AUGMENTED REALITY (AR) MOBILE APPLICATION

PLYMOUTH UNIVERSITY

ABSTRACT
EXPLAINING THE INSIGHT OF THE DEVELOPMENT PROCESS (ZICO) TO THE CLIENT

GROUP LEADER-D. T KIRIELLA
PUSL 2021 COMPUTING GROUP PROJECT

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BATCH 09

2nd YEAR 1st SEMESTER

AUGMENTED REALITY EMBEDDED MOBILE APPLICATION

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PREFACE

Developing "Zico" (Mobile Application) was a brainstorming idea that occurred to our group members while discussing ideas to initiate with the project. We basically searched for problems that we are facing in day to day to life and looked for a solution that would ease the hectic workload that any of us will have to go through to achieve a simple task. At times like this almost everything is being carried out online, where a considerable percentage of all the things are taken place without any interaction among people. Also, with the advancing of technology people would tend to prefer things to get done using technology due to tight schedules in day-to-day life, where some people may not even have time to purchase grocery and specially practicing social distancing is a must these days. So, we decided to develop something that will be useful for the future and enhance the productivity of the industry sector we have chosen to rely on.

Last but not least we would make this an opportunity to thank all the people who have supported to achieve our desired goal including our very own lecturer Mr. Pramudya Thilakaratne who has helped us, guided us enormously till the end.

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CHAPTER 1

SURVEY RESEARCH

A research was conducted to gather information on AR technology awareness level in our region, to identify whether the product will be a successful once released to the market. This survey was done through online, where we created a google form questionnaire to receive responses once shared among the community. Responses were in a low range, but we were able to make decisions relying on the numbers we received. This can be considered as a sample experiment, the outcome would have been different if the number were raised by reasonable margin, nevertheless this survey was useful to identify some of the key areas where we must be concerned.

Figure 1: Questionnaire form

The following are the screenshots of the final results

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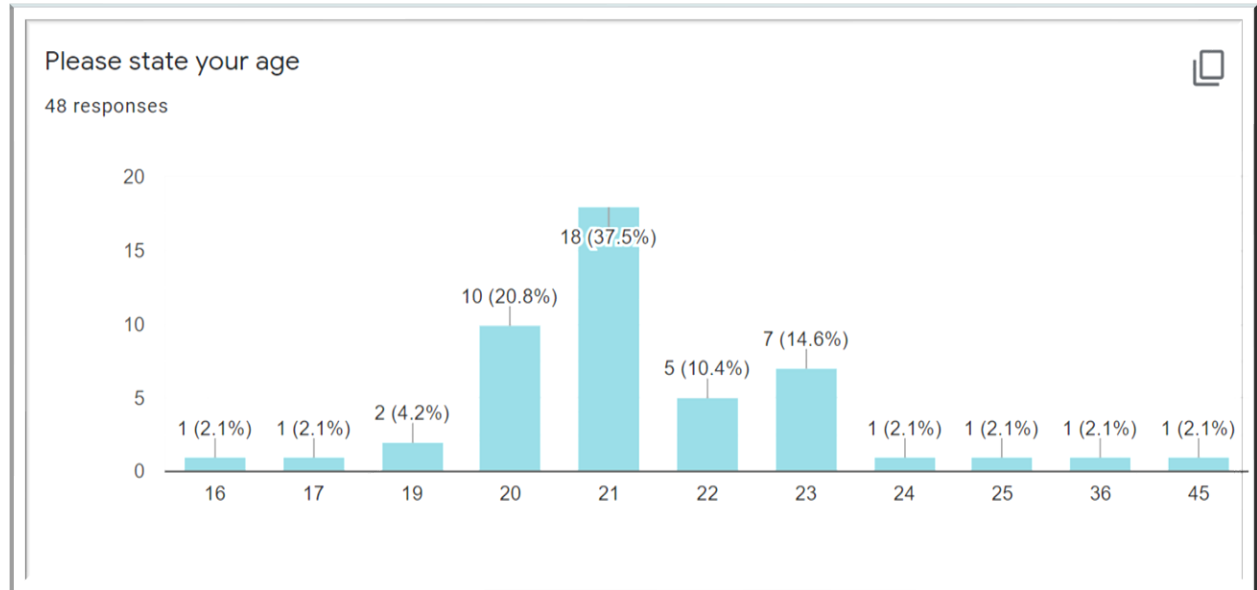
Figure 2: Bar chart representing the ages categories
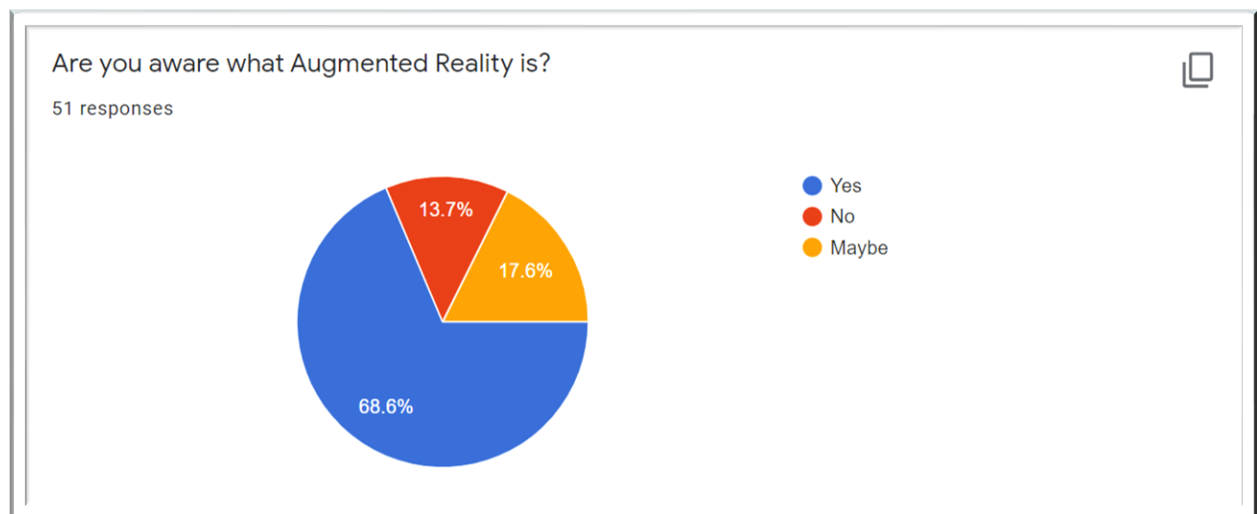
Figure 3: Pie chart representing awareness percentages

