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Programming Integration Project (CO3103)

Project Report **Mobile Phone Selling Webapp**

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1 Topic

This project focuses on creating a web-based application that allows users or customers to browse and make transactions. The specific target of product is phone, primarily smart mobile devices.

This e-commerce application is analogous to real life phone selling retailers that require a more convenient and efficient way for customers to interact with their products. Because of that, the requirements and features will mainly focus on practical demands as if it was proposed to solve the problem.

1.1 Proposed workload

Task	Component	Member
Database	Backend	Hoàng
Deployment	Backend & Frontend	Hoàng
Create mock-up homepage	Frontend	Nhi
Codebase implementation	Backend	Hưng & Hoàng
Codebase implementation	Frontend	Khôi & Nhi

1.2 Proposed Features

- Authentication: Sign in and sign up, SSO optional
- Homepage: Display list of products
- Cart: Store items

1.3 Feature details

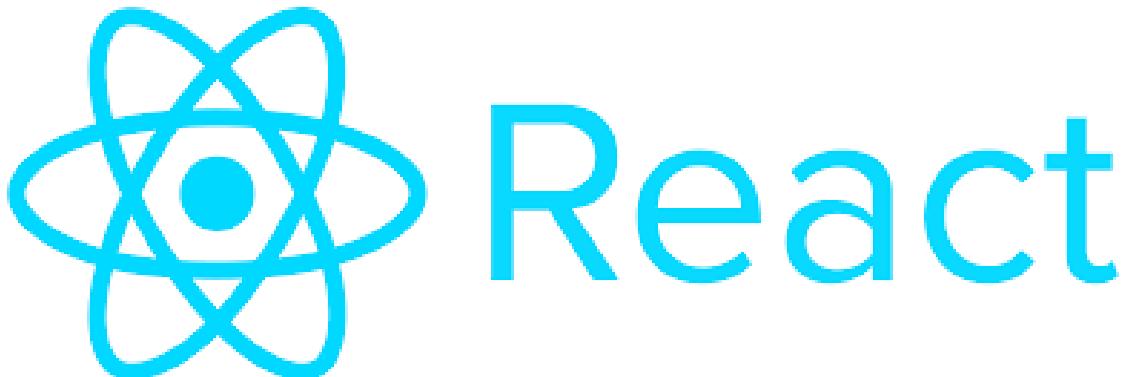
- Menubar: Half left shows sections like products, brands, etc.; right portion has user's avatar and button for cart
- Authentication: On mouse hover over the user's avatar shows a drop-down list; if the user is signed in, this list will show a button to sign out, else show sign in and sign up buttons
- Authentication pages: Sign in and sign up have dedicated pages, with placeholder for SSO in the case we can implement it
- Homepage: Show some news divided by brands or the site's news
- Products page: Show about 20 products; allow usage for filter and sort
- Item page: Show all information about the item like colors, memory options, etc.; add placeholder for other recommended items
- Cart button: With small number indicating total number of items in cart; on mouse hover shows a truncated drop-down list of cart
- Cart page: Shows all item in cart; allows changing properties like colors, quantity, etc.; calculate total price by item choice and overall



2 Technologies & Features

So far, we have been learning about the thinking process of a developer. For this integration project, we decided to practice this thinking process using some new frameworks. At this point, we have already picked our tools, and after hours of research, we draw the conclusion on how all these technologies work and work together.

2.1 Frontend: Reactjs



React (React.js or ReactJS) is a free and open-source front-end JavaScript library for building user interfaces or UI components. Developed at Facebook and released in 2013, it can be said that React has been the most influential UI library of recent years.

We use React to build components that represent logical reusable parts of the UI. The beauty of React is that the simplicity of building a component has been brought down to its theoretical minimum: a Javascript function. The return value from these functions is the HTML or UI, which is written in a special syntax called JSX, allowing easy combination of Javascript with Html markup.

The main reason we want to use React is not the library itself but the massive ecosystem surrounding it. React itself does not care about routing state management, animation or anything like that. Instead, it lets those concerns evolve naturally within the open-source community. No matter what we are trying to do, there is a good chance that a good supporting library to help us get it done has already existed.

2.1.1 Component Reuse

Why would you constantly reinvent the wheel when you can simply reuse code that has already been written and tested by other developers?

ReactJS introduces the so-called components, which make it possible to split the UI into independent, reusable pieces, and think about each piece in isolation.

For instance, we can have a button component display with different colors in several parts of our application. Although it is the same button component when we provide it with a data set (e.g color, or a function), it modifies itself and outputs a UI instance of the element.

This pattern of creating React components is necessary for scaling. It helps save time by ensuring less code is written, development is faster, the code base is simpler, and maintenance is stress-free.



2.1.2 Virtual DOM

The Document Object Model (DOM) is an application programming interface that represents an XML document as a tree structure wherein each node is an object representing a part of the document.

Most often it's inefficient and slow because it's necessary to recalculate the CSS, recreate the layout, and essentially repaint the entire web page every time the DOM changes.

ReactJS overcomes the DOM's inefficiencies by using the so-called Virtual DOM.

Just like the actual DOM, the Virtual DOM represents all elements and their attributes as a node tree. When something changes, React JS updates the Virtual DOM and figures out how it differs from the actual DOM, updating the actual DOM only with what has actually changed.

