

AMERICAN
UNIVERSITY OF BEIRUT

MAROUN SEMAAN FACULTY OF
ENGINEERING & ARCHITECTURE



AUB

MarketPlace

Final Design Document Report

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Project Title: AUB Marketplace

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Introduction

The AUB student community faces the challenge of navigating scattered resources when attempting to buy or sell items and recover lost AUB IDs. This decentralization results in some inefficiencies and risks, for example, when dealing with unverified individuals on any open social media platforms. Moreover, the loss of AUB IDs from the community is a frequent case that needs a dedicated system to deal with it. The AUB Marketplace project provided a solution where it not only facilitates the procedures of buying and selling inside the AUB community, but it also integrates a feature that helps students in locating their lost IDs.

The AUB Marketplace provides a centralized, easy-to-use platform that facilitates transactions among students and helps recover lost IDs. It also encourages environmentally friendly consumption through enabling students to resell their items that they no longer need or use, purchase from their peers and efficiently recover their misplaced IDs. Additionally, it secures privacy by allowing only authenticated AUB members into the system, thereby protecting students from potential scams.

This report presents an overview of the AUB Marketplace project, detailing the problem we aimed to solve, the solution we developed, and the key steps taken during the development process. This document will also explore the contributions of each team member and outline potential future enhancements to the platform.

Problem Statement

What is the Problem?

The primary issue is the absence of a centralized platform for AUB students to buy, sell items and recover lost IDs. Currently, students rely on a fragmented network of resources, including WhatsApp chats, Instagram posts, and individual messages to conduct transactions and seek assistance for lost IDs. These decentralized methods make the process inefficient and insecure at the same time; the system becomes disorganized, resulting in listings that are hardly visible since they get lost among unrelated posts, and often fail to reach the intended audience. This lack of

structure and centralization makes it more difficult for students to trust each other, as there is no reliable mechanism to verify the identities of individuals involved in transactions. Consequently, there is an increase in scams with students often falling victim to individuals who represent themselves as members of the AUB while they are not.

This implies that the current methods of buying, selling and recovering IDs among AUB students are not efficient and lack the necessary measures to guarantee safe transactions and ID recovery. This problem limits student opportunities and decreases the trust and safety of the campus environment.

Significance of the Problem

The lack of a centralized marketplace within the AUB community has many impacts in terms of trust and sustainability. Since most students experience trust issues, they tend to buy new items from secure websites. While this brings peace of mind, it unfortunately detracts from sustainable practices by encouraging the constant consumption of new goods rather than reusing existing ones. Without a dedicated platform, students are deprived of the opportunity for eco-friendly transactions.

The lack of a marketplace does not only face the risk of sustainable exchanges but also affects the student experience through economic activity and less opportunity for students to interact with one another. Students lack a secure and convenient platform for buying and selling their items. They also lack an organized online platform where they can report and find lost ID. A centralized platform would help address these challenges by providing a secure environment for buying, selling, exchanging goods, and managing lost items. It would support affordable prices based on student's budget, enhance the overall student experience and promote an interconnected campus.

In short, all buying, selling and managing lost ID methods within AUB are currently conducted through external sites or secure websites, which do not contribute to the sustainability aspect and reduce the sense of community. The marketplace will let students have a greater degree of interaction and permit sustainable practices.

Relevant Statistics

To gather valuable insights from the target group, we conducted a survey in which around 35 AUB students participated. These surveys were distributed through WhatsApp group communities to ensure we would reach a very diverse audience. The principal idea behind conducting the survey was to understand how AUB students make their purchases, manage their lost IDS, what they like, and what they think. This approach allowed us to set up the platform regarding the needs and expectations of the student community, so that it would best fit the solution to their challenges and the improvement in their experience.

1. The survey shows that 25% of respondents use online platforms to sell pre-owned products, which indicates there is demand and willingness among AUB students to engage in this type of transaction. The AUB Marketplace could provide a convenient platform to facilitate the buying and selling of pre-owned items within the university community.
2. 68.8% of respondents believe that if their listings got more exposure to AUB students, it could help sellers reach a wider audience of potential buyers. This suggests that providing visibility and access to the AUB student community could be beneficial for the marketplace.
3. 59.4% of respondents indicated they have items they wish to sell or buy but are facing difficulties with the process. The top challenges seem to be delivery inaccessibility, needing to use a credit card, difficulty reaching potential customers, and safety and fraud concerns. The AUB Marketplace could address these points by offering convenient and secure transaction methods, and a trusted platform for the university community.
4. The survey shows that AUB students are active online shoppers, with 28.6% buying items online frequently, multiple times a month. Additionally, 14.3% of respondents buy items occasionally, a few times a year. This indicates a significant level of engagement with online platforms among the university community.
5. When asked about the items they are usually looking to buy, AUB students expressed interest in a wide range of products. The most popular categories include books (28.6%), and electronics (28.6%). Other notable interests were sports-related products (28.6%), fitness products (14.3%), and art supplies (14.3%). This diversity of product preferences suggests that an AUB marketplace could help meet the needs of the students.

6. The survey revealed that AUB students predominantly use social media platforms like WhatsApp, Instagram, and Facebook (71.4%) for their online buying and selling activities. Online marketplaces such as Amazon and eBay are also commonly utilized (42.9%). This indicates that an AUB Marketplace could build upon these existing shopping behaviors and preferences.
7. The survey reveals that the loss of AUB IDs is a common occurrence, with 34.3% of respondents indicating that they have lost their ID. This suggests that a significant portion of the student community has faced the challenges associated with misplacing or losing their university-issued identification. The AUB Marketplace platform can help in this matter.
8. When asked about the number of times they have lost their ID in the past year, most respondents (66.7%) reported losing it once. However, a notable 8.3% had lost their ID twice, and 25% had lost it three times or more. This pattern highlights the recurring nature of this issue and the need for measurements to address it.
9. The survey respondents described the various steps they took to recover their lost IDs. The most common approach was reporting the loss to the university's security office, as indicated by 83.3% of the respondents. Additionally, 58.3% of students turned to social media platforms, such as WhatsApp and Instagram, to seek assistance in locating their lost ID. A significant proportion (75%) also checked places where they might have misplaced the card. The AUB Marketplace can help by being a unique place students turn to when losing their ID, and where students would immediately know if someone found their ID. However, when using social media, the message would be hidden very easily and have a probability of not even reaching the owner of the ID.
10. Despite the efforts made by students, the survey results show that not all lost IDs were successfully recovered. While 75% of respondents were able to recover their ID, 25% were ultimately unable to do so. This suggests that while the university's processes and resources are generally effective, there is still room for improvement in ensuring a higher rate of successful recoveries.
11. The time it took to recover the lost IDs varied among the respondents. Nearly half (41.7%) were able to recover their ID within a day, while 25% were able to do so within a week. However, 16.7% took more than a week to recover their ID, and 16.7% never managed to

