UNIVERSITY OF WOLLONGONG

Bachelor of Information Technology

CSCI321 Final Year Project Report

English to Sign Language Translator and Sign Language Learning Tool - BabySlang

Assessor:	**Mr. Premarajan**
Supervisor:	**Mr. John Lim**
Group Number:	**IT10/2H**

Group Members:

3804379	Tay Jun Xiang (Leader)
3720640	Ng Chong Seng
3715504	Wu Jinqing
3761149	Yap Min Hao

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Table of Contents

1. Executive Summary

1.1 The Team

The IT10/2H Team is assign by University of Wollongong to develop an English to Sign Language translator software to assist in learning sign language as our group final year project.

1.2 Mission Statement

The team's ultimate goal for this software is, through its usage, to close up the language barrier between the deaf and the hearing community in Singapore. Therefore, both parties will be able to communicate well and understand each other better.

1.3 The Product

The product, BabySlang, will be a web-based software developed base on the sign language Signing Exact English (SEE). SEE is the official sign language being used in Singapore. Therefore it will appeal to the masses in Singapore.

BabySlang will facilitate the hearing community to learn SEE in a fun and efficient way. Firstly, a search feature is provided for fast searching of words or even phrases to be translated. Secondly, rich multimedia features such as playing of video clips to demonstrate the hand signs. Thirdly, a quiz in the form of a game is included for the users to participate.

1.4 Market Opportunity

One search in the Internet it is hard to find a sign language translator for Signing Exact English. Those available in the web are mostly for English to American Sign Language translation.

Therefore there is a demand for a translator English to Signing Exact English in Singapore. The multimedia features of the product will definitely be preferred over conventional media like a book with static photos or picture illustrations of hand signs.

Moreover, the product allows ease of use and is more efficient with its search features instead of flipping through the pages of a book.

1.5 Target Audience

The team particularly target at hearing parents with deaf children of age three to five years old. It is a necessity for them to have BabySlang to facilitate communication with their children.

As BabySlang is a web-based application, it can reach out anyone over the Internet. This can attract more users other than the targeted group.

By exposing SEE to children at a young age, they will be able to cope with the demands of English language in the future. With a better command in English, it means that they have a competitive edge when they step into the workforce. Therefore, a sign language translator becomes a necessity for them.

2. Marketing plan

Any excellent product must be accompanied by a sound marketing plan. With a proper marketing plan, it can be ensured that the target audience will be aware of the product being offered. The following are the strategies adopted to market BabySlang.

2.1 Marketing Strategies

Firstly, our team will liaise with The Singapore Association of the Deaf, informed them the purpose and educational values of our web site. Request our web site to be featured in their news section, on the other hand, to put up advertising banners at the Singapore Association of the Deaf compound. Therefore, whoever who wished to learn sign language in the Singapore Association of the Deaf will get to know the existence of our web site.

Secondly, we can advertise our website on face book and through direct mails of the website to our friends, letting word of mouth spread to more people, through this source of advertising.

Lastly, we will post a topic of our web site on discussion forums such as hardware zone, in order for more people to comment and participate on the discussion of the web site, we believe through all this low cost advertising, within a short period of time a substantial amount of public will get to know the web site and might even tried it.

2.2 Gaining Profit Strategies

There will not be any subscription fee or sign up for our web site. So user will be able to access the web site for free. So this come to the question on how are we suppose to maintain the web site with no profits. The solutions to this concern, is by selling advertising spaces on our website, creating weekly Ezine with monthly subscription, and lastly e-donations from users.

Initially, no one will actually subscribe to an advertising space on our website, as our web site is new and do not have high web traffic; therefore we will adopt the Affiliate Programs. We will use Automated Context-Sensitive Advertising.

This method will allow advertising network automatically checks your web page and determines the most relevant advertisement for the page. As a result, without much additional effort from us, we will get advertisements targeted at the interests of your visitors.

We will adopt Pay per Impression payment scheme, which means we are paid according to the number of times the advertiser's banner is displayed on our site. In general, the amount paid is usually small, but it is easy to earn since every time a visitor loads the page, we earn.

In future, when our web site gains popularity, we can sell advertising spaces, to advertiser instead of Affiliate Programs to gain more profits.

The other platform to gain profit is by subscription through Ezine also known as E-magazine. We can publish a weekly sign language related E-magazine every once a week. Consumer will have to pay a monthly subscription in order to receive our Ezine. Ezine will be in PDF format and will be e-mailed to subscriber weekly. It is easily accessible as consumers can view the Ezine on their computers, Ipad etc.

3. Technical Manual

The Technical Manual describes development approach and the technical details of the product being developed.

The Technical Manual covers the following critical components:

1. Project Approach
2. Project management and Activity Planning
3. Software Development
4. Software Testing

3.1 Project Approach

Rational Unified Process (RUP) has been adopted as the approach to develop BabySlang and to manage the software development lifecycle.

The development life cycle consists of four phases, namely:

1. Inception Phase
2. Elaboration Phase
3. Construction Phase
4. Transition Phase

3.1.1 Inception Phase

During the inception phase, the business case is established and the project scope is defined.

The business case includes:

1. Feasibility study
2. Project scope and objectives
3. Project cost estimation
4. Roles and responsibilities of each team member
5. Measure of effectiveness and success
6. Initial risk assessment

All these are documented in the Terms of Reference. Please refer to Appendix A for the Terms of Reference.

3.1.2 Elaboration Phase

In the elaboration phase, the problem domain is analyzed in detail to understand the requirements, technical constraints and development risks of the system to be built. Requirements include core functional and non-core functional requirements.

A detail project plan is developed to ensure that enough resources can be allocated without exceeding budget. Risks mitigation and contingency plans are established at this phase. The elements mentioned shall be discussed in detail in the Project Management and Activity Planning and Software Development section.

3.1.3 Construction Phase

In the construction phase, all the product features decided during the elaboration phase are developed and integrated. The integrated software will go through complete and formal testing procedures.

A complete test plan and test cases are developed to ensure that the product is of high-quality when delivered to its end-users. A comprehensive user manual is documented so that the end-users are ready to go operational with the product.

The formal testing procedures shall be discussed in detail in the Software Testing section.

3.1.4 Transition Phase

In the transition phase, the product is ready to be introduced to the end-users. Product documentation will be completed and provided for them.

3.2 Project Management and Activity Planning

3.2.1 Products for Project

The Product Breakdown Structure identifies all the products that will be produced in this project implementation. The products identified are more specific as compared to the ones identified in the Terms of Reference. Please refer to Appendix B for the Product Breakdown Structure diagram.

3.2.2 Ideal Activity Network for Project

The Ideal Activity Network diagram identifies all the activities that will be executed in this project implementation. The activities identified are more specific as compared to the ones identified in the Terms of Reference. Please refer Appendix C for the Ideal Activity Network Diagram.

3.2.3 Software Effort Estimation

Albrecht Function Points Analysis is used to estimate the effort for developing BabySlang. The table below shows the estimation.

BabySlang Software Modules	External User Type	Multiplier
Translate Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6
Learning Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6
Quiz Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6

Register Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6
Login Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6
Change Password Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6
Reset Password Module	Logical Internal File Type	Average – 10
	External Inquiry Type	High – 6
Manage Videos Module	Logical Internal File Type	High – 15
	External Inquiry Type	High – 6
Total:		133 Function Points
Team Productivity on average:		1.65 Function Point / Day
Effort:		133 / 1.65 = 81 Days

The estimated effort for developing BabySlang is approximately 81 Days.

3.2.4 Resource Allocation

After taking software effort into consideration, resources are allocated to the various activities identified in the Ideal Activity Network. The amount of time allocated for each activity is illustrated in the Gantt chart in Appendix D. Critical tasks are also indicated red in the Gantt chart. The critical paths identified are illustrated in the PERT diagram in Appendix E.

The individual contributions are as follows:

	Tay Jun Xiang	Wu Jinqing	Ng Chong Seng	Yap Min Hao
Translate Module Design	25.00%	25.00%	25.00%	25.00%
Translate Module Implementaion	100.00%	0.00%	0.00%	0.00%
Learn Module Design	25.00%	25.00%	25.00%	25.00%
Learn Module Implementation	20.00%	15.00%	65.00%	0.00%
Quiz Module Design	25.00%	25.00%	25.00%	25.00%

Quiz Module Implementation	10.00%	70.00%	0.00%	20.00%
Login Module Design	25.00%	25.00%	25.00%	25.00%
Login Module Implementation	10.00%	10.00%	10.00%	70.00%
Register Module Design	25.00%	25.00%	25.00%	25.00%
Register Module Implementation	10.00%	0.00%	0.00%	90.00%
Manage Video Module Design	25.00%	25.00%	25.00%	25.00%
Manage Video Module Implementation	30.00%	0.00%	60.00%	10.00%
Update Video Module Design	25.00%	25.00%	25.00%	25.00%
Update Video Module Implementation	15.00%	0.00%	70.00%	15.00%
Database Design and Implementation	0.00%	100.00%	0.00%	0.00%
Documentation	30.00%	30.00%	20.00%	20.00%
Total	400.00%	400.00%	400.00%	400.00%
Individual Contribution	100.00%	100.00%	100.00%	100.00%

3.2.5 Risks Identified and Contingency/Mitigation Plan

Risk List	
Description	Contingency Plan / Mitigation Strategy
1. The team is unfamiliar with using Silverlight to display videos in ASP.NET 4 web pages.	Jinqing will carry out extensive research on Silverlight capabilities and usage on video display. If the team is unable to have a confirmation of this capability by 15/07/2010, Microsoft Media Player will be used.
2. The team is unfamiliar with ASP.NET 4 programming language in terms of the syntax and structure.	Jun Xiang is 75% confident of using ASP.NET 4 as it is different from classic ASP by a number of new features and programming elements. The knowledge can be learnt by 15/07/2010.
3. The team is unfamiliar with the software tools for video editing	Jun Xiang has decided to use Microsoft Live Essentials Movie Maker for video editing.
4. The computers in the SIM laboratory may not have the required development software and tools for this project. Installation of the required software and tools are not allowed by students. This will directly affect the project presentation.	Jun Xiang's personal laptops will be setup as contingency equipment for achieving the required environment for development and testing as well as for product presentation.

5. Web pages written in ASP.NET 4 are not able to embed videos in web pages compared to conventional HTML.	Microsoft Silverlight web applications will be incorporated into the web pages to display video else Microsoft Media Player will be used for it. ASP.NET has a workaround to display embedded videos in web forms.
6. Change requests for the user interface by the stakeholders are likely to happen. Requirements are likely to change during the implementation.	Evolutionary Prototyping will be adopted in the project implementation. This is to ensure that the stakeholders are satisfied with the prototypes before finalizing to be the actual product.
7. The number of the words to be added in the database can be too large for the team to handle.	Jun Xiang has selected words suitable for children between 3 to 5 years old. These words are based on recommendations from children educational websites and Dolch word list.
8. Users may not be able to follow the numerous hand sign videos for the translated phrase.	Jun Xiang has suggested including captions in the videos for showing in the Translate and Learning Module. Quiz module will use the original videos.
9. A suitable web host may not be available to host the product online.	Jun Xiang has contacted MochaHost.com for advice on this. They have replied in their Email that they offer hosting services for ASP.Net web applications and MS SQL Server. A user-friendly interface is provided to administer the web domain.
10. The web host may not be functional during the product presentation	Jun Xiang has decided to create another copy of the product to be able to run on localhost on his notebook. This will be used as a contingency plan if the web host fails during the presentation.

3.2.6 Project Minutes and Meeting

Please refer to Appendix F for the project minutes and meetings.

4. Software Development

4.1 Requirement Specifications

Requirements are categorized into the following groups:

1. User
2. Software
3. Hardware

4.1.1 User requirements

4.1.1.1 Functional Requirements

1. The system shall be able to translate English words into SEE Sign Language.
2. The system shall provide a learning tool to teach users SEE Sign Language.

3. The system shall provide a short quiz to help users assess their knowledge on SEE Sign Language.
4. The system shall provide a platform for more personalized or customized learning of SEE Sign Language. An example would be uploading of user's own SEE Sign Language videos.

The functional requirements stated above are illustrated in the Use-case model in Appendix G.

The anticipated tasks performed by the users are illustrated in the Hierarchical Task Analysis diagram in Appendix H. Due to the complexity of the system; all the tasks are not put together in a single page. The tasks are shown separately for clarity.

4.1.1.2 Non-Functional Requirements

4.1.1.2.1 Timeliness

There is a need for the website to stream videos. The loading of the videos shall not exceed 3s and shall start streaming at the end of 3s.

4.1.1.2.2 Interactivity

There is a need for users to interact with the website. The acceptable delay to load a web page shall be less than 2s.

4.1.1.2.3 Reliability

The website shall require good response and real-time activity, thus it cannot be down. RMA requirement would be 99.9%.

4.1.1.2.4 Presentation Quality

Videos presented must be of good quality as users need the videos to learn the Sign Language. The qualities of the video should be clear and not pixilated.

4.1.1.2.5 Adaptability

The web pages shall be compatible with major Internet browsers i.e. Microsoft Internet Explorer and Mozilla Firefox.

4.1.1.2.6 Supportability

There will be an online help in the website to assist users on using the functions.

4.1.2 End-User Hardware and Software Requirements

The hardware and software specifications are as follows:

1. Windows XP Service Pack 3 or above
2. Microsoft Internet Explorer 7.0 or above or Mozilla Firefox or equivalent browsers
3. Microsoft Media Player Plug-in
4. RAM of 2GB or above
5. Hard disk storage of 30GB or above
6. Intel® 945 Video Graphics of above

4.2 Technical Specifications of Project

4.2.1 Development Environment

The computer laboratory of Singapore Institute of Management will be the environment for this project to be developed, tested, completed and delivered.

The team will also use their personal laptops for development if the computer laboratory is not available.

4.2.2 Development Hardware and Software Standards

4.2.2.1 Software Specifications

Web Server	Minimum Requirement
Operating System	Windows XP Professional Service Pack 3
Web Server Software	IIS 6.0

Database Server	Minimum Requirement
Operating System	Windows XP Professional Service Pack 3
Database Server Software	Microsoft SQL Server 2005

Language Translator	Minimum Requirement
Operating System	Windows XP Professional Service Pack 3
Framework	ASP.NET

Personal Laptop	Minimum Requirement
Operating System	Windows XP Professional Service Pack 3
Browser Software	Internet Explorer 6.0 or other equivalents
Development Tool	Microsoft Visual Web Developer Express 2010
	Microsoft SQL Management Studio
	Microsoft Live Essentials Movie Maker

4.2.2.2 Hardware Specifications

Web Server	Minimum Requirement
CPU	Intel Pentium Core 2 Duo 1.83Ghz
Memory	2GB DDR2 RAM
Hard disk	30GB of free space

Database Server	Minimum Requirement
CPU	Intel Pentium Core 2 Duo 1.83Ghz
Memory	2GB DDR2 RAM
Hard disk	30GB of free space

Personal Laptop	Minimum Requirement
CPU	Intel Pentium Core 2 Duo 1.83Ghz
Memory	2GB DDR2 RAM
Hard disk	30GB of free space

4.3 System Architecture

System architecture is an overview of the system structure. The architecture is viewed as a single system consisting of different components serving different functions.
The system components are namely:

1. Main Menu
2. Translate Interface
3. Lesson Interface
4. Quiz Interface
5. Register Interface
6. Login Interface
7. Reset Password Interface
8. Change Password Interface
9. Upload Video Interface
10. Update Video Interface
11. View Video Interface
12. Delete Video Interface

The system architecture explores the interactions between these components. Functions provided by each component are also taken into consideration

4.3.1 Interactions between System Components

The interactions between the system components are shown in the Sequence Diagrams in Appendix I.

4.3.2 Functions of each System Component

4.3.2.1 Main Menu

1. Display the three main options to the user
2. Request the user to choose an option
3. Receive the option chosen by the user
4. Direct the user to the correct web page according to the user's selected option

4.3.2.2 Translate Interface

1. Display the input interface to the user
2. Request inputs of English words from the user
3. Receive the inputs from the user
4. Process the input
5. Query the database
6. Receive selected records from the database
7. Display the results to the user

4.3.2.3 Lesson Interface

1. Display the input interface to the user
2. Request the user to select a theme
3. Receive the selection from the user
4. Process the selection
5. Query the database
6. Receive selected records from the database
7. Display the results to the user

4.3.2.4 Quiz Interface

1. Query the database
2. Receive selected records from the database
3. Display the input interface to the user
4. Request quiz answers from the user
5. Receive quiz answers from the user
6. Process the answers
7. Display the results to the user

4.3.2.5 Register Interface

8. Display the input interface to the user
9. Request inputs of user name, Email and password from the user
10. Receive the inputs from the user
11. Process the input
12. Passes data input to the database for processing
13. Receive registration results from the database
14. Inform user the registration results

4.3.2.6 Login Interface

1. Display the input interface to the user
2. Request inputs of Email and password from the user
3. Receive the inputs from the user
4. Process the input
5. Query database using data input
6. Receive login results from the database
7. Inform user the login results

4.3.2.7 Reset Password Interface

1. Display the input interface to the user
2. Request inputs of Email from the user
3. Receive the inputs from the user
4. Process the input
5. Passes data input to the database for processing
6. Receive reset password results from the database
7. Inform user the reset password results

4.3.2.8 Change Password Interface

1. Display the input interface to the user
2. Request inputs of current password and new password from the user
3. Receive the inputs from the user
4. Process the inputs
5. Passes data input to the database for processing
6. Receive change password results from the database
7. Inform user the change password results

4.3.2.9 Upload Video Interface

1. Query the database
2. Receive selected records from the database
3. Display the input interface to the user
4. Request inputs of video title and video file from the user
5. Receive the inputs from the user
6. Process the inputs
7. Passes data input to the database for processing
8. Receive upload video results from the database
9. Passes video data file to the file server for storage
10. Inform user the upload video results

4.3.2.10 Update Video Interface

1. Query the database
2. Receive selected records from the database
3. Display the input interface to the user
4. Request inputs of video title and/or video file from the user
5. Receive the inputs from the user
6. Process the inputs
7. Passes data input to the database for processing
8. Receive upload video results from the database
9. Passes video data file to the file server for storage if any
10. Inform user the update video results

4.3.2.11 Delete Video Interface

1. Display the input interface to the user
2. Request inputs of selected video from the user
3. Receive the inputs from the user
4. Process the inputs
5. Passes data input to the database for processing
6. Receive deleted video results from the database
7. Inform user the deleted video results

4.3.2.12 View Video Interface

1. Display the input interface to the user
2. Request inputs of selected video from the user
3. Receive the inputs from the user
4. Process the inputs
5. Passes data input to the database for processing
6. Receive selected video results from the database
7. Display selected video results

4.4 English to Sign Language Processing in BabySlang

The language chosen to implement BabySlang is Signing Exact English (SEE). SEE is exact word-for-word English signing. SEE is a system that strives to be an exact representation of English vocabulary and grammar.

In other words, almost every English word has a SEE sign representation. If an SEE sign is not available for an English word, the word will be translated using Fingerspelling.

