered. A same user name is not allowed in this system because this can cause a conflict when creating a new table with the same table name and when retrieving learning contents. If the user name is found in the database, the system

informs the new user to enter a new user name. A list of registered user name can be viewed from the drop down list box for user name on log in frame. Next, the system guides new user to choose the available contents of sharable Learning Objects to add into their initial personal learning contents. Sharable Learning Objects are existing Learning Objects that have been created and to be shared among users. This operation is not compulsory because user can choose to add the contents in the future.

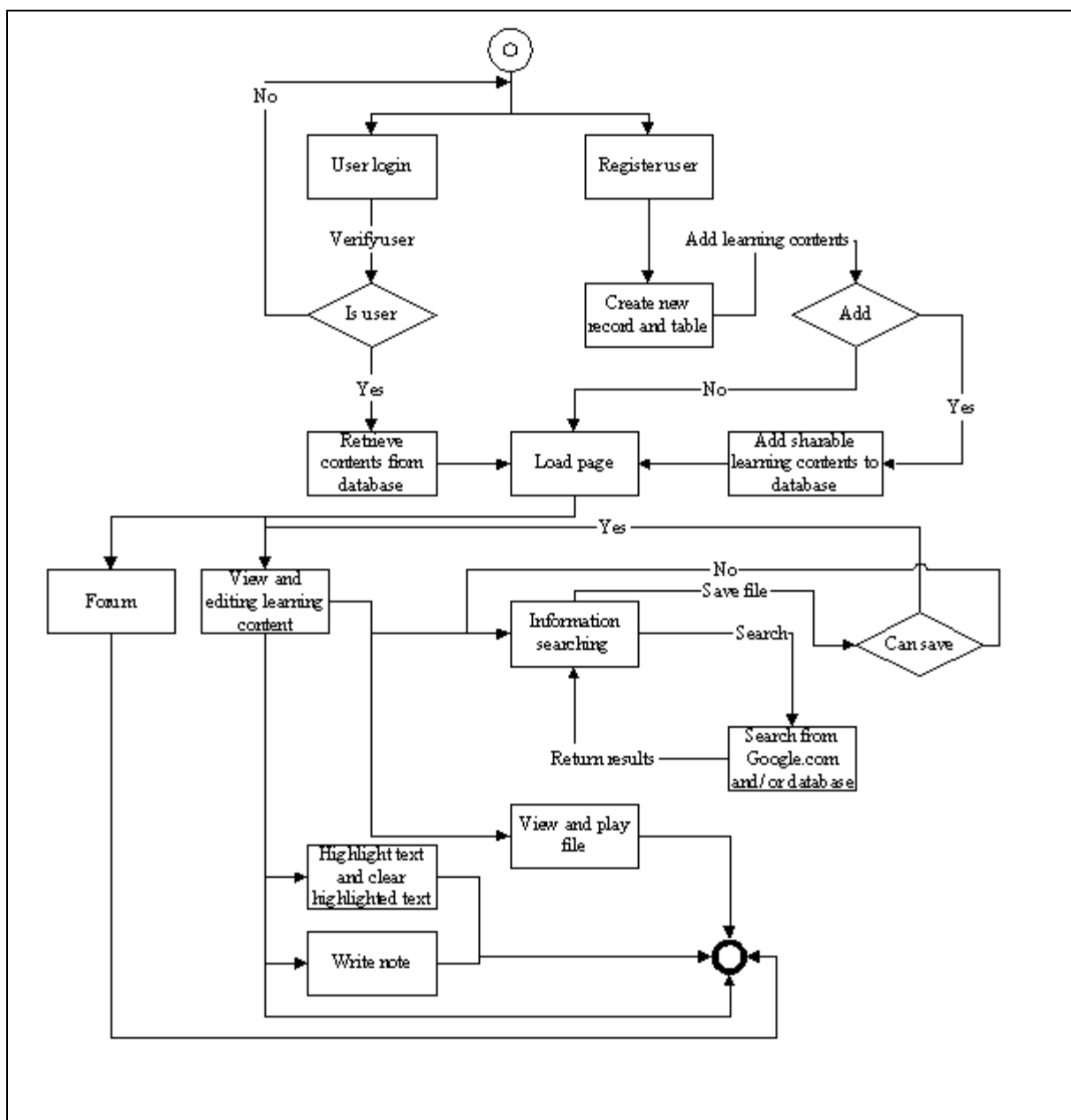


Figure 6.4 Process Flow

Generally, the process flow that uses Learning Objects begins after user successfully login to the system. Every time a user login to the system, the system retrieves the Learning Objects from user personal database and displays the content of Learning Objects on the screen. After the contents are successfully allocated on the screen, the Learning Objects is now ready to be modified or to be viewed. Besides, users are able to perform traditional learning styles such as highlighting the text and clear highlighted text, write notes and information searching via Google.com using the features tool that are provided in the system. Any changes will change the contents of currently viewed Learning Objects when it is saved. Thus, user can also create a new Learning Objects or shares the existing personal Learning Objects among registered users. Most of the functions provided are simple where system can execute directly, but still there are some that are complex, such as information searching, view and play file.

Once the users login themselves to the system, they are able to access to the forum for discussion. The forum will lists out the entire available online registered user. Besides having a discussion among users, users can also send file including the Learning Objects that are saved in LOOOP language file to any user in the forum. For information searching, user needs to give a term, word or phrase to the system. LOOOP retrieves the search page for the search term from Google.com and extract the first 30 results. The results are displayed to user in a list box with URL and its description. Besides, LOOOP also searches the keywords on sharable contents of Learning Objects that is saved in the database and displays the results to user. For durability purposes, user can save the information found in the system as their personal learning contents. Furthermore, Learning Objects can be a combination of text, image, animation and sound and video. For this purpose, a 'view and play file' process includes in the system for playing multimedia file or animation file and viewing image file that associates with Learning Objects. When a file is requested, LOOOP

retrieves the selected file data string from database and converts it into its original file type. The file is displayed on a provided file viewer.

6.3.1 How Learning Objects Are Applied In The System

In LOOOP, Learning Objects is saved as a single record in database. The database of the system acts as a Learning Objects repository. The database contains several tables including a single table for sharable Learning Objects. Sharable Learning Objects is the Learning Objects that can be shared by user and the contents of Learning Objects can only modify after another user saves it as his or her personal Learning Objects in his or her own table. Besides sharable Learning Objects, user can create a new Learning Objects using the system from blank or save from information searching. The Learning Objects in this system can be viewed and modified when it is retrieved from repository and its content showed to user. Besides, the animation file, multimedia file or image file associates with Learning Objects can also be played using the system. Thus, user can also perform some traditional learning styles such as highlighting text and jotting down notes on the currently viewed Learning Objects. The modification of the contents can be saved into the repository for future review.

6.4 Entity Relationship Diagram And Context Diagram

ERD is a diagram illustrating the relationship between two or more entities. Crow's foot notation, which is one of several types of cardinality notation, has been chosen to be used in this project to show relationships between entities (Gary, Thomas & Harry, 2001). Before defining the entities, the type of Learning Objects repository has been reviewed to decide which type of Learning Objects repository needs to be developed. In LOOOP, every

single record in a table is a Learning Objects and every single field in a table is the metadata for the Learning Objects.

Figure 6.5 illustrates the ERD design for LOOOP. LOOOP contains nine entities including user, sharable content, personal content, content picture file, board file, animation file, multimedia file, image file and last view chapter record. All these entities are separated as small chunks that has few attributes by table in database which means they are not arranged by chapter, but arranged by type of media or content.