2.1.3 JSX

ReactJS introduces another concept called JSX, and it is a syntax extension to JavaScript.

React embraces the fact that rendering logic is inherently coupled with other UI logic: how events are handled, how the state changes over time, and how the data is prepared for display.

Instead of artificially separating technologies by putting markup and logic in separate files, React separates concerns with loosely coupled units called "components" that contain both.

React doesn't require using JSX, but most people find it helpful as a visual aid when working with UI inside the JavaScript code. It also allows React to show more useful error and warning messages.

2.2 Backend: Django



Django is a high-level Python web framework that encourages rapid development and clean, pragmatic design. Built by experienced developers, it takes care of much of the hassle of web development, so you can focus on writing your app without needing to reinvent the wheel.

2.2.1 Django REST framework

Django REST framework is an open-source application platform that allows developers to build applications on top of the REST framework without having to worry about the infras-



structure being compromised. Django REST framework supports multiple languages including JavaScript which we use for Reactjs and provide complete solution for managing data using Serializers.

2.2.2 Architecture

For the sake of this project, we decided to build this website using the simplest architecture: the **MVC**.

MVC stands for Model-View-Controller and have the most basic interactions between **Model** at the backend and **View** at the frontend through a medium **Controller**. Technically, the request of the user is captured by the Controller, it then calls the database to retrieve the the corresponding object(s) and return it in form of JSON/XML.

For example, when a user presses a button “Apple” in the Homepage **View**, a corresponding action in **Controller** will be triggered and retrieve all the mobile phones whose manufacturer is “Apple” using the predefined **Model**. Otherwise, the HTTP mechanism will return an error page.

2.2.3 Serializers

Serialization is a common terminology that is not new to Web Programming. To implements serialization, we use a so-called **Serializer**.

Serializers in Django REST Framework are responsible for transforming objects into data types that are understandable in JavaScript and the front-end framework. The serializer also provides deserialization, allowing the parsed data to be reverted to a complex type after the received data is first validated.

In our website, we prefer **ModelSerializer** rather than regular **Serializer** as it has some of the following advantages:

1. It auto-generates a set of fields that is specified by the Model we created.
2. It provides some validators for serialization such as `unique_together`.
3. It contains some of the default function like `create()`, `save()` for the ease of storing data.

2.3 Database





PostgreSQL is a powerful, open source object-relational database system that uses and extends the SQL language combined with many features that safely store and scale the most complicated data workloads.

With more than 30 years of active development on the core platform, PostgreSQL has earned a strong reputation for its proven architecture, reliability, data integrity and more.

3 UI and screen flow

3.1 Mock-up

We have sketched the design of four pages that is in the scope of this project. They are the Home page, Product List (displaying list of products) page, Product Detail page, and View Cart page. We also sketched the log-in pop-up window if customers clicked on the icon, and the show-cart pop-up window if you hover the mouse to the cart icon on the navigation bar.

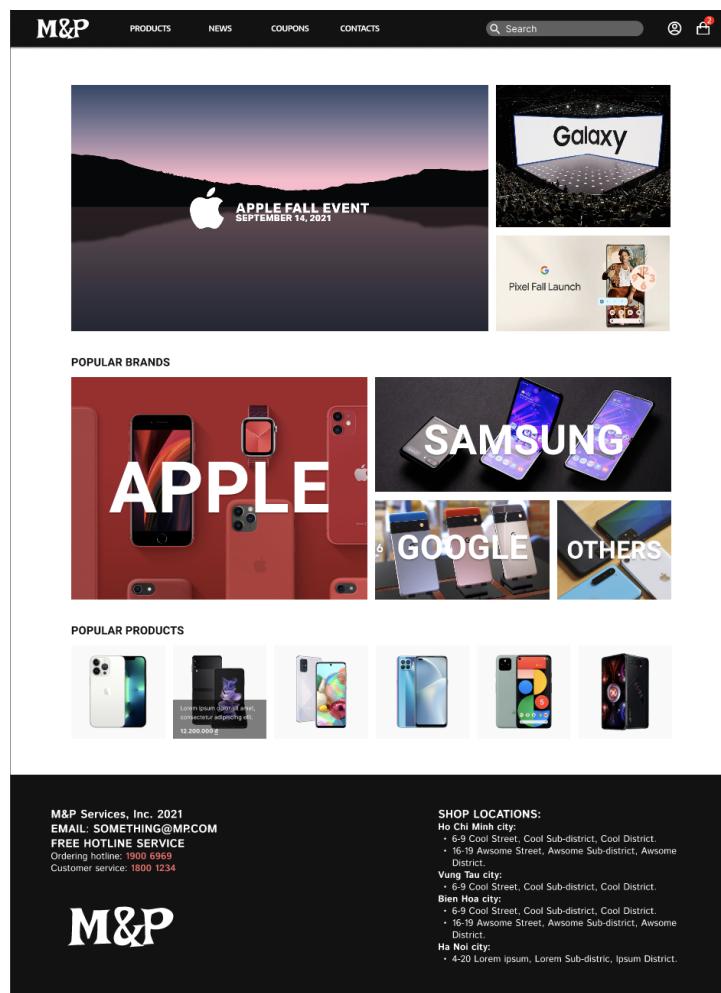


Figure 1: Home Page

These are the screenshots of the pages we designed using **Figma**. **Figma** is a vector graphics editor and prototyping tool, which is suitable for basic UI design. For a higher resolution view, please see the link [Mock-up](#).