In terms of language processing, SEE is the same as processing the English language – sentences are interpreted from left to right. As for communicating in SEE, it is the same as speaking the English language.

The steps for the SEE language processing are described as follows:

1. An English phrase with one word or more is processed from left to right.

2. Each word is compared with the existing words in the system database.
    a. If the word is found in the database, the SEE video representation data is retrieved and saved in a dynamic playlist.
    b. If the word is not found, the word will be stored in a temporary array instance to be used for Fingerspelling later on.

3. The dynamic playlist will be processed by a player to stream the list of videos to represent the translation.

The steps for the Fingerspelling language processing are described as follows:

1. An English word is processed from left to right.

    a. The SEE video representation data for each alphabet is retrieved and saved in a dynamic playlist.

2. The dynamic playlist will be processed by a player to stream the list of videos to represent the translation.

4.5 Database Design

BabySlang database consists of five tables:

1. tbAlphabet
2. tbEngWords
3. tbQuiz
4. tbUsers
5. tbUserVideos.

Below are the descriptions.

4.5.1 Table tbAlphabet

Column Name	Data Type (Length)	Null / Not Null	Remarks
Alphabet	char(1)	Not Null	English alphabet to be finger spelled, also the primary key of the table.
Picture	varchar(50)	Not Null	Filename of the pictures which caters to future enhancement when finger spelled hand signs pictures were to be included in the product.
Video	varchar(50)	Not Null	Filename of the SEE sign language videos that correspond to the English alphabets.

4.5.2 Table tbEngWords

Column Name	Data Type (Length)	Null / Not Null	Remarks
WordID	int	Not Null	Primary key of the table, which is a running number that uniquely identifies each word.
Word	varchar(20)	Not Null	English word to be translated into SEE sign language.
Theme	varchar(20)	Not Null	Theme that the English words belong to.
Grp	char(2)	Not Null	The first letter of the English words.
Picture	varchar(50)	Not Null	Filename of the pictures which caters to future enhancement when SEE sign language pictures were to be included in the product.
Video	varchar(50)	Not Null	Filename of the SEE sign language videos that correspond to the English words.

4.5.3 Table tbQuiz

Column Name	Data Type (Length)	Null / Not Null	Remarks
QnNum	int	Not Null	Question number of the quiz, together with column theme forms the composite primary key.
Theme	varchar(20)	Not Null	Theme of the quiz, together with column QnNum forms the composite primary key.
CorrectAnsWordID	int	Not Null	Correct answer WordID referencing table tbEngWords WordID.
WrongAnsWordID1	int	Not Null	First wrong answer WordID referencing table tbEngWords WordID.
WrongAnsWordID2	int	Not Null	Second wrong answer WordID referencing table tbEngWords WordID.

4.5.4 Table tbUsers

Column Name	Data Type (Length)	Null / Not Null	Remarks
UserID	int	Not Null	Primary key of the table that is auto-incremented, each time a new registered user record is being inserted.
UserName	varchar(80)	Not Null	Username of the registered users.
Password	varchar(50)	Not Null	Password of the registered users.
Email	varchar(80)	Not Null	Email address of the registered users.

4.5.5 Table tbUserVideos

Column Name	Data Type (Length)	Null / Not Null	Remarks
VideoID	int	Not Null	Primary key of the table that is auto-incremented, each time a new video record is being inserted.
UserID	int	Not Null	Foreign key that identifies the user of the video record referencing table tbUsers UserID.
VideoTitle	varchar(80)	Not Null	Title of the registered user's videos.
VideoName	varchar(80)	Not Null	Filename of the registered user's videos.

Please refer to Appendix J for the Conceptual Schema and Relational Schema.

The database will contain an approximate of 200 English words. The words selected are based on the research on English education for Pre-school children. The term Pre-school refers to the age of between 3 to 5 years old. Please refer to Appendix K for the research on English education for Pre-school children.

5. Software Testing

As the full test report consists of approximately 70 pages, it is not included in this report. It can be accessed via the CD (filename IT102H_Project_Test_Cases.pdf) that accompanies with the project submission or via the project website at http://sign-lang.webs.com/documentation.htm .

5.1 Purpose

The purpose for testing is to detect software faults so that defects may be discovered and corrected before product delivery.

5.2 Scope

The scope of software testing includes examining the source code and designing test data inputs and scenarios. The test cases consist of various conditions to ensure that the software does what it is supposed to do and do what it needs to do.

5.3 Approach

White box testing strategy is adopted to create test data inputs and scenarios to be conducted in the software testing.

The following types of white box testing methods are executed:

1. Unit Testing
2. Statement Coverage
3. Branch Coverage
4. Security Testing

5.3.1 Unit Testing

Test Objective:	Ensure proper functionality, navigation, input entry validation and processing, information retrieval and display of results to users. Ensure events triggered by web controls produce desirable effects.
Completion Criteria:	All planned tests have been executed. All actual results identical to expected result

5.3.2 Statement Coverage

Test Objective:	Ensure all statements of the software are executed at least once to assure that the codes execute without undesirable effects.
Completion Criteria:	All planned tests have been executed. All actual results identical to expected result

5.3.3 Branch Coverage

Test Objective:	Ensure all IF/ELSE branches in the software are executed to assure that branching execute without undesirable effects.
Completion Criteria:	All planned tests have been executed. All actual results identical to expected result

5.3.4 Security Testing

Test Objective:	Ensure software is resilient to unauthorized access and SQL injection
Completion Criteria:	All planned tests have been executed. All actual results identical to expected result

6. Conclusion

BabySlang is developed and fulfilled 99.9% of the requirements. The only requirement that is not fulfilled 100% is the delay requirement of video streaming.

As BabySlang.net is hosted on a commercial web host with a shared bandwidth hosting plan, network bandwidth may not be optimal at certain times. Therefore video streaming could be delayed by limited bandwidth at those times. The reliability and availability of BabySlang.net is estimated to be 99.9%.

Conclusively, this project can be considered to be 99.9% successful.

Appendix A – Terms of Reference

A1. Project Introduction

The project assigned is to develop software for English to Sign Language translation and a tool for learning Sign Language. The team has named the product BabySlang. The software can either be web-based or desktop-based software. This project is a product-based project where the final product – BabySlang – is to be delivered on the 25th September 2010.

A2. Preliminary Studies

A2.1 Hearing-Impaired Community in Singapore

Statistics have shown that six out of every 1,000 new born babies in Singapore have a degree of hearing loss. As a country increases in population, the number of hearing-impaired population will also increase.

A2.2 Sign Language in Singapore

In Singapore, SEE (Signing Exact English) is adopted as the official sign language.
Therefore in the context of the project, the team is developing BabySlang based on Signing Exact English.

A2.3 Background of Sign Language

Sign language is a form of communication which uses body language and lip patterns to convey the meaning, instead of the traditional acoustically conveying sound patterns through oral communication.

Sign language works by simultaneously combining hand signs, orientation and movement of the hands, arms or body, and facial expressions to fluently express the speaker's thoughts.

Sign languages are developed mainly to assist the deaf communities to communicate with one another. Sign languages are also learnt by the hearing community where in most cases are families of deaf people.

Many types of sign language exist in this world. The common types of sign language adopted worldwide are the American Sign Language (ASL), British Sign Language (BSL) and Australian Sign Language (Auslan).

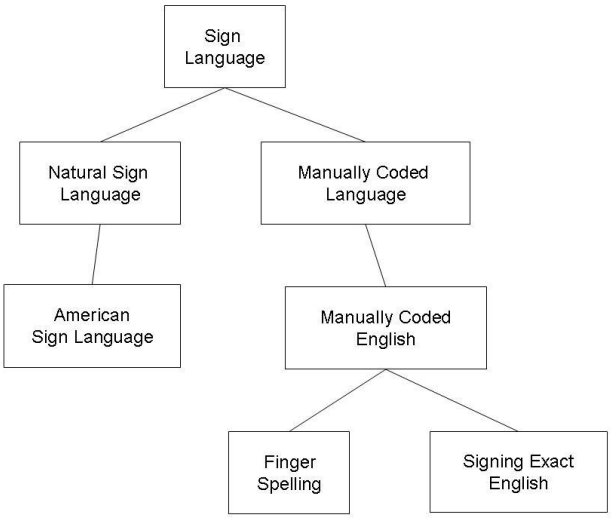

Fig A1. Hierarchical Structure of Sign Languages

From the diagram above, sign language has evolved into many versions over the years. In general, there are two categories – Natural Sign Language and Manually Coded Language.
Signing Exact English (SEE) falls under the latter category. The following text shall give an insight of each category in the branch.

Natural sign languages are formed by the deaf communities and are distinct to their country or region. Each has its own grammar, syntax and idioms. Analogous to the example of it is different from English as are Spanish, German or Chinese. An example of natural sign language is ASL (American Sign Language).

A2.3.1 Manually Coded Languages

Manually coded languages (MCLs) are representations of spoken languages in a gestural-visual form. It can be referred as "sign language" versions of spoken languages. Manually coded languages are created by the hearing communities and follow the structure of the written form of the spoken language. They have been mainly used in deaf schools as a communication tool for education.

A2.3.2 Manually Coded English

Manually Coded English (MCE) is a general term used to describe a variety of visual communication methods expressed through the hands which attempt to represent the English language. Unlike Deaf sign languages which have evolved naturally in Deaf communities, the different forms of MCE were artificially created, and generally follow the grammar of English.

Unlike natural sign language, MCE can be used simultaneously with speech the same time. This is so because it has a similar grammar and syntax with English.

In English-speaking countries, it is common for users of natural sign languages to adopt MCE where the dominant language is English. MCE is mostly favored by hearing people because it is much easier to master than a natural sign language. The reason being the syntax of MCE is similar to English.

A2.3.2.1 Manually Coded English in Education

Various forms of Manually Coded English were originally developed for use in the education of deaf children, as their literacy in written English has been typically low compared to their hearing peers. Education is still the most common setting where Manually Coded English is used to educate children with speech or language difficulties.

A2.3.3 Types of MCE

A2.3.3.1 Finger spelling

Finger spelling uses 26 different signs to represent the 26 letters of the Roman alphabet. Every word is spelled as in written English.

Being the simplest form of MCE, it is usually a beginners' attempt for English speakers to learn before progressing to more advance MCE. Finger spelling is also adopted by Deaf people to complement natural sign languages to describe proper nouns and quoting words or short phrases from English.

Finger spelling comes in two flavors – two-handed system and one-handed system. The latter is adopted by the deaf community in Singapore.

A2.3.3.2 Signing Exact English

SEE2 was developed by Gerilee Gustason and Esther Zawolkow in the early 1970s. As a successor of SEE1, many features of SEE2 are identical to that code system.
As there is no more formal use of SEE1, the term SEE and SEE 2 is used interchangeably in some literature works on this subject.

SEE is exact word-for-word English signing. Signing Exact English (SEE 2) is a system that strives to be an exact representation of English vocabulary and grammar. It is derived from American Sign Language (ASL) and much of its vocabulary of signs is adopted from ASL.

SEE is used most often with deaf children in educational settings. It is widely adopted by hearing parents of deaf children because they do not require them to learn a new grammar or syntax. Therefore, SEE are easy to pick up for people who know English.

In recent years, researchers have found that deaf children who adopt SEE have good, idiomatic English skills, with many of them reading at or above grade level. Such students had internalized some of the most complex rules of syntactic structure in English.

A2.4 Existing Technologies

A2.4.1 ASLPro.com

ASLPro.com was created with the purpose of providing free, easy-to-use and learning tool resources to enhance in-classroom learning for the classroom teacher. It allows the teachers to create accounts and personalize a quiz for their students. The hand signs are shown in flash videos. ASLPro.com needs minimum software requirements of Flash Player 6 and Internet Explorer 6 (or Firefox 2) to view these videos.

Some of the features include:

1. Alphabets/words corresponding to dictionary
2. Conversational phrases
3. Short videos on alphabets/words and conversational phrases
4. Simple ASL for babies
5. Quiz with a selection of answers

A2.4.2 ASL Browser

ASL Browser is an online American Sign Language (ASL) browser with thousands of ASL signs videos. It was created in 1997 to provide an online sign language resource. The ASL Browser requires the user to have web browser installed with QuickTime plug-in.

Some of the features include:

1. Alphabet/word corresponding to dictionary
2. Static images on alphabets and short QuickTime videos on words

A2.4.3 Signing Savvy

Signing Savvy is developed by a group of educators, interactive media designers and sign language experts. The Signing Savvy website was launched in January 2009. Their constantly expanding dictionary contains high resolution flash videos of American Sign Language (ASL) signs for more than 5000 words and phrases. It requires the users to have the latest version of Flash Player installed on the PC to view these videos. There are three types of Signing Savvy users: Guest User, Registered User and Full Member. Guest Users have limited access to a few of its features; Registered Users have limited access to more of its features while Full Members have unlimited access to all of its features. Full members are required to pay a monthly fee of US$9.95 or a yearly fee of US$49.95.

Some of its features include:

1. A signs search engine that allows user to search for sign
2. Browse signs by letter
3. Browse signs in the precompiled words lists

A2.5 Market Research

A2.5.1 The Need for an English to SEE 2 Translator

One search in the Internet it is hard to find any sign language translator for Signing Exact English (SEE 2). The sign language translators available in the web are mostly English to American Sign Language (ASL).

Therefore we want to develop a sign language translator that translates English to Signing Exact English, and it would likely to be a web-based application which anyone can access over the Internet. This will allow the general public to learn the official sign language in Singapore through our sign language translator.

A2.5.2 Proposed Solution

Our team wants to develop a sign language translator and a learning tool BabySlang to facilitate the hearing community to learn SEE 2 in a fun and efficient way. Firstly, a search feature is provided for fast searching of words or even phrases to be translated. Secondly, rich multimedia features such as playing of video clips to demonstrate the hand signs. Thirdly, a quiz in the form of a game is included for the users to participate.

Our team will launch a Beta version of the system to attract the target audiences and gain awareness to the product. The purpose of Beta version allows the users to try out and understand the system better.

A2.5.3 Target Audience

We particularly target at those hearing parents with deaf children of age three to five years old. The parents can learn the sign language and impart the knowledge to their deaf children.

Most of the families in Singapore are dual income earners where both the parents are working and may not have time to attend the sign language courses.

By exposing SEE 2 to children at a young age, they will be able to cope with the demands of English language in the future. Moreover, research has shown that children who know SEE 2 have better command of the English language compared to children who do not. With a better command in English, it means that they have a competitive edge when they step into the workforce. Therefore, a sign language translator becomes a necessity for them.

It will definitely be more efficient to learn the sign language through our sign language translator than any sign language handbook or textbook. Conventional sign language books only show pictures of hand signs or complemented with multimedia tools in the form of a CD-ROM.

Conversely, our sign language translator allows the users to easily search through the database of videos on the hand signs. It can be a translation of a single English word or a phrase to SEE 2 hand sign presented in a video clip.

A3. Project Planning

A3.1 Select project

The team has chosen to create English to Sign Language translator software.

A3.2 Identify Project Scope and Objectives

A3.2.1 Main Objectives

1. To develop a web-based English to Sign Language translator software
2. The system will translate an English word or a phrase to a SEE Sign Language.
3. The response time of the system should never be longer than three second to process the search query and display the results.
4. Software must pass the user acceptance test.

A3.2.2 Sub-objectives

Web site must be user friendly and the layout design is to follow the principles of Human Computer Interface Design.

A3.2.3 Objectives by Stakeholders

Project Assessor, Mr. Premarajan has assigned the team to build English to Sign Language translator and learning tool that has the functions stated in the proposed solution.
Such a task is to have the students can apply the knowledge on principles and practices of software engineering.

Project Supervisor, Mr. John Lim focuses on facilitating the students with his knowledge and experiences on principles and practices of managing the software development process.

Steering Committee of UOW hopes to provide the student with a learning experience in the software development life cycle. Gearing the student up for complex and demanding process in hope that in the end the student can demonstrate proficiency in software project management.

A3.3 Change Request by End Users

No changes will be expected from the end users for this project because this is an in-house project given by Mr. Premarajan and Mr. John Lim. No major amendments will be expected as the description and objectives will be tie down by the project description given by Mr. John Lim. The students are to follow the instructions given in the CSCI321 Project Outline unless stated otherwise.

A3.4 Establish Methods of Communication with all Parties

In-house members – Exchange mobile and email contacts. Communication via email and mobile to arrange for regular meet ups during weekend to check on progress and assignment of task. Consultation with Mr. John Lim will be arranged as stated in the Project Outline.
There is no external parties involve therefore there will not be documentation on communication with external parties.

A3.5 Minutes and Team Meeting Diary

Please refer to the project website http://sign-lang.webs.com/ for regular updates on the minutes and meeting diary.

A3.6 Project Cost Estimation

The resources for this project are provided by SIM therefore there is no cost for the resource allocation. There will not be any modification from our client as this is an in-house project therefore there will not be any cost involved in the case of possibilities in modification or change request.

A3.7 Responsibilities of Individual

Responsibilities	Yap Min Hao	Ng Chong Seng	Wu Jinqing	Tay Jun Xiang
Research	X	X	X	X
Scope and Risk Evaluation				X
System Requirement Identification	X	X	X	X
Create Test Case	X	X		
Create Test Plan			X	X
Meeting Minutes			X	X
System Design	X	X	X	X
Architectural Design	X	X	X	X
User Manual	X	X		
Implementation	X	X	X	X
User Acceptance Test	X	X	X	X
Presentation	X	X	X	X

A3.7.1 Roles of Individual

Manager Role - Manager:

1. Allocates resources, accommodating to user and customer's requirements.
2. Plan product's transition to the user community and ensure delivery accuracy.
3. Overlooks the whole project throughout the whole phrase.

Analyst Role – Designer:

1. Identifying actors and actions required in Use Cases.
2. Layout and initial design of the system.
3. Specifies the system's functionality.

Developer Role – Lead Designer/Lead Implementer:

1. Identify responsibilities, operations, attributes and relationship of elements required.
2. Designing the system.
3. Defines the database structures and layout.

Tester Role - Tester:

1. Responsible for identifying the errors and flaws in the system.
2. Testing the final output and effectiveness of the system.

Production/Support role - System Integrator/System Trainer:

1. Maintain development process.
2. Supporting tools for the project
3. Providing training materials and user guides for the users.

Roles	Yap Min Hao	Ng Chong Seng	Wu Jinqing	Tay Jun Xiang
Manager				X
System Analyst	X	X	X	X
Implementer	X	X	X	X
Designer	X	X	X	
Tester	X	X	X	X
System Integrator	X	X	X	X
Documentor	X	X	X	X

A3.8 Measure of Effectiveness

1. The submitted search query must be English word or phrase and can only include whitespace.
2. The product must be delivered by 25th September 2010.
3. Users will be familiarized with the system within 15 minutes of usage.
4. The software should not have errors that cause the system to crash.
5. The software should provide 99.9% service reliability.
6. The software must pass the user acceptance test.