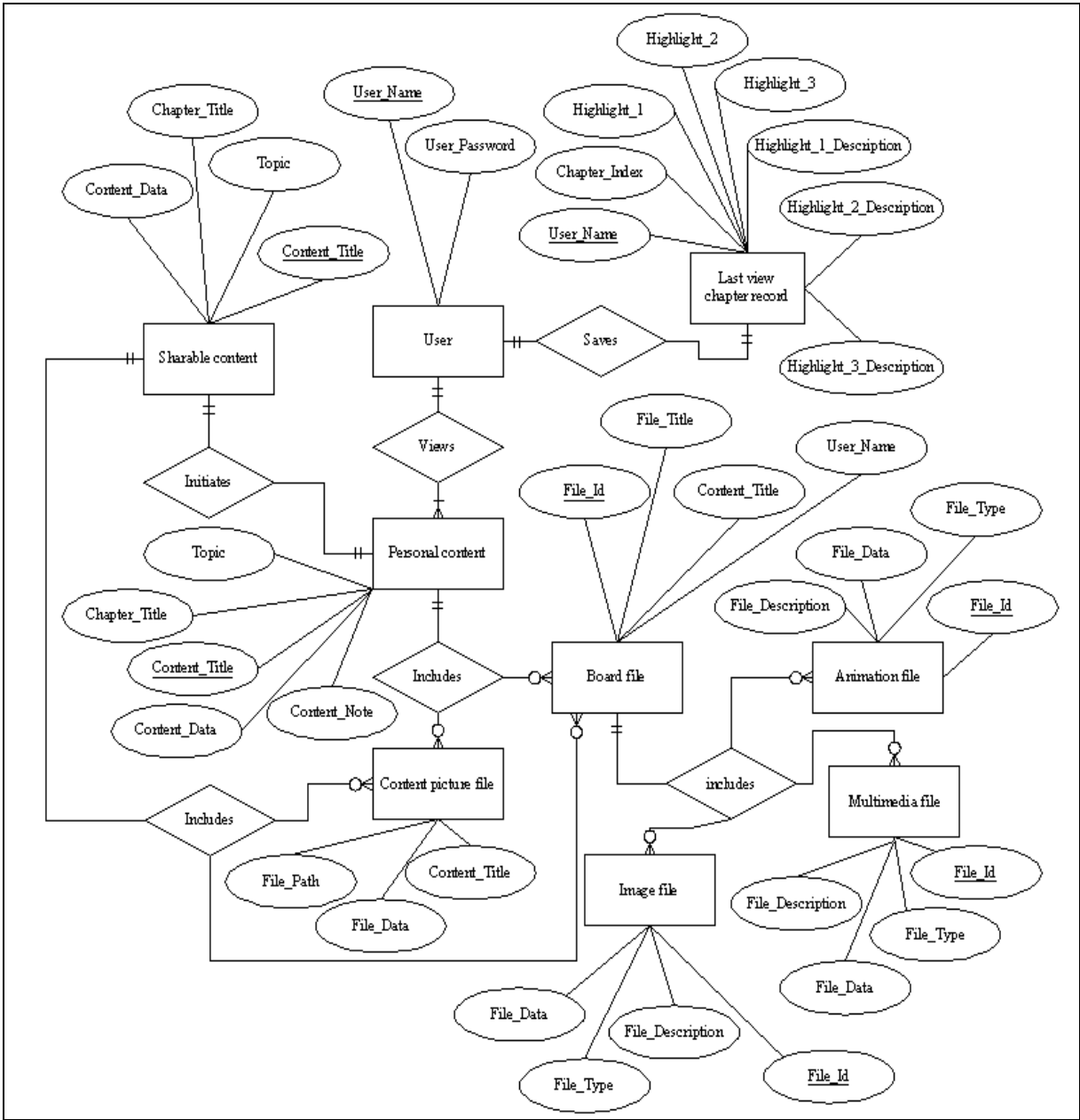


Figure 6.5 ERD For LOOOP

To form a complete ERD for LOOOP, the process flow that is described in Section 6.3 is reviewed. When a user log in to LOOOP, user can modify the record of the 'last view chapter record' at the same time. This is shown with the cardinality between user and last view chapter record is one to one. After user successfully log in to LOOOP, user is able to view one or more content from his or her personal content. The cardinality between user and personal content will be then one to many.

A page of content may be a plain text or has picture on it. The cardinality between personal content and content picture file is one to zero or many. The board file can also be attached with the page of content. The cardinality between personal content and board file is one to zero or many. Board file is a table that contains information for animation file, multimedia file and image file such as 'file_id'. As the description, a single record of board file can have either one of these three types of file. The cardinality between board file and animation file, multimedia file and image file is one to zero or many. At last, the cardinality between personal content and sharable content is one to one because no duplicated title for contents are allowed in record. As an information, sharable content is the entity that contains Learning Objects that is shared and can only be modify after save to personal content.

Context diagram is a simple top-level diagram that has only one process that represents the entire system and shows the relation to system environment (Gary, Thomas & Harry, 2001). In order to represent the entire system, Yourdon symbol set is chosen to be use in this project. Figure 6.6 illustrates the context diagram for LOOOP. In this diagram, there are three entities Learner, Google.com and LOOOP Socket and one process LOOOP.

This context diagram is drawn with the assumption that a learner is using online database to save their learning contents. For the learner who is using standalone application and not connected to Internet access, entity Google.com and entity LOOOP Socket are

eliminated because LOOOP needs Internet connection to access to the entity Google.com and LOOOP Socket. For a learner who is using standalone application and connects to Internet, only entity LOOOP Socket is eliminated because the learning contents is saved in the learner's computer.

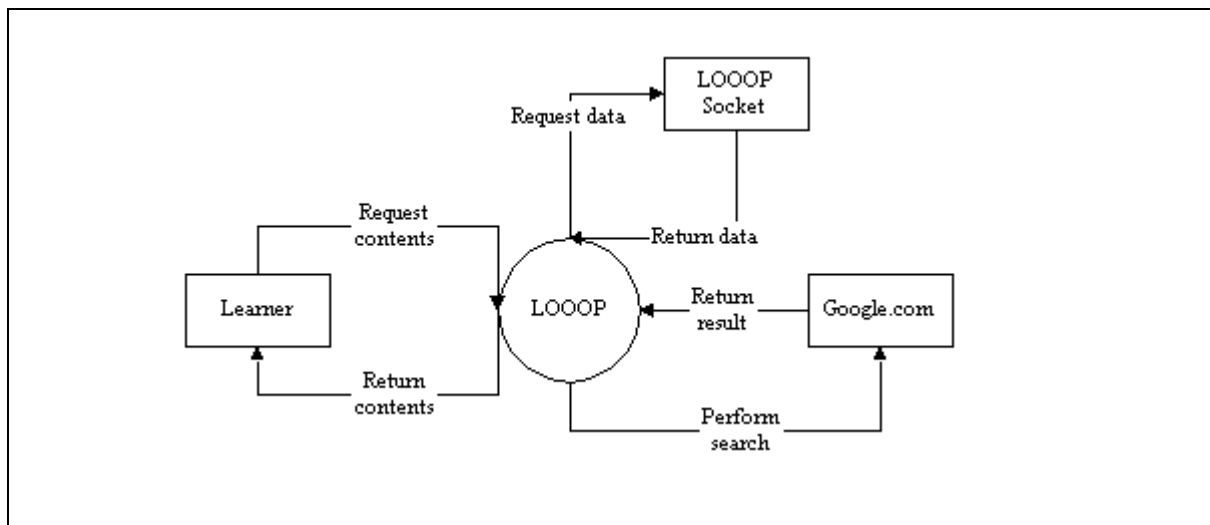


Figure 6.6 Context Diagram For LOOOP

First, learner requests learning contents from LOOOP. LOOOP receives the command and sends the requested message to LOOOP Socket that is located on the server in LOOOP language. LOOOP Socket retrieves the related data from database and returns the results to LOOOP in LOOOP language. The results that are in LOOOP language are extracted before being displayed to the learner on LOOOP. For information searching, LOOOP sends the terms to Google.com and retrieves the result page from Google.com. The result page is extracted for getting the records URL and descriptions. The URL and descriptions are displayed to the learner through LOOOP.

6.5 Data Flow Diagram

A data flow diagram (DFD) shows how data moves through an information system and represents a logical model that shows how the system is done. Context diagram is one

of the data flow diagrams. By zooming in context diagram, a diagram that shows major processes, data flows, and data stores is drawn. This diagram is called diagram 0 (Gary, Thomas & Harry, 2001). Figure 6.7 illustrates the diagram 0 for LOOOP.

