

IM3180 Design and Innovation Project

(AY2023/24 Semester 1)

Project Report

Title: NTU MART

Github: <https://github.com/garrysjh/NTUMart>

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1. Background and Motivation

1.1 Background Information

The introduction of ecommerce apps such as Shopee and Lazada in Singapore has contributed to the rise of the consumerism culture in Singapore. There is a plethora of products to choose from online where anyone can buy them with a simple click of a button. With the convenience of purchasing items online, many students end up buying an excessive amount of items for their hall room.

An annual report by NTU pointed out that NTU's 25 residential housing houses more than 14,000 students [1]. Our survey respondents have revealed that while they are moving in and out of halls, many students encounter difficulty finding buyers for the items they purchased for their halls. These items include fans, fridges, hangers, and an unending list of hall items being thrown away just because a new owner cannot be found. The students also stressed the challenges of transporting these items when moving in or out.

Existing avenues for NTU students are the NTU marketplace telegram group and general eCommerce applications(apps) such as Carousell and Shopee. However, almost all of these options suffer from a lack of moderation and oftentimes information overload for users. Examples include the NTU marketplace telegram group, in which the admin has been making use of the popularity of the telegram group to promote his own projects, both academic and monetary. Furthermore, mobile eCommerce apps such as Carousell try to maximise in-app sales, causing users to be recommended products outside of their interests and intrusive advertisements that hinder the user experience. Additionally, these apps cater to the wider user

base, causing lack of moderation along with less safe transactions, leading to a higher possibility of untracked scams.

We conducted a survey on NTU students on their experiences with the NTU marketplace telegram group and other general e-commerce applications.

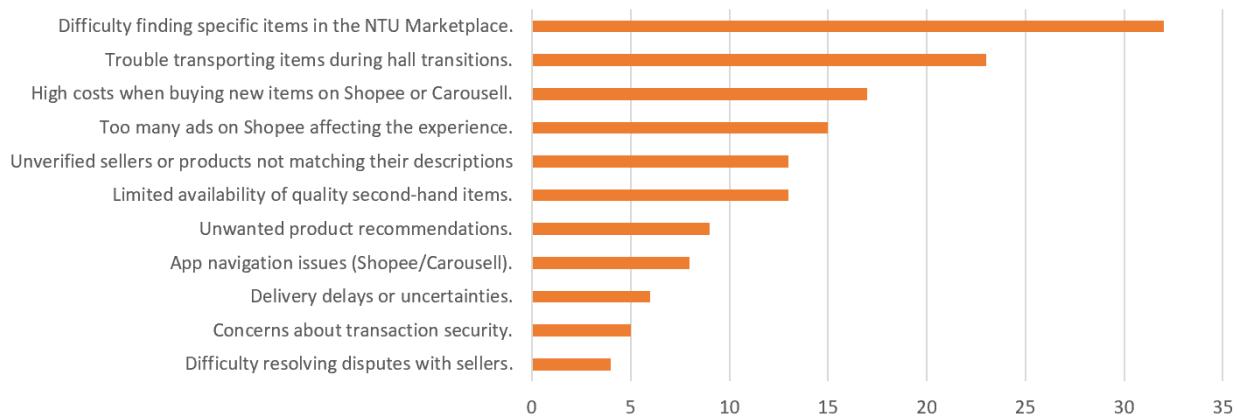
"The NTU marketplace telegram app is too convoluted and cluttered, and it's hard to find items that I want because I have to use the exact search terms and there's no moderation"

–Anonymous student on the NTU marketplace telegram group

"I don't like how I'm being bombarded with advertisements and bright colours the moment I open the app"

–Anonymous student on general e-commerce applications

What challenges do you face when shopping online in NTU Hall? (NTU Marketplace telegram group, other eCommerce apps)



The survey results highlight the challenges NTU students face when shopping online, especially in the context of the NTU marketplace Telegram group and general e-commerce applications. Furthermore, it highlighted the problem that students might face during hall transitions. Based on the feedback received, it is clear that there is a demand for a more streamlined, user-friendly, and moderated platform that caters specifically to the needs of NTU students. Here are some key takeaways and potential solutions:

1. Clutter and Convolution:

Address the issue of clutter and convolution by designing a clean and intuitive user interface. Simplify navigation and categorization to make it easier for users to find what they need.

2. Moderation and Community Guidelines:

Implement robust moderation mechanisms to ensure a positive and trustworthy environment. Establish clear community guidelines to prevent misuse or self-promotion by group administrators and members.

3. Targeted Recommendations:

Differentiate from existing e-commerce apps by providing personalised and targeted recommendations. Avoid intrusive ads and focus on enhancing the user experience rather than maximising in-app sales.

4. Hall Transition Support:

Recognize the challenges faced by students during hall transitions. Create specific features to facilitate the buying and selling of items related to hall living, especially during move-ins and move-outs.

5. Inclusive and Community-Driven Approach:

Differentiate the platform by adopting a more community-centric model. Emphasise the convenience and affordability of daily-use items for students, fostering a sense of community support.

1.2 Motivation of Our Mobile Application: NTUMart

To make an all-in-one student online marketplace where students can go to buy and sell items, especially during peak periods, mainly the beginning and end of each academic year, when students are attempting to furnish or clear out their hall rooms. The app would also serve as a more organised decentralised library for all items sold by students which would ease the browsing experience when trying to find specific items online.

2. Objective

2.1 Improved UI/UX Experience

Our application prioritises user-friendly design to ensure that students, regardless of their digital proficiency, can navigate with ease. The intuitive interface focuses on simplicity, minimising clutter through intentional design choices. Here's how we achieve this:

1. Home Page:

The home page serves as a centralised hub, featuring a clean and organised layout. Taskbar buttons lead to broad categories, ensuring a straightforward starting point for users. Customised product recommendations based on chosen interests, addressing the problem of too many disruptive ads on other eCommerce apps and avoiding unwanted product suggestions.

2. Broad Categories:

Features are grouped into broad categories such as "Buy", "Sell", "Search", "Hall", and "Profile".

Each category encompasses related functionalities, reducing complexity and making navigation more straightforward.

3. Navigation Bar:

A simple and easily accessible navigation bar remains present across all pages.

Icon-based navigation aids visual recognition, allowing users to quickly identify and access different sections.

4. Search Functionality:

A prominent search feature is implemented for users to find specific items, posts, or information effortlessly.

5. Minimalist Design:

The overall design adheres to minimalist principles, ensuring a clean and uncluttered aesthetic.

Unnecessary elements are removed, focusing on essential features and content.

6. User-Friendly Forms:

When users need to create posts or listings, user-friendly forms with clear instructions and intuitive input fields are implemented.

Error messages are concise and guide users in correcting any input issues.

7. Feedback and Help:

Clear prompts and tooltips are provided throughout the application to guide users.

A dedicated help section or chat support is available for users who may need assistance.

8. Responsive Design:

The interface is designed to be responsive, ensuring a seamless experience across various devices, including smartphones, tablets, and desktops.

By focusing on these design principles, our application aims to provide an inclusive and user-friendly experience, catering to the diverse digital proficiencies of NTU students.

2.2 Chatbot Feature to Guide Users and Assist Them in Their Inquiries

Our in-app chatbot is a powerful functionality designed to enhance user interactions by providing real-time guidance and assistance. This feature employs advanced natural language processing algorithms to understand user inquiries and respond with relevant information, step-by-step instructions, or suggestions. Whether users seek information, need help navigating the app, or have specific queries, the chatbot intelligently engages in conversation to guide them toward the desired outcome. This interactive and user-friendly tool streamlines the user experience, offering a personalised and efficient way to address inquiries while minimising frustration and increasing overall satisfaction.

2.3 All-In-One Social Media Integration with NTU Halls

The integration of an in-app message board with temporary image posts in our application addresses a significant challenge faced by NTU students during their hall transitions. Our solution facilitates seamless communication and connectivity among NTU students, resembling the temporary image post features seen in Instagram stories.

By leveraging this feature, students can effortlessly connect with their hallmates, sharing information about items they wish to sell or buy. The temporary image posts provide a visually appealing and efficient way for users to showcase their items and preferences. This not only streamlines the process of selling and buying goods but also fosters a sense of community within the halls. Moderation can also be done on the hall committee end, to promote events

hosted by the halls themselves and can even extend to further use cases such as large-scale flea markets.

