Team Name - PayNothing
Project/App/Service Name - <mark>PayNothing</mark>[*]

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[*]Video presentation: https://drive.google.com/file/d/1FXmkMfHknDURBwEyvh4TOEhNbVgKh76z/view?usp=sharing

1 Team Agreement

- **Participation:** Team members are expected to work on the project at least 10 hours weekly.

- **Engagement:** Team members are expected to check and respond to group messages in Microsoft Teams within 12 hours ~~24 hours~~.

- **Short In-person Discussion:** Team members are expected to meet after class at the study space in front of the lecture room.

- **Remote Meeting:** Team members are expected to attend online meetings via Zoom Meetings ~~MS Teams/Zoom~~.

- **Decision-Making:** Done by majority votes within team. Xiangsheng Gu takes the role of tiebreaker.

- **Roles & Responsibilities**

  1. **Xiangsheng Gu:** Oversees project progress, leads the core development, arranges meetings, and ensures deadlines are met.
  2. **Suhas Kumar:** Co-lead team meetings, organize deadlines and team management, oversee back-end development and database operations.
  3. **Chen Zhang:** Leads front-end development, ensuring an intuitive and user-friendly interface. Implements core UI/UX features, integrates front-end components with the back-end, and collaborates with the team to enhance overall application functionality.
  4. **Zhining Zhang:** Assist in project coordination, contribute to brainstorming and feature development, and adapt responsibilities based on evolving team needs.

- **Tools for Collaboration**

  1. **Version Control:** Team members can push updates on codes to the project repository.
  2. **Communication:** Team members can chat, schedule a time to meet, and share their progress in MS Teams.
  3. **Project Notebook:** Team members can document together on Overleaf.
  4. **Demonstrations:** Team members can construct presentation together on Google slides.

- **Dispute-resolving process:** Team members are expected to address issues during remote meetings or in-person discussion. If unresolved, we will seek guidance from instructors.

2 Problem Overview

Popular e-commerce platforms like eBay, Facebook Marketplace, OfferUp, and Craigslist allow users to buy and sell used items online. However, in these platforms:

1. Users are required to take photos, upload them sequentially, write detailed descriptions, and repeat this tedious process for each item.

2. After this time-consuming struggle, users often need to pay extra fees for their items, such as shipping fees, seller fees, and sales tax.

3. Disappointing experiences happen when photos are reused to create duplicate listings, fake items with images of real items, non-delivery of shipped items or delivery of wrong items.

PayNothing eliminates these issues by serving as a **local bartering** platform where users **record and post short videos** of open-to-trade items or giveaways **in** the app — keeping the process simple and authentic. To avoid extra fees, it focuses on connecting users in **the same city or drivable distance**. Users can chat directly about items, and transactions take place in **public locations** to ensure safety and prevent fraud.

~~There exists popular applications that offer selling services to customers, such as customers selling used items to others. Popular applications include Ebay, Facebook Marketplace, and OfferUp that require users to take pictures of their item and write a full description. However, customers/sellers are oftentimes subject to pay many fees such as shipping fees and seller fees. Our app is designed to avoid all these issues, operating as a local bartering platform where users can post short videos of items they are open to trade or simply give away to others interested. To avoid shipping fees, our app will be geared to local communities within drivable ranges. In addition, users will have the ability to have conversations with other users related to items. Transactions will occur in public settings to ensure customer safety and fraud prevention.~~

2.1 Analysis of Survey Responses

According to responses from our conducted survey[1], participants appreciate the affordability of buying used items and some of them reported positive experiences with sellers being fair and honest about item conditions, but only a few of them found the process easy and had no complaints. Besides that, according responses to the last survey question "Could you briefly share some thoughts or concerns on your experience of buying/selling/trading used items?", concerns about the quality and authenticity of items were common and some of the participants suggested features like seller reviews and verification to improve trust. Moreover, concerns about meeting buyers or sellers in certain areas were mentioned, highlighting the need for safe and convenient transaction locations. Many participants called for a more streamlined and less tedious process for selling items, including reducing the number of steps and eliminating unnecessary fees.

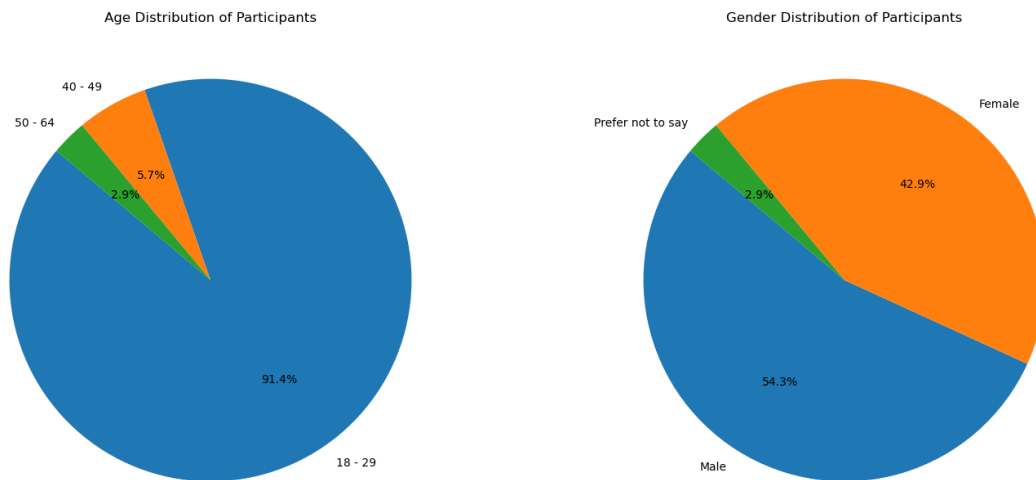[1]Please view Appendix 12.2: Responses on the Survey Questions

Figure 1: Demographic Distribution of Participants
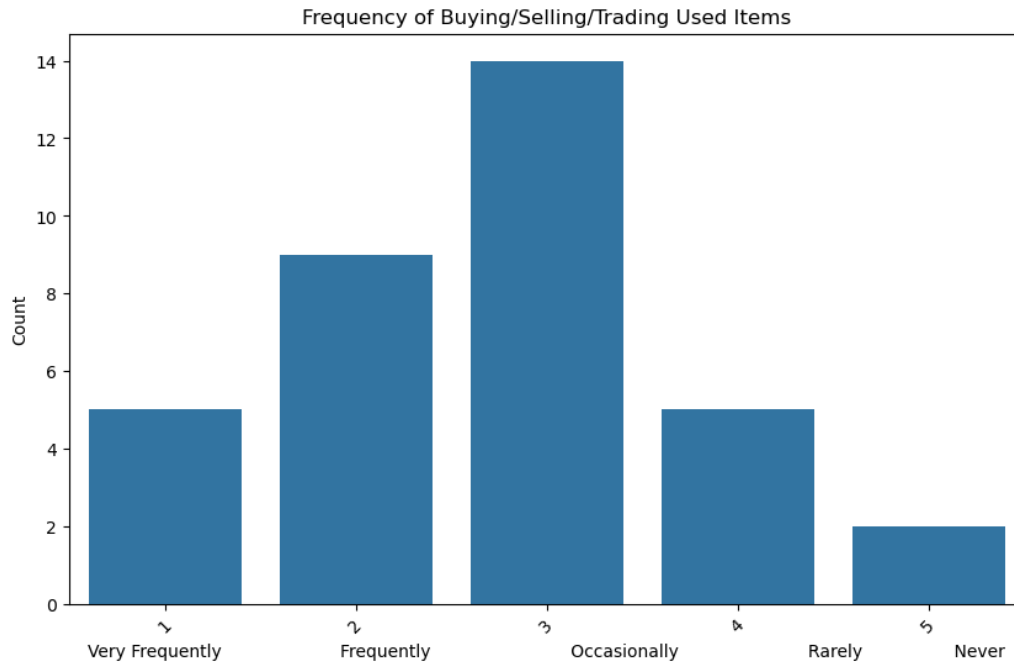

Figure 2: Many participants either occasionally or frequently buy, sell, and trade used items
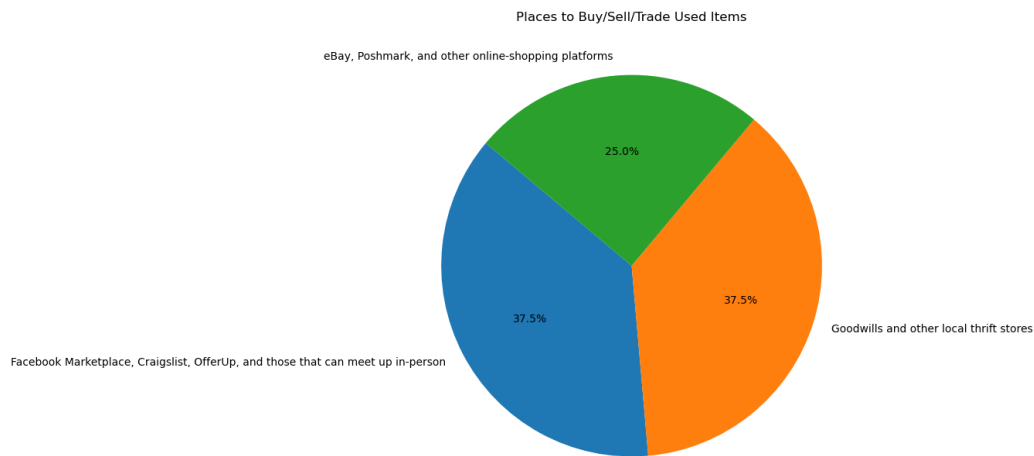
Figure 3: More than one third of participants found platforms that allow meeting up in-person are more reliable compared to online-shopping-only platforms
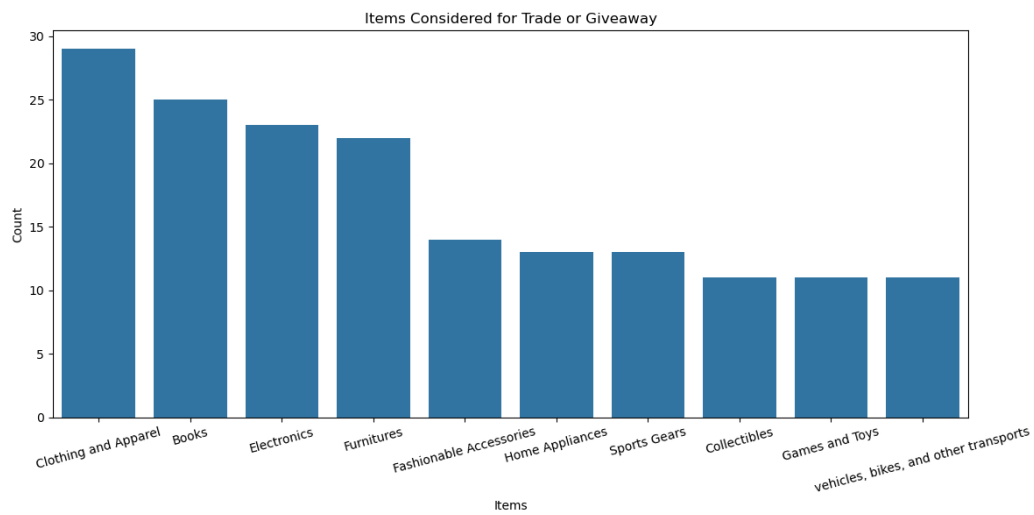
Figure 4: Clothing & Apparel, Books, Electronics, Furniture are the most popular used items that participants buy, sell, and trade online