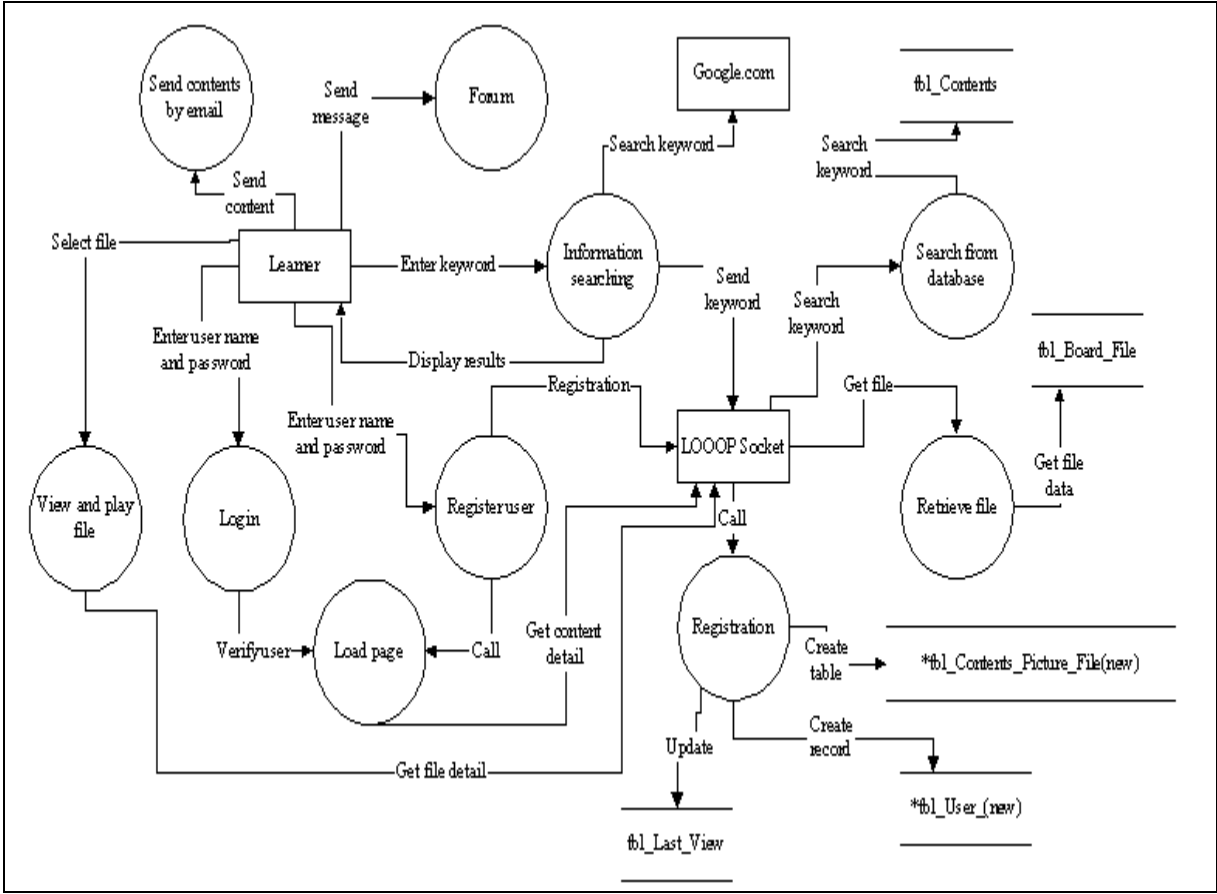


Figure 6.7 Diagram 0 For LOOOP

As in the Figure 6.7, the learner is a starting point. The process login and process register user are first process when the system starts executing, depending on whether the learner is an existing user or new user. For existing user, the learner enters the user name and password. The load page process is called after the login process verifies the user name and whether the password is valid. For a new user, the learner enters a new user name and password to register to the system. The register user process is executed and then sent the user name and password to entity LOOOP Socket for registration. In the registration process, table `tbl_User_(New)` and `tbl_Contents_Picture_File_(New)` are created. Besides,

a new record is also created in table tbl_Register_User. The '(New)' is a changeable word depending on the new user name that has been saved. For example, a new table for the user who is named 'Richard' is 'tbl_User_Richard'. After this, the load page process begins.

For information searching, learner needs to key in a keyword. Information searching process is called to send the keyword to entity Google.com and also entity LOOOP Socket for the process search from database. Process search from database searches the keyword from the table tbl_Contents, which is a table that saves all the sharable learning contents.

To view and play file, learner needs to select a file. The process view and play file is called to get the file data and information from the database through entity LOOOP Socket. The 'sent contents by email' process is called when a learner needs to send his or her personal learning content to his or her friend. Lastly is the forum process. This process is called when sending a message to the forum.

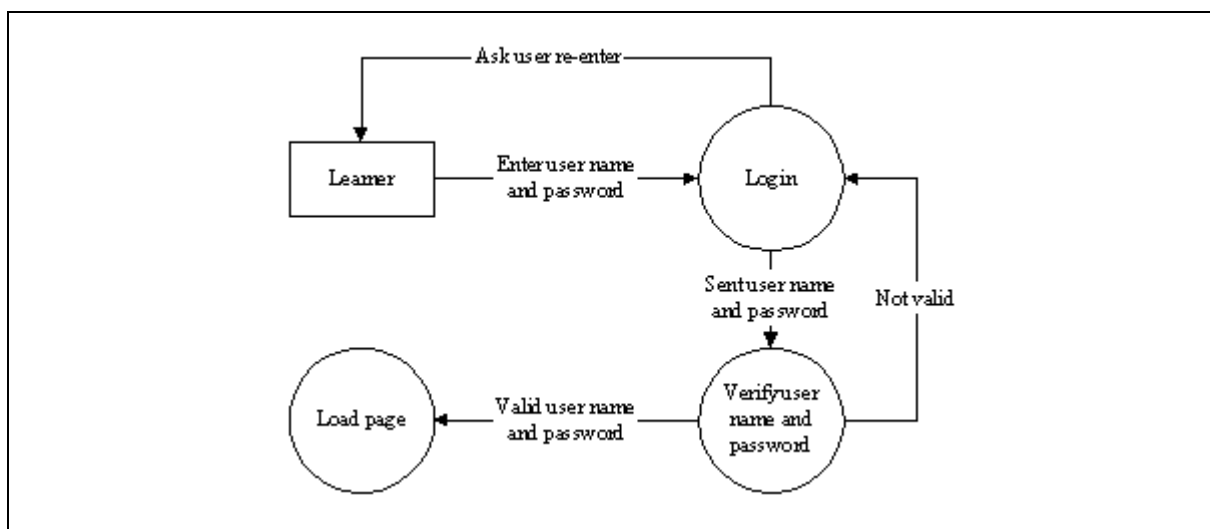


Figure 6.8 Diagram 1 DFD For Login

Figure 6.8 shows the diagram 1 for login. First, a learner enters his or her user name and password to the system. The login process calls the verify user name and password process to check the validity of the user name and password that have been entered. If the

information is not valid, login process requests the learner to reenter the user name and password. If the information is valid, then the load page process is called.

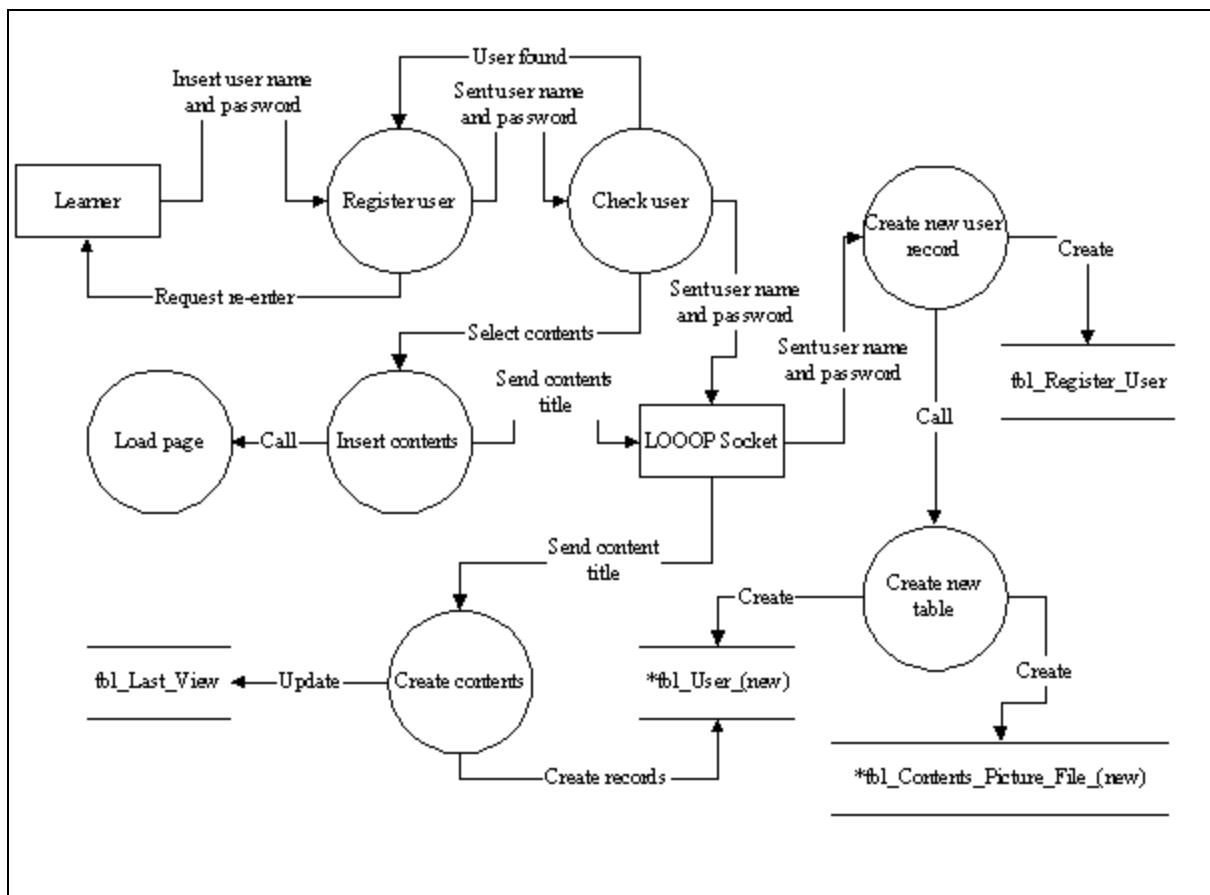


Figure 6.9 Diagram 1 DFD For Register User

Figure 6.9 illustrates the diagram 1 for the register user. First, a learner enters the user name and password to the system. The check user process is called to check whether the user name that has been entered is found in the registered user list. If a record is found, the system requests the learner to enter another user name. If the user name cannot be found, the system sends the user name and password to entity LOOOP Socket to save it in the table `tbl_Register_User`. At the same time, create new table process is called to create a `tbl_Contents_Picture_File_(new)` table and create a `tbl_User_(new)` table. On the system side, the learner is guided to insert contents process. If the learner selects to insert the available sharable learning contents as his or her personal learning contents, then insert contents process sends the selected contents title to entity LOOOP Socket. The create

contents process is called to create the learning contents record on table tbl_User_(new) and updates the tbl_Last_View. After that, the load page process is called.

Figure 6.10 illustrates the diagram 1 DFD for load page. Load page process is called after the login process or register user process. This process sends the content title to entity LOOOP Socket for retrieving the learning content, note and the associated files. The process retrieve learning content is called to retrieve the learning content from table tbl_User_(new). The process retrieve file is called to retrieve the file data and information from table tbl_Board_File and table tbl_Contents_Picture_File_(new). Besides, the update record process is also called to update the table tbl_Last_View.

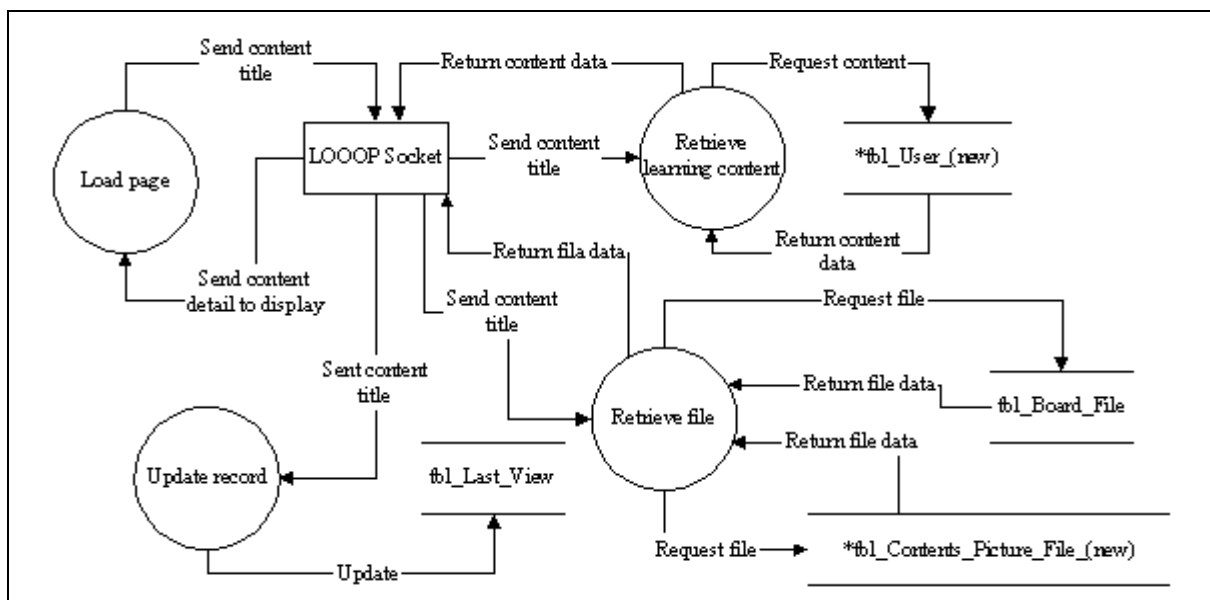


Figure 6.10 Diagram 1 DFD For Load Page

Figure 6.11 illustrates the diagram 1 DFD for view and play file. First, a learner selects a file from the files listed box. The system sends the file information to LOOOP Socket. LOOOP Socket will then extract the LOOOP language and get the 'file_id'. The file detail and data are sent back to view and play file process after LOOOP Socket performs a search file process and retrieves the file details from the table 'tbl_Animation_File', 'tbl_Multimedia_File' and 'tbl_Image_File' in database. To avoid duplication of 'file_id' in these three table, the 'file_id' follows the 'file_id' that is created

on 'tbl_Board_File'. The file data is sent to a process called convert string to file. The process converts the file from string to its original format before displaying to the learner. The file is saved in string format in the database.

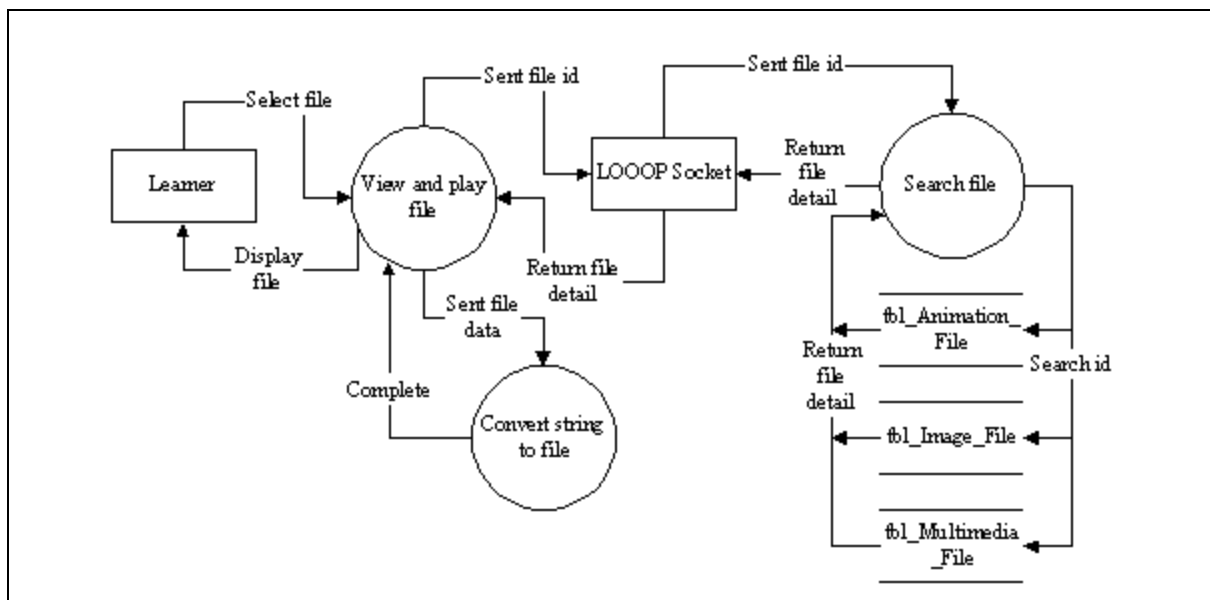


Figure 6.11 Diagram 1 DFD For View And Play File

Figure 6.12 illustrates the diagram 1 DFD for forum. First, a learner types and sends the message to process forum. This process sends the message to LOOP Socket. After LOOP Socket searches for all available online learners' IP address, the message is sent to all online learners according to their location.

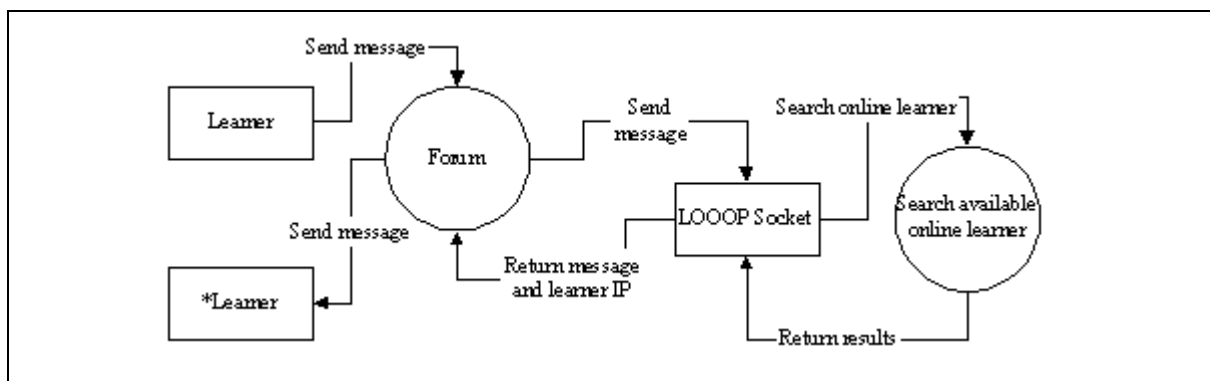


Figure 6.12 Diagram 1 DFD For Forum

Figure 6.13 illustrates the diagram 1 DFD for information searching. First, a learner needs to enter a keyword, word or phrase to perform a search. The system sends the keyword to Google.com and retrieves the result page. The result page is passed through a

process that is called extract HTML page process to get the entire records URL and descriptions and is shown to the learner. At the same time, the system also sends the keyword to a process that is called search from database. This process sends the keyword to the LOOOP Socket. A search match word process is called to search the matched word from the sharable learning contents table and the results returns to the LOOOP Socket. LOOOP Socket sends back the results and lists out the related learning content title to the learner.

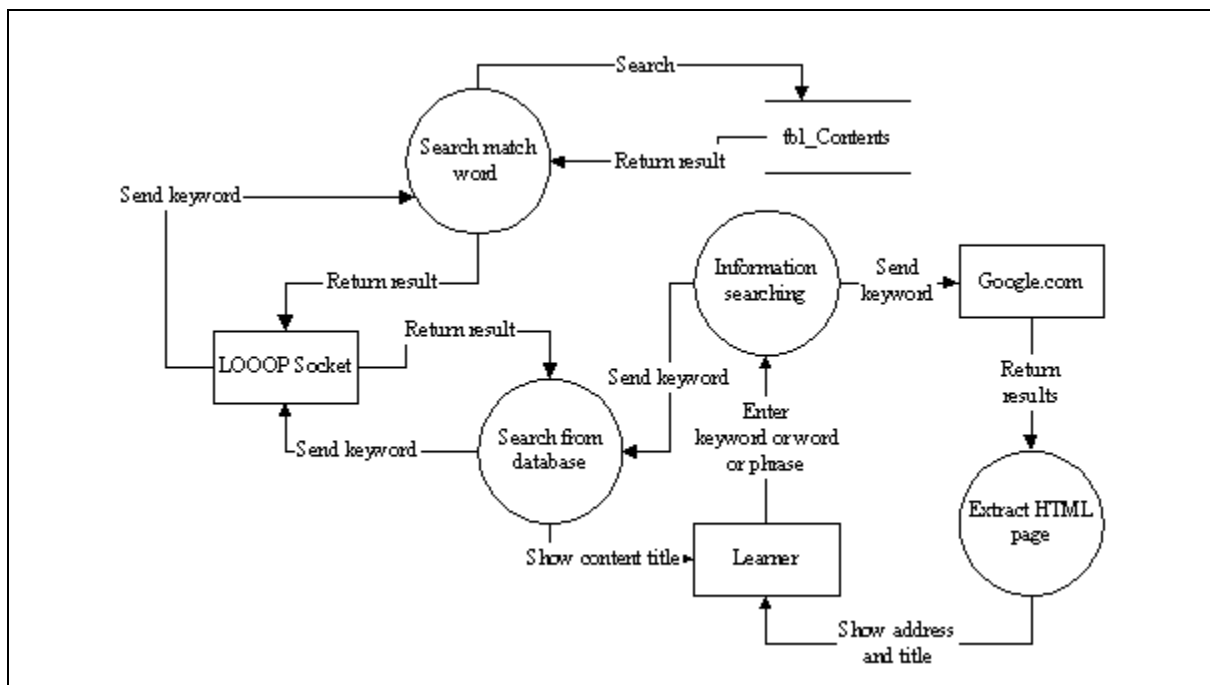


Figure 6.13 Diagram 1 DFD For Information Searching

Figure 6.14 shows the diagram 1 DFD for send learning contents by e-mail. This is a simple process in LOOOP. When learner clicks on the send email button, the button sends a command to the system to write the current displayed learning content and note to LOOOP language file. The file is sent as attachment on the email and sends to the recipient. The sending email process requires user configures his or her client's mailing system, such as Microsoft Outlook.

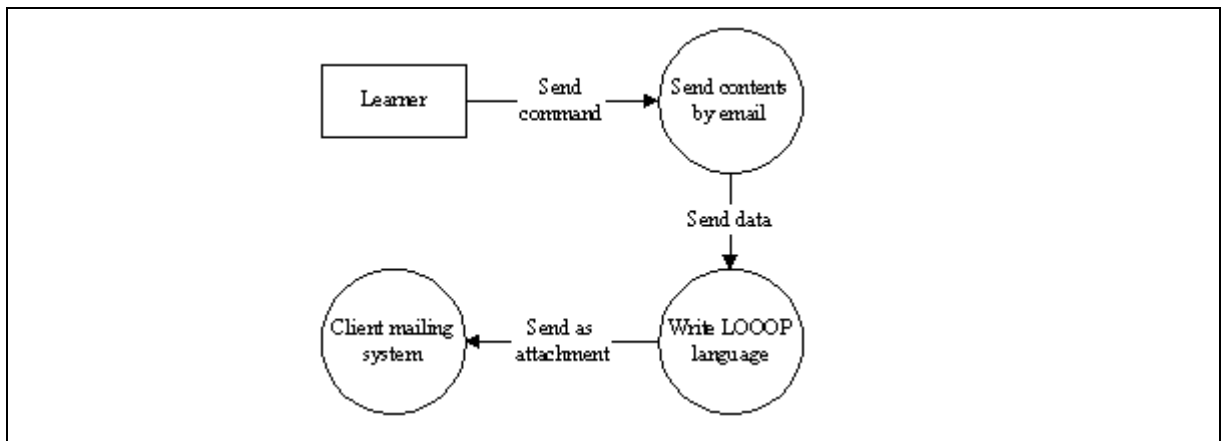


Figure 6.14 Diagram 1 DFD For Sent Learning Contents By E-mail

6.6 Database Design

Database and metadata are important components in LOOOP. A database is a carefully organized set of data stores on a computer and is managed by a special application calls database management system (DBMS) (William, 2000). A metadata is data that provides information about, or documentation of other data that is managed within an application or environment. In this project, the metadata is the field name of every created table in the database. For example, the metadata for table `tbl_Register_User` are `User_Name` and `User_Password`.

There are several tables in LOOOP database, such as `tbl_Register_User`, `tbl_Contents`, `tbl_Board_File`, `tbl_Animation_File`, `tbl_Multimedia_File`, `tbl_Image_File`, `tbl_Contents_Picture_File`, `tbl_Last_View`, user defined table `tbl_User_(new)` and `tbl_Contents_Picture_File_(new)`. Table 6.1 shows the details for table ‘`tbl_Board_File`’. Table ‘`tbl_Board_File`’ is used to record the external file such as animation file, multimedia file and image file id and information.

Table 6.1 Details For Table tbl_Board_File

Table: tbl_Board_File			
Field name	Key	Data type	Description
File_Id	Primary	Autonumber	Number of file.
File_Title		Text	Title of the file.
User_Name		Text	The user name that current file belong to.
Content_Title		Text	The chapter that current file belong to.

Table 6.2 shows the details for table ‘tbl_Contents’. Table ‘tbl_Contents’ is used to record the sharable learning contents or contents of Learning Objects, such as content title, chapter title and contents.

Table 6.2 Details For Table tbl_Contents

Table: tbl_Contents			
Field name	Key	Data type	Description
Topic		Memo	Topic for current chapter.
Chapter_Title		Memo	Chapter title.
Content_Title		Memo	Content title.
Content_Data		Memo	Chapter contents.

User defined table ‘tbl_User_(new)’ and ‘tbl_Contents_Picture_File_(new)’ are created while a new user registered to the system. Table 6.3 shows the details for table ‘tbl_User_New’. Table ‘tbl_User_(new)’ is used to record user personal learning contents. This table is an instance for table ‘tbl_Contents’.

Table 6.3 Details For Table tbl_User_New

Table: *tbl_User_New			
Field name	Key	Data type	Description
Topic		Memo	Topic for current chapter.
Chapter_Title		Memo	Chapter title.
Content_Title		Memo	Content title.
Content_Data		Memo	Chapter contents.
Content_Note		Memo	Content note.

Table 6.4 shows the details for table ‘tbl_Contents_Picture_File’ and table 6.5 shows the details for table ‘tbl_Contents_Picture_File_(new)’. Table

‘tbl_Contents_Picture_File_(new)’ is used to record the picture file that is found in the learning content page. This table is an instance for table ‘tbl_Contents_Picture_File’. The ‘(new)’ is renamed with user name while a new user register to the system. The number of user defined table are increased when a new user is registered.

Table 6.4 Details For Table tbl_Contents_Picture_File

Table: tbl_Contents_Picture_File			
Field name	Key	Data type	Description
File_Path		Text	File path and file name.
File_Data		Memo	File data that had been converted to string.
Chapter_Title		Memo	The chapter that current file belong to.

Table 6.5 Details For Table tbl_Contents_Picture_File_new

Table: **tbl_Contents_Picture_File_new			
Field name	Key	Data type	Description
File_Path		Text	File path and file name.
File_Data		Memo	File data that had been converted to string.
Chapter_Title		Memo	The chapter that current file belong to.

Table 6.6 shows the details for table ‘tbl_Register_User’. Table ‘tbl_Register_User’ is used to record those registered users details.

Table 6.6 Details For Table_Register_User

Table: tbl_Register_User			
Field name	Key	Data type	Description
User_Name	Primary	Text	User name (Only unique user name is allowed to be create).
User_Password		Text	User defined password.

Table 6.7 shows the details for table ‘tbl_Last_View’. Table ‘tbl_Last_View’ is used to record the chapter that user last view and other information.

