Effects of Metaverse Technology and Drone Delovery:

Online mobile accessories shopping in a virtual shop.

Ravindu Jayathilaka
Department of Software Engineering
Author
Sri Lanka Institute of Information Technology
00prabashwara123@gmail.com

2nd Sadisha Samarasinghe
Department of Software Engineering
Author
Sri Lanka Institute of Information Technology
lksadish@gmail.com

3rd Parami Jayasekara
Department of Software Engineering
Author
Sri Lanka Institute of Information Technology
paraminawodya500@gmail.com

4th Randika Batawala
Department of Software Engineering
Author
Sri Lanka Institute of Information Technology
randika.batawala99@gmail.com

5th D. I. De Silva
Department of Software Engineering
Sri Lanka Institute of Information Technology
dilshan.i@sliit.lk

6th Dulanji Cooray
Department of Software Engineering
Sri Lanka Institute of Information Technology
dulanji.c@sliit.lk

***Abstract*— In the busy world most people don't have time for shopping. So, in that situation online shopping is more popular in many countries including Sri Lanka. So, we intend to use the Metaverse technology to make mobile accessories shopping easier in our busy life by this research. In addition, we also intend to introduce an improved drone delivery system through this research So, in the future we have an idea to develop our previous web application by using Metaverse technology and Drone delivery system. As the functions of our previous web application, we used Manage user profile, manage accessories, Purchase order part, add to cart part, manage delivery and Manage feedback & complaints. This research paper discusses the creation of a virtual world in a way that appeals to the customer while using the Metaverse technology and how to provide the customer with the experience of shopping from home in the future. Furthermore, through this research, the problems that occur while shopping in shopping malls are predicted. It aims to provide a superior shopping experience by reducing transaction costs. This type of research is useful for the development of the future e-commerce industry.**

***Keywords*— mobile accessories, Metaverse technology, AI technology, virtual, companies, business, MERN stack**

I. INTRODUCTION

In today's increasingly busy world, many customers have resorted to buying the things they want using the online method. Not only that, many countries in the world, including Sri Lanka, are currently facing the covid disaster. If such a situation occurs again, we will have to maintain our distance. So the e-commerce method has become more popular in the world because of that. According to e-commerce reports in Sri Lanka, the number of users in Sri Lanka's e-commerce market is expected to be 9.2 million by 2025[1]. In such a case, we intended to create a web application to online mobile accessories.

The e-commerce revenue has been calculated by "Statista". In such calculations, the following is the calculations of the users who have used mobile accessories so far and the statistics of the expected e-commerce users in the future are given below. (*Figure 1*)

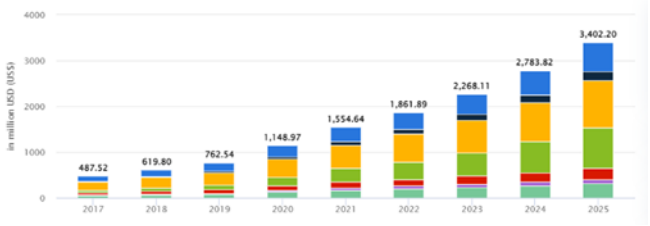

Figure 1: E-commerce statistics

Highlights of the "Statista" revenue are,

- The revenue of the e-commerce market is predicted to reach 2,582 million dollars.
- The revenue is expected to show a CAGR of 21.57% (2022-2025) and is expected to result in a projected market volume of US$4,819 by 2025.
- China will generate the most revenue in 2022 with a projected market volume of US$1,412.
- The e-commerce market is expected to have 9.2 million users by 2025.
- User penetration will be 35.2% in 2022. It is expected to be 42.3% by 2025.
- Average revenue per user is expected to be US$352.90. [2]

Therefore, our online mobile accessories web application has been proven to be more effective.

In order to further develop this idea, we decided to create a virtual shop using metaverse technology. This process, which is carried out using AI technology, is still at the experimental level in the world. Here the AI technology creates a virtual shopping mall and gives the actual experience of a shopping mall to the customer. We intended to make the system in such a way that avatars with all facial expressions are created here with the help of VR, AR and NFTs. So, users get online adventure everywhere. That is, here we will create

XXX-X-XXXX-XXXX-X/XX/$XX.00 ©2022 IEEE

an idea to create a shop setup by digitally creating a 100% real world through this research. And we are also concerned about privacy issues. We hope to make the system to minimize them. Furthermore, lack of accessories is a problem in a physical shopping mall and this method can be used to order accessories online. Therefore, the customer gets the opportunity to order accessories from anywhere in the world. We expect that this idea will be able to achieve great growth in the business sector. Because it is a great opportunity for anyone to make the most of as a business, there by gaining an advantage and attention. The most important thing is this method enables customers to shop according to their needs without any human intervention. It is very efficient and easy to attract customers.

Digital mobile accessories can be purchased. Considering all the hype surrounding the Metaverse and the metaverse solutions already in place, it can be assumed that the future is closer than imagined. With the option to rent or buy a commercial space, store can be set up and users can check out your products in the metaverse. And introduce innovative advertising methods, we expect the metaverse to introduce a new approach to brand storytelling and advertising.