This in-app message board serves as a centralised hub for students to navigate their hall-related transactions, reducing the hassle associated with finding buyers or sellers through traditional means. Furthermore, it acts as a medium of connection between rooms; for outgoing hall stayers to have a message board to give away or sell items to incoming hall stayers, or for roommates who have not met each other to leave a message for each other. Ultimately, our application aims to enhance the overall experience of NTU students during their stay in halls by promoting a convenient and interconnected community.

2.4 Augmented Reality

One novel feature that NTUMart offers is the integration of augmented reality to allow users to pick up, examine, and manipulate virtual representations of products, providing a more immersive understanding of their design and functionality. Additionally, the application provides interactive elements, such as zooming in on details or rotating items, to offer a closer look at product features. While the integration of augmented reality (AR) in NTUMart presents a novel and immersive shopping experience, the requirement for users to input their own 3D models introduces a potential limitation. To address this challenge and enhance user convenience, we propose the following solutions:

1. Pre-loaded 3D Models:

NTUMart can collaborate with product manufacturers and suppliers to obtain standardised 3D models for popular products. These pre-loaded models would cover a wide range of items, allowing users to explore and interact with them without the need for individual 3D inputs.

2. User-Friendly 3D Scanning:

Develop a user-friendly 3D scanning feature within the app that enables users to capture and upload their own product models. This could involve leveraging the capabilities of modern smartphones for scanning purposes, making the process accessible to a broader user base.

3. Review of Literature/Technology

3.1 Base Applications

We reviewed existing marketplace applications targeted towards university students, in order to analyse their respective pain points. This would allow us to take these pain points into consideration, to minimise shortcomings in the design and implementation of our app. While we examined various case studies such as Rumie, Hazaar and Carousell, ultimately Hazaar was chosen as our base application to build upon (Appendix E). Hazaar is another marketplace app designed for university students residing in the United Kingdom, with a focus on sustainability. Hazaar also emphasises community, by utilising a university-specific database to allow students of the same university to buy and sell pre-loved items. This university-specific database allows for convenient meet-ups on campus for the sale of items, given that both parties involved are students of the university.

4. Design and Implementation

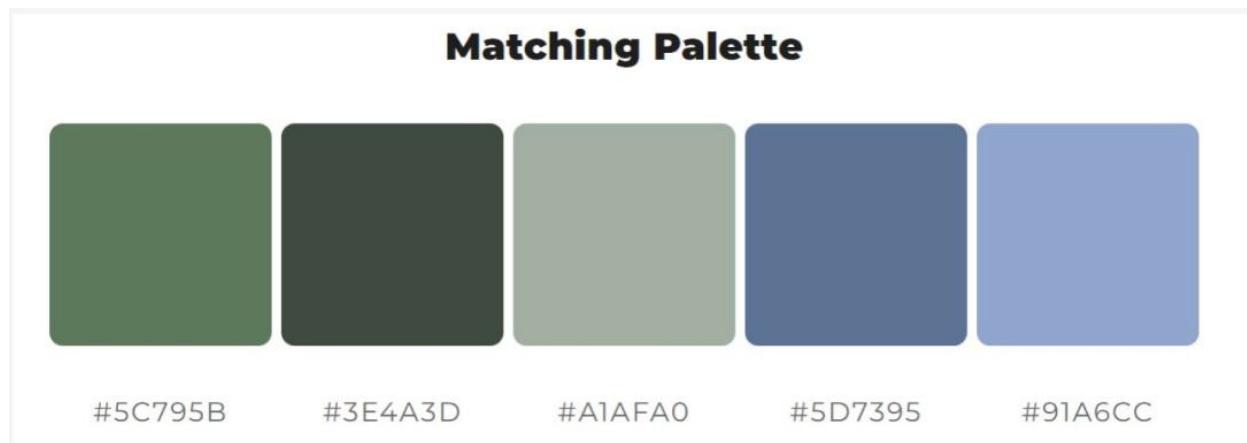
4.1 Design Consideration / Choice of Components

To provide a clean but user-friendly interface, design components mainly utilise rounded corners such as circular buttons or rectangular item cards with rounded corners. To keep with our objective of providing a beginner-friendly experience, features are compartmentalised into broad categories and have minimal overlap, the profile tab is used to amend the user's details or

modify any app-related settings, the community tab is used for the room-specific message board and level-specific chats.

4.1.1 Thematic Choices — Color Scheme and Font

For the colour scheme of the app, we decided on an off-white background with green accents, and this colour scheme is used consistently throughout the app. An off-white background provides a clean and modern look, promoting a sense of simplicity and clarity, without the striking glare that a pure white colour gives, especially in dim-lit environments. This can enhance the overall visual appeal of the university marketplace application. Using green accents on an off-white background allows the green colour to stand out prominently. Green, associated with vitality and growth, can be strategically used to draw attention to important elements such as buttons, icons, or calls to action within the app. Blue is used as a secondary colour to provide a complementary feel but also provide a sense of differentiation from an off-white and green colour scheme that may seem too monochromatic.



4.1.2 Illustrations and Icons

For our mascot design, we integrated the university's lion mascot to create a sense of belonging and connection for NTU students. By featuring the iconic lion, we aim to evoke a strong sense

of familiarity, pride, and community amongst students when they use our marketplace app. The mascot serves as a symbolic link, reinforcing the app's association with the NTU community and providing users with a visual representation of their university identity.

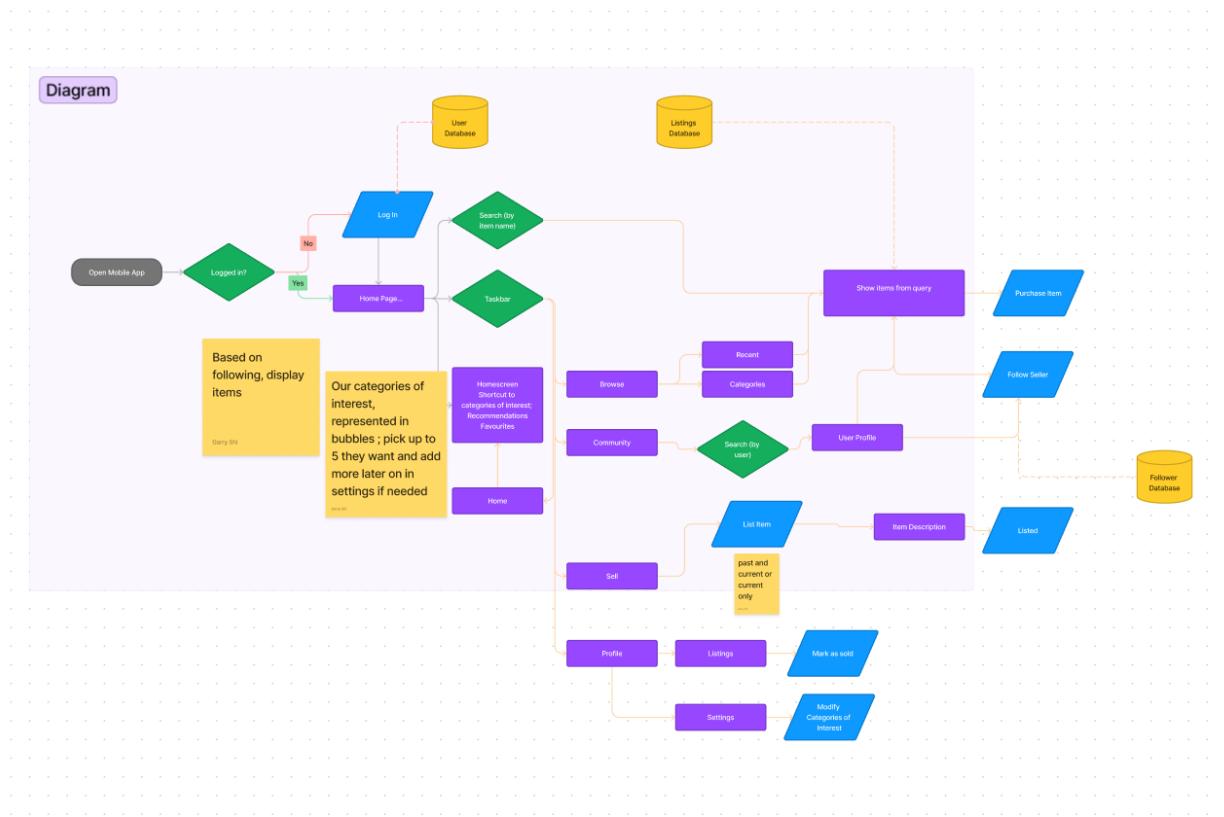
4.1.3 Design Considerations

- User-friendly interface: Emphasising a user-friendly interface was a key focus for us, prioritising a clean and intuitive design to facilitate effortless navigation for university students, and acknowledging the potential variation in their technical proficiency. This involved employing a palette of subdued and limited colours, a deliberate choice aimed at promoting accessibility and ensuring a positive user experience. By incorporating these design elements, we aimed to create a platform that caters to the diverse technological backgrounds of our users, ultimately enhancing the usability and satisfaction of the interface for all.
- Verification and Safety: Integrated a reliable user verification system to enhance security and foster trust among users within the university community. All users have to sign up with their NTU emails. This allows us to resolve any potential disputes that may arise between buyers and sellers. Furthermore, to maintain a safe and respectful community environment, stringent measures are in place to promptly identify and address malicious and inappropriate behaviour. By integrating this verification process, we not only bolstered the safety measures of our platform but also established a sense of reliability and authenticity among users. This deliberate approach to user verification reflects our commitment to providing a secure environment for all members of the university community, promoting confidence in the integrity of the platform.
- Location-based Services: Leverage location data to enable students to find and connect on campus easily, fostering a sense of community and ease of navigation.

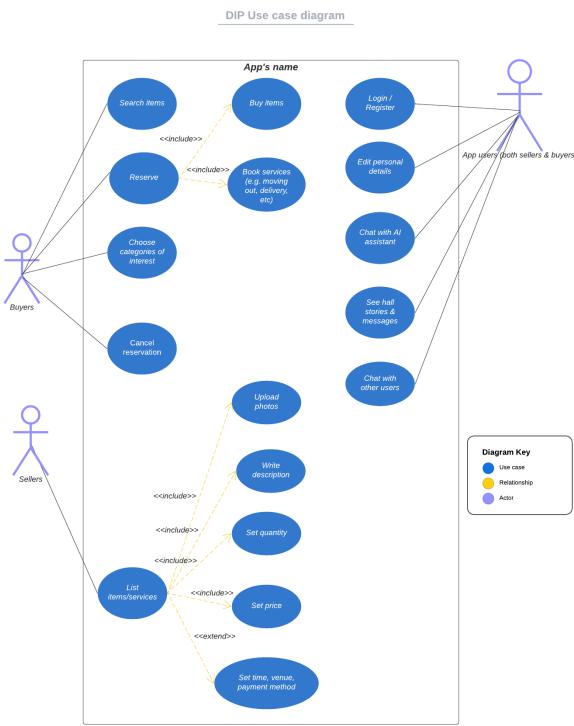
- Student-Centric Features: We introduced customised features catering specifically to the needs of students and residents within university halls. This includes a platform for the sale of used textbooks, facilitating a cost-effective and sustainable way for students to acquire course materials. Additionally, we incorporated student services into the platform, offering resources and support tailored to the academic journey. As part of our commitment to sustainability and community well-being, we implemented a feature for giving away hall essentials when moving out after an academic year, promoting a collaborative and eco-friendly approach to resource sharing within the student community. These tailored features aim to enhance the overall experience for students and residents, addressing their unique needs and fostering a sense of community within the university environment.

4.2 Final Design

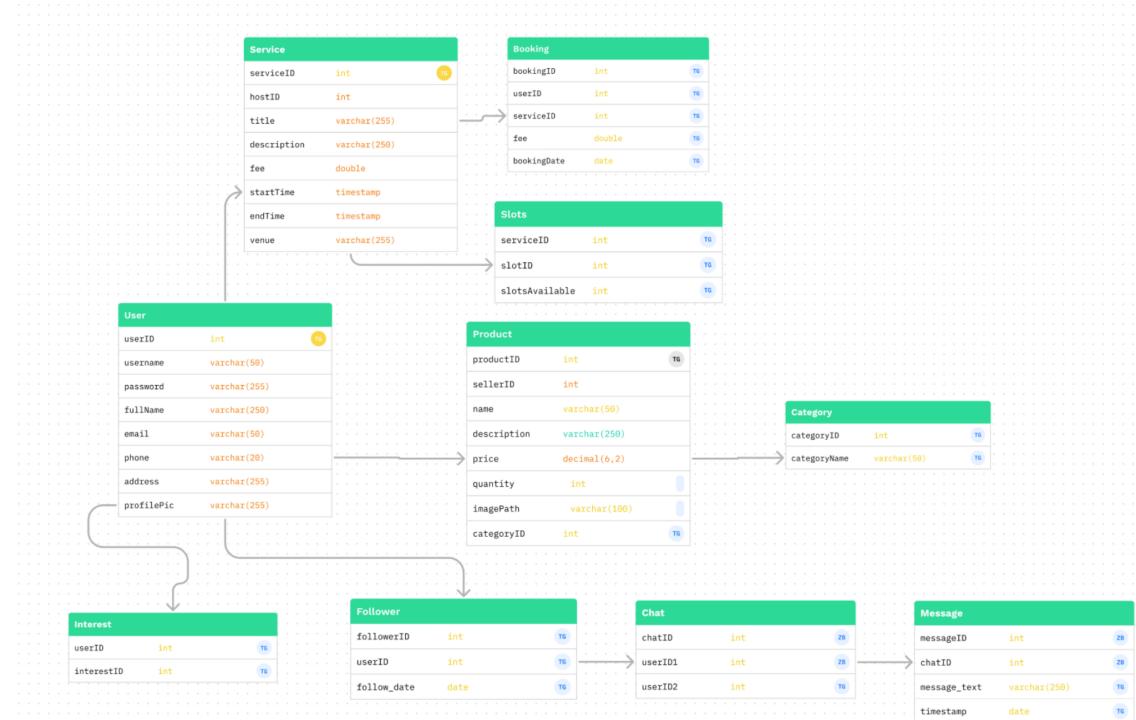
4.2.1 Sitemap



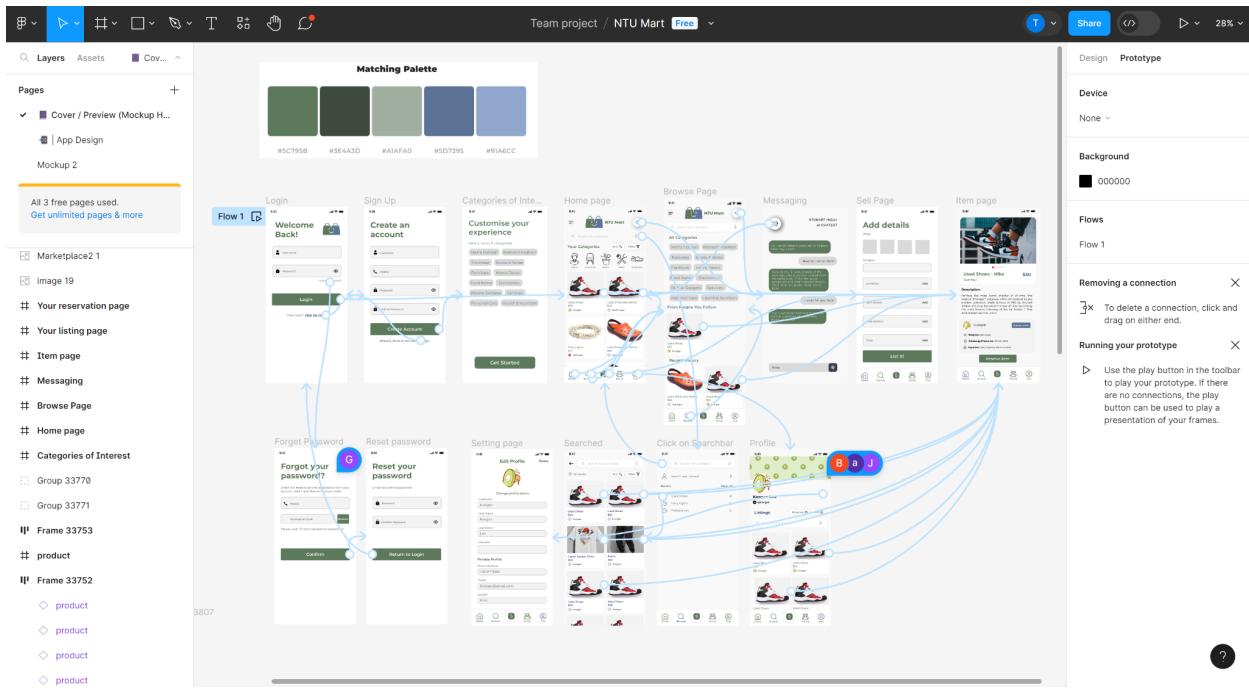
4.2.2 Use-Case Diagram



4.2.3 ER Diagram



4.2.4 Figma Interface Design



4.3 Implementation

4.3.1 Frontend

The front-end framework of our choice was Flutter. Flutter is an open-source framework developed by Google that utilises the Dart language that allows for the building of natively compiled cross-platform apps. We chose Flutter due to 2 main reasons: The cross-platform nature of the framework and the Flutter development support by Google.