Table 6.7 Details For Table tbl_Last_View

Table: tbl_Last_View			
Field name	Key	Data type	Description
User_Name		Text	User name that current record belong to.
Chapter_Index		Text	Last content view index. (tree-view node index)
Highlight_1		Text	First highlight color.
Highlight_2		Text	Second highlight color.
Highlight_3		Text	Third highlight color.
Highlight_1_Description		Text	First highlight color description.
Highlight_2_Description		Text	Second highlight color description.
Highlight_3_Description		Text	Third highlight color description.

Table 6.8 shows the details for table ‘tbl_Animation_File’. Table ‘tbl_Animation_File’ is used to record the file data of animation file.

Table 6.8 Details For Table tbl_Animation_File

Table: tbl_Animation_File			
Field name	Key	Data type	Description
File_Id	Primary	Autonumber	Number of file.
File_Description		Memo	Description of the file.
File_Type		Text	File type.
File_Data		Memo	File data that had been converted to string.

Table 6.9 shows the details for table ‘tbl_Multimedia_File’. Table ‘tbl_Multimedia_File’ is used to record the file data of multimedia file such as video file and audio file.

Table 6.9 Details For Table tbl_Multimedia_File

Table: tbl_Multimedia_File			
Field name	Key	Data type	Description
File_Id	Primary	Autonumber	Number of file.
File_Description		Memo	Description of the file.
File_Type		Text	File type.
File_Data		Memo	File data that had been converted to string.

Table 6.10 shows the details for table ‘tbl_Image_File’. Table ‘tbl_Image_File’ is used to record the additional image file data that associates with the Learning Objects.

Table 6.10 Details For Table tbl_Image_File

Table: tbl_Image_File			
Field name	Key	Data type	Description
File_Id	Primary	Autonumber	Number of file.
File_Description		Memo	Description of the file.
File_Type		Text	File type.
File_Data		Memo	File data that had been converted to string.

Figure 6.15 illustrates the relationship between each table.

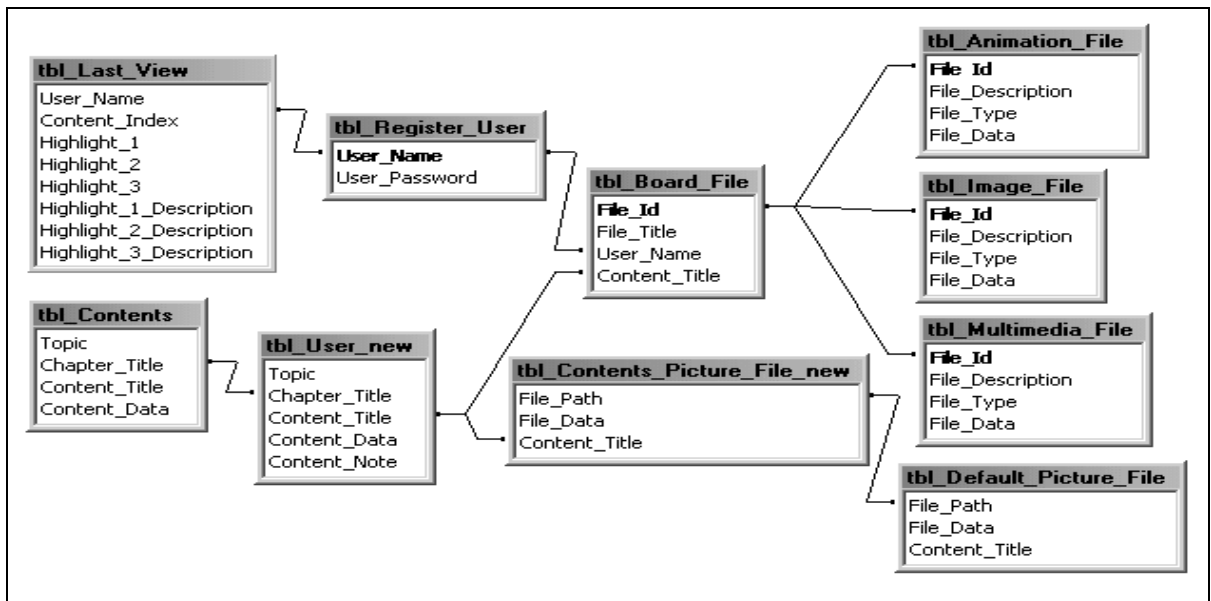


Figure 6.15 Relationship Between Each Table

6.7 Graphical User Interface Design

LOOP graphical user interface (GUI) is the place where the system interacts with the learner. LOOP GUI is designed with WIMP (Window, Icon, Menu and Pointer) interface based on the template shows in Figure 6.16, Figure 6.17 and Figure 6.18.

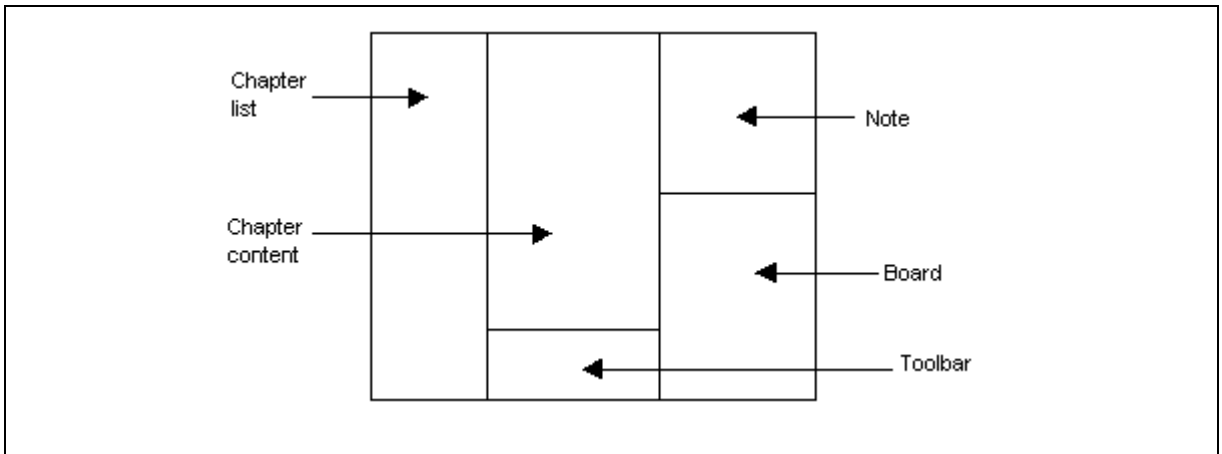


Figure 6.16 GUI Template For Learning Contents Page

Figure 6.16 illustrates the GUI template for learning contents page. There are five parts that are drawn in this template, such as chapter list, chapter content, toolbar, note and board. The chapter list is the list of all the content title in learner personal learning contents. The chapter content is the displayed content page. Toolbar is the editing tool for learning contents page. Note is an additional note that is written by user. Board is the list of external file that associates with the current content.

Figure 6.17 illustrates the GUI template for search information page. There are three parts drawn in this template, such as keyword input box, result list and web page. The keyword input box is the place for user key in the term, phrase or keywords that is needed to search. The result list is the list of all records found including search from database or Internet. The web page is the place to display the selected result page.

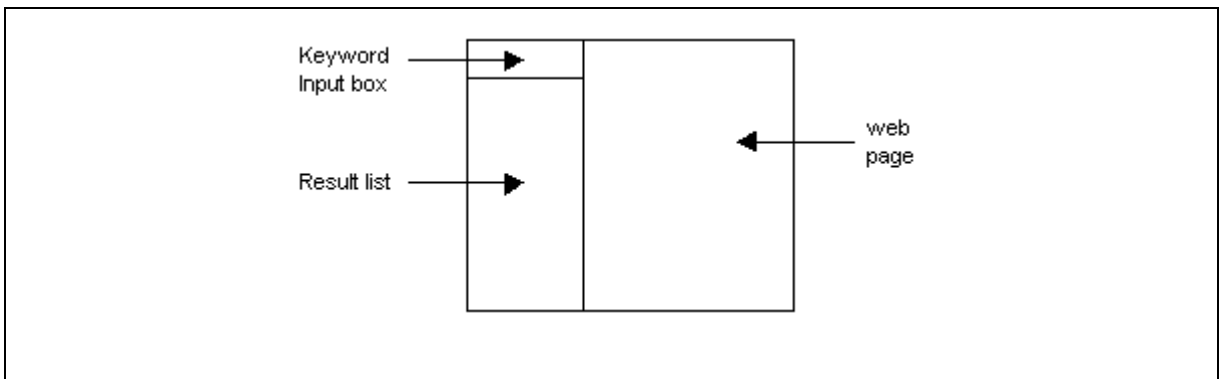


Figure 6.17 GUI Template For Search Information Page

Figure 6.18 illustrates the GUI template for view file page. There are two parts in this template, such as file information and file viewer. The file information is the place showing the details of currently displayed file. The file viewer is the place displaying or playing the file.

