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## Preface

Despite the public fascination with augmented reality (AR) and virtual reality (VR), few within the broader audience understand how these systems actually function. AR and VR are seen as cool technologies for better gaming and entertainment experiences. In the past people usually buy interior components by physically going to the shop , and later on some e-commerce site provide a specification based catalogue upon any product . But it was not a reliable way to choose suitable products according to people' home interior . In this way people might get the right fit having the detailed dimensions in the site but when that is delivered the composition with interior doesn't always meet customer satisfaction .But for e-commerce purpose specially interior specs , AR is a very effective way to get a proper visualization and idea how it will appear in real. And in extension the VR facility will let a user design his own home. V(A)RSHOPIX is one of the reliable solution that combines both Augmented Reality and Virtual Reality and help user get a proper visual based product detail that solves the previous problem significantly .

## 1. Introduction

V(A)RSHOPIX is an online shopping app that lets user to place true-to-scale 3D furniture in their home using the lens of user's smartphone camera. With the help of augmented reality that can create an abstract image on a particular spot as in a 3D perception. Basically augmented reality is a technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

V(A)RSHOPIX has another segment for Virtual Reality devices. Virtual Reality is the computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors. It enables user to choose a model room for perspective and design the room on their chosen 3D furniture . User can then take a tour to the room designed by them and experience a whole new online shopping experience .

## 2. Glossary of Terms of the V(A)RSHOPIX project

**AR:**
A technology that superimposes a computer-generated image on a user's view of the real world, thus providing a composite view.

**VR:**
The computer-generated simulation of a three-dimensional image or environment that can be interacted with in a seemingly real or physical way by a person using special electronic equipment, such as a helmet with a screen inside or gloves fitted with sensors.

**Vuforia:**
The Vuforia Web Services (VWS) API is a RESTful web API that enables developers to use their own Content Management System (CMS) with Vuforia's Cloud Recognition service and VuMark Generation API.

**API:**
A set of functions and procedures allowing the creation of applications that access the features or data of an operating system, application, or other service.

**Cloud Storage:**
Cloud storage is a cloud computing model in which data is stored on remote servers accessed from the internet, or "cloud." It is maintained, operated and managed by a cloud storage service provider on a storage servers that are built on virtualization techniques.

**Firebase:**
Firebase is a Backend-as-a-Service — BAAS — that started as a YC11 startup and grew up into a next-generation app-development platform on Google Cloud Platform.

**ARCORE:**
ARCORE (Google ARCORE) is a development platform for building augmented reality apps (AR apps) for Android mobile devices.

**LumenCore:**
LumenCore is a touchable sensor API used for communicating Augmented Reality models and structures.

**GEARVR:**
It's a collection of premium services through mobile applications, and hardware that supports the creation, discovery, and viewing of immersive 360° video content.

**Image Targeting:**
Image Targets represent images that Vuforia Engine can detect and track. ... The Engine detects and tracks the features that are naturally found in the image itself by comparing these natural features against a known target resource database.

**Ground Plane Detection:**
Vuforia's augmented reality SDK for Unity 3D uses ARCORE and ARKit to detect ground planes in AR.

**SDK(Software Development Kit):**
SDK is the acronym for "Software Development Kit". The SDK brings together a group of tools that enable the programming of mobile applications.

## 3. Requirements Discovery

To collect the user requirements we have conducted interviews with the stakeholders and also with the users. After interaction with the stakeholders we have discovered their requirements. For that we have used Google form to interact directly to the users to know their requirements. We also talked with some of the users face to face. Then we have consulted with our team members for identify and discover requirements.

## 4. User Requirements

Through requirements discovery process we have found the following user requirements –

**4.1.** App and website should be user friendly.

**4.2**. 3D models should be moved in real world which can be used by the smartphone camera and models should be same and exact size.

**4.3**. It will be able to create a room virtually which anyone can design and manage their buying products.

**4.4**. More security should be implemented in app and website.

**4.5**. Almost all types of interior design products can cover as much as possible.

## 5. System Architecture

Layered architecture approach is followed in V(A)RSHOPIX .This is used to model the interfacing of subsystems. This architecture organizes the system into a set of layers, each of which provides a set of services. On this architecture lowest level layers represent core services. There are five layers for the V(A)RSHOPIX. Application interface on the top most layer. Then Login system administrator, system controller etc on the next layer. Then Distributed search, product retrieval, accounting and transaction, right manager on the next layer. Operating system, databases On the lowest layer. So these are the layers for the V(A)RSHOPIX system. The layered architecture is showing in Fig-1 which is given below:

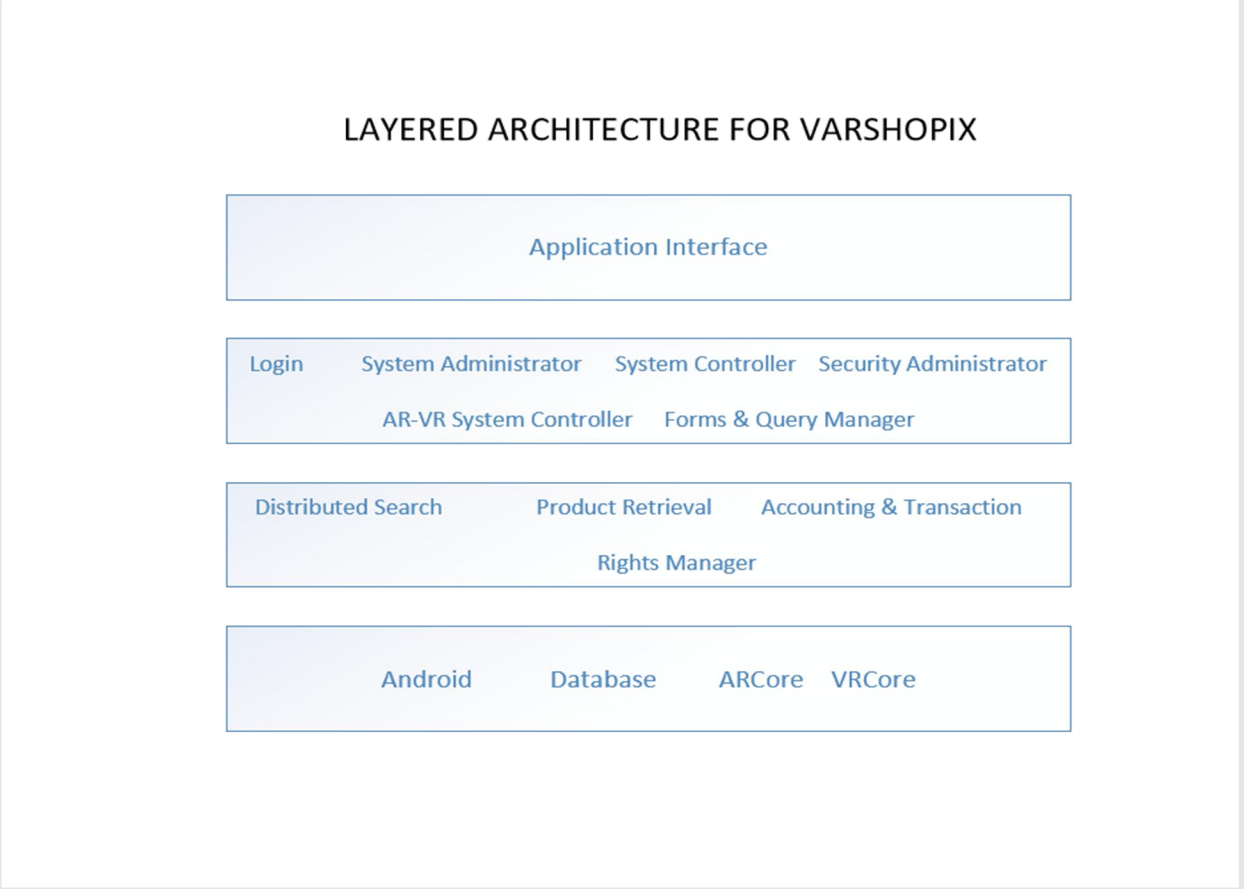


Fig-1: Layered Architecture of V(A)RSHOPIX.

Layer-1:Application interface through which end user will interact with the system.

Layer**-2:** The System Administrator can add or modify products, Manufacturer can also add products which can be modified through system admin for selling their products through our system, transaction manager ensures the proper and secure payment through third party API, database manager design or modify the system database.

Layer**-3:** Distributed Search technique can be applicable using ML-Agents. Rating product system stores rating data through their particular product in the system. Account and Transaction will be verified by secure Mailing and SSL system or OTP system. Offers/Discount will be verified through user cookies.

Layer-4: Shows the database management which will be firebase and also ARCore VRCore is the development platform for building augmented reality and virtual reality app.

## 6. System Requirements specification

**6.**1 User friendly marketplace

**6.1.1**. Well-developed frontend and user Interface for website and app should be designed.

**6.1.2.** Admin shall get the privilege of accessing and controlling database and employee information.

**6.1.3.** Customer shall be able to choose and compare products and purchase according to their choice.

**6.2** Augmentation Reality

**6.2.1.** 3D modeling of products should be done by using some 3D modeling software.

**6.2.2.** Augmentation Reality should be done by application programmable interface (API).

**6.3** Virtual Reality

**6.3.1**. System shall provide the option to choose from various 3D room models.

**6.3.2.** User shall be able to set up the room with various 3D furniture models and place on that virtual room.

**6.4** Security Requirements:

**6.4.1.** System will use secured database.

**6.4.2.** Normal users can just read information but they cannot edit or modify

except their personal and some other information.