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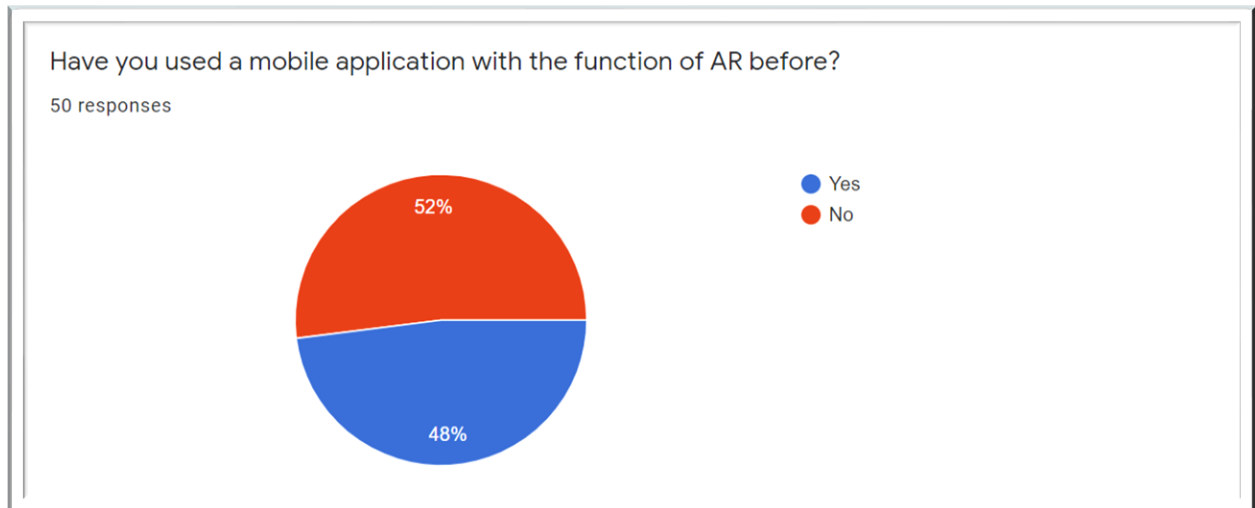
Figure 4: Pie chart representing prior experiences
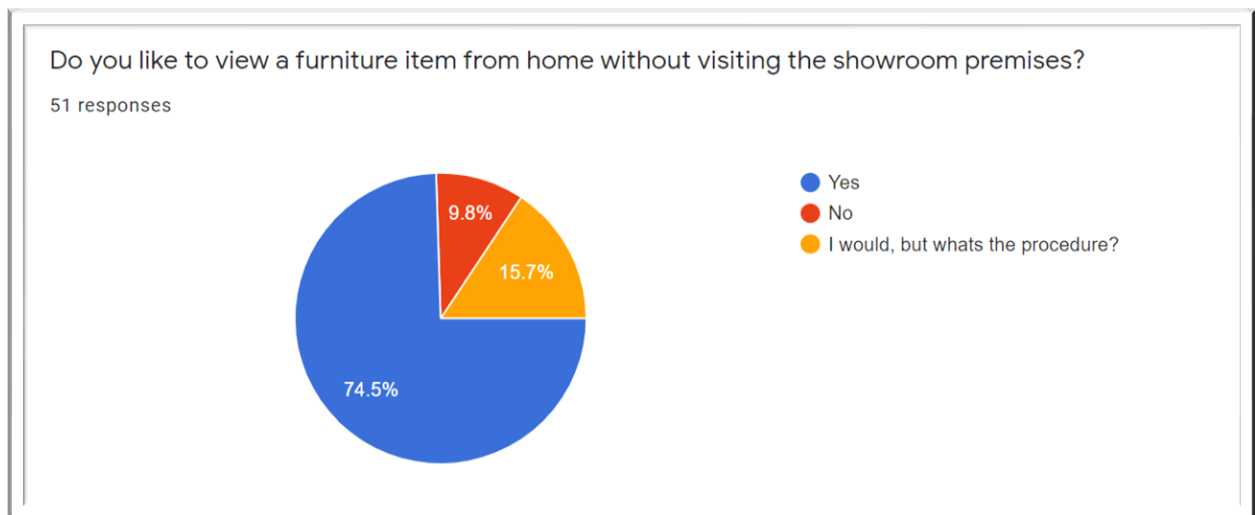
Figure 5: Pie chart representing the likeability