- recover it at all. 50% stated that they were unsatisfactory with the ID recovery process. The diversity in recovery timelines highlights the need for streamlined and efficient procedures.
12. The results of the survey provided a clear picture of the experiences and challenges that AUB students go through with their lost IDs which inform targeted strategies and improvements towards enhancing efficiency and effectiveness in managing the university's ID system to benefit all AUB.

At large, this survey also demonstrates a strong need for an AUB Marketplace. This is supported by high user satisfaction with current online methods, diverse product interests, and active online buying habits implying that an AUB Marketplace platform could be very useful. Additionally, respondents offered insights into various features they would prefer to have in an AUB Marketplace including low prices, comprehensive product photos and easy communication between buyers and sellers among others that can make the platform more suited to the needs and preferences of the community at the university.

Motivation

The motivation behind choosing this problem comes from its significant impact on the AUB student community and the benefits it offers. As students, we are conscious of the difficulties associated with the existing methods. The inefficiencies, security risks, and low visibility of the current procedures act as barriers that prevent students from getting cheap goods, selling things they no longer need, conducting safe and secure transactions and managing lost ID.

A centralized platform enhances the student experience since it not only makes buying, selling, and managing lost ID easier, but it also strengthens the sense of community among students by facilitating easy connections and sharing.

Furthermore, by encouraging the reuse of things, this platform contributes to waste reduction and the development of a culture of responsible consumption, both of which are consistent with the principles of environmental sustainability.

From here, we chose to tackle this problem because we want to enhance the student experience, build a stronger community, and promote environmental sustainability.

Solution Overview

The AUB Marketplace is a comprehensive platform designed to centralize all the selling, buying and managing of lost IDs processes within the university community. It addresses the inefficiencies and associated risks in the existing process by providing a secure, user-friendly space for the student to connect and carry out their transactions.

One of the main features of AUB Marketplace is a very strong authentication system to ensure that members that join are verified AUB members; users logging in are required to use the AUB email. It also supports password recovery and step authentication. These features ensure the security and safety of the platform.

The core of AUB Marketplace is item listings, where users can post and delete posts for items they wish to sell. Each listing can be accompanied by detailed descriptions, images, and categorization for appropriate searching and filtering by other users. The platform supports image processing with AI-based recognition for categorization.

Simple messaging services will allow buyers and vendors to quickly connect—a feature that serves as an intermediate service to link buyers to the sellers. Due to its exclusivity to AUB students, the platform would allow the users to meet on campus for the item exchange, ensuring a safe place and space for the exchange. It further gives the user the chance to set the meeting place and time. Additionally, the item sold is marked as “SOLD”.

Beyond the core marketplace functionalities, the platform includes additional features like a Lost and Found section, where it sends an email to the users that have the same initials as the ones on the lost ID.

In short, AUB Marketplace is a robust, secure, user-centric platform that does not only facilitate the buying, selling and managing of lost ID processes but also creates a closer, more caring community at AUB through sustainable practices.

Features

This AUB Marketplace project is categorized into four priority levels: P0, P1, P2, and P3. Each of these would be tagged with a different level of importance and urgency in the implementation

process to ensure that the most critical features are developed and deployed, and the non-implemented features form part of the project's future plan. The main features that are implemented are the following:

1. Sign-Up/Log-In:

Provides the ability for users to create an account using their AUB email or log in if they have created one. The system assigns a username based on the first five characters of their email at AUB. One can set a new password upon registration.

2. Password Recovery:

Allows users to reset their passwords in case they are forgotten, thus continuously having access to their accounts.

3. Profile Management:

Allows users to update their personal information, including username, major, profile picture, and biography.

4. Create Listings:

Allows users to create new items for sale by filling out a form with details such as title, description, category, price, condition, and uploading images.

5. Edit Listings:

Allows users to edit the details of their existing listings to keep them updated by marking them as sold or deleting them from the marketplace.

6. Image Upload:

Users can upload images of the items they are selling.

7. Detailed View:

Provides a detailed view of an item that includes all images, a detailed description, condition and price. The user can contact the seller about questions, negotiations, and setting up a meeting point for the transaction to happen.

8. Search and Filtering:

Provides a search bar along with filter options to the users for searching items through keywords and filtering the results through categories, price, date posted, and condition.

9. Messages:

Implements a simple messaging system to facilitate communication between buyers and sellers.

10. Image Recognition:

Utilizes AI-based image recognition for categorization of items through their images.

11. Lost and Found Section:

Sends an email to the users that have the same initials as the ones on the lost ID.

12. Security Features:

Includes a verification code via email at signup and password recovery, along with an access token at login. Now, on sending a request to the API Gateway, it checks whether a token associated with the request matches the access token at login.

Technologies Used

Frontend Technologies

In the development of the AUB Marketplace project, we combined React and CSS to provide a dynamic, responsive, and visually appealing user interface.

React

React is a very popular JavaScript library for building user interfaces. It has a component architecture that enables any developer to create components that are reusable for user interface creation.

The component-based structure of React makes it possible to create modular, reusable components. It can be noted even in the project structure, where every page or functional area, like LoginForm.js, HomePage.js, and Product.js, constitutes just one React component. React takes state management out of the box. It ensures that the view automatically changes when data changes in the background, thus providing a seamless user experience.

It uses a virtual DOM, optimizing the rendering process by updating only the parts of the user interface that really changed. It runs a fast and responsive application; this only gets better as the UI gets more complex.

CSS

The project has extensive usage of CSS, which styles the HTML created by React components.