Mr. Athar C Clark has mentioned in the book 3001 about communicating with the mind. Confirming it more, there is no doubt that everyone will have to live in a virtual world in the future.[3]

The other idea we intend to develop is the drone delivery service. It is unmanned aircraft that can deliver only light packages. It is a delivery method that is currently used in the world and our idea is to improve it and introduce it to Sri Lanka. For example, the Amazon Prime Air, Flytrex, UPS Flight Forward, Wing services are more popular companies use this method.[4]

There are many problems that have to be faced here. But it can be considered as a very good delivery method because drones can easily go to places that cannot be traveled, Reduced roadway congestion, Greater route flexibility and many other. Our aim is to make it more popular in Sri Lanka. 2.5-4.5 miles (4-8km) range of high-end consumer drones and mid-range consumer drones are calculated to be 0.25-1.5 miles (400m-3km) [5]. This idea aims to provide high-quality delivery facility to the customer by avoiding all the problems as much as possible.

II. RELATED WORKS

A. *Metavers Technology*

VR marketing has already made its way to the Metaverse, which is a virtual-reality (VR) space which user can interact with a computer-generated environment and other users. VR tech is used by New York Times for storytelling. Adidas uses VR for promote their shoe products. They have created virtual mountain climbing. And Volvo Company uses VR for virtual reality test drives. Most important one for this topic is Ikea place. They use VR based application that allow users to virtually place 3D model of the items (furniture) inside their own home. It is a live size model, so the user can pick something to buy without even going there.[6]

Just like the Ikea did, we are using this VR technology to give a true scale 3D view of our every items in the shop, so the customers can actually inspect the item before buying it. And just like the companies like Flytrex and Wingcopter did, we are using drone for delivering goods in short range distance. This will eventually leads us to less labors and more work..[7]

B. *Drone Delivery System*

There are world class companies who use drones for their deliveries. Though the drone deliveries are still limited, some companies are trying to work with the technology well.

Amazon Prime is one of the major delivery companies in the business industry. Amazon prime is well known for their hunger to do something new to amplify their deliveries. They got their FAA (Federal Aviation Administration) to operate It's prime air drones. Like: 5–30-pound deliveries. They do not stop from there. They are still trying to improve the technology by testing and experimenting various stuff in UK, USA, France and Israel.[8]

When it comes to drones Flytrex name cannot be forgotten. "Flytrex is the 1st company in the world to offer complete end to end drone delivery solutions". Their drones can deliver 6.6 pounds packages up to 6.2 miles away from the delivery station.

All before these huge companies, Israel started the first drone delivery company in 2013. They supplied groceries and various kind of goods. Big news is the Walmart is going to use Flytrex drones for their pilot program. There are few other drone delivering companies. Wing is one of them, which started on 2014 in Australia, USA and Finland. They delivered foods back in the day. Another company is UPS Flight Forward. It is a fully owned subsidiary of UPS (United Parcel Service) focused on drone delivery which was launched in 2019. Wingcopter, DHL Parcelcopter.[8]

III. METHONOLOGY

A. *Research Objective*

Many studies have been undertaken on the different aspects of online purchasing and online purchasing websites. Nowadays due to the new trends, business of the world and also the craze of using internet many educated and young people have turned to online shopping. Using online shopping they can buy anything at any time. In a normal and traditional shopping scenario what happens is people goes to buy products from shops physically. Sometimes they get tired of walking around shops to select the best suited product for themselves. In that scenario sometimes they will not what they need to get. At some point they have to face problems like the unavailability. That is why people are moving to the online shopping rather than the normal traditional shopping method.

Before creating this application, we did some research about the technologies that we have to use to build this product. Because there are many kinds of technologies in the world but we have to select the most suitable tech stack to build this product.

The following are the technologies (*Figure 2*) that we can you to build this product for scratch.

- **Backend** - Node JS, Express JS
- **Frontend** – React JS, Bootstrap, Material UI
- **Database** – MongoDB
- **Version control Tool** – Github
- **Testing** – Selenium and Sonar Cube

Figure 2: MERN stack structure

see the how it is going to effect on SDLC. The effective SDLC requires a tech stack that is,

- Cost-effective
- Scalable,
- Flexible,
- Easy to setup
- Provides advanced integrations

In other words, the application that we are about to develop must be very fast, reliable and scale according to users' changing needs. The tech stack is critical in ensuring higher software performance as it impacts different phases of SDLC. Following is a simple description about the tech stack that have used and the pros and cons of this stack.

- **React JS** – is a JavaScript – based library that enables dynamic frontend development for your web application.
- **Node JS and Express JS** – offers more than just backend development capabilities. It is a JavaScript runtime environment based on the Chrome V8 engine enabling enhanced software development.
- **Github** – is a hosting service for the developments of software and also provides the capability of version control using Git.
- **MongoDB** – is a database program of cross – platform and document – oriented. It is a NoSQL database programs and it uses JSON – like documents with options schemas.
- **Bootstrap and Material UI** – are two kinds of online services that provides with UIs and UI components to develop the frontends easily without using any unnecessary effort.

B. Main functions in the system.

Since this is an online shopping system for mobile accessories there are several main functions that we have discovered that must include to the system. Following are the functions that we use as the main functions in the system.