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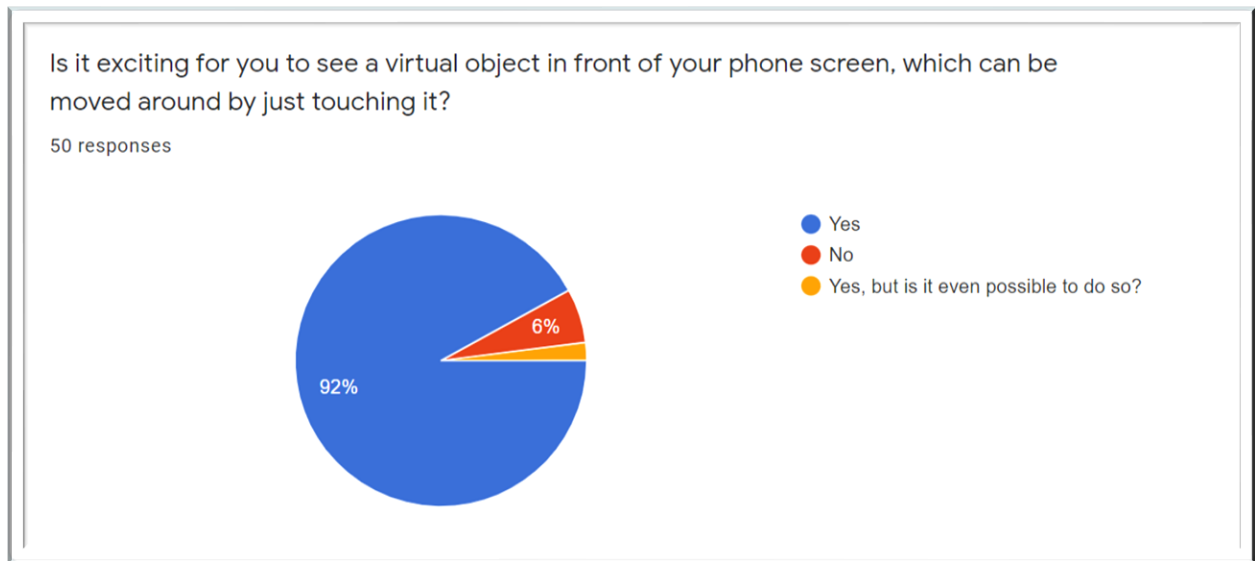
Figure 6: Pie chart representing the willingness to use AR mobile app
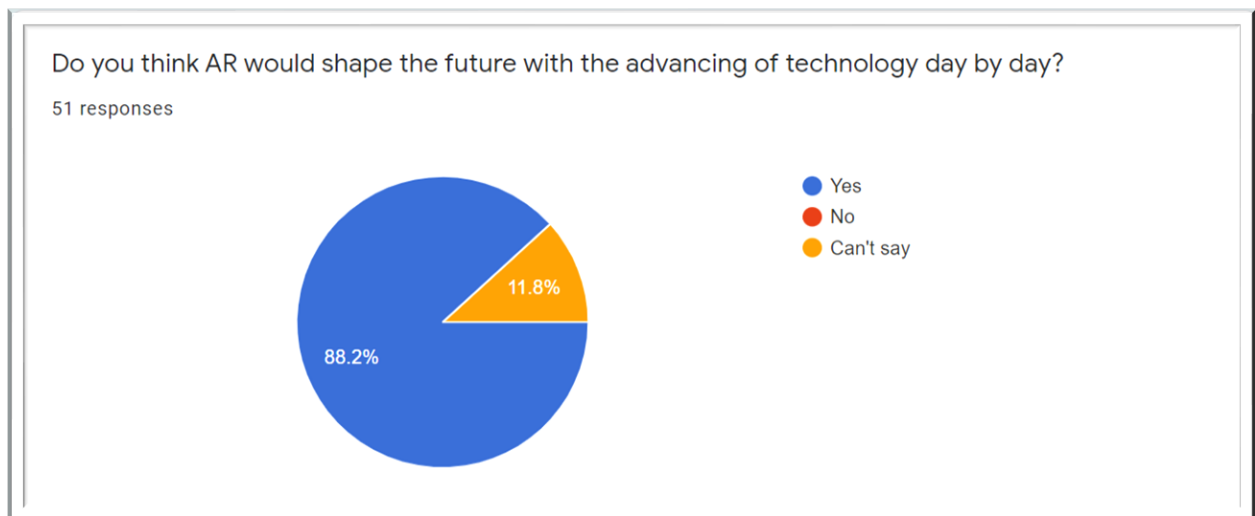
Figure 7: Pie chart representing the opinions