A4. Project Team Organization

Team members involved in product development

1. Tay Jun Xiang
2. Ng Chong Seng
3. Wu Jinqing
4. Yap Min Hao

A5. Analyze Project Characteristics

A5.1 Chosen Technology

A5.1.1 Programming Language

Our team has decided to develop our sign language translator as a web-based application using ASP.NET.

Some advantages of ASP.NET include:

1. ASP.NET largely cut down the amount of code needed to develop large applications.
2. It enhances performance by taking advantage of early binding, just-in-time compilation, native optimization, and caching services right out of the box.
3. ASP.NET provides simplicity as it is easy to perform common tasks, from simple form submission and client authentication to deployment and site configuration.
4. The source code is run on the server. This offers a lot of control and flexibility to the web pages.

5. ASP.NET runtime monitored and managed all the processes closely. Therefore, if any of the processes is dead, it substitutes with a new process. This helps to keep the application constantly available to handle requests.
6. Due to built-in configuration information, there is no need to register components. This makes deployment much easier.

A5.1.2 Database Server

Some advantages of Microsoft SQL Server

1. Allow administrators to abstract database
2. Has built-in triggers
3. Has mechanism for security

A5.1.3 Development tools

A5.1.3.1 Microsoft Visual Studio

Microsoft Visual Studio is an Integrated Development Environment (IDE). It is used to build console and graphical user interface (GUI) applications together with Windows Forms applications, web sites, web applications, and web services.

A5.1.3.2 Microsoft Internet Information Server

Internet Information Services (IIS) which is also previously known as Internet Information Server is a web server application and set of feature extension modules created by Microsoft for use with Microsoft Windows.

A5.1.3.3 Microsoft SQL server 2005

Microsoft SQL Server is a relational database management system (RDBMS). It executes on T-SQL (Transact-SQL), which is a set of programming extensions from Sybase and Microsoft that add some features to standard SQL, including transaction control, exception and error handling, row processing, and declared variables.

A5.1.3.4 Microsoft SQL Server Management Studio Express

Microsoft SQL Server Management Studio Express is a tool for managing, administering and configuring all components within Microsoft SQL Server. It comprises of both script editors and graphical tools which work with objects and features of the server.

A5.2 Software Development Method

Rational Unified Process (RUP) is selected as the development methodology for the software process management.

RUP methodology has the following advantages.

Iterative software development- This allows for minimized risk and a closer feedback loop with the stakeholders and sponsors, as they can actually see working code in a constant manner.

Requirements management - Capture requirements as use cases and scenarios, organize track, document decisions and the reasoning for the project.

Divide large project into component-based architectures - RUP recommends developing a flexible architecture that can accommodate change and foster reuse of these components in different parts of the projects or, across several projects.

Visual modeling of software - To allow for better design and demonstration on the relationships of components.

Software quality verification - The quality of a solution is verified to ensure that it meets the functional as well as the performance and load requirements.

Change control - Changes made are tractable when made along the process. This enable the team to know what had been changed to indentify the root cause of the new issues. RUP describes how to control, track, and monitor changes for successful development in iterations.

Source: Thomas Stober . Uwe Hansmann, Agile software Development, Best Practices for Large Software Development Projects, Springer-Verlag Berlin Heidelberg 2010, Pg52

A6. Project Products and Activities

A6.1 Identify Products

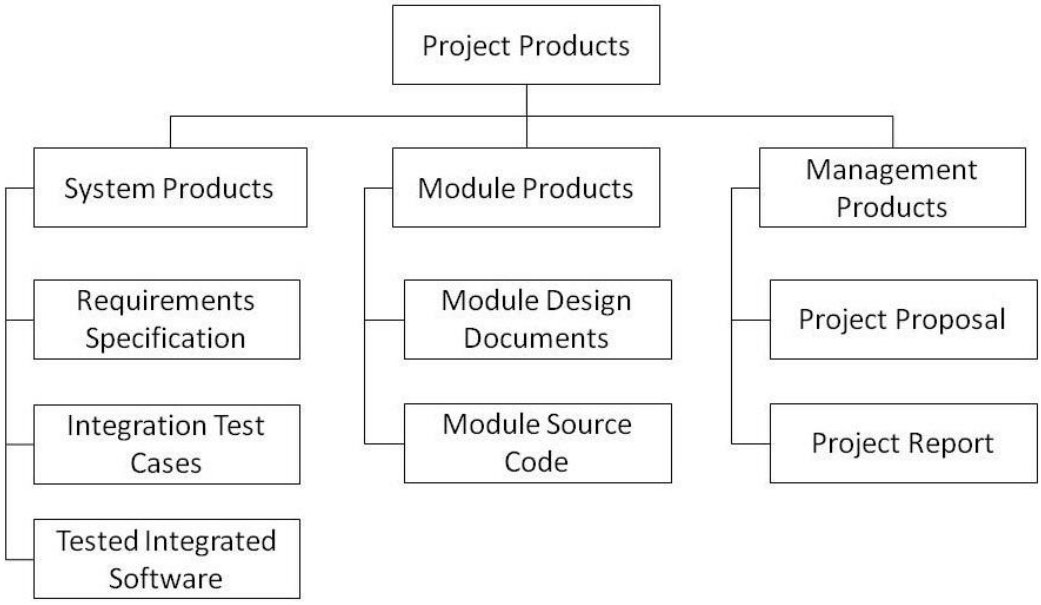

Fig 2. Product Breakdown Structure

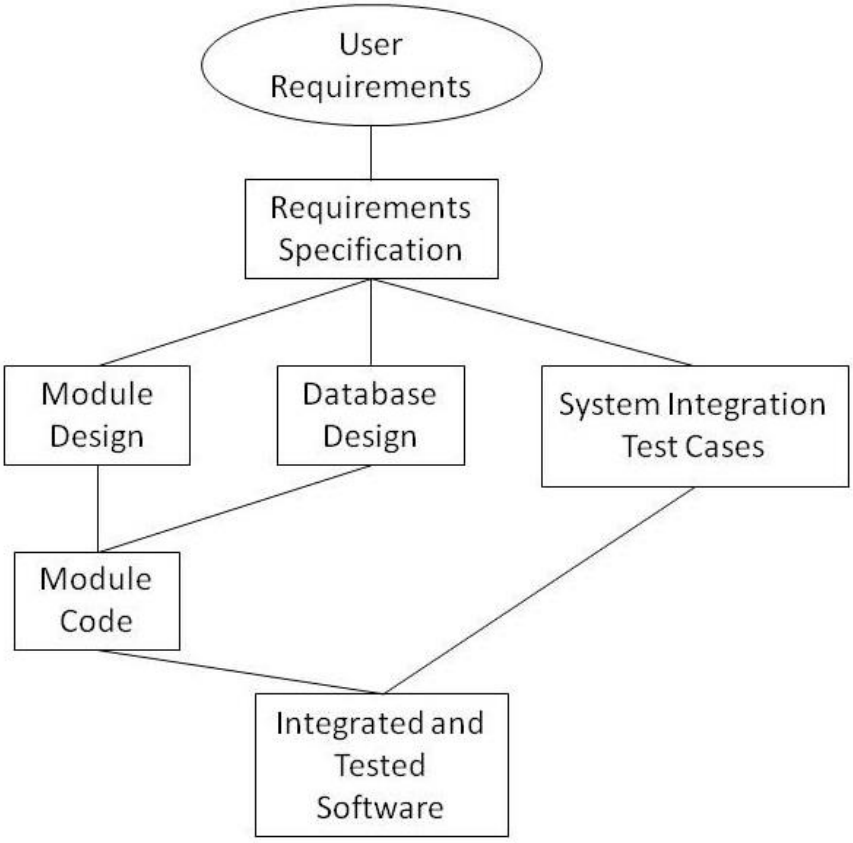

Fig 3. Product Flow Diagram

A6.2 Identify Activities

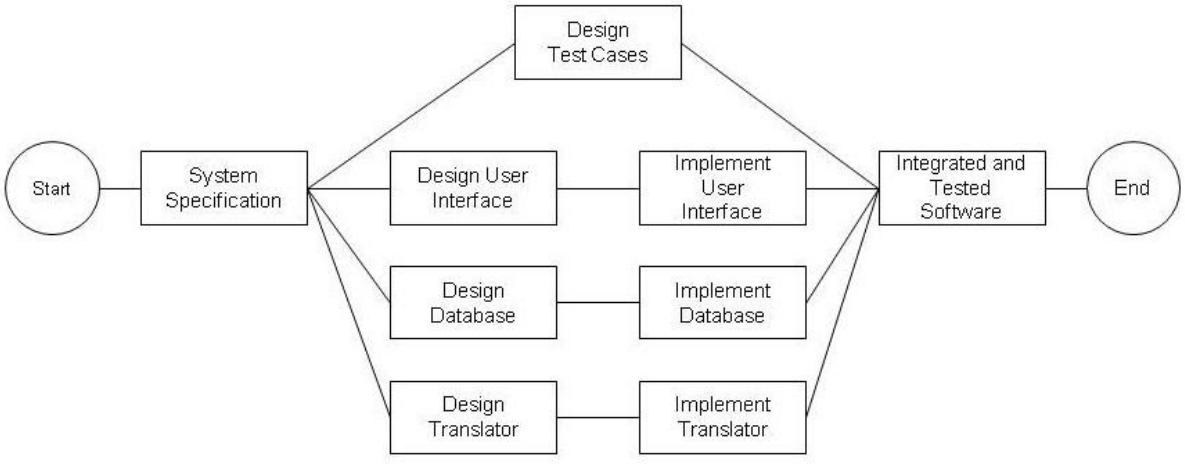

Fig 4. Ideal activity network

A7. Risk Management

Risk Management is the process of defining and analyzing risks, then decide on the appropriate actions to take in order to mitigate these risks while still achieving the project's goals. A risk management system includes various policies, procedures and practices that work in unison to identify, analyze, evaluate, address and scrutinize risk.

A7.1 Purpose

To identify any possible risk that might affect the whole project and minimizing the project exposure to risk.

A7.2 Scope

1. Identify what risks might there be.
2. Analysis and prioritization risk by their severity.
3. Planning on how to resolve the risk found.
4. Monitoring what is the current state of the risk.

A7.3 Risk Description

Possible risk for our project will be divided into 3 main categories.

1. Internal Risk
2. External Risk
3. Technical Risk

A7.3.1 Internal Risk

1. Lack of communication and miscommunication affects productivity of the team.
2. Limited knowledge of sign language might cause the team to deliver a sign language translator that cannot fulfill the requirements.
3. Due to work commitments, the team is unable to complete assigned tasks on time.
4. Limited knowledge of graphics and video authoring affects quality of the multimedia features of the product
5. Lack of progress monitoring leads to incompletion of tasks and affect the project schedule.
6. Limited knowledge on web designing affects the usability of the web site.

A7.3.2 External Risk

1. Tutor / assessor additional expectation
2. Client unexpected expectation

A7.3.3 Technical Risk

1. Breakdown of hardware
2. Software crash
3. Limited equipments to perform required tasks
4. Chosen development technologies unable to implement product.

A7.4 Contingency Plan / Mitigation Strategy

Not all risk faced can be fully eradicate. Our risk plan will not be able to eliminate all risks; therefore, risk reduction and risk transfer are other ways to help us mitigate the amount of risk.

A7.4.1 Internal Risk

Lack of Communication	
Description	Contingency Plan / Mitigation Strategy
Lack of communication and miscommunication	Project manager to setup agenda prior to meeting to ensure that meetings are done effectively. Project manager plan to explore online communication tools like MSN Messenger to establish meetings with team members when they are not available to meet in person.

Limited knowledge of sign language	
Description	Contingency Plan / Mitigation Strategy
Limited knowledge of sign language might cause the team to deliver a sign language translator that cannot fulfill the requirements.	The team will read up books on sign language to gain better knowledge of it. One example is Signing Exact English written by Gerilee Gustason and Esther Zawolkow.

Unable to complete assigned tasks on time	
Description	Contingency Plan / Mitigation Strategy
Due to work commitments, the team is unable to complete assigned tasks on time. .	Project manager will discuss with the team members on the deadline of their tasks and follows up closely. Project manager will assign another team member to help out with the uncompleted tasks.

Lack of progress monitoring	
Description	Contingency Plan / Mitigation Strategy
Lack of progress monitoring leads to incompletion of tasks and affect the project schedule.	Project manager will follows up closely and requires members to feedback on their progress and problems faced in their tasks. .

Limited knowledge of graphics and video authoring	
Description	Contingency Plan / Mitigation Strategy
Limited knowledge of graphics and video authoring skills affects quality of the multimedia features of the product	Chong Seng has industrial experience in graphics and video authoring. He can impart his knowledge to the team.

Limited knowledge on web designing	
Description	Contingency Plan / Mitigation Strategy
Limited knowledge of web design affects the usability of the web site.	Chong Seng has industrial experience in web designing. He can impart his knowledge to the team.

A7.4.2 External Risk

External Expectations	
Description	Contingency Plan / Mitigation Strategy
Tutor / assessor / client expectation.	Product had to be robust enough to cater to any future changes.

A7.4.3 Technical Risk

Lack of Relevant Equipment	
Description	Contingency Plan / Mitigation Strategy
Limited equipments to perform required tasks	Borrow or use similar equipment to complete required tasks.

Hardware Issue	
Description	Contingency Plan / Mitigation Strategy
Breakdown of hardware.	Do a backup regularly. Accept and take time to repair the hardware like laptop. Use computers in computer lab to do project.

Software Issue	
Description	Contingency Plan / Mitigation Strategy
Software crash	Do a backup regularly. Accept and take time to reinstall software

Chosen development technologies unable to implement product	
Description	Contingency Plan / Mitigation Strategy
Chosen development technologies unable to implement product. For example the chosen technology is not able to implement some functions of the product.	The team will conduct a thorough research on the possible development tools on their capabilities, constraints, advantages and disadvantages.

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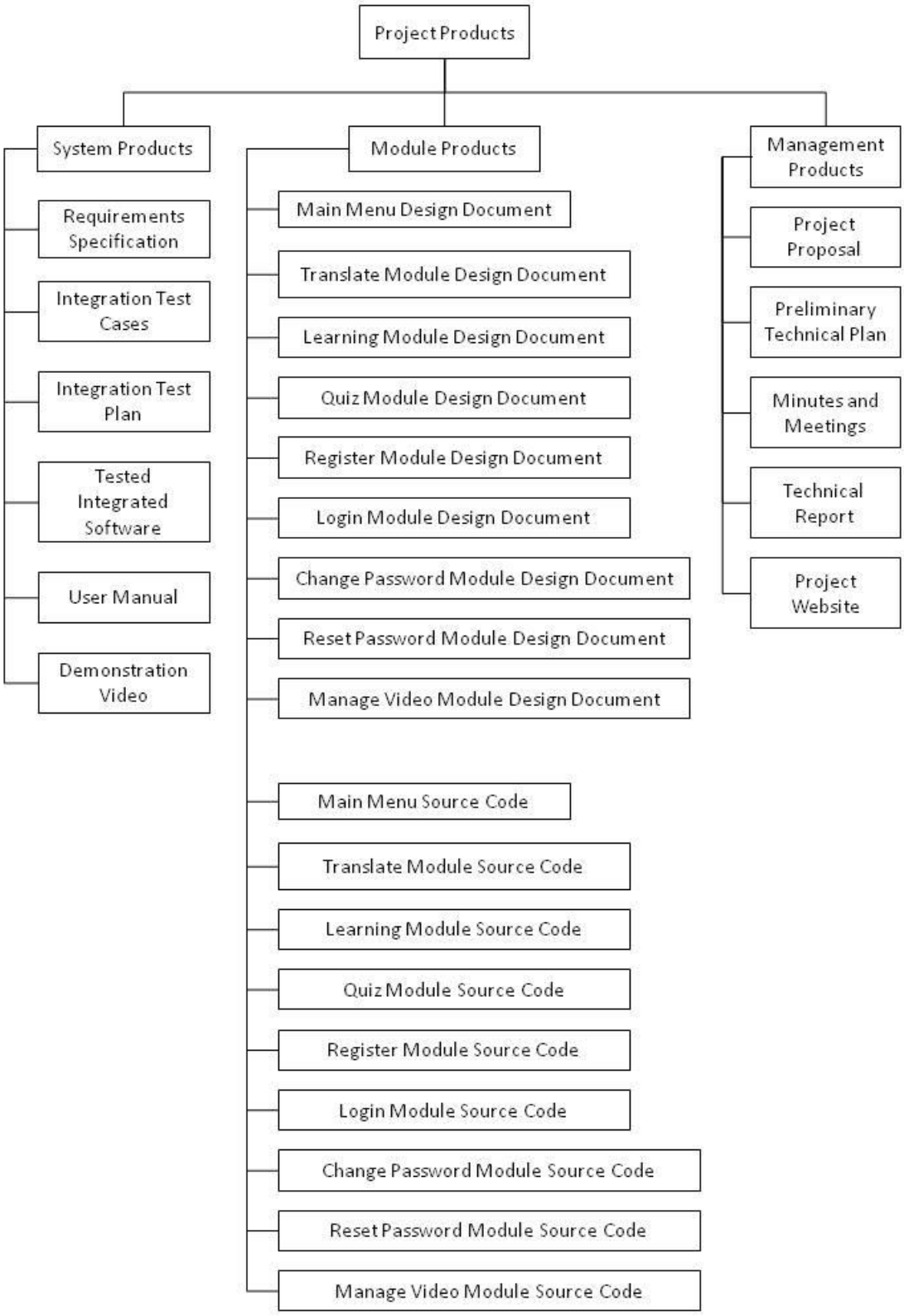
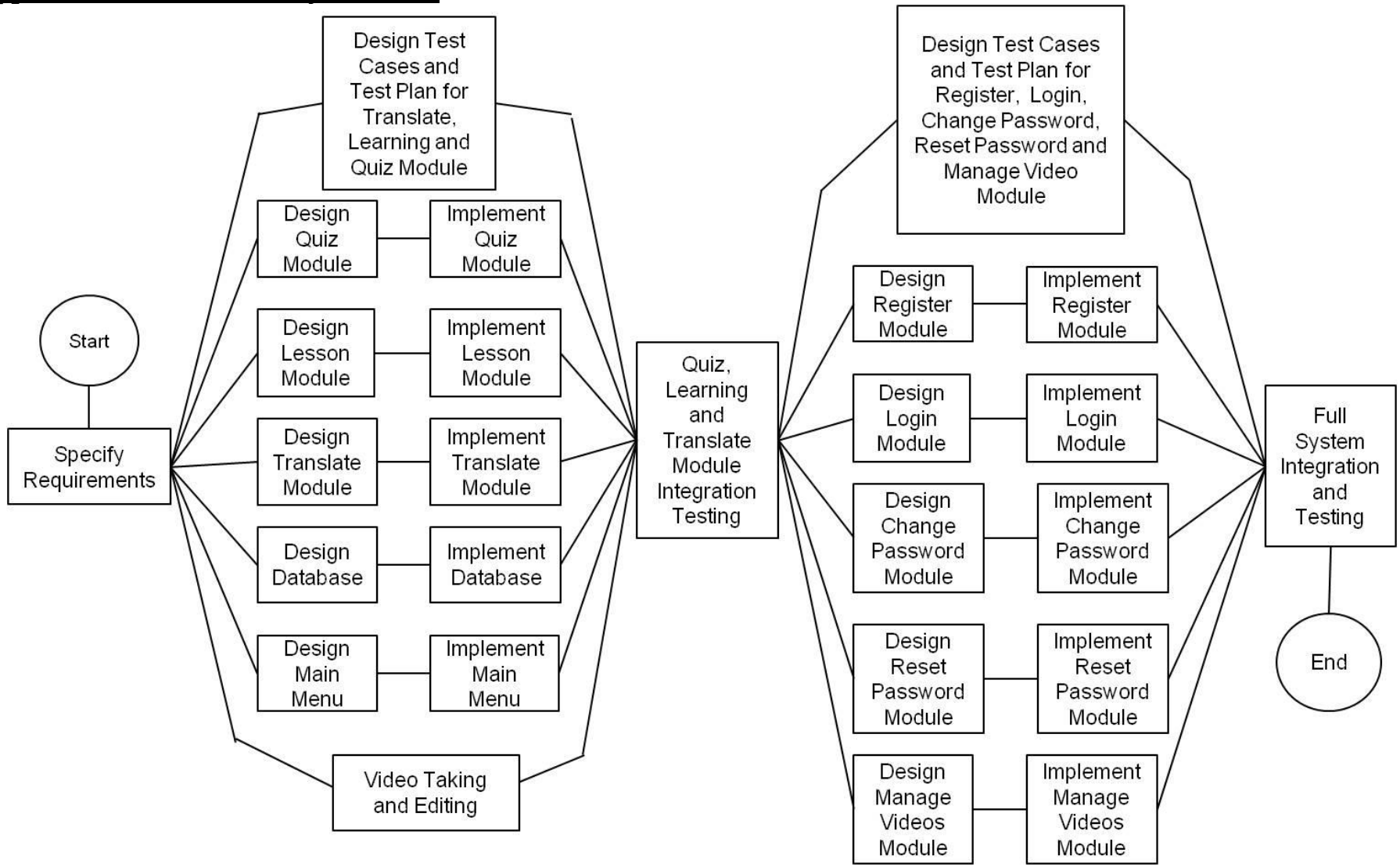
Appendix B – Product Breakdown Structure

