

**DYSLEXIA ALPHABET USING AUGMENTED  
REALITY**

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## DECLARATION

I hereby declare that this report is based on my original work with helps getting information from sources that I have confessing, except for quotations and citations, which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Sultan Zainal Abidin or any other institutions.

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## CONFIRMATION

This is to confirm that:

The research conducted and the writing of this report was under my supervision

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Name : En. Mohd Sufian Bin Mat Deris

Date : \_\_\_\_\_

## **DEDICATION**

I would like to take this opportunity to thank you all of those who concern and giving out efforts to accomplish this final year project report.

First of all, I would like to thank my family. They give me confidence and fully support to complete this final year project.

Next, I would like to point my appreciation to my supervisor En Mohd Sufian Bin Mat Deris for guiding me along the way to make this final year project into complete. He provides idea for me when I cannot think of a proper idea for my project at the beginning and give me the direction when I am going the wrong way.

Besides, I would like to thank all my friends. Thank you for willing to help me when I am in the stance that need for help.

In addition, I would also like to thank my beloved parents, Mr. Subri bin Shaari and Mrs. Zaiton Bt Kamaruddin, family and friends for their full support, concern and encouragement that give me a lot of strength, enthusiasm and confidence to complete this study. Last but not least, thank you to anybody who had been directly or indirectly involved in this study.

## **ABSTRACT**

Technology is changing and growing so rapidly day by day, which are widespread throughout this world. Technology makes people demand more in their life. One of the rising technologies nowadays is the augmented reality. Augmented reality (AR) is an emerging form of experience in which the real world is enhanced by computer-generated content tied to specific locations and/or activities. AR applications have become portable and widely available on mobile devices. AR is becoming visible in our audio-visual media and is beginning to enter other aspects of our lives in tangible and exciting ways. In recent years, there has been an increasing interest in applying Augmented Reality (AR) to create unique educational settings. Augmented Reality technology, where interactive three-dimensional (3D) content was developed and combined with traditional printed materials to enhance the visualization and understanding of technical information. There are many factors to study on the implementation of augmented reality such as the uses, advantages, limitations, effectiveness, challenges and features of augmented reality in educational settings. AR is used to facilitate the learning whereas it enables students to access information provided through various sources.

## **ABSTRAK**

*Teknologi berubah dan berkembang pesat dan meluas setiap hari di seluruh dunia. Teknologi membuat orang sentiasa mahukan pelbagai perkara dalam kehidupan mereka. Salah satu teknologi yang semakin meningkat pada masa kini adalah Augmented Reality. Augmented Reality (AR) adalah satu perkara baru yang muncul di mana dunia nyata dipertingkatkan oleh kandungan yang dijana komputer. Aplikasi AR boleh didapati secara meluas pada peranti mudah alih. AR menjadi media audio-visual dan mulai memasuki kehidupan kita dengan cara yang nyata dan menarik. Dalam tahun-tahun kebelakangan ini, terdapat minat yang semakin meningkat dalam mengaplikasikan Augmented Reality (AR) untuk mewujudkan kaedah pendidikan yang unik. Teknologi Augmented Reality diperkaya dengan kandungan tiga dimensi (3D) interaktif dikembangkan dan digabungkan dengan bahan bercetak tradisional untuk meningkatkan visualisasi dan pemahaman maklumat teknikal. Terdapat banyak faktor untuk mengkaji mengenai pelaksanaan realiti seperti kegunaan, kelebihan, batasan, keberkesanan, cabaran dan ciri realiti yang ditambah untuk tujuan pendidikan. AR digunakan untuk memudahkan pembelajaran sedangkan ia membolehkan pelajar mengakses maklumat yang disediakan melalui pelbagai sumber.*

## TABLE OF CONTENT

<b>CHAPTER I</b>	<b>CONTENT</b>	<b>PAGE</b>
1.1	Introduction	1
1.2	Project Background	2
1.3	Problem Statement	3
1.4	Objective	
1.5	Scope	4
1.6	Limitation Of Work	5
1.7	Expected Result	
1.8	Milestone	6 - 7
<b>CHAPTER II</b>	<b>CONTENT</b>	<b>PAGE</b>
2.1	Introduction	8
2.2	Related Product	
2.2.1	Kids Learning Game	9
2.2.2	ABC Alphabet Book	10
2.2.3	AR Flashcards Animal Alphabet	11
2.2.4	ABC Kids	12
2.3	Overall Analysis	13
2.4	Summary	14

<b>CHAPTER III</b>	<b>CONTENT</b>	<b>PAGE</b>
3.1	Introduction	15
3.2	Project methodology	16 - 17
3.2.1	Analysis Phase	18 - 21
3.2.2	Design Phase	22
	3.2.2.1 Flowchart	23
	3.2.2.2 Framework	24
	3.2.2.3 Storyboard	25 - 33
3.2.3	Development Phase	34
3.2.4	Implement Phase	
3.2.5	Evaluation Phase	
3.3	System Requirement	35 - 37
3.2.1	Hardware Requirement	
3.2.2	Software Requirement	
3.4	Summary	38
	<b>REFERENCE</b>	39



# CHAPTER I

## INTRODUCTION

### 1.1 INTRODUCTION

Chapter one consists of six section. This chapter presents about the project background, problem statement, objectives, scope, limitation of work and expected result. This section is the introduction to the report for developed application. It will provide a basic overview of the whole app. Project Background of the application discuss about basic information about this application. Problem statements discuss about related issues of the application. Objectives state all main goal of this application. The scope shows who are using the system and what the user can do. Limitation of work is discuss what problems and limitations in conducting this system. Expected result is about what expected result when this system has been done.

What is *Dyslexia Alphabet* Argument Reality ?

This argument reality system is developing to provide the option for students who has *Dyslexia* to learn more about alphabet. The teacher also can choose the right way to teach *Dyslexia* student to become more effective in class with other friends and the system also allows *Dyslexia* student to do more activities.

*Dyslexia Alphabet* Augmented Reality (AR) allow to help student who has dyslexia to write an alphabet they see and pronounce correctly and learn more about alphabet and help dyslexia student to arrange alphabet in correct way.

Until now, there are still schools that adopt a teaching method is very difficult way. In addition, student that has dyslexia will get complicate to adopt and learn quickly because their style.

## **1.2 PROJECT BACKGROUND**

Augmented Reality (AR) is a type of interactive, reality based display environment that takes the capabilities of computer generated display, text and effects to enhance the user's real-world experience. Augmented reality combines real and computer-based scenes and images to deliver a unified but enhanced view of the world. Augmented Reality works by employing computerized simulation and techniques such as image and speech recognition, animation, head-mounted and hand-held devices and powered display environments to add a virtual display on top of real images and surroundings.

This Board Book will containing illustrative objects with words to help develop a child to recognize objects and alphabet words appropriately. This Board Book it suitable for kindergarten-level children or primary school children who has dyslexia as the reference for learning. This system has interesting and colorful pictures for children as well.

For this application, I am developing the application using the AR technology in Board Book. This Board Book contains object as model included with every alphabet character.

### **1.3 PROBLEM STATEMENT**

i. Manual Learning.

Lack of fun elements in books such as multimedia elements and only having static images and less interaction with students who have dyslexia.

ii. Individual learning approach.

Teachers are less focused on students who have dyslexia and lack of support in the learning process.

iii. Less variation in learning.

Learning should involve a variety of senses such as seeing, hearing, talking, touching and so on. This is because each student is different and has a different way of learning.

## 1.4 OBJECTIVE

- i. To study interactive augmented reality technique towards alphabets learning.
- ii. To develop a prototype of augmented reality application to alphabet learning.
- iii. To evaluate the functional of alphabet learning using augmented reality technique.

## 1.5 SCOPE

In this study, this project can determine how children react with augmented reality technology in learning. The effectiveness and the usefulness of this learning activities play a vital role in this project. Therefore, children from six to eight years old are the main user of this project. This study will only involve research on alphabet learning using augmented reality. This project will be created using Adobe Photoshop, Unity3D and Autodesk Maya to incorporate the augmented reality technology.

### 1.5.1 System scope.

- i. Augmented reality technology integrated in mobile application for smartphone and allows the *Dyslexia* students to learn more about alphabet easily.

### 1.5.2 User scope.

- i. Students: Can view the alphabet.
- ii. Admin: Control all the system and maintaining the system. Besides that, admin able to responses to the feedback which comes from the users.

## **1.6 LIMITATION OF WORK**

There are several limitations and constraint that occurred throughout the development of this board book picture. These problems and limitations in conducting this study are:

- i. Only android user can use this application.
- ii. The users need a smartphone to start playing the augmented reality.
- iii. This application needs special marker in order to make it work.

## **1.7 EXPECTED RESULT**

The expected result following the development of the proposed project as follows:

- i. The application is expected to be implemented in the mobile based and user be able to explore this application augmented reality using board book.
- ii. Augmented reality with good interface in this application.
- iii. The user can choose any picture of object for pop up 3D animation.

## 1.8 MILESTONES

### APPENDIX A: GANTT CHART FYP 1

	Activities	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Topic Discussion and Determination															
	1.1 discuss title															
2	Project Title Proposal															
	2.1 submit title															
	2.2 submit brief proposal project															
3	Proposal Writing															
	3.1 write introduction															
4	Write literature review															
5	Proposal progress presentation and evaluation															
6	Discussion and correction proposal and proposed solution methodology															
7	Proposed solution methodology															



## **CHAPTER II**

### **LITERATURE REVIEW**

#### **2.1 INTRODUCTION**

To learn how to read, the importance thing before read is it must memorize all the alphabets first. If the first step is not being fulfilled properly, it will not be able to read properly for the rest of his life. It will be an unfortunate event as inability to read will restrict a major portion of the self-development of the individual physically or mentally. This literature review section will discuss about the current learning method for alphabet and this research will comparison between the current product and the new developed product is done to overcome the weakness of the current product. The aim is to find a proper mixture of all the elements to produce augmented reality software that will be able to teach children on alphabets. It can be guideline to develop a new product so that the new product can provide a better functionality compared to the existing product.



## 2.2 RELATED PRODUCTS

### 2.2.1 Kids Learning Game

The Kids learning game is an alphabet learning app that teaches children to learn alphabet by audio and image in the process. Kids learning game apps allows kids to choose the alphabet they are interested and learn on how to spell an object that started with that alphabet. It functionally just like the ABC board, the only differences is that Kids Learning its operate using smartphone.



Figure 2.1: Figure show the Kids Learning Game App

Platform	Advantages	Disadvantage
<ul style="list-style-type: none"> <li>Android OS</li> </ul>	<ul style="list-style-type: none"> <li>Have multimedia element</li> <li>Offline</li> </ul>	<ul style="list-style-type: none"> <li>Animation cannot move</li> <li>No AR technology</li> </ul>

Table 2.1 Advantages and Disadvantage

### 2.2.2 ABC Alphabet Book

ABC Alphabet Book refer figure 2.2 is a children's book geared towards introducing the alphabet, with beautiful and modern illustrations. The 10x9 cm with 13 page board book will feature a different letter on each page. There are advantages and disadvantage to the product.

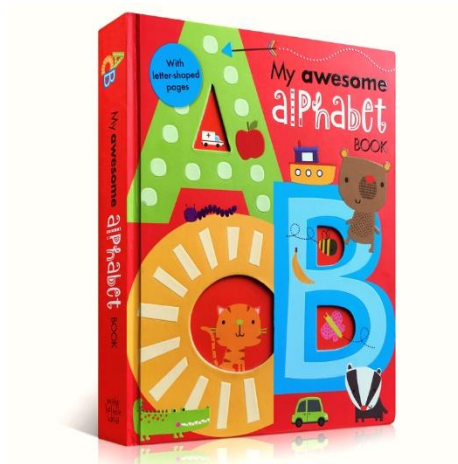


Figure 2.2 : ABC Alphabet Book

Platform	Advantages	Disadvantage
<ul style="list-style-type: none"><li>Printed</li></ul>	<ul style="list-style-type: none"><li>Easily accessible</li></ul>	<ul style="list-style-type: none"><li>No animation</li><li>No audio</li></ul>

Table 2.2 Advantages and Disadvantage

### 2.2.3 AR Flashcards Animal-Alphabet - AR Flashcards

The AR Flashcards Animal-Alphabet - AR Flashcards was developed by Peak Reality in 2013. Refer figure 2.1 The app uses an android devices and does not use full internet connection to access. There are advantages and drawback to the application.