Flutter as a framework provides reusable existing styled-components, which also promises a shorter time to development than Kotlin or React Native. Flutter exists as a more flexible framework with minimum dependency on third-party tools, while at the same time maintaining the same code base between different operating systems (IOS and Android), which suits our small team of 10 developers very well.

4.3.2 Backend

The backend framework of our application was Spring Boot. Spring Boot is an open-source Java-based framework developed by Pivotal that is designed to make it easier to create production-ready applications with minimal setup and configuration.

We also decided to choose a customised framework with auto-customization over a Backend service such as Firebase, so that we could have more control over our processed data. This is because an application such as ours is data-heavy, and we prioritised scalability over time-to-ship products. Furthermore, having our application run on JVM with Spring Boot allows for easier scalability for multiple clusters in the cloud, such as an on-prem Kubernetes cluster for better performance, to allow for potential future expansions into other universities such as NUS or SUTD.

4.3.3 Database

We selected MySQL as our database of choice, opting for a relational database over a non-relational one. Despite the more intricate implementation process, we prioritised consistency and speed in our backend. This decision was made to spare our backend team from managing rapidly changing data shapes. Utilising a relational database ensures that the structure remains organised, streamlining the implementation process.

Relational databases are often designed to scale vertically efficiently because they can take advantage of the increased resources on a single machine. Horizontal scaling involves distributing the load across multiple servers, commonly achieved through technologies like sharding or replication. For relational databases, horizontal scaling can be more complex because maintaining consistency across distributed data sets while ensuring transactional integrity becomes a challenge. Therefore, given our application is specifically designed for

university students, we opted for vertical scaling over horizontal scaling. This decision aligns with the fixed number of university students, allowing us to optimise performance and efficiency in a controlled environment.

4.3.4 Final Product

Please refer to “Appendix D - Final Design Guide” to see all the screens of our app.

4.4 Development Phase

During the duration of the project, the team was split into 2 different sub-groups, frontend and backend. In the first few weeks, the team emphasised brainstorming, wireframing, and designing UI to get started with the coding. Wireframing was finished on week 3 and the frontend team started with the coding of the wireframe.

During the development phase of the project, our group implemented loose communication between the sub-groups with weekly meetings. Every meeting was about weekly deliverables and updates on our progress. Implementing such a system allowed everyone to contribute to the project effectively.

In addition to fostering communication through weekly meetings, we leveraged Jira as a comprehensive project management tool. Jira played a pivotal role in tracking and managing tasks, facilitating seamless collaboration among team members, and providing a centralised platform for project-related information. It allowed us to create and prioritise tasks, assign responsibilities, set deadlines, and monitor progress in real-time. The use of Jira not only enhanced our project's organisational efficiency but also provided a transparent and accessible framework for the entire team to stay aligned with project goals and milestones.

To combine the individual progress of each member, we used Figma for design and GitHub for code. With different branching names, version control, and features like pull requests from GitHub, we can review and merge the code easily.

4.5 Discussion

The project requires a lot of effort in the process, from planning to development. This involves the collaboration of 3 aspects: design, frontend and backend. To achieve a fully working application, we needed to spend an extensive duration of 6-10 hours a week.

There are some challenges faced throughout the development such as information discrepancy and code integration. By continuously searching for resources, we managed to get to where we are now.

The choice of software that we use allowed us to expedite the development process. Having Github makes the collaboration between developers easier, especially with branching and version control.

The selection of Jira as our project management and issue-tracking tool played a crucial role in streamlining and enhancing our development process. Jira provided a robust platform that facilitated effective collaboration and project management throughout the development lifecycle.

One notable advantage of using Jira was its powerful issue-tracking capabilities. It allowed us to create, prioritise, and assign tasks seamlessly. The intuitive interface made it easy to track the progress of each task, ensuring that everyone on the team was aware of current priorities and upcoming deadlines.

5. Business Model

5.1 Initial Funding

Given the existence of a working prototype of NTUMart and a predefined customer base that has yet to be tapped into, we aim to raise funds through a pre-seed round. The funds from pre-seed investments are then utilised for minimum viable product (MVP) development, and to develop a marketing and sales strategy to grow and secure our customer base. We will then run pilot trials in order to gain initial user traction and to also gain feedback from early adopters.

During the pre-seed round, we intend to validate our value proposition through consolidated feedback from existing users and differentiate ourselves from existing competitors in the market and develop a business plan as a roadmap for the future of our app. Our business plan would include existing market research as well as financial projections to demonstrate the potential of our app.

Given the oversaturation of start-ups vying for seed fund investors, we first aim to have a definite MVP, an existing user base and a detailed business plan. By having these components ready during the pre-seed round, we will be able to attract investors through detailed preparation and proof of concept.

During the seed round, we aim to establish a positioning strategy that would allow us to achieve product-market fit, by refining NTUMart such that it resonates with our target audience of NTU students. Subsequently, we can develop a foundation for sustainable growth through achieving product-market fit, defining the future scalability of our app, and generating early revenue. However, in order to achieve these objectives, we will need to implement monetisation models

during the seed stage. Monetisation models can help to prove NTUMart's financial viability to seed investors.

5.2 Monetisation Models

Furthermore, we have also prepared various avenues for monetisation and expansion in the future. Given the nature of our app having a smaller user base due to market segmentation, we decided to offer more services to assist this smaller user base in easing into the transactional process, ultimately providing a higher quality of service. By diversifying our monetisation strategies, we can also enhance the sustainability of our app in the long run.

5.2.1 Paying Extra for a Delivery Service

Upon the listing of an item to be sold, one can opt-in to pay extra for a delivery service provided by our team at a low cost which is currently defined at S\$3. A transport service such as this is akin to nighttime food trucks that are currently operating in NTU, such as Dingo and Raydys. These food trucks deliver pre-ordered food to defined locations in halls to offer convenience to customers. In the same vein, one of our monetisation models would then involve us serving as the middleman. This allows customers who are buying or selling to not have to deal with the hassle of collection or delivery, in exchange for a small fee.

5.2.2 Switching to a Pay-for-Exposure Model

We currently offer multiple avenues for exposure, especially since we have integrated social media-esque features in our application, such as stories for each individual hall or level, which are run by a designated team. We also provide exposure in the form of our own personal recommendations system, for which we show the items buyers are more likely to buy based on their personal interests on the front page of the app. Eventually, we can switch to a pay-for-exposure model, in which a seller chooses to pay more to ensure that their item reaches

a larger user base. This would involve either or both, paying extra to have their items be advertised in the hall stories (for residents who want to sell items desperately such as those who are moving out) or paying extra to have their items show up in other peoples' recommended items.

5.2.3 Collaborations and Partnerships

Given the thriving community in NTU consisting of student-led organisations and small businesses, we can collaborate with these organisations in exchange for a commission fee. App users stand to benefit from exclusive deals and discounts from these collaborations, and we subsequently benefit financially through a percentage-based fee imposed on the generated revenue. This also aligns with our goal of enriching the NTU community by promoting student-led initiatives and allows us to tap into another market segment of people looking to support local businesses.

6. Conclusion and Recommendation

6.1 Conclusion

In summary, our app offers practical solutions to common challenges faced by NTU students when doing online shopping while staying in NTU Halls.

- For those struggling with "Difficulty finding specific items in the NTU Marketplace Telegram group," our app provides an efficient search function, allowing users to find items based on name, category, and seller, and sort by price.
- When it comes to the concern of "Trouble transporting items during hall transitions," our platform facilitates a "hall moving service" listing and a "Community page" where users can explore posts and messages from hallmates, making it easier to find items nearby and simplify transportation during transitions.