The screenshot shows a web-based e-commerce platform for mobile phones. At the top, there's a navigation bar with links for PRODUCTS, NEWS, COUPONS, and CONTACTS, along with a search bar and user account icons. On the left side, there's a sidebar titled "FILTER OPTIONS" containing dropdown menus for Brand, RAM, Camera, Screen, Storage, Year manufacture, and Price, each with several filterable options. Below the sidebar is a grid of 12 smartphone thumbnails arranged in three rows of four. Each thumbnail includes a price tag of "12.200.000 ₫" and a "Add to cart" button. The phones shown are various models from different brands, including one with a triple-camera setup and another with a prominent camera hole punch.

M&P Services, Inc. 2021
EMAIL: SOMETHING@MP.COM
FREE HOTLINE SERVICE
Ordering hotline: **1900 6969**
Customer service: **1800 1234**

SHOP LOCATIONS:

Ho Chi Minh city:

- 6-9 Cool Street, Cool Sub-district, Cool District.
- 16-19 Awsome Street, Awsome Sub-district, Awsome District.

Vung Tau city:

- 6-9 Cool Street, Cool Sub-district, Cool District.
- 16-19 Awsome Street, Awsome Sub-district, Awsome District.

Bien Hoa city:

- 6-9 Cool Street, Cool Sub-district, Cool District.
- 16-19 Awsome Street, Awsome Sub-district, Awsome District.

Ha Noi city:

- 4-20 Lorem ipsum, Lorem Sub-district, Ipsum District.

Figure 2: Product List Page



The screenshot shows a product detail page for the iPhone 13 Pro. At the top, there's a navigation bar with links for PRODUCTS, NEWS, COUPONS, and CONTACTS, along with a search bar and user icons. The main content area features a large image of the iPhone 13 Pro with a green gradient back panel. Below the image, the product name "iPhone 13 Pro" and its price "27.000.000 ₫" are displayed. There are three storage options: 128GB, 256GB (selected), and 512GB. Below the storage options are color swatches for white, red, blue, and gold. Two buttons are present: a red "Buy now" button with a flame icon and a black "Add to cart" button with a shopping bag icon. To the left of the main image, there's a sidebar with the heading "About Apple" and a brief description. To the right, there's a table with technical specifications: Screen (6.1", OLED, Super Retina XDR, ProMotion 120Hz), Camera (3 cameras 12 MP, LiDAR sensor), Battery (Up to 22 hours), RAM (4 GB), and Material (Stainless Steel, Ceramic Shield). Below the main product details, there's a section titled "RELATED PRODUCTS" featuring five smaller images of other phones.

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- 16-19 Awsome Street, Awsome Sub-district, Awsome District.

Ha Noi city:

- 4-20 Lorem ipsum, Lorem Sub-district, Ipsum District.

Figure 3: Product Detail Page



The screenshot shows the M&P Check Out page. At the top, there is a navigation bar with links for PRODUCTS, NEWS, COUPONS, and CONTACTS, along with a search bar and user icons. Below the navigation is a "CHECK OUT" button.

The main area displays a shopping cart table with the following data:

Image	Product name	Price/ Product	Total Price	Quantity
	Lorem ipsum dolor sit amet, consectetur adipiscing elit.	12.200.000 ₫	12.200.000 ₫	- 1 +
	Lorem ipsum dolor sit amet, consectetur.	4.200.000 ₫	8.400.000 ₫	- 2 +
	Lorem ipsum dolor sit consectetur adipiscing amet.	9.200.000 ₫	9.200.000 ₫	- 1 +
	Lorem sit amet, consectetur adipiscing elit.	5.200.000 ₫	26.000.000 ₫	- 5 +
	Ipsum dolor sit amet, consectetur amet adipiscing elit.	14.500.000 ₫	14.500.000 ₫	- 1 +
	Lorem ipsum dolor sit amet, consectetur adipiscing.	3.000.000 ₫	21.000.000 ₫	- 7 +

Total Cost: **91.300.000 ₫**

Below the cart, there is a "PERSONAL INFORMATION" section with fields for User (Lastname Midname Firstname), Phone (0969696969), and Address (6-9 Cool Street, Cool Sub-district, Cool District). There is also a note about payment methods: Pay by Payment Systems (PayPal, Google Pay, etc.), Pay by Credit Card (Mastercard, Visa, etc.), and Pay by E-Wallet (M-Pesa, etc.).

Total Cost: **91.300.000 ₫** Proceed

M&P Services, Inc. 2021
EMAIL: SOMETHING@MPCOM
FREE HOTLINE SERVICE
Ordering hotline: 1900 6969
Customer service: 1800 1234

SHOP LOCATIONS:

Ho Chi Minh city:

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- 16-19 Awsome Street, Awsome Sub-district, Awsome District.

Ha Noi city:

- 4-20 Lorem ipsum, Lorem Sub-district, Ipsum District.

Figure 4: Check Out Page

3.2 Screen Flow

This is the general screen flow of the website. Most of the pages are linked by the buttons on the navigation bar.

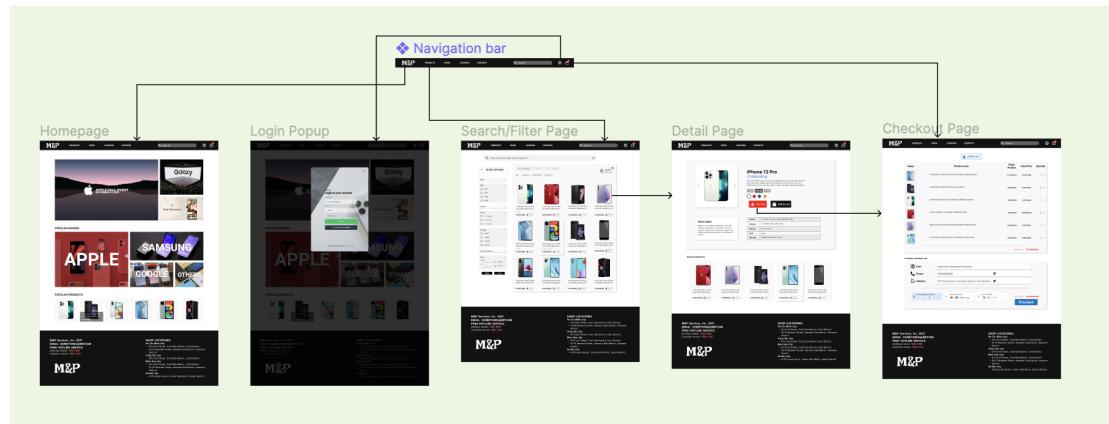


Figure 5: General screen flow

We also drew a flow chart to represent the normal flow when a customer navigates through the website. The boxes in green are the pages associated with a destination, and the blue ones are the pop-ups that can appear on top of any page when we click the icon in the navigation bar. Both are components of the website. The yellow diamonds show some decisions that need to be made.

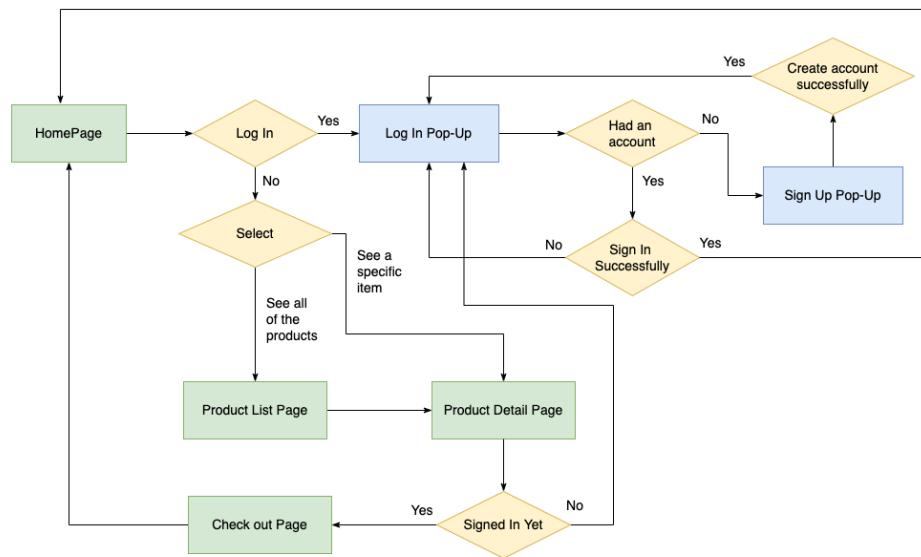


Figure 6: The normal flow



The normal flow does not contain all possibilities when navigating. This is mostly because the customers can opt out of the flow and choose the page that they want to visit by clicking the options on the navigation bar or enter the correct URL. This gives the customers much more freedom when visiting the website.

This also does not interrupt the main flow of the website. Two important states (whether the customer is signed in or not, and what items do they have in their cart) are managed. Therefore, it is not necessary to be worried if the customer choose not to go strictly the same as the normal flow.

4 Feature details

4.1 Home Page

The Home Page is similar to the UI design. Some animations and features are also added. If a user click on a brand, such as Apple, he/she will be directed to a page that only shows the products of the respective brand.

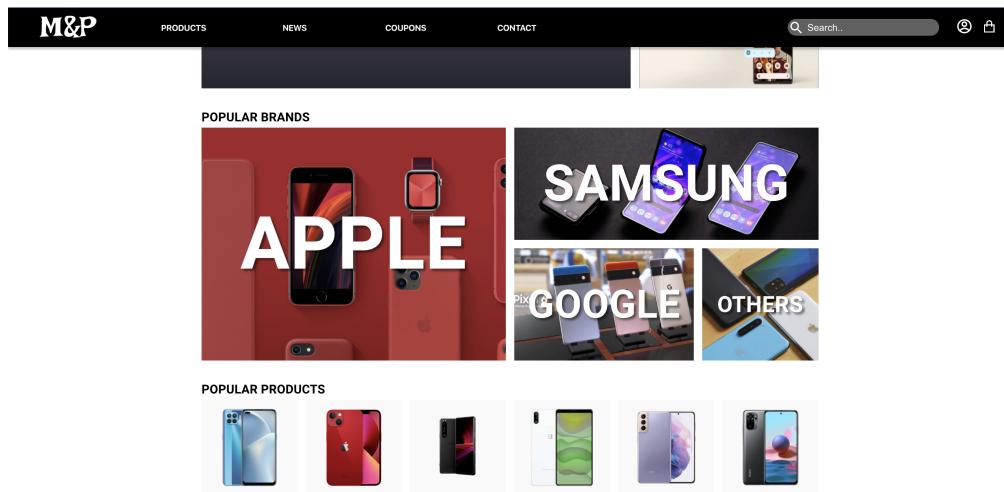


Figure 7: Home Page

If a user hover on a product image, the name and price of the product will pop up. If he/she click on the image, he/she will be directed to the detail page of the respective product.

POPULAR PRODUCTS



Figure 8: Popular Products



4.2 Navigation bar

The navigation bar contains the link to all of the essential pages. We have implemented the destinations for the PRODUCTS and M&P text. The NEWS, COUPONS, CONTACT text are just for presentation and are out of our project scope.



Figure 9: Navigation bar

The search bar, account, view cart icons are all usable. When searching by typing in iphone, the products showing are filtered to only phones that have the keyword in their names.



Figure 10: Search bar

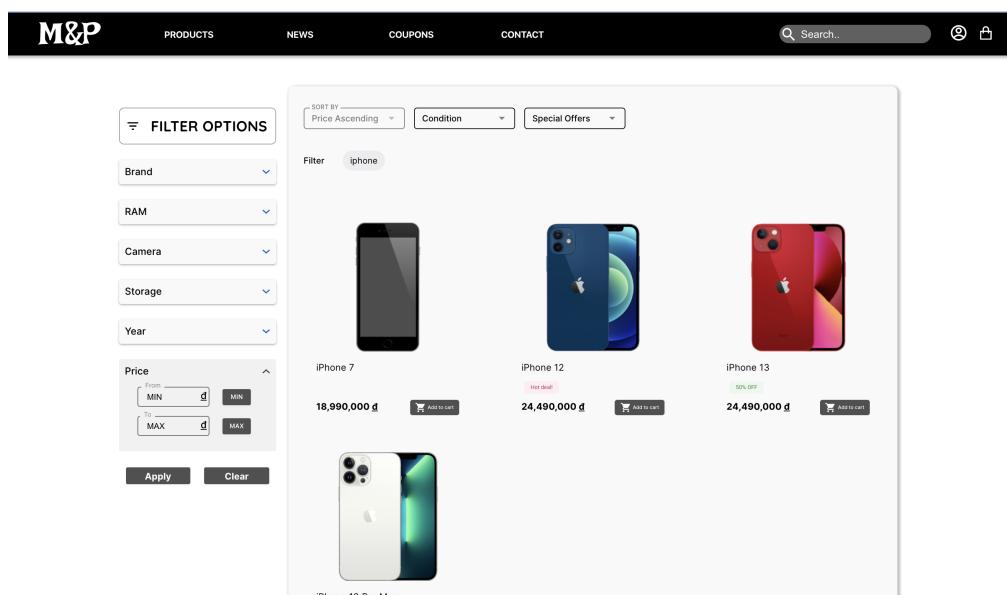


Figure 11: List of the iPhones after searching

By clicking on the cart icon, a summary of the cart shows up like this. The cart contains one or more products only when users have successfully signed in and some items are added to the cart.

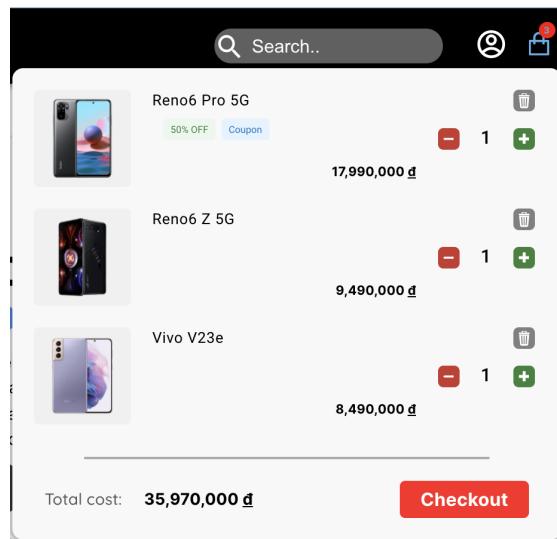


Figure 12: Cart summary

4.3 Authentication

If a user is not logged in, a list of **Sign In** and **Sign Up** options appeared. By clicking in either option, a corresponded pop-up will show up. If the user is logged in, there will only be one option **Sign Out** displayed here.

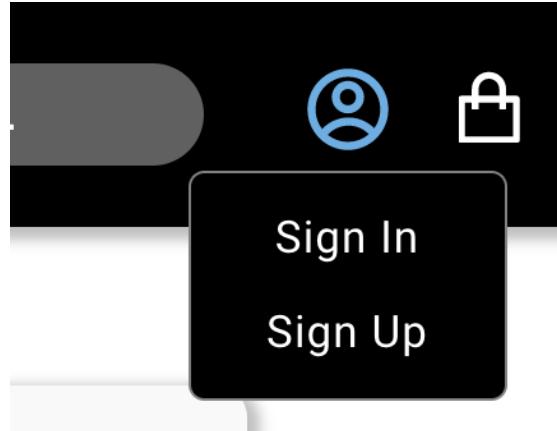
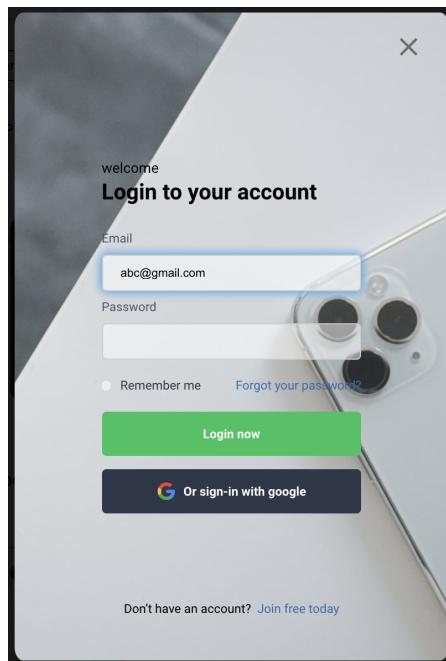