Reasons Preventing Buying/Selling/Trading Used Items
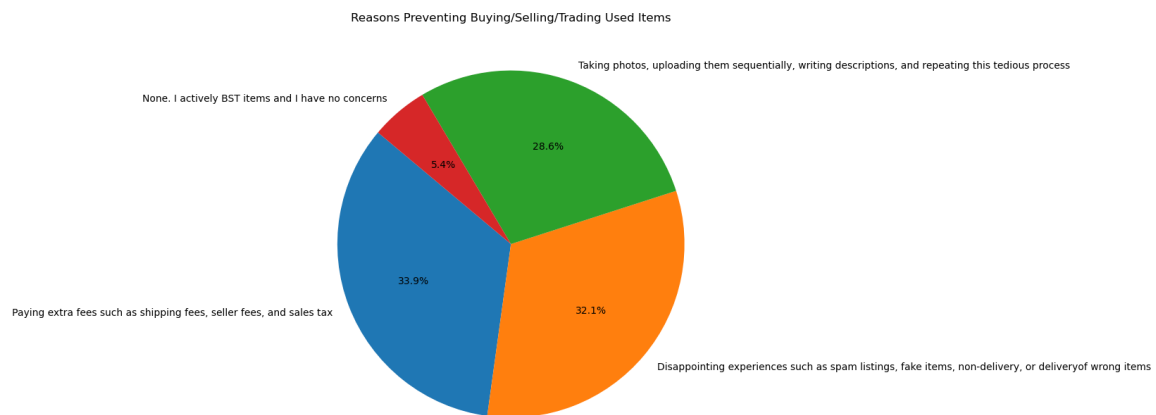
Figure 5: Many participants do not want to sell or trade used items not only because of additional fees, such as shipping fees, seller fees, and sales tax, but also the effort required to sell items, such as taking photos, uploading, and writing descriptions

Willingness to Engage in Local Trades and Giveaways

Figure 6: Primary users who engaging in buying, selling, and trading used items are students, work professionals, and families

2.2   Domain Research

After conducting local interviews [2], several key pain points emerged:

- People feel that selling items online involves too much effort, and handling inquiries can be time-consuming.
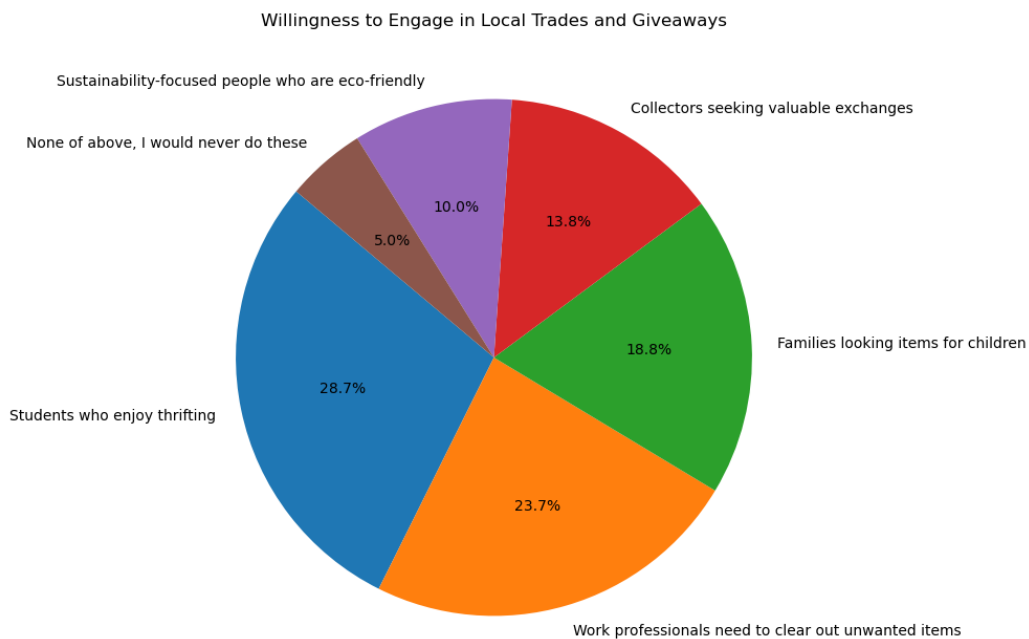
- Some are discouraged by seller fees, shipping costs, and long waiting times for delivery.

- They also shared concerns about scams, counterfeit items, and personal safety.

- Some also mentioned the importance of ensuring fairness and quality control to make bartering more reliable and trustworthy.

As a result, users expressed a desire for an easier, more interactive way to give away or exchange items without the hassle of creating lengthy posts or dealing with hidden fees. Regarding academic papers, there are a multitude of sources that highlight the importance of a bartering style app in order to improve sustainability and community participation in this type of exchange. According to "E-barter Exchanging System: Toward a Smart and Sustainable Community"[3], a bartering system aims to provide public benefits, reduce environmental waste, and increase social cohesion. This shows a clear indication that a bartering app not only has a place in the market, but puts forth social benefits impacting the community positively.

Within the domain of selling used items online, there already exist many applications to service this field, such as Ebay, Facebook Marketplace, Depop, Craigslist, and the list goes on. However, what do all of these applications have in common that users have an issue with? After interviewing on the topic, many were frustrated with the numerous miscellaneous fees associated with these apps, as these apps are aimed to generate revenue for the company. Many times, ads are also filled within these applications, also deemed "annoying" by many users as it interferes with UI design and takes away from the true purpose of the application. Our app is completely free, ad free, no shipping fees, and no strings attached. These solutions address the research conducted within the domain research, trying to appease the users as much as possible.

2.3   Competitive analysis

Competitors have existed for many years, gaining traction, posting advertisements, and letting their services become known throughout the community. However, none of them is adapting video-based item listings, which show the item's true condition. This features we believe is a promising alternative to static photos and textual descriptions. As trading items on our app require no additional costs and it ensures local transaction safety, we target our app at the gap within the competitive industry.

Competitions already exist in this domain, as mentioned before, popular applications such as Ebay already have a customer base with millions of users. Depop, for example, is geared to only clothes, but has the same principle as Ebay, selling used clothing/shoes/jewelry,

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[2]Please view Appendix 12.3: The First Interview

[3]Published in: Intelligent Sustainable Systems, Lecture Notes in Networks and Systems, 2023, pp. 355–371 $DOI : 10.1007/978 − 981 − 19 − 7660 − 5_3 1$

etc. All of these competitors have big customer bases, but also have existed for many years, gaining traction, posting advertisements, and letting their services become known throughout the community. However, as our app is to be geared to be completely free, offering a bartering feature, ensuring transaction safety, and within drivable distance. This allows our app to target the gap within the competitive industry, addressing customer concerns and servicing a useful process within communities.

Feature	PayNothing	eBay	Facebook Marketplace	OfferUp	Craigslist
Listing Type	Video-based	Image/Text-based	Image/Text-based	Image/Text-based	Image/Text-based
Item Types	Used, Tradeable, Giveaways	New, Used	New, Used	New, Used	New, Used
Primary Model	Bartering and Free Giveaways	Bidding, Fixed-Price Sales	Buy/Sell	Buy/Sell	Buy/Sell
Local Transactions	Yes	No	Yes	Yes	Yes
Shipping Available	No	Yes	Yes	Yes	No
Transaction Fees	None	12-15% Seller Fees	None	Service Fee for Shipping	None
Scam Prevention	Video-based verification	Buyer/Seller Ratings	Community Reports	Buyer/Seller Ratings	None
User Verification	Email, Phone Verification	Verified eBay Accounts	Facebook Profiles	TruYou Identity Verification	None
Privacy Concerns	No Personal Data in Listings	Shipping Addresses Required	Facebook Profile Visibility	Profile-Based Information	Email-Based Contact
Ease of Use	High (One-tap video posting)	Moderate (Detailed listings required)	High (Integrated with Facebook)	Moderate (App-based listings)	Low (Manual posting required)
Buyer/Seller Communication	In-app Messaging	eBay Messages	Facebook Messenger	In-app Chat	Email or Phone
Fraud and Scam Risks	Low (Authenticity via Video)	High (Fake Listings, Payment Scams)	Medium (Fake Profiles)	Medium (Fake Listings)	High (No Verification or Moderation)
Ads and Promotions	No Ads, Community-Based Leaderboard	Paid Promotions	Paid Promotions	Paid Promotions	No Paid Promotions
Main Drawback	Limited by local supply and demand	High seller fees	Privacy concerns due to public profiles	Limited user base	No user protections

Table 1: Competitive Analysis: PayNothing vs. Existing Marketplaces

3 Solution Approaches

For Sprint 3, we continue to use the previous 3 solutions of our application. According to the previous survey, we chose the 1st solution (Posting Item and Video Feeds) to implement for codes. Also, we further did survey the other solutions with users of our first prototype to figure out whether we need to achieve these functions in subsequent sprints.

For sprint 2, we proposed 3 solutions (functions) to further improve the functions of our application. Considering the core degree of the functions, we finally chose method 1 and method 2 for development.

3.1 Posting Item and Video Feeds (selected)

- **Approach:** Users navigate to the 'Post' screen to record and upload short videos of their items for bartering or giveaway purposes. The system curates these video posts into personalized feeds on 'Home' screen based on user location and previously liked items.

- **Pros:**

  1. In-App video posts provide a more authentic and transparent way of showcasing items compared to static images.
  2. Encourages more local trades and giveaways in drivable distance as user accessing video feeds.
  3. No shipping fee, seller fee, sale tax, or wait on delivery.
  4. Enhances user engagement with a dynamic video-based feed.

- **Cons:**

  1. Video data requires more storage, bandwidth, and costs to our Startup.
  2. Contents are limited by locations and users cannot find items in other cities.
  3. Privacy concerns related to user location services and recordings of actual voice and surroundings.

- **How it can be differentiated from existing solutions?** Unlike eBay, Facebook Marketplace, or OfferUp, this approach emphasizes live presentation of an item through videos rather than static photos, which eliminates photo reuse scams, fake listings, and duplicate posts.

- **Use Cases**

  1. **Givers**

– **Scenario description:** Tom has two pairs of used sneakers in good condition and some clothes he doesn't wear anymore. He wants to give away clothes to people who truly need, and two pairs of shoes to trade for something he might interested.
– **Steps:**
  (a) He creates his user profile with location setup, and navigates to the 'Post' screen of the app.
  (b) He records a short video to showcase and introduce all his items, then post it to the 'Home' screen.
  (c) Alternatively, he can record videos for each item and post them separately to the 'Home' screen.
  (d) System notify users in the same city to view this new post.
  (e) On the 'Inbox' screen, Tom receives messages from users and negotiates the meetup time and location.
  (f) He arrives to the agreed-upon public location and safely completes the exchange.

2. **Systems**
– **Scenario description:** The app system organizes and moderates video posts, ensuring content quality and safety for users. It prioritizes local posts in the feed based on user location.
– **Steps:**
  (a) System collects user video data, location data, and other activities.
  (b) Collected video data will be viewable for other users from the same city.
  (c) Collected location data will be used to check if both the giver and receiver are at the same city.
  (d) Item search history from users can be used to personalize the video feed.