- Addressing the issue of "High costs when buying new items on Shopee or Carousell/Limited availability of quality second-hand items," NTUMart becomes a valuable resource for students seeking affordable second-hand items within their network of friends.
- In response to the problems of "Too many ads on Shopee affecting the experience" and "Unwanted product recommendations," our user-centric approach allows users to customise their preferences. By selecting preferred categories, the app's home page only suggests items falling under those chosen categories, prioritising a seamless and personalised shopping experience.
- Concerns about "Unverified sellers or products not matching their descriptions" are alleviated by the app's exclusive access for NTU students, who must register using their NTU emails. Additionally, the incorporation of an AR model displays real 3D models of items, enhancing trust and reducing the likelihood of misrepresented products.
- For those who've faced "App navigation issues (Shopee/Carousell)," our user-friendly interface and AI chatbot offer assistance, ensuring a smoother and more intuitive shopping experience.

Throughout the project, we encountered technical challenges but collaboratively overcame them. This endeavour significantly enhanced our technical skills, including proficiency in Flutter for frontend development, Java Spring Boot for the backend, and MySQL for the database. The project also honed our teamwork and project management skills, providing valuable lessons in industry-standard tools like Git, GitHub for version control, and Jira for agile processes. The experience has not only equipped us with practical skills but also instilled a deep understanding of user-centric problem-solving. This project stands as a valuable addition to our resumes, showcasing our ability to address user pain points and contribute effectively to a collaborative project.

6.2 Recommendation for Future Works

Looking ahead, we have strategic recommendations for the future development and promotion of our app. To expand its reach, we aim to collaborate with NTU's Student Affairs Office (SAO) and the Nanyang Technological University Students' Union (NTUSU), leveraging their platforms to connect with a broader student audience. Additionally, establishing a dedicated Instagram account for our app will serve as an effective marketing tool to engage and inform users about our services.

In terms of scalability, our focus is on the technical enhancement of the app to accommodate a growing user base. This involves the addition of advanced technical and network services to ensure the app remains robust and performs optimally, especially during peak usage times when many users may access it simultaneously.

Furthermore, in order to maintain a healthy and secure app environment, we plan to introduce an 'administrator' role. These administrators, who could be members of our development team or representatives from NTUSU or SAO, will be responsible for overseeing the platform. Their duties will include monitoring and taking down inappropriate listings, enforcing rules and policies, and, importantly, blocking users who violate terms and policies. This multifaceted approach aims to create and maintain a positive user experience for everyone engaging with the app.

7. Appendices

7.1 Appendix A — Design Diagrams

Please refer to “4.2 Final Design” to see our Sitemap, Use-Case Diagram, ER Diagram, and Figma Interface Design.

7.2 Appendix B — User Guide

User guide

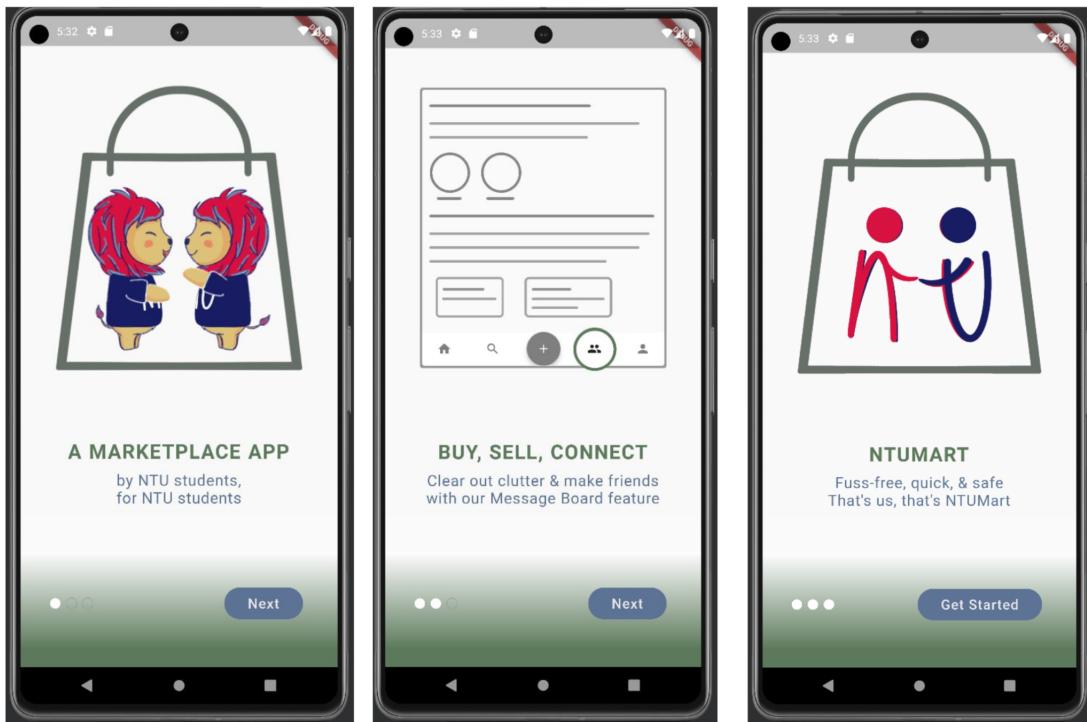
- Create an account in our app
- After logging in, users are prompted to select up to 5 product categories they are interested in (categories of interest) to customise their shopping experience.
- Once a user successfully logs in, they can browse the available listings on their homepage or search for the item they are looking for from the search bar.
- In a case where the user is having issues finding the item they want, they can utilise the built-in chatbot to aid them.
- If they are not here to purchase, they can also list any items they want simply by attaching images of the product and filling up the information of the product such as price, condition, and description.

7.3 Appendix C – Source Code

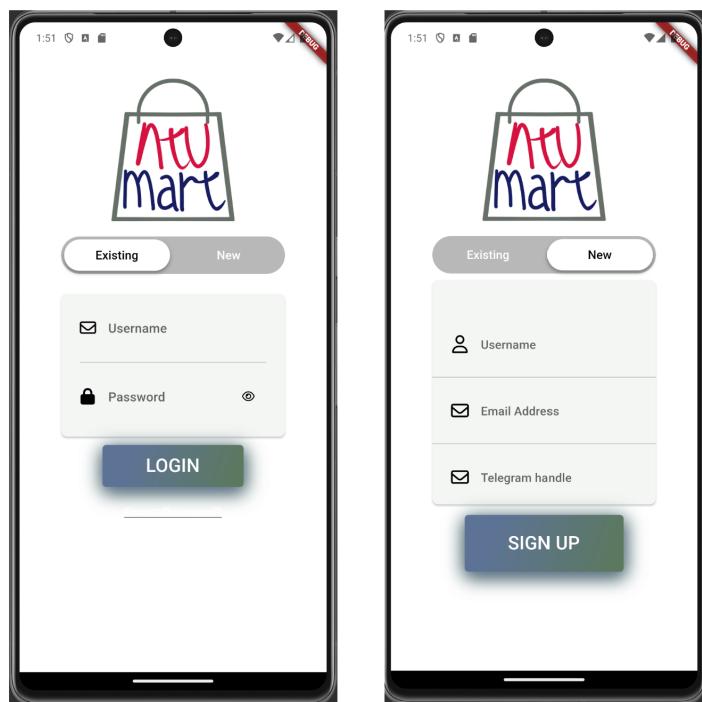
All codes can be accessible via <https://github.com/garrysjh/NTUMart>

7.4 Appendix D – Final Design Guide

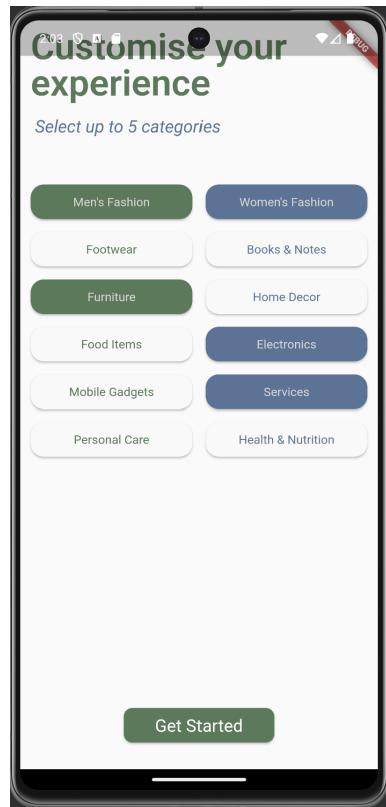
1. Onboarding screen:



2. Log In and Sign Up:



3. Select Preference: Select up to 5 categories



4. Home Page (with Chatbot)

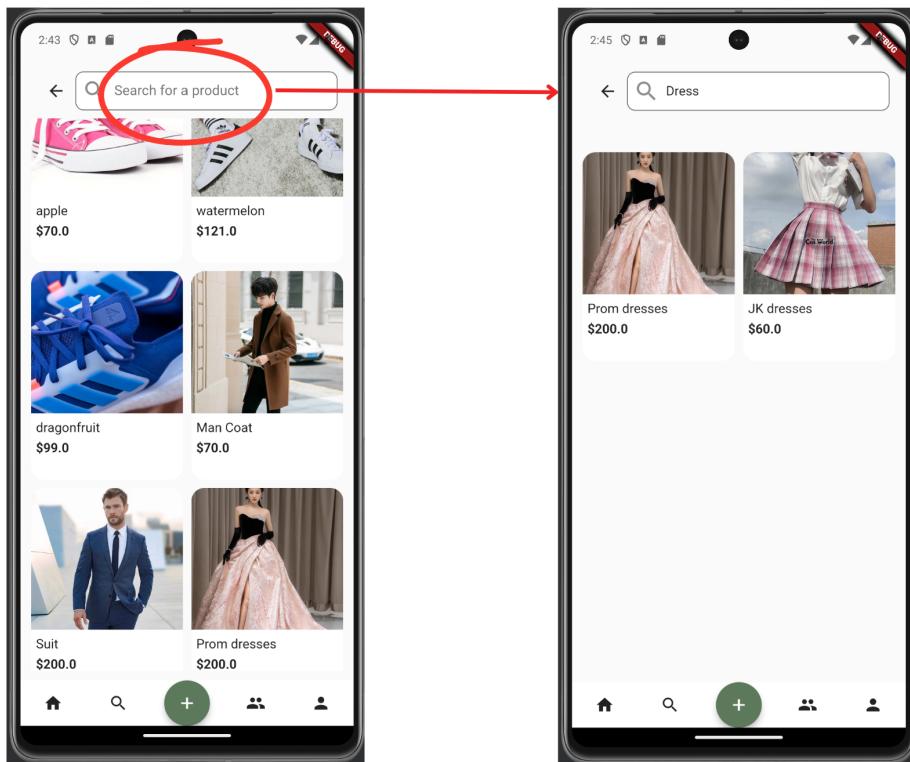
The figure consists of three screenshots of a mobile application demonstrating its features:

- Screenshot 1 (Left):** Shows the search bar at the top and two product cards below: "Dyson Hair Dryer" (\$60.0) and "Fan" (\$40.0). A red arrow points from this screen to the "Electronics" category button on the "Customise your experience" screen.
- Screenshot 2 (Middle):** Shows the "Categories" section with icons for Men's Fashion, Footwear, Electronics, Books & Notes, and Personal Care. The "Electronics" icon is circled in red. A red arrow points from the "Electronics" category button on the previous screen to this one. Below the categories are "Suggested Products" cards for "Man Coat" (\$70.0) and "Suit" (\$200.0), which are also circled in red. A red arrow points from the "Electronics" category button on the previous screen to the "Electronics" card on this screen.
- Screenshot 3 (Right):** Shows the "NTU Marketplace Chatbot" interface. It displays a welcome message from the AI assistant: "Hi there! I'm NTUMart's personal AI assistant. My role is to help you get around the app and to take note of any other questions you might have. Is there something you're struggling with? (Note: Please avoid grammatical mistakes or uncommon abbreviations so that I can understand you better)". It also shows a message history: "Where is the Home Page?", "Understood! For this one, simply navigate to the taskbar at the bottom of the screen and tap the Home button (the first button). Need help with anything else?", "How can I search a product?", and "Understood! For this one, simply navigate to the taskbar at the bottom of the screen and tap the Search button (the second button with a magnifying glass)".

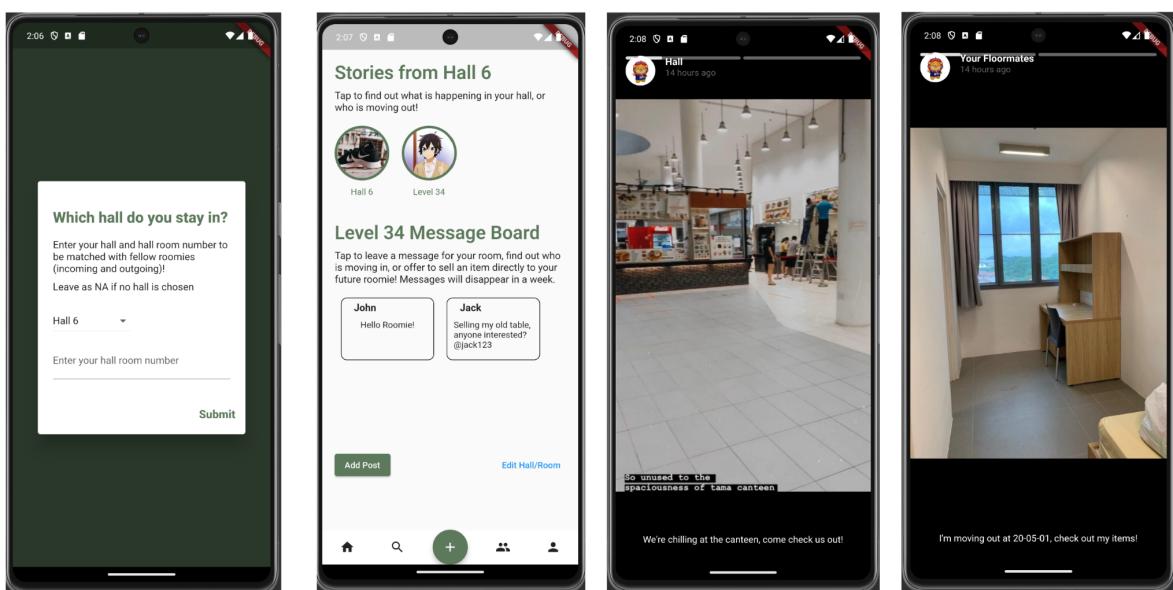
Annotations:

- "Click here to show all products under this category" (points to the Electronics category icon).
- "Only suggest products according to user's preference" (points to the Suggested Products cards).