**6.4.3.** System will have different types of users and every user has access constraints.

**6.5** All types of interior design products availability

**6.5.1.** Products list should be stored in a server and database

**6.5.2.** All vendors must take permission form the administrator for selling their products under this system.

**6.5.3.** All vendor shall able to do advertising their own products from the marketplace.

Functional and Non-Functional requirements classification: -

| Serial no. | User Requirements | Types of Requirement | |
|---|---|---|---|
| | | Functional | Non-Functional |
| 01. | App and website should be user friendly | × | ✓ |
| 02. | 3D models should be moved in real world which can be used by the smartphone camera and models should be same and exact size. | ✓ | × |
| 03. | It will be able to create a room virtually which anyone can design and manage their buying products. | ✓ | × |
| 04. | More security should be implemented in app and website. | × | ✓ |
| 05. | Almost all types of interior design products can cover as much as possible | × | ✓ |

Table-1:Fuctional and Non-functional requirements of the system

## 7. System Model

The process of developing abstract models of our system, with each model presenting a different view or perspective of that system. The System model for the project consists of four different types of models. Those are given below:

i. Context Diagram
ii. Use case Diagram
iii. Sequence Diagram
iv. Activity Diagram

### 7.1 Context Diagram

Each user payment order will send a request to the bank and the bank will get the user information to complete the payment process and a transaction information will be provided to the user . For VR user's real time motion data will be processed by the system and the users VR screen will be changing accordingly In AR the camera will detect the spaces for true-to-scale fitting that will require real time camera data and the 3D image will be seen.

A Context Diagram for our system is showing below:

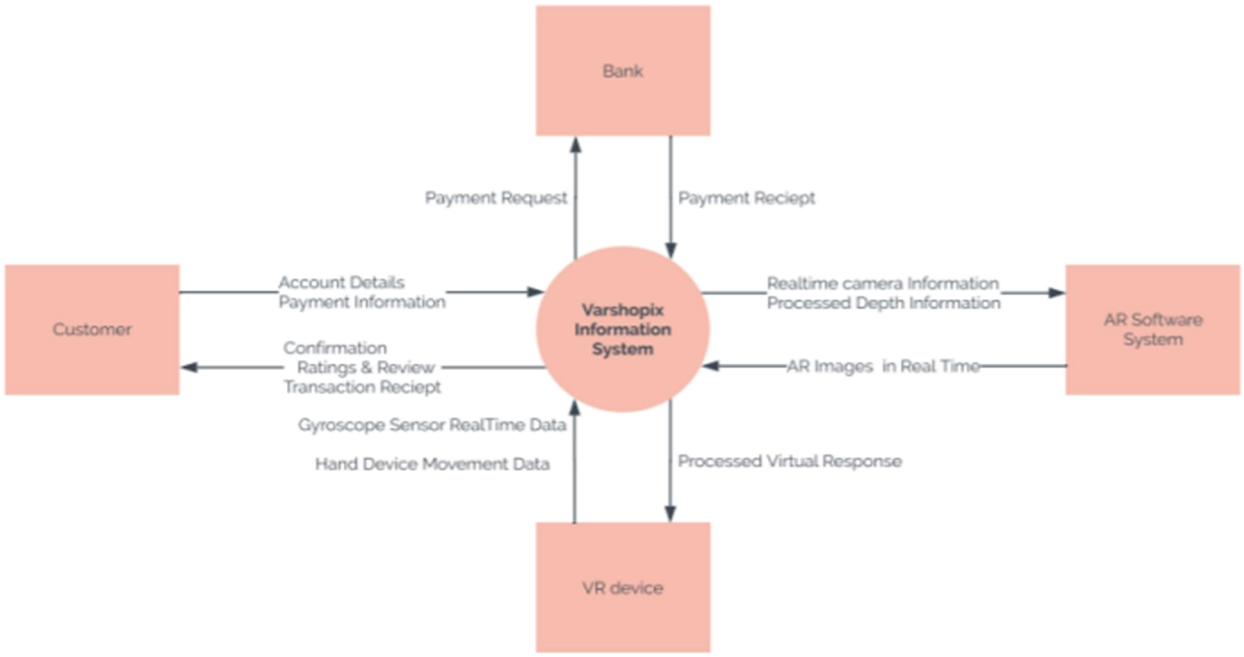


Fig-2: Context diagram of V(A)RSHOPIX system.