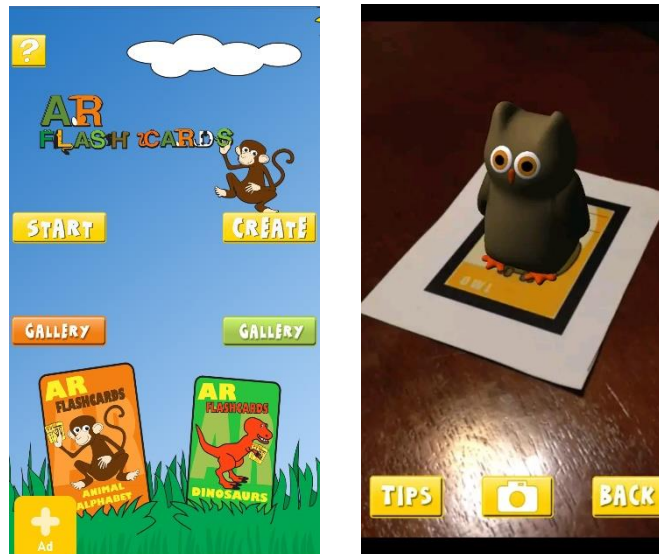


Figure 2.3 : Figure shows the AR Flashcards Animal-Alphabet - AR Flashcards

Platform	Advantages	Disadvantage
<ul style="list-style-type: none"> <li>Printed</li> <li>Android OS</li> </ul>	<ul style="list-style-type: none"> <li>AR technology</li> <li>Have multimedia element</li> </ul>	<ul style="list-style-type: none"> <li>No animation</li> <li>No audio visual</li> </ul>

Table 2.3 Advantages and Disadvantage

### 2.2.4 ABC Kids

ABC Kids app is another application that is used to teach children alphabet. This application allows children to learn alphabet which they might already know yet, the add-on of this application is it shows the children the proper way to write the alphabet. At the same time, this app has exercise for them to enhance and revise what they had learn from the application. Through the exercise, it's certain that kids are going to be able to learn faster.



Figure 2.4 : Figure shows the ABC Kids app

Platform	Advantages	Disadvantage
<ul style="list-style-type: none"> <li>Android</li> <li>OS</li> </ul>	<ul style="list-style-type: none"> <li>Contain game</li> <li>Have level</li> <li>Has info how to play</li> </ul>	<ul style="list-style-type: none"> <li>No animation</li> <li>No audio visual</li> </ul>

Table 2.4 Advantages and Disadvantage

**2.3 COMPARISON TABLE OF THE EXISTING PRODUCTS WITH 5 ELEMENT OF MULTIMEDIA**

Product	Text	Image	Video	Audio	Animation
<b>Kids Learning Game</b>	✓	✓	✗	✓	✗
<b>ABC Alphabet Book</b>	✓	✓	✗	✗	✗
<b>AR Flashcards Animal-Alphabet - AR Flashcards</b>	✓	✓	✗	✗	✗
<b>ABC Kids</b>	✓	✓	✗	✗	✗

Table 2.5 Comparison table of the existing products with 5 element of multimedia

## **2.4 SUMMARY**

In this whole chapter, this chapter discusses a product for learning Alphabet to develop an augmented reality. This chapter also discussed the technique used in the new system and the technique used in the previous research articles and journal. The comparison with the previous research is done so that the right choice will be selected.

## **CHAPTER III**

### **METHODOLOGY**

#### **3.1 Introduction**

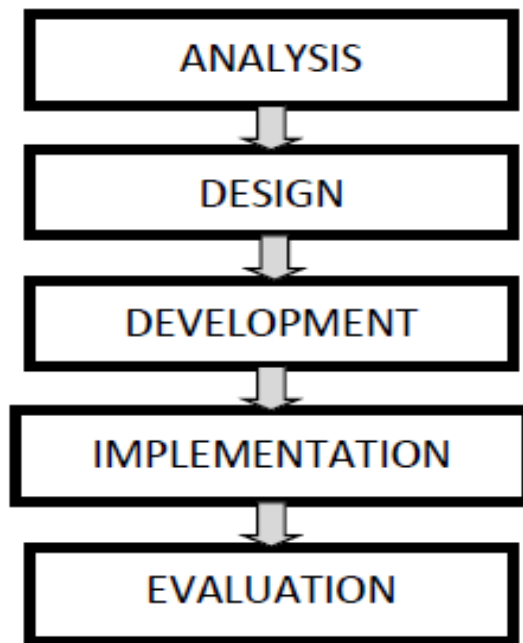
In this chapter, it about methodology and the process of developing Dyslexia Alphabet book board using AR Technology. By the way, the methodology that has been used to develop this interactive book board is described. The methodology will guide the system to solve the problem smoothly and complete the project within the given time. There are many types of methodology that can be applied and used in the development of AR technology. The approach must be chosen correctly for the project. It is important to guide the researcher to manage the given task. Hence, the ADDIE model is used for this project. Furthermore, every details about each phase that involve in the development of this project will be explained later in this chapter. Besides that, also rates this chapter describes the software and hardware requirement that will be used for development process.

### **3.2 Project Methodology**

It is important to know and understand the ADDIE model if a developer want to develop a successful project. The ADDIE model has five phase acronyms is Analysis, Design, Development, Implementation, and Evaluation. ADDIE is an extremely effective tool in training development that addresses instruction. Most employees have a significant amount of information to learn in order to become more proficient at their jobs. Therefore, the ADDIE model could be quite helpful for many in planning a course of action that would lead to the successful implementation of a project. When dealing with projects that involve instruction or steps, the approach fits nicely.

In order to ensure effective learning outcomes from augmented reality (AR) education development, careful planning are required before the development process begins. ADDIE Instructional Design Model is used in this mobile AR application development methodology. The ADDIE model for instructional system design (ISD) is a basic model that can be applied to any kind of learning solution. The ADDIE model has five steps processes which is analysis, design, development, implementation, and evaluation as illustrated in the Figure 3.1.