There is a separate CSS file for every page or functionality, like App.css, HomePage.css,

Product.css, managing the visuals of the appearance. CSS oversees the layout, colors, fonts, spacing, and, generally, the looks of the web application.

The project guarantees a responsive user interface, that adjusts to different screen sizes and devices; this is critical for a good user experience whether access is from a desktop, tablet, or mobile device.

First, the AUB Marketplace project was designed using Figma, a well-known design tool. After designing, the output is then coded, with corresponding JavaScript (.js) and CSS (.css) files for every page or component.

The project follows a structured approach: each major feature or page will have its own React component JS file accompanied by its own CSS file. Separation of concerns here implies each component is self-contained, thus making a codebase easy to maintain and update.

Backend Technologies

We have used several AWS services at the backend of the AUB Marketplace project for the efficient handling of core functionalities. We implemented Amazon SNS to send notifications to users, particularly at the time of their sign-up, offering them the option to subscribe to lost ID notifications. This service ensures that users receive notifications related only to lost IDs with initials that match their own, thus handling privacy and relevance issues.

AWS Lambda functions work as part of our system and perform operations on our DynamoDB tables, such as uploading items, deleting items, and storing conversations. Therefore, the URL of the uploaded image is kept in DynamoDB but is stored in Amazon S3. Amazon Cognito handles user authentication and sign-up procedures, including tasks like sending verification codes and resetting passwords. After pushing everything to the GitHub repository, the whole application was then deployed using Amplify. It provides a fully managed platform to support efficient deployment and scaling. With these services, through the SDK, Boto3, communication and

automation of AWS operations are done efficiently to ensure a scalable, serverless backend architecture.

Architecture or System Design (Low-Level Design)

The following components form the core of the architecture:

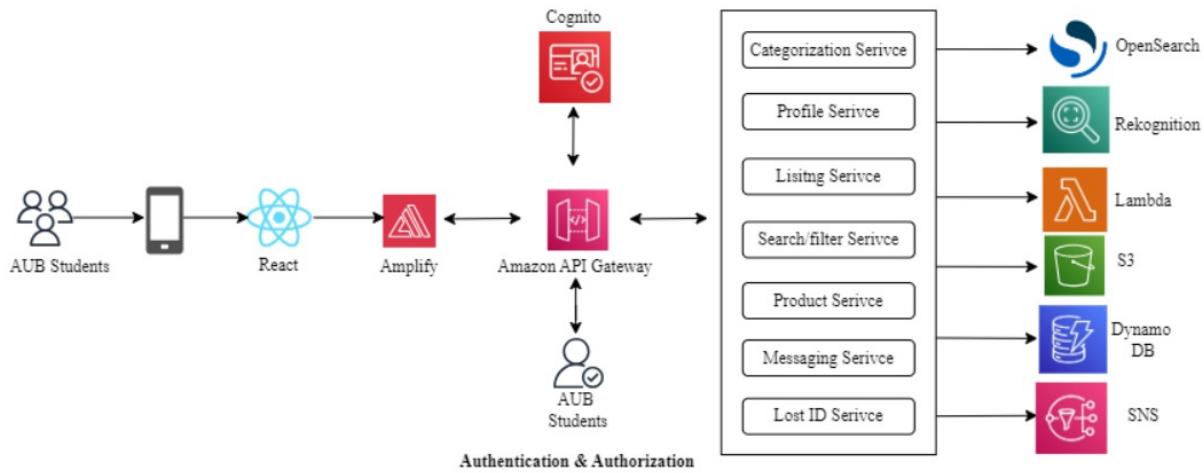


Figure 1: High Level Diagram

- AUB Students: They are the target users in the marketplace.
- React: It is the front-end framework used for developing the user interface, ensuring a dynamic and responsive experience for the users.
- Amplify: AWS Amplify is used for application deployment, as it bridges the frontend, React, with the services in the backend, making the platform scalable and more manageable.
- Amazon API Gateway: API Gateway serves as the main interface between the front-end and back-end services. It processes the incoming API requests from the React application and routes them to the respective microservices.
- Authentication & Authorization: This will be managed via API Gateway and integrated with Amazon Cognito to ensure secure access to the platform.

- Cognito: Amazon Cognito manages user authentication, authorization, sign-up, login, and password recovery, ensuring secure access to the platform and integration with other AWS services.

Various Services:

- Profile Service: Manages user profiles.
- Listing Service: Handles item listings, updates, and removals in the marketplace, utilizing AWS Lambda for scalable execution.
- Product Service: Manages the product database, storing details in DynamoDB and images in S3.
- Messaging Service: Facilitates communication between buyers and sellers.
- Categorization Service: Organizes and categorizes the listed items, enhancing searchability and the user experience.
- Search Filter Service: Allows users to search for products and listings using keywords and apply various filters to refine their results.
- Lost ID Service: Allows users to recover lost IDs.

AWS Services:

- Rekognition: Used for AI-based categorization.
- Lambda: Executes backend functions, such as database operations.
- S3: Stores images related to products, providing a scalable and secure storage solution.
- DynamoDB: Serves as the primary database for storing structured data, such as user information and product details.
- SNS: Sends notifications to users, particularly in case of a lost ID.
- OpenSearch: Enhances the search experience for users.

The architecture is designed to be highly scalable, secure, and responsive, making use of AWS services to handle different areas of the platform and ensuring smooth interactions between users and the system. The microservices will combine with the AWS services, making the management, update, and future extension of the platform more manageable.

Side Note

The time it takes to fetch categories is approximately 3 seconds which is way less than the time it takes to input product details. Also, uploading images is the first step and choosing a category is the last step which provides sufficient time to fetch categories and prevent hauling the user until categories are fetched.