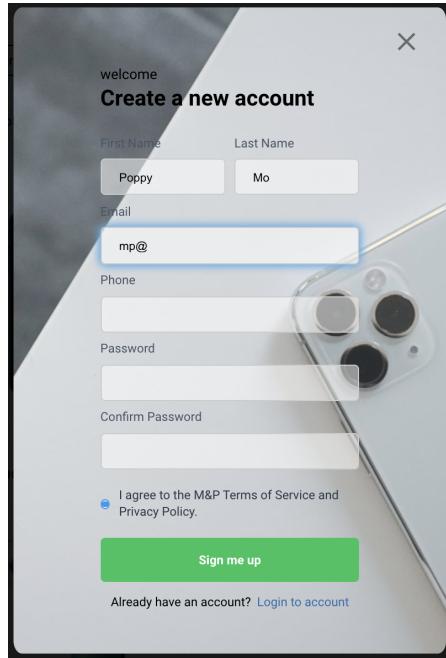
Figure 13: Sign In/ Sign Up Options

This is the sign-in form. If a user have successfully created an account on the website, he/she can input the email and password to sign in to the page. If not, he/she can click on the **Join free today** link, and a sign-up form will appear.



The login form is titled "Login to your account". It features a "welcome" message at the top. The "Email" field contains "abc@gmail.com". Below it is a "Password" field. There are "Remember me" and "Forgot your password?" links. A green "Login now" button is at the bottom left, and a "Or sign-in with google" button with a Google logo is at the bottom right. At the very bottom, there is a link "Don't have an account? [Join free today](#)".

Figure 14: Sign In Form



The sign up form is titled "Create a new account". It has fields for "First Name" (Poppy) and "Last Name" (Mo). The "Email" field contains "mp@". There is a "Phone" field, a "Password" field, and a "Confirm Password" field. A checkbox at the bottom left indicates agreement to the "M&P Terms of Service and Privacy Policy". A green "Sign me up" button is at the bottom left, and a link "Already have an account? [Login to account](#)" is at the bottom right.

Figure 15: Sign Up Form



4.4 Product List Page

This is the page that shows the list of the products. Based on the filter options, it can show different sets of products.

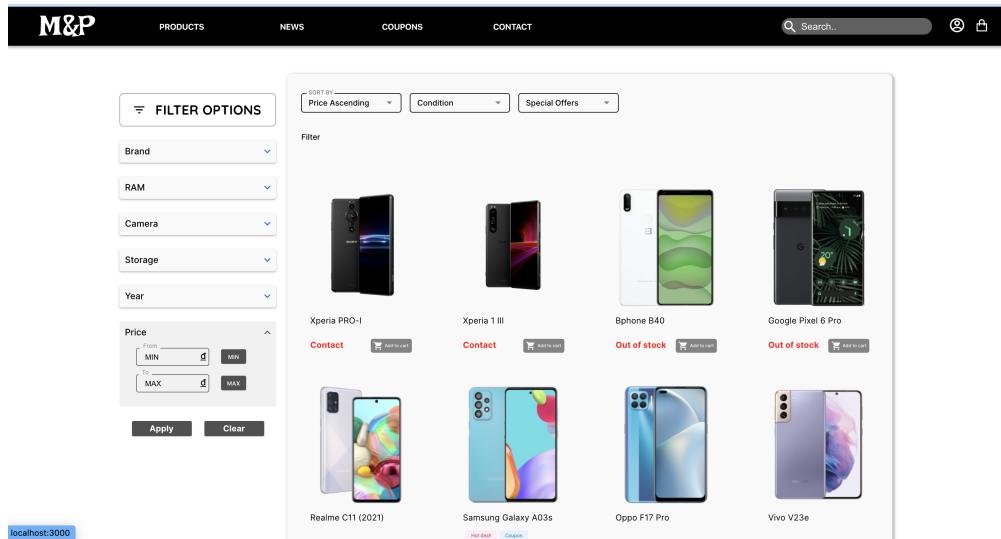


Figure 16: Product List Page

The filter list is initially collapsed, and will be expanded if clicked. The price range can be indicated as well. After clicking the **Apply** button, the page will be refreshed and the filtered will be applied. If the **Clear** button is clicked, all of the filters will be cleared. After filter is applied, the filter options are also displayed.