1. Login and registration function.
2. Order Placing function.
3. Purchasing for the order function.
4. Generating reports in excel format

Apart from that we found some function that are not get as main functions but still can get as functions of the system. Following is those functions.

1. Feedback sending function.
2. Customer profile edit function.
3. Product edit function.

Those are the functions that can be found in this project. In below sections will explain the above functions clearly with the respective backend process and flows.

C. Function description.

1. Login and registration function

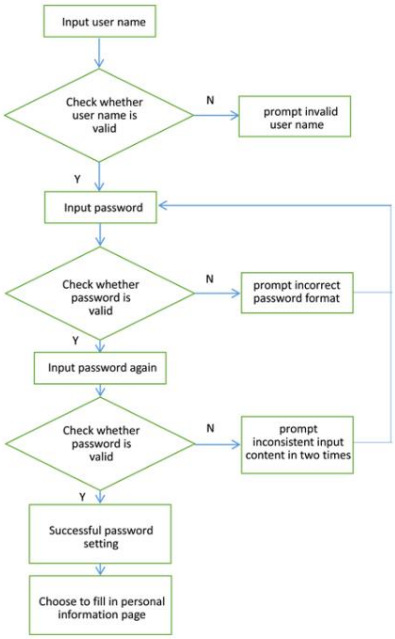

Figure 3: Login Process Flow

In this function, user can log into the system if the user has registries in to the system before, unless the user has to register to the system before, using the registration function. The basic objective behind this function is to collect records and keep record of the users. In the login function what happens is, in order to login to the system user must enter the login credentials. In this system, user has to input the email as the username and the password. In there the front end will send the data as a json data set to the backend. In the backend the first it will take the username and search for the user in the users' database in MongoDB. If the user in not in the database, then the backend will send a response to the frontend saying that the user is not exist in the database and then the frontend will display an error message or an alert to the user about the issue. If somehow the backend manages to find the matching username, then there will be another checking for the password. The above image (*Figure 3*) shows the login process flow.

The interesting thing behind that checking is that there is a password encryption is used in the backend. Therefor for that checking the backend will find the matching user and get the encrypted password and compare with the user entered password. In there instead of decrypting the password, the user entered password will be also encrypted and the compare the two encrypted passwords. There for it will be easy to compare because there will be less effort rather that decrypting the encrypted password.

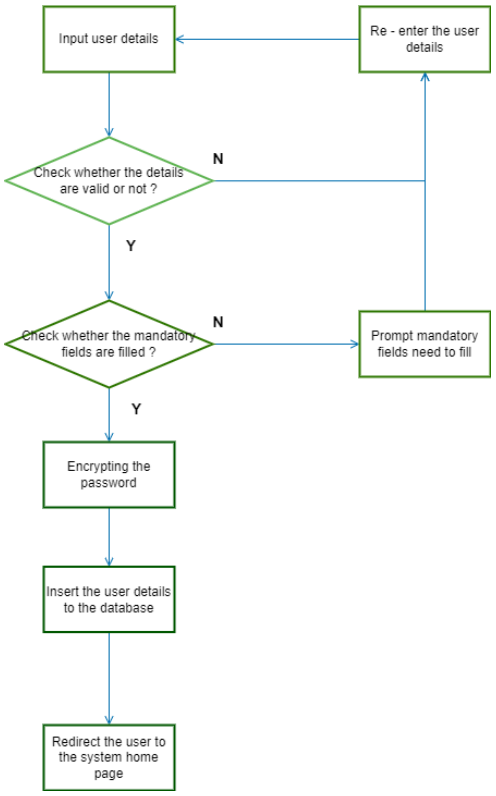

Figure 4: Registration Function Flow

In the registration function (*Figure 4*) user needs to input some details to the system and once the user sends the information it will take the information as a data set a then the data will be added to the database. In this system, it has been given a special attention to the user privacy. So, the user password will be encrypted before send it to the database. In case anything happens to the database the user passwords will be not exposed to the others.

2. *Order Placing function.*

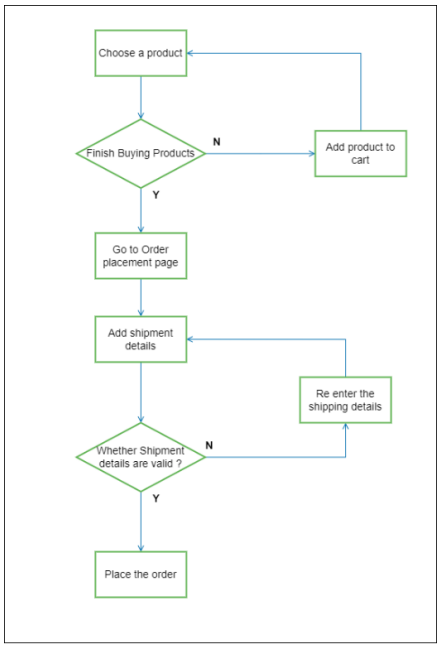

Figure 5: Placing an Order

In the order placing function what happens is the user will select a product that need to be taken by himself and place an order in the system. In here there are two options that we gave to the user. Following are those two options,

- Directly buy a product.
- Add product to a cart, to be buy in later.