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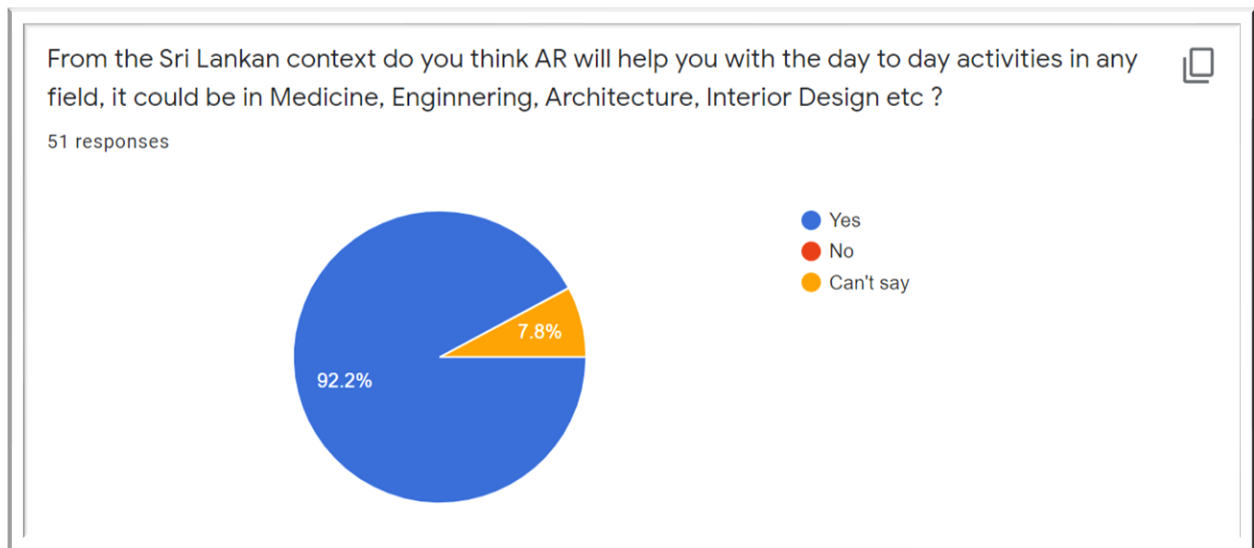
Figure 8: Pie chart representing the future ideology

Figure 9: Suggestions

Figure 10: Bar chart presenting similar applications

OVERVIEW

The online market is increasing exponentially, and consumers are becoming more demanding in their online shopping experience, so companies are looking for innovative ways to gain competitive advantages.(Lin *et al.*, 2006) When it comes to the furniture retail companies even though most outlets consist of websites which showcase their products that are available to be purchased, the most impractical scenario is customer cannot decide whether the product would fit the phy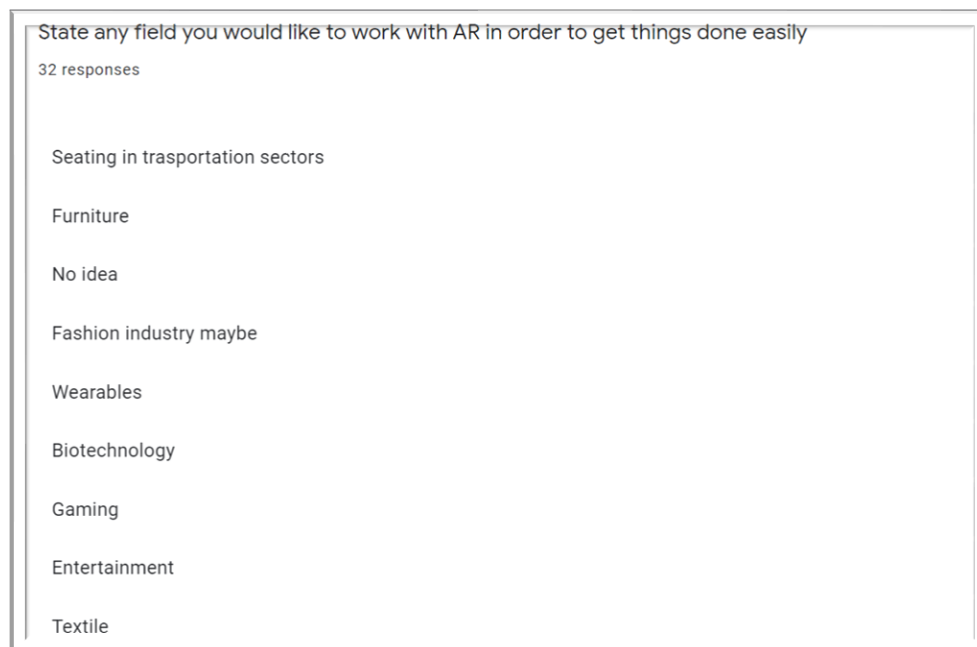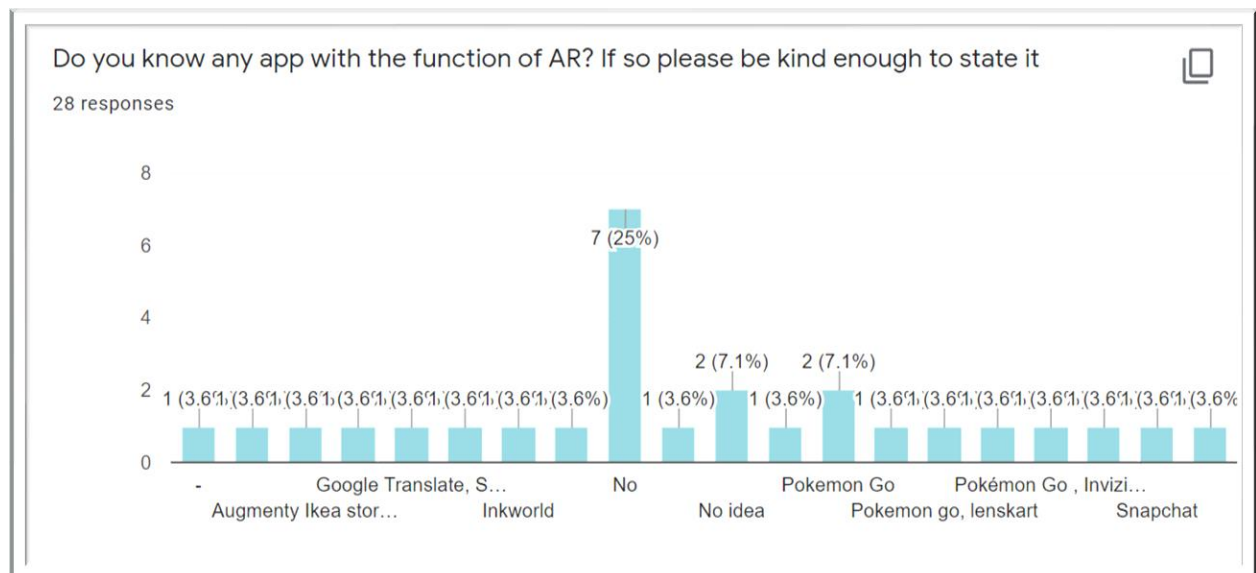sical position available at home even though the physical dimensions are stated in the website information, customer will have to measure the size of the available space manually using a measuring tape or any other device to get the relevant measurements. This way consumers are getting frustrated to make a simple decision within a short period of time*. Augmented Reality (AR) is an interactive technology applied to several fields and has been developed throughout the years, allowing an easy accessibility and proximity between customers and products. Smartphone applications, smart glasses, smart mirrors, and other devices allows a connection between the virtual and the real world contributing for the growth of AR in online retail, especially in fashion and furniture industries.*(Smink *et al.*, 2019) The major drawback of online purchasing is the customer is unable to see the physical nature of the product as it is, due to that customer may have to face many obstacles after purchasing the good either it could be a damaged product or the ordered product might not be up to the expectation level of the customer due to various reasons. This is the time where Augmented Reality technology comes in play, with the help of Augmented Reality, it is possible to give the user an experience closer to the real-world scenario, where it would be useful in day-to-day activities. By developing this application, the customer can decide which product to be bought after viewing the spacious area using the Augmented Reality mode. The camera of the smartphone is used to scan the area of the floor and after selecting the desired product, projection of a virtual object can be seen within the scanned area and the user is able to drag and place the virtual object in a suitable position. The important thing is the dimensions are automatically adjustable according to the scanned area.