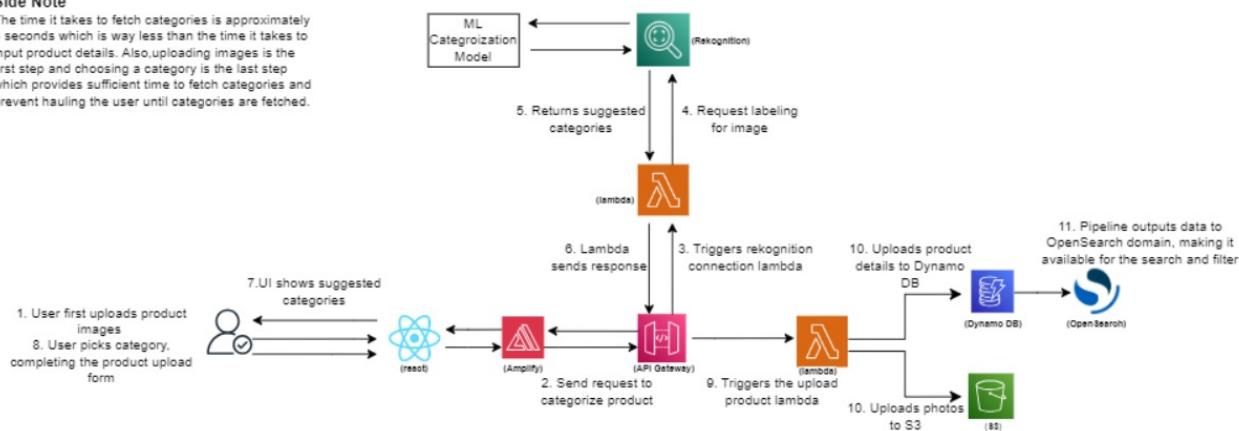


Figure 2: Low Level Diagram explaining the upload process in the website

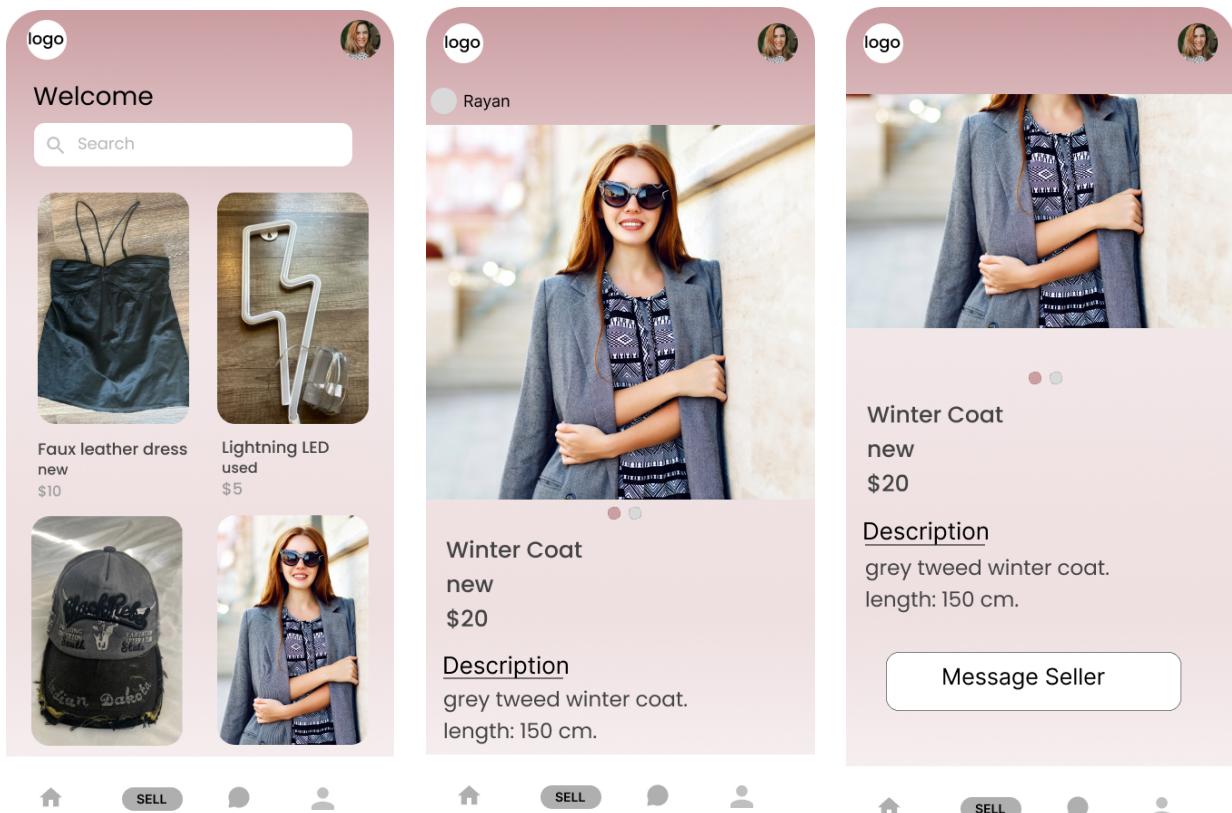
UI Design

As part of our UI design process, we created our prototype using Figma. This prototype includes eight main pages:

- **Homepage:** The homepage features a display of various items, each shown with a picture, price, and condition. The layout also includes a search bar, a logo on the left, and a user profile icon on the right.
- **Item Detail Page:** When a user selects an item and navigates to the item detail page, they can view two pictures of the item, along with its price, condition, and a detailed description. At the bottom of the page, there is a "Message Seller" button.
- **Messaging:** Clicking the "Message Seller" button takes the user to a conversation page where they can communicate directly with the seller to arrange a meeting or negotiate the price.
- **Profile Page:** When the user clicks on the profile icon located at the bottom left, he/she is taken to his/her profile page. Here, he/she can edit his/her profile, add a bio, and view the items he/she has uploaded on the website.

- **Add New Item:** By pressing the "Add New Item" button, user can upload images of his/her item, provide the product name, description, condition, and price, and then post it on the platform.
- **Messages Page:** Clicking the messages icon at the bottom of the screen directs the user to their conversations with other users.

These pages together create a streamlined user experience, ensuring that all key functions are easily accessible and user-friendly.



Product Listing:

Rayan

Winter Coat

new
\$20

Description

grey tweed winter coat.
length: 150 cm.

Messaging Screen:

Rayan

Winter Coat

Hello! I would like to purchase this item

Hello! yes, of course

I can give you the item this week. Can you provide me with the times you're available?

I can do Wednesday at 1:30 pm. Would that work?

Perfect! Would Wednesday at 1:30 pm in front of West Hall work?

Yes! That would be great. I'll text you if I can't find you.

Deal! It's going to be 20\$ as the post says.
Thank you for your purchase!

User Profile:

lmf15 lama

Edit Profile Share Profile

Bio

My Items

Jacket Jeans new \$20

Acrylic Sweater used \$22

Product Creation:

Add images

Name of product

Description

Condition

New Used

Price

USD | Enter Price

POST

Search Results:

Search

- Lama
- Hadi
- Elias
- Tia
- Ahmad
- Miriam

Regarding our platform, first, for testing, we can browse using the provided link (for testing, you can use: Email: judges@mail.aub.edu, Password: Amazon123@).

If the user does not have an account, he/she can sign up by entering his/her AUB email, setting a password, and re-entering the password. A verification code will be sent to the email, which the user can use to verify the account. In case the user forgets the password, he/she can reset it by entering their AUB email and the verification code sent to him/her.

Once logged in, the user will be on the homepage where different items are displayed with their names, prices, pictures, and a "SOLD" mark for items that have been sold. The user can press the "LOST ID?" button on the top right to insert his/her full name, ID name, phone number, and comments about where the ID will be picked.

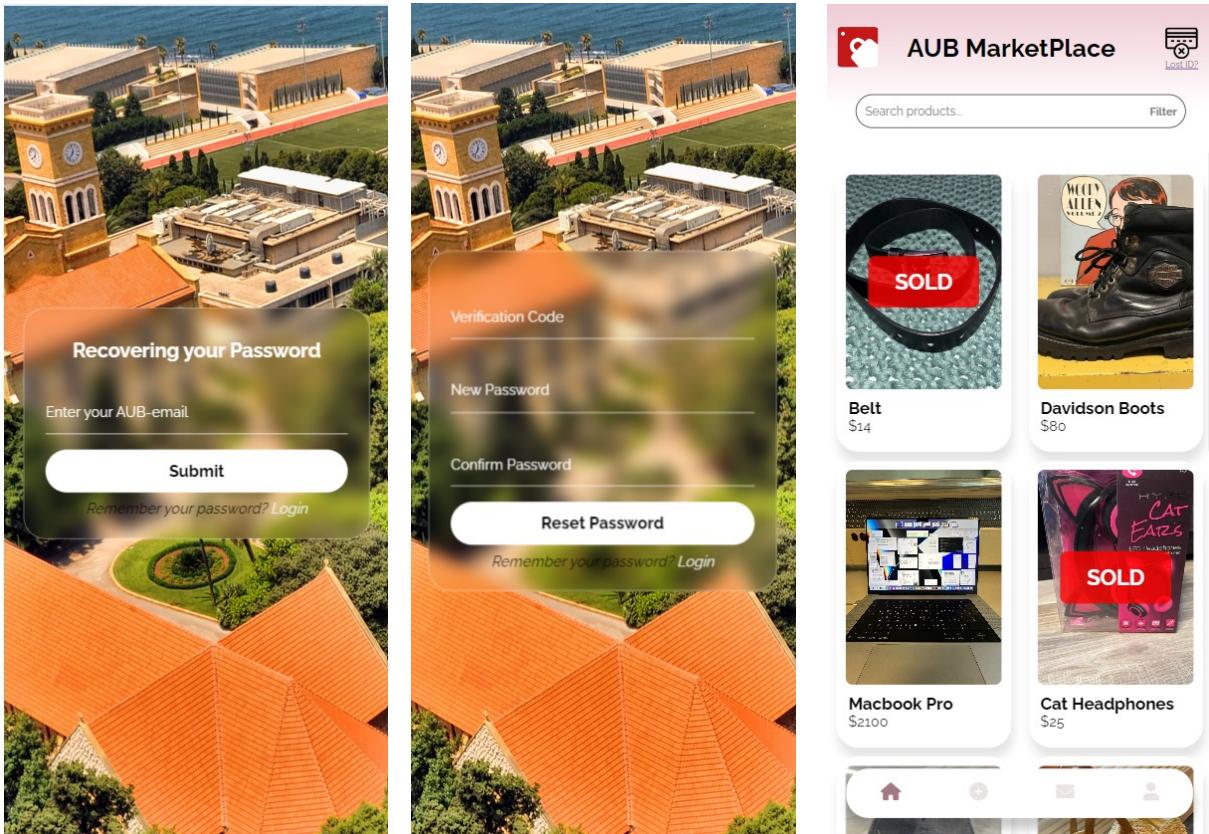
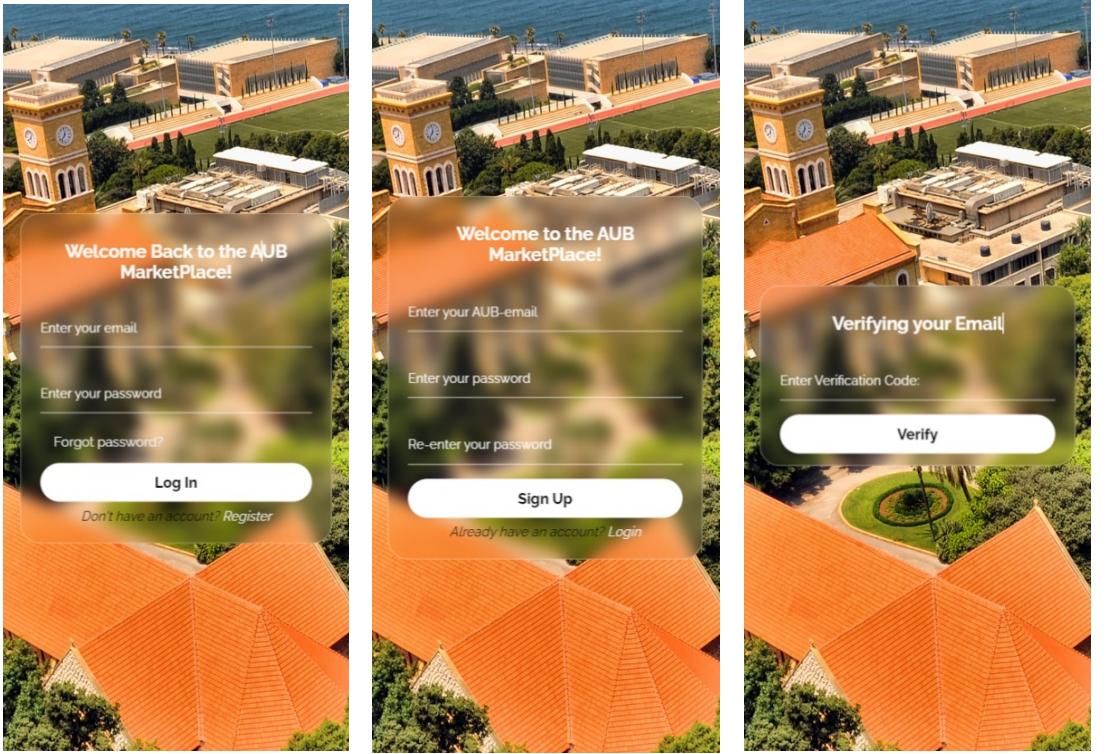
Returning to the homepage, the user can apply filters by category, condition, price, and date of upload to view items that match the selected criteria.