So, under these options the user can directly buy a one product for the store buy select a product and then place an order in the system. Otherwise, the user can add the product to the cart so that the user can buy several products at once. Once you select a product there are several state variables that will update. Using the use State react – hook there will be some variable that update in order to the changes happens in the frontend and they will be stored at the local storage in the local pc and pass that data to the other components as well. As an example, once you add a product to the car what happens in the behind is that the product details will be load in to state variables and send it to the local storage and then before send it to the backend, create a data set form the data the system collected. In the backend the order class will be inserted with a new record of order

3. *Purchasing for the order function.*

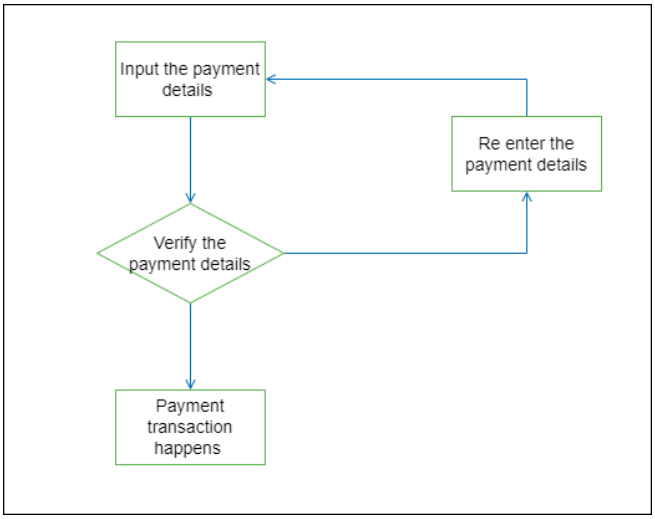

Figure6: purchasing order flow

Under this part what happens is the purchasing part happens in the placed order. Once you place the order it will be added to the order database with the purchasing column value as incomplete. And there you can input the payment details to the system and once the payment is successful the column will be updated as complete. Once the user enters the user details the details will be checked by the payment gateway and verify that there is a user matching to the payment credentials and then only the payment or the transaction will happen. In this project, the PayPal sandbox has been used to simulate an actual payment gateway.

4. *Generating Reports in excel format.*

Under the report generation process, it will generate a report in 4 major parts. Because the reports will give the admin users

a better understanding about the business's path. Following are the major report generation parts.

1. Product report generation
2. Payment report generation
3. Customer report generation
4. Feedback report generation

Under the product report generation part, it will give the products and the details about them. It will help admin users to understand what product categories are in the inventory and how the products sales are moving though out the year. Also, it will be a beneficial for the users because they can know what product have been add to the inventory recently. As for the Payment report it will help the admin user to calculate the income and the expenses in the business. Also, it will give a better idea about the payment methods that the users use mostly which will a major development point in future. The customer report will be helpful because using that report the admin users can get a basic idea about the user categories who are using the application and it will gives better understanding what kind of products that the application should have. The feedback report is the base of the future upliftment for the application. It will give the ideas that help the developers to develop the application and also it will be beneficial for the all-admin users to improve their quality of the products.
In the application it will analyze the data and generate table and then download the data to an excel file.

II. PRPOSED SYSTEM

Currently our team has developed a system to purchase computer and mobile accessories online and hope to develop the store in this system as with metaverse technology and drone delivery system.

This system will follow the MVC architecture to implement the system. In the currently existing system we have developed with product handling, payment handling, user handling, shipping and delivery handling functions. Initially, we implemented registration and login functions with proper validations and authentication systems to enhance user experience. Here we have developed payment functions with most trusting and comfort online money transferring methods. (*Figure 7*)

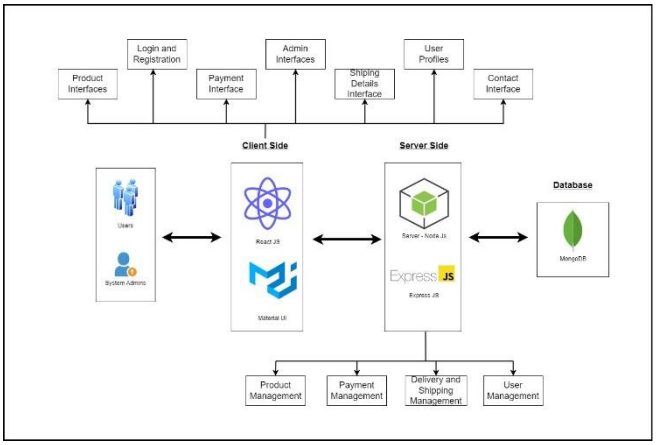

figure 7: System Overview Diagram

Initially Admin or customer should register to the website by filling out the registration form using their username, email, password and confirming password as in *Figure 8* and *Figure 9*. If the customer or admin has already registered to the system user can simply login with filling email and password as in *Figure 10*.