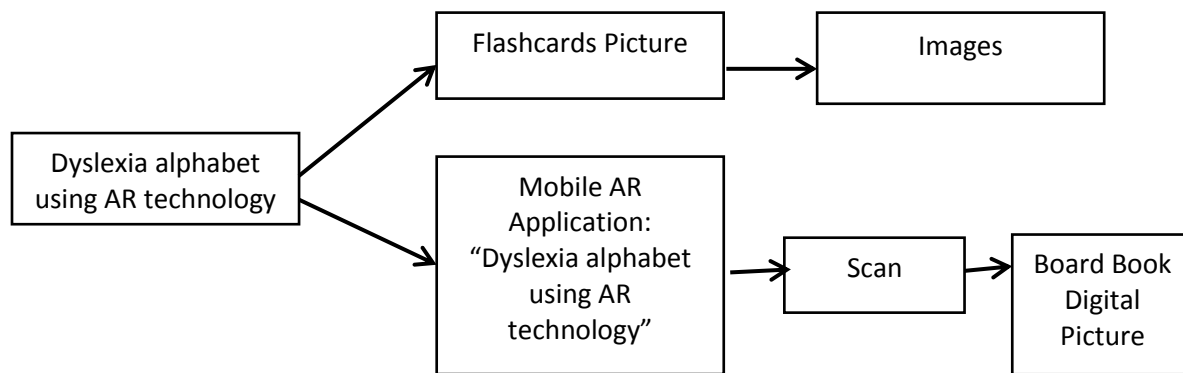




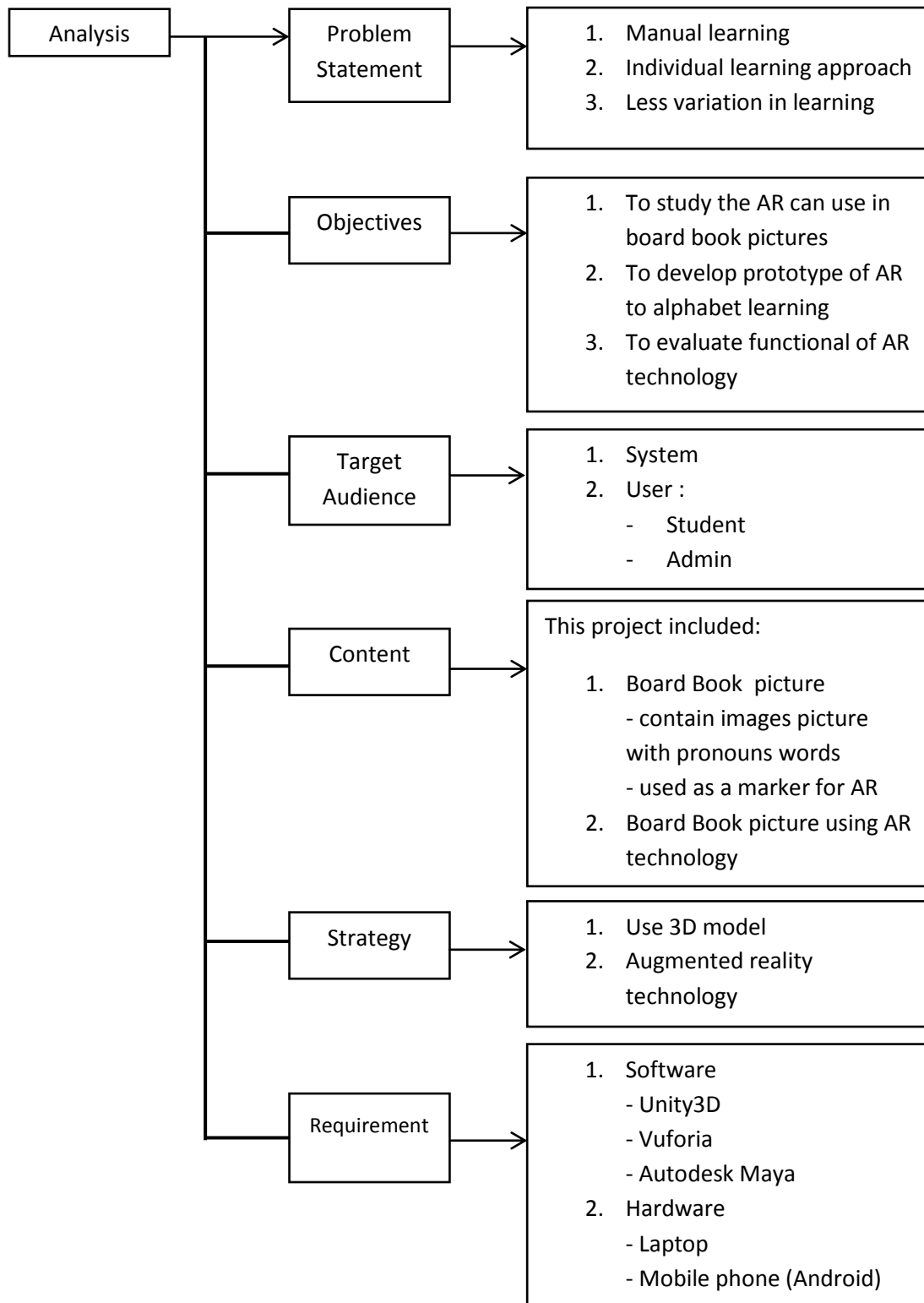
**Figure 3.1 ADDIE Model**

### 3.2.1 Analysis phases

In this phase, analysis was done to identify the need to develop the mobile AR application. The activities involved are identifying the problem statement, establishing the goals and objectives, the users' need, existing knowledge and any other relevant characteristics and also the content of mobile AR application. The content of mobile AR application can be referred to figure 3.2 below and for analysis phase can be referred to figure 3.3 below.



**Figure 3.2 Content of Board Book Pictures AR**



**Figure 3.3 Analysis Phases**

## **Problem statement**

i. Manual Learning.

Lack of fun elements in books such as multimedia elements and only having static images and less interaction with students who have dyslexia.

ii. Individual learning approach.

Teachers are less focused on students who have dyslexia and lack of support in the learning process.

iii. Less variation in learning.

Learning should involve a variety of senses such as seeing, hearing, talking, touching and so on. This is because each student is different and has a different way of learning.

## **Objective**

i. To study interactive augmented reality technique towards alphabets learning.

ii. To develop a prototype of augmented reality application to alphabet learning.

iii. To evaluate the functional of alphabet learning using augmented reality technique.

## Target audience

In this study, this project can determine how children react with augmented reality technology in learning. The effectiveness and the usefulness of this learning activities play a vital role in this project. Therefore, children from six to eight years old are the main user of this project. This study will only involve research on alphabet learning using augmented reality. This project will be created using Adobe Photoshop, Unity3D and Autodesk Maya to incorporate the augmented reality technology.

System scope.

- Augmented reality technology integrated in mobile application for smartphone and allows the *Dyslexia* students to learn more about alphabet easily.

User scope.

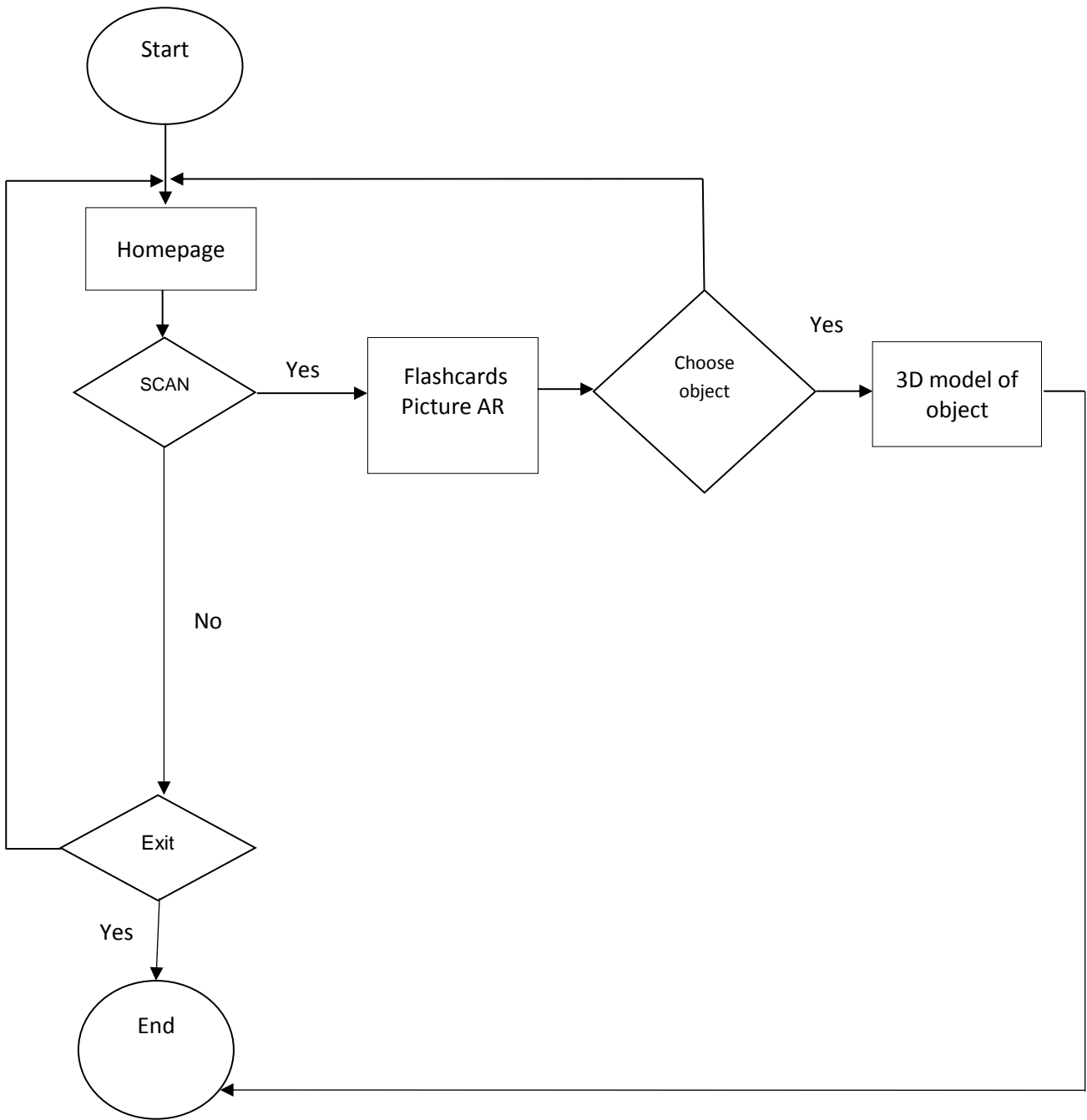
- Students : Can view the alphabet.
- Admin : Control all the system and maintaining the system. Besides that, admin able to responses to the feedback which comes from the users.

### **3.2.2 Design phase**

This phase should be systematic and specific. Flowchart, framework and storyboard were developed in order to know more detail about the flow of this mobile AR application. The simple interfaces also can be sketched in this phase. Lastly, the draft of the AR book that is required to perform this application.

#### **3.2.2.1 Flowchart**

Flowchart is a diagram that shows the progress flow of system. The application starts by providing users to click scan button from homepage. Next, on the main page the users providing to choose start button, how to play/information button, credit button and exit button. The start button is the most important button for this application. This button will automatically turn on the camera on user's mobile phone. The scan button will give the opportunities to the users to choose any image object. The user needs to scan an image that created on the page using the mobile phone camera. In a few second, a 3D model will pop out automatically at the mobile phone screen. Next, the user needs to touch the physical button that provided on the page. Then, the home button will bring users directly to the homepage which is making the optional to the users either to click scan or exit button. The technology used is augmented reality that combined the reality and virtual environment together to make a learning process become more interesting. The content of flowchart can be referred to figure 3.4 below.



**Figure 3.4 : Flowchart of Flashcards Pictures AR**

### 3.2.2.2 Frame work

Figure 3.5 shows the framework for Dyslexia Alphabet with AR application. Admin of this application is able to do all the activities by the users and more importantly, admin can update the content of the mobile application.

For users, they can scan the marker available in AR book which is using their mobile phone camera. Then, their mobile phone camera screen will view content which are AR element such as 3D model.

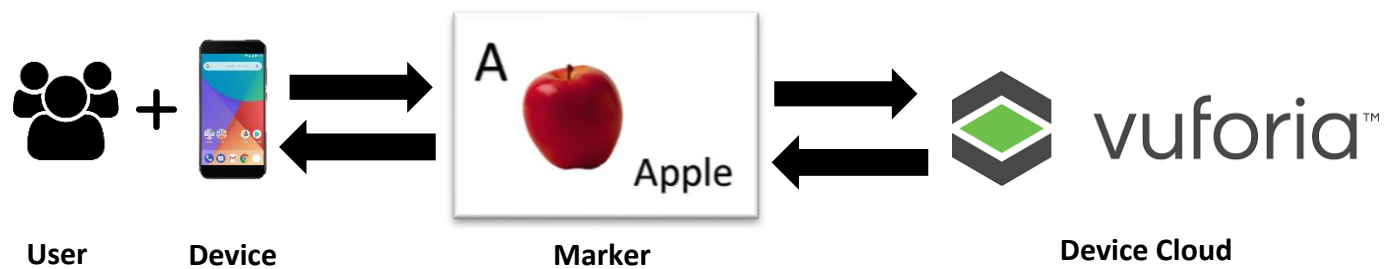


Figure 3.5 : Framework of application

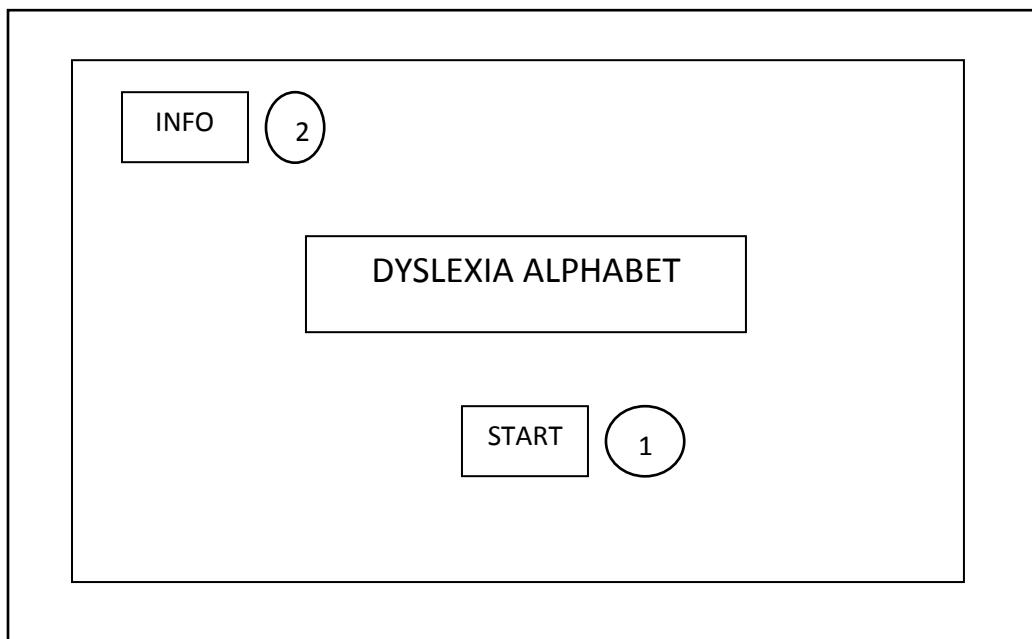


### 3.2.2.3 Storyboard

Storyboarding is also a part of multimedia design process. The storyboard shows the look and feel of the application that will be developed. Some of the storyboard can be seen in picture below.

#### Start page

At this page application there is 2 button on this page which is 'Start' button and 'Information' button. 'Information' button function is user can get information about this application and 'start' button allow user go to main page which is the page user can navigate all of the activities in this application. The content of logical interface for start page can be referred to figure 3.6 below.



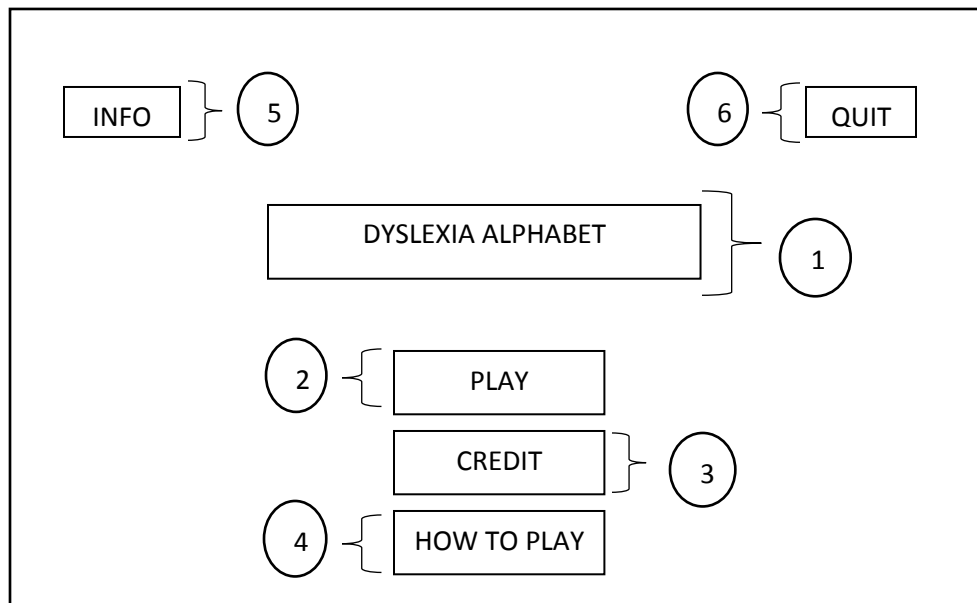
**Figure 3.6 : Logical interface for start page**

NO	Type	Name	Function
1	Button	Start	To go to Main page
2	Button	Information	To get information about this application

**Table 1.0 : The detail of logical interface for start page**

### Home page

At the home page is the main page of this app there is 5 button on this page which is 'Play' button, 'Credit' button, 'How to play' button, 'Information' button and 'Exit' button, 'Play' button function is user can get through to Alphabet Table. 'Credit' button function is user can see the developer dan supervisor who create this application. On 'How to play' button function is user can get knowledge how to play this application before user can use it. The content of logical interface for home page can be referred to figure 3.7 below.



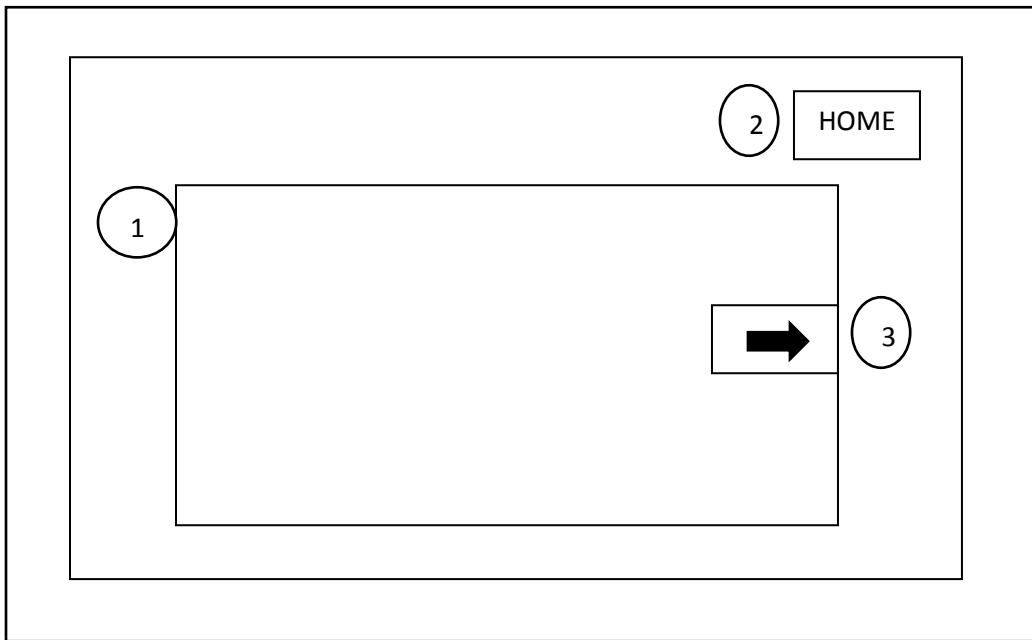
**Figure 3.7 : Logical interface for home page**

<b>NO</b>	<b>Type</b>	<b>Name</b>	<b>Function</b>
1	NonButton	DYSLEXIA ALPHABET	Project Title
2	Button	PLAY	To go to Alphabet Table
3	Button	CREDIT	To see the developer dan supervisor
4	Button	HOW TO PLAY	Information how to play this application
5	Button	INFORMATION	To get information about this application
6	Button	QUIT	To quit from this application

**Table 1.1 : The detail of logical interface for home page**

## Alphabet table page

At this page, it will show the list of alphabet in table type, user can choose the alphabet to learn. 'Home' button provided to able user return to Home Page. 'Next' button provide to able user go through to all alphabet that has been arrange. The content of logical interface for alphabet table page can be referred to figure 3.8 below.