When viewing a product, the user can see up to 6 images, the item's name, a description, its price, condition, and a "Message Seller" button. If the user wants to purchase the item, he/she can press "Message Seller" to start a conversation with the item's owner. The user can also view the seller's profile by clicking on the profile.

The user can upload items by pressing "+", then uploading images (up to 6), entering the product's name, description, condition, price, and selecting a category. He/She must agree to the terms and conditions before posting.

In the user's profile (accessible from the bottom right), he/she can edit his/her profile, including the nickname and major. The user can also manage items he/she has posted, mark items as sold. Additionally, he/she can view the list of conversations with other users.

As shown on the last page, the user will receive an email if someone finds his/her lost ID.



← Lost ID?

Found a lost ID? Fill the form below. We'll find the owner and let them contact you!

Full Name
Enter the full name, as seen on the ID

Your Name (Optional)
Enter your name

Phone Number (Optional)
Enter your contact phone number

Comments
Will the ID be dropped at some office or kept with you?..

REPORT ID

AUB MarketPlace

Search products...

Filter Products

By Category: Select Category

By Condition: Select Condition

By Price: Min Max

Uploaded After: mm/dd/yyyy

Filter

Macbook Pro
\$2100

Cat Headphones
\$25

eje11



Belt

Description: No more worries about your pants not fitting

Condition: Very Good

Price: \$14

Message Seller

eje11



Belt
\$14

About Elias

About Elias...

Elias's Items

Macbook Pro
\$2100

Davidson Boots
\$80

Type a message... 

eje11
Elias
CCE

About Elias

About Elias...

Elias's Items

Macbook Pro
\$2100

Davidson Boots
\$80

NIKE Slides
\$20

SOLD

Upload Product

Ready to sell what you don't need anymore?
Start uploading your product now and make space for something new.

Start

Upload Product

Upload Images

No images added yet. Add up to 6 images!

← →

[Home](#) [+](#) [Email](#) [Profile](#)

Upload Product

Name of product

Enter name of product

Description

Add a description

Condition

Select condition

Price (USD)

Enter price

← →

[Home](#) [+](#) [Email](#) [Profile](#)

Upload Product

Choose Category

Select a category

← →

[Home](#) [+](#) [Email](#) [Profile](#)

Upload Product

Terms and Conditions for Uploading a Product

By uploading a product, you agree to the following:

- **Accuracy:** Ensure all product details are correct and not misleading.
- **Ownership:** You confirm you own the rights to the product and that it does not violate any third-party rights.
- **Prohibited Items:** Do not upload illegal, counterfeit, or prohibited items.
- **Compliance:** Your product must comply with all applicable laws.
- **Liability:** AUB MarketPlace is not responsible for disputes arising from your listings.
- **Removal:** We may remove listings that violate these terms.

By proceeding, you agree to these terms.

I agree to the terms and conditions.

POST

← →

[Home](#) [+](#) [Email](#) [Profile](#)

 **hac23**
Hadi
CCE

[Edit](#) [Log Out](#) [Delete](#)

About You

CCE E3

My Items


Small pouch
\$10


Jeans
\$25



[Home](#) [+](#) [Email](#) [Profile](#)

 **hac23**
Hadi
CCE

[Save](#) [Log Out](#) [Delete](#)

Nickname
Hadi

Major
CCE

[Upload Profile Image +](#)

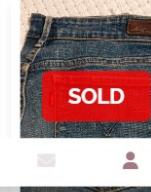
[Delete Profile Image -](#)

About You

CCE E3

My Items


Small pouch
\$10


Jeans
\$25

[Home](#) [+](#) [Email](#) [Profile](#)



Small pouch

Description: Each includes one letter or heart!

Condition: New

Price: \$10

Delete Item Mark as Sold



Jeans

Description: Brand-type: Bershka

Size: L

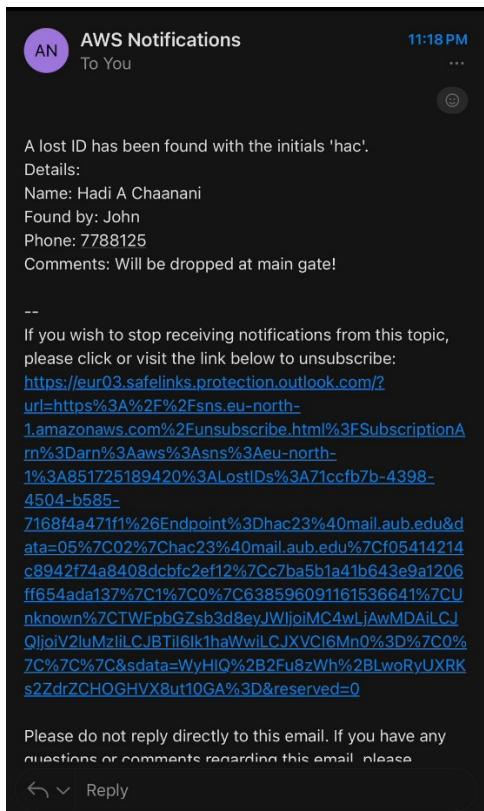
Condition: Good

Price: \$25

Delete Item Sold

Chats

User	Message	Time
 ej011	\$ 14	10:45 PM
 ej011	\$ 2100	04:32 PM
 ej011	\$ 12	11:32 AM



Target Audience

The primary target audience for the AUB Marketplace platform consists of AUB students, who form the core of the university. Their needs would be met by the platform through its secure, and user-friendly interface to enhance buying, selling and managing of lost IDs within the AUB community. Through many well-worked-out features that improve convenience, safety, and community engagement, the AUB Marketplace platform satisfies its users effectively. It ensures that AUB students have a reliable and user-friendly environment.

1. Accessibility and Convenience:

The platform is easily accessible to any student at AUB, thereby providing a special gateway where students can interact, buy, sell items and manage ID lost without using or logging into other external platforms. This ensures students can get what they need within their community from textbooks or electronics or ...

2. Security and Trust:

By making users log in with their AUB email, it ensures that users are only legitimate students at AUB. This feature builds trust in the fact that users are dealing with fellow students.

3. Affordability:

AUB students often look out for economical deals when buying anything, be it books or even simple essentials. The website enables them to find the items at lower rates, according to the student budget.

4. Community Engagement:

The concept is to give students a sense of community through peer-to-peer transactions. Through this platform, sustainability in the use of items is advanced, which appeals to students who are increasingly aware of the difference they can make for the environment.

5. Ease of Use:

The user interface is friendly; thus, it is easy for a student to get around the site, listing items for sale, searching for products, and contacting the seller. This ease of use provides efficiency, which is a high priority for students with time constraints.

Challenges Encountered

Some of the challenges we faced:

1. Database Design Complexity

- Challenge: Designing a single-table DynamoDB schema that efficiently supports all access patterns based on user stories.
- Details: Ensuring that the primary keys (partition key and sort key) are correctly defined to avoid conflicts and allow efficient querying was a significant challenge. The need to balance between flexible schema design and optimizing for specific access patterns required careful planning and iteration.

2. Understanding and Implementing Access Patterns

- Challenge: Identifying and implementing the correct access patterns for various user stories.
- Details: Determining how the data would be accessed and queried was critical to the project's success. This required a deep understanding of user requirements and translating them into efficient database queries, which was a non-trivial task.

3. Frontend Design and Integration

- Challenge: Designing and integrating a responsive and user-friendly frontend that effectively interacts with backend services.
- Details: Ensuring that the user interface (UI) was both visually appealing and functionally robust across different devices and screen sizes posed challenges. Additionally, integrating the frontend with backend APIs, managing state, and handling dynamic data required careful coordination and testing.

4. UI/UX Consistency

- Challenge: Maintaining consistency in the UI/UX design across different components and pages of the application.

- Details: As the project progressed, ensuring that all UI elements followed a consistent design language, especially when multiple team members were contributing to the frontend, was a challenge. Aligning the design with AUB's branding and ensuring an intuitive user experience required ongoing adjustments and refinements.

5. Real-time Data Handling and Messaging

- Challenge: Implementing real-time data updates and direct messaging between users.
- Details: Ensuring that users could communicate in real-time and see up-to-date information without refreshing the page required implementing websockets or other real-time data handling methods, which added complexity to both frontend and backend development.

6. CSS Layout and Positioning Issues

- Challenge: Handling CSS layout and positioning issues, especially with responsive design elements.
- Details: Specific issues like the placement of the filter button in the search bar required careful tweaking of CSS properties and understanding of flexbox and other layout models. Ensuring that all elements aligned properly across different screen sizes was a persistent challenge.

7. Coordination and Task Management

- Challenge: Effectively managing and coordinating tasks among team members, particularly in a remote or hybrid work environment.
- Details: Ensuring clear communication, timely task completion, and synchronization between frontend, backend, and database workstreams required strong project management skills and frequent check-ins.

8. Technical Documentation and Knowledge Transfer

- Challenge: Creating comprehensive documentation and ensuring knowledge transfer among team members.
- Details: As the project involved multiple technologies (e.g., React for frontend, DynamoDB for backend), documenting the codebase, design decisions, and processes was essential but challenging. Ensuring that all team members were on the same page and could easily understand and contribute to the project required well-maintained documentation.

9. Mentor Feedback and Iteration

- Challenge: Iterating on the project based on mentor feedback, which sometimes required significant changes to the design or implementation.
- Details: Incorporating mentor feedback often meant revisiting earlier design decisions, which could be time-consuming and required flexibility from the team to make necessary adjustments.

These challenges reflect both the complexity and learning opportunities presented by the AUB Marketplace project. Each challenge required careful consideration, collaboration, and problem-solving, contributing to the overall development of the platform and the team's skills.

Implementation Plan

The development process for the AUB Marketplace project was organized and executed through a series of phases, each with its own timeline and set of milestones.

Week 1: June 17 - June 23

Introductory Week

During the first week, we focused on establishing communication channels and building a collaborative environment. We joined the Slack channels to streamline communication with the mentors. Each team member introduced himself/herself, got acquainted with the mentors, shared experiences, and discussed the collective goals he/she aimed to achieve during the project. A

meeting was scheduled with the mentors, where the goals and expectations were discussed; it was also defined how they could best support the project's success during each phase of the development process.

Week 2: June 24 - June 30

Design and Planning

In the second week, the primary task was to develop and submit a comprehensive Design Document. Lama and Elias worked on the introduction part, including the problem statement and the project objectives. Tia and Hadi focused on the low-level design. Elias outlined the technologies that would be used. This design phase was critical to align all elements of the project with its goals.

Week 3: July 1 - July 7

Implementation Phase

With the design document finalized, we moved into the implementation phase. The roles were distributed as follows: Hadi was a software developer handling both frontend and backend development; Elias served as the team leader and was also a software developer responsible for both frontend and backend development; Lama was the product manager and a software developer focusing on frontend tasks; and Tia was a software developer working on frontend development.

Week 4: July 8 - July 14

Prototype Submission

During this week, Lama and Elias worked on developing and refining the Figma prototypes. The goal was to create a prototype that effectively demonstrated both the functionality and user interface of the AUB Marketplace. Elias searched for a template for the project, and Lama worked on the template, ensuring it met all necessary requirements and accurately reflected the design intentions.