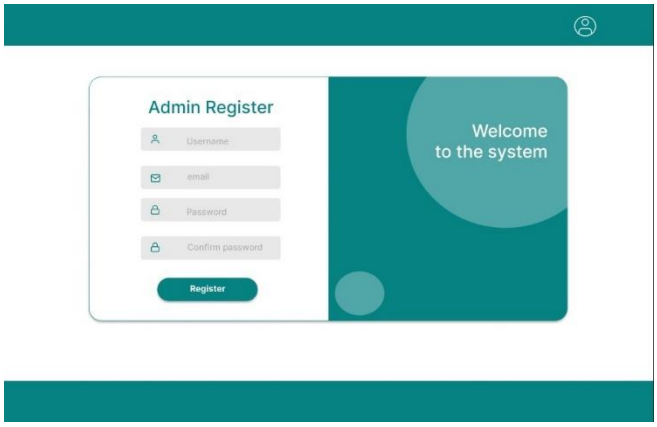

Figure 7: Admin Registration

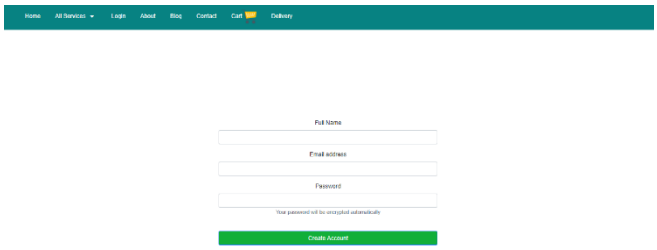

Figure 8: User Registration

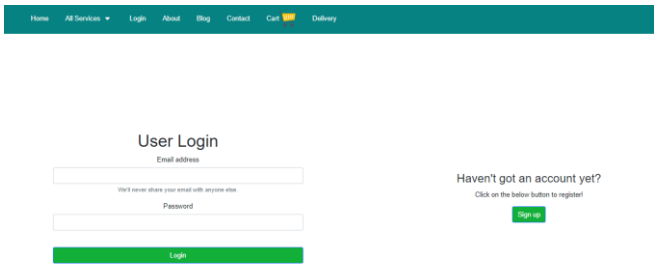

Figure 9: User Login

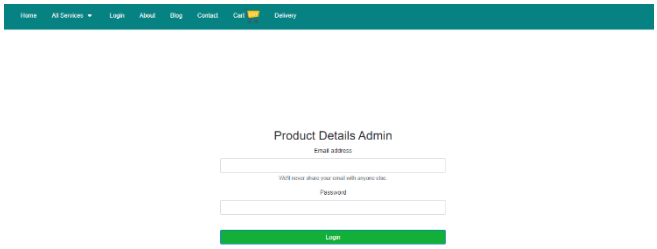

Figure 10: Admin Login

When a user logs into the system properly, the customer can view, search or filter products as in *Figure 11* and users

can view details like product description, price, quantity and can add that product to the cart as in *Figure 12*. Then users have to enter shipping details as in *Figure 13* and place the order. Then the user will direct to the payment page and have to fill the payment details properly and confirm the payment as in *Figure 14*. Users can give feedback or complaints by filling contact forms.