3. **Receivers:**
– **Scenario description:** Jerry is a newly-enrolled user who recently posted two vintage t-shirts. He wants to trade them for a pair of shoes, but also wants to avoid spams posts and rude users.
– **Steps:**
  (a) He searches 'shoes', 'size 10', and other keywords to find relevant posts in the app.
  (b) The system sorts the most relevant posts based on keywords, and he views the results.
  (c) He taps the post to message users who posted shoes he want to trade with.
  (d) The system crosschecks user locations with, and inform safety warnings to each user in the 'Inbox' screen.
  (e) Jerry acknowledges the alert and negotiates the meetup time and location with the other user.
  (f) He arrives to the agreed-upon public location and safely completes the exchange.

3.2 Gamification and Reward System with LoopCoin

- **Approach:** To enhance user engagement and reward active participation, we introduce LoopCoin, a platform-specific cryptocurrency. Users earn LoopCoins by keeping the app active in the foreground for at least 1 hour or completing successful trades confirmed by both parties with detailed reviews. LoopCoins can be spent on various perks, such as bumping posts to the top of the latest feed or instantly revealing pickup locations for giveaway items.

- **Pros:**

  1. Encourages consistent app usage and active participation.
  2. Adds real value and utility through the LoopCoin economy.
  3. Creates an incentive-driven community with positive interactions.

- **Cons:**

  1. Users may attempt to game the system for excessive LoopCoin accumulation.
  2. Requires secure and scalable blockchain integration for crypto management.

- **How it can be differentiated from existing solutions?** Unlike traditional local bartering platforms, PayNothing gamifies the experience through LoopCoin incentives, creating a thriving virtual economy. Current platforms rely on organic engagement without providing clear motivation to participate actively. Our cryptocurrency-driven approach differentiates PayNothing from platforms like Craigslist and Facebook Marketplace by blending blockchain technology with real-life community interactions.

- **Use Cases**

  1. **Active Trader Using LoopCoins**
     - **Scenario description:** Emily is an active user who frequently trades items. She often keep the PayNothing app open for an 1 hour while browsing posts and messaging others. She also use the LoopCoins she earned to promote her new video posts.
     - **Steps:**
       (a) Keep the app open for at least 1 hour to earn 1 LoopCoin.
       (b) Post an item and complete a successful trade with positive feedback.
       (c) Earn an additional LoopCoin for the successful transaction.
       (d) Spend 1 LoopCoin to bump her new item video to the top of the latest video feeds.

  2. **New User Incentivized by LoopCoin**
     - **Scenario description:** Joshua is a new user hesitant to participate until he learns that he can earn LoopCoins for verifying identity and post his first video. Motivated by the opportunity to earn and spend these coins, he lists an item and completes his first transaction.
     - **Steps:**

(a) He creates his user account and explore the platform.

(b) He discovers that verifying identity and posting the first item video can earn 10 LoopCoins.

(c) He then posts an item video for trade or giveaway and find a match.

(d) Successfully completed his first transaction and earned 10 LoopCoins.

(e) He learns more about spending the LoopCoins to bump his future posts for greater visibility.

3. **First Comes First Serves**

   – **Scenario description:** Sarah is interested in a furniture listed on PayNothing. Instead of waiting for the video poster to respond her with pickup location details, she spends 1 LoopCoin to reveal the pickup location immediately and go pick it up right away.

   – **Steps:**

   (a) She browses videos on 'Home' screen of the app and finds a furniture she wants.

   (b) This furniture is still available as its hidden pickup location has not been revealed by others.

   (c) She decides to spend 1 LoopCoin to reveal the location instantly to her, while the post is marked as 'Location Revealed'.

   (d) She drives to pick up the furniture and the transaction completed.

3.3   Community-based Leaderboards (Needs and Haves)

- **Approach:** Because we focus on bartering method, it is important to know the current demand and supply of the nearby community. Therefore, users should add tags when posting so that we can count the supply. By counting the search content on the main interface, we can understand the needs of users. Then, through the ranking, the community will know what items are currently needed or available.

- **Pros:**

  1. Improve visibility by showing the most needed and readily available items.

  2. Increase matching efficiency by showing high-demand.

  3. Encourages community participation.

- **Cons:**

  1. Need user to tag correctly to ensure data accuracy.

  2. Maintain an active user base to enhance the effectiveness of the leaderboard.

- **How it can be differentiated from existing solutions?** Craigslist or HaveNeed do not provide a leaderboard feature and instead rely on keyword-based search to display posts. Our approach introduces a ranking system that highlights the most needed and available items, making it easier for users to identify trade opportunities.

- **Use Cases**

  1. **Poster**
     - **Scenario description:** Mike has extra PlayStation games at home, and he hopes to exchange them for other games through the community's barter platform. Therefore, when he posts, he needs to fill in the items he can provide (Haves) and the items he wants to get (Needs).
     - **Steps:**
       (a) Log in to the app and enter the "Post" interface.
       (b) Enter the information and video of the items that can be provided.
       (c) Add appropriate item tags (such as: #PlayStation #Game) .
       (d) Enter the type of items you want to exchange (such as: Games).
       (e) Post the post and wait for responses from community members.
       (f) Receive private messages from interested users, negotiate exchange details, and complete the transaction.

  2. **Modify published post**
     - **Scenario description:** Jeff originally posted a thread hoping to trade a printer card for a gift card. However, after checking the community leaderboard, he saw that gift cards were in low supply, while PlayStation games were in ample supply. Therefore, he decided to amend his thread.
     - **Steps:**
       (a) Log into the app. Check the leaderboard and find that gift cards haves scarcity, but PlayStation games are easier to get.
       (b) Go to the "My Posts" interface.
       (c) Find the previously posted post
       (d) Edit the needs (Needs): change from "Gift Card" to "PlayStation Game"
       (e) Update the tag (such as: #PlayStation Game).
       (f) Save the changes and repost the post, waiting for the community members to respond.

  3. **Potential participants**
     - **Scenario description:** Murry usually does not actively publish demand or supply, but she likes to check the leaderboard to understand the demand and supply situation in the community. One day, she found that the leaderboard showed "High demand item: NIP haircare", and she happened to have an extra one at home.
     - **Steps:**
       (a) Open the app and enter the "Ranking" interface to view the current popular needs and haves in the community.
       (b) Look through videos and find a video that matches the items you have (e.g., #haircare demand is high).
       (c) Click the "trade button" to create a thread in "inbox screen". And communicate with the poster of the video to finish the transaction.

3.4 AI-Powered Video Feeds and Item Matching

- **Approach:** Use AI models/ algorithms to protect users from spams and scammers' video posts. To avoid hit-and-miss situations, feed users with personalized video posts based on their preferences or previous posted contents.

- **Pros:**

  1. Reduces spam and fraudulent posts, increasing user trust.
  2. Enhances engagement by showing relevant items to users.
  3. Encourages more trades and giveaways through personalized feeds.

- **Cons:**

  1. Requires continuous model training to remain accurate and efficient.
  2. Potential bias in recommendations if AI models are not properly optimized.
  3. Privacy concerns related to user behavior tracking.

- **How it can be differentiated from existing solutions?** Unlike Offerup and Craigslist, this approach should significantly eliminate scammers' video posts. Most popular platforms did not integrate AI-driven technology for local bartering, instead they are doing commercial selling.

- **Use Cases**

  1. **Givers**
     - **Scenario description:** Tom has two pairs of used sneakers but in great condition. He wants to give away one pair to people who truly need, and another pair to trade for something he might interested.
     - **Steps:**
       (a) He records and uploads a video showcasing his sneakers.
       (b) AI classified the posted items to the 'Shoes' category.
       (c) System notify users who recently liked posts in that category to view this new post.
       (d) AI analyze Tom's recently liked videos and crosscheck users who posted these items with users who recently liked posts in the 'Shoes' category.
       (e) Items appears in the feeds of targeted users, increasing the likelihood of a successful giveaway or exchange.
  2. **Intelligent systems**
     - **Scenario description:** The AI system automatically filters and ranks video posts based on relevance and user trust scores.

- **Steps:**
  (a) AI detects and flags suspicious or spam posts based on content analysis and user reports.
  (b) Posts from verified and frequently engaged users receive higher rankings.
  (c) Personalized recommendations adjust dynamically based on user engagement.
  (d) Users can provide feedback on recommendations, further refining AI learning.

3. **Receivers:**
  - **Scenario description:** Jerry recently posted two vintage t-shirts. He wants to trade them from a pair of shoes but wants to avoid spams posts and rude users.
  - **Steps:**
    (a) He can open the app and search 'shoes', 'size 10', and other keywords to find relevant posts.
    (b) AI sorts the most relevant posts based on keywords, liked, and accounts activity.
    (c) He can tap the post to message users who posted shoes he want to trade with.
    (d) AI crosschecks video post locations with user actual locations, and inform transaction histories to each user in the 'Inbox' screen.
    (e) Jerry acknowledges the alert and will make a decision whether continue chatting or block the user.

3.5   Gamification and Reward System

- **Approach:** To drive engagement, users can earn points for completing transactions, responding quickly, and maintaining a positive transaction history. Points can be redeemed for perks such as priority listings, exclusive trade opportunities, or digital badges.

- **Pros:**

  1. Encourages participation and community involvement.
  2. Reduces inactive user base by incentivizing engagement.
  3. Adds a fun, competitive aspect to the platform.

- **Cons:**

1. Could lead to users exploiting the system solely for points.

2. Requires a well-designed reward structure to make it effective.

- **How it can be differentiated from existing solutions?** Unlike existing barter platforms like Craigslist or Facebook marketplace, which do not provide incentives beyond the transaction itself, our system introduces an interactive, game-like experience. Current platforms rely on organic engagement without providing clear motivation to participate actively. With our gamified approach, users can feel a sense of accomplishment and progression, which encourages them to continue using the platform.

- **Use Cases**

  1. **Active Participant Earning Rewards**
     - **Scenario description:** Emily regularly trades items and wants to maximize her benefits. By completing transactions and maintaining positive interactions, she earns reward points that grant her access to premium features.
     - **Steps:**
       (a) Log into the app and browse available listings.
       (b) Initiate and complete a barter transaction.
       (c) Receive positive feedback from the trade partner.
       (d) Earn points that can be redeemed for priority listing placement.
       (e) Continue engaging on the platform to unlock additional perks.

  2. **New User Incentivized to Participate**
     - **Scenario description:** Joshua is new to the app and hesitant to engage. He notices that first-time trades earn a significant bonus, motivating him to post his first listing.
     - **Steps:**
       (a) Create an account and explore the platform.
       (b) Discover the "First Trade Bonus" promotion.
       (c) List an item for trade and find a match.
       (d) Successfully complete his first transaction and earn bonus points.
       (e) Use the points to enhance his visibility on the platform.

  3. **Leaderboard Competitor**
     - **Scenario description:** Andy enjoys competition and wants to be a top-ranked user. He actively engages with the community to climb the leaderboard and unlock exclusive rewards.
     - **Steps:**
       (a) Check the leaderboard rankings on the app.
       (b) Engage in more trades and respond quickly to inquiries.

(c) Earn additional points for consistent transactions and positive feedback.

(d) See his ranking improve on the leaderboard.

(e) Redeem exclusive perks, such as featured trader status.

3.6 Contactless Package Locker and Delivery Integration

- **Approach:** Integrate our platform with contactless package lockers and delivery systems located in residential and commercial areas. This allows users to complete trades and giveaways contactlessly for convenience and safety. Once users agree on an exchange through Inbox in PayNothing app, they can drop off and collect items at nearby lockers using secure access codes provided by the system. It requires geo-location data to suggest nearby package lockers and collaborating with third-party locker providers (such as Luxer One and Amazon). Notifications are sent to users with pickup/drop-off instructions.