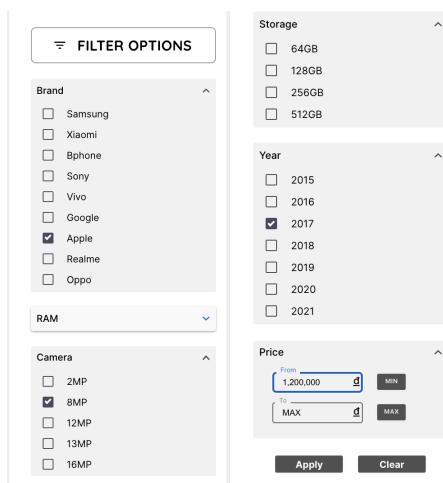


Figure 17: The filter column

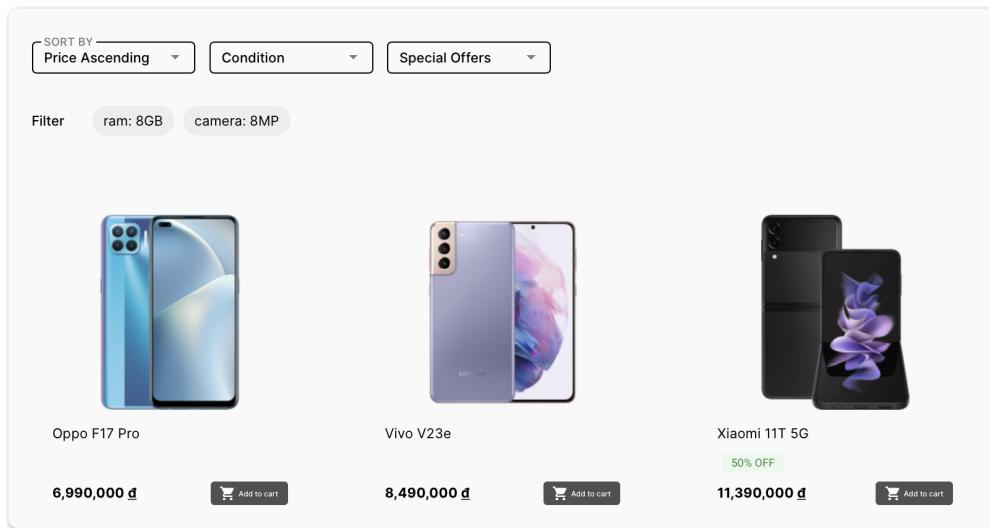


Figure 18: Filter by RAM: 8GB and camera: 8MP

There is also a row to sort the products by price, filter the products by their condition and special offers. A product will pop up if we hover the mouse over it. For each product, we can view its name, price, and image. If the product is Out of stock or its price is not available, the price will be replaced with its condition. If the products come with one or more special offers, its perks will also be included. Users can also add items to their cart in this page.

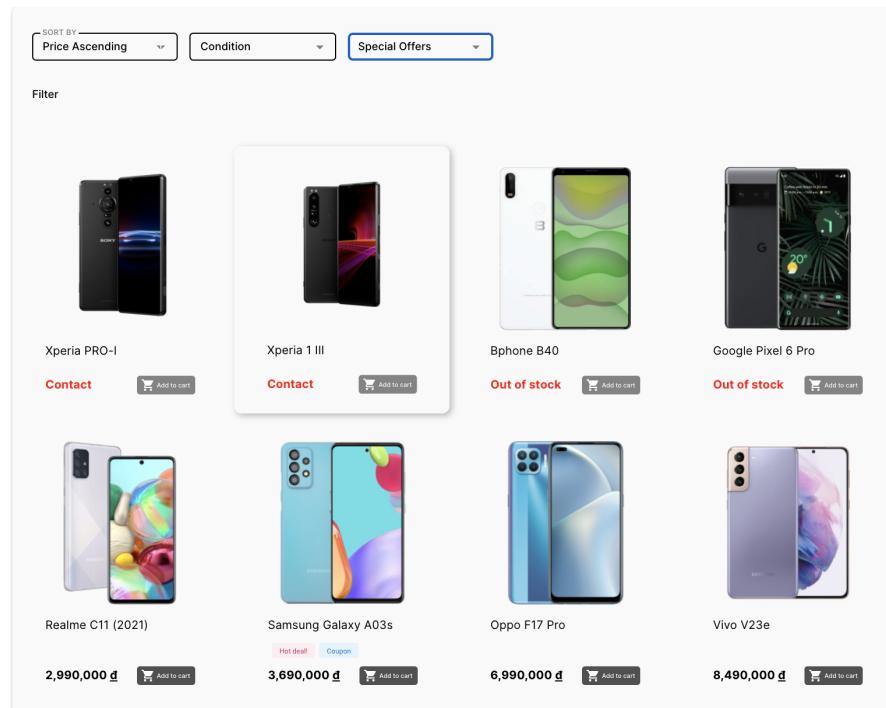


Figure 19: Close-up of the Product Page

4.5 Product Detail Page

By clicking on an image of a product, users will be navigated to this page, which contains more information. The **Brand** card shows a general description of the phone's brand. The table provides detail specifications. Since inputting the correct detail is quite problematic, sometimes we only placed some random passages.

Each product is associated with a different list of storage and color options. Users can choose from the options, and those chosen will be emphasized. If the user clicks the **Add to cart** button, it will simply add the item to their cart, and they can check immediately by clicking on the cart icon on the navigation bar. By clicking the **Buy now** button, the item is not only added to cart, the page is also directed to the **Check Out Page**.