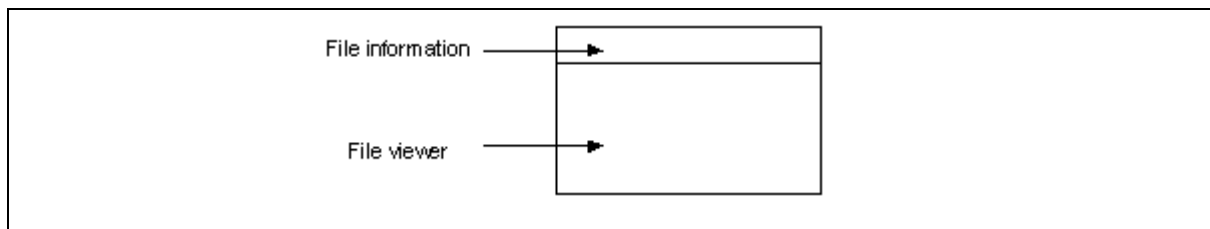


Figure 6.18 GUI Template For View File Page

From the templates that has been designed earlier in this project, the actual LOOOP GUI is finally designed out. The entire system has four pages and two external windows. The four pages are login page, learning contents page, search information page and view file page. The two external windows are forum window and help window.

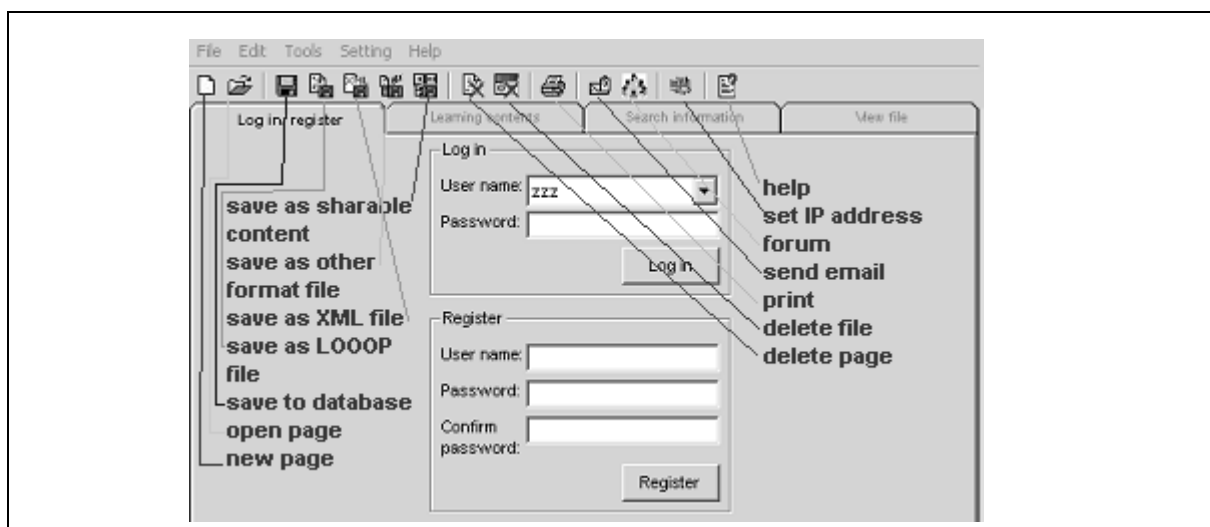


Figure 6.19 Login Page

Figure 6.19 illustrates the login page for the system. This page contains two frames, such as login frame and register frame. Login frame is for the registered user to login to the system, while register frame is for the new user to register to the system. Login frame contains one user name combo box control, one password textbox control and one login button. Register frame contains one user name textbox control, one password textbox

control and one confirm password textbox control. For login frame, user needs to select the registered user name that is already listed in the combo box control.

Figure 6.20 illustrates the learning contents page for the system. Based on the GUI template that has been designed in the earlier stage, the actual learning contents page is implemented. This page contains five parts, list of contents in treeview control, contents in DHTML control, editing tools in toolbar, user note in textbox control and extra file that associates with the content in treeview control. Besides, there is a list of useful tools is provided in the system as shown in the Figure 6.20 for content editing purpose. The tools provided include content navigation tool, editing tool, Internet search button, reader agent, highlight text and clear highlighted text button.

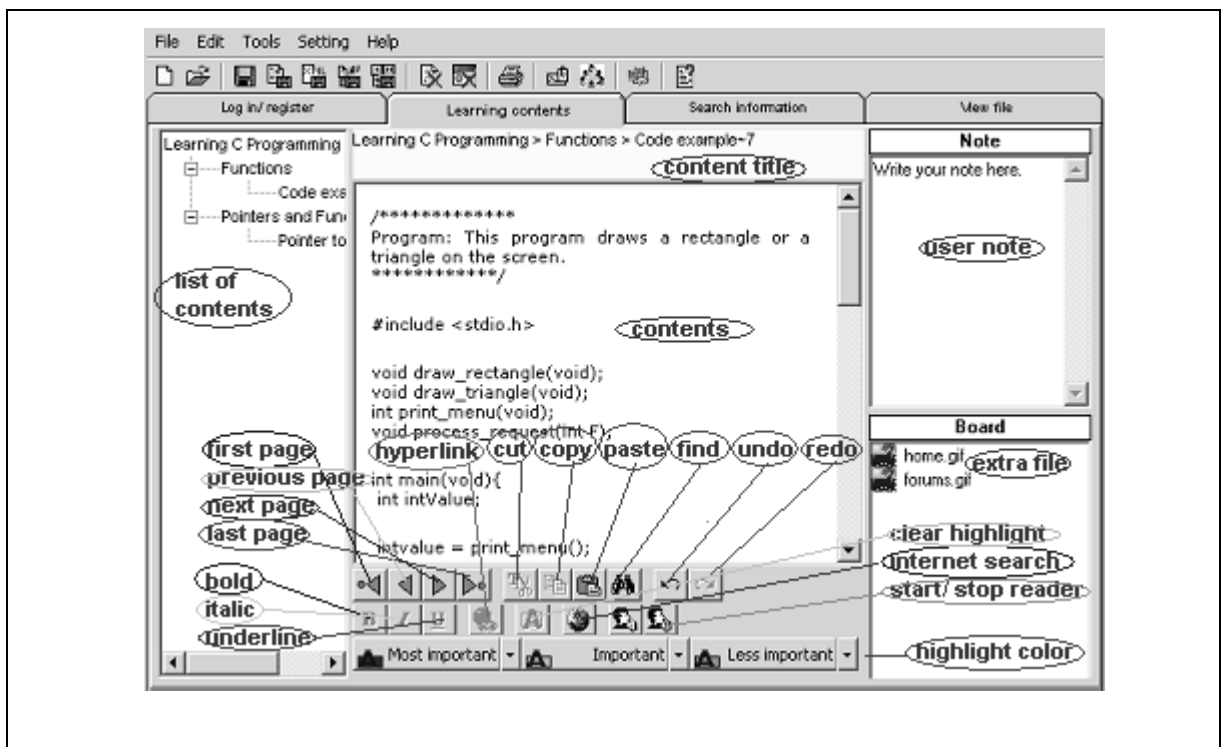


Figure 6.20 Learning Contents Page

Figure 6.21 illustrates the search information page for the system. This page has three main parts. The keywords input part is the place for user key in the keyword and search. In this part, there is an input keyword area in textbox control, two selections in checkbox control and a search button. The user needs to select either search from contents

or search from Internet or both when performing a search. The result list part is the part listed out all the records found from Internet and database in treeview control. The final part is the result page review in web browser control. This part contains two frames for file saving process and one frame for a list of downloadable file. The two file saving frames are located on top and bottom of the web browser control.