- **Pros:**

  1. Enhances user safety by avoiding direct face-to-face exchanges.

  2. Increases convenience, allowing trades to happen at flexible times.

  3. Reduces the risk of failed transactions or missed meetings.

- **Cons:**

  1. Requires partnerships with locker providers.

  2. Limited availability in rural or less populated areas.

  3. Potential logistical challenges during high-usage periods.

- **How it can be differentiated from existing solutions?** Unlike traditional marketplaces, this approach provides contactless and secure item exchanges through modern infrastructure, increasing user trust and flexibility. No other major bartering platforms offer locker-based exchange services.

4 Learning Prototypes

4.1 Posting Item and Video Feeds (selected)

- **Unknowns:**

  - How connivent is "posting item and browsing video Feeds" on a scale of

1-10? May compare with popular e-commerce platforms that you previously used.

– How easy is it to browse videos on the home page, did you find any issues or some other features you wish it can have?

– How was your experience of posting videos? Were there any issues or something you wish could be different?

– How was your experience of messaging someone? Were there any issues or something you wish could be different?

– If you like an item you saw, would you message them? Did you app make it easy for you to contact them?

– For the overall functionality of the app, were you able to effectively browse video feeds, post videos, and message users? If not, why not?

– ~~Will users find this approach of posting and video feeds interesting?~~

– ~~Will users accept that short videos can be used as a better way to barter?~~

- **Develop & Test:**

  – Interviews on the first learning prototype (Done): Participants are asked all the Unknowns and gave feedback after experiencing our app.

  – Storyboard survey (Done): Use storyboards to create a Posting and video feeds scenario and use it to conduct a number of user surveys [a].

  – Function development (Done): Initially implement the Posting and video feeds functions and allow users to experience them.

4.2 Community-based leaderboards (needs and haves)

- **Unknowns:**

  – Will the leaderboard provide useful insights to encourage user engagement?

- **Develop & Test:**

  – Storyboard survey (Done): Use storyboard to create a scenario and use the scenario to conduct a certain number of user surveys (Learning prototype results). Haves and Needs could be displayed.

  – Function development (Not done): Develop a simple ranking page and use firebase to track the number of clicks on the current page. Use user activity and clicks to understand whether users are willing to use the ranking page.

4.3 Gamification and Reward System

- **Unknowns:**

  – Will users be motivated by a crypto-coin-base system?

      – What rewards mechanisms are most effective in driving engagement?

      – Could users find ways to exploit the system unfairly?

- **Develop & Test:**

      – Launch a small scale crypto-coin reward with limited amount.

      – Analyze transaction frequency before and after reward implementation.

      – Introduce different reward ways and track which incentives drive the most engagement.

      – Monitor potential abuse of the system and adjust rules as needed.

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[a]Please check 'Learning prototype results' for more details.

4.4 AI-Powered Video Feeds and Item Matching

- **Unknowns:** Will AI successfully detect spams or scammers' videos? Will item recommendations actually relevant to user's preferences?

- **Develop & Test:** For spams detection, we can design test cases that randomly create some user accounts to be in the role of scammers and post videos that do not match their item descriptions, or user locations are far away from video post locations. Testing to against our basic detection algorithm and optimize it for better performance. For content recommendations, deploy a basic matching algorithm that collect user data such as titles from liked posts and generated transcripts from videos they posted. Utilize these data to feed personalized videos to users, and assess user satisfaction through survey.

5 Technical Discussion

Our App and its functionalities will be developed using **React Native with Expo Framework**, making it cross-platform for both **iOS** and **Android** mobile devices.

1. Firebase for authentication such as sign-up, sign-in, and user profile management.

2. Firebase for database storage such as storing user messaging data, videos, etc.

3. Expo Camera for media capture and Expo Location for location services.

Features are implemented using TypeScript as following:

- **Basic layout and app navigation** (`_layout.tsx`): Established four screen (home, post, inbox, profile) and navigation between these screens by tapping their icons in the lower bar area.

Figure 7: The high-level project architecture drawing of PayNothing mobile app

- **Home Screen** (`index.tsx`): Displays a single video post with item title and a touchable 'like' button to count how many likes of this post. Users can scroll to view the next video post, acting as a for you page. A search bar located in the top right corner of the screen to filter by title of posts. Touchable buttons such as 'Latest' and 'Trending' are available to tap, and are fully functional in this sprint. Trending sort by highest likes, and latest sort by upload time. Allow users to sort by relevance and popularity. Message button also exist on the post, allowing users to directly click the message button. This will automatically take this to the inbox page, allowing direct messaging with the seller.

- **Post Screen** (`post.tsx`): To enter the post page, users first need to log in; for users who are not logged in, they will be directly redirected to the profile page and prompted to log in. When entering the post page in the logged-in state, for users who have not authorized camera and microphone permissions, the

camera and microphone permission application windows will automatically pop up in sequence; if the user does not click the permission window that pops up automatically, the page will also display the current authorization status of the two permissions, and the user can click to apply for permissions again.

Upon approved, it can shows the back camera view, timer and a touchable button for users to tap to record or stop recording. After recording, display the current video cover, and let the user add a title and description before posting. Once upload, recordings are saved as user data to Firebase Storage.

- **Inbox Screen** (`inbox.tsx`): The inbox screen has now been implemented with a proper UI that allows for direct messaging capabilities between two users. The user can send messages to other users and receive messages from others. The past conversations that the user had with other users are displayed as a list on the inbox screen, each with the title of the other user's username. The user is able to select any past conversation from the list and open a new chat window to continue the conversation. The user is required to log in first before viewing the chat history. All messages are now stored in Firestore Database that are linked to the user.

- **Profile Screen** (`profile.tsx`): Integrated Firebase authentication that allows users to have multiple sign-up/sign-in methods as such:

  1. Login via phone number: Upon passing the reCAPTCHA verifier, it'll send a verification code to the user's phone so the user can sign in with the verification code.
  2. Sign in with Google using Gmail account.
  3. Login/Create Account by entering email address and password.

Upon signed in, user can upload image from local photos to edit their profile picture, and they can edit their username, gender, and ages. User's location retrieval is also implemented via Expo Location, which asks users for location services permission for the first time and will display (city, state) upon approved.

Our App and its functionalities will be developed using **React Native with Expo Framework**, making it cross-platform for both **iOS** and **Android** mobile devices.

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(home, post, inbox, profile) and navigation between these screens by tapping their icons in the lower bar area.
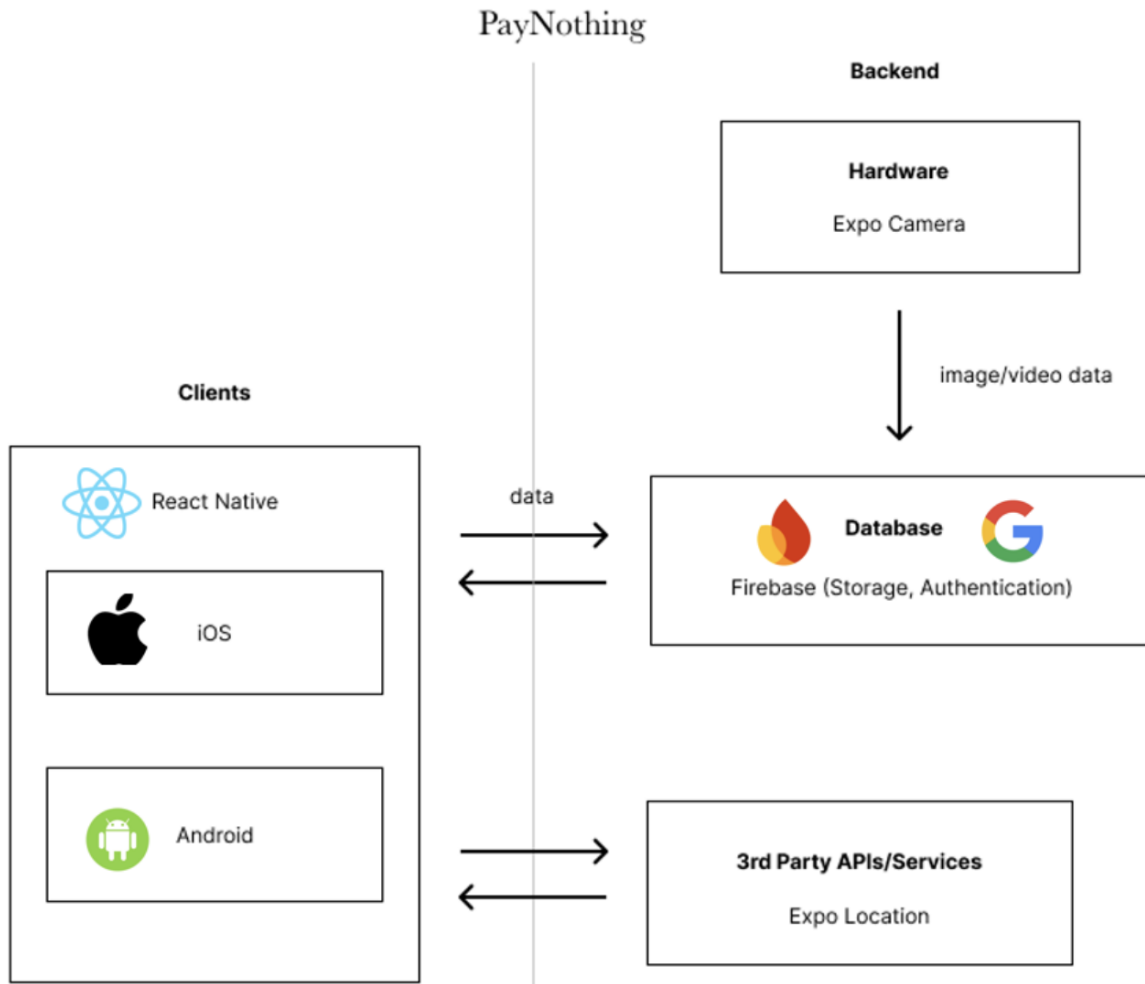
- **Home Screen** (`index.tsx`): Displays a single video post with item title and a touchable 'like' button to count how many likes of this post. Users can scroll to view the next video post, but have minor problems need to be fixed later. A search bar located on the top right corner of the screen to filter by title of posts. Touchable buttons such as 'Latest' and 'Trending' are available to tap, but are still in development of their functionalities.

- **Post Screen** (`post.tsx`): Users will be asked for phone's camera and microphone permissions for the first time. Upon approved, it can shows the back camera view and a touchable button for users to tap to record or stop recording. Recordings are saved as user data to Firebase Storage.

- **Inbox Screen** (`inbox.tsx`): Initialized but still in development.

- **Profile Screen** (`profile.tsx`): Integrated Firebase authentication that allows users to login or sign up with email address and password. Upon signed in, user can edit their username. User's location retrieval is also implemented via Expo Location, which asks users for location services permission for the first time and will display (city, state) upon approved.

6 Business Model Canvas

We has two main concepts that allow us to target the gap in the market. First being our app allowing a bartering type transactions. Instead of receiving money for items, sellers can have three options, barter off their item, give out their item for free, or last option is to have some sort of monetary compensation. The target market becomes communities of all ages that want to get rid of items that are of no use to them. Sellers can be anyone who wants to get rid of their items, and "buyers" can be anyone who could either want to get rid of something as well and exchange items with another, trying to get free items, or is willing to pay to get a used item.
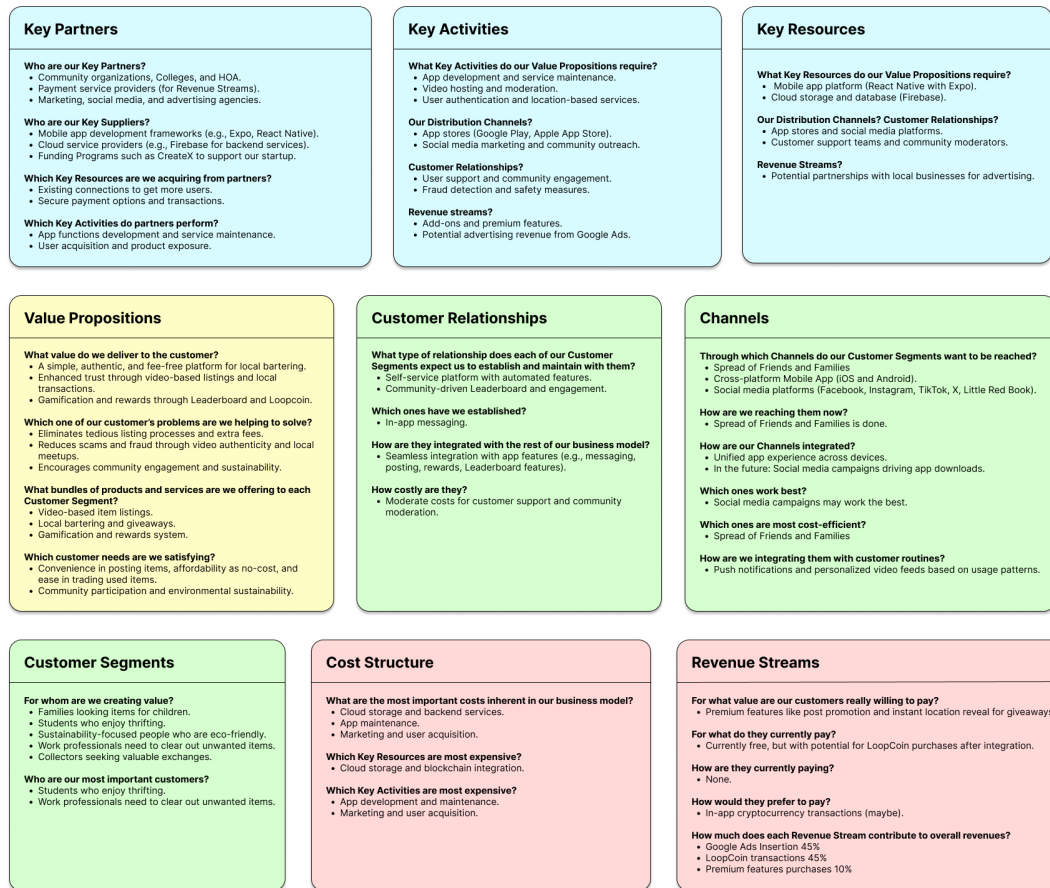
Key Partners

Who are our Key Partners?
- Community organizations, Colleges, and HOA.
- Payment service providers (for Revenue Streams).
- Marketing, social media, and advertising agencies.

Who are our Key Suppliers?
- Mobile app development frameworks (e.g., Expo, React Native).
- Cloud service providers (e.g., Firebase for backend services).
- Funding Programs such as CreateX to support our startup.

Which Key Resources are we acquiring from partners?
- Existing connections to get more users.
- Secure payment options and transactions.

Which Key Activities do partners perform?
- App functions development and service maintenance.
- User acquisition and product exposure.

Key Activities

What Key Activities do our Value Propositions require?
- App development and service maintenance.
- Video hosting and moderation.
- User authentication and location-based services.

Our Distribution Channels?
- App stores (Google Play, Apple App Store).
- Social media marketing and community outreach.

Customer Relationships?
- User support and community engagement.
- Fraud detection and safety measures.

Revenue streams?
- Add-ons and premium features.
- Potential advertising revenue from Google Ads.

Key Resources

What Key Resources do our Value Propositions require?
- Mobile app platform (React Native with Expo).
- Cloud storage and database (Firebase).

Our Distribution Channels? Customer Relationships?
- App stores and social media platforms.
- Customer support teams and community moderators.

Revenue Streams?
- Potential partnerships with local businesses for advertising.

Value Propositions

What value do we deliver to the customer?
- A simple, authentic, and fee-free platform for local bartering.
- Enhanced trust through video-based listings and local transactions.
- Gamification and rewards through Leaderboard and Loopcoin.

Which one of our customer's problems are we helping to solve?
- Eliminates tedious listing processes and extra fees.
- Reduces scams and fraud through video authenticity and local meetups.
- Encourages community engagement and sustainability.

What bundles of products and services are we offering to each Customer Segment?
- Video-based item listings.
- Local bartering and giveaways.
- Gamification and rewards system.

Which customer needs are we satisfying?
- Convenience in posting items, affordability as no-cost, and ease in trading used items.
- Community participation and environmental sustainability.

Customer Relationships

What type of relationship does each of our Customer Segments expect us to establish and maintain with them?
- Self-service platform with automated features.
- Community-driven Leaderboard and engagement.

Which ones have we established?
- In-app messaging.

How are they integrated with the rest of our business model?
- Seamless integration with app features (e.g., messaging, posting, rewards, Leaderboard features).

How costly are they?
- Moderate costs for customer support and community moderation.

Channels

Through which Channels do our Customer Segments want to be reached?
- Spread of Friends and Families
- Cross-platform Mobile App (iOS and Android).
- Social media platforms (Facebook, Instagram, TikTok, X, Little Red Book).

How are we reaching them now?
- Spread of Friends and Families is done.

How are our Channels integrated?
- Unified app experience across devices.
- In the future: Social media campaigns driving app downloads.

Which ones work best?
- Social media campaigns may work the best.

Which ones are most cost-efficient?
- Spread of Friends and Families

How are we integrating them with customer routines?
- Push notifications and personalized video feeds based on usage patterns.

Customer Segments

For whom are we creating value?
- Families looking items for children.
- Students who enjoy thrifting.
- Sustainability-focused people who are eco-friendly.
- Work professionals need to clear out unwanted items.
- Collectors seeking valuable exchanges.

Who are our most important customers?
- Students who enjoy thrifting.
- Work professionals need to clear out unwanted items.

Cost Structure

What are the most important costs inherent in our business model?
- Cloud storage and backend services.
- App maintenance.
- Marketing and user acquisition.

Which Key Resources are most expensive?
- Cloud storage and blockchain integration.

Which Key Activities are most expensive?
- App development and maintenance.
- Marketing and user acquisition.

Revenue Streams

For what value are our customers really willing to pay?
- Premium features like post promotion and instant location reveal for giveaways.

For what do they currently pay?
- Currently free, but with potential for LoopCoin purchases after integration.

How are they currently paying?
- None.

How would they prefer to pay?
- In-app cryptocurrency transactions (maybe).

How much does each Revenue Stream contribute to overall revenues?
- Google Ads Insertion 45%
- LoopCoin transactions 45%
- Premium features purchases 10%

Figure 8: The Business Model Canvas of our product

7 Feature Analysis

This section provides an overview of the core features that are planned to be implemented in PayNothing, detailing their descriptions, use cases, and their ranking based on their necessity and impact on user experience.

7.1 Core Features and Ranking

- **Home Screen**: Serves as the main interface where users browse video listings of available items for trade or giveaway. It includes:

  - Advanced search bar to support synonyms, related terms, and search history (High Priority).
  - Allow users to tag items when posting. Provide filters for item categories (High Priority).
  - Add a "saved" button to each video so that you can browse the videos you have previously "saved" (High Priority).
  - Add a filter based on user's location or the city they select (with radius distance options). (Medium Priority)
  - Auto-fold long item descriptions under each video, allowing "See More" expansion. (Medium Priority)
  - Create a "Leaderboard" section showing users who made the most impressive or highest-value trades of the month, and feature stories of active users who traded so often that end up getting something huge and valuable like a car. (Low Priority)
  - Match-based video interaction such that swipe left/right to message/save the post. Provide an option to switch between vertical scroll (like TikTok) and grid view (like Little Red Book). (Low Priority)

  Use Cases:

  - User can conveniently search items they interested and see the search history in case of revisiting.
  - Users can use tags to filter the categories of items they want and browse the corresponding videos.
  - Users click the save icon at the bottom right of the video to save their favorite videos for later viewing.
  - Users can browse video feeds withing drivable distance.

- **Post Screen**: Allows users to create and upload new video listings for items they want to barter or give away. It includes:

- Added classification function to allow users to categorize their post (High Priority).
- Let users record up to 3-5 video clips per video to show items in different angles (Hight Priority).
- Add more detailed functions: video clarity when shooting, whether to modify the cover, chapters, scheduled publishing, etc (Medium Priority).

Use Cases:

- Users should add tags of the categories of items in videos when they edit the information of videos.
- Users can reposition the item in between each video clips instead of holdin the phone to record throughout the whole process.
- Users can edit the cover picture of the video, schedule a time to post, etc.

- **Inbox Screen**: Enables in-app messaging for negotiations and communication regarding item trades. Features include:

  - Fixed bug: Automatically hide the keyboard when users hit "return/send". Keyboard is covering the text input when user texting. Some users cannot display previous conversation history after sending a message (High Priority).
  - Added conversation status details: conversation timestamp, conversation read/unread status, etc (Medium Priority).

  Use Cases:

  - All users can find their histories of all conversation in "Inbox" page.
  - Users can find more details of conversations, such as knowing time of each message, knowing each message is read or not. etc.

- **Profile Screen**: Provides account management functionalities, including:

  - Fixed bug: Automatically hide the keyboard when users hit "return/send". Authentication issue with "Sign in with Google" (High Priority).
  - Update the user's published posts in the previous posts list; Update the saved posts list with the posts of the user "saved"(High Priority).
  - Display user rating score based on transaction reviews from other users (Medium Priority).
  - Move all personal information such as gender and age to a "Setting" section (Low Priority).

  Use Cases:

- – Users can find their previous posts in "Profile" page, and click to see the video.
- – Users can find saved posts in "Saved Posts" part, and they can click to browse the video.

- **Gamification with LoopCoin (Medium Priority)**: A rewards system to encourage platform engagement. Features include:

  - – Users earn LoopCoins by posting items, completing trades, and engaging with the app.
  - – LoopCoins can be redeemed to promote listings or unlock special app features.

  Use Cases:

  - – Users are incentivized to actively participate in the community.
  - – Frequent traders gain perks, fostering a vibrant exchange network.

- **Community-Based Leaderboards (Medium Priority)**: Displays trending items and high-demand categories. Features include:

  - – A real-time ranking system showing the most sought-after and frequently listed items.
  - – Filters to customize leaderboard views based on location or categories.

  Use Cases:

  - – Users can easily identify high-demand items to post more relevant trades.
  - – The app encourages competitive participation by ranking frequent traders.