The main ideology that led to initiate the developing process of an Augmented Reality embedded mobile application is, the use of Augmented Reality will open doors for international trading as well. *Nowadays, due to the increase of e-commerce, retailers face problems such as online shopping card abandonment, high returns and webrooming, which is searching for a product online and then purchasing it in a physical store.*(Smink *et al.*, 2019) and involvement of Augmented Reality will work efficiently between webrooming, *enabling consumers to have direct product experience and be able to virtually try a specific product in real time providing enough product information.* (Poushneh and Vasquez-Parraga, 2017) Engaging in this process will be very convenient for the customer as well as for the retail shop and gradually shifting from the ordinary system will be a win-win situation for both parties.

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LIMITATIONS/POSSIBILITIES

- If variety of goods are not displayed for purchasing under one roof people may tend deviate from using this application
- Electronic devices cannot be displayed since it would be impractical to check the working nature of the product using Augmented Reality technology
- This application will be mostly suitable for timber products (Tables, Chairs, Armchairs, Tv stand, Sofas, Dressing Tables, Pantry Cupboard, Wardrobes etc.)
- Client can decide whether to make this application a source of income or make it available freely to the public
- Client can also decide which apps stores can be reserved for availability of this application based on the type of Operating System chosen to initiate the development process
- Client has the full freedom of choosing the regions to make the products available to be purchased either locally or internationally based on the delivery services
- This application will only be supported in smartphones (Camera, GPS, Accelerometer and Compass-magnetometer) are essential

PROJECT INFORMATION

To develop this application, firstly a similar type of product needs to be investigated to identify the key areas to be concerned in the development process.

Let's go through some research articles to identify the technologies required for the development process.

AR methodology is a combination between virtual objects and real images. (Kerthyayana Manuaba, 2021) *there are three methodologies that are normally being used for virtual objects overlay with real scene environment. These methodologies are:*

• Image projection: This method works by projecting the virtual objects into a surface of real-world object.

• Optical combination: This method is implemented by projecting the virtual objects into user visual field/devices and being used together while the user observes the real-world objects.

• Video mixing: This method is a combination between camera and digital information through a rework computer to produce a scene that can be used by users indirectly to observe the real-world objects. For the purpose of this study in developing the mobile base AR application prototype, the AR methodology being used is focused on video mixing methodology.

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In applying remote collaboration scenario as the main application feature, the virtual object needs to be created inside the application. This feature is developed by using Unity Engine as the integrated environment development (IDE) with ARCore software development Kit (SDK) as the main core library package(Dini and Mura, 2015)

From the above statement it is clear the following applications are required for the process

- o   Unity Engine

- o   Android Studio

Any application compatible with iOS or android can be developed using the Android Studio software and in order to create the virtual objects the Unity Engine is used.

The primary objective is first to develop the mobile application with implementing the necessary functionalities and integrate the AR technology along with it. Database connections are to be considered and back of the mind another technology will be required for the process as we are being concerned about it.