5. Browse Page: show all existing products + search function

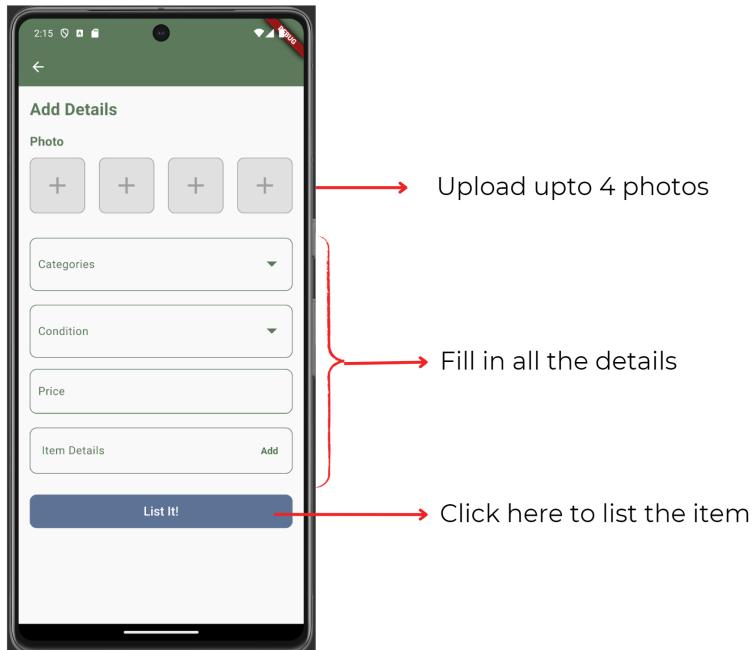


6. Community Page

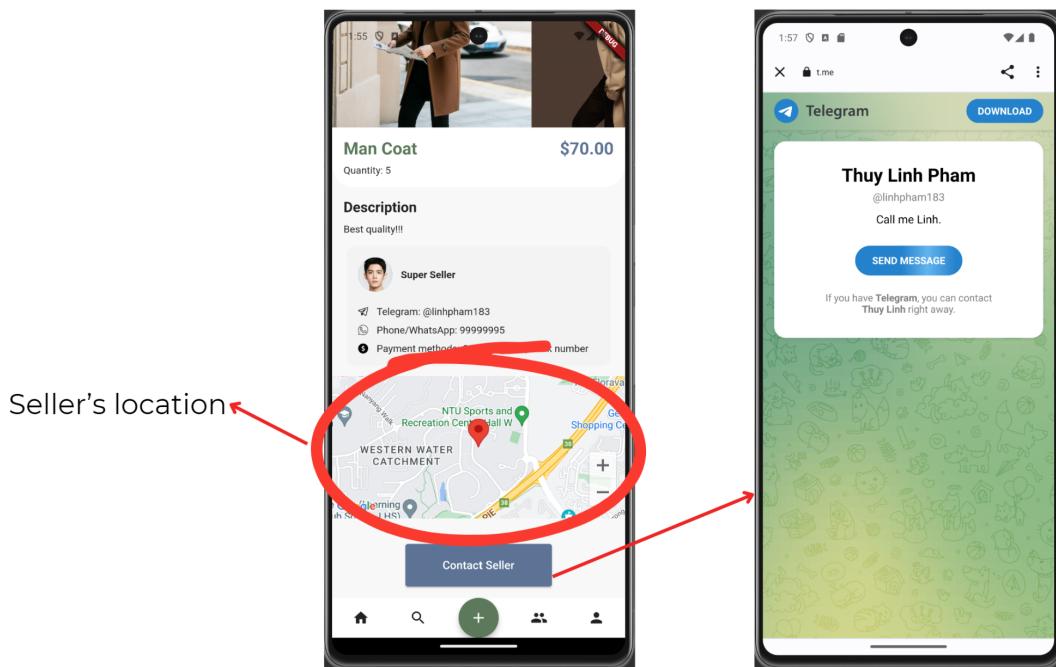


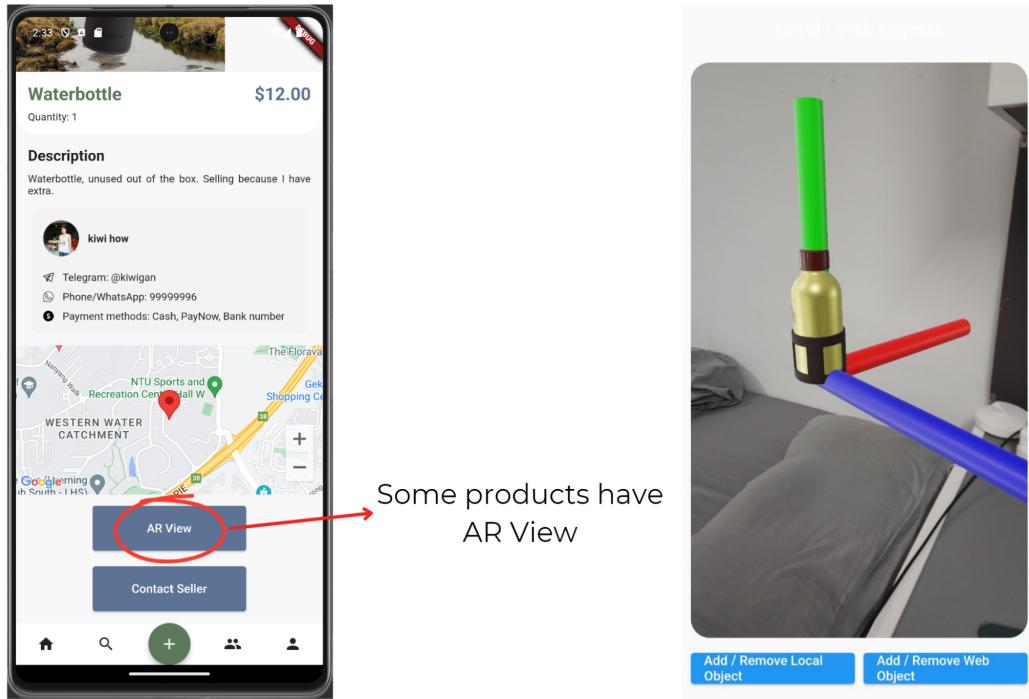
See messages, stories, and the latest listings of your hallmates
You can easily buy from those who are moving out!

7. Listings Page

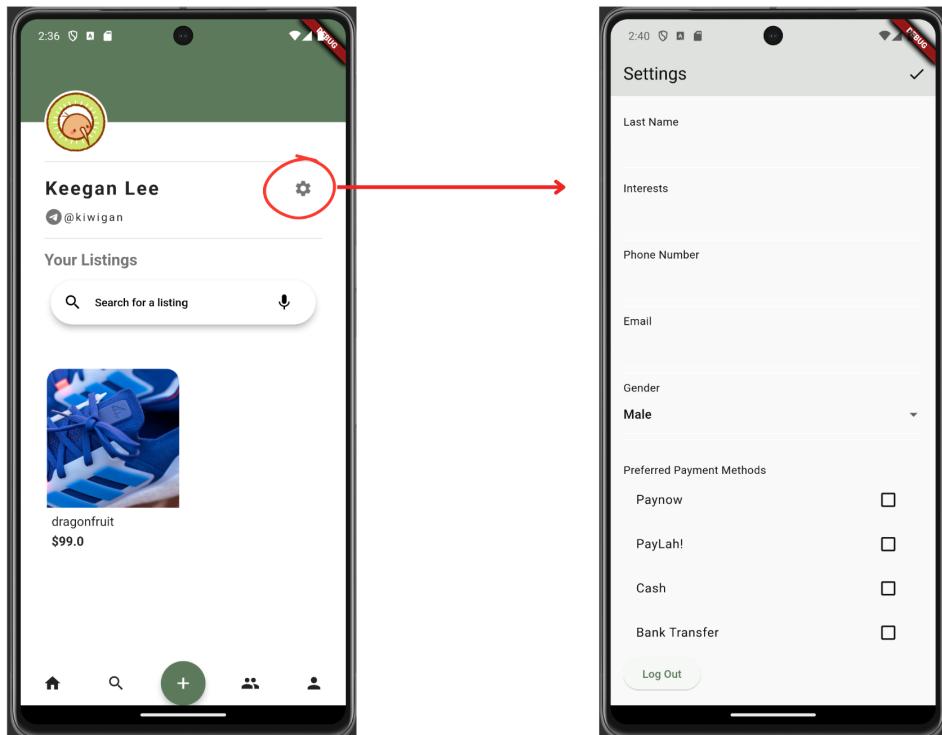


8. Product Page





9. Profile Page:



Profile page
See all your listings

Settings page
Change your information here

7.5 Appendix E – NTUMart Case Studies

NTUMart

Case Study Brief Analysis

01. rumie



"The key to your college experience."

Access the first ever college exclusive marketplace to buy, sell and rent with other students."

Primary Use Case:

A seller snaps picture of any item, lists price and posts listing on the app; A buyer goes into the app, views list of items (Fig 1.1), then sends an offer to the seller through an inbuilt chat feature. (Fig 1.2)

Extras:

- Secondary features include calculated clothes rentals for precise rental periods.
- Saved addresses for frequently used addresses.
- Recently incorporated nationwide shipping as expansion
- Safety through only accepting .edu emails

Monetization:

- Advertisements from local businesses
- Along with nationwide shipping, takes a cut of shipping fees
- Raised 115k in pre-seed and received 130k seed funding in awards

Propagation Model:

- Organic growth through on-campus events for campus ambassadors
- Influencers who promote the product on social media

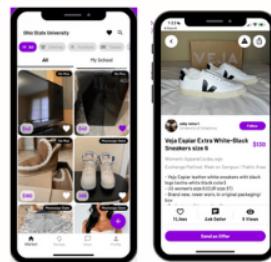


Fig 1.1

Fig 1.2

Things we can take note of:

- Student safety with .edu emails only
- Added features through rental
- Focus on students making money from selling their own products

02. Hazaar



"Your zero waste student marketplace. Made for students, by students. Buy and sell pre loved items on our app, then meet up in person to hand the items over. No postage. No packaging. No travel miles."

Primary Use Case:

A seller snaps picture of any item, lists price and posts listing on the app; A buyer goes into the app, views list of items (Fig 2.1), contacting the seller through messaging (Fig 2.2). After receiving the item on campus, buyer scans a unique code which releases the money to the seller.