Home Screen (High Priority): Serves as the main interface where users browse video listings of available items for trade or giveaway. It includes:

- • A vertically scroll-able video feed displaying posts sorted by latest uploads or trending status.
- – A like button on each video post to allow user interaction and ranking of popular items.
- – A search bar at the top to filter listings by keywords, item types, or categories.
- – Dynamic sorting options for users to switch between "Latest" and "Trending" posts.

Use Cases:

- Users can browse and discover items available for trade in their local area.
- Users can engage with posts by liking and saving items for later negotiation.
- Users can quickly search for specific items instead of scrolling through the entire feed.

Post Screen (High Priority): Allows users to create and upload new video listings for items they want to barter or give away. It includes:

- A built-in video recorder that enables users to film their items within the app.
- A preview option for users to review the recording before posting.
- A text input field where users can add a short description and relevant tags for better discoverability.
- Automatic geolocation tagging to ensure users see local listings.

Use Cases:

- Users can effortlessly showcase their items through video instead of static images.
- Users can include additional information about the item's condition and intended exchange terms.
- Users can ensure their posts appear in the right regional feed for better trade matching.

Inbox Screen (High Priority): Enables in-app messaging for negotiations and communication regarding item trades. Features include:

- A chat system that allows direct messaging between interested parties.
- Timestamped message threads to keep track of discussions.
- Push notifications for new messages to facilitate prompt responses.
- User safety measures, such as reporting inappropriate messages or blocking users.

Use Cases:

- Users can securely communicate to negotiate trades, meeting locations, and exchange details.
- Users receive instant alerts when they get a message from another trader.
- Users can filter messages by unread, ongoing, or completed trades for organization.

Profile Screen (High Priority): Provides account management functionalities, including:

- User authentication via Firebase for secure access.
- Editable profile details such as username, profile picture, and preferred location.
- A personal dashboard displaying posted items, saved posts, and trade history.

Use Cases:

- Users can personalize their profile and update contact preferences.
- Users can view and manage all of their active and past listings.
- Users can track their past trades to maintain a record of successful transactions.

Authentication (High Priority): Secures user authentication process via Firebase, featuring:

- Email-based registration and login.
- Google authentication for fast account creation.
- Secure session handling to keep users logged in across sessions.

Use Cases:

- Users can create accounts quickly using their Google credentials.
- Users can securely log in and out without losing session data.
- Users can recover lost accounts through Firebase password recovery options.

Gamification with LoopCoin (Medium Priority): A rewards system to encourage platform engagement. Features include:

- Users earn LoopCoins by posting items, completing trades, and engaging with the app.
- LoopCoins can be redeemed to promote listings or unlock special app features.

Use Cases:

- Users are incentivized to actively participate in the community.
- Frequent traders gain perks, fostering a vibrant exchange network.

Community-Based Leaderboards (Medium Priority): Displays trending items and high-demand categories. Features include:

- A real-time ranking system showing the most sought-after and frequently listed items.
- Filters to customize leaderboard views based on location or categories.

Use Cases:

- Users can easily identify high-demand items to post more relevant trades.
- The app encourages competitive participation by ranking frequent traders.

AI-Powered Video Moderation (Medium Priority): Implements machine learning techniques to analyze videos and prevent spam or inappropriate content. Features include:

- AI algorithms to detect explicit content or fraudulent listings.
- A reporting system where users can flag suspicious posts for review.

Use Cases:

- Users feel safer as fraudulent or inappropriate listings are automatically detected.
- Moderators have a streamlined process to review flagged content.

8 Learning Prototype Results

8.1 Posting Item and Video Feeds(selected)

In sprint 3, we completed the construction of the prototype of the core functions. We did not change the user-case and storyboard, and mainly updated the functional screenshots 9 of our prototype in this part.

In sprint 2, we have preliminarily completed the development of this part of the function. The above pictures show the video effect of the "home" interface, the permissions of the "post" interface, recording videos, and uploading after recording[4].

- Tom sets up his profile on the app and enters his location
- Tom took the old sneakers and shot a short video with his mobile phone.
- After Tom posted the video, nearby users saw the video on their mobile phones.
- Tom and the other party reply to the message in the app's Inbox to confirm the transaction details.

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[4]Please view Appendix 1: The First Interview
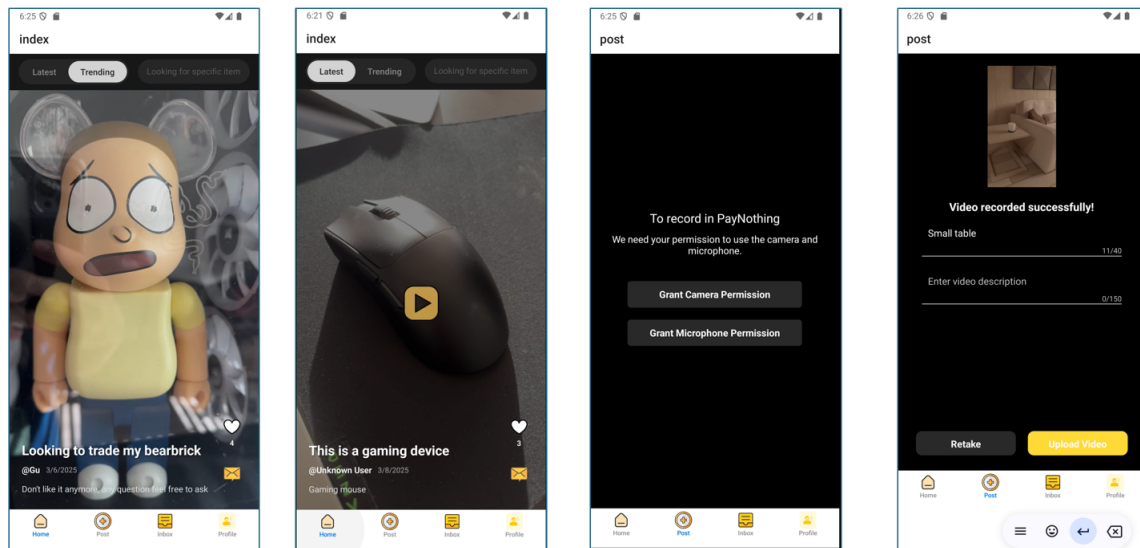
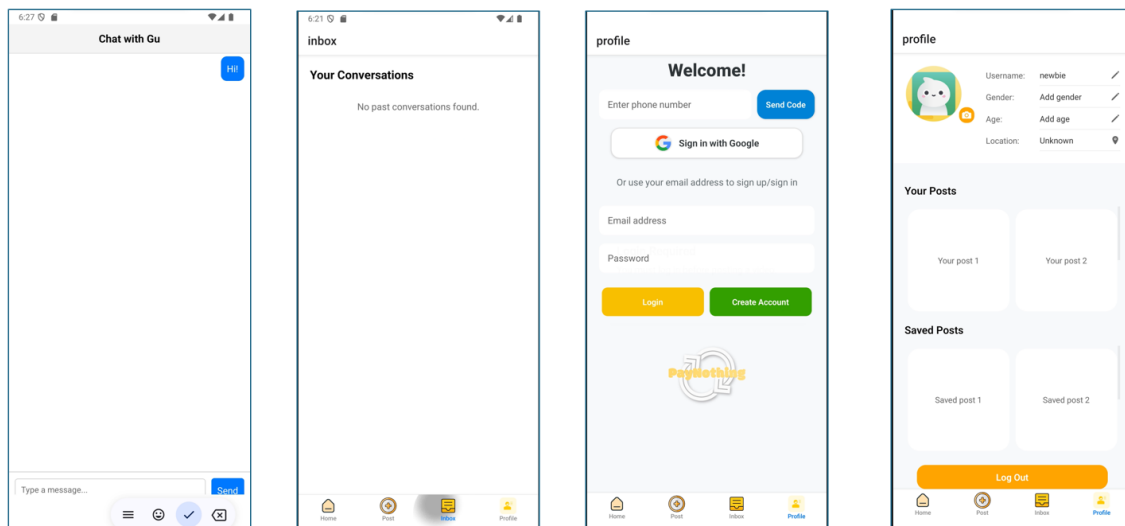Figure 9: The screenshots of "Posting Item and Video Feeds" for the First Prototype.

Figure 10: The screenshots of "Inbox & Conversation and Profile" for the First Prototype.

8.2 Community-based leaderboards

- Jeff opened the PayNothing app when he was free.

- Jeff browsed the leaderboard page in the community to check needs and haves.

- Jeff found a lot of second-hand graphics cards and clicked to view the corresponding videos.

- Jeff communicated with the poster about the graphics card information and confirmed
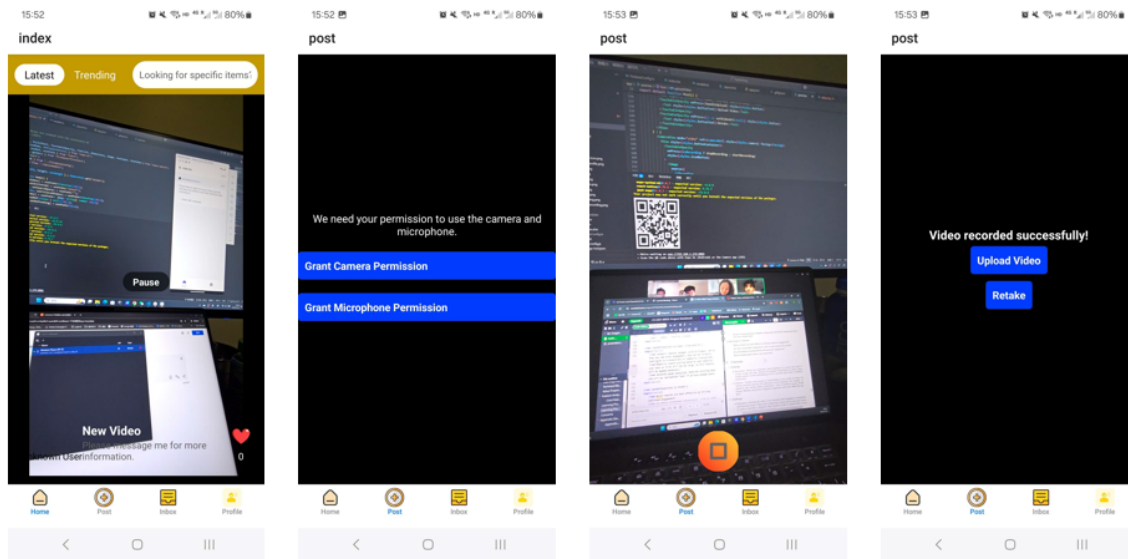
Figure 11: The screenshots of "Posting Item and Video Feeds"

Figure 12: The storyboard of "Posting Item and Video Feeds" generated by OpenAI's ChatGPT (2025)

the transaction details.