- o   Firebase

When considering about the programming languages requirement, Android Studio is compatible with both

- o   Java
- o   Kotlin

Based on the functionalities both the languages can be useful for the coding

OBJECTIVES

Customer point of view

- To let users, access the products digitally from any part of the world
- Hoping to develop based on client requirements (personalized)
- To reduce inconvenience when visiting to a store physically, especially during these day of pandemic (pre-determined selections can be made by using this applications)
- A clear understanding about the product dimensions and how it will suit into the background can be comprehended

Business point of view

- Ability to keep a track of the growth of the business and enhance publicity among similar competitive other businesses
- Usage of this application will tend to reduce the showroom staff, directly this will be an advantage for the business, since wage cost reduction takes place

TARGET USERS

When analysing the experience with a touchpoint in a larger context, a measurement of the user experience is necessary(Hassenzahl and Tractinsky, 2006)

Target Users will be

- Local customers between the age category of (20-35) – mostly since married couples tend to move out, so new furniture is required
- Apartment holders- stakeholders tend to buy in bulk
- Showroom staff members- to upload the newly arrived items into the system
- International trading partners- to make a collaboration with the local traders

APPLICATION FEATURES AND DESCRIPTION

Opening the application

> ➢ Zico icon will be displayed

Inside the application

> ➢ *Login (Admins and Customers)*

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<u>Sign up</u> (Options)

o   User can Sign up with the Personal Email address
o   Password relevant to the Email must be entered
o   Password needs to be confirmed
o   Also, user can sign up with the social media accounts (Facebook, Google or Twitter) based on the choice
o   Login button is allocated

❖ **Both fields must be filled with the relevant details in order again access into the system if the user decides to login with the Personal Email address**
❖ **If a user decides to login via a social media, relevant details will be retrieved from the databases to give access**
❖ **Login button will be highlighted, when all fields are accurately filled with the necessary data types are matching to the specific fields**
❖ **A pop-up box will surface with a message saying "Please Enter the correct Email and Password to gain access" if any field is left off or inaccurately filled(The required field will be highlighted)**

<u>Sign in</u> (Options)

o   User can sign in with the Personal Email address based on the sign-up procedure carried out
o   Password needs to be entered, the one relevant to the Email
o   "Remember me" option is included if any user is reluctant to enter the email and the password every time a login takes place, it would automatically generate the previous entered details to the relevant field
o   "Forgot Password" option is included in case the user forgets the correct password, a four-digit number will be sent to the specific email, so that user can enter the digits to the field generated in the forgot password tab
o   Login button is allocated

➢ *Catalog*

Admin

Featured

o   There will be a "ADD" button to add items into the application
o   A different tab will be shown to enter the details of a certain product (Product Details)
o   A picture box will be allocated to upload the pictures of the product (Max 5)
o   A textbox to enter the name of the product

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- A textbox to enter the price of the product
- A textbox to enter the color name and a picture circle to upload the color gradient
- A textbox to enter the product description
- Product attribute textboxes will be allocated (Item no, Width in mm, Height in mm, Depth in mm, weight in kg, Volume in cubic meters, Warranty, Material type, Available sizes)
- Textbox to enter discount price when necessary
- A button to give access, which lead to enabling of AR

❖ **Once after all the details are entered there will be a Saving button to confirm the details and post it online**
❖ **There also will be an edit button in case a rectification needs to be done**
❖ **There will be another option to check the uploaded items to the system**
❖ **Pressing the "Back" button will direct back to the Featured page and the newly added item will be seen by a preview**
❖ **In this tab data isn't categorized based on the product type, the items will be displayed in the Home Page as a one unit**

By Room

- Subsections (Bedroom, Living Room, Kitchen, Kids, Office, Entry way) will be present in order to enter details specifically
- Under each subsection the above-mentioned fields in the "Featured" section will also be allocated

❖ <u>**Bedrooms consist of**</u>**: Collection slide show, Wardrobes, Dressers, Mirrors, Beds, Bedside Tables, Dressing Tables, Chairs, Benches, Wall Shelves**
❖ <u>**Living Room consist of**</u>**: Wardrobes, Sofas, Dressers, Armchairs, Dining Tables, Mirrors, Display Cabinets, Tv Stands, Consoles, Buffets, Bars, shelves, Bookcases, Coffee Tables, Chairs, Benches, Wall Shelves**
❖ <u>**Kids sections consist of**</u>**: Wardrobes, Dressers, Mirrors, Beds, Bedside Tables, Bookcases, Desks, Dressing Tables, Chairs, Benches, Wall Shelves**
❖ <u>**Kitchen consist of**</u>**: Dining Tables, Buffets, Bars, Chairs**
❖ <u>**Entry way consist of**</u>**: Wardrobes, Dressers, Mirrors, Benches,**
❖ <u>**Home Office consist of**</u>**: Wardrobes, Dressers, Armchairs, Tv Stand, Consoles, Shelves, Bookcases, Desks, Chairs, Wall Shelves**

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By Style

- o There will be 3 types of particular architecture patterns that will mentioned (Italian, Modern, Wooden Deluxe)
- o Under each category there will a tab to enter details of the products specifically under the relevant category

- ❖ **Provence consist of: Blanch, Fleuron, Brianson**
- ❖ **Italian consists of: Trio, Luisa, Angeles Gold**
- ❖ **Lofts consist of: Cube Design, Dillinger, Hedmark**

Customer

Featured

- o Customer can view the newly included item in the Home Page
- o The image of the product will be displayed along with the price and a button to activate in AR
- o The image is clickable and once the customer clicks on it will direct to another tab displaying all the details
- o Customer can view the required information (Price, Item no, Width in mm, Height in mm, Depth in mm, Weight in kg, Volume in cubic meters, Warranty, Material type, Available sizes, Color)

By Room

- o If the customer wants to view by any category in particular by clicking on By Style, a variety of categories can be seen (Bedroom, Living Room, Kitchen, Kids, Office, Entry way)
- o Similarly, as stated in the Featured, all the options are valid for this section as well where all the information can be viewed as well as the product can be viewed in AR