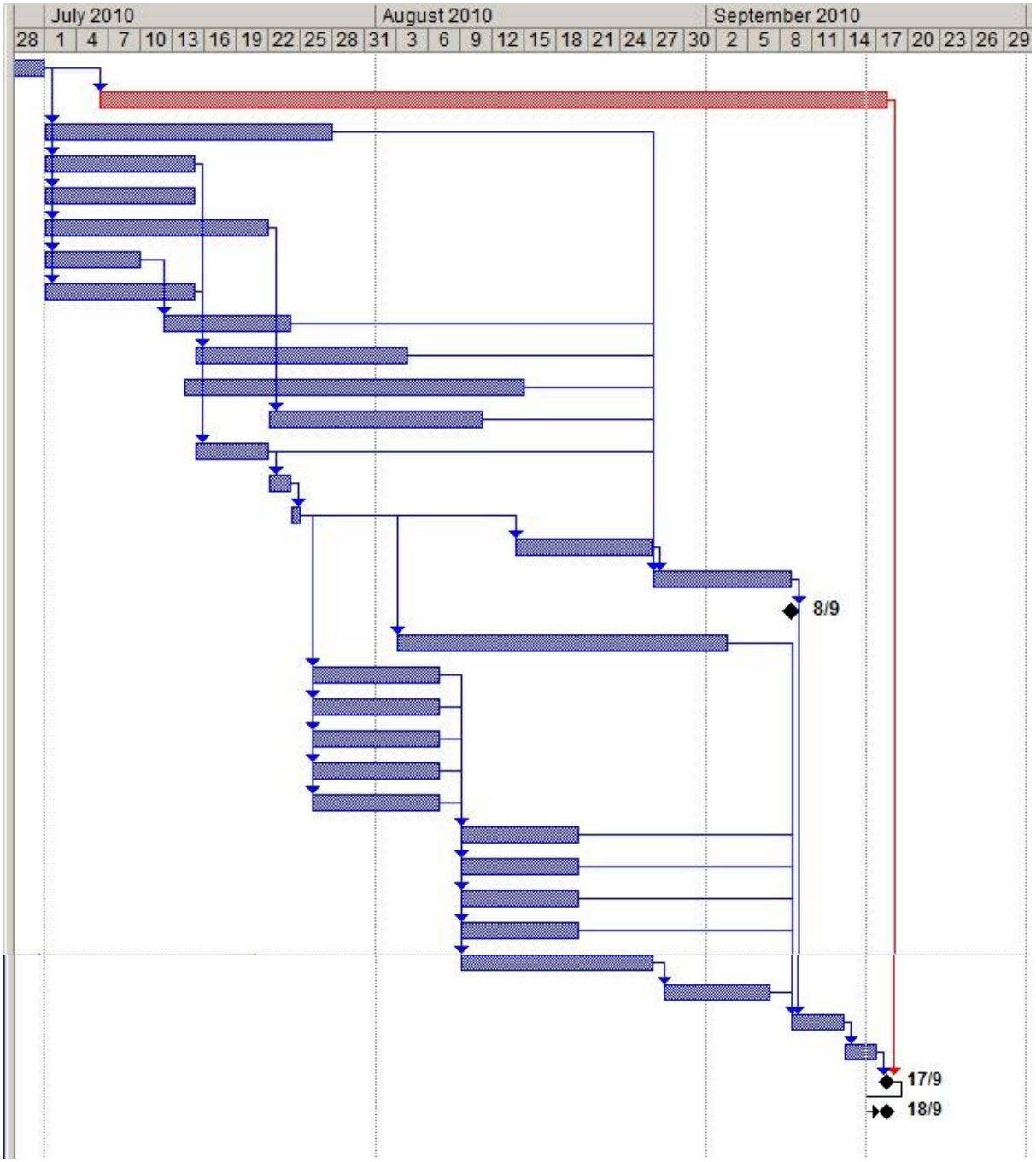


Appendix C – Ideal Activity Network

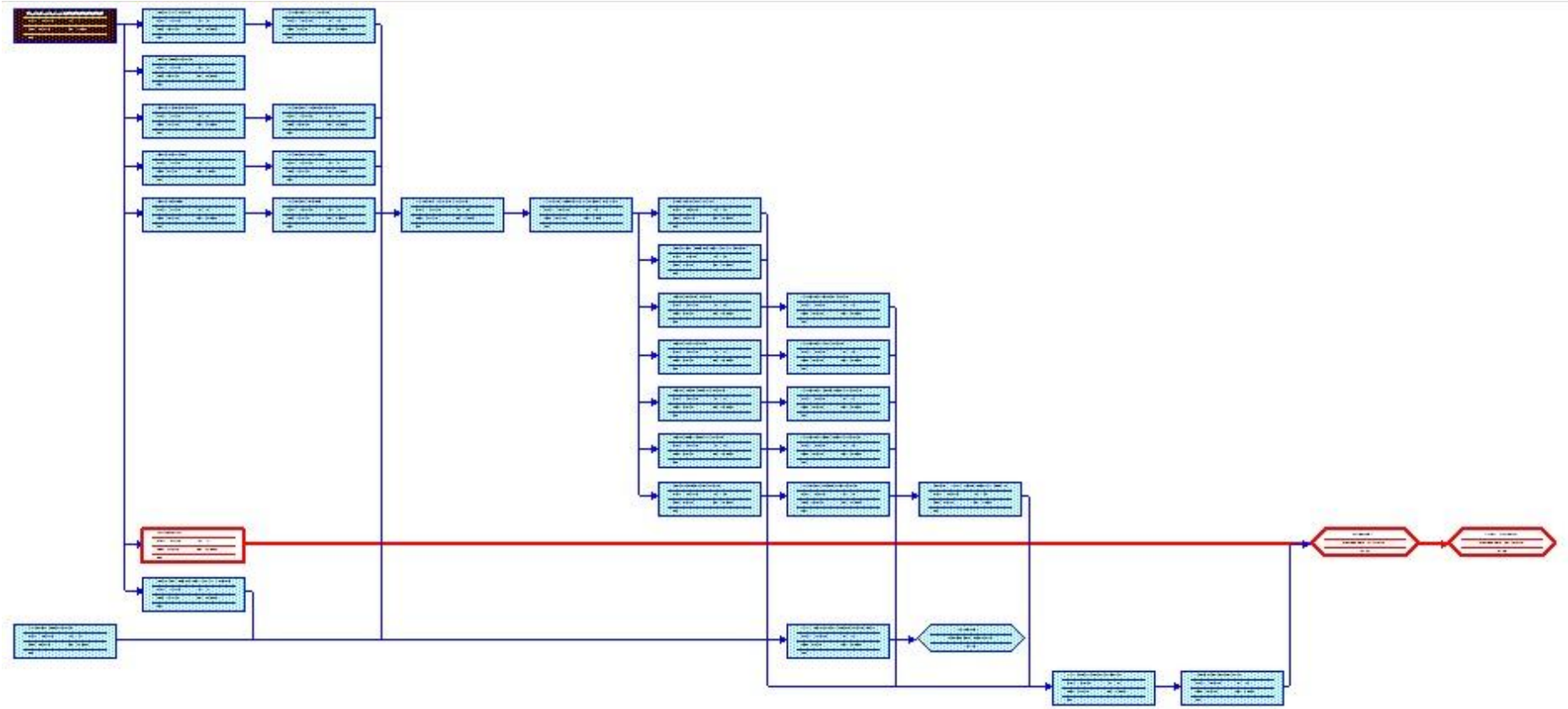


Appendix D – Gantt Chart

	Task Name	Duration	Start	Finish
1	Specify Requirements	3 days	Mon 28/6/10	Wed 30/6/10
2	Documentation	57 days	Tue 6/7/10	Fri 17/9/10
3	Design Test Case and Test Plan for Translate, Learning and Quiz Module	20 days	Thu 1/7/10	Tue 27/7/10
4	Design Quiz Module	10 days	Thu 1/7/10	Wed 14/7/10
5	Design Lesson Module	10 days	Thu 1/7/10	Wed 14/7/10
6	Design Translate Module	15 days	Thu 1/7/10	Wed 21/7/10
7	Design Main Menu	7 days	Thu 1/7/10	Fri 9/7/10
8	Design Database	10 days	Thu 1/7/10	Wed 14/7/10
9	Implement Main Menu	10 days	Mon 12/7/10	Fri 23/7/10
10	Implement Quiz Module	15 days	Thu 15/7/10	Tue 3/8/10
11	Implement Lesson Module	25 days	Wed 14/7/10	Sat 14/8/10
12	Implement Translate Module	15 days	Thu 22/7/10	Tue 10/8/10
13	Implement Database	5 days	Thu 15/7/10	Wed 21/7/10
14	Implement Software Prototype	2 days	Thu 22/7/10	Fri 23/7/10
15	Prototype Presentation to Accessor and Gather New Requirements	1 day	Sat 24/7/10	Sat 24/7/10
16	Video Taking and Editing	10 days	Sat 14/8/10	Thu 26/8/10
17	Quiz, Learning and Translate Module Testing	10 days	Fri 27/8/10	Wed 8/9/10
18	Milestone 1	0 days	Wed 8/9/10	Wed 8/9/10
19	Design Test Cases and Test Plan for Register, Login, Change Password, Reset Password and Manage Video Module	25 days	Tue 3/8/10	Thu 2/9/10
20	Design Register Module	10 days	Mon 26/7/10	Fri 6/8/10
21	Design Login Module	10 days	Mon 26/7/10	Fri 6/8/10
22	Design Change Password Module	10 days	Mon 26/7/10	Fri 6/8/10
23	Design Reset Password Module	10 days	Mon 26/7/10	Fri 6/8/10
24	Design Manage Video Module	10 days	Mon 26/7/10	Fri 6/8/10
25	Implement Register Module	10 days	Mon 9/8/10	Thu 19/8/10
26	Implement Login Module	10 days	Mon 9/8/10	Thu 19/8/10
27	Implement Change Password Module	10 days	Mon 9/8/10	Thu 19/8/10
28	Implement Reset Password Module	10 days	Mon 9/8/10	Thu 19/8/10
29	Implement Manage Video Module	15 days	Mon 9/8/10	Thu 26/8/10
30	Register, Login, Change Password, Reset Password and Manage Video Module Testing	7 days	Sat 28/8/10	Mon 6/9/10
31	Full System Integration Testing	3 days	Thu 9/9/10	Mon 13/9/10
32	Create Video Demonstration	3 days	Tue 14/9/10	Thu 16/9/10
33	Milestone 2	0 days	Fri 17/9/10	Fri 17/9/10
34	Project Submission	0 days	Sat 18/9/10	Sat 18/9/10


July 2010
August 2010
September 2010
28 1 4 7 10 13 16 19 22 25 28 31 3 6 9 12 15 18 21 24 27 30 2 5 8 11 14 17 20 23 26 29
8/9
17/9
18/9

Appendix E – PERT Diagram



Critical Path: Documentation, Milestone 2, Project Submission

Appendix F – Minutes and Meetings

Subject:	IT10/2H Group Meeting
Date:	8th of May 2010
Time:	01:00 pm to 01:30 pm
Location:	SIM Lecture Hall 4.20
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Ng Cong Seng
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Dedicate roles and responsibilities of each team members.
2) Project Website.

Meeting Conclusion:

1) Team members have exchanged contacts and email addresses.
2) Our team decided to appoint Jun Xiang as the project manager.
3) Roles and Responsibilities of each team member

Roles	Yap Min Hao	Ng Chong Seng	Wu Jinqing	Tay Jun Xiang
Manager				X
System Analyst	X	X	X	X
Implementer	X	X	X	X
Designer	X	X	X	
Tester	X	X	X	X
System Integrator	X	X	X	X
Documentor	X	X	X	X

Responsibilities	Yap Min Hao	Ng Chong Seng	Wu Jinqing	Tay Jun Xiang
Research	X	X	X	X
Scope and Risk Evaluation				X
System Requirement Identification	X	X	X	X
Create Test Case	X	X		
Create Test Plan			X	X
Meeting Minutes			X	X
System Design	X	X	X	X
Architectural Design	X	X	X	X
User Manual	X	X		
Implementation	X	X	X	X
User Acceptance Test	X	X	X	X
Presentation	X	X	X	X

Action Item	Assigned to	Date Due
Research on the Official Sign Language used in Singapore	All	14/05/2010
Create the Project Website	Jinqing	16/05/2010

Future Meeting:

Date	Time	Place
15th of May 2010	10:00 am	Suntec Gloria Jeans

Subject:	IT10/2H Group Meeting with Supervisor
Date:	15th of May 2010
Time:	10:05 am to 11:40 am
Location:	Suntec Gloria Jeans
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Yap Min Hao
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Functional requirement
2) Core requirement - able to translate words to sign language
3) Advance requirement - able to translate phrase to sign language
4) Enhancement - adding of game or quiz to the sign language translator
5) Project Proposal format – what to include
6) Visual illustration of sign language – combination of pictures and videos
7) Content management – a GUI to add content into database
8) Programming languages
9) Development tools and what Silverlight offers
10) Business Case

Meeting Conclusion:

1) The team has decided to develop the sign language translator as a web-based application using asp.net.
2) The database to be used will be Microsoft SQL Server.

Action Item	Assigned to	Date Due
Research on Signing Exact English	All	19/05/2010
Install and explore Microsoft Visual Studio 2010	All	19/05/2010
Brainstorm on Business Case	All	21/05/2010
Research on development tools	All	21/05/2010
Research and explore Silverlight	All	21/05/2010
Research on technical specifications	All	21/05/2010

Future Meeting:

Date	Time	Place
2nd of June 2010	09:00pm	SIM Laboratory 5.34/35

Subject:	IT10/2H Group Meeting
Date:	2nd of June 2010
Time:	09:00 pm to 10:30 pm
Location:	SIM Laboratory 5.34/35
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Ng Cong Seng
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

11) Initial version of project proposal
12) Silverlight functionalities and features
13) Target audiences and product name
14) Prototype of the product

Meeting Conclusion:

1) Our team has discussed and decided to use BabySlang as the name of our product.
2) The main target audiences of our product will be hearing parents with deaf children of age three to five years old. The parents can learn the sign language and impart the knowledge to their deaf children.

Action Item	Assigned to	Date Due
Business case and marketing plan	Min Hao	03/06/2010
Finalize project proposal	Jun Xiang	03/06/2010
Prototype of the product	Chong Seng	08/07/2010
Advertise the product in the Project Website	Jinqing	30/06/2010

Future Meeting:

Date	Time	Place
16th of June 2010	07:30 pm	SIM

Subject:	IT10/2H Group Meeting
Date:	16th of June 2010
Time:	02:00 pm to 03:30 pm
Location:	Ngee Ann Polytechnic Canteen
Facilitator:	Tay Jun Xiang
Note Taker:	Yap Min Hao
Timekeeper:	Wu Jinqing
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Product (BabySlang) prototype, via hand-drawn mock-up.
2) Search function algorithm.
3) Database design.
4) Quiz layout and format.

Meeting Conclusion:

1) Chong Seng will be using Microsoft Visual Studio to develop the screen prototype for BabySlang.

Action Item	Assigned to	Date Due
Research on search algorithm	Jun Xiang	23/06/10
Brainstorm on database design	Jinqing	23/06/10
Brainstorm on quiz layout and format	Min Hao	23/06/10
Develop screen prototype for BabySlang	Chong Seng	23/06/10

Future Meeting:

Date	Time	Place
22nd of June 2010	07:30pm	SIM

Subject:	IT10/2H Group Meeting
Date:	21st of June 2010
Time:	08:00 pm to 09:30 pm
Location:	SIM
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Ng Chong Seng
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Words to be selected for the product (BabySlang)
2) Enhancement of GUI
3) Sentences for learning tool
4) Questions for quiz
5) Dynamic capability of GUI – results of video and quiz
6) System Architecture
7) Database Design

Meeting Conclusion:

1) The team has decided to select words from Dolch words and ESL kids for the product.
2) The team has agreed that 15th of July will be the final deadline for exploring and learning the features of Silverlight for dynamic capability of GUI. However the team is not limiting Silverlight as the only choice, the team will also consider and explore other alternatives.