9 User Testing Results and Insights

Based on the detailed user testing conducted, we collected feedback from participants of various age groups and levels of trading experience. The primary use case of posting videos and messaging was generally well received, averaging a usability rating of 7/10. However, multiple areas for improvement emerged:
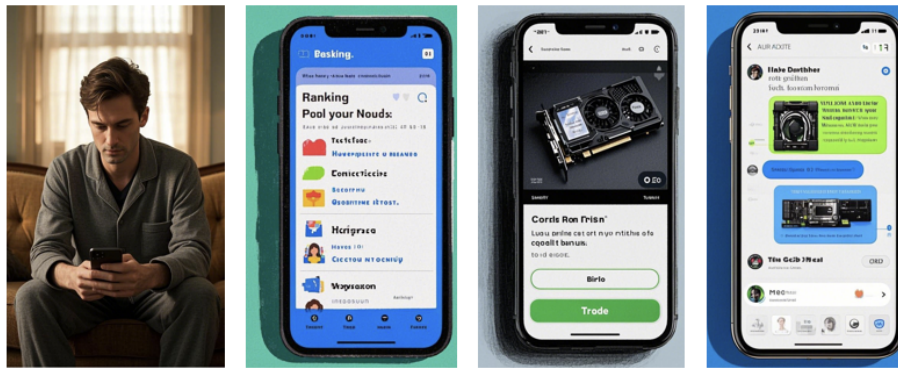
Figure 13: The storyboard of "Community-based leaderboards" generated by OpenAI's ChatGPT (2025)

- **Posting Videos:**

  - Several users requested additional control over video uploads, including the ability to trim video length and upload pre-recorded high-quality videos.

  - Some interviewees found the current recording process straightforward but desired more customization options, such as applying filters, adding captions, and scheduling posts.

  - Users expressed interest in categorizing posts with tags, allowing for better discoverability.

- **Messaging System:**

  - While messaging was generally perceived as intuitive, users requested message timestamps and read receipts to confirm whether their messages were delivered and seen.

  - Some interviewees noted that past conversations disappeared from the inbox, making it difficult to track discussions with other users.

  - Quick message templates were suggested to improve the efficiency of negotiations between buyers and sellers.

- **Browsing Experience:**

  - Browsing videos was generally smooth (average rating: 7.5/10), but some users found the homepage cluttered and suggested improved content organization.

  - Users requested better filtering and sorting options, such as category-based browsing, price-based sorting, and personalized recommendations.

  - Some participants noted the absence of a "saved posts" feature, which would allow users to bookmark interesting listings for later reference.

- Some users think that full-screen video display is indeed helpful for understanding items. But it is not good for displaying search results. They hope to use small pictures to display multiple search results. When clicking on a search result, they can enter the full-screen video & scrolling mode.

- A small number of users believe that when clicking on a user's avatar, they should not enter the chat interface but instead enter the corresponding user's homepage to browse their historical posts.

- **User Interface and Aesthetics:**

  - Multiple interviewees mentioned that the UI, while functional, lacked visual appeal and could be redesigned for better engagement.

  - Alignment issues were reported on the video information bar on the home screen, making some elements hard to read.

  - A few users suggested adding a dark mode option for better readability and usability in low-light environments.

- **Security and Transparency:**

  - Some users expressed concerns about safety, requesting features such as user verification and fraud detection mechanisms.

  - Transparency features such as seller/buyer activity indicators, user rating systems, and verified account badges were suggested to build trust among users.

- **Leaderboards and Community Engagement:**

  - The idea of a leaderboard for tracking trades and community activity was received with mixed reactions. Some users found it interesting, while others considered it unnecessary.

  - Users proposed implementing a reward-based system for active traders, encouraging participation through achievements or ranking badges.

  - Some participants suggested a section dedicated to unique or high-value trades, such as antique exchanges or rare item collections.

  - One user thought that the leaderboard could be added in the search bar on the homepage.

10   Learning Prototype Plans (Post-Testing Adjustments)

To address the insights from user feedback, the next prototype will integrate the following improvements:

- **Enhancements to Posting Features:**

- Implement support for uploading pre-recorded videos and allow users to trim them before posting.
- Add filters and effects for video customization.
- Introduce tagging and categorization for posts, improving discoverability through better sorting.
- Allow users to preview how their post will appear before publishing.
- Implement a post scheduling feature, enabling users to plan their listings in advance.

- **Messaging Improvements:**

  - Display timestamps and read receipts to confirm message delivery and viewing status.
  - Store conversation history in the inbox for future reference.
  - Introduce quick reply templates to facilitate faster responses.
  - Improve message notification settings, ensuring users receive timely updates.

- **UI and Browsing Enhancements:**

  - Redesign the homepage for a cleaner and more structured browsing experience.
  - Implement filtering options for easier content navigation (e.g., price, location, category sorting).
  - Introduce a recommendation algorithm to personalize video feeds based on user activity.
  - Add a "saved posts" feature, allowing users to bookmark interesting listings.

- **Security and Transparency Features:**

  - Develop a user verification system to reduce fraudulent activity.
  - Enable a reporting mechanism for flagging suspicious accounts and listings.
  - Implement seller/buyer activity indicators to show user responsiveness and reliability.

- **Leaderboards and Community Engagement:**

  - Introduce an optional leaderboard showcasing top traders and unique transactions.
  - Develop a reward-based system encouraging active engagement through milestones and achievements.
  - Consider a dedicated section for high-value or unique trades, catering to niche users interested in collectibles and antiques.

10.1   Questions to Answer in Next Testing Phase

To validate these changes, the next round of testing will focus on answering:

- Do new posting features improve user satisfaction and engagement?

- Does the addition of read receipts and message history enhance communication effectiveness?

- Are filtering options and recommendations increasing discoverability and user retention?

- Are security features improving trust and transparency among users?

- How does the leaderboard impact user motivation and app engagement?

- Can we update the storyboard by showcasing there exists someone making trades from one item to another and ends up getting a car.

- Is there a quicker way to trade without messaging each post such as item matching just like dating apps?

- **Purpose of next learning prototype:**
  - Fix some bugs in the codes for each screen for app improvements.
  - Continually developing the core functionalities for users to post items and browse video feeds.
  - Refining interface designs of core functionalities for better user experience.

- **Planned features:**
  - Fix the alignment issues of video information bar on the 'Home' screen.
  - Implement the sort by 'Trending' feature on the 'Home' screen.
  - Implement review features of recordings on the 'Post' screen.
  - Continue developing 'Inbox' screen.
  - Add 3rd party Sign-in via Gmail for faster authentication on 'Profile' screen.
  - Refine the overall interface designs of 'Home', 'Post', 'Inbox', 'Profile' screens.
  - Adaptive reward scaling based on user behavior.
  - A basic recommendation algorithm for video feeds.

- **Features Considered:**
  - Adaptive reward scaling: ensures sling-term engagement by adjusting incentives based on user activity, which can prevent stagnation.

- Leaderboards and tiers: encourages friendly competition, which is a proven driver for continued participation.
- Seasonal events: creates short-term excitement and keeps users returning to the platform.
- Trust score ranking for user posts.

- **Features Considered:**

  - **Home**: The default screen shows the latest video post. User can scroll to view more posts. Fix the alignment issues of video information bar on the 'Home' screen. Implement the sort by 'Trending' feature on the 'Home' screen. **Suhas
  - **Post**: Users can record and upload videos using their phone's camera. After recording, a confirmation tap will upload the video. Implement review features of recordings on the 'Post' screen. **Zhining
  - **Inbox**: For messaging and interaction between users (inquiries about items, scheduling a time and location for local meetups, etc.). **Chen
  - **Profile**: Users can manage their account, view saved posts, and set their location. Add 3rd party Sign-in via Google for faster authentication on 'Profile' screen. ** Xiangsheng
  - Refine the overall interface designs of 'Home', 'Post', 'Inbox', 'Profile' screens. **Everyone (your own screen)

- **Questions to Answer:**

  - Which rewards are most effective at driving continued engagement?
  - Are there unintended consequences, such as users gaming the system?
  - Do personalized recommendations increase user engagement?
  - How do leaderboards impact user motivation?

- **Purpose of next learning prototype:**

  - Refine the reward system by testing different incentive structures.
  - Introduce dynamic leaderboards with real-time rankings.
  - Identify the best-performing rewards and refine the points economy.
  - Evaluate the effectiveness of AI-powered video filtering and recommendations in improving user engagement and reducing spam.

- **Planned features:**

  - Adaptive reward scaling based on user behavior.

- Special seasonal events with time-limited rewards.
- A tiered ranking system for top users.
- A basic recommendation algorithm for video feeds.

- **Features Considered:**

  - Adaptive reward scaling: ensures sling-term engagement by adjusting incentives based on user activity, which can prevent stagnation.
  - Leaderboards and tiers: encourages friendly competition, which is a proven driver for continued participation.
  - Seasonal events: creates short-term excitement and keeps users returning to the platform.
  - Trust score ranking for user posts.

- **Features Excluded & Explanation:**

  - Cosmetic rewards (badges, profile frames): while they may add minor engagement, they do not directly contribute to transactions or community interactions.
  - Social sharing incentives: while they are using, they are secondary to ensuring actual trades occur within the platform.
  - Advanced spams detection: Requires training data and will be implemented later if we have enough users.

- **Questions to Answer:**

  - Which rewards are most effective at driving continued engagement?
  - How do leaderboards impact user motivation?
  - Are there unintended consequences, such as users gaming the system?
  - Do personalized recommendations increase user engagement?

11   Concerns

1. **Challenge**

   - Description: Facing our community barter platform is to ensure that there is a large enough user base. Because the premise of bartering is to have a large enough number of users participating, so as to provide more items to facilitate transactions.
   - Solution: Conduct some surveys or consultations to try to find out where the current potential users get the information about bartering? For example: integration with existing online communities: such as Facebook groups, Reddit forums, WeChat group chats, Telegram; cooperation with some offline flea mar-

kets?

2. **Challenge**

- Description: Ensuring the safety of our customers when engaging in transactions and bartering actions. There may be illegitimate claims and our app must ensure as much as possible to eliminate these threats in order to ensure safety of our customers and validity of these transactions.

- Solution: We must implement countermeasures in order to prevent these actions, simple solutions include meeting in public areas to ensure a safer transaction environment, in app verification of people ID's through multi-factor authentication, safety deposit on both sides to prevent scamming, and a rating system for sellers to allow future customers to see their past customers opinions.

12   Appendix

12.1   Interviews on the First Learning Prototype

Participants acknowledged popular e-commerce platforms that allow local bartering such as Facebook Marketplace and OfferUp, and they knew the 'Problem Overview'. Participants used PayNothing app as "Sign-up/sign-in → Posting items → Browsing videos → Messaging others". Participants are asked questions related to "Posting Item and Video Feeds" — our First Learning Prototype. Questions are as such:

- Interviewee age, gender, social role (optional), and other demographic information (optional).

- How connivent is our app to use on a scale of 1-10 (Focus on primary use case)? May compare with popular e-commerce platforms that you previously used.

- How easy is it to browse videos on the home page, did you find any issues or some other features you wish it can have?

- How was your experience of posting videos? Were there any issues or something you wish could be different?

- How was your experience of messaging someone? Were there any issues or something you wish could be different? Messaging and Inbox features looks too simple. I cannot see my profile image, chat history, and other people's information.

- If you like an item you saw, would you message them? Did you app make it easy for you to contact them?

- For the overall functionality of the app, were you able to effectively browse video feeds, post videos, and message users? If not, why not?

Here are all collected responses:

1. **24 years old, male, a current MSCS student at Tufts University**

   I would consider this app an 8 on a scale of 1-10 overall. UI is okay but there is an alignment issue, so this feature is like a 7 on a scale of 1-10. I wish to have a 'comments' area for each post to discuss the item, and also an item category to classify different items, which you can refer to 'Xian Yu' app. For better user experience, item description on the video can auto fold if it is too long. Why can I not simply upload videos from my phone? If this constraint has a reason then please introduce the reason in the guide when users use it for the first time. Messaging is necessary as I need to contact the user regarding the item I like, but currently the 'inbox' is not displaying my previous chats, and I want the chat to show timestamp as well. I'm able to effectively post and message users, but the keyboard block my view when messaging users and

keyboard can not automatically hide once finising editing stuff. Also, I want my personal information not always display on the profile screen but they can stay in a setting page.

