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ABSTRACT

The city of Buea, located in the South West region of Cameroon, is experiencing rapid growth in its tech ecosystem, driven by an increasing number of tech events, startups, and student clubs from institutions such as the University of Buea and Catholic University. Despite this growth, tech enthusiasts, students, and new entrants face challenges in accessing accurate and comprehensive information about ongoing tech events, startup activities, and student clubs. This lack of centralized information creates barriers to participation and engagement within the local tech community.

To address this challenge, our project aims to design a mobile application using the design thinking approach, focusing on the needs and experiences of the targeted users. The application will serve as a centralized information hub, providing details on tech events, startups, and student clubs in Buea. Users will have access to information about event schedules, locations, descriptions, objectives, and activities. Additionally, the app will feature notifications for upcoming events, contact information for club administrators, and descriptions of startup services and popular software products.

By leveraging user-centered design methodologies, we aim to create an intuitive and effective solution that enhances the digital literacy and engagement of tech enthusiasts in Buea. This application will not only facilitate better access to information but also foster a more connected and active tech community.

Keywords: Tech ecosystem, Buea, centralized information, mobile application, design thinking, tech events, startups, student clubs.

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1. INTRODUCTION

In today's interconnected world, the technology sector plays a pivotal role in shaping global economies and societies. The exponential growth of tech startups, the vibrant activities of student clubs, and the increase in the number of tech events highlight the dynamic nature of this ecosystem. The proliferation of startups in the tech industry has significantly impacted economic growth and innovation [1]. Startups contribute to job creation, technological advancement, and disruption across various sectors. In recent years, the city of Buea in the South West region of Cameroon has emerged as a burgeoning tech hub. With a notable increase in tech-driven activities, events, and a growing number of startups and tech communities, Buea has positioned itself as a fertile ground for digital innovation and literacy. Institutions such as the University of Buea and the Catholic University play pivotal roles in nurturing tech talent through various student clubs and initiatives. However, despite this rapid growth and the wealth of opportunities it presents, accessing detailed information about these startups, including their technologies and milestones, often requires navigating multiple platforms and sources, which can be inefficient and time-consuming [2]. Also, Student clubs within universities and colleges are crucial hubs for fostering collaboration, learning, and innovation among future tech professionals [3]. These clubs organize workshops, competitions, and networking events that are instrumental in shaping the skills and career trajectories of their members. Yet, information about their activities and opportunities for engagement may not be readily accessible to external audiences. Tech events, such as conferences, hackathons, and networking sessions, play a vital role in knowledge dissemination and community building within the tech ecosystem [4]. These events facilitate networking opportunities, showcase emerging technologies, and provide platforms for collaboration and recruitment [5]. However, staying updated on upcoming events and accessing relevant details can be challenging without centralized and easily accessible information sources.

1.1. PROBLEM STATEMENT

The primary challenge lies in the lack of a centralized source of information about tech events, startups, and student clubs in Buea. This fragmented access to information hinder the ability of tech enthusiasts, students, and interