

**WEB-BASED E-COMMERCE FOR VISUALLY IMPAIRED  
USING ARTIFICIAL INTELLIGENCE**

by

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Dissertation submitted in partial fulfilment of  
the requirements for the  
Bachelor of Information Technology (Hons)

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**CERTIFICATION OF APPROVAL**

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Approved by,

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SEPTEMBER 2021

## **CERTIFICATION OF ORIGINALITY**

This is to certify that I am responsible for the work submitted in this project, that the original work is mine except as specified in the references and acknowledgements, and that the original work contained herein has not been undertaken or done by unspecified sources or person.



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FARAH BATRISYIA BINTI MUHAMMAD AL SUHAIMI

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## **ABSTRACT**

Visual impairment is a severe issue that needs to be tackled. This problem is related to human beings as the population of visually impaired has been increased yearly. Though technologies are making online shopping easier by the day, visually impaired people are still not completely dependent on using e-commerce. This problem will make the visually impaired even more vulnerable as there is lack of technology available that can provide an accessible website for the visually impaired people. Nowadays, there is lack of technology available to the visually impaired, especially in e-commerce context. Studies have been conducted on the past projects to analyse approaches to the related project and improvement have been made to make sure this project aligns with its objectives and scope. This project aims to develop a web-based for e-commerce for visually impaired persons. With the help of artificial intelligence (AI) technology and natural language processing (NLP), a tool shall be developed for converting text-to-speech (TTS) synthesizer and speech-to-text (STT) synthesizer. This can help visually impaired to be able to use online purchase independently and achieve Sustainable Development Goals.

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## LIST OF ABBREVIATIONS

AI	Artificial Intelligence
WHO	World Health Organization
SDG	Sustainable Development Goals
IAPB	International Agency for the Prevention of Blindness
RGCs	Retinal ganglion cells
RNFL	Retinal nerve fibre layer
W3C	World Wide Web Consortium
EOA	Electronic Orientation Aids
OWASP	Open Web Application Security Project
XXE	XML external entities
XXS	Cross-site scripting
R-CNN	Region-based convolutional neural network
RNN	Recurrent neural networks
NLP	Natural language processing
TTS	Text-to-speech
STT	Speech-to-text
IDE	Integrated development environment
SDK	Software Development Kit
BARD	Braille and Audio Reading Download
DAISY	Digital Accessible Information System
HTML	Hypertext Markup Language
UI	User interface
UX	User experience
UNCTAD	United Nations Conference on Trade and Development

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# CHAPTER 1

## INTRODUCTION

### 1.1 Project Background

There is a widespread assumption that e-commerce aids the growth of enterprises in developing countries (Alemayehu, Paul, 2005). This is demonstrated by the fact that the COVID-19 issue has boosted e-commerce's and expanded its scope, particularly through new enterprises, customer categories, and products. Though technologies are making online shopping easier by the day, visually impaired people are still not completely dependent on using e-commerce.

This problem will make the visually impaired even more vulnerable as there is lack of technology available that can provide an accessible website for the visually impaired people. According to a survey that was conducted, 87.5% of the respondents mentioned that they are not aware and familiar with e-commerce website for visually impaired. While 75% of the respondents agreed that the COVID-19 issue has increased dynamism in the online shopping and e-commerce.

Studies have been conducted on the past projects to analyse methods to the related project and improvements have been made to make sure this project aligns with its objectives and scope. This project aims to develop a web-based e-commerce for visually impaired. With the help of AI technology, a conversational voice tool shall be used to integrate with the website. This can help visually impaired people to deserve the same access to information and opportunities as others, which can also broaden the market segment for any business. A website tool using programming language is created to provide user with real time feature, which is during online transaction.

### 1.2 Problem Statement

This project examines challenges and hardships for visually impaired in using e-commerce. According to World Health Organization (WHO) in 2021, visually impaired population vision impairment has at least 2.2 billion individuals worldwide.

The annual global cost of lost productivity due to vision impairment caused by untreated myopia and presbyopia alone is estimated to be US\$ 244 billion and US\$ 25.4 billion, respectively. Hence, this is a very severe issue that needs to be tackled. Globally, California Optometric Association has identified the common category of visual impairment as per below:

- Loss vision impairment;
- Peripheral (side) vision loss;
- Generalized haze;
- Night Blindness;
- Extreme light sensitivity; and
- Blurred vision.

This is a significant issue, as WHO's recommendation in the 2019 World Report on "integrated, person-centered eye care, including preventable blindness and vision impairment" emphasises that Member States and their partners should make a concerted effort to minimise the burden of eye disease and visual impairment to meet the Sustainable Development Goals (SDG). Hence, an e-commerce for visually impaired shall be a great initiative in achieving the SDGs. According to the International Agency for the Prevention of Blindness (IAPB), vision has an impact on several critical Sustainable Development Goals (SDGs), the most crucial one, which is related with this project is SDG 3.

SDG 3 stated that poor vision has a significant influence on one's wellness and mental health and has been related to an increased risk of sorrow and anxiety, as well as a loss of independence and capacity to care for oneself. Furthermore, it raises the risk of falls and fractures in the elderly. Hence, e-commerce shall be a great initiative that can influence the visually impaired persons in wellness.

Currently, there has only a quite number of e-commerce that provides feature to help with visual impairment problem. This problem will make the visually impaired even more vulnerable as there is lack of technology available to the public that can provide an accessible website for them. The visually impaired have special requirements for accessing E-commerce websites and developing a site that they can

readily engage with presents developers will be a challenge. According to the New Straits Times (2021), around 1.2 percent of Malaysia's population is blind.

Studies have been conducted on the past projects to analyse approach to the related project and improvement have been made to make sure this project aligns with its objectives and scope. This project aims to develop an e-commerce that can be used for visually impaired people. With the help of AI technology, a tool shall be developed for conversational purposes and to be used as a feature in the application. This can help visually impaired to be able to use online purchase through their devices as efficient as others.

To tackle this problem, awareness plays a big role in solving this issue. People need to aware that they are a quite number of people who are affected and categorized as visually impaired face the difficulties in doing online purchase. According to a survey conducted, a percentage of 87.5% of the respondent agreed that they are not familiar and aware of web-based e-commerce for the visually impaired. To conclude, Covid-19 has emphasised the necessity to enhance all actions connected to digital accessibility and assistive technology.

The government shall also play a vital role in broadening the scope of equal-access regulations in telecommunications industry, to accommodate to the visually impaired persons as well, which is implemented in India. According to the survey, 36% respondents believed that the no government intervention is the factor that leads to unawareness of web-based e-commerce for the visually impaired. Users who are blind or visually impaired will benefit immensely from this evolving virtual e-commerce because it will enable them to do essential life tasks without the need for traditional physical hurdles. Furthermore, more active, and independent impaired persons benefit society.

The struggle of providing visually impaired persons with equitable access to technology continues, and the World Wide Web is one of the most challenge places to adapt. Businesses can most successfully build websites that accommodate visually impaired people by first identifying the major obstacles that they face. This is counted inclusive constraints to help creating a useful e-commerce for them. A conversational



tool can help easily as user can always find it easy to use without having difficulty in reading to lengthy texts in the application.

In conclusion, people with visually impaired have limits when it comes to shopping, which puts them in an inconvenient position due to their physical restrictions. The internet, on the other hand, has provided new opportunities for online buying. It is a little too ambitious to solve this issue within one simple project. However, this project can break the problem and solve it a bit. There are not many tools that visually impaired people can use through e-commerce, which can be used easily by visually impaired persons. This can be a big help in solving this issue as it can provide features that help them to face the challenges.

This project focuses on the issue of faced by visually impaired persons that will be mitigate through an e-commerce. This can create an awareness and alert on the constraints and challenges by them to the public. Nowadays, with the emerging AI technology and availability of technology, there are many ways we can make this available and accessible to all. This project aims to create a web-based e-commerce for visually impaired using AI that is easy, and support to help use a better e-commerce for visually impaired persons as there is lack of awareness towards this population.

### **1.3 Project Objective**

The objective of this project is to solve problems that have been mentioned in the previous section. The objectives are listed as the following:

- To design and develop a web-based e-commerce for visually impaired; and
- To integrate the web-based e-commerce with a specialized AI.

### **1.4 Project Scope**

For this project, some scope in certain areas have been set to specify the project according to the project objective and problem statement. This tool is intended to be used in web development base. The web-based e-commerce can as well be used by non-visually impaired or non-affected person. It employs an artificial intelligent tool,

which is using NLP tool to help as voice assistant in speech recognition, which will converse to users in a feasible way.

NLP is a subset of machine learning in artificial intelligence in which neural networks are used to learn unsupervised from unstructured or unlabelled data. This web-based e-commerce can provide real-time transaction to end user if the user is connected to an internet connection.

This research study analyses and improves ways of comfort by reducing suffering and hardship for visually impaired in using e-commerce. This project uses React for the back-end development which is a JavaScript. The data collected are stored in a database is an open-source database for user registration system.

# CHAPTER 2

## LITERATURE REVIEW

### 2.1 Visual Impairment

A Visual impairment, according to the National Eye Institute, cannot be corrected with normal glasses, contact lenses, medicine, or surgery, and significantly hinders ability to do daily duties. Visual impairment is described as a loss of vision to the extent where it causes problems that cannot be solved with standard means such as glasses (Industries for the Blind and Visually Impaired, 2021). The WHO warned in a report that population ageing will result in a significant increase in the number of people who are visually impaired or blind. According to Global Estimates of Vision Loss, 1.1 billion people worldwide suffered from visual loss in 2020.

According to WHO (2021), visual impairment imposes a massive financial burden on the global economy and is responsible for productive economy losses totaling US\$ 244 billion and US\$ 25.4 billion, respectively, due to untreated myopia and presbyopia. A study shows the rate number affected by vision loss is increasing linearly by Industries for Blind and Visually Impaired (2020) as per diagram below:

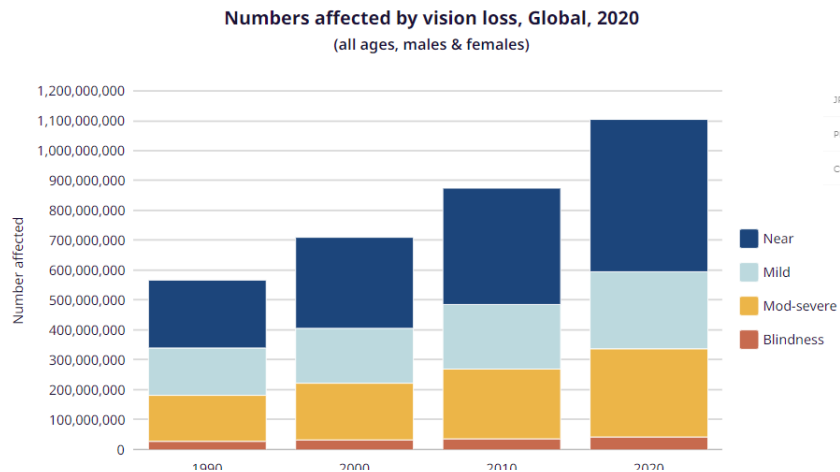


Figure 2.1: Visual Assistive Technologies

The figure shows that the “near” category consists of the majority number of people affected, followed by mild, mod-severe, and blindness. According to IAPB, below are the percentage statistics type of visual impairment:

- 43 million blind persons in the world, with crude prevalence of 0.5 percent;
- 295 million people worldwide suffer from mild to severe vision impairment, with crude prevalence of 3.7 percent;
- 258 million people worldwide suffer from minor vision impairment with crude prevalence of 3.3 percent; and
- Near vision impairment affects 510 million individuals with crude prevalence of 6.5 percent.

To add on, according to a study by National Center for Biotechnology Information (2018) a total of 15,000 persons were examined from each region in Malaysia with a response rate of 95.3%, below are the results of the study:

- 1.2% is bilateral blindness;
- 0.9% is severe visual impaired; and
- 5.5% is moderate visual impaired.

## 2.2 Classification and Causes of Visual Impairment

According to the Centres for Disease Control and Prevention (2019) and the WHO, visual acuity and impairment are classified as follows:

Category	Presenting distance visual acuity	
	Worse than	Equal or better than
Mild or no visual impairment	6/12	6/18
Moderate visual impairment	6/18	6/60

Severe visual impairment	6/60	3/60
Blindness	3/60	-

Table 2.1: Classification of Visual Impairment by WHO (2018)

There are numerous probable reasons of visual impairment, including eye damage and the brain's inability to effectively interpret instructions from the eyes. A multivariate regression analysis revealed that patients with any degree of visual impairment incurred 46.7 percent more total expenses than those without vision impairment (Thomas, Patti, John et al., 2008). Hyperglycemia can result in blurred vision, cataracts, glaucoma, and retinopathy. Indeed, diabetes is the leading cause of blindness in persons between the ages of 20 and 74 (Whitney, 2021).

WHO (2019) estimated diabetic retinopathy affects approximately 3 million people (Down To Earth, 2019). A person with blurred vision should keep his or her blood sugar between 70 to 130 milligrammes per decilitre, or mg/dL, before meals and less than 180 mg/dL one to two hours after meals to allow the eyesight to fully recover, which may take up to three months. Diabetic retinopathy is a condition that occurs when the retina's microscopic blood vessels are damaged. It relates to hyperglycaemia. If diabetes patients do not recognise and treat the disease early enough, they risk losing their sight and get visual impairment. The longer you have diabetes, the more probable it will reoccur.

Moreover, age-related macular degeneration is a risk factor for visual impairment. Macular degeneration caused by ageing is a progressive chronic illness of the central retina that is the major cause of visual loss globally (Laurence, Paul, Johanna, Frank, Tien, 2012). According to WHO report in 2019, cataract affects 10.9 million people. Macular degeneration refers to the disintegration of the macula, the portion of the retina which produces the sharpest vision of an object. The illness, which arises with age, varies in the speed with which it affects people and often can be remedied with magnifying glasses.

Moreover, cataract is also one of the factors that could lead to vision impairment. According to WHO report in 2019, cataract affects 65.2 million. Cataracts

are caused by an excess of sugar in the aqueous humour. The aqueous humour is the fluid that exists between the eyeballs and the corneal lens. It nourishes and oxygenates the lens. When blood sugar levels rise, the lens expands and causes blurred vision and visual impairment (Healthline, 2021).

Glaucoma is another risk factor for vision impairment. Glaucoma affects 6.9 million individuals worldwide, according to a 2019 WHO report. Glaucoma is defined by dysfunction and loss of retinal ganglion cells (RGCs), which leads to disruption of the optic nerve head and the layer of retinal nerve fibres (RNFL), and the ganglion cell and inner plexiform layers, as well as loss of visual field (Robert, Tin Aung, Felipe, 2014).

Finally, there is refractive error. Uncorrected refractive error is a leading cause of visual impairment globally and a leading cause of blindness in Australia (Hilman, Jyoti, Michael, Konrad, 2017). Uncorrected refractive error, posterior capsule opacity, and retinal disease were the primary causes of visual impairment and blindness in cataract-operated eyes, accounting for 20.4% with mild visual impairment (Jialiang, Xiao, Leon, Huaijin et al, 2019).

### 2.3 Challenges and Feasibility of Visually Impaired

Numerous systems have been developed to assist and improve the quality of life of visually impaired persons. Regrettably, most of these technologies are limited in their capabilities. A survey reveals a "digital barrier" between the blind and internet access, with two-thirds of blind persons abandoning online transactions due to their inability to access key areas of a website (Andrew, 2019). Additionally, the author noted in comprehensive interviews with 73 persons who are blind or have significant visual impairments that disabled individuals have a very difficult time purchasing online.

Numerous studies demonstrate that non-standard page layouts, embedded graphical elements, and dynamic Hypertext Markup Language (HTML), particularly JavaScript and Flash animation, all contribute to the inaccessibility of web content (Roopa, Helmut, 2014). The following are the obstacles faced by vision-impaired individuals, as documented in Krzysztof's 2017 study Accessibility of E-Commerce Websites for Vision-Impaired Individuals:

- Abstraction layer;
- Delay in operation of text to speech engines; and
- Writing characters.

To add on, the author also mentioned that below are the feasibilities and recommendations to design applications for the visually impaired:

- Comply World Wide Web Consortium (W3C);
- Minimizing the set presented information;
- Hidden navigation menus;
- Provide a reasonable default size for content;
- Adapt the label and link text widths to the viewport width;
- Positioning form fields below labels;
- Able text resizing; and
- No specific timings for key.

All systems, services, gadgets, and appliances used by disabled people to support them in their daily lives, simplify their activities, and ensure safe mobility are referred to as assistive technology (Wafa, Khaled, 2017) as per figure below. Hence, this project shall be a great initiative in helping the visually impaired persons in easing their every day's lives.

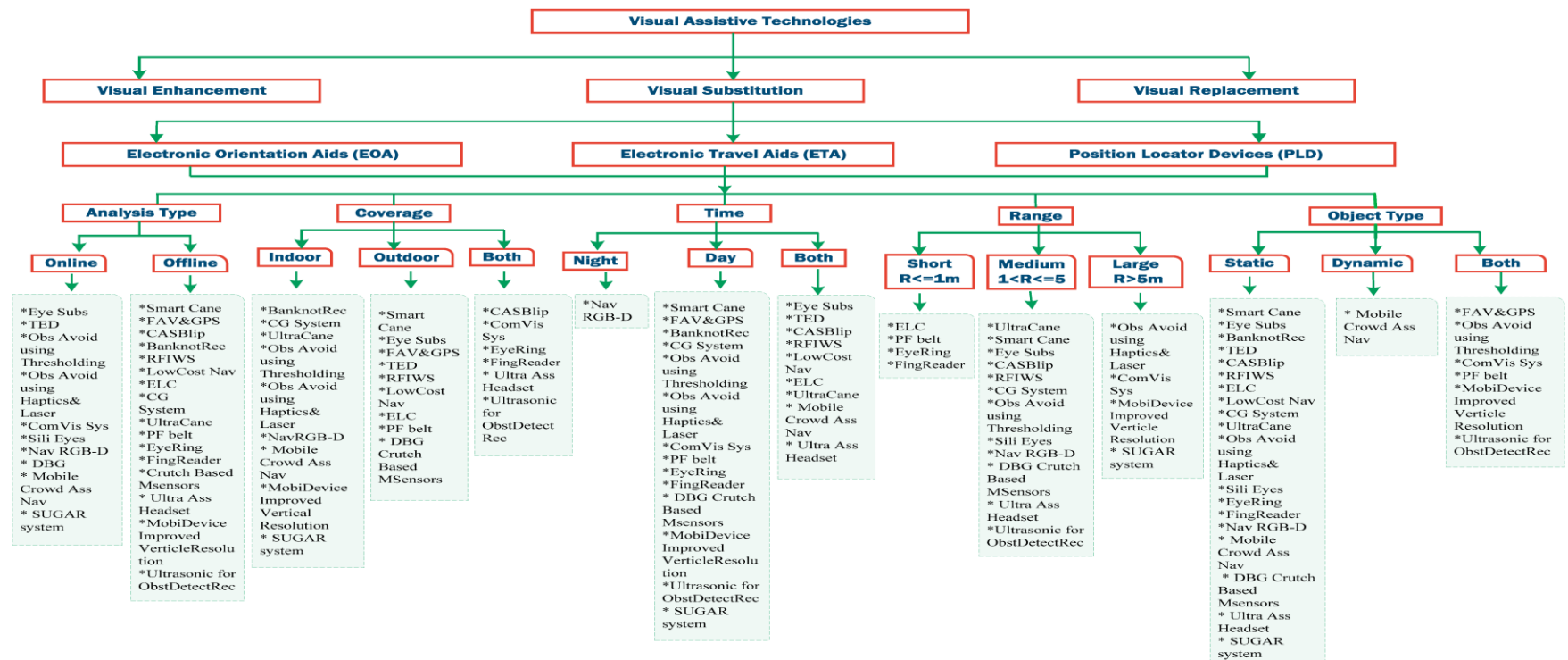


Figure 2.2: Visual Assistive Technologies



This project is categorized under Electronic Orientation Aids (EOA), which is for conversational tool. This project also identifies the hardships and will improve the e-commerce based on the challenges faced by them. According to Sharon (2019), the colour of e-commerce may be essential to its growth if its smart placement benefits consumers with visual impairments. All the mentioned recommendation and feasibilities above will be the applied in this project to ensure that this project is reliable to achieve the project's objectives. A colour-blind friendly palette will also be used to make the e-commerce more visually impaired friendly, which is specifically for deuteranopes and protanope persons (National Bureau of Standards, 2017).

## **2.4 E-commerce Web-Based**

Electronic commerce (e-commerce) is a broad term that refers to the activity of purchasing, selling, and marketing of products and services using electronic systems such as the internet or computer networks (Bambang, Muhammad, Danang, 2020). For this project, security level shall be considered and applied to deliver a good project for the visually impaired persons. According to the Open Web Application Security Project (OWASP), the ten most serious application security concerns by Journal of Physics: Conference Series include the following:

- Injection;
- Poor session authentication;
- Sensitive data exposed;
- XML external entities (XXE);
- Poor access control;
- Erroneous security configuration;
- Cross-site scripting (XSS);
- Unregulated decentralization;
- Utilizes components known to be sensitive; and
- Insufficient recording and monitoring.

## **2.5 Existing Approaches**

### **2.5.1 Artificial Intelligence**

There are various tools that are commonly found in using AI. There are some previous projects that have been identified in using AI tools and techniques in their projects.

According to a study conducted by Galina and Assem (2016), the study used AI approaches to increase the efficiency and quality of education for visually impaired students enrolled in distance learning. The study developed the Smart System of distance learning using a cognitive approach and a combined ontological model.

Additionally, Naveen, Linga, Venkatesh, and Sumangali (2016), in a study that serves as an android-based instructional tool, suggest the use of artificial intelligence for visually impaired individuals. According to the study, programmes may be simply used via speech form by utilising Google voice search.

A study by Matteo, and Stefano (2016) applied AI, which leveraging on deep learning techniques which enables to semantically categorize in detecting obstacles for environment. The wearable mobility aids the visually impaired persons that works in synergy with a smartphone.

Additionally, a study conducted by Balasuriya, Lokuhettiarachichi, Ranasinghe, Siwantha, and Jayawardena (2017) on a learning platform for visually impaired youngsters that incorporates artificial intelligence and computer vision said that the platform incorporates artificial technologies such as deep regional-based convolutional neural networks (R-CNN), recurrent neural networks (RNN), and speech models. This study provides visually impaired individuals with an interactive learning experience.

Additionally, a study conducted by Shubham, Sumer and Veeramuthu (2018) applies AI as Smart AI Assistant for visually impaired persons. Through the study, they implemented AI such as on voice assistant, image recognition, currency recognition and chatbot. The application aids the visually impaired in interacting with the environment.

To add on, there is a study conducted by Daniele, Laura, Federica, Ilenia, Giovanni, and Domenico (2019) used AI which is called ARIANNA system. The unique solution of this study makes use of both inertial sensors and the smartphone's embedded camera as sensors. The system provides direction estimates to tracking the system to the visually impaired persons.

Moreover, a study by Rakesh, Saumya, Malay and Carlos (2020) implemented AI as an assistive technology that acts as Smart Navigation for visually impaired. The project applies deep learning and distance-measuring sensor to for object recognition. As a result, the suggested technique has an accuracy of 95.19% for object detection and 99.69% for object recognition, respectively.

A study by Wan-Jung, Liang-Bi, and Ching-Hsiang (2021) uses employs AI to provide an assistive device for visually impaired pedestrians at zebra crossings. The study also adopted deep learning method for image recognition. A pair of smart sunglasses, a waist-mounted intelligent gadget, and an intelligent walking cane compose the assistance system. An application with a message about the current traffics and situations will appear with an accuracy up to 90%.

Significantly, a study by Jagadish, Daniel, Barry, Anita and Suchendra (2021) incorporated AI, which is called mobile edge. It is a computer vision-based help system for visually impaired individuals to do complicated activities that need deep learning and a voice interface in this study. Systems with advanced functionality such as assessment of traffics and obstacle recognition are available in this system.

### **2.5.2 Natural language processing**

Natural language processing is the study of how computers interact with human language; more precisely, it is the study of how to train computers to process and analyse massive volumes of natural language data. NLP is defined by Sethunya, Kutlwano, Hlmonai, and Freeson (2016) as a collection of theoretically motivated computer strategies for analysing and representing naturally occurring texts at one or more levels of linguistic analysis to achieve human-like language processing for a variety of tasks or applications. Numerous methodologies and research that incorporate NLP into existing approaches are available.

A study conducted by Naveen, Linga, Venkatesh and Sumangali (2016) used NLP in android based educational chatbot for visually impaired. This application applies NLP by giving a voice instruction to use any application. Hence, the output of this study will be provided in voice form as well, which is a TTS feature.

To add on, a study conducted by Rucha, Mayuri, Ashwini, Tejaswini and Parminder (2017) of their android application specifically for the visually impaired persons. This study of an android application applies NLP in voice commands. Features such as calling, messaging, and operations are available in this project. The voice recognizing application allows access to most of the phone's functions and will enable visually impaired persons to interact with society.

Additionally, Sansaka and Nirosha (2018) did research on a software solution for image detection and artistic skills in braille for visually challenged individuals. This study converts of image to braille as the visually impaired persons do not perform or engage much in art. Hence, this study reduces the complexity of the software solution by converting image from the basic shapes to complex image conversions.

To add on, a study by Partha, Soumen, Subhajit, Ananya, Pubali and Arpan (2018) the TTS synthesiser is used to power an e-stick module that is coupled with a voice-activated Android application. The objective of the study is to create a simple and economical option for the visually impaired by architecturally mimicking the traditional stick.

Moreover, a study conducted by Ankush, Madhurima, Gautham, Jishin and Annapura (2018) for describing images to the visually impaired persons. The neural network methods is used for NLP. The MSCOCO Captioning dataset's accuracy is discussed, as well as the software architecture for extending it as a standalone program.

Additionally, Chitranjali, Dakshayini, Gagana, Hegade, and Mane (2019) conducted research on the use of voice-activated text reading smart specs to aid visually impaired persons. A TTS synthesiser is used to read any text aloud, while a STT is used using Optical Character Recognition Tesseract OCR.

Next, a study by Sushama, Bhakti, Lenora and Devika (2019) applied NLP for visually impaired assistant for aiding and recognizing objects in their environment. The primary goal of this project is to develop a system that will aid visually impaired individuals who face societal restrictions in doing fundamental everyday tasks. This study assists them in gaining access to most critical elements while improving their living conditions through the usage of various custom layouts.

A study by Luis, Dario, Jorge, Carlos, and Jesus (2020) discussed about developing open-source roguelike or video games for visually impaired persons. The approach of this study integrates a multilingual module, which can generate text descriptions using NLP of what is happening within the game.

A paper by Özkan, Burak, and Volkan (2020) proposed a captioning system for visually impaired individuals based on a smartphone. The purpose of this article is to enable users to select an image from the gallery or take a new one, which will then

be displayed and read out by the suggested captioning system via the narrator option. The system makes use of NLP, Inception v3-deep learning for the encoder-decoder framework, and the MSCOCO 2017 server.

Additionally, Sripriya, Poornima, Mohanavalli, Pooja, and Nikita (2020) conducted research on a speech-based virtual assistant for visually impaired individuals utilising NLP. Most virtual assistants on the market today are chatbots, which consumers may find uncomfortable in certain scenarios and prefer a conversational interface. As a result, this study was released, which serves as a virtual tour guide, particularly while in high-use scenarios such as driving. A bot creation has proven to be effective in providing information such as suggested locations, opening hours, rating, and address for various locations.

A study by Abhishek, Daniela, and Richard (2021) in a project that introducing an open-source platform, which will include components for customised speech recognition and online tutoring. The NLP is being implemented to help the visually impaired students to learn new mathematical concepts.

### **2.5.3 Alan**

Alan Platform provides an AI (AI) backend for this application, allowing to develop conversational experiences. Alan enables users to get information from programmes via voice requests. In contrast to some other voice assistants, Alan enables developers to create their own custom voice experiences for their applications. According to Alan AI through their LinkedIn, Alan facilitates direct human-like communications between web-based applications and their consumers.

This tool is very useful in fulfilling the projects' objectives as the Alan AI enables the rapid deployment of a conversational speech experience, which is specifically for the visually impaired persons. There are several studies conducted using Alan AI due to the software established and founded in 2018.

According to a study by Sameer and Nahush (2020), the research on technological advancements in reading news more interactive using Alan voice assistant. The Alan will be used with the Alan Studio, which is a web-based integrated

development environment (IDE) and Alan Software Development Kit (SDK). The user can access the web-based application news by category, popular news by terms and much more using voice-command. Next, a study conducted by Aaditya, Ajay, Ranjeet and Akash (2021) on news web application using Alan Studio. Additionally, the system enables users to search for news based on their favourite area, source, theme, or interest.

## 2.6 Comparison of Existing Approaches

The following table highlights the existing approaches that were considered for this project. After examining different ways, there are some similarities and distinctions between them. The projects are categorized in both, e-commerce, and non-e-commerce. However, for the approaches that use Alan Ai, is more to latest study research as the system is founded in 2018. To summarize, there is no right or incorrect technique; it all depends on the project's aim and constraints.

Year	Title	Tools	Contributions
2015	Be My Eyes	Rear-facing camera, iOS and Android SDK, Microsoft.	The mobile application provides more than over 4 million volunteers, which visually impaired persons can call and use rear-facing camera to ask for help.
2015	Aira	Rear-facing camera, iOS SDK, Android SDK, Xcode.	The application connects between visually impaired persons and Aira agent, that are trained to help them using a rear-facing camera.

2015	Braille and Audio Reading Download (BARD)	iOS SDK, Android SDK, TTS.	A web-based service that delivers audio versions of thousands of books, periodicals, and music scores for visually impaired individuals.
2015	Audible	TTS	An application that provides commercial audiobook with updated and new releases books.
2017	Seeing AI (iOS)/ Google Lookout (Android)	Rear-facing camera, iOS and Android SDK, facial recognition system, OCR	The application is used for used to describe to brief text, papers, products, people, currency scenery, colours, calligraphy, and light.
2018	Bookshare	iOS SDK, Android SDK, Digital Accessible Information System (DAISY) format.	A cash reader application the domination of bills.
2020	WeZoom	Android SDK, camera-rear facing.	An application that acts as magnifier with advanced gestures.
2019	CashReader	iOS SDK, camera-rear facing	A cash reader application the domination of bills.



Table 2.2: Comparison of existing project

There are several of projects with each adapt different approaches in tackling this problem. Though technologies are evolving, there is no specified e-commerce application for the visually impaired people. Some of the projects have become obsolete, as they received negative feedbacks from the public and there are always room for improvements. For example, we can see in several projects above, the projects use TTS for the application, which can the visually impaired in using the application efficiently. Based on my findings, the development for the project use programming languages that could not be run on both, client, and server. Although it is not a big issue by using different programming languages, it will be a problem when integrating with the web page, which is in interoperability especially using different devices. For instance, Python needs to use Django while c# uses VS.NET and ASP.NET. The last gap is that existing projects do not allow to modify text size which should be the main concern in developing application for visually impaired. For readers who are likely to be blind or partly sighted, the Royal National Institute for the Blind recommends a minimum font size of 14 points (Mark, 2001).

This project took into consideration all the gaps that have been specified and worked on minimising or solving the gaps. The objective is to create an ecommerce that is visually impaired friendly as they deserve to use technology independently, without any assist of other. As this system uses Alan AI for conversational speech to text tool, it will produce accuracy in prompting inputs and executing outputs and transactions. This system also provides general information about visual impairment as the data collected by the survey to create more awareness about this issue. The last feature is that the system is a reliable system as during development phase, the functionality will be done with the visually impaired persons to ensure the reliability of this project and to avoid this project to become obsolete unlike others. This ensures that the users can do online shopping with ease of use.

# CHAPTER 3

## PROJECT METHODOLOGY

### 3.1 Agile Methodology

Agile methodology is the suitable methodology and implemented in this project. This project is a development of integration of software with NLP. Thesing et al., (2021) mentioned that agile project management planning is incremental, constant, and focused on a short term. There are six phases in this methodology that must be followed, and it will be discussed in detail further in the coming subsection.



Figure 3.1: Phases in Agile Methodology (Nnamdi, O., 2021)

Figure 3.1 shows the phases and approach that make up the agile methodology design that is used in this project. The next subsection will explain in detail about each phase and their implementation in this project. Additionally, agile is a good fit for this six-month project as it focuses on providing quality and value to its users while adhering to the project's criteria.

#### 3.1.1 Requirements

The first phase is the requirement phase. In this phase, there were two types of requirements that need to be defined. To strengthen the topic chose, a study of previous research papers was done. Additionally, data collecting on surveys to identify and

understand the awareness through public was conducted. The first one is the functional and the other is non-functional requirements.

The main requirement for this tool is to integrate an AI into the web-based e-commerce to be able to deliver a project that meet the criteria for visually impaired. The tools will receive and identify input by speech recognition from the user's microphone and send to the platform on the web to ease the transactions.

- **Functionality:** This system is designed to integrate between web-based e-commerce and AI to increase the software's reliability and ease of use;
- **Performance:** The system will appear pop-out message for every successful transaction;
- **Cost:** The cost of the project should be not more than RM 500 for AI application since the most of development use open-source software; and
- **Device requirement:** User must have an internet connection and a microphone to able to use all the features provided.

### **3.1.2 Design**

Following by system design, the prototype's user interface (UI) for a better user experience (UX) was produced using Figma, which is an open-source application that transforms ideas and concepts into presentable UI designs. According to the results in the creation of a user-friendly system concept in smartphone view, as the survey collected shows that percentage of 87.5% respondents use smart phone for online shopping. Hence, a smart phone model prototype is made to match with the result. In design, there are two approaches to design which are visual design and architectural structure which are:

- **Software design:** The software design used React and JavaScript; and
- **UI/ UX design:** The prototype was produced using Figma.

### **3.1.3 Development**

This phase is the next stage in the agile technique, and it is the phase of development that was developed during Final Year Project 2. The web-based e-

commerce platform was built and deployed using the integrated development environment (IDE) Visual Studio Code. This project includes debugging, syntax highlighting, intelligent code completion, snippets, and code refactoring. The web-based e-commerce system collected data from users during registration and transactions. The system is coupled with an artificial intelligence (AI) programme called Alan AI, which utilises NLP to act as a voice assistant for speech recognition and converses with users in a natural manner.

#### **3.1.4 Testing**

Once finished, a validation procedure was carried out to ensure the system's functionality, since it is vital to identify defects/bugs prior to providing the product to the user, as well as assuring the software's quality. Software that has been thoroughly tested to ensure its dependability and convenience of use for the user. To assure quality, a series of tests was performed to confirm that the code was clean and that the project's objectives were met.

#### **3.1.5 Deployment**

Following that, a report was created. After that, the deployment phase ensures that the system is ready for use, and the review and maintenance phase is used to detect and address any issues that arise during the last phase of the agile process. During this phase, integration between the web-based and artificial intelligence systems was implemented to ensure interoperability.

#### **3.1.6 Review**

Following the completion of all prior development phases, a review was conducted to ensure that no concerns arose during the preceding phase. Feedback and concerns gathered during deployment must be addressed in order to sustain and discover any faults. Reporting was implemented to assist in decision-making and to identify any inconsistencies.

### 3.2 Tools

The methodologies employed in this project are classified into two which are in research tools and software development tools. The following is a list of the tools that were utilised in software development tools:

No.	Feature	Proposed Software
1.	To program the application	Visual Studio Code
2.	To store the database	MySQL
3.	To convert speech-to-text feature	Alan AI
4.	To create flow of the project	Lucidchart
5.	To create prototype	Figma

Table 3.1: Required Software Components

### 3.3 Project Timeline

This timeline is created for keeping track of the progress and making sure that everything is lined up as in the early plan. This will cover the task needed in completing this project, duration of each task and its milestone. Gantt Chart is also included for better visualisation of the progress made as per attached in (Appendix 1-A) and (Appendix 1-B).

## CHAPTER 4

### RESULT AND DISCUSSION

#### 4.1 System Architecture

This system is developed from the front end to the back end. Visual Studio Code will be utilised for front-end development. React is used to produce the front-end content for web pages, which simplifies the process of producing visually beautiful web pages using Tailwind. Following that, JavaScript was employed to optimise the web-based functionality. Alan AI was included into the front-end development process as a conversational speech tool to accomplish the project's goals. For back-end development, the system made advantage of the register functionality to create a database that will be connected using MySQL using Visual Studio Code. Finally, Figma was utilised for prototyping, the process through which ideas and concepts are transformed into presentable user interface and user experience designs. Web-based e-commerce can be utilised on any device that supports web-based commerce as long as it is linked to the internet and is being used on a device that supports web-based commerce.

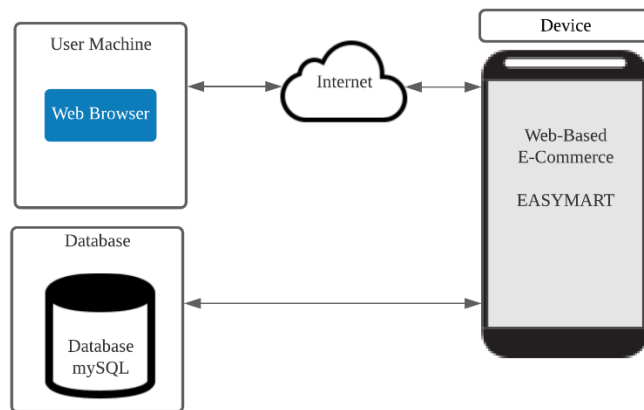


Figure 4.1: Architecture Design for Web-Based E-Commerce

## 4.2 Use Case Diagram

In this use case diagram, presents the features involved in this project and the actors that are related to it. This helps to understand more on the features and the affected parties. There are three parties in the development of this project, which are customer, system, and credit payment service. The customers able to view item in using the e-commerce as a registered user. User registration can be done by the customer to able to make a purchase and checkout the items. The system able to handle the checkout transaction to view the purchased items by the customers. Besides, the system allows to handle in user registration to ensure that the data prompted is properly formatted. Lastly, credit payment system which handles in checkout process to ensure either the transactions made by the users are successful or otherwise.

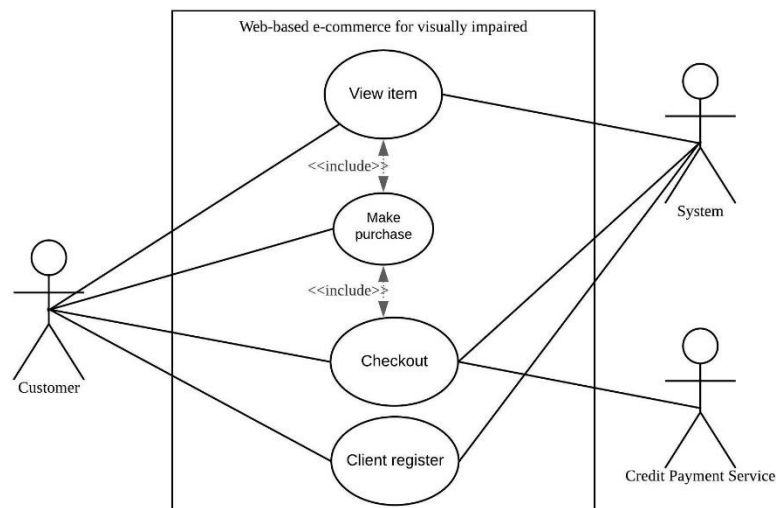


Figure 4.2: Use Case Diagram for Web-Based E-Commerce

### 4.3 Flow Chart

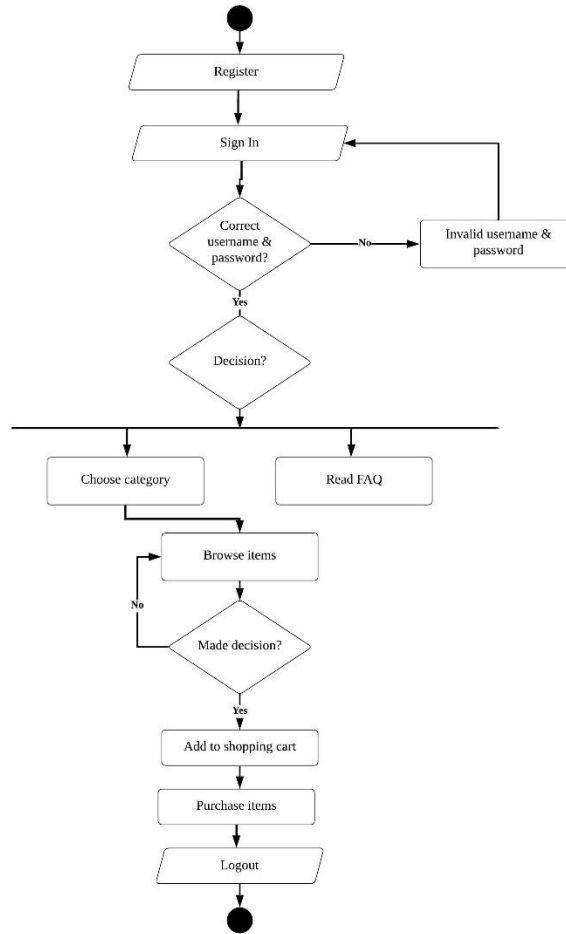


Figure 4.3: Flow Chart for Web-Based E-Commerce

This flowchart presents the flow of the system. First, the user needs to register to be able to make any transaction or purchase. Next, the system will authorize to match the user's email and password according with the project's database. The user can make any purchase easily using conversation speech tool by Alan AI. Adding and removing items to the cart is available to increase the user reliability in using the project. The payment will be done to complete the transaction. A pop-out message will be shown in the e-commerce to end user before logging out from the system.



#### 4.4 Context Diagram

This context diagram provides a better understanding how each process is connected to one and another. Diagram below is the context diagram for this project. The web-based e-commerce will show product catalogue, which the user will insert their information when registering, prompt the number of items and confirm the product to do the transaction. The system has its own database of list of users, list of products and list of confirmation according to the data that is inserted by the user.

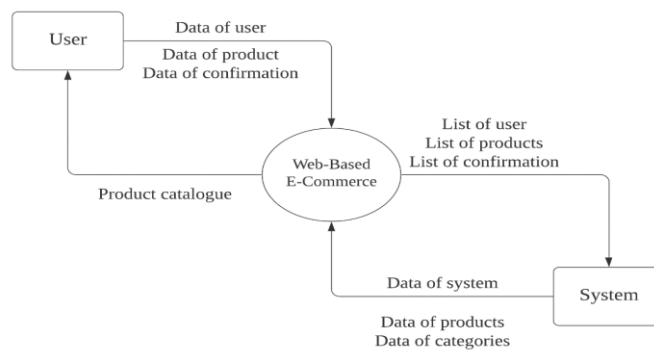


Figure 4.4: Context Diagram for Web-Based E-Commerce

#### 4.5 Data Flow Diagram

This data flow diagram visualizes the data flow between the processes with more details than the previous context diagram. It includes all the processes involved and the parties involved in this tool operation. The system has the product record and price details of the products that are available in the e-commerce. The purchase/ order details and payment details to the web-based e-commerce and the payment message will be sent to the customer to complete the transaction. The e-commerce will send information such as customer information and purchase/ order details to the system to be able to proceed with the order.

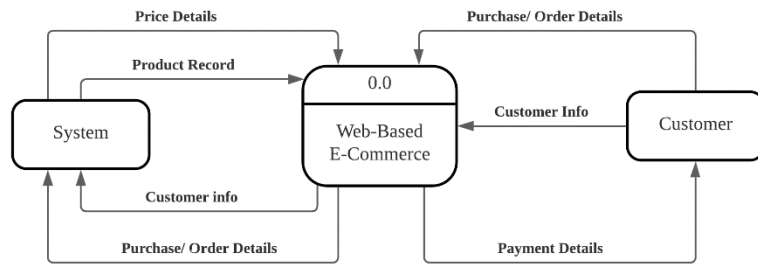


Figure 4.5: Data Flow Diagram

#### 4.6 Block Diagram

This block diagram is meant to give an overview of components used to create this tool and how the connectivity and interactivity between the tools. Figure 4.6 include all the main component of the project and the flow of the data started form the back-end development to the front-end development. As this project is a web-based e-commerce, it requires internet to able to use this project in a real time process. Every block will link with the internet such as the user in filling the user information, administrator to view the purchase order, and the system for payment details. The database will link with the system such as item stocks. Lastly, the administrator can handle the system.

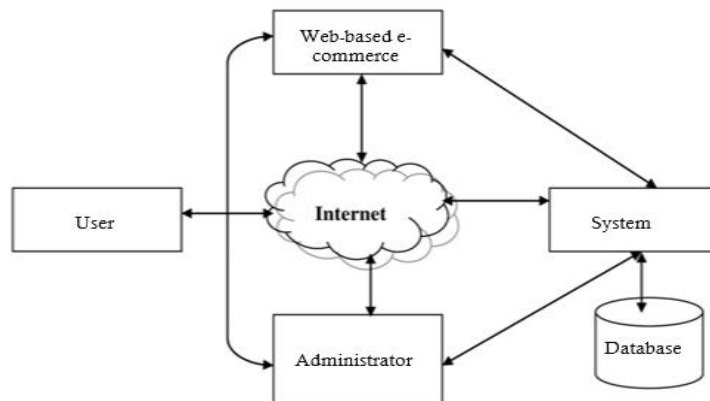


Figure 4.6: Block Diagram

## **4.7 Visualization Design**

This design consists of the UI and a better UX created by Figma to represent in a presentable way and more user friendly. The theme for this design is designated using colour blindness friendly palette which are using orange and blue.

### **4.7.1 Interface Prototype: Home Page & Register Page**

A home page is the initial page a person sees upon entering the web-based e-commerce, and it may also function as a landing page to attract visitors. As a result, a well-designed home page is often a website's first focus. For instance, this project makes use of a well-organized and straightforward home page.

If the user does not already have an account, he or she can establish one by clicking the register button. For those who have created an account, they may log in using their registered username and password. Additionally, the main page contains basic information about vision impairment, which might help enhance public awareness, as noted in the poll.

On the registration page, the system will request basic information such as your email address and password. Only the password area is case sensitive, as the visually handicapped are unable to differentiate clearly while inputting or prompting the inputs.

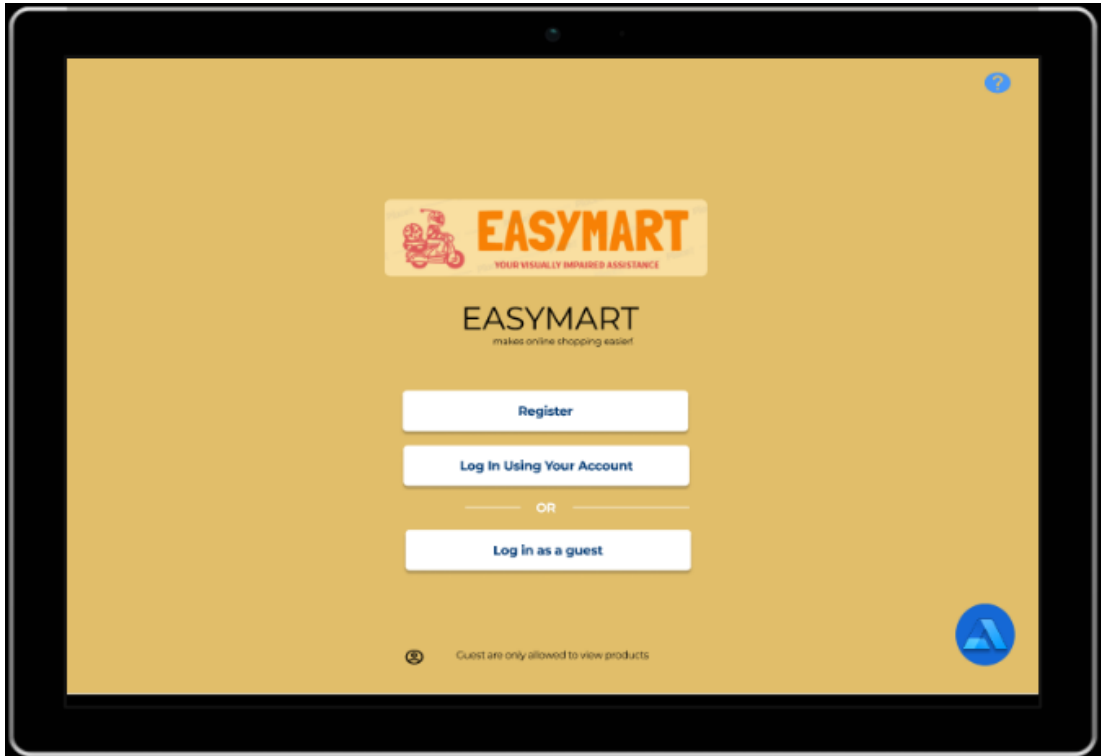


Figure 4.8: Register Page for Web-Based E-Commerce

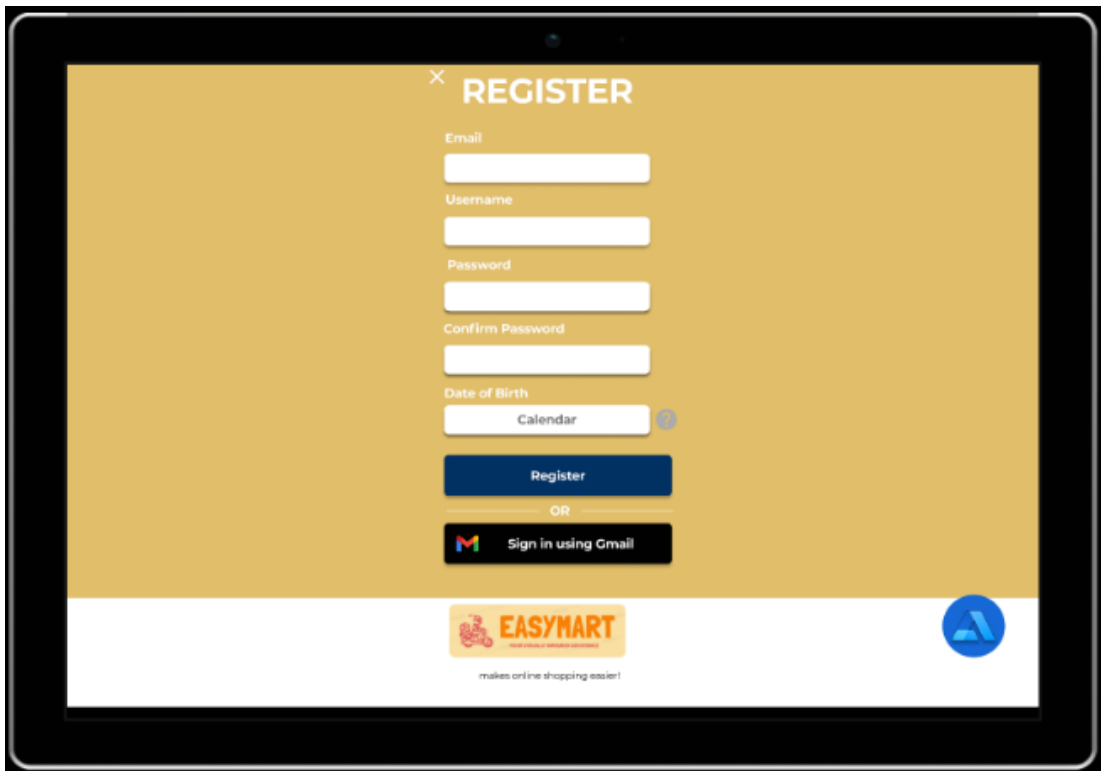


Figure 4.7: Product Page for Web-Based E-Commerce

#### 4.7.2 Interface Prototype: Main Page

This area allows the user to view goods available. The main page enables users to search for items based on their category and price. On this page, Easymarket's specialised market is confined to clothes.

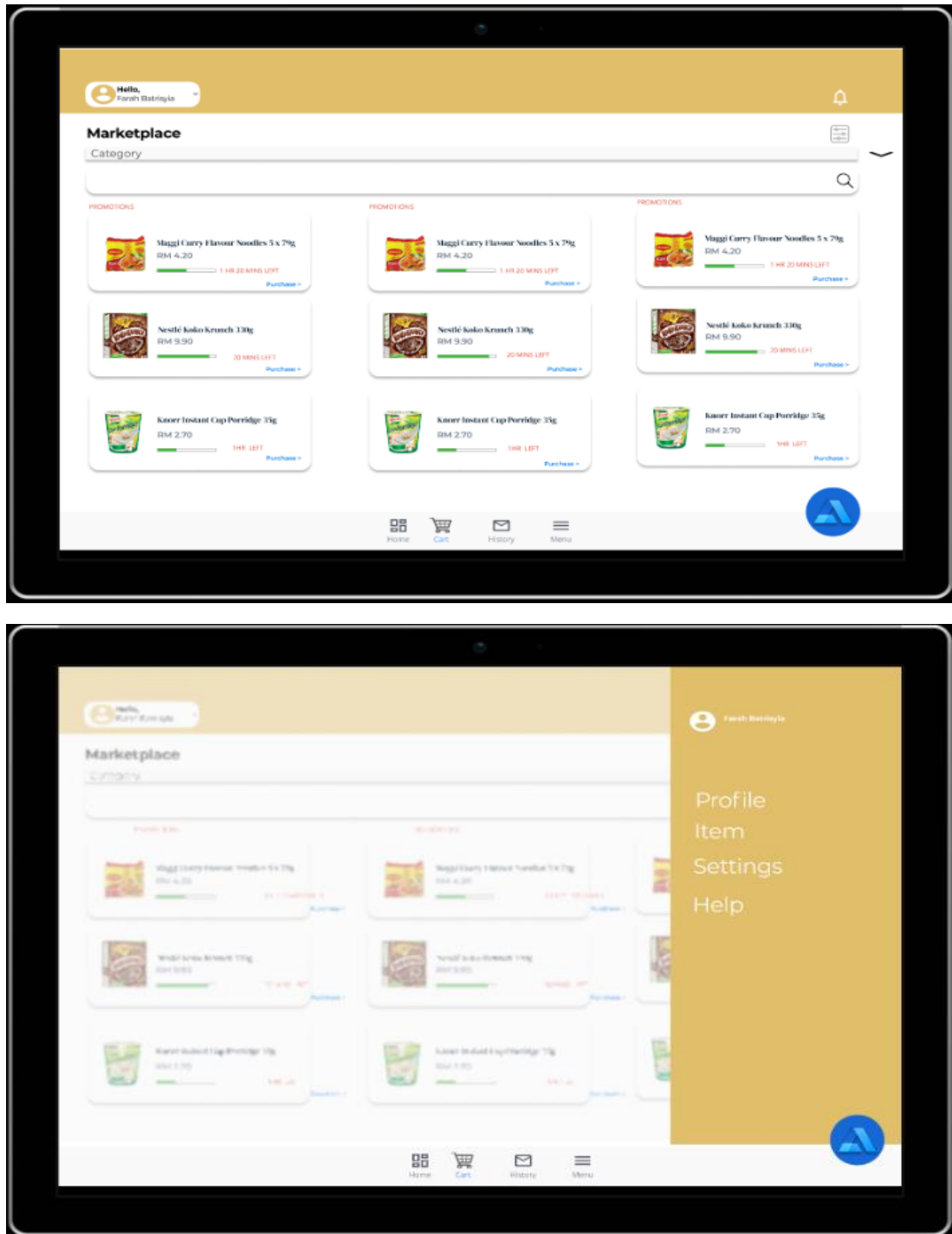


Figure 4.10: Main Page for Web-Based E-Commerce

### 4.7.3 Interface Prototype: Product Page & Cart Page

In product page, the user can view products variations based on the selected in the home page. Pricing information, and quantity and call-to-action are available in this page. The system is user-friendly as the project can remove items, according to the decision made. A huge “add to cart” button is used to be able for user to make transaction clearly.

In this section, the user can view their shopping cart, where users can pile up all the selected products in the previous section. The call-to-action can be performed through “Make Payment” button, which is in contrast colour, to make it more visible for the user.

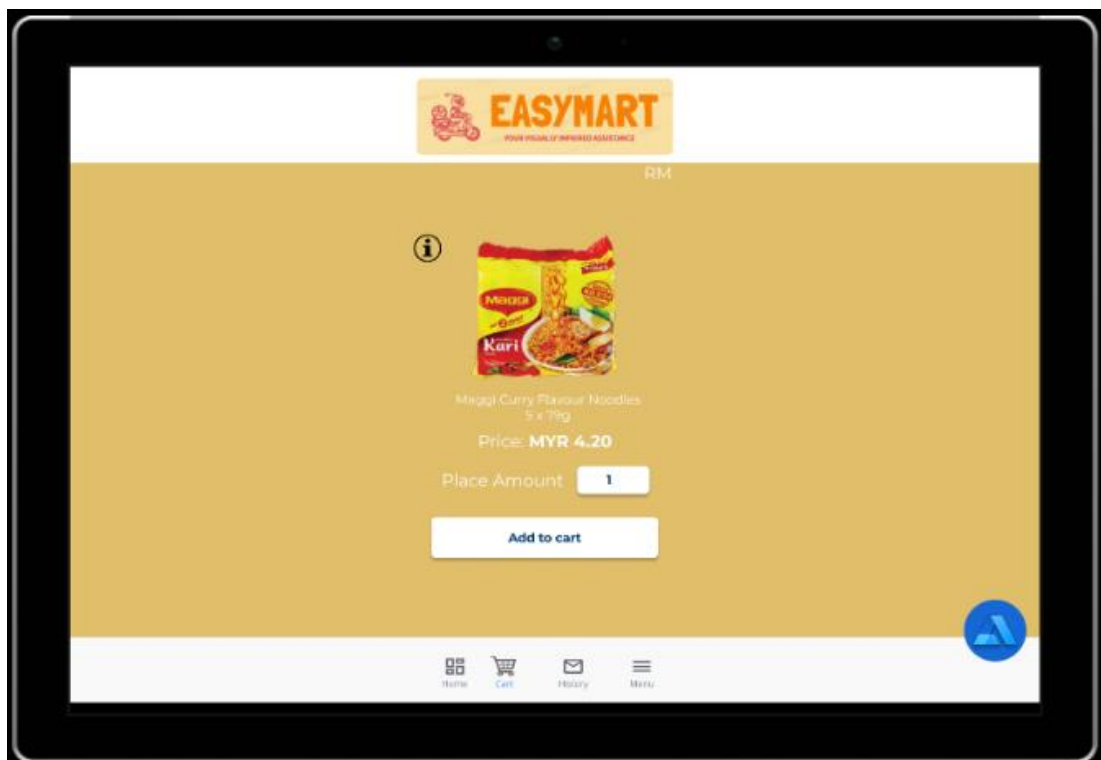


Figure 4.11: Cart Page for Web-Based E-Commerce

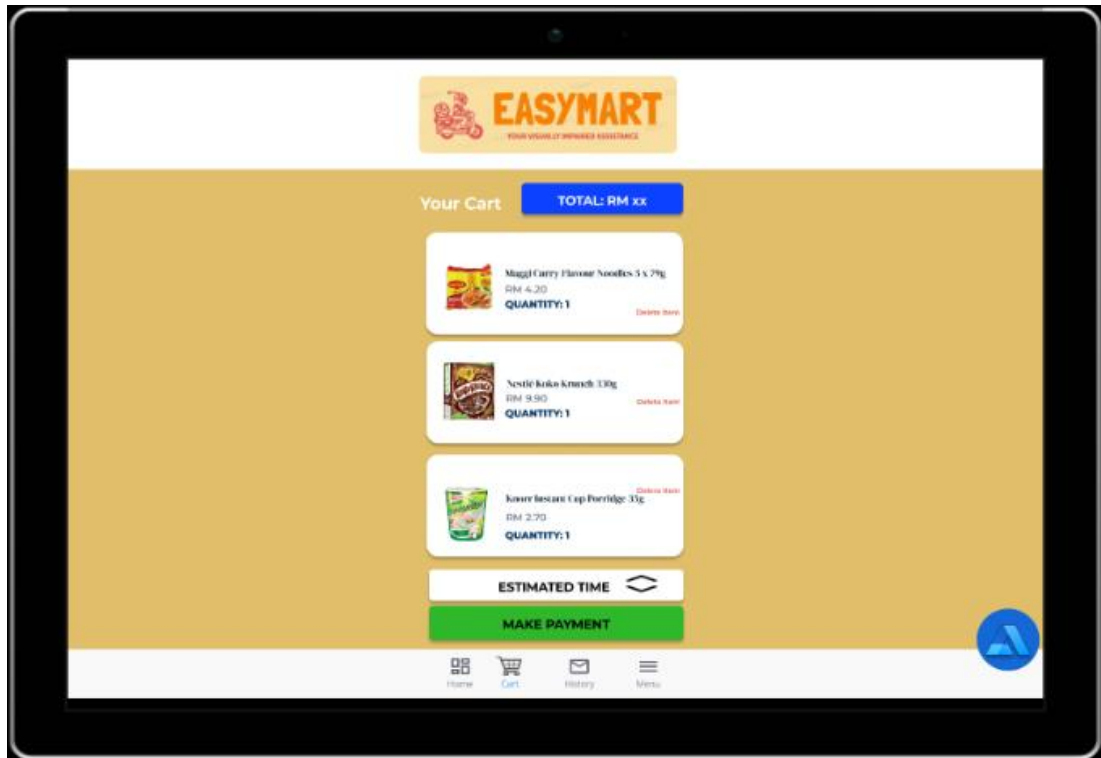


Figure 4.12: Product Page for Web-Based E-Commerce

#### 4.7.4 Interface Prototype: Order History Page

The user can purchase the items that are in the cart easily and securely using this project. This project applies security configuration. There will be no captcha to complete the transactions as a study conducted by Roopa and Helmut, which they stated the visually impaired persons are having difficulty in online shopping when inputting captcha. Hence, no captcha needed in purchasing using the e-commerce. Order history page in this project is a straightforward way for a buyer to keep track of the order, as well as the status of those orders along the order process.

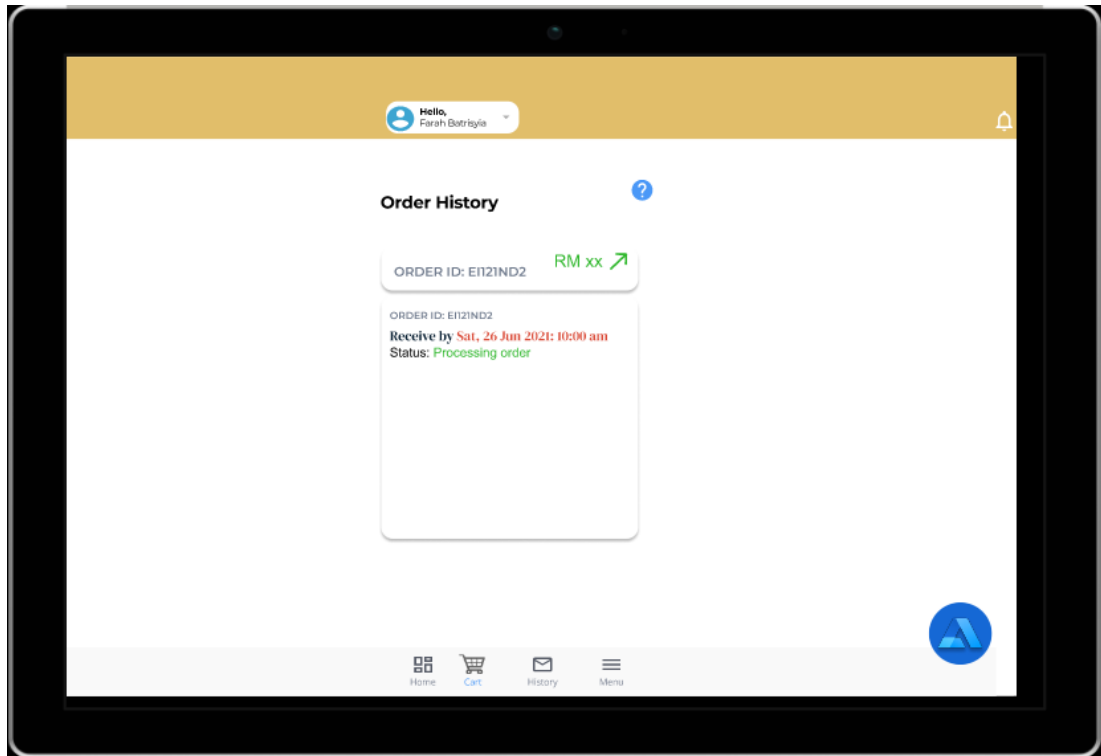


Figure 4.13: Order History Page

## 4.8 System Interface

The web-based application's designed system interface features and functionality were produced based on data collection analysis, which was made in the chapter 2. The following figures depict the produced application's UI screenshots. The user interface is designed to ensure that it is compatible to be used by visually impaired persons, ranging from moderate visual impairment, mild visual impairment, severe visual impairment as well as colour blind people.

### 4.8.1 Login Page Interface

According to figure 4.15, the user is prompted for two inputs: an email address and a password. Because the password is case sensitive, it must be typed in a certain format. The integration of AI is not possible on the login page due to the system's inability to apply case-sensitive rules to the circumstance. This page's user interface is straightforward and unobtrusive, allowing visitors to easily navigate. Adobe reports that 58% of users would skim if time were limited. Additionally, the web-based e-commerce application's font size is acceptable for visually challenged users due to its



usage of larger letters that make it simpler to read. If users provide an invalid username or password, a notification similar to that shown in figure 4.14 will be shown.

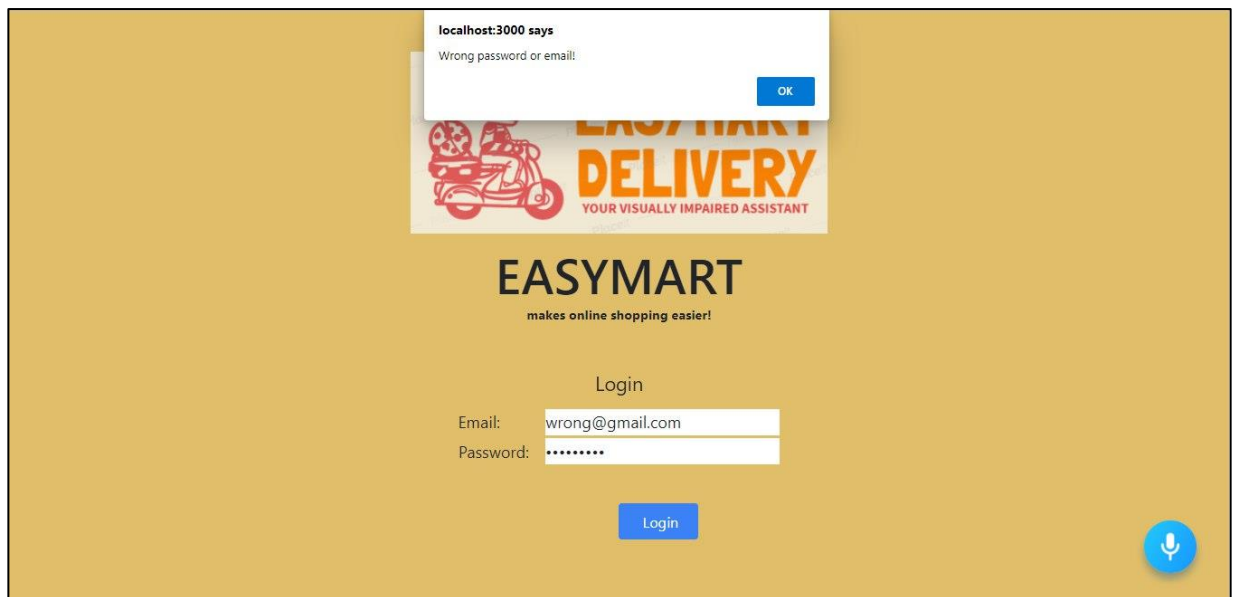


Figure 4.14: Incorrect Message Interface

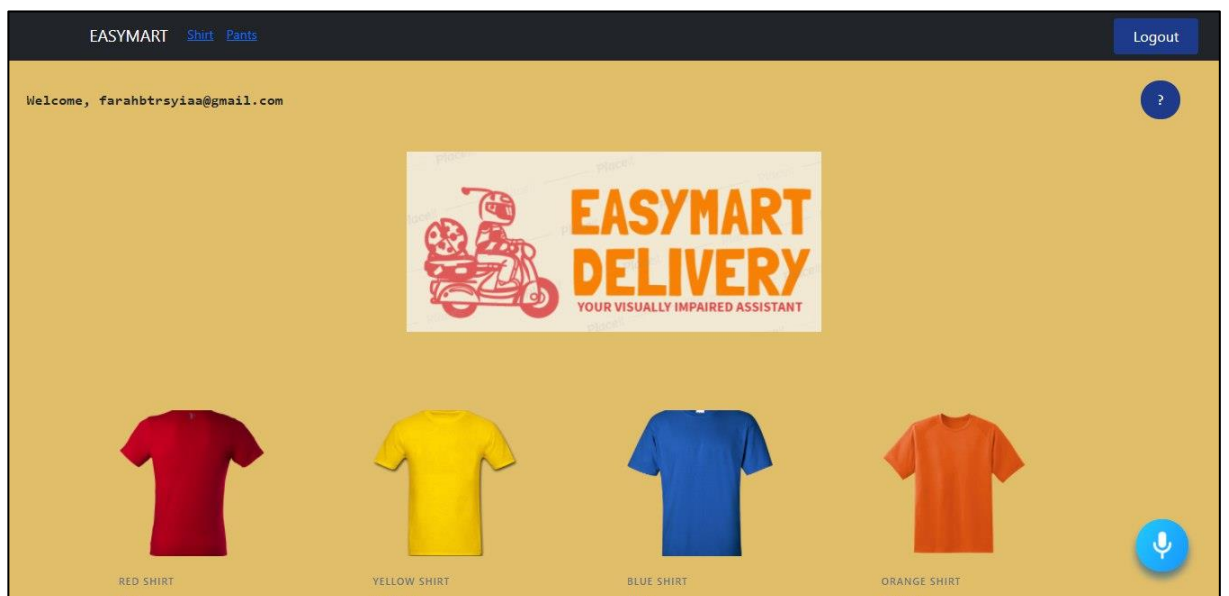


Figure 4.15: Login Page Interface

## 4.8.2 Home Page Interface

Once a user logs into the web-based e-commerce site, they are sent to the main page, which displays the store's items. The home page enables the user to prompt input using the system's integrated conversational STT tool. Thus, the consumer may make the most of any additional features available to them while purchasing things. The following are the benefits of artificial intelligence in e-commerce:

- Open shopping cart;
- Close shopping cart;
- Add item;
- Remove item; and
- Checkout.

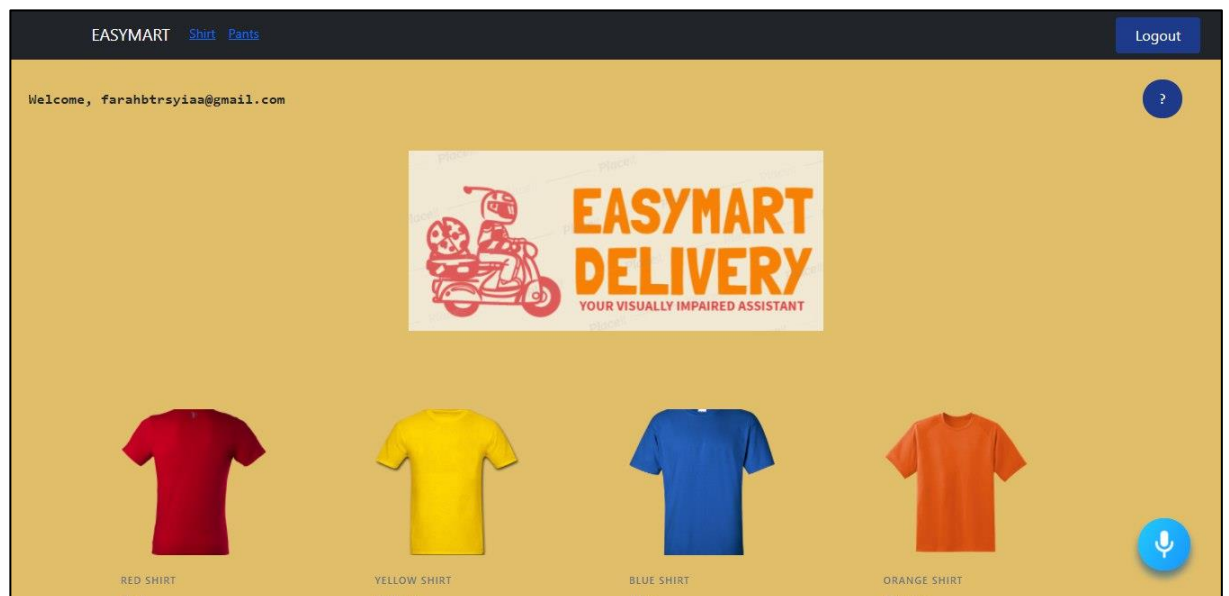


Figure 4.16: Home Page Interface

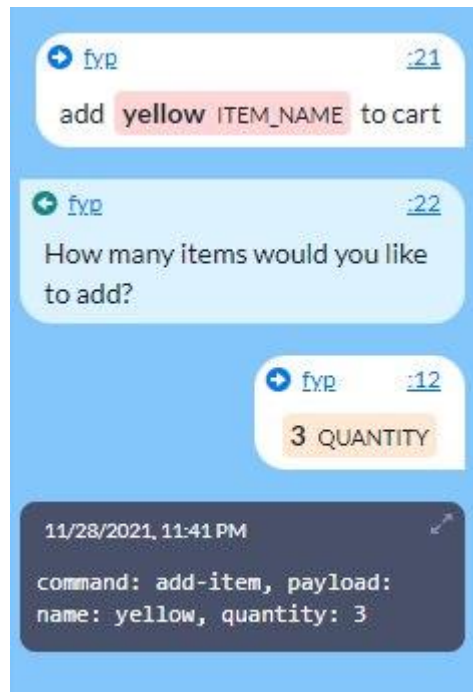


Figure 4.17: Alan AI Add Item

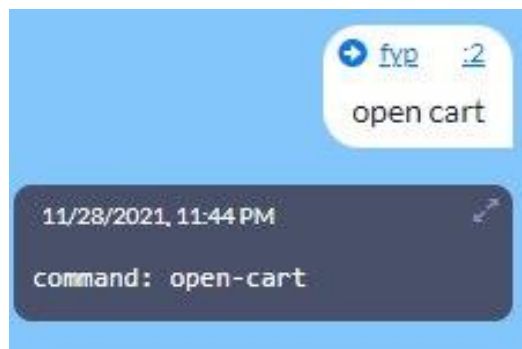


Figure 4.18: Alan AI Open Cart



Figure 4.19: Alan AI Remove Item

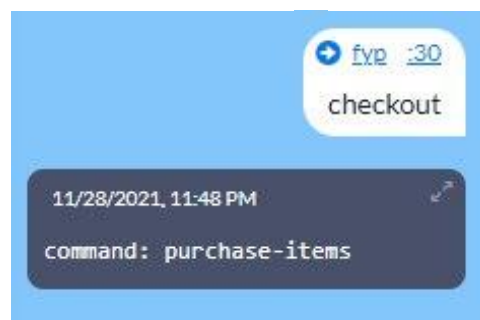


Figure 4.20: Alan AI Checkout

### 4.8.3 Product Detail Interface

The product information section summarises the attributes of each product offered by the e-commerce. This page will display the product's details, which are shown below. This would benefit users by satisfying their preferences.

- Product description;
- Product rating review; and
- Product price.

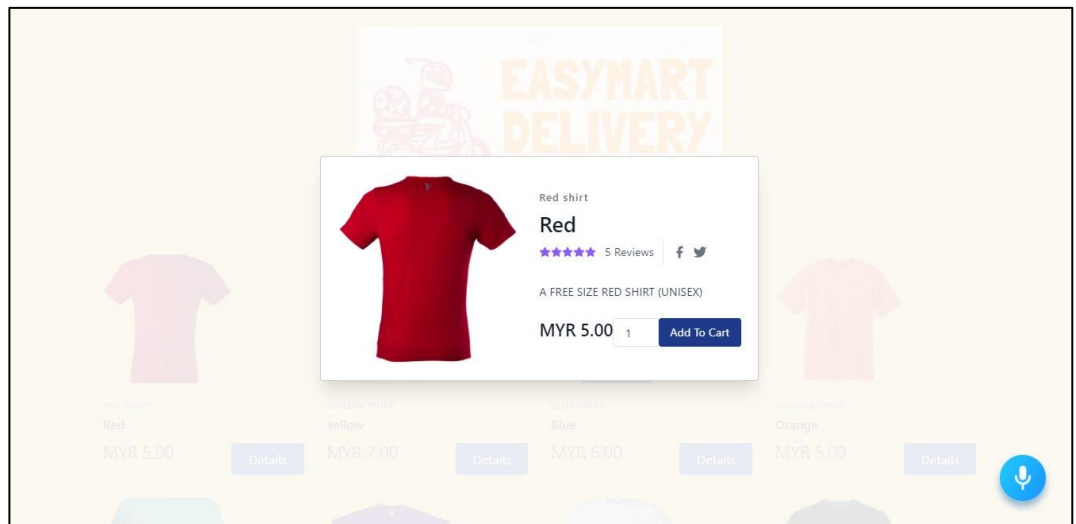


Figure 4.21: Product Detail Interface

### 4.8.4 Cart Page Interface

Once the user has selected which things they wish to purchase, they may utilise Alan AI to add them to their basket. Before checking out, the shopping cart would assist the customer in automating the entire purchasing procedure. The automatic total bills will be gathered in this interface in the manner depicted in Figure 4.22.

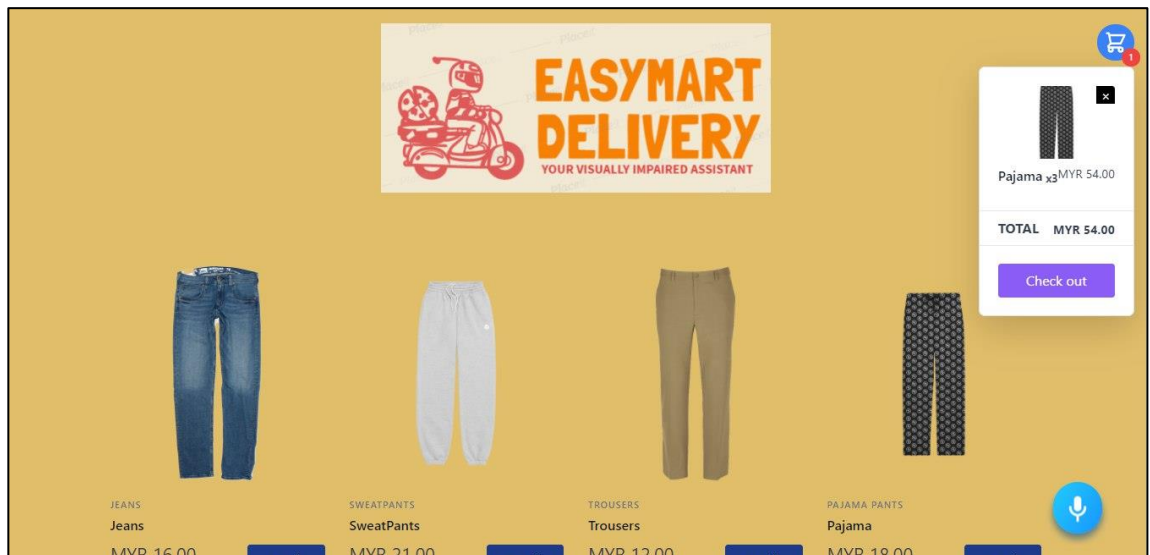


Figure 4.22: Cart Page Interface

#### 4.8.5 Check out Message Interface

The user can check out the purchase by using Alan AI command and a pop-out message will appear in the e-commerce as per figure 4.23.

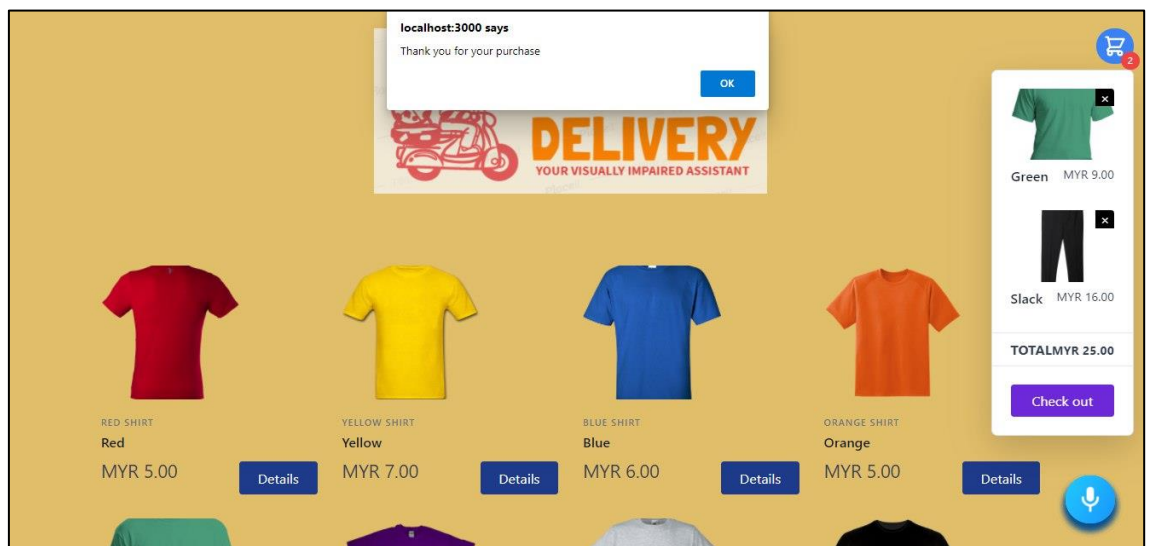


Figure 4.23: Check out Message Interface

#### 4.8.6 Log out Message Interface

The user can sign out after done the transaction by using Alan AI command and a pop-out message will appear in the e-commerce before the e-commerce redirect to the sign in page as per figure 4.24.

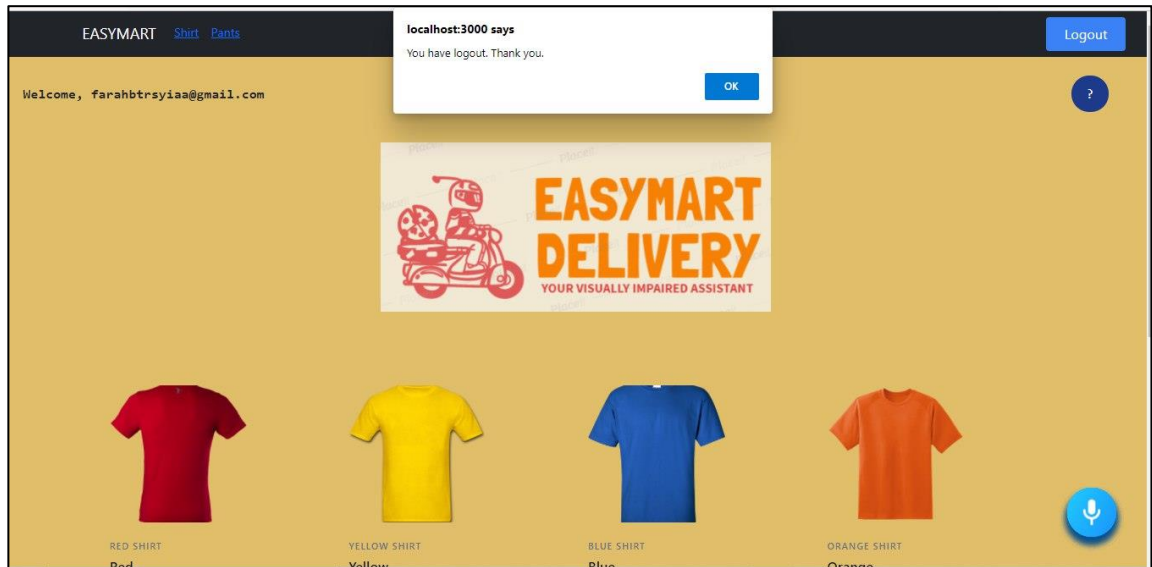


Figure 4.24: Log out Message Interface

#### 4.8.7 Frequently Asked Question Message Interface

Frequently asked questions will be shown to assist users in efficiently utilising the application. As a poll revealed that a sizable majority of respondents are unaware of this issue, this part assists them in raising public awareness about vision impairment.

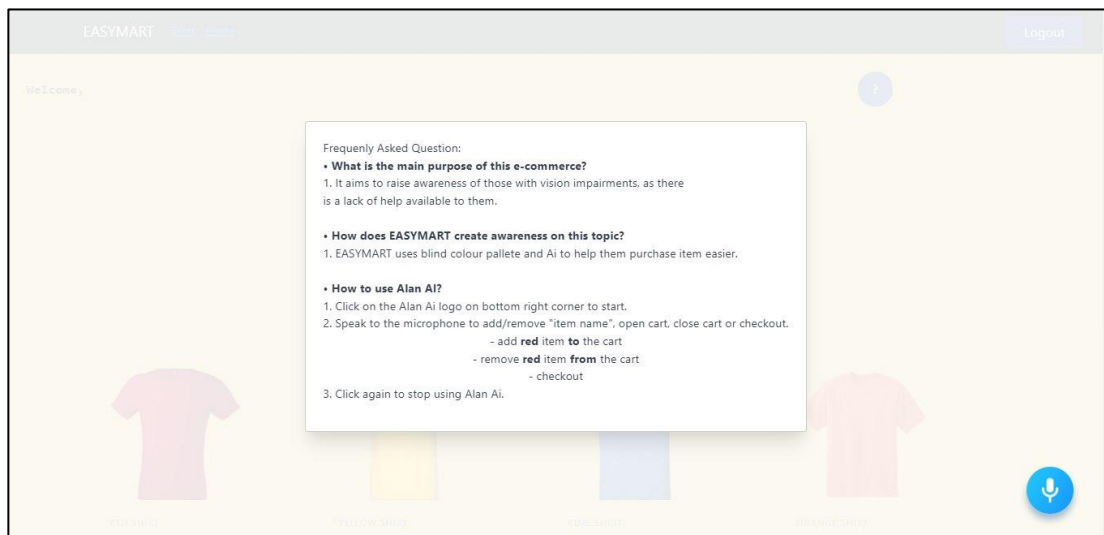


Figure 4.25: Frequently Asked Question Message Interface

## 4.9 Survey

On 20th June 2021, a survey was created to understand the awareness level public, identify hardships in using online shopping and public approval towards this project. Hence, the survey was blasted through social medias and the results of 56 respondents were collected in various visualization.

### 4.9.1 Survey Setting

A preliminary survey has been conducted with visually impaired people and public across Malaysia, who experiencing difficulties in using online application in general. A set of both, open-ended and close-ended questionnaires have been distributed to the related respondents as per attached in (Appendix A-3).

### 4.9.2 Covid-19 Impact on Online Shopping

This question discusses on the respondent's opinion about Covid-19 impact on online shopping. According to the responds, 75% believes that Covid-19 impacts on online shopping, with 17.9% disagreed that Covid-19 gives impact on online shopping and the remaining 7.1% is unsure of Covid-19 impacts on online shopping. As the majority result shows that they agreed with Covid-19 gives impact of online shopping, it is a great initiative in proposing a project that is related with e-commerce.

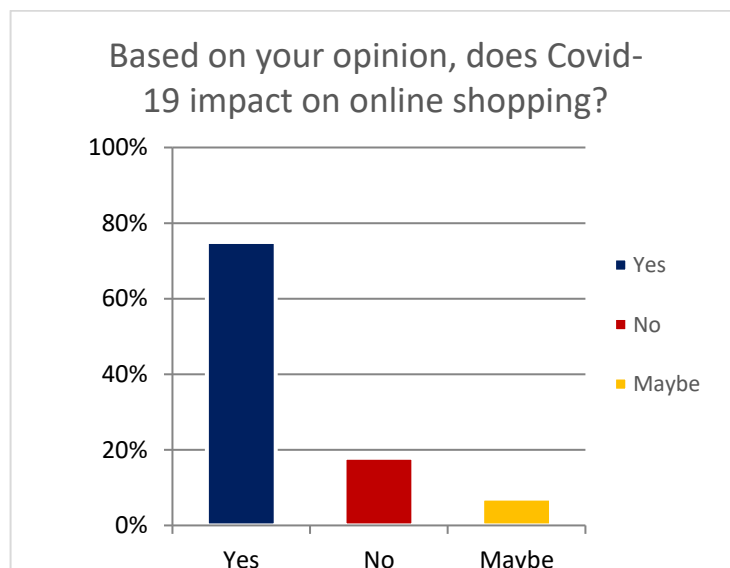


Figure 4.26: Covid-19 Impact on Online Shopping

### 4.9.3 Shopping Preference

This question discusses on the respondent's opinion about their preference in shopping. According to the responds, 50% responded that would prefer to use physical shopping, which is brick and mortar store. While the remaining 50% responded that they would prefer to use online shopping. Hence, it shows that the respondents might incline to do online shopping especially during pandemic.



Figure 4.27: Shopping Preference

### 4.9.4 E-Commerce Website Awareness for Visually Impaired

This question discusses to understand the respondent's awareness level of e-commerce website that is visually impaired friendly. According to the responds, 87.5% responded that they are not aware of e-commerce website that is visually impaired friendly. With 8.9% responded that they are aware of e-commerce for visually impaired. And the remaining 3.6% is unsure of this e-commerce for them. Hence, it shows that this issue or problem should be tackled to help the visually impaired persons in doing online shopping with ease of use.



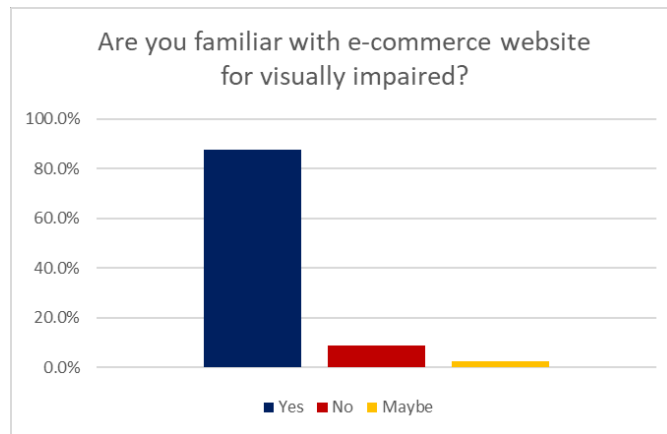


Figure 4.28: Factors that Affect Awareness Level

#### 4.9.5 Factors Affect the Awareness Level

This question discusses to understand the respondent’s opinion that affect the awareness level of this issue. According to the responds, 88% responded that they lack awareness/ exposure is the factor that affects their awareness level of this issue. With 50% responded that the visually impaired persons are minority population/ unrelated. While 36% believes that no/ less government intervention is the factor that makes them unaware of this issue. And the remaining 20% believes that it is not practicable to create an e-commerce website for visually impaired persons. Hence, the figure below shows that there are many factors that could lead to the unawareness level of this e-commerce for visually impaired issue. Some of actions shall be considered in succeeding this project.

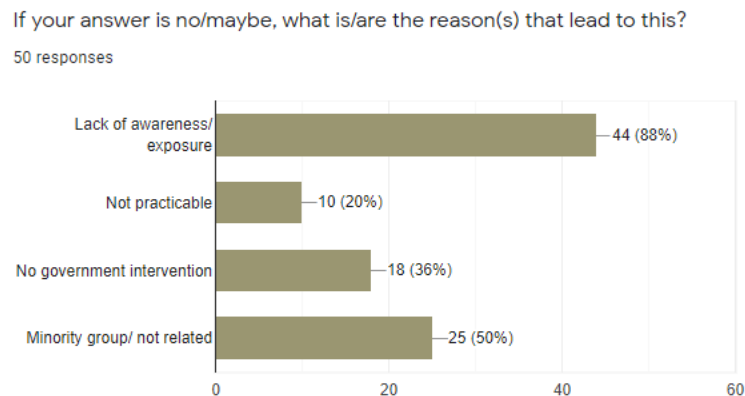


Figure 4.29: E-Commerce Website for Visually Impaired

#### 4.9.6 Project Approval

This question identifies on the respondent's approval for this project to ensure this project is reliable or not. According to the responds, 73.2% responded that are very agree in developing this project. While the remaining 19.6% responded that they agree of this project. While the remaining 7.1 is neutral of this project. To conclude, this project receives approval from the public with the result of 92.8% supports this project development.

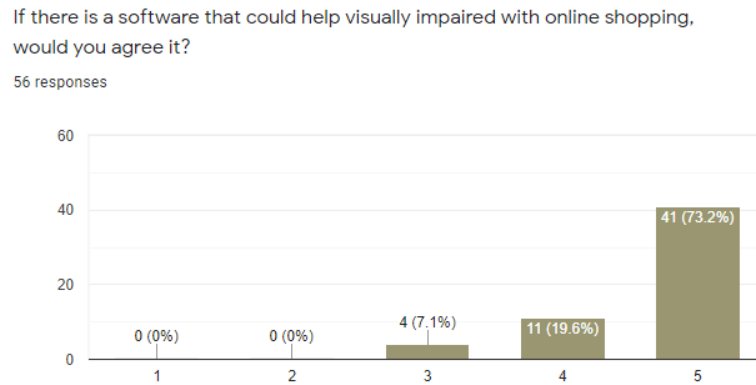


Figure 4.30: Project Approval

#### 4.10 Testing Phase

This phase included user acceptability testing to confirm that the project could complete the needed activities during the final step of testing following the deployment phase. External acceptability testing was conducted on visually impaired individuals, focusing on colourblind individuals within mutuals and relatives. To summarise, they gave positive feedback to this project due to its use of Alpha and Beta testing.