Action Item	Assigned to	Date Due
Refinement on GUI	Jun Xiang	10/07/10
Create a list of words for the product	Jun Xiang	27/06/10
Construct sentences for learning tool	Jun Xiang Chong Seng	10/07/10
Construct questions for quiz	Jun Xiang Min Hao	10/07/10
Create database design	Jun Xiang Jinqing	28/06/10
Setup and build database	Jinqing	30/06/10
Explore Silverlight's features	All	15/07/10

Future Meeting:

Date	Time	Place
30th of June 2010	08:00pm	SIM

Subject:	IT10/2H Group Meeting
Date:	30th of June 2010
Time:	08:00 pm to 09:30 pm
Location:	SIM
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Yap Min Hao
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

5) Task allocation for developing each module of the product (BabySlang)
6) Format of the quiz
7) Layout of the learning tool

Meeting Conclusion:

1) There are three main modules of the product: Quiz, learning tool and translate. Each member except Jinqing will take on 1 module.
   Quiz – Min Hao
   Learning tool – Chong Seng
   Translate – Jun Xiang
2) As Jinqing has finished the setup and build database, he will help out the rest of the team mates with their modules.
3) Jinqing will also learn how to integrate asp.net with Microsoft SQL Server.
4) The quiz has been finalized that it will be in 4 scenarios with 4 questions. Each question will provide with 3 answers, only 1 of them is the correct answer. The scoring system of the quiz will be in percentage, i.e. each question answered correct is 25%.
5) The learning tool will be classified by each alphabet and learning theme.

Action Item	Assigned to	Date Due
Develop quiz module functional prototype	Min Hao	10/07/10
Develop learning tool module functional prototype	Chong Seng	10/07/10
Develop translate module functional prototype	Jun Xiang	10/07/10
Integrate asp.net with Microsoft SQL Server	Jinqing	07/07/10

Future Meeting:

Date	Time	Place
10th of July 2010	02:00pm	SIM

Subject:	IT10/2H Group Meeting
Date:	10th of July 2010
Time:	04:30 pm to 07:00 pm
Location:	SIM
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Ng Chong Seng
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

8) Submit initial individual prototype
9) Comment about the initial prototype developed by each member
10) Pros and cons of various prototype proposed by each member
11) User Manual

Meeting Conclusion:

1) Basically there are two types of proposed prototype
    - The textbox or drop down list to search for video demonstrating SEE 2 hand signs will be shown on the same window itself, which is quite similar to existing online sign language translator ASLPro.com.
    - Separate the video being played from the textbox or drop down list into an opened new window, rather than when no video is being played, displays an empty video player with the textbox or drop down list on the same window.
2) The team decided to consult the project supervisor to feedback on the above proposed prototypes.
3) The team will take into consideration the monitor size of 1024 x 768 when developing the final product (BabySlang).

Action Item	Assigned to	Date Due
Develop and fine tuning quiz module functional prototype	Min Hao	14/07/10
Develop and fine tuning learning tool module functional prototype	Chong Seng	14/07/10
Develop and fine tuning translate module functional prototype	Jun Xiang	14/07/10
Design test plan and test cases	Jinqing	17/07/10

Future Meeting:

Date	Time	Place
17th of July 2010	10:00 am	Suntec Gloria Jeans

Subject:	IT10/2H Group Meeting with Supervisor
Date:	17th of July 2010
Time:	10:00 am to 11:15 am
Location:	Suntec Gloria Jeans
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Yap Min Hao
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

12) Get the feedback from supervisor about the initial functional prototype and technical plan.

Meeting Conclusion:

1) Include authentication of the users by incorporating Registration Page into the product (BabySlang).
2) Translator not comprehensive enough, and it will be further enhanced by:
    - Validating the words entered by user via dictionary e.g. merriam-webster.com.
    - Requesting the user to re-enter and simplify his/her sentence, if the sentence is too complex.
3) The questions in the quiz should be random. i.e. For each theme, the quiz will randomly select 5 out of 10 questions.
4) Due to some overlapping features of the learning tool and quiz, certain features can be integrated.
5) Explore the features of Expression Web and how it can be used to enhance the interface of BabySlang.
6) Size of the videos and the rendering time of the videos will be considered carefully for the final presentation of the Final Year Project.
7) Adult language learning books will be used as a reference for BabySlang.
8) Customization of the quiz questions – Allows user to select a list of themes' questions he/she wants to be tested on.
9) Technical Plan' Risk Contingency Plan – Try to focus on the strategy that can be carried out by individuals to mitigate the risk, instead of the strategy that involved the whole team effort.
10) The Learnt It home link will be changed to the picture with link, so as to further improve the appearance of the interface.
11) The selected video to be shown will be played in the same window either by redirecting or enabling the visibility of the video, instead of playing it in a new pop up window.

Action Item	Assigned to	Date Due
Brainstorm the quiz questions and answers	Min Hao	21/07/10
Develop functional Quiz prototype with connection to database	Min Hao Jinqing	31/07/10
Develop Cascading Style Sheets (CSS)	Chong Seng Jun Xiang	22/07/10
Integration of the prototypes	Jun Xiang	23/07/10
o Develop Registration Page o Develop About Us Page o Reconstruct and redesign the database	Jinqing	22/07/10

Future Meeting:

Date	Time	Place
24th of July 2010	12:00 pm	SIM

Subject:	IT10/2H Group Meeting with Assessor
Date:	24th of July 2010
Time:	02:00 pm to 02:30 pm (with assessor) 02:30 pm to 04:00 pm
Location:	SIM LT3-12
Facilitator:	Tay Jun Xiang
Note Taker:	Yap Min Hao
Timekeeper:	Wu Jinqing
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

13) Get the feedback from assessor about the initial prototype and technical plan.
14) The assessor had suggested using animation for the hand signs, however the team had feedback to the assessor that the team does not have adequate knowledge about animation, and already found ways to embed Windows Media Player into the asp pages.
15) The assessor then advice the team that the product (BabySlang) can be further enhanced by including some sort of personalization for the users. An example would be Content Management System (CMS) that allows the users to upload their hand signs videos to the server.

Meeting Conclusion:

1) The team had taken the assessor's advice and decided to develop the CMS.
2) The CMS would require additional of tables in the database and also an additional asp page i.e. login page.
3) The tables to be created will be users and userVideos.

Action Item	Assigned to	Date Due
Create users and userVideos tables	Jinqing	31/07/10
Develop the CMS	Min Hao Chong Seng	28/08/10
o Fine tuning of Cascading Style Sheets (CSS) o Search images in Microsoft Clip Art, which will be used to enhance the appearance of BabySlang	Jun Xiang	31/07/10

Future Meeting:

Date	Time	Place
31st of July 2010	02:00 pm	SIM

Subject:	IT10/2H Group Meeting
Date:	31st of July 2010
Time:	02:00 pm to 04:00 pm
Location:	SIM
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Ng Chong Seng
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Jinqing presented to the team functional quiz module with connection to the database. The quiz module is dynamic and each time it is being run, it will display a different set of random questions and answers using arraylists that generate a list of random numbers.
2) Jun Xiang helped Jinqing to implement the arraylists that generate a list of random numbers for the quiz module.
3) Chong Seng also presented his learning module to the team. The learning module is not fully functional as he has not finished it.
4) The team also discussed about the pixels of the sign language videos to be recorded. Several concerns were raised about the file size of the videos and the quality of the videos.

Meeting Conclusion:

4) The team had decided that the sign language videos to be recorded will be in 320 x 340 pixels resolution.
5) The team will meet Min Hao's friend Joseph on 14th of August to film the sign language videos. All team members will take turn to film Joseph doing the sign language. After all the sign language videos have been filmed, all team members will be involved in the editing and converting of these sign language videos.

Action Item	Assigned to	Date Due
Integrate the functional quiz module into the product (BabySlang)	Jun Xiang Jinqing	06/08/10
Develop fully functional learning module	Chong Seng	14/08/10
Research on the Content Management System	Min Hao	14/08/10

Future Meeting:

Date	Time	Place
14th of August 2010	10:00 am	SIM Discussion Room 2

Subject:	IT10/2H Group Meeting
Date:	14th of August 2010
Time:	10:00 am to 02:00 pm
Location:	SIM Discussion Room 2
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Yap Min Hao
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) The team met with Min Hao's friend Joseph to film the sign language videos.
2) The team took turns to film Joseph doing the sign language.
3) Chong Seng highlighted to Jinqing that the tables for Content Management System (CMS) i.e. tbUsers and tbUserVideos should allow its primary key to be auto-incremented each time a new row is being inserted.
4) Jinqing then researched on the Internet on how to set primary key to be auto-incremented. He found out that the identity of the primary key need to be set to true, with both of its identity seed and identity increment initialized to 1. He then made the necessary changes to the database and sent the backup of the database to every member via email.
5) Chong Seng had finished his learning module and he presented to the team. However the learning module was unable to play video.
6) Lastly, Min Hao and Chong Seng discussed in detailed on how to go about developing the CMS.

Meeting Conclusion:

1) Basically, the CMS to be developed consists of registration, login, change password, upload videos and edit details for uploaded videos.
2) Min Hao will be developing the registration, login and change password, while Chong Seng will be developing upload videos and edit details for uploaded videos.
3) In order to make the product (BabySlang) login more comprehensive, users will be able to request a default password to be sent to their email, when they have forgotten their password. The users will be asked to change their password immediately, once they are logged in with the default password.
4) For the login part of forget password, Jinqing will be assisting Min Hao in coding the Simple Mail Transfer Protocol (SMTP) codes for sending email of the default password.

Action Item	Assigned to	Date Due
Edit the sign language videos and convert them to .wmv format	All	19/08/10
Debug and integrate the learning module into the product (BabySlang)	Jun Xiang	19/08/10
Develop Content Management System	Chong Seng Min Hao	28/08/10
Code the SMTP portion for the login	Jinqing	19/08/10

Future Meeting:

Date	Time	Place
29th of August 2010	04:30 pm	SIM

Subject:	IT10/2H Group Meeting
Date:	29th of August 2010
Time:	04:30 pm to 06:00 pm
Location:	SIM
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Yap Min Hao
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Chong Seng and Min Hao presented the Content Management System (CMS) to the team. Several questions were asked about its functionalities. One of the crucial components of the CMS was missing, that is to allow users to view their uploaded videos.
2) Jun Xiang had already subscribed to MochaHost.com. The domain name for our product (BabySlang) is www.babyslang.net
3) Jun Xiang had also uploaded several asp pages and restored the MS SQL Database backup file to the web server. Currently the www.babyslang.net is able to translate, learn SEE and take quiz.
4) Jinqing presented to the team a basic Simple Mail Transfer Protocol (SMTP) asp.net application that is able to use a gmail email account to send an email. Jun Xiang then suggested to the team that since MochaHost.com provides an email account perhaps it can be used instead of gmail.

Meeting Conclusion:

1) Jun Xiang had designed the test cases for translate, learn SEE and quiz and Jinqing will execute and take screenshot for these test cases.
2) The email account to be used to send the default password to the registered users will be the email account provided by MochaHost.com
3) Jun Xiang will further enhance the CMS that include:
    - Validating the data input by users
    - Allowing users to view their uploaded video
    - Allowing users to request a default password to be sent to their email, if users forgot their password for login

Action Item	Assigned to	Date Due
Execute test cases for translate, learn SEE and quiz	Jinqing	04/09/10
Further enhance CMS	Jun Xiang	11/09/10
Upload CMS asp pages to the web server	Jun Xiang	11/09/10

Future Meeting:

Date	Time	Place
13th of September 2010	09:00 pm	SIM

Subject:	IT10/2H Group Meeting
Date:	13th of September 2010
Time:	09:00 pm to 10:00 pm
Location:	SIM
Facilitator:	Tay Jun Xiang
Note Taker:	Wu Jinqing
Timekeeper:	Yap Min Hao
Attendees:	Tay Jun Xiang, Wu Jinqing, Ng Chong Seng, Yap Min Hao
Absent:	Nil

Meeting Discussion:

1) Jun Xiang had told the team that he had uploaded the CMS asp pages and also designed the CMS test cases; he then passed the test cases to Jinqing on last Saturday. On the following day, Jinqing executed the test cases and all test cases passed.
2) Min Hao highlighted to the team that there is a problem with the email sent by the email account provided by MochaHost.com, which is it is unable to be received in the hotmail email accounts. Jinqing seconded with Min Hao that he also realized the same problem.

Meeting Conclusion:

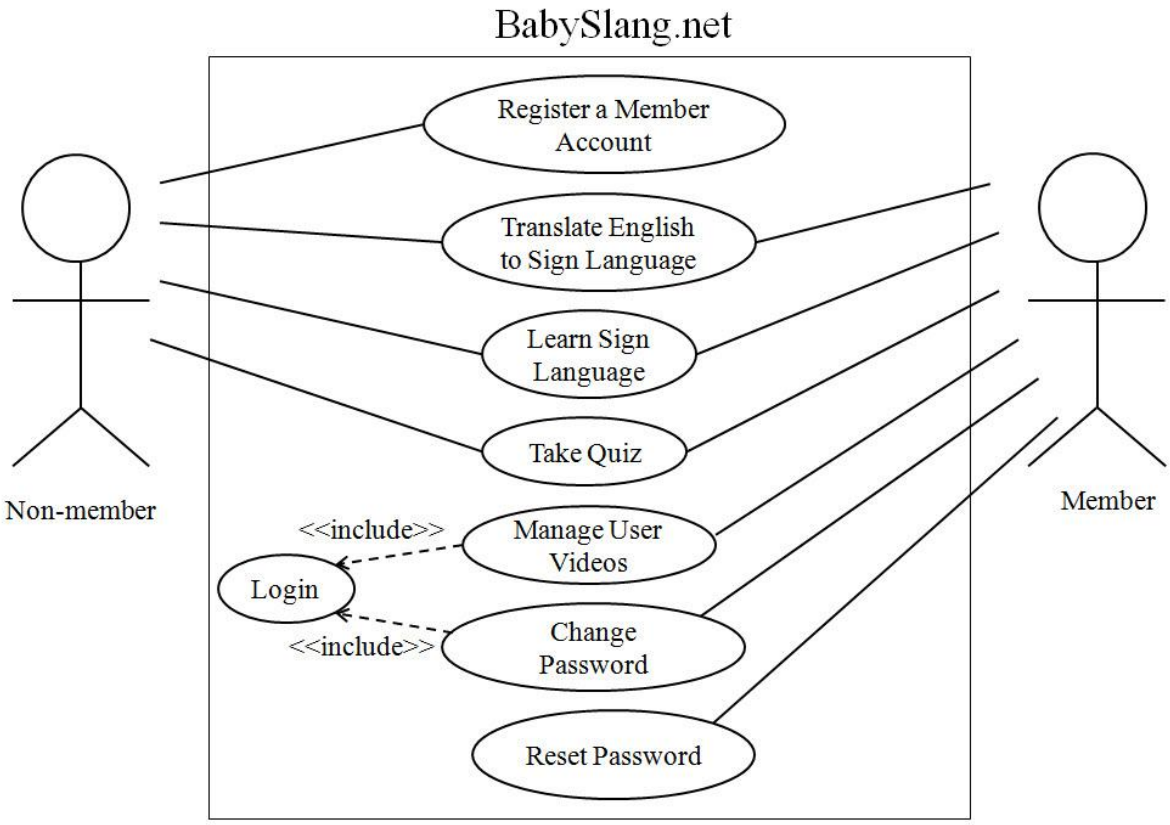
1) The email account to be used to send the default password to the registered users will be gmail email account. Thus, the Simple Mail Transfer Protocol (SMTP) coding has to be changed i.e. deploy gmail email account as the mail sender to send the default password.
2) Jinqing to re-execute the test case for requesting the default password to be sent to the users' email, if the users had forgotten their password for login.
3) The next group meeting will be meeting with project supervisor.

Action Item	Assigned to	Date Due
Amend the (SMTP) coding and upload the relevant page to the web server	Jun Xiang	16/09/10
Re-execute the test case for requesting of the default password	Jinqing	16/09/10
Finalize technical report	Jun Xiang Jinqing	16/09/10
Do user manual and video presentation of the project	Chong Seng	16/09/10
Brainstorm the marketing plan for the technical report	Min Hao	16/09/10

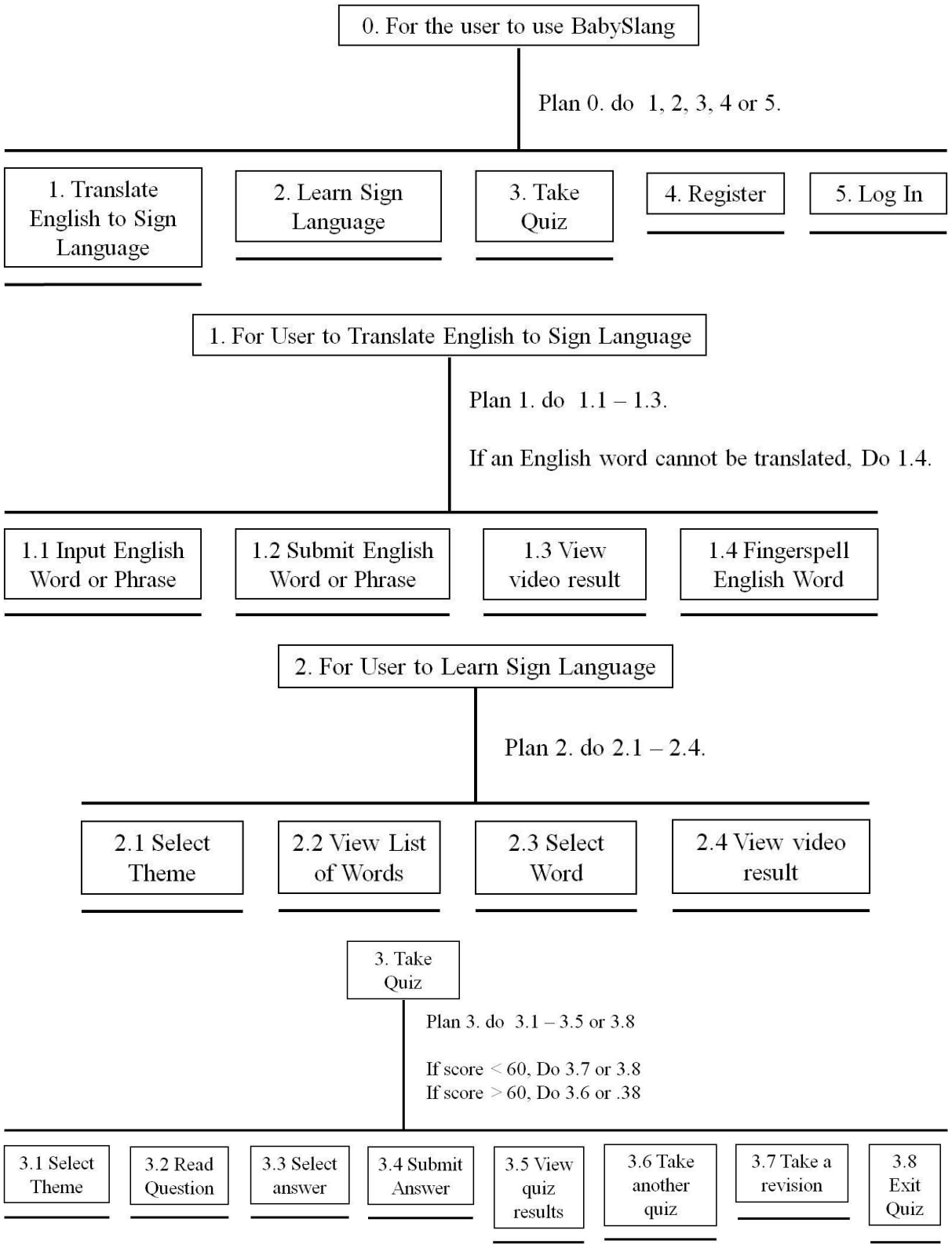
Future Meeting:

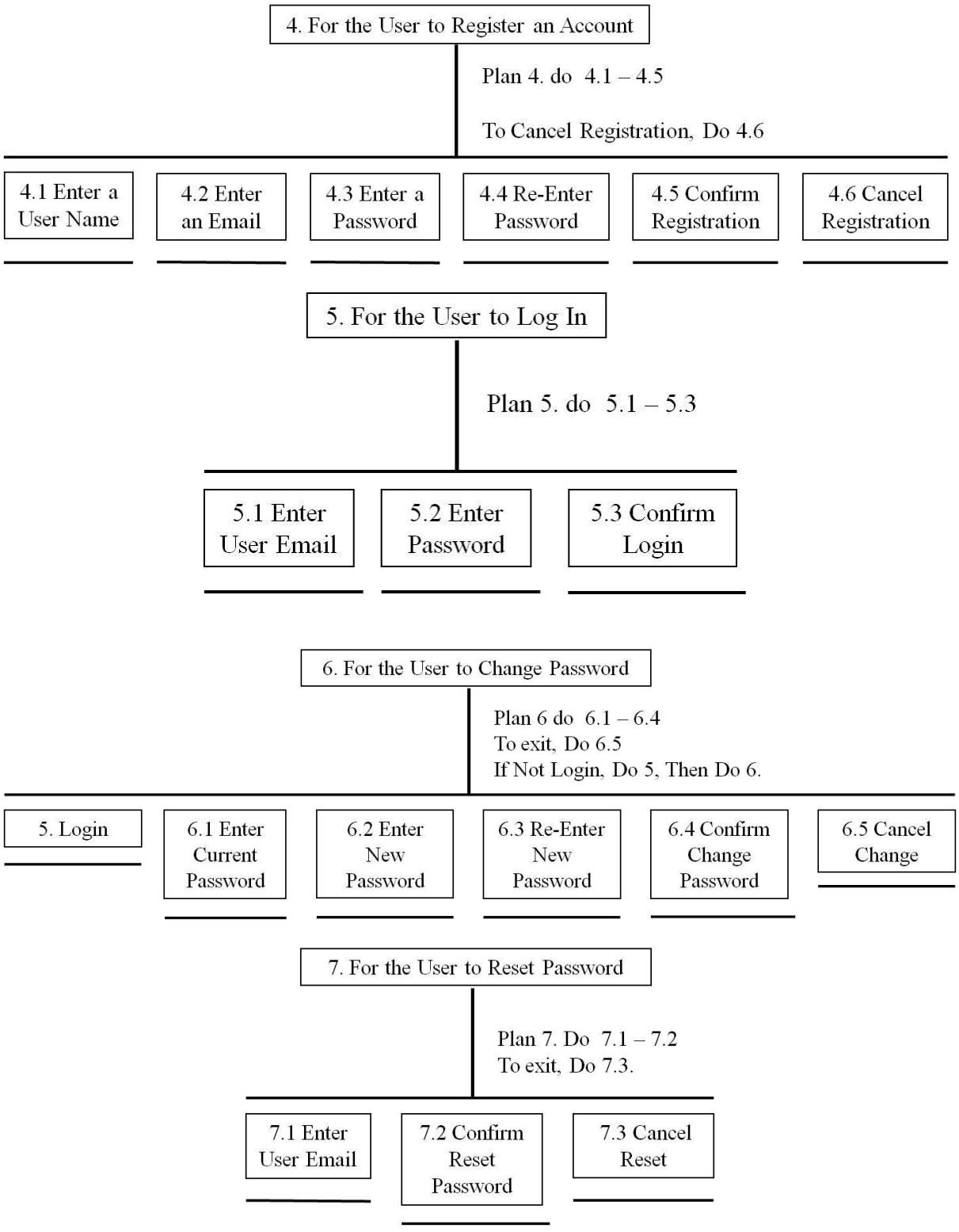
Date	Time	Place
18th of September 2010	11:00 am	Suntec Gloria Jeans

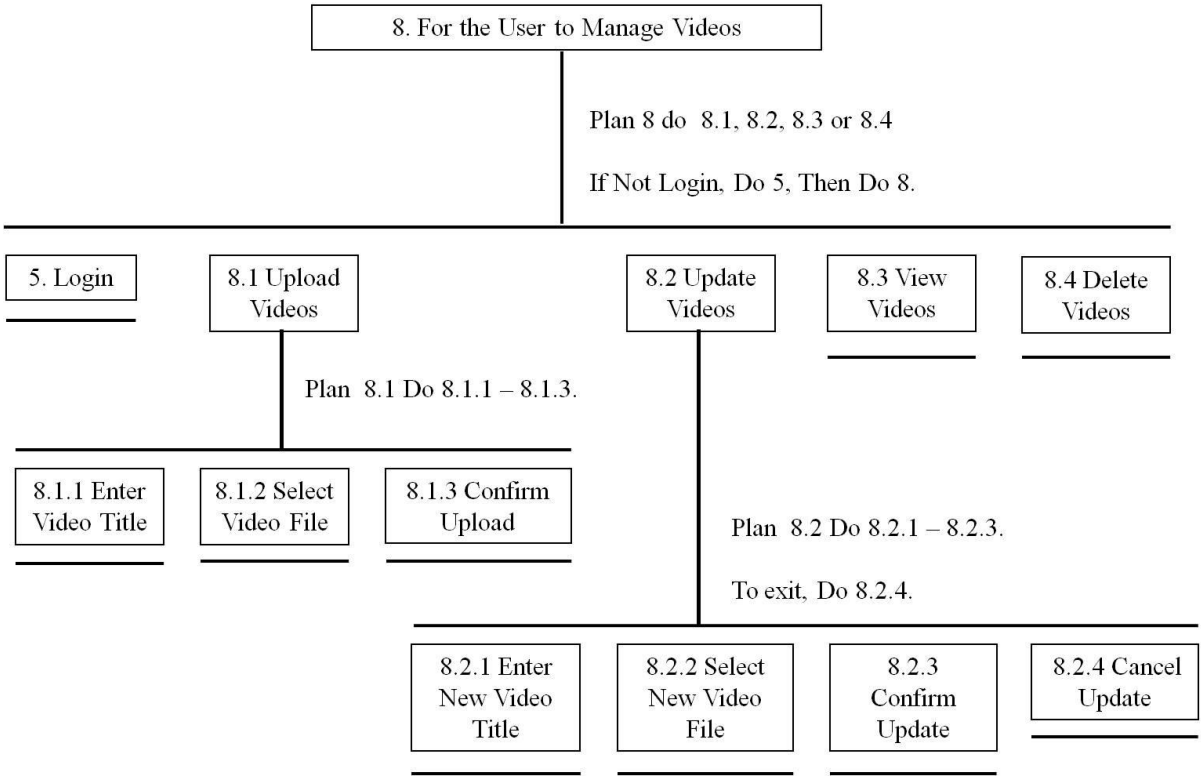
Appendix G – Use-case Model



Appendix H – Hierarchical Tasks Analysis

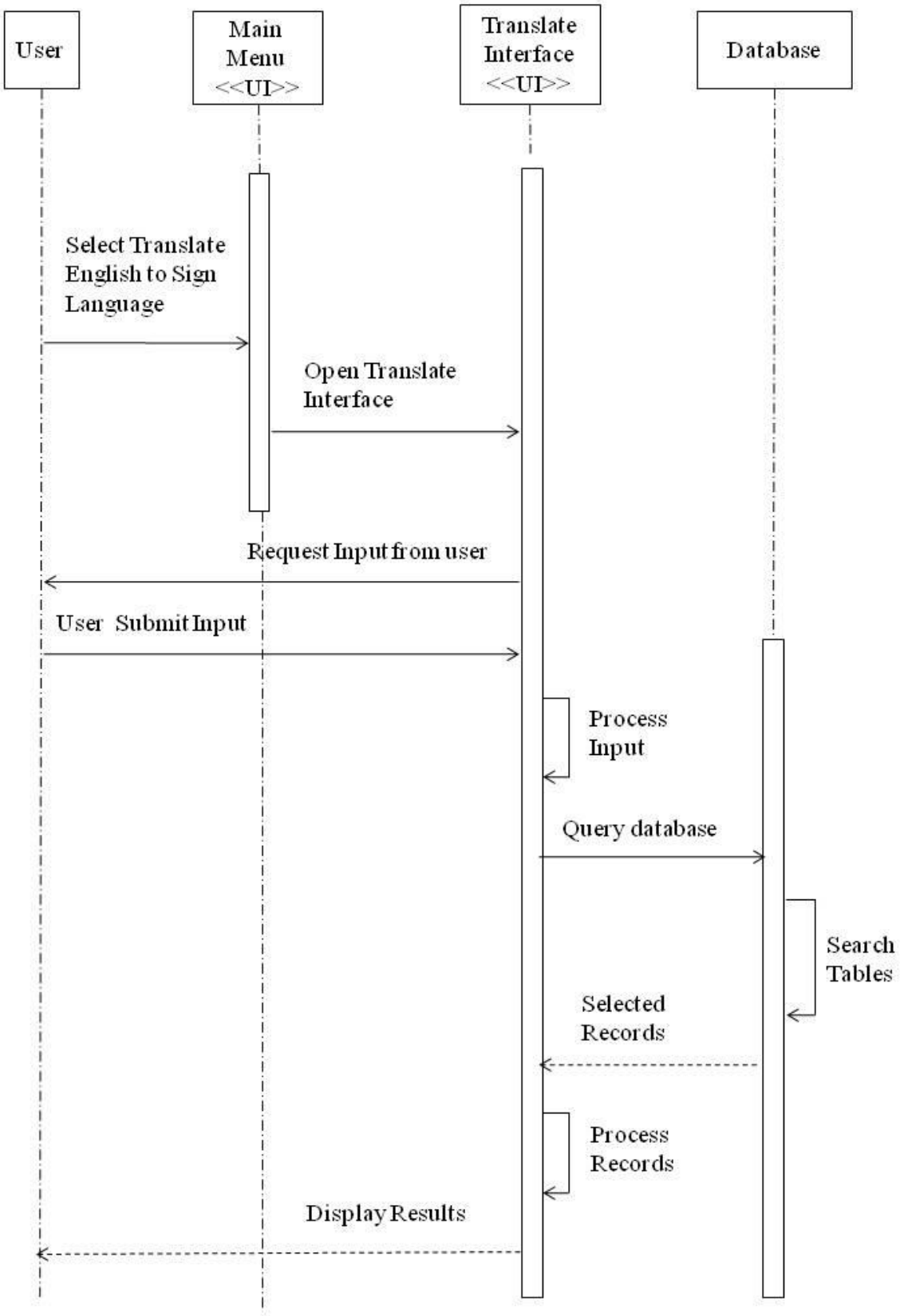



4. For the User to Register an Account
Plan 4. do 4.1 – 4.5
To Cancel Registration, Do 4.6
4.1 Enter a User Name
4.2 Enter an Email
4.3 Enter a Password
4.4 Re-Enter Password
4.5 Confirm Registration
4.6 Cancel Registration
5. For the User to Log In
Plan 5. do 5.1 – 5.3
5.1 Enter User Email
5.2 Enter Password
5.3 Confirm Login
6. For the User to Change Password
Plan 6 do 6.1 – 6.4
To exit, Do 6.5
If Not Login, Do 5, Then Do 6.
5. Login
6.1 Enter Current Password
6.2 Enter New Password
6.3 Re-Enter New Password
6.4 Confirm Change Password
6.5 Cancel Change
7. For the User to Reset Password
Plan 7. Do 7.1 – 7.2
To exit, Do 7.3.
7.1 Enter User Email
7.2 Confirm Reset Password
7.3 Cancel Reset

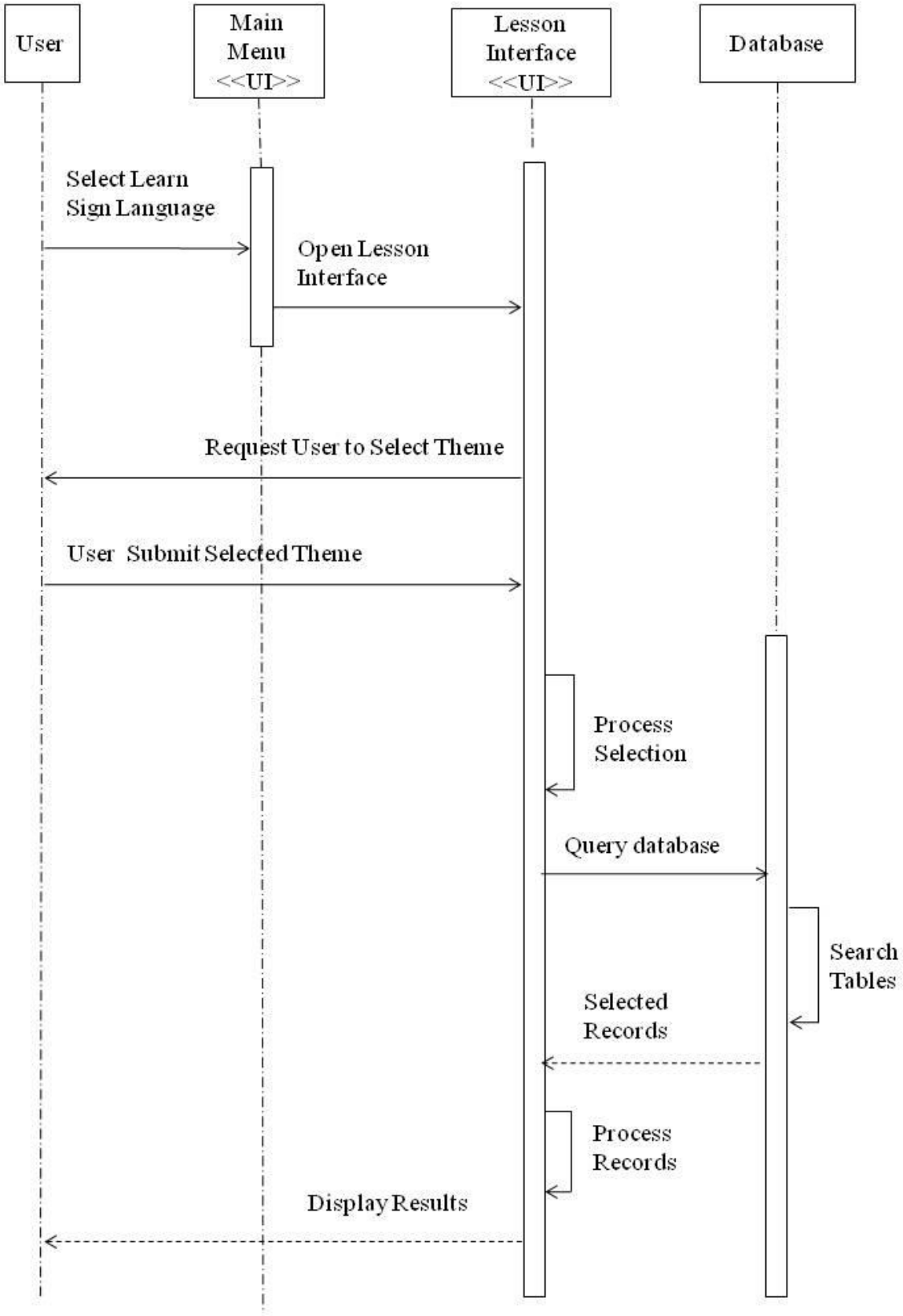

8. For the User to Manage Videos
Plan 8 do 8.1, 8.2, 8.3 or 8.4
If Not Login, Do 5, Then Do 8.
5. Login
8.1 Upload Videos
8.2 Update Videos
8.3 View Videos
8.4 Delete Videos
Plan 8.1 Do 8.1.1 – 8.1.3.
8.1.1 Enter Video Title
8.1.2 Select Video File
8.1.3 Confirm Upload
Plan 8.2 Do 8.2.1 – 8.2.3.
To exit, Do 8.2.4.
8.2.1 Enter New Video Title
8.2.2 Select New Video File
8.2.3 Confirm Update
8.2.4 Cancel Update

Appendix I – Sequence Diagrams

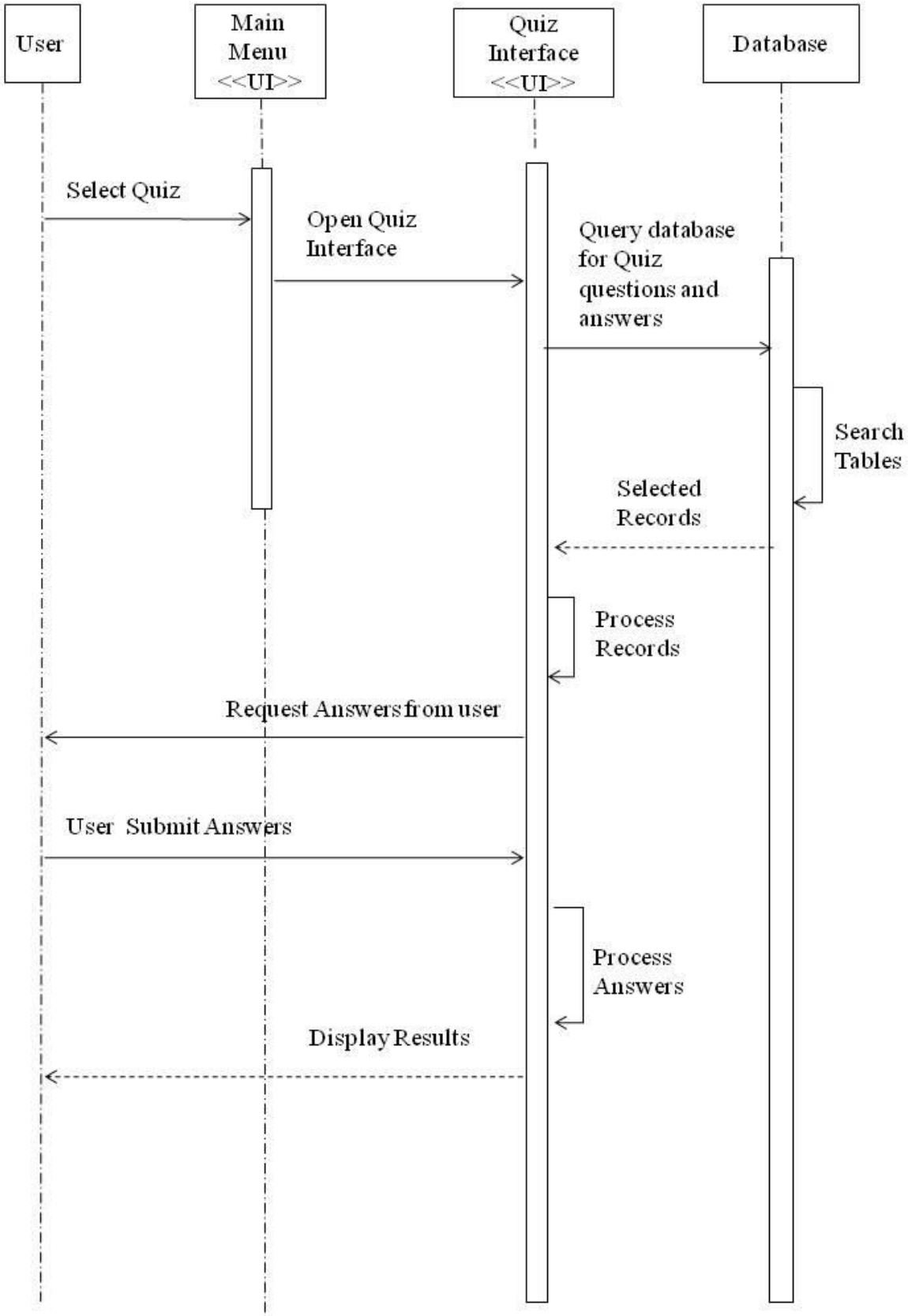
Sequence Diagram for Translate Interface