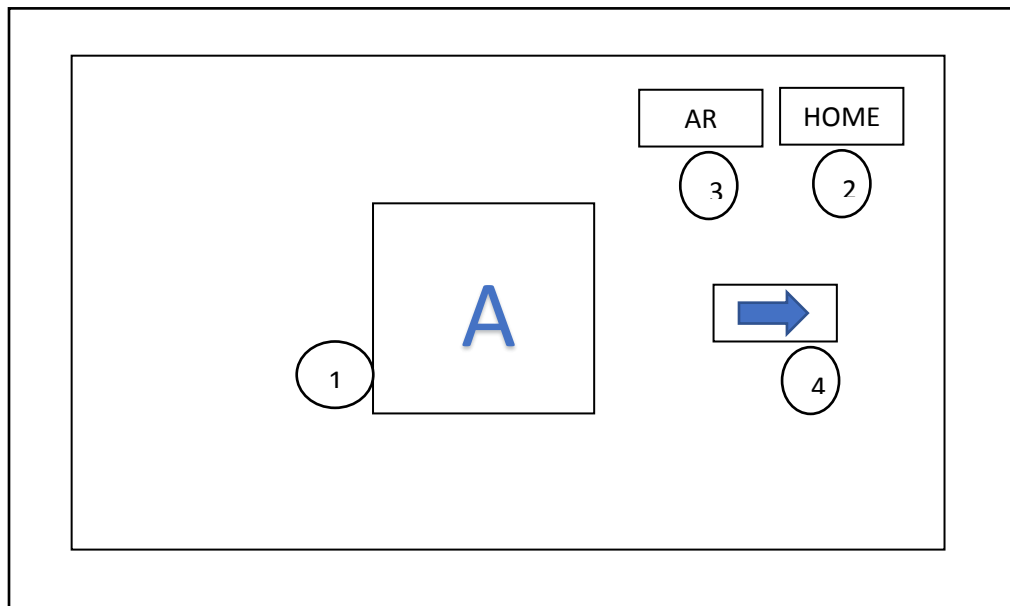
**Figure 3.8 : Logical interface for alphabet table page**

<b>NO</b>	<b>Type</b>	<b>Name</b>	<b>Function</b>
1	Button	Alphabet table	Alphabet list
2	Button	Home	To go to home page
3	Button	Next	To go to alphabet list

**Table 1.2 : The detail of logical interface for alphabet table page**

## Alphabet page

At this page, it will appear when user has been choosing the alphabet that they want learn. At this page, it has 4 button which is 'home' button, 'alphabet table' button and 'next' button. 'Home' button provided to able user return to Home Page. 'Alphabet table' button provided to able user return to Alphabet table page and 'Next' button provide to able user go through to all alphabet that has been arrange. The content of logical interface for alphabet page can be referred to figure 3.9 below.



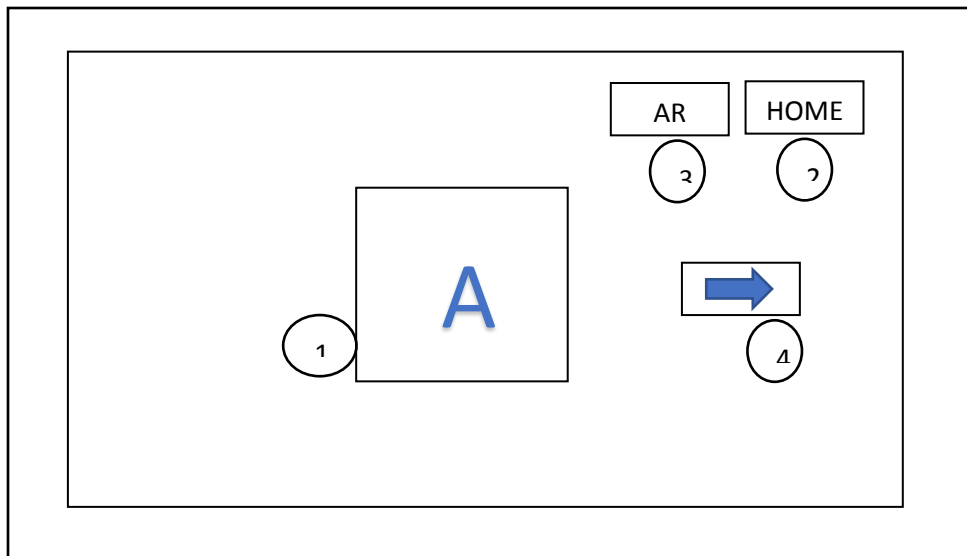
**Figure 3.9 : Logical interface for alphabet page**

NO	Type	Name	Function
1	Button	Alphabet	Click to scan Object 3D
2	Button	Home	To go to home page
3	Button	Alphabet Table	To go to Alphabet table page
4	Button	Next	To go to alphabet list

**Table 1.3 : The detail of logical interface for alphabet page**

### AR camera page

At this page, phone camera on, then user can scan the marker that provided in ‘Dyslexia Alphabet’ book and display the AR element on screen. it has 3 button which is ‘home’ button, ‘alphabet table’ button and ‘next’ button. ‘Home’ button provided to able user return to Home Page. ‘Alphabet table’ button provided to able user return to Alphabet table page and ‘Next’ button provide to able user go through to all alphabet that has been arrange. The content of logical interface for AR camera page can be referred to figure 3.10 below.



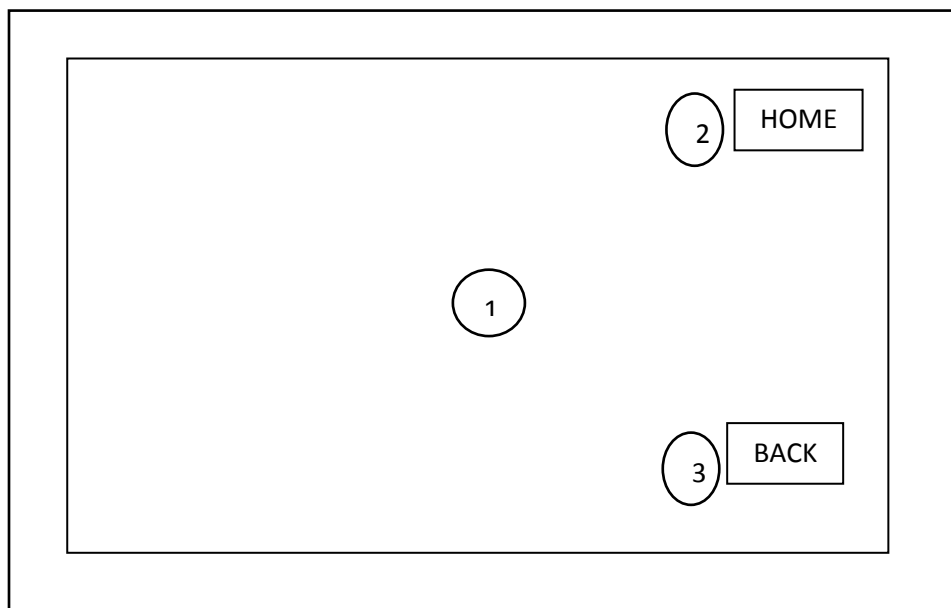
**Figure 3.10 : Logical interface for AR camera page**

NO	Type	Name	Function
1	Button	AR camera	Scan Object 3D
2	Button	Home	To go to home page
3	Button	Alphabet Table	To go to Alphabet table page
4	Button	Next	Scan 3D alphabet object list

**Table 1.4 : The detail of logical interface for AR camera**

### How to play page

At this page, before user start to play with this Dyslexia Alphabet AR application. user easily can learn how to use this application with learning from page how to play in this application. 'Home' and 'back' button provided to able user return to Home Page. The content of logical interface for how to play page can be referred to figure 3.11 below.