Task 1	
Goal	Calculated total amount of added items in cart
Input	Add items into the cart

Assumptions	The accumulated total of items are calculated
Steps	<ol style="list-style-type: none"> <li>1. User insert the items into the cart</li> <li>2. User can remove the unwanted items</li> <li>3. The total amount of calculated items are correctly calculated</li> </ol>
Fail/ Success	Success
Notes	The amount in the cart is successfully calculated accordingly

Table 4.1: Task 1 for Usability Testing

Task 2	
Goal	User able to sign out from the project
Input	Prompt the input using the “logout“ button
Assumptions	The system able to sign out the user from the system
Steps	<ol style="list-style-type: none"> <li>1. User click the logout button</li> <li>2. All activities are terminated</li> </ol>
Fail/ Success	Success
Notes	The system terminates once it signs out

Table 4.2: Task 2 for Usability Testing

Task 3	
Goal	Register user detail; email and password
Input	Fill in the information
Assumptions	The information stored in MySQL
Steps	<ol style="list-style-type: none"> <li>1. User enter the registration section</li> <li>2. Prompt data accordingly</li> <li>3. Click the “Register” button to store the information</li> <li>4. A pop-out message will appear on the screen</li> </ol>
Fail/ Success	Success
Notes	User information successfully stored in MySQL

Table 4.3: Task 3 for Usability Testing

Task 4	
Goal	User able to use speech-to-text feature
Input	Prompt the input using the “Alan Ai” button
Assumptions	The AI able to capture the input prompted
Steps	<ol style="list-style-type: none"> <li>1. User click the Alan AI button</li> <li>2. Prompt input accordingly</li> <li>3. Click the Alan Ai again to end the activity</li> </ol>

	4. Check to ensure the input is prompted
Fail/ Success	Success
Notes	Inputs are captured using Alan AI

Table 4.4: Task 4 for Usability Testing

#### 4.11 Discussion

Based on the results, the project systems and designs are being visualized through various designs. The system architecture shows how different platform in this project interact with each other. The use case describes the functionalities of the tool. The flowchart explained on the flow of the project. Context diagram provides the relationship between different parties involved. The data flow diagram visualizes the data flow between the processes with more details than the previous context diagram. The block diagram gives an overview on components used to create this tool and how the connectivity and interactivity between the tools. Lastly, the visualization design shows how prototype designs will be visualized.

Next, the discussion of this project is in UI/ UX term. Based on my findings and research, colour-blind people are also being categorized as visually impaired persons as they have a third category of visual disability, which is colour-deficiency. Hence, consideration in designing web content using colour-blind palette friendly is applied through this project. Designers may still consider the needs of colour-blind users, particularly when it comes to the five primary colours which are black, red, green, blue, and yellow, that are frequently utilised in web design Soegoto, Fadhlurrahman, Hermawan (2019).

The next discussion is on the survey. Based on the survey, we can conclude that covid-19 impacts on online shopping. This can be used to support the idea and objective of this project. This would be a beneficial project as it is an opportunity to create an e-commerce during this peak phase of online shopping. To justify this statement, according to a study conducted by the United Nations Conference on Trade and Development (UNCTAD) and the Netcomm Suisse eCommerce Association in

collaboration with the Brazilian Network Information Center and Inveon, online purchases increased between 6 and 10% across the majority of product categories, with a 2% increase in fashion and accessories.

According to the survey conducted, majority with 87.5% of the respondents are not aware of the web-based e-commerce for the visually impaired. Hence, this is a great initiative in tackling this issue as they cover a huge number of population and should not be neglected by the public. Based on the comparison of existing studies shows a small number of e-commerce provided to the visually impaired. This should issue should be tackled as according to a book called Making Eye Health a Population Imperative: Vision for Tomorrow in 2016, numerous studies have demonstrated that vision impairment is frequently connected with a variety of adverse health consequences and a low quality of life. This helps to achieve the SDGs which are stated in the problem statements.

To add on, this project receives a great approval by the public as there is no responds that disagree for this project. The respondents believe that this is a great initiative in helping the visually impaired population. This project also got approval from the visually impaired persons, as per attached in (Appendix A-3). Hence, this initiative should proceed with the project development.

## **CHAPTER 5**

### **CONCLUSION**

#### **5.1 Research Summary**

During final year project phase one, there are various research and studies had been done to achieve the project objectives. Related existing approaches and studies related to the visually impaired were done to ensure that this project weighs and improves to cater the best and improved project for them. Results, discussion, and proposed solutions were also being discussed. Problems that have been encountered, being used, and improved were applied in this project. As lack of awareness from the public, it would be a beneficial initiative to be taken to tackle this issue according to the findings.

#### **5.2 Achievement of Objectives**

To conclude, this project has achieved the objectives in chapter 1 which are as per below:

- To design and develop a web-based e-commerce for visually impaired  
This initiative was successfully designed in response to the difficulties visually impaired individuals when online shopping. The design of the project is being done by Figma and Tailwind to achieve the objective. React was used to construct the web-based e-commerce platform. The project is being developed to guarantee that it is accessible to visually impaired individuals with varying degrees of visual impairment, including moderate visual impairment, mild visual impairment, severe visual impairment, and colour-blind individuals.

- To integrate the web-based e-commerce with a specialized AI.  
This aim has been met since the project successfully captures and implements all of the elements necessary for online buying. With the React platform, the project was combined with Alan AI as a new product in the AI business.

### **5.3 Recommendation**

In the future, there are some recommendations that can be done to make this project better. The first recommendation is in the way it can be tested by a more population across Malaysia of visually impaired persons, and not only limited to one area to get more feedback and recommendations to always improve this system. Also, more detailed research can be done on AI tools, which might have a higher accuracy output compared to this project. The final recommendation is to improve in ambiguity as Alan AI might face problem in distinguishing lexical, semantic, and syntactic ambiguity. A user manual should be provided for them to use this project easily as this AI is new.



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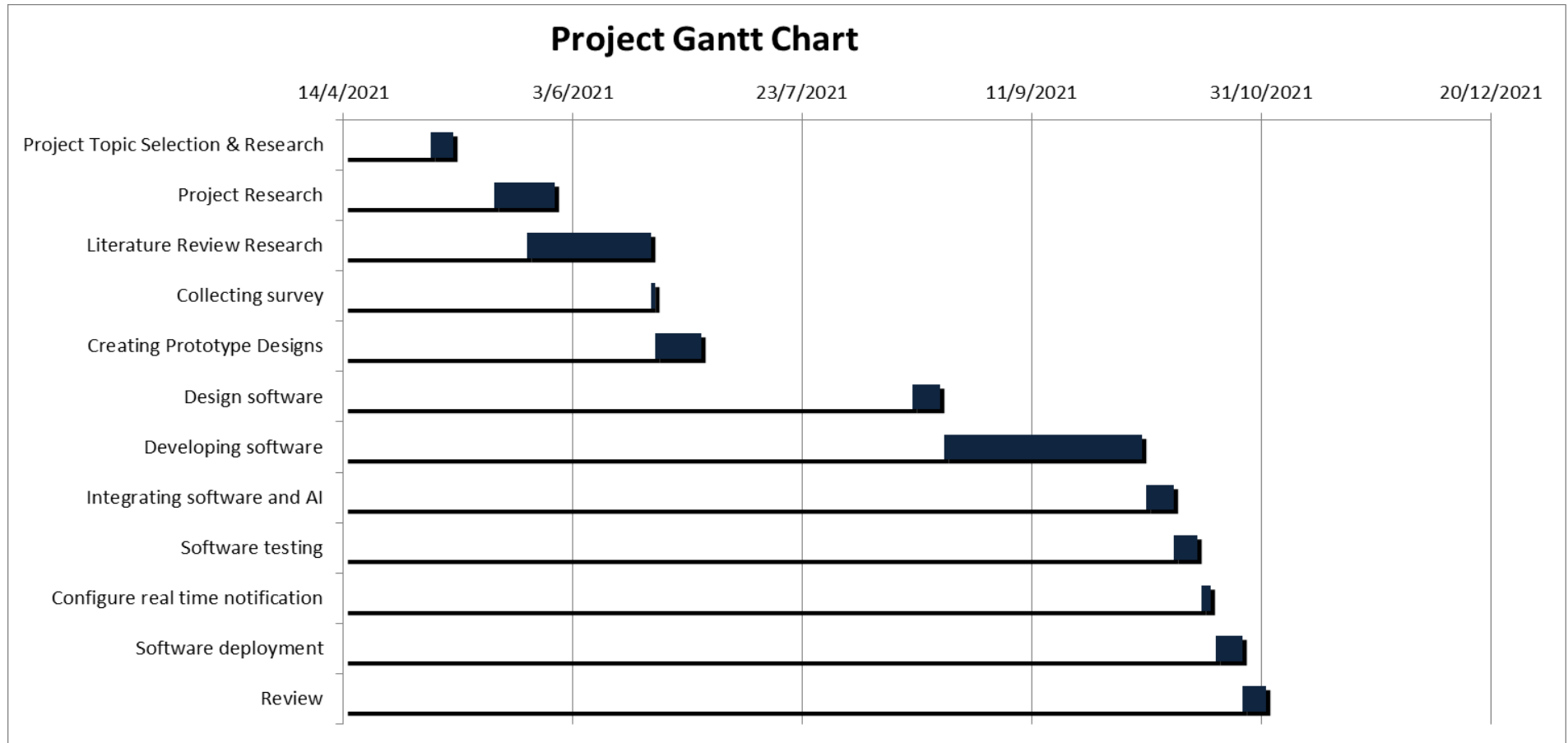
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# **APPENDICES**

## Appendix A- 1: Gantt Chart



## Appendix A- 2: Project Timeline

Task Name	Start	End	Duration (days)
Project Topic Selection & Research	3/5/2021	16/5/2021	5
Project Research	17/5/2021	30/5/2021	13
Literature Review Research	24/5/2021	20/6/2021	27
Writing Product Documentation	20/6/2021	21/6/2021	1
Creating Prototype Designs	21/6/2021	1/7/2021	10
Design software	16/8/2021	22/8/2021	6
Developing Frontend	23/8/2021	5/10/2021	43
Developing Backend	6/10/2021	12/10/2021	6
Software testing	12/10/2021	17/10/2021	5
Configure real time notification	18/10/2021	20/10/2021	2
Software deployment	21/10/2021	27/10/2021	6
Review	27/10/2021	1/11/2021	5



### Appendix A- 3: Survey Setting

Do you know anyone who is visually impaired? (eg: blindness, night blindness)

- Yes
- No
- Maybe

Are you familiar with e-commerce website for visually impaired? \*

- Yes
- No
- Maybe

If your answer is no/maybe, what is/are the reason(s) that lead to this?

- Lack of awareness/ exposure
- Not practicable
- No government intervention
- Minority group/ not related
- Other: \_\_\_\_\_

Based on your opinion, does Covid-19 impact on online shopping? \*

- Yes
- No
- Maybe

Which one do you prefer for shopping? \*

- Physical shopping
- Online shopping

What device do you use for online shopping? \*

- PC
- Smart phone
- Laptop
- Tablet
- Other: \_\_\_\_\_

What is/are reason(s) would make you unlikely to do online shopping? \*

- Cluttering interface
- Bad navigation
- Lengthy description
- User interface incompatibility
- Bad colour scheme
- Other: \_\_\_\_\_

If there is a software that could help visually impaired with online shopping, would you agree it? \*

	1	2	3	4	5	
Disagree	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	Agree

Any recommendation(s)/ comment(s) on this project? \*

Your answer

---

## Appendix A- 4: Extended Questionnaire

Any recommendation(s)/ comment(s) on this project?

56 responses

Make shopping great again !

no

Goodluck kak farah <333

Due to my own lack of awareness, i want to suggest to make a infographic video regarding the e-commerce for visually impaired issues and share on social media and other video sharing platform.

sounds cool!

I'm not familiar about this kind of e-commerce but it is a good project and can help ease the visually impaired persons to shop.

no comment

Any recommendation(s)/ comment(s) on this project?

56 responses

Make sure the platform is easy for visually impaired people to navigate maybe you can use voice assistant or text to speech.

No.

No

Looking forward for your initiative to help the visually impaired! Goodluck!

Ui simpler design not too crowded and focus more to SME to help them during Covid period

A good issue to be working on

none

Idk

Any recommendation(s)/ comment(s) on this project?

56 responses

- none
- Idk
- .
- Good luck sis!
- All the best !
- Notification feature
- add screen reading features
- Thank you for coming up with this project!
- Interview visually impaired person to get more accurate requirements of the project

Any recommendation(s)/ comment(s) on this project?

56 responses

- screen reading with diff languages.
- Nothing
- maybe add like pulse setting , like brailing system but in terms of pulse so when they go to an icon, there will be a pulse indicating that's the icon that they are searching for
- :)
- Use the sound of text to help the visually impaired community
- There is no recommendation. Everything is fine amd straight to the point. Goodjob
- Share more with a lot of people
- As a fellow IT student, My fyp was also related to the visually impaired. I suggest adding audio feedback into the website for easier navigation. If it's on a smartphone, I suggest adding tactile feedback in the form of vibration.

Any recommendation(s)/ comment(s) on this project?

56 responses

No

Not familiar with online shopping

Make a "Dependent" section like MySejahtera. For example the visually impaired person need to key in the data (phone number/email) of her parents or family members in the Dependent section. So once he/she would like to buy or proceed to checkout/pay the things, there will be a two confirmation . One on his phone . The second confirmation will be send to the Dependent's number/email. Because ecommerce is a process involving money so we need to take serious for the security.

Good project idea. This will be beneficial for the visual impaired group

It is a very good project

Everything's good

Good project