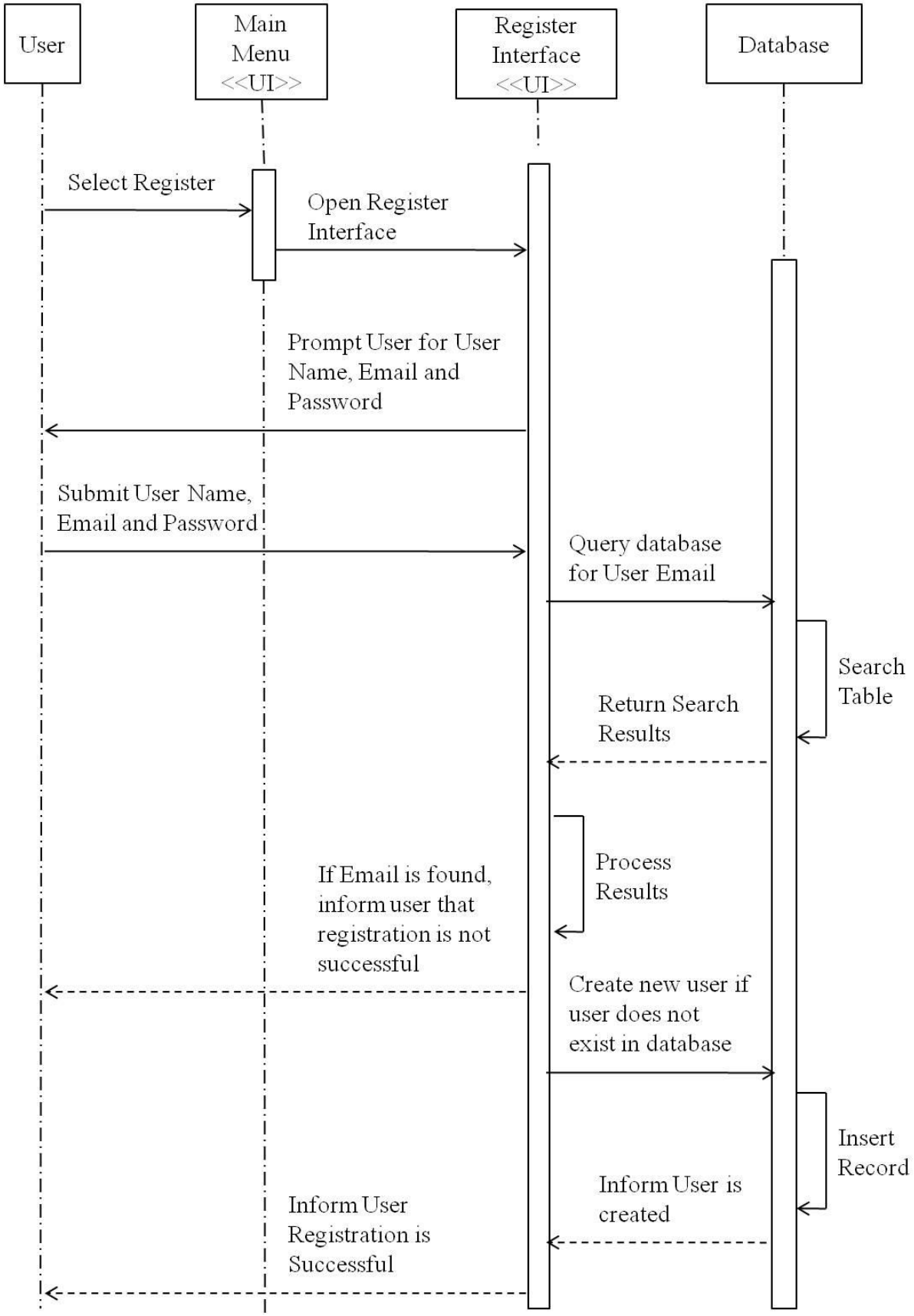
Sequence Diagram for Lesson Interface



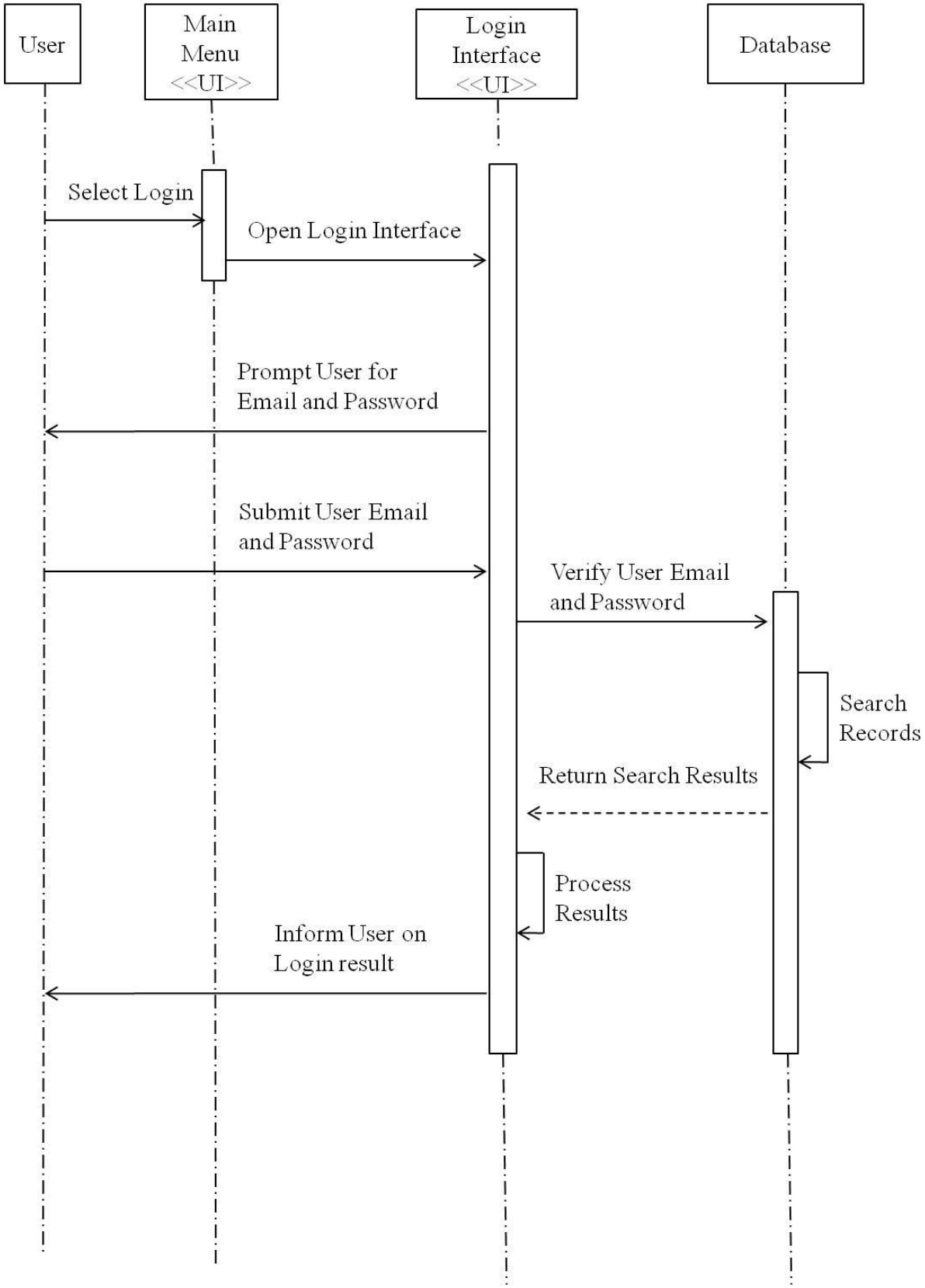
Sequence Diagram for Quiz Interface



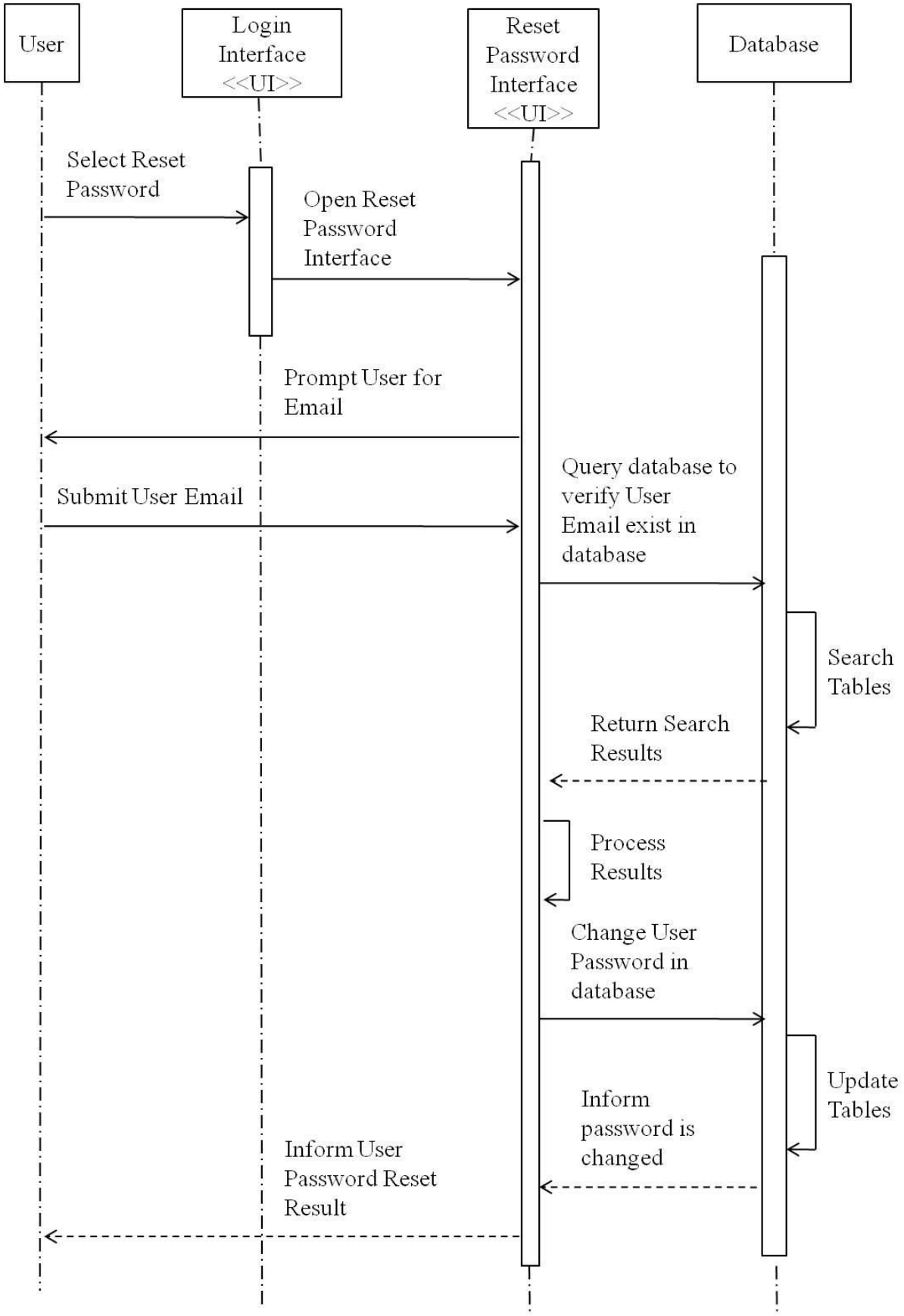
Sequence Diagram for Register Interface



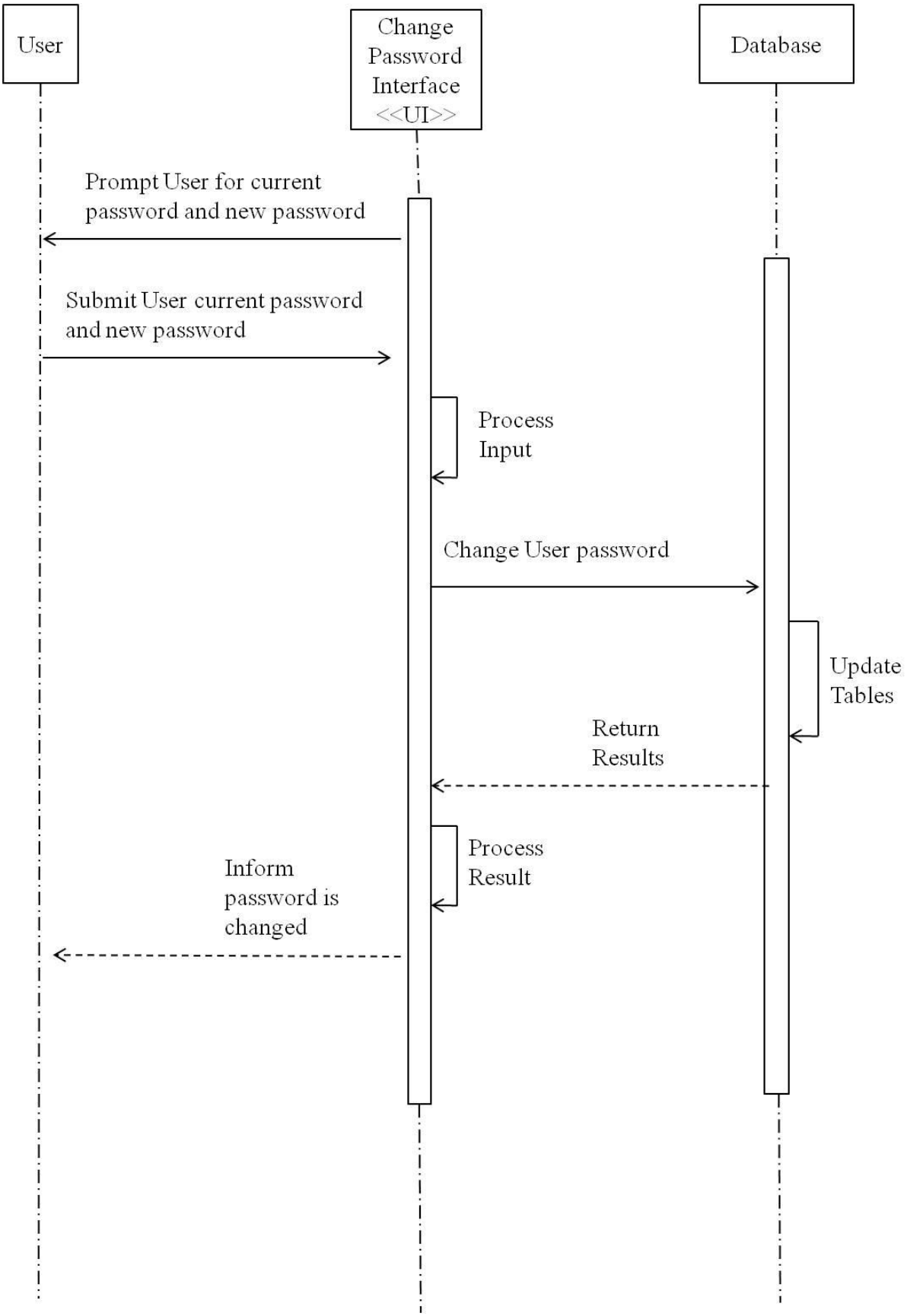
Sequence Diagram for Login Interface



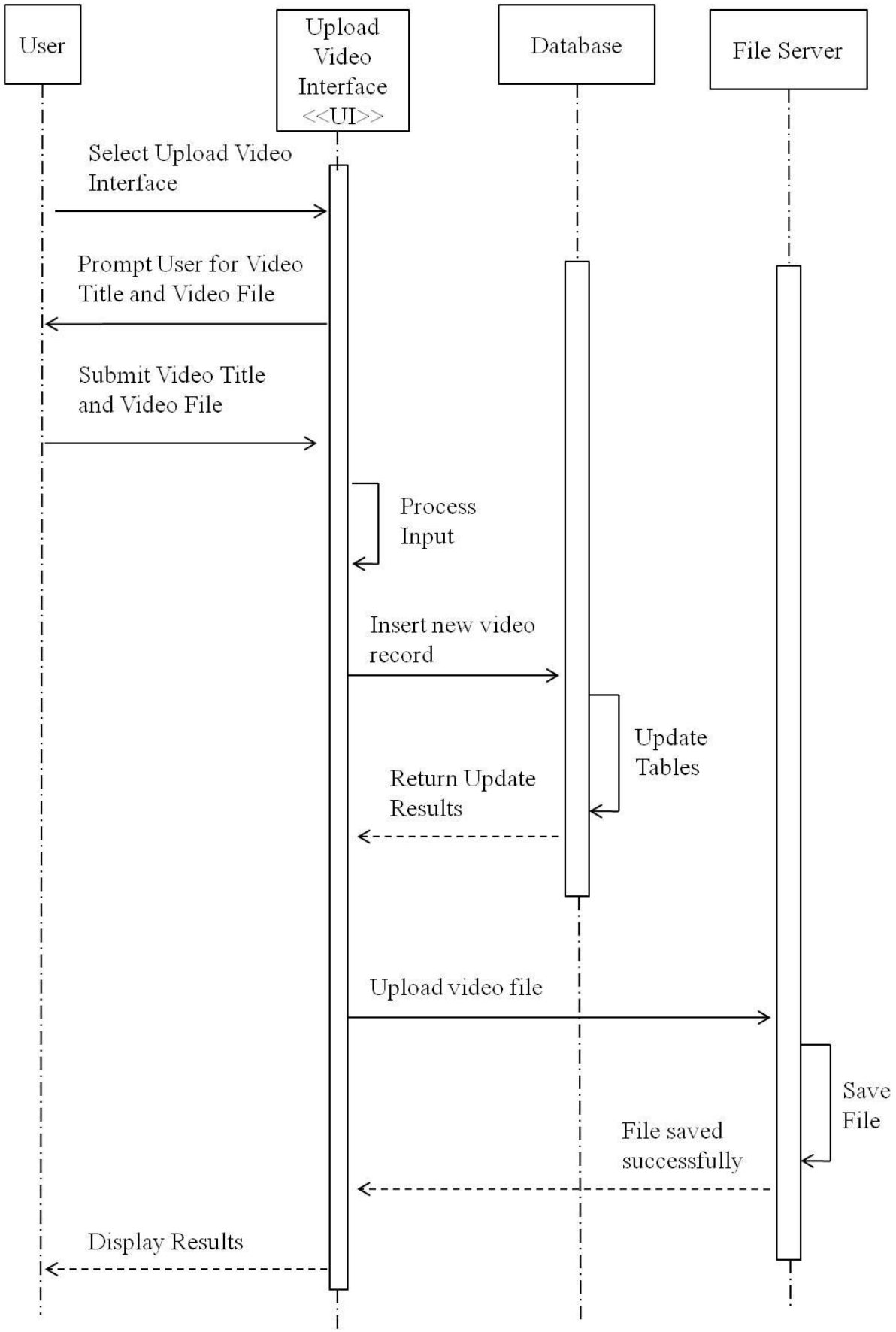
Sequence Diagram for Reset Password Interface