2. **25 years old, male, a current MSCS student at Northeast University**

    I gave Facebook Marketplace (8/10) and OfferUp (7/10), so I would consider this app is a 5 on a scale of 1-10. Items need to be categorized somehow I think. I would add location display to only show items in that area. I would like to change the view of video posts in grid of 4. The search function can only search the exact keywords in title, smart search mechanisms and search history are needed I think. After signed-in via phone number or email address, I tapped 'Post' but cannot view the page and it keep asking me to login to view. I wish I can tag the video in terms of item category so each posted item can be sorted in different categories. Can a post contains multiple videos? What if I want to post the item in different angles but one hand is holding the phone to record and another hand cannot move the item conveniently? I would want to know the time of each message, whether I actually sent the message, the user actually received my message, and read my message, so updating status of each message would be helpful. I think the overall functionality satisfy my use for posting used item and message other users, but I would also like it to have a function somewhere to change the city/distance of item posts.

3. **50 years old, male, a business owner**

    I would consider this app a 5 on a scale of 1-10 overall. How can this app be profitable besides Ads and subscriptions? Can you give some kind of rewards for active users who made 100 item transactions on the app? Will there be a special area on the home page for collectors who are bidding on gemstones and making antique trades? I want you to have a story for the app, such as describing that there exists such a person making trades from one item to another and ends up getting a car. What about adding a leader-board that shows the weekly craziest trades? For example, someone traded a pair of shoes to a rare jewelry that turns out worth a lot. For each posted item, is there a quicker way to trade without messaging others such as showing all matched items for the user so they can pick one of them to exchange.

4. **25 years old, male, a local construction engineer**

    I would consider this app a 6 on a scale of 1-10 overall. Lack of popular features such as item categories, 'Save' and 'Share' videos to friends. I encountered 'Console Error occurred while recording a video' while posting. User should be able to add tags to categorize items. Messaging and Inbox features looks too simple. I cannot see my profile image, chat history, and other people's information. I wish there's a way to match items and trade directly without chatting that much. I cannot record video for some reasons so it is hard to say the efficiency. All I can

say is that this app is interesting compared with current platforms for buying, selling, trading used items.

5. **45 years old, female, not in trading previously**

Rated the app 7/10 for convenience. Posting videos and messaging were easy, but the UI could be more aesthetic. Browsing videos was smooth (7/10), but the UI could be improved. Posting was straightforward, and messaging was easy. Overall, the app effectively handled posting and messaging.

6. **50 years old, male, not in trading previously**

Rated the app 6.5/10. Posting was easy, but more control over video editing (e.g., trimming, quality) was desired. Browsing videos was very easy (8/10), but the UI could be improved. Messaging was straightforward. Overall, the app met the primary use case but could be enhanced.

7. **21 years old, male, not in trading previously**

Rated the app 7.5/10. The primary use case was covered, but the app's look and color scheme could be improved. Browsing videos was smooth (9/10). Posting and messaging were easy and straightforward. Overall, the app was effective but needed UI improvements.

8. **20 years old, male, not in trading previously**

Rated the app 6/10. The app felt like a shell and needed more features to encourage posting and messaging. Browsing was easy (7/10), but the app needed more safety reassurance. Overall, the primary use case was covered, but the UI and features needed work.

9. **25 years old, male, not in trading previously**

Rated the app 8/10. Posting and messaging were seamless, but better categorization and filtering options were desired. Browsing was intuitive but felt cluttered (7.5/10). Posting was smooth, but scheduling posts or saving drafts would be helpful. Messaging was easy, but quick message templates could improve communication. Overall, the app was effective but needed better organization tools.

10. **21 years old, female, used Facebook Marketplace before**

Rated the app 7.5/10. The app achieved its purpose, but messaging could be more streamlined (e.g., automatic replies). Browsing was easy (8/10), but saving or favoriting posts would be helpful. Posting was easy, but cross-posting to other platforms would maximize reach. Messaging was straightforward, but more transparency (e.g., active seller indicators) would improve the experience. Overall, the app worked well but needed quality-of-life improvements.

11. **28 years old, male, not in trading previously**

Rated the app 7/10. Posting felt too basic, and messaging needed better notification settings. Browsing was smooth (9/10), but a "related items" section would be a great addition. Posting was easy, but previewing posts would be helpful. Messaging worked fine, but read receipts would improve the experience. Overall, the app worked well but needed more personalization options.

12. **26 years old, female, used Facebook Marketplace before**

Rated the app 8/10. Posting and messaging were straightforward, but safety features (e.g., user verification) were lacking. Browsing was fine (7/10), but customizing the feed based on interests would improve the experience. Posting was easy, but templates or pre-set descriptions would speed up the process. Messaging was simple, but a "negotiation" feature would be helpful. Overall, the app worked but needed better personalization and security tools.

13. **53 years old, female, not in trading previously**

Rated the app 7/10. The app was smooth to operate but felt incomplete. Browsing was good (7/10), but a recommendation algorithm and product classification would improve the experience. Posting was easy, but automatic categorization would be helpful. Messaging was functional but needed more features. Overall, the app was effective but needed functional improvements.

14. **24 years old, male, used WeChat groups before**

Rated the app 7/10. The functions were clear, but some features seemed problematic. Browsing was smooth (8.5/10), but tags were missing. Posting was okay, but posts didn't automatically play after uploading. Messaging was basic, but message history was missing. Overall, the app was effective but needed feature improvements. Leader-board can be a complementary function that combined with the search bar.

15. **25 years old, male, used Facebook Marketplace before**

Rated the app 5.5/10. The app was functional but needed optimization. Browsing was smooth (7/10), but video tags, favorites, and forwarding were needed. Posting was okay, but categories/tags and UI optimization were necessary. Messaging was functional, but avatars and message status indicators were needed. Overall, the app worked but needed significant improvements. Leader-board is unnecessary. You can add it if you want to increase competitiveness.

16. **23 years old, male, not in trading previously**

Rated the app 8.5/10. The app needed improvements compared to TikTok-style apps. Browsing was easy (8/10), but saving videos and classifying items were needed. Posting was smooth, but combining pictures with videos would improve clarity. Messaging was okay, but read receipts were needed. Overall, the app was effective but needed feature enhancements. Leaderboard can be added as a recommendation for users.

12.2 Responses on the Survey Questions

In addition to interviews on our First Learning Prototype, we also conducted a survey for need-finding and improving aspects of the primary problem, here are the questions in our survey:

1. Select your age: 18-29;30-39;40-49;50-64

2. What is your gender? Female;Male;Prefer not to say

3. What is your frequency of buying/selling/trading USED items?
   Very Frequently;Frequently; Occasionally;Rarely;Never

4. What places you'd expect to buy/sell/trade used items? eBay, Poshmark, and other online-shopping platforms; Facebook Marketplace, Craigslist, OfferUp, and those that can meet up in-person; Goodwills and other local thrift stores

5. What items you may consider to trade or giveaway? Clothing and Apparel; Electronics; Books; Home Appliances; Furniture; Collectibles; Games and Toys; Fashionable Accessories; Sports Gears; vehicles, bikes, and other transports

6. What prevent you from buying/selling/trading used items? Taking photos, uploading them sequentially, writing descriptions, and repeating this tedious process;Paying extra fees such as shipping fees, seller fees, and sales tax; Disappointing experiences such as spam listings, fake items, non-delivery, or delivery of wrong items; None. I actively BST items and I have no concerns

7. If you are willing to engage in local trades and giveaways, that would be: Families looking items for children; Collectors seeking valuable exchanges;Sustainability-focused people who are eco-friendly; Students who enjoy thrifting; Work professionals need to clear out unwanted items; None of above, I would never do these

8. Could you briefly share some thoughts or concerns on your experience of buying/selling/trading used items?

Collected survey responses are stored in `response.csv`.

12.3 The First Interview

All the e-commerce platforms that participants mentioned are reviewed and used as additional resources of previous knowledge. Below are my notes taken after the end of each chat using the *Notes* App by Apple.

- Day 1 — Learning commons on campus (2 out of 4 quality interviews)

  - **A 1st year grad student:** She sometimes uses Amazon to buy things, and knew other apps such as Ebay and Facebook marketplace but never bought anything from them. She never bought used items from others and she is not familiar with

OfferUp and Poshmark. She has/had items that she rarely uses but never sells them because it sounds like a lot of work. Bartering items sounds interesting but she feels lazy taking pictures, writing descriptions, and replying to people.

- **A 3rd year undergrad student:** He recently bought a used guitar on Facebook marketplace, and it was a local pickup. He previously listed his sneakers and old textbooks to sell but it was like "hit or miss". He never sold anything on Offerup or Ebay, because he got used to the Facebook marketplace. For buying used items, he prefers local transactions because chances of good finds, but scammers can be a waste of time. He rarely sells his items because seller fees and the process of shipping. He never trades items with people online and does not know how that works.

- **Chats that did not go far:** One student said he has a lecture soon and she cannot chat for long. Another student said he was working on something and asked if I could do this with somebody else.

• Day 2 — At a local cocktail bar (3 out of 3 quality interviews)

- **A middle-aged man in casual wear:** He previously sold used furniture and tools on Facebook marketplace. He also uses Craigslist and Reddit to find good tools and electronics for work purposes. He mentioned sometimes people flake on him or offer really low prices on items he tries to sell. He is not sure if online bartering is a good idea because cash is the king and he needs some money back for valuable things he bought before.

- **A lady and her boyfriend in business attire:** She recently bought clothing from Free People online after trying them on in-store. Both her boyfriend and she knew e-commerce platforms/ apps such as Pacsun, Macy's, Nike, Chewy (her boyfriend has a dog). They prefer shopping malls than online because it is more fun to walk around and find stuff that you really like. The lady believes that it is hard to check the actual quality of an item from pictures, and that is why she returns things she bought online more often than things she bought in person. They both have some old clothes, shoes, and books they do not use anymore, but do not have time to post them online so they rather donate to Goodwill. They think online bartering is interesting, but needs moderators to check the quality to prevent unfair situations.

• Day 3 — At at Starbucks location (2 out of 3 quality interviews)

- **A young guy in his street-wear:** He often does online shopping because it is convenient. The top 3 apps that he uses the most for buying things are Nike, Ebay, and Depop. He has done some local sneaker trades on Offerup before, and he mentioned that people should be cautious with buying fake shoes. He sold a few things on Ebay but his earnings are low due to all kinds of seller fees. Online bartering is a good idea, but he is concerned about shipping fees and whether users will receive the items as described, or will there be an authentication step? He used to buy and sell sneakers on StockX but it took too long to receive the shoes or funds because of the authentication step.

- **A middle-aged woman waiting for her daughter:** She has Walmart and Amazon apps on her phone for online shopping, but she hasn't used them for a while. She said that her daughter, a high school student, bought some skincares and anime stickers from Tiktok influencers. Things she does not use anymore will either be donated or thrown away because they are broken or damaged. She prefers buying items in person because both shipping and returning take longer time than doing it in-person. Local bartering sounds more appealing than online bartering because exchangeable items are low-valued and shipping could be expensive and time consuming.

- **Chats that did not go far:** The guy was waiting on his order, and he got his order in the middle of the conversation. He said he needed to go somewhere else so I decided to end the conversation.