By Style

- o The customer has the opportunity to select any architecture pattern out of the 3 types (Italian, Modern, Wooden Deluxe)
- o In there all the products available under each category will be displayed

Profile

o The Name and the Email address will be displayed in the tab
o Edit option to change the Name, Email and an option to enter the Contact number and the shipping address will be allocated
o A Save changing and a Cancel button will be allocated

Location

o The Warehouse or the Showroom can be located using the Google maps

➢ *AR View (Admins and Customers)*

o Firstly, the application will ask for the permission of the camera from the settings
o The permission must be enabled to proceed further, upon entering into the tab the camera will be active and there will be 3 buttons at the bottom
o Left side button will be the button to enable the scanning of the floor area
o The button in the middle will be the option to save the video in the library
o Also, there will be a delete option in case the customer wants to take a new footage
o The right-side button will direct to the profile information

➢ *Contact*

o A telephone number will be displayed along with the Email address
o To get more information about AR a YouTube video will be played once the play button is clicked

➢ *Check out*

o The delivery address, reference no:, order no:, Name of the receiver, contact number will be displayed
o Option to select the delivery method will allocated (Home delivery option or pick up at Store option- These will be radio button lists)
o All the entered details will be sent to the Email address of the company showroom

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The following images will illustrate how the final output will look like, once the application is deployed, similarities can be seen.
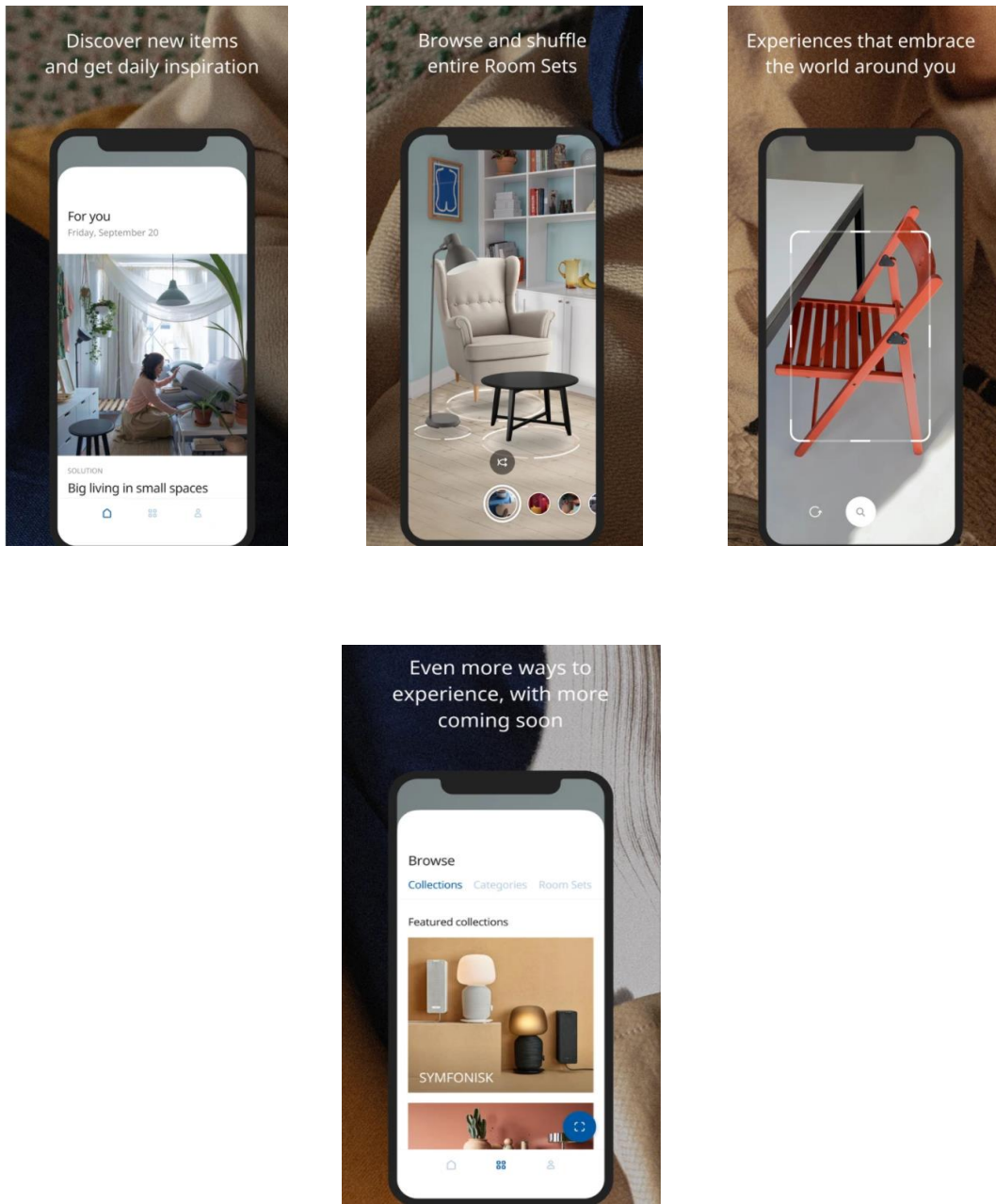
Figure 11: The UI inside the IKEA application (IKEA Place, 2021)