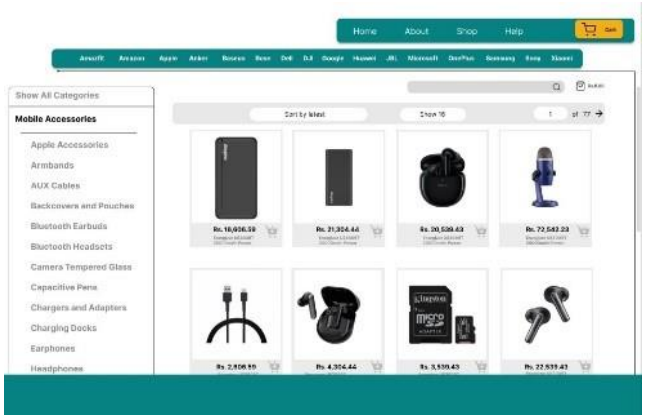

Figure 11: Home page

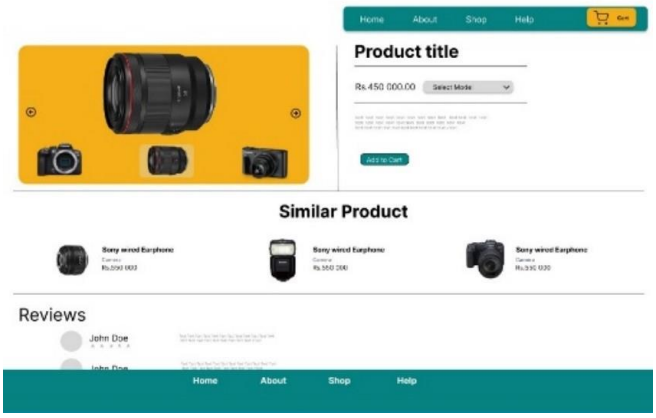

figure 12: Product view

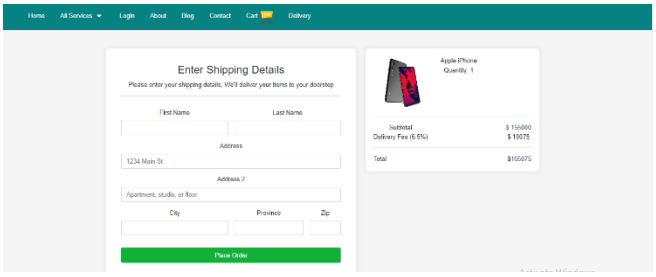

figure 13: Shipping form

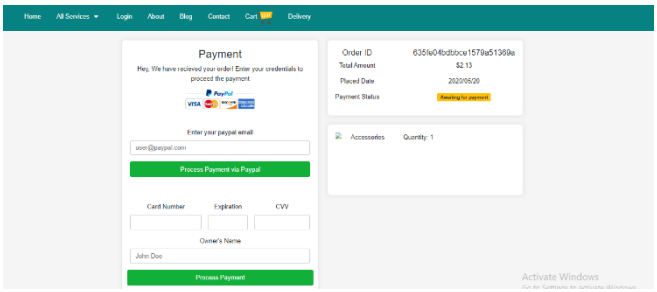

Figure 14: Payment

In admin side they can view product details, shipping details, order details, customer details and complaint or feedback details as in *Figure 15, Figure 16 and Figure 17*. Admin also can add, edit or delete products, delivery details as in *Figure 18, Figure 19 and Figure 20* and always give feedback to the customer as a successful message as in *Figure 21 and Figure 22*.