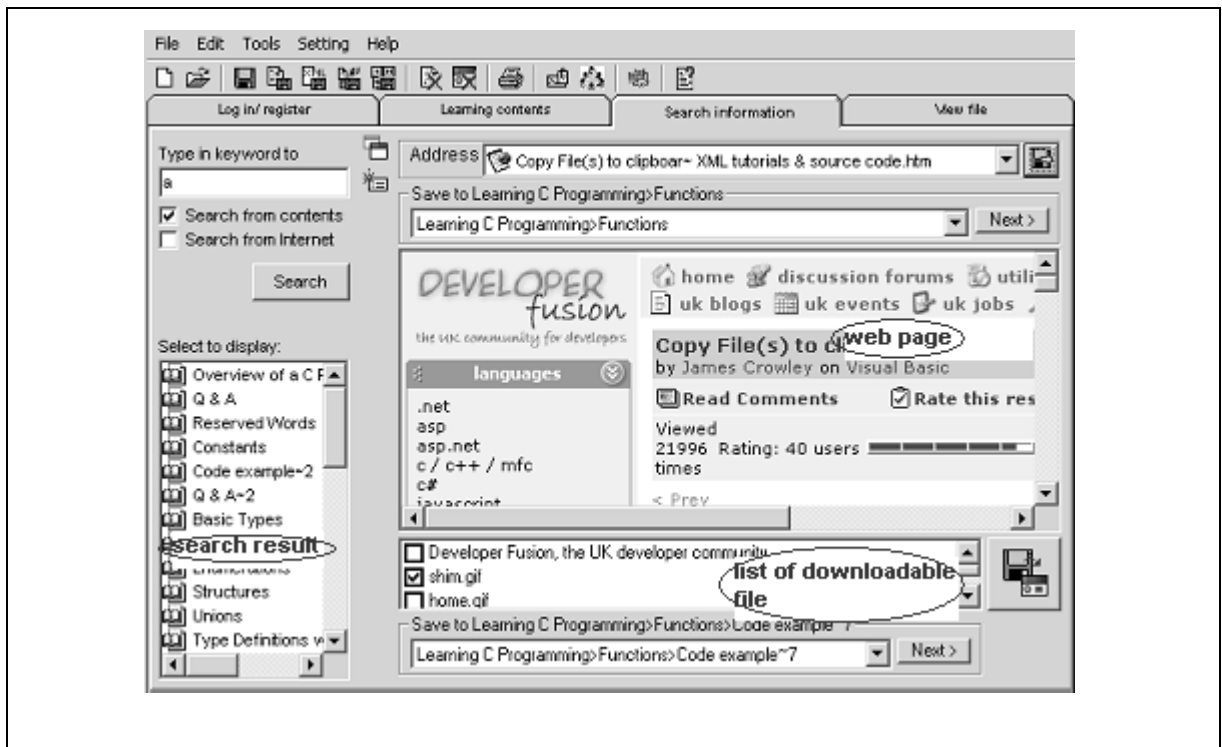


Figure 6.21 Search Information Page

Figure 6.22 illustrates the view file page for the system. Same with what has been discussed on GUI template for view file page earlier, the actual GUI for view file page is divided into two parts. The upper part is the file information part. The file title and file descriptions are displayed to the user. The user can change the file title and file description on each textbox. The lower part is for viewing and playing file.

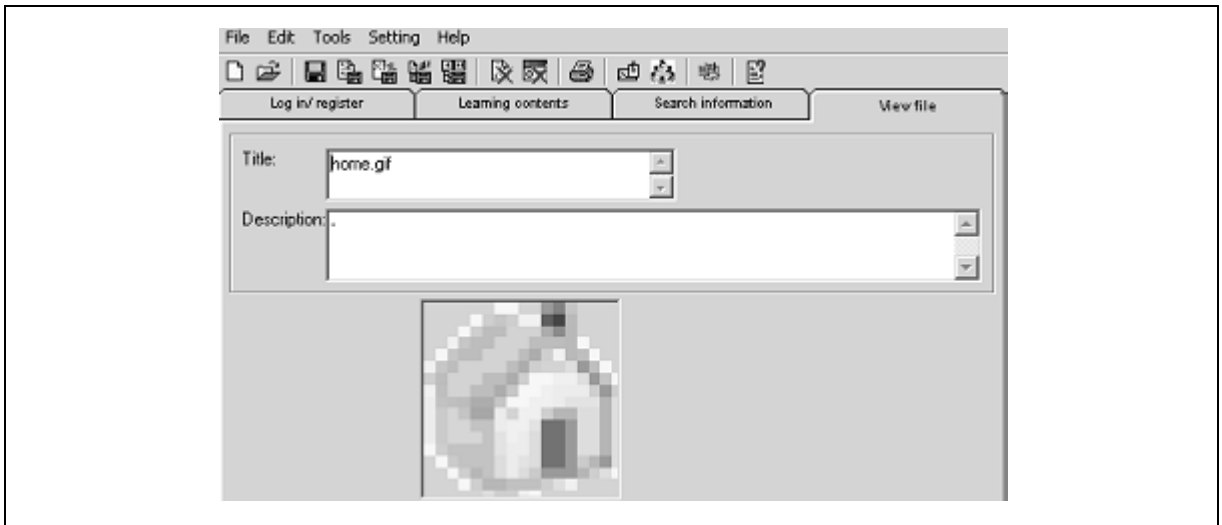


Figure 6.22 View File Page

Figure 6.23 illustrates the forum window for the system. This window contains one chat screen in textbox control, one message input area in textbox control, one online user list in listbox control and two buttons. One button is for the user sending file to another online user and another one button is for sending the message written in message input area.

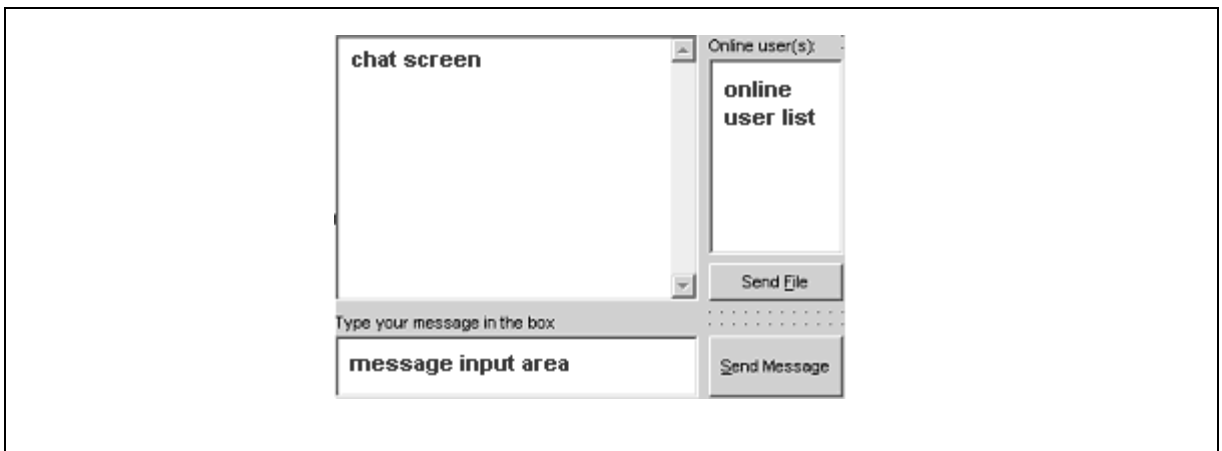


Figure 6.23 Forum Window

Figure 6.24 illustrates the help window for the system. This window contains one help topics list in treeview control and one web browser control to display the content of each help topic.

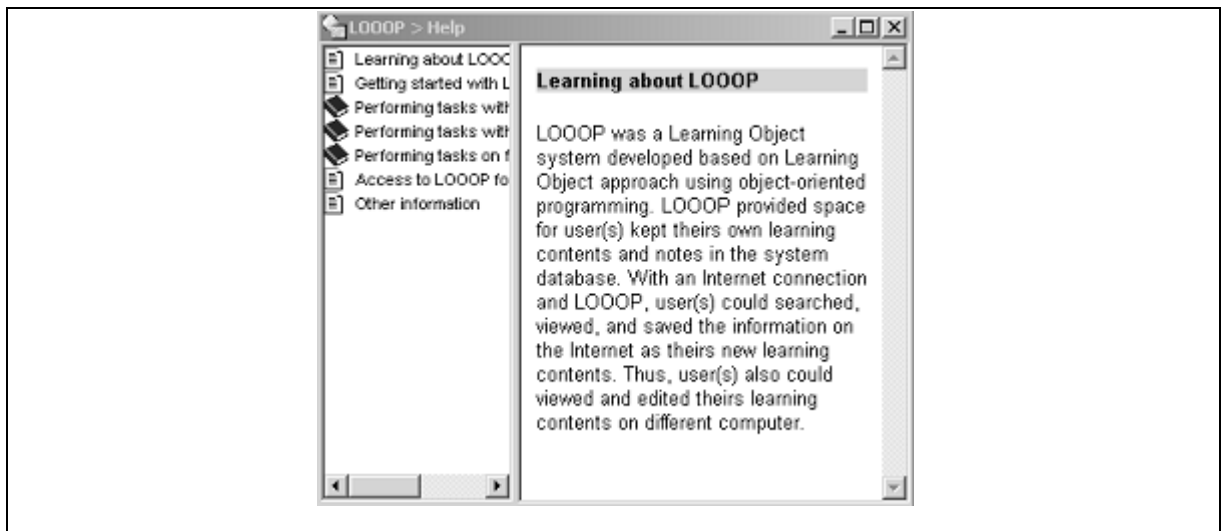


Figure 6.24 Help Window

6.8 Summary

Based on the analysis done on system analysis, the design of architecture, process flow, ERD diagram and others are designed. First, the system architecture is drawn as the structure of the system. Next, the process flow is identified for clearly determining the flows of each process for the system. Thus, the relationship between entities is identified and the data flow for each functions or features is drawn. After that, the database is drawn based on the data flow diagram. From the design, the GUI is drawn out based on the template that is designed in the earlier stage of software development life cycle.