TIME FRAME

Table 1: Project Duration

PROJECT GUIDE							
	OCT	**NOV**	**DEC**	**JAN**	**FEB**	**MAR**	**APR**
PLANNING	Start 18th	End 11th					
DESIGN		11th -30th					
PROGRAMMING							
INTEGRATING							
TESTING							
DEPLOYMENT							
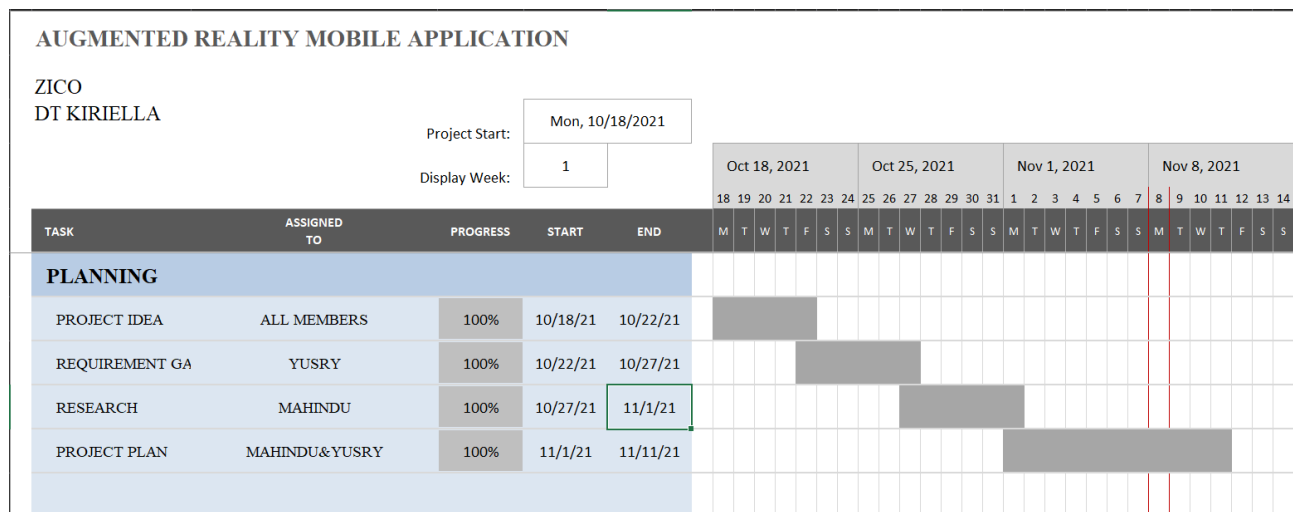
Figure 12: Information about the Pre-determined Plan (Screenshots from the Gantt chart)

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TASK	ASSIGNED TO	PROGRESS	START	END
DESIGN				
LOGINS&LOGO+B	DEWMITH,NIPUNI,MATHEESHA	100%	11/1/21	11/6/21
DASHBOARD UI/U	DEWMITH&NIPUNI	100%	11/6/21	11/11/21
INCLUDING ITEMS	DEWMITH&NIPUNI	0%	11/11/21	11/15/21
WIREFRAMING	DEWMITH&NIPUNI	0%	11/15/21	11/21/21
CONTACT	DEWMITH&NIPUNI	0%	11/21/21	11/30/21

Figure 13: Information about the Pre-determined Plan (Screenshots from the Gantt chart)

TASK	ASSIGNED TO	PROGRESS	START	END
PROGRAMMING				
LOGINS	NIPUNI&YENUKA	0%	12/1/21	12/10/21
STRUCTURE	DEWMITH&MAHINDU	0%	12/10/21	12/18/21
IMAGE INSERTION	YUSRY&MATHEESHA	0%	12/18/21	12/27/21
AR DEVELOPMENT	YUSRY&DEWMITH	0%	1/3/22	1/30/22

Figure 14: Information about the Pre-determined Plan (Screenshots from the Gantt chart)

TASK	ASSIGNED TO	PROGRESS	START	END
INTEGRATING,TESTING&DEPLOYMENT				
AR 3D MODELLING	YUSRY&DEWMITH	0%	2/2/22	2/28/22
ALLOCATING CREATE	NIPUNI&MATHEESHA	0%	2/29/22	3/10/22
RELEASING TO A MOI	DEWMITH&YUSRY	0%	3/12/22	3/13/22
RECTIFICATION PERI(	DEWMITH&YUSRY	0%	3/13/22	3/30/22
RELASE TIME	DEWMITH&YUSRY	0%	4/1/22	4/15/22

Figure 15:Information about the Pre-determined Plan (Screenshots from the Gantt chart)

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RISK MANAGEMENT

1. **In order avoid misconceptions, misinterpretations or any predicament we have divided the work matrix accordingly among the six-member group , where we will be accountable for the part which we have undertaken.**

Table 2:Work Breakdown Structure

NAME	JOB ROLE	PLYMOUTH ID
D T KIRIELLA	**PROJECT AND GROUP LEADER**	10748147
S M A DHARMASENA	**PLANNING LEADER**	10749195
M P V BANDARANAYAKE	**TECHNICAL LEADER**	10749841
M Y M YUSRY	**PROGRAMMING LEADER**	10749082
P H N KAVINDYA	**QUALITY LEADER**	10748162
E A Y I EDIRISINGHE	**TESTING AND MAINTENANCE LEADER**	10749143

2. **To keep a track on the working days and to increase efficiency and also to have a better understanding on the current level of the project, use of a link planning software is very important.**

For the purpose, project management software tool Trello will be used

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3. To prevent the loss of the completed work, use of a version control software will be necessary. All the copies of the developed sections will be uploaded to the software in order to save and to allow collaboration among the members.

4. Any change of the following will be conveyed immediately through a document
   - Feature change
   - Technology change
   - Time Frame change

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