### 7.2 Use Case Diagram

There are two scenarios for the use case diagram of our system. Those are shown below :

## AR Scenario:

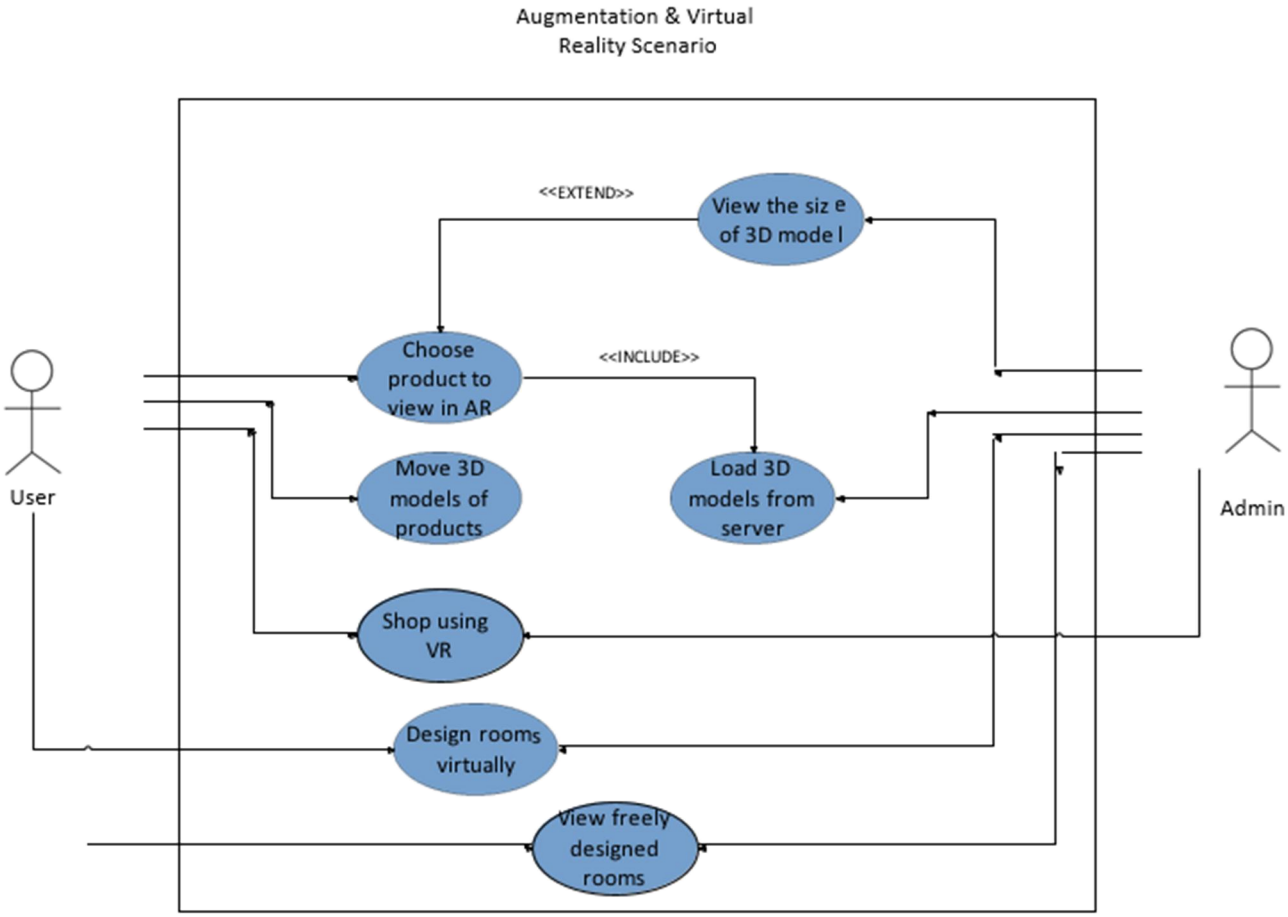


Fig-3: Use case scenario –AR scenario

## Tabular Description of the 'Augmentation & Virtual Reality Scenario' use-case

| **Use Case:** Augmented & Virtual Reality Scenario | |
|---|---|
| **Primary Actors:** | User, Admin |
| **Secondary Actors:** | - |
| **Pre-condition:** | Customer need to have VR headset and 360 degree camera for the virtual design of the room |
| **Post-condition:** | - |
| **Main flow:** | i. A user can choose products to view in AR where they can move the 3D virtual model of the products.<br>ii. They can use virtual reality to do shopping and to design interior room models using products which they want to buy.<br>iii. Those 3D virtual models load on the server which are being controlled by Admin. After completion of designing room, user can view the virtual designed room freely in Virtual Reality. |