On the bottom of the page, there is also a list of related products. These products are not fixed, they are randomly generated every time.

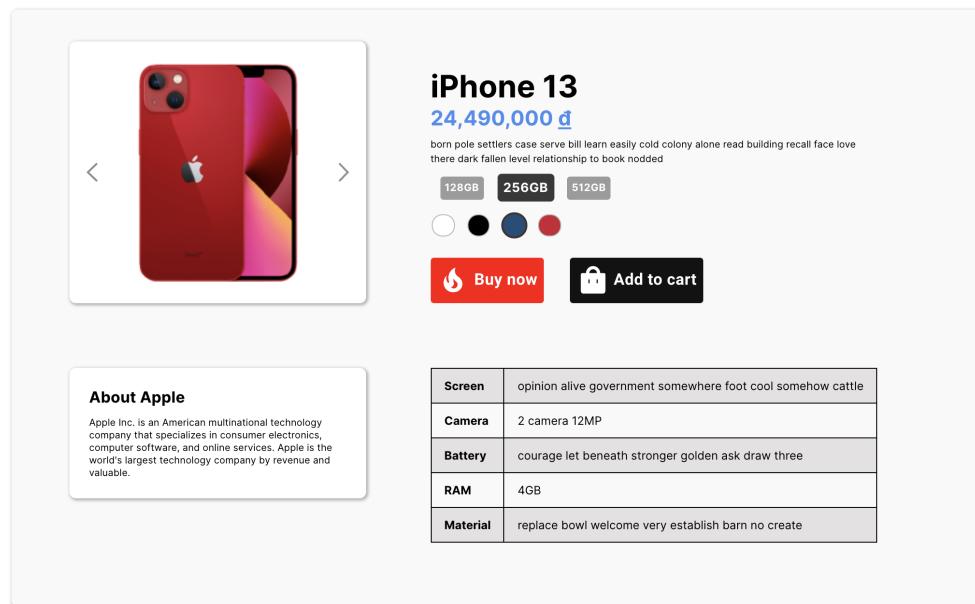


Figure 20: Product Detail Page



About Apple Apple Inc. is an American multinational technology company that specializes in consumer electronics, computer software, and online services. Apple is the world's largest technology company by revenue and valuable.	<table border="1"><tr><td>Screen</td><td>park before improve combine orange happened steam pair</td></tr><tr><td>Camera</td><td>3 camera 12MP</td></tr><tr><td>Battery</td><td>love compare fastened opinion region daily cloth fourth</td></tr><tr><td>RAM</td><td>4GB</td></tr><tr><td>Material</td><td>article place broad closer further store top later</td></tr></table>	Screen	park before improve combine orange happened steam pair	Camera	3 camera 12MP	Battery	love compare fastened opinion region daily cloth fourth	RAM	4GB	Material	article place broad closer further store top later
Screen	park before improve combine orange happened steam pair										
Camera	3 camera 12MP										
Battery	love compare fastened opinion region daily cloth fourth										
RAM	4GB										
Material	article place broad closer further store top later										

RELATED PRODUCTS

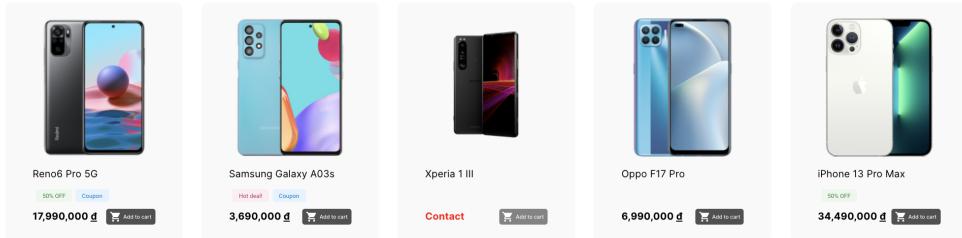


Figure 21: Related Products



4.6 Check Out Page

Finally, users can check out at this page after they signed in and have one or more products in the cart. Users can modified the quantities of the existing products and can remove them at this stage. The total price will be calculated for them.

Image	Product name	Price / Product	Total price	Quantity	
	iPhone 13	24,490,000đ	24,490,000đ	- 1 +	Remove
	iPhone 13 Pro Max	34,490,000đ	34,490,000đ	- 1 +	Remove
	iPhone 7	18,990,000đ	18,990,000đ	- 1 +	Remove
	Reno6 Pro 5G	17,990,000đ	17,990,000đ	- 1 +	Remove
	Xiaomi 11T 5G	11,390,000đ	11,390,000đ	- 1 +	Remove
Total cost: 107,350,000đ					

Figure 22: Check Out Page

Below that, there is a simple form which is halfway filled in by the information provided when users signed up an account. At this stage, he/she needs to fill in the correct address, choose a payment option, then click **Proceed**. An alert will show up indicating that the simulation is successful, and an order placement activity ends here.



The form displays the following information:

- Total cost: 107,350,000 ₫
- PERSONAL INFORMATION:
 - User: Mobi Poohne
 - Phone: 08212345618
 - Email: mp@gmail.com
 - Address: Enter your address...
- Payment Options:
 - Pay by Payment Systems: ePay, GPay,...
 - Pay by Credit Card: VISA,...
 - Pay by E-Wallet:...
- Total cost: 107,350,000 ₫
- Proceed button

Figure 23: Check Out Form