Extras:

- Focus on sustainability and market for side hustles
- Emphasis on community

Monetization:

- Without in-app purchases; still in marketing stage (?)
- Received 150k pre-seed investments

Propagation:

- Through emphasis on community, popups conducted at universities.

Things we can take note of:

- Sustainability perspective
- Community feature
- Safety with unique code that only releases money after confirmation
- Focus on brands and individual side hustles (Fig 2.3)



Fig 2.3

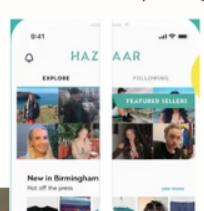


Fig 2.1

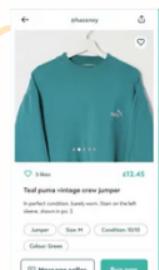


Fig 2.2

03. Carousell



Primary Use Case:

A seller snaps picture of any item, lists price and posts listing on the app; A buyer goes into the app, views list of items (Fig 3.1), then sends an offer to the seller through an inbuilt chat feature. (Fig 3.2)

Extras:

- Doesn't sell to just students, but everyone in Singapore
- Includes home services and extends to even property
- Review sellers for increased trust

Monetization

- In-app advertising space by external companies
- Acquired Caarly, a company for used cars for high-value verticals
- Only started monetizing after 5 years, instead relying on investor funding prior
- Buyer protection to secure customers

Propagation

- Organic, app ranked second on top free lifestyle apps on third day of launch

Things we can take note of:

- Review system for increased trust
- Buyer protection through paying via Carousell; earnings only validated once buyer receives order

Sources:

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<https://alechungcircle.rumie.com/set-to-unveil-update-introducing-innovative-features-for-enhanced-college-marketplace-experience/>
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[https://edfranchise.birmingham.ac.uk/ai/employability/b-enterprise/uobleviate/uobleviate/hazaar.aspx](https://edfranchise.birmingham.ac.uk/ai/employability/b-enterprise/uobleviate/uobleviate/uobleviate/hazaar.aspx)
<https://www.edfranchise.birmingham.ac.uk/ai/employability/b-enterprise/uobleviate/uobleviate/hazaar.aspx>
<https://techcrunch.com/2016/10/26/carousell-monetization-caarly-acquisition/>
<https://press.carousell.com/fact-sheet/>

Fig 2.2

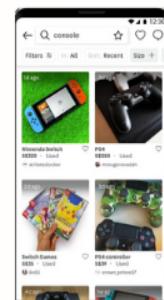


Fig 3.1



Fig 3.2

A Closer Look @ Hazaar



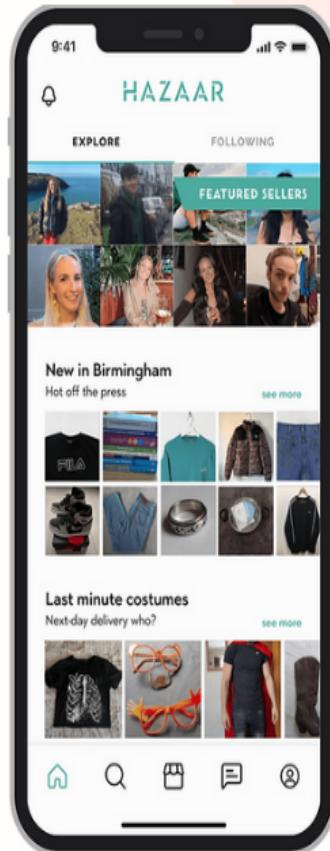
- The homepage of Hazaar utilises two tabs: "Explore" and "Following".
- The "Following" tab allows one to view products sold by users that they follow.
- The "Explore" tab allows users to view the highly ranked sellers with a good track record, view newly posted products and offers curated categories based on the user's viewed products.
- The taskbar shows five main tabs: the homepage, browse, sell an item, notifications, and one's personal profile.

While curated categories are tailored to the user's search history, ultimately the user would have to continuously scroll through the homepage until they find a category they're interested in, or scroll through the alphabetically-ordered browse page. Ultimately, effort is required to find a category of their interest.

In order to improve the user experience, NTUMart requests users to select categories of interest, which become bubbled shortcuts at the top of the homepage for easy access. These categories are also changeable in the settings to match the user's changing interests.

A screenshot of the NTUMart mobile application. At the top is a search bar with a magnifying glass icon and the placeholder text "Search for items". Below the search bar is a horizontal row of three small product images: a white t-shirt, a black t-shirt with a graphic, and a dark t-shirt. Underneath this is a section titled "Browse By Category" with a list of categories: "Accessories", "Costumes", "Household Items", "Mens Shoes", "Menswear", "Random", and "Reworked". Each category entry includes a small icon to its left and a right-pointing arrow indicating it can be selected.

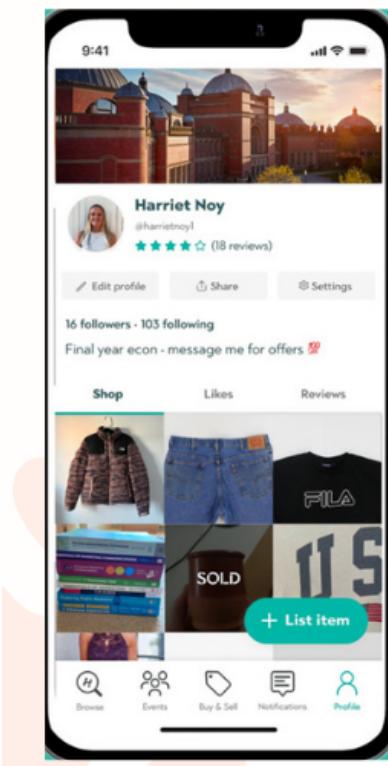
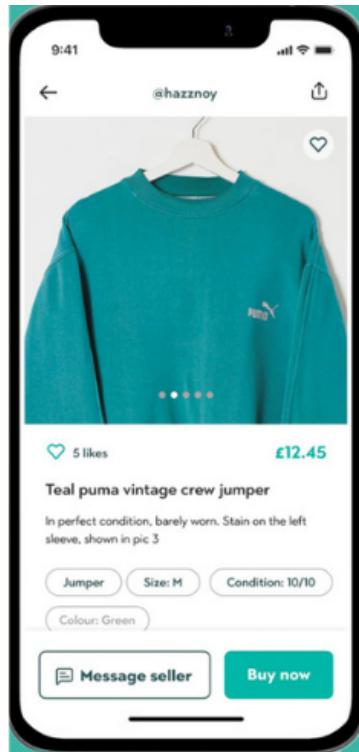
- In the browse tab, users can look at all existing product categories in alphabetical order if they wish to browse a specific category.
- The browse tab also offers a search function to allow users to search for products via keywords.
- A brief history of the user's past viewed items is shown in the browse tab for repeated viewing.





- In the specific item, users can look at pictures snapped of the image, the number of likes on an image, along with the price and description of the item. These are categorized into condition and size.
- 2 options are given to the buyer, to message the seller directly to inquire about the item, and the second option to buy at the price listed. The money is then sent to Hazaar, in which they hold the money until the buyer receives the item, inspects its condition and scans a unique QR code afterwhich the money is released to the seller.

Leaving an option to buy now allows for the security of proper payment, but lacks the flexibility for bargaining on prices of items that may not have received much visibility due to the originally listed price, allowing for quicker sales when the seller is aiming to clear stock as soon as possible.



- In each user's profile, each user has their name, username, a review system averaged out of 5 stars, along with a list of following and followers and a description of their account; similar to that of Instagram.
- For users looking at their own profile, they have 3 options, to edit profile, share their profile to another platform and settings.
- Each user's listings are listed in a grid style in the shop category, akin to that of Instagram, while there are 2 other tabs for likes by the user; to keep track of liked items and reviews; for items that were previously reviewed by the user.
- Sold items are greyed out and overlaid by a "SOLD" in caps.

The profile's UI is aesthetically pleasing due to being similar to that of a fine-tuned app: Instagram, but QOL and UX can be improved such as the prioritization of listings on the profile rather than follower-following metrics that make it akin to a social media app rather than its original purpose as a marketplace app.

References

- [1] “NTU at a glance 2022,” *Nanyang Technological University*, 2022. [Online]. Available:<https://www.ntu.edu.sg/docs/default-source/corporate-ntu/isu/ntuataglance2020678c7c5eca2b4b218ad04c69365b9e3f#:~:text=Residential%20community%20The%20Yunnan%20Garden,for%20about%201%2C200%20graduate%20students>.