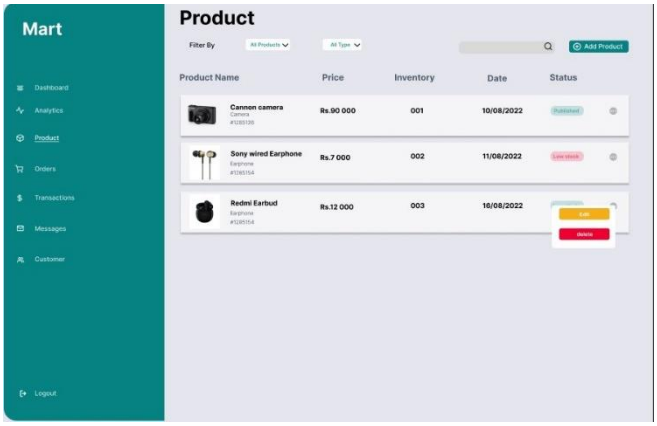

Figure 15: Admin Product details view

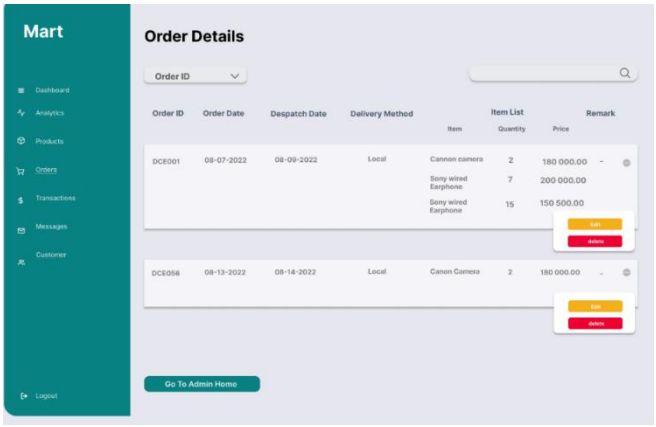

Figure 16: Admin Order details view

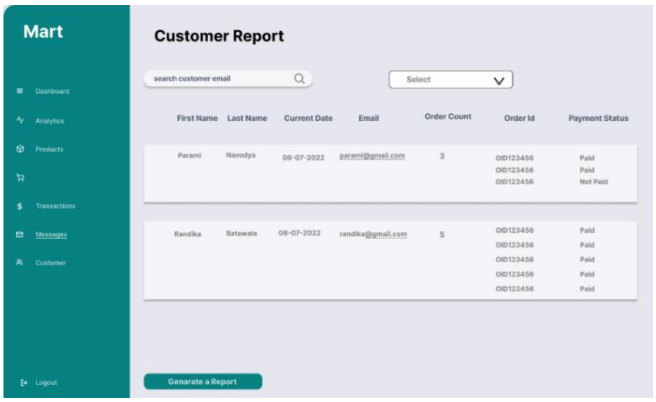

Figure 17: Admin Customer details view

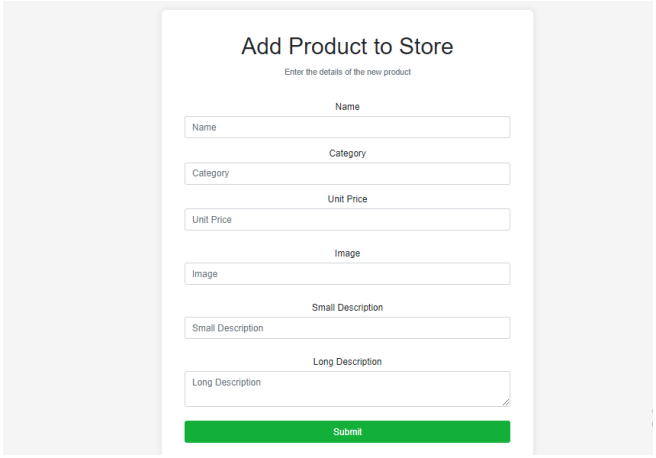

Figure 18: Admin Add Product details

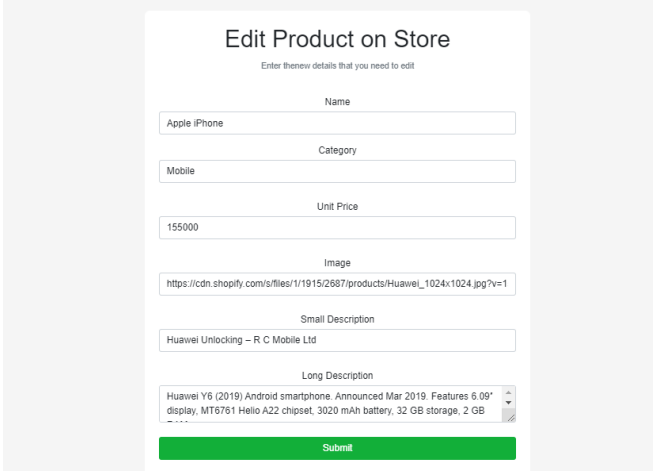

Figure 19: Admin Edit Product details

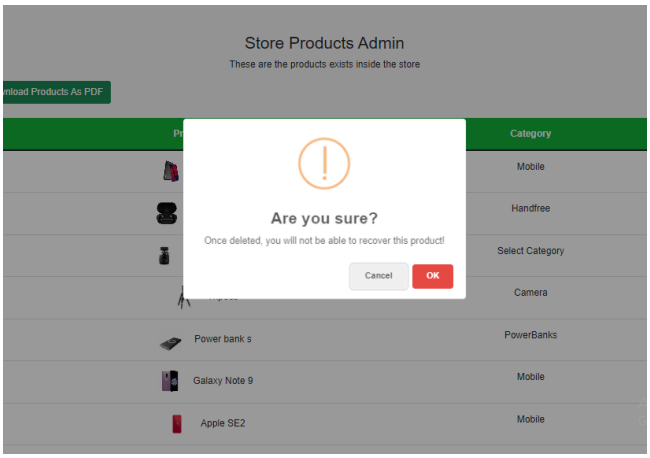

Figure 20: Admin Product Delete Message

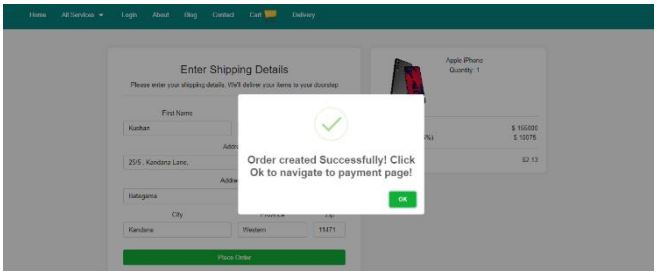

Figure 21: Successful Alert

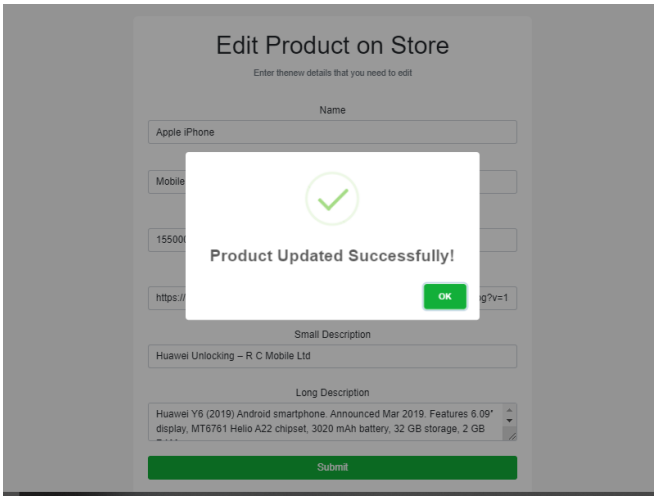

Figure 22: Update Successful Alert in Admin View

We designed user interfaces and user flow simply and attractively as in *Figure 23*. In every form that users have to fill we have used proper validations and authentications to improve usability.