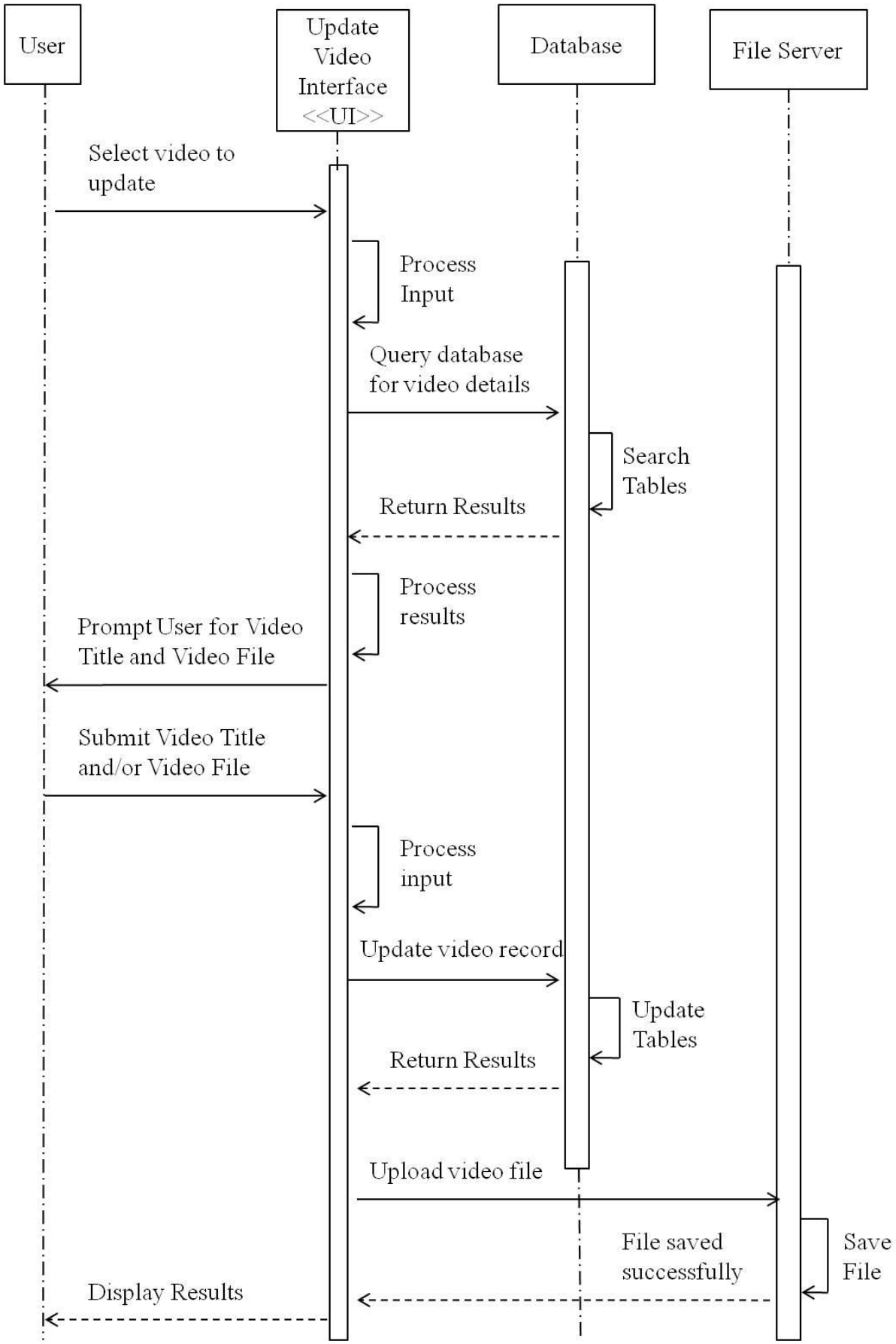
Sequence Diagram for Change Password Interface



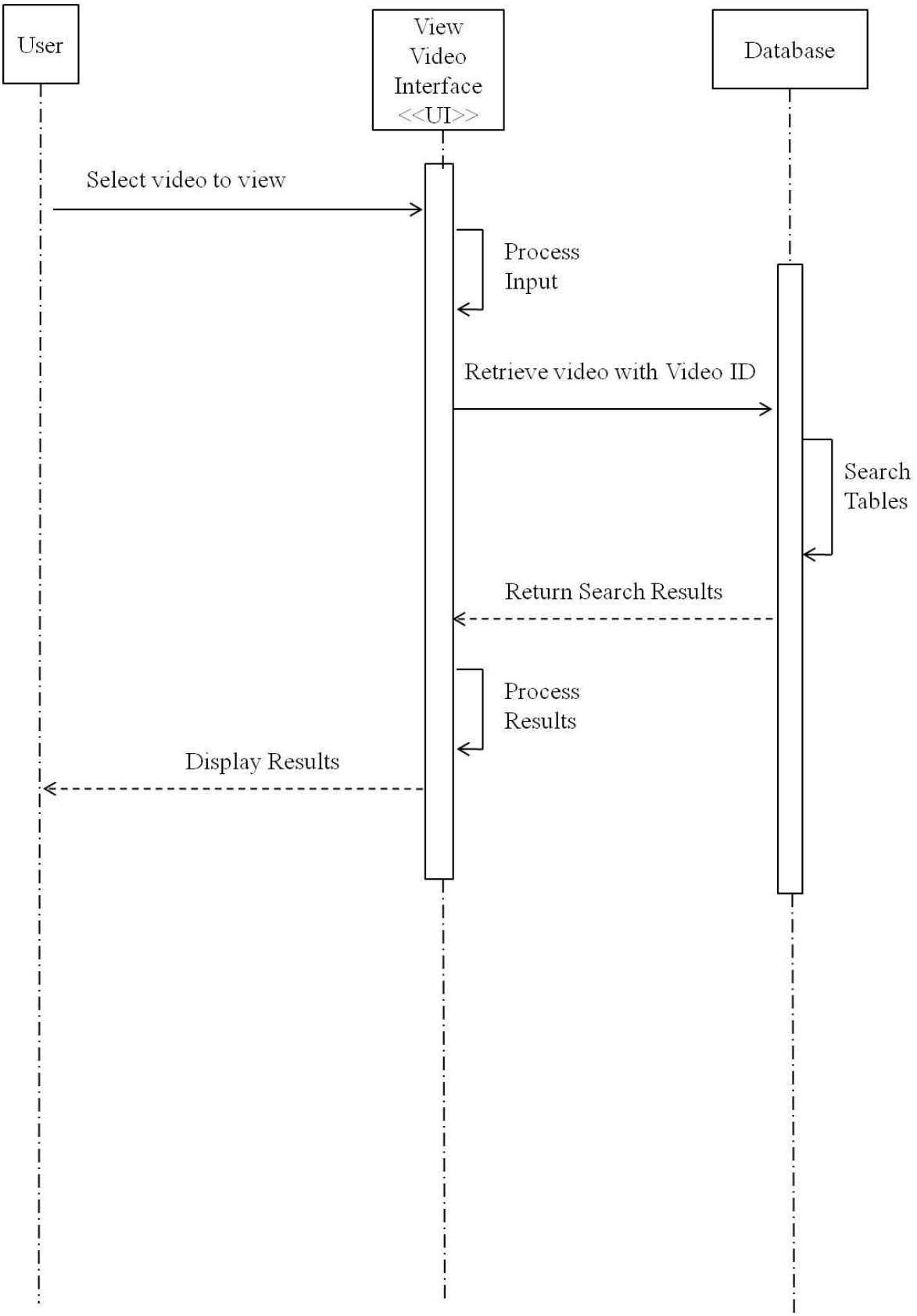
Sequence Diagram for Upload Video Interface



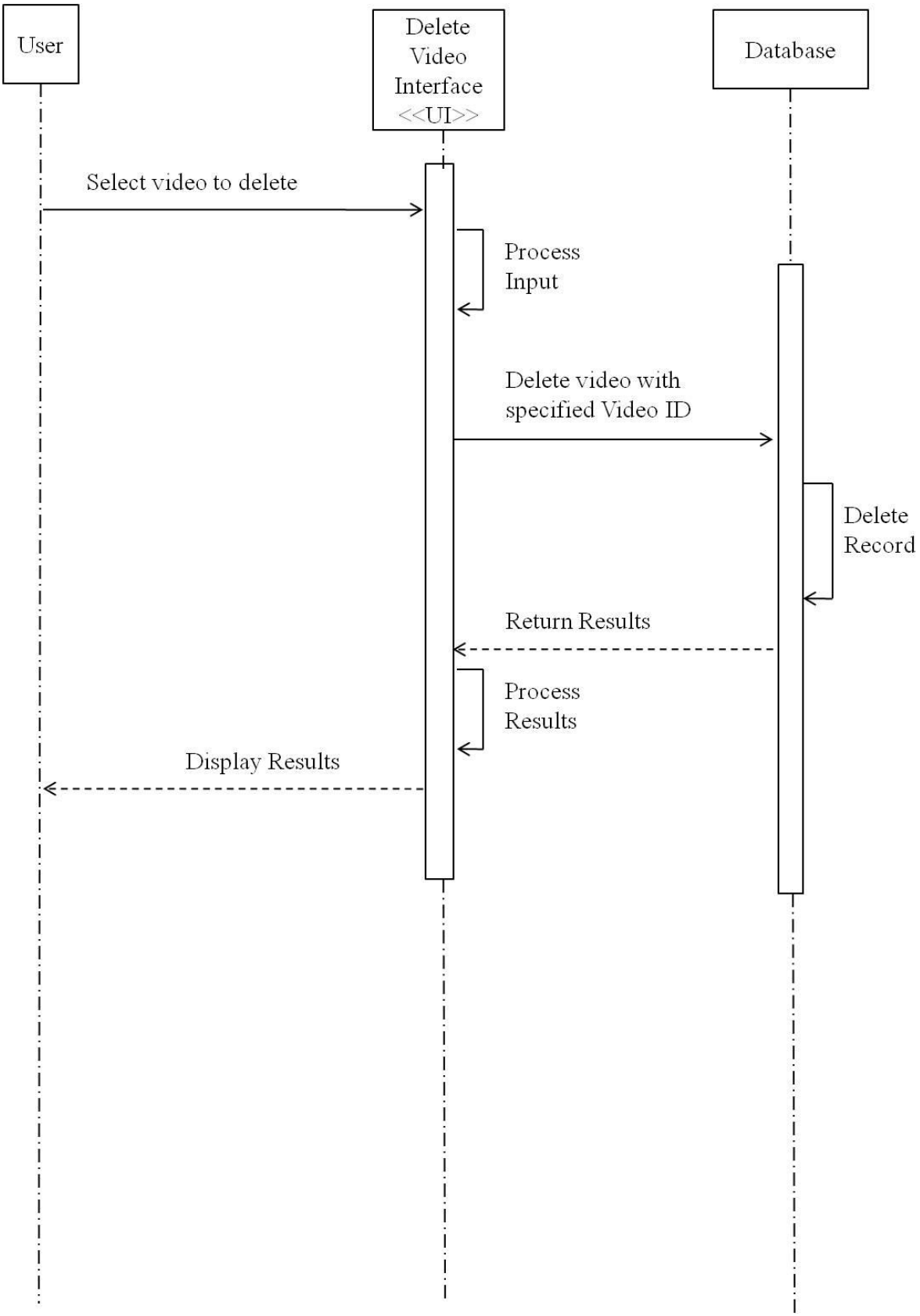
Sequence Diagram for Update Video Interface



Sequence Diagram for View Video Interface

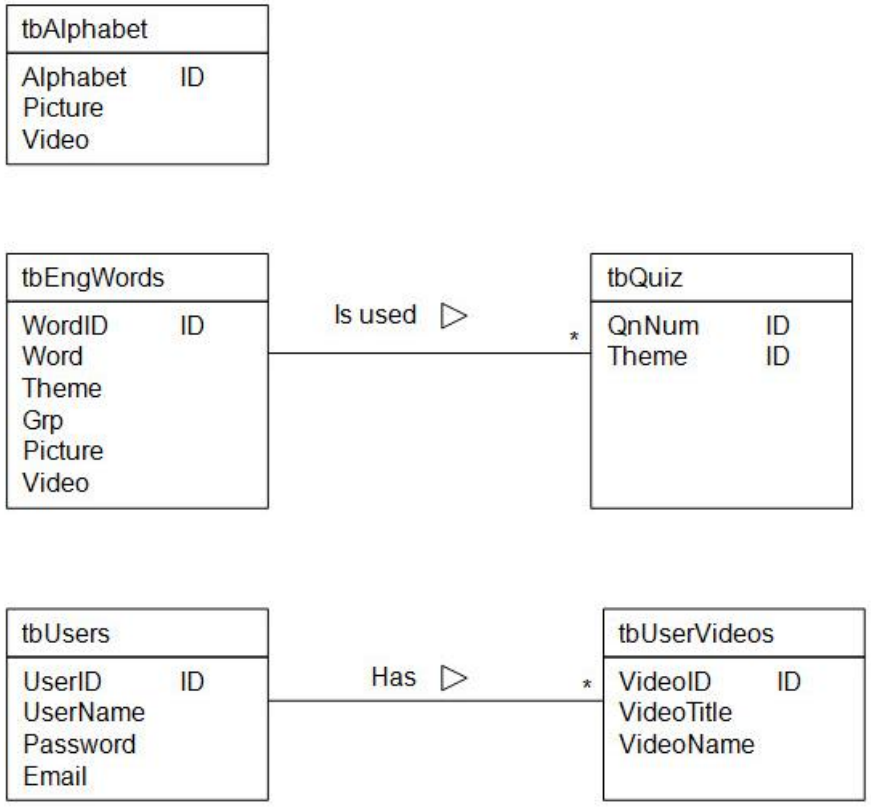


Sequence Diagram for Delete Video Interface



Appendix J – Conceptual Schema and Relational Schema

Conceptual Schema



Relational Schema

tbAlphabet (Alphabet, Picture, Video)
Primary key = (Alphabet)

tbEngWords (WordID, Word, Theme, Grp, Picture, Video)
Primary key = (WordID)

tbQuiz (QnNum, Theme , CorrectAnsWordID, WrongAnsWordID1, WrongAnsWordID2)
Primary key = (QnNum, Theme)
Foreign key1 = (CorrectAnsWordID) references tbEngWords (WordID)
Foreign key2 = (WrongAnsWordID1) references tbEngWords (WordID)
Foreign key3 = (WrongAnsWordID2) references tbEngWords (WordID)

tbUsers(UserID, UserName, Password, Email)
Primary Key = (UserID)

tbUserVideos(VideoID, VideoTitle, VideoName)
Primary Key = (VideoID)
Foreign key = (UserID) references tbUsers (UserID)

Appendix K – Research on Education for Pre-school Children

The intention of BabySlang is to teach Signed Exact English to hearing-impaired children between 3 to 5 years with the assistance of their parents. Therefore the choice of English words and phrases to be translated must be suitable for children of that age.

Therefore a research is done on children education websites, books and articles to have a better idea of how the English language is taught to Pre-school children. Most importantly, the English words recommended by Educators to teach Pre-school children.

A few excellent resources are found. They are namely:

1. English4Kids.com website
2. MrsPerkins.com

English4Kids.com Website

The lessons in this website are for kindergarten kids or nursery school toddlers and young learners of English. These lessons teach kids new English vocabulary, spelling, reading, listening, pronunciation and speaking.

From the lessons provided in this website, the team has a better understanding of the choice of vocabulary for hearing-impaired children of 3 to 5 years old.

MrsPerkins.com Website

This website emphasizes the importance of Dolch words found in children's book. Fluency in reading the Dolch 220 and the 95 nouns is essential to literacy; therefore they are to be included in this project. The remaining sections will explain the origins and the purpose of Dolch words.

The Dolch Word List, was compiled by Edward William Dolch, PhD, in 1948. The list was originally published in his book "Problems in Reading". Dolch compiled the list based on words used in children's reading books in the 1930s and 40s. The list contains 220 "service words" that must be quickly recognized in order to achieve reading fluency.

The Dolch Word List is also called Sight Words or The Dolch 220. It includes the most frequently used words in the English language. Sight words make up 50 to 70 percent of any general text. Therefore, teaching The Dolch Word List is a crucial goal of education in grades kindergarten through 3.

English words included in this project are selected from the list shown in the table below.

Dolch Word List for Pre-primer

a	can	funny	in	little	not	run	three	we
and	come	go	is	look	one	said	to	where
away	down	help	it	make	play	see	two	yellow
big	find	here	jump	me	red	the	up	you
blue	for	I		my				

Dolch Word List for Pre-primer

all	black	eat	into	on	ride	that	want	white
am	brown	four	like	our	saw	there	was	who
are	but	get	must	out	say	they	well	will
at	came	good	new	please	she	this	went	with
ate	did	have	no	pretty	so	too	what	yes
be	do	he	now	ran	soon	under		

95 Common Dolch Nouns

apple	children	flower	money	sister
baby	Christmas	game	morning	snow
back	coat	garden	mother	song
ball	corn	girl	name	squirrel
bear	cow	good-bye	nest	stick
bed	day	grass	night	street
bell	dog	ground	paper	sun
bird	doll	hand	party	table
birthday	door	head	picture	thing
boat	duck	hill	pig	time
box	egg	home	rabbit	top
boy	eye	horse	rain	toy
bread	farm	house	ring	tree
brother	farmer	kitty	robin	watch
cake	father	leg	Santa Claus	water
car	feet	letter	school	way
cat	fire	man	seed	wind
chair	fish	men	sheep	window
chicken	floor	milk	shoe	wood