## Shopping Scenario

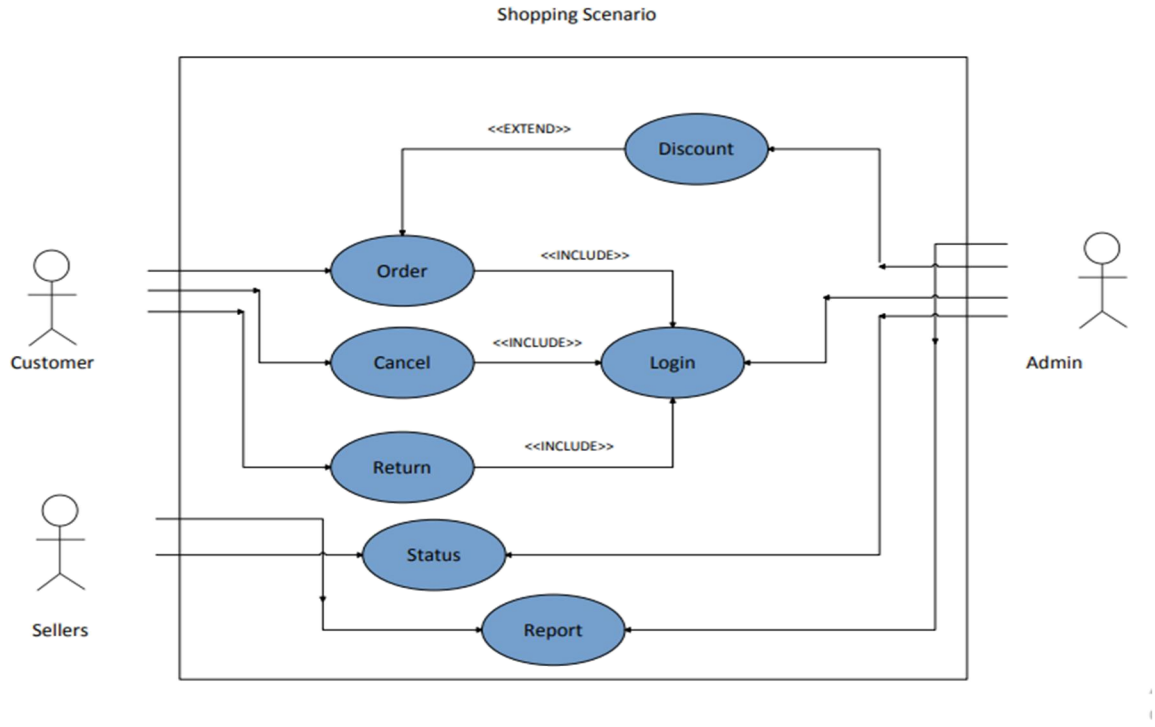


Fig-4: Use case scenario- shopping scenario

### Tabular Description of the 'Shopping Scenario' Use-Case

| **Use Case:** Shopping Scenario | |
|---|---|
| **Primary Actor:** | Customers ,Sellers, Admin |
| **Secondary Actors:** | - |
| **Pre-condition:** | Customer must have an user account to access in the system for shopping |
| **Post-condition:** | - |
| **Main flow:** | I. A user can order products, return and cancel products from the shopping management system which requires login system.<br>II. From the login system, user can record data of users whether they want to buy, return or cancel products.<br>III. Admin can give discount to a particular user or all users.<br>IV. Sellers can get status, report of their products which are intend to sell. |

## 7.3 Sequence Diagram

Here depends on the use case scenario there also have two sequence scenarios. Those are shown below:

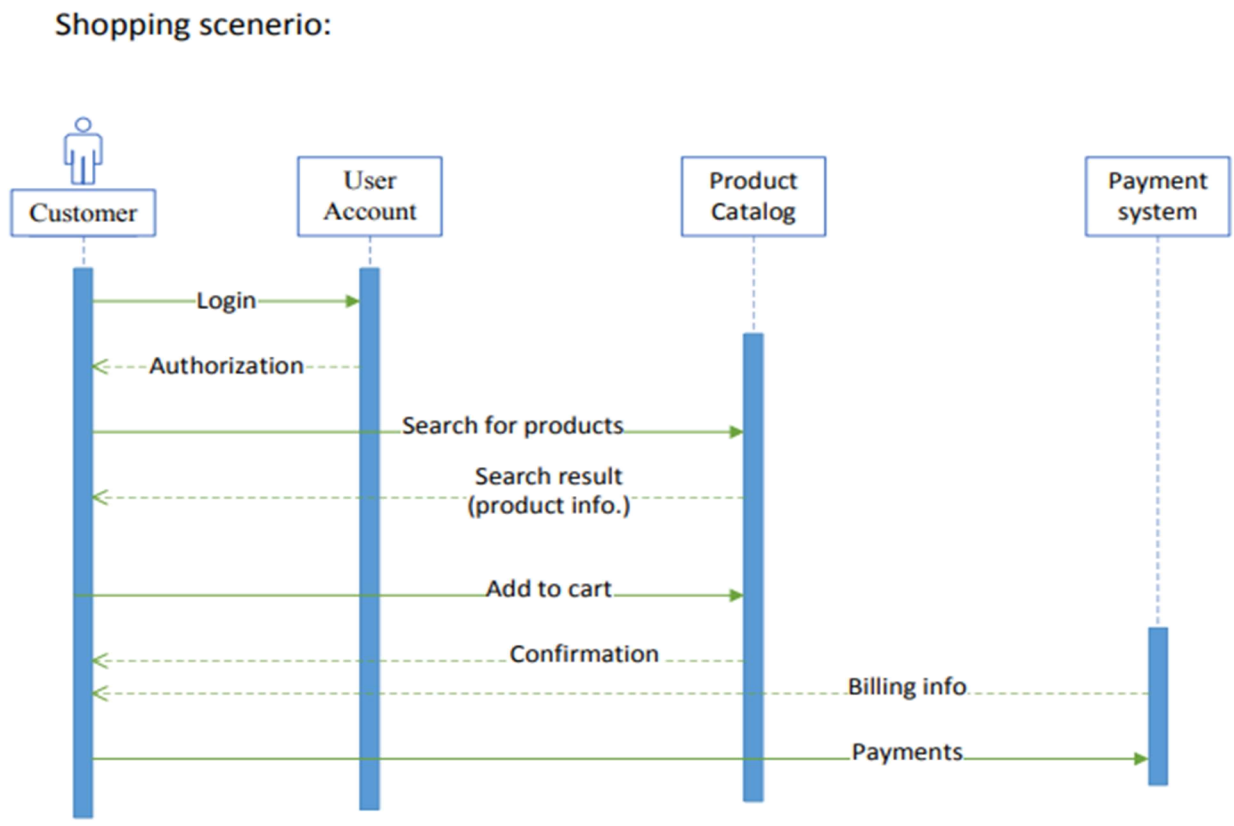


Fig-5: Sequence Diagram for shopping scenario.

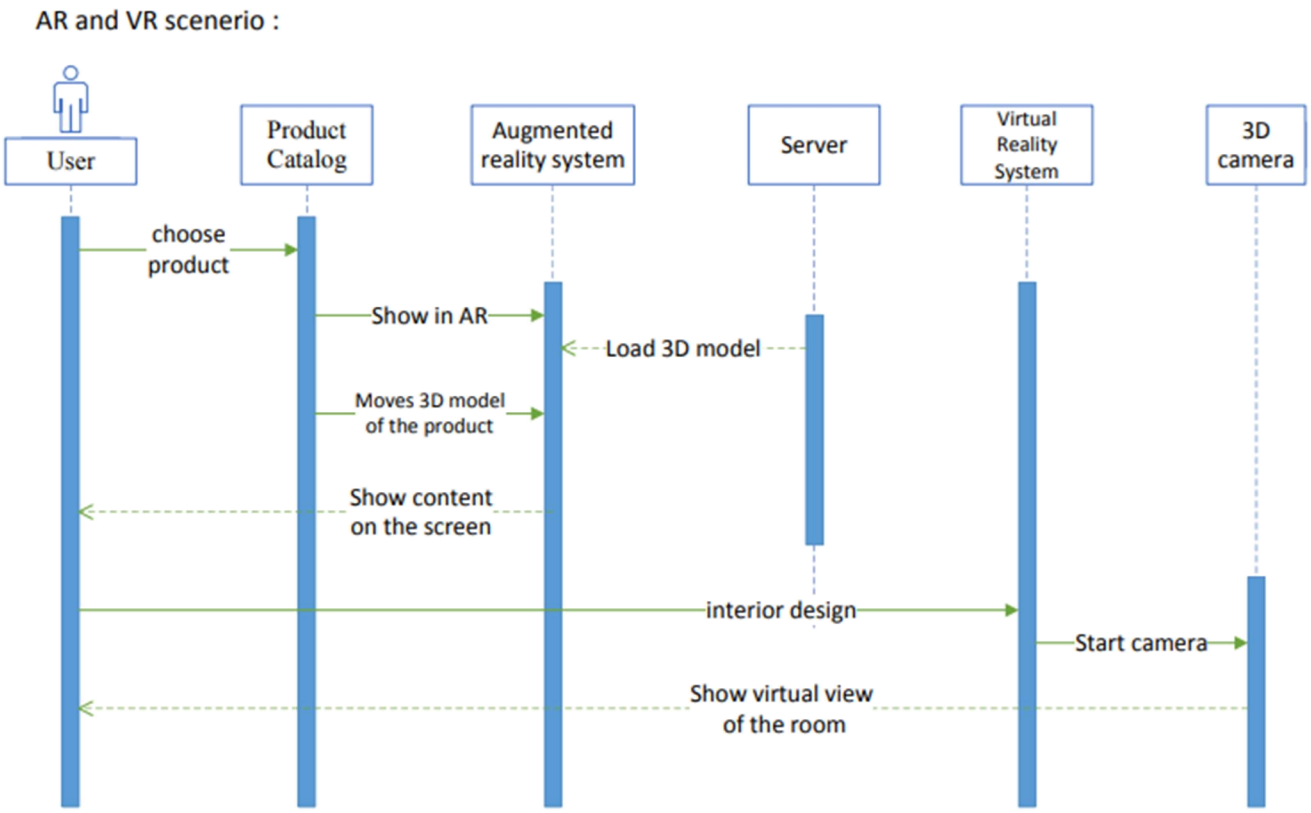


Fig-6: Sequence diagram for AR and VR scenario.