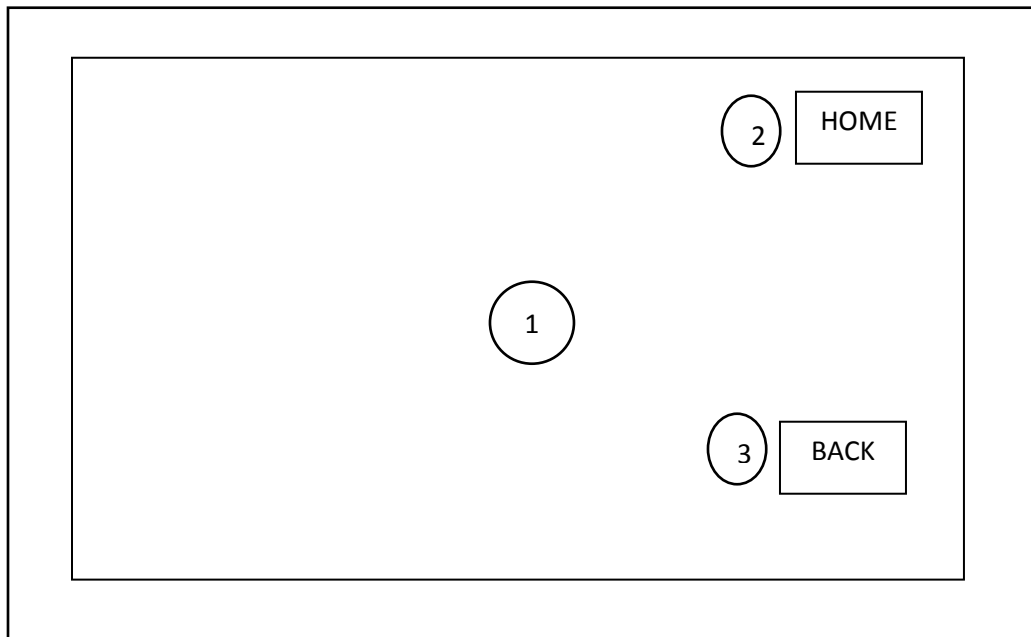
**Figure 3.11 : Logical interface for How to play page**

NO	Type	Name	Function
1	Button	Instruction	Instruction how to play this application
2	Button	Home	To go to home page
3	Button	Next	To go to home page

**Table 1.5 : The detail of logical interface for How to play page**

### Credit page

At this credit page, this page have a brief about of the developer of this project and the supervisor of this project development. 'Home' and 'back' button provided to able user return to Home Page. The content of logical interface for credit page can be referred to figure 3.12 below.



**Figure 3.12 : Logical interface for Credit page**



<b>NO</b>	<b>Type</b>	<b>Name</b>	<b>Function</b>
1	Button	Credit	To show who the developer for this application
2	Button	Home	To go to home page
3	Button	Back	To go to home page

**Table 1.6 : The detail of logical interface for Credit page**

### **3.2.3 Development Phase**

This is the phase where development of this project start based on two phases before.

#### **1. Development of mobile AR application**

For the development of this app, the previous two phases which are Analysis and Design can guide user on how the app look like. Home page, AR camera/scan page and How to play page are the three pages in this app.

#### **2. Development of AR book**

For the development of AR book, the book was created based on the draft at design phase.

### **3.2.4 Implementation Phase**

Completed application is presented to test its effectiveness and see problems that have never been realized when at the design and development stage possible. Testing will be conducted to find out the available weaknesses and to detect any unnecessary errors during the authorization process before being issued or officially used.

### **3.2.5 Evaluation Phase**

Evaluation involves the process of getting feedback from users on this application. This action is taken to ensure that it is appropriate or not within the scope of the user set. Evaluation was made first by supervisors and lecturers. In the event of a feedback stating that it does not conform to the requirements of the user, the modification process will be implemented to ensure that it is appropriate to the user's scope within the set period.

### 3.3 System Requirement

This section will show that the all hardware and software that involve in the development process. All of these elements are important in the process of development of the system. List of hardware and software are shown as below:

#### 3.3.1 Hardware requirement

 <p>Laptop Acer</p>	<ul style="list-style-type: none"><li>• To create the sketches for the characters, background and create scripts or documents</li><li>• Processor : Intel Core i5-2450M CPU @ 2.50GHz</li><li>• Operating System : Windows 8 – 64 bit</li><li>• Memory : 8GB RAM</li></ul>
 <p>Xiaomi MI A1</p>	<ul style="list-style-type: none"><li>• Used to run and testing the application</li><li>• Android version : Android 9.0 (Pie)</li><li>• RAM : 4 GB</li><li>• ROM : 6 GB</li><li>• Resolution : 1080 x 1920 pixels, 16:9 ratio (~403 ppi density)</li><li>• Camera : 12 Megapixel</li></ul>
	<ul style="list-style-type: none"><li>• Used to store data and backup file</li><li>• Model : Western Digital</li><li>• Storage : 500 GB</li></ul>
	<ul style="list-style-type: none"><li>• Used to print out documentation</li><li>• To print flashcards pictures</li><li>• Model : HP Deskjet</li></ul>

### 3.3.2 Software requirement

 vuforia™	<ul style="list-style-type: none"><li>• To create creation of augmented reality applications</li><li>• To recognize and track images and 3D objects in real time.</li></ul>
	<ul style="list-style-type: none"><li>• Unity 2018</li><li>• Used to create the augmented reality application and overall project an modelling 3D object.</li></ul>
	<ul style="list-style-type: none"><li>• Maya 2018</li><li>• Used to create 3D model</li></ul>
	<ul style="list-style-type: none"><li>• Adobe Illustrator</li><li>• Used to integrated graphic designs on scan card as AR marker</li></ul>
	<ul style="list-style-type: none"><li>• Android SDK is a platform to developers to run and test application through smartphone</li></ul>

### **3.4 Summary**

Methodology is very important in a system development. It helps to make sure the system develop correctly from phases to phases. In this system, Iterative model had been chosen as a guide to build system. It also helps to ensure all the objectives can be achieved. Besides, this chapter also explains the hardware and software requirements for this system.

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