Week 5: July 15 - July 21

Market Insight

In the fifth week, there was a meeting where all the members discussed their market insights in

order to clearly understand the market trends, the potential customer base, and the competitive landscape relevant to the AUB Marketplace project. At the end of the week, Lama, being the product manager, conducted some surveys to be sent to the AUB community.

Weeks 6 - 8: July 22 - August 12

These weeks were dedicated to advancing the development of the project. The team focused on addressing any challenges encountered and refining features. We were working on the integration of all components of the project, making sure that all the separate elements work together in a coherent and functional way on the platform. We have also consulted our mentors, Miriam Bilac and Amad Salmon, in finalizing all tasks and making sure this project does what it is intended for.

Throughout these phases, we maintained a structured approach, regularly reviewing progress and adapting as necessary to meet the project goals. The involvement of mentors played a significant role in guiding the team, offering support, and ensuring the successful delivery of the AUB Marketplace project.

Future Work

For future work, the integration of local businesses would enhance the AUB Marketplace, providing a greater variety of products and services for the students while helping to boost the local economy. This would be achievable through creating dedicated interfaces for business accounts, offering promotional opportunities and local vendors' collaboration for exclusive student deals. Besides, many of the features that contribute to the continued growth and satisfaction of users on the platform were those that we didn't get enough time to complete.

These features will further include a User Reviews and Ratings system, where students would rate sellers and buyers based on previous experience with them, then write reviews about that person in order to gain trust and clarity on each other's intentions. It could add an extra layer of safety by introducing authentication with Authenticator, which checks the identity of the users

through an authenticator app.

A History feature would be very useful to see browsing and transaction history. This will help users keep track of all activities done on the platform. Language Options, would be useful for a varied audience by providing the app in many different languages, like Arabic, English, and probably French.

Favorites/Wishlist would allow users to save all the items of interest to them for later, while notifications would serve to keep users informed of new messages, offers, or updates on their listings in real-time.

Finally, additional functionalities will include Club and Event Announcements, a way for clubs to provide updates and for other events, such as workshops or concerts, to be advertised. Such refinements will make the AUB Marketplace more user-friendly and secure and position it as a central hub for students and local businesses, thus fueling a greater sense of community and more sustainable economic activity on campus.

Conclusion

The AUB Marketplace project was initiated to address the huge gap within the AUB community for a safe and centralized platform through which students can be involved in buying, selling, and managing of lost ID. Consolidating all activities in one user-friendly space, this platform has the potential to further enhance student experiences, promote sustainable consumption, and foster a stronger sense of campus community.

The effects of AUB Marketplace on the student would be multifaceted: safety in transactions, breaking dependency on external platforms that usually lack safety, and reusing items to contribute to sustainability.

The project development process has been challenging and enriching for the team. It gave them valuable insights into real-world application development: attention to the needs of the user, security, and scaling of applications. While reflecting on our journey, we are proud of what we have accomplished and excited about the future enhancements and possibilities for the AUB Marketplace.

Team Contributions

Each member played a significant role in the development of the AUB Marketplace.

Elias:

- **Front-End Development:** Worked on the development, bug fixes, and finalization of all pages. Focused on building a responsive and intuitive design, integrating with the backend, optimizing code, and performing thorough testing. Utilized version control tools like Git and GitHub for code management.
- **Database Management:** Designed, created, developed, and optimized the website's database, ensuring efficient data storage and retrieval.
- **Team Leadership:** Managed project planning and execution, coordinated team activities, communicated with stakeholders (Amad), and provided technical oversight to ensure project alignment with objectives.

Hadi:

- **Back-End Services:** Designed and implemented back-end services and systems, including integration with other services. Developed and finalized the user conversations table for efficient storage and retrieval.
- **Front-End Development:** Developed and finalized all front-end pages, ensuring user-friendly design and adaptive functionality. Integrated front-end components with the back-end through API Gateways, Lambda functions, and databases.
- **AI Integration:** Implemented AI-based image classification to automatically analyze and categorize images, enhancing the user experience with accurate and efficient categorization.
- **Search Functionality:** Designed and integrated OpenSearch for product search capabilities, including filter implementation and the creation of an effective search interface for querying and result filtering.

Tia:

- **Front-End Framework:**

Selling Pages: Designed the front-end for two pages related to item selling.

Messaging Pages: Designed the front-end for two messaging pages.

Responsive Design: Worked on making the homepage responsive. This involved adjusting and refining the design to ensure compatibility and optimal display across various devices and screen sizes, providing a consistent user experience.

- **Project Documentation:**

Report Creation: Compiled and organized the project document report, ensuring it provides a comprehensive overview of the project's development. This includes detailed sections on the project's objectives, the solution and the implementation plan.

Lama:

- **Figma Design:** Developed design prototypes using Figma.
- **Surveys:** Conducted surveys to gather insights into students' preferences, habits, and pain points.
- **AI Categorization:** Researched and chose AWS Rekognition for its extensive label range and robust image and object recognition capabilities. Mapped AWS Rekognition labels to the specific categories defined for the website.
- **Lost IDs Page:** Focused on the front-end framework for the Lost IDs page.

As a team, we worked closely together, supporting each other whenever necessary. This collaborative spirit pushed us to work as a unified force, overcoming challenges and leading the project to completion. Additionally, we received invaluable guidance and support from our mentors, who played a significant role in helping us navigate challenges and refine our approach. Through our combined efforts, we were able to create a platform that meets most of the needs of the AUB community.

References

Prototype:

<https://dribbble.com/shots/20449197-Marketplace-Mobile-App-Concept-Tokosmile>

[Online Marketplace App Projects :: Photos, videos, logos, illustrations and branding :: Behance](#)

[Marketplace Mobile App Concept - Tokosmile by Ali Husni ✨ for Enver Studio on Dribbble](#)

Front end:

[Quick Start – React](#)

AI for Categorization:

<https://docs.aws.amazon.com/rekognition/latest/dg/lambda-s3-tutorial-python.html>

Search and Filter Features:

<https://aws.amazon.com/cloudsearch/>

<https://aws.amazon.com/opensearch-service/>