### 7.4 Activity Diagram

Activity diagram for the admin side and user side is showing below:

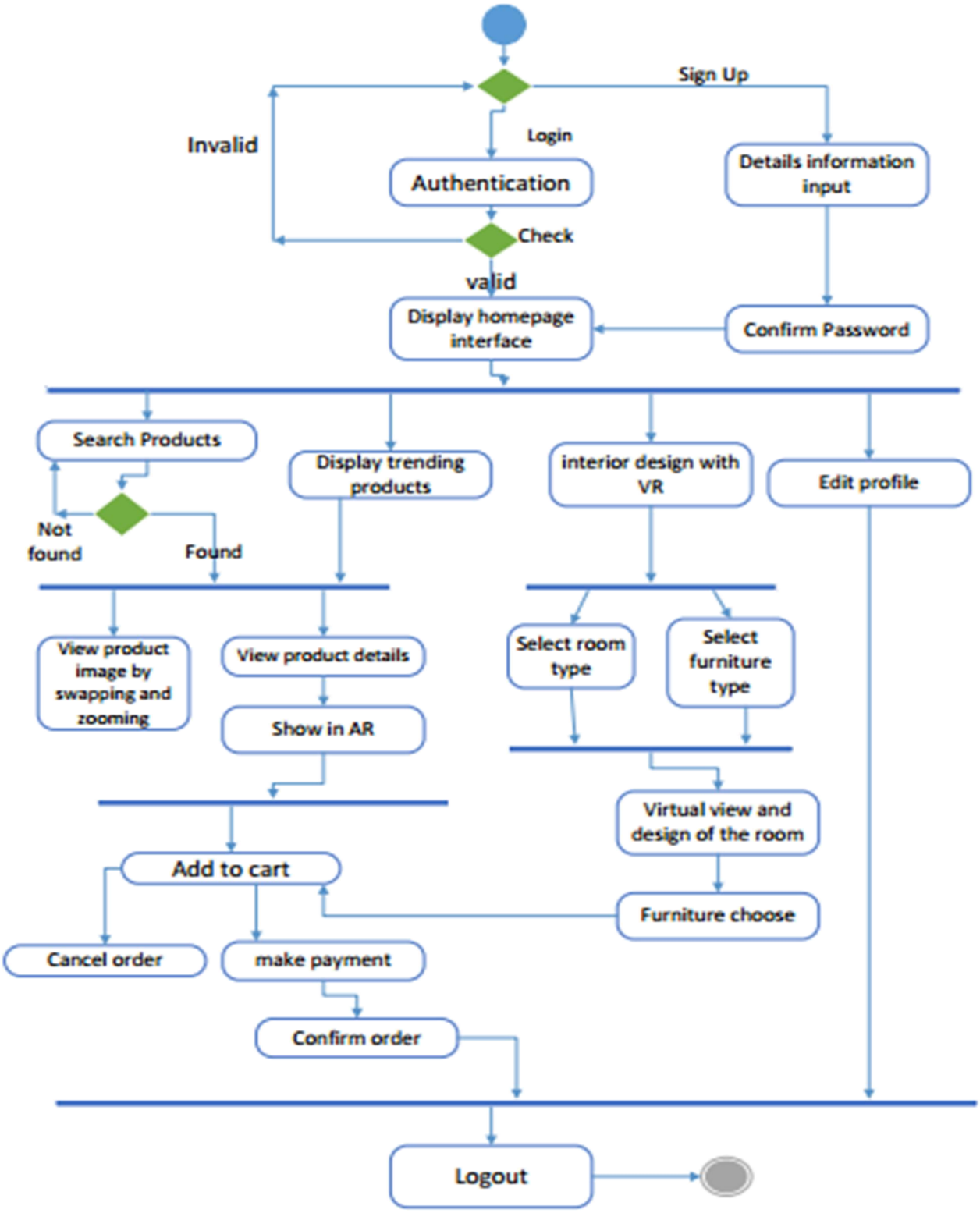


Fig-6: Activity Diagram for User side

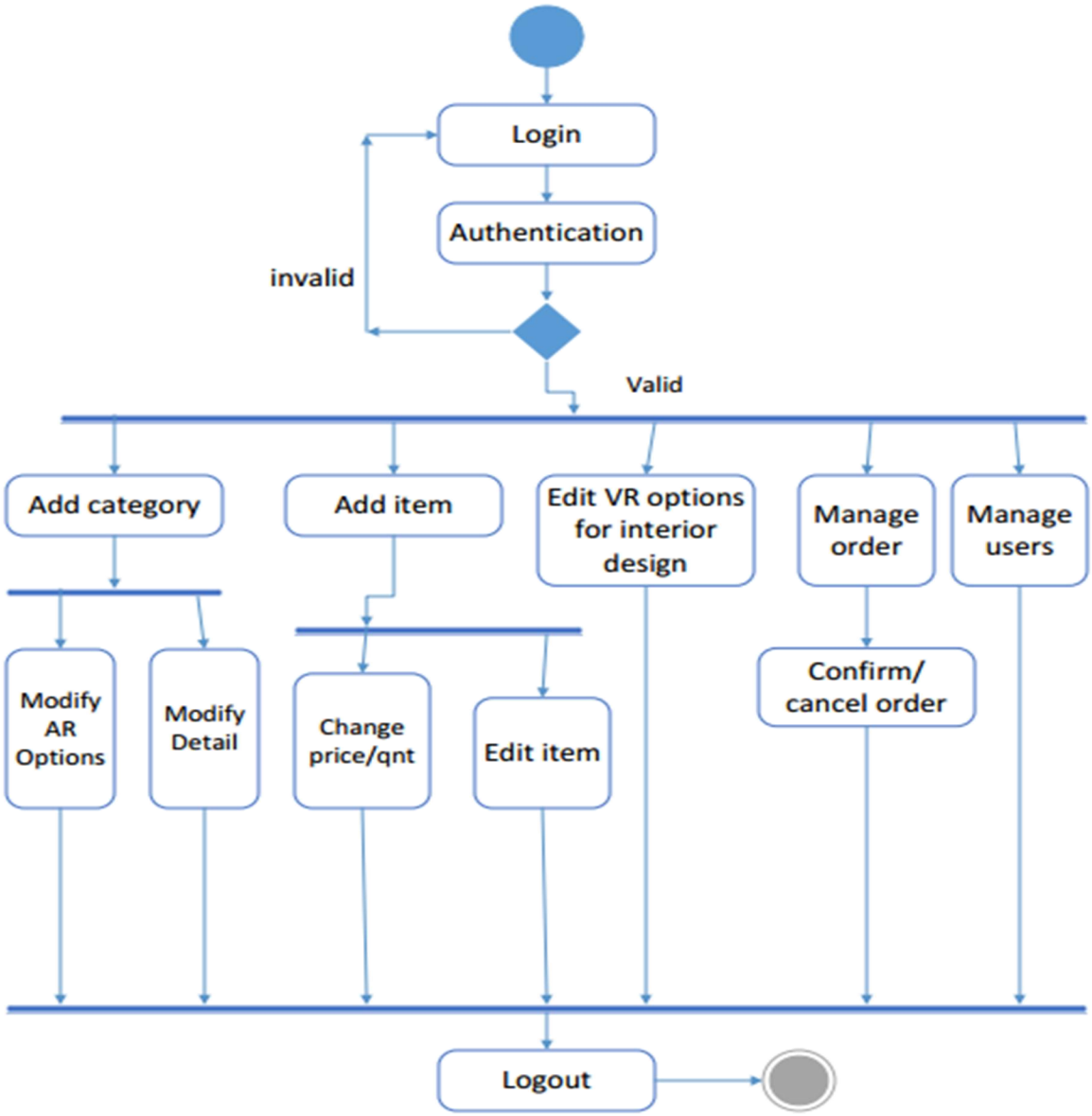


**Fig-7: Activity Diagram for admin side.**

## 8. System Evolution:

There are many possible changes for the evolution of our project. The possibilities for evolution are given below:

1. Many user wants to suggest that they want to track their orders according to their buying products. To track their order there should have some possible changes where user can track their orders whether their order is being processed or not or is it send it to delivery services or not. This is a one kind of evolution or possible changes for our system.

2. Some may be preferred that before giving any particular information of themselves, they want to just visit and explore our new shopping feature system. In that case authentication might not be a necessary for a new user who are just want to explore. In our project Authentication system is necessary for all users who want to use our application. In that case this could be a evolution for authentication system.

3. Some user can't have the ability to use the handset module in Virtual Reality features. So in that case head tracking method can be applied for our system whether user can use Virtual Reality features without using handset module.

## 9. Appendices

**Augmented reality** (**AR**) is an interactive experience of a real-world environment where the objects that reside in the real-world are enhanced by computer-generated perceptual information, sometimes across multiple sensory modalities, including visual, auditory.

**Virtual reality** (**VR**) is an experience that can be similar to or completely different from the real world. Applications of VR can include entertainment (i.e. gaming) and educational purposes (i.e. medical or military training). Other, distinct types of VR style technology include AR.

**ARCORE** uses three key technologies to integrate virtual content with the real world as seen through your phone's camera.

**Software development kit** (**SDK**) is typically a set of software development tools that allows the creation of applications for certain software package, software framework, hardware platform, computer system, OS or similar development platform. To enrich applications with advanced functionalities, advertisements, push notifications,[1] and more, most app developers implement specific software development kits.

# Software Requirements Specification

**for**

# V(A)RSHOPIX

**Prepared by**


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