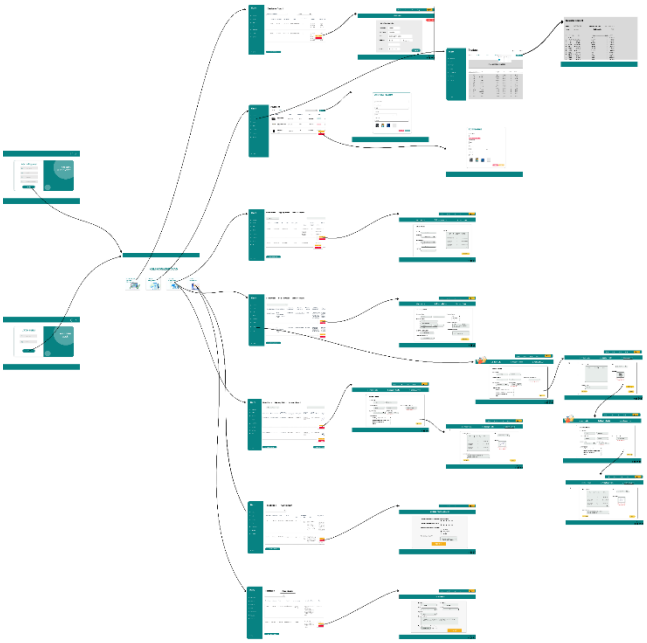

Figure 23: Admin Flow

Here, the most important topic that we hope to develop is metaverse technology and drone delivery systems. Metaverse systems are still conceptual and fast developing technology that could be widely used in the near future world. It simply means a virtual, digital, 3D cosmos created by fusing several virtual worlds and actual realities. In their digital avatars, users can travel through the Metaverse and engage in interactions. The figurative proprietors of the Metaverse are tool creators, software developers, world builders, artists, 3D modelers, game developers, consumers, and investors. Consequently, depending on the feature-set and technologies employed to construct the platform, it will have more features.

Through the use of technology like virtual reality (VR), augmented reality (AR), artificial intelligence (AI), social media, and virtual currency, users can navigate a virtual environment that closely resembles the real world. People use the internet to do their browsing. However, individuals can "live" in the Metaverse to some extent. (*Figure 24)*

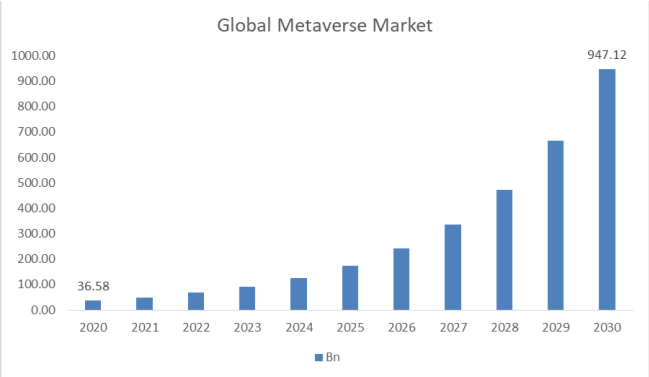

Figure 19: Increment of Global Metaverse Market

People will therefore be able to trade, purchase, and sell virtual land in the Metaverse. We anticipate that the virtual world will emulate and acquire features of the real world, including economies.. The Metaverse will have its own virtual real estate market where people can buy, sell, and trade virtual land. So imagine, as an ecommerce platform, developing the current system into a meta world will be a great experience to the users. Customers can see and feel the products as they shop physically and feel real world experience with second. So, here we hope to use new technologies and existing technologies like 3D modeling tools, Interaction frameworks and so many.

III. DISSCUSSTION

Advantages of MERN Stack!

1.Rendering and Efficiency of UI
The greatest framework for UI layer abstraction is React JS. React gives you the freedom to create the application and arrange the code however you choose because it is merely a library. In terms of performance and UI rendering, it is therefore superior to Angular.

2. Cost-Effective
It will be beneficial for a corporation to recruit JavaScript expertise alone rather than separate specialists for different technologies, as MERN Stack uses JavaScript as its primary language. Time and money will be significantly reduced by this action.

3. Open Source
The technologies used by MERN are all open-source. With the help of this tool, a developer can find answers to questions that can arise as they work on a project. It will therefore be advantageous for a developer.

4. Easy to switch between client and server
MERN is straightforward and quick because everything is written in a single language. Additionally, switching between client and server is simple.

Disadvantages of MERN Stack!

1. Productivity
Since React is merely a library, it makes developers less productive because it utilizes numerous third-party libraries. Additionally, the React code demands additional work as a result of this upgrade.

2. Large-Scale Applications
With MERN, it becomes challenging to create a sizable project with numerous people collaborating. Single-page apps are ideally suited for the MERN stack.

3. Error prevention:
The MEAN stack is a better option if what you're looking for is a technology stack that, by design, guards against typical coding errors. Because Angular EMPLOYS Typescript, it guards against typical coding mistakes right throughout the coding process. But React falls short in this area.

IV. CONCLUTION

Metaverse technology can be considered as a new face of innovation with a new experience that suits the modern society.

Also, drone delivery is a valuable idea that can be used in emergency situations. This idea can be realized by using drone equipment which is further developed by the ever-advancing technology.

They are examples that fits very well with the concept of the future is close at hand. With the advancement of technology, we have to provide an output full of quality.

V. REFERENCES

[1] https://www.statista.com/outlook/dmo/ecommerce/sri-lanka

[2] https://www.statista.com/outlook/dmo/ecommerce/sri-lanka

[3] https://spikemagazine.com/0198clar/

[4] https://www.fehrandpeers.com/drone-delivery/

[5]https://www.droneblog.com/how-far-can-a-drone-fly-from-the-controller/

[6],[7] https://www.wired.com/story/what-is-the-metaverse/

[8] https://www.ecommercenext.org/top-10-commercial-drone-delivery-companies/

[9] https://www.ijemr.net/ojs/index.php/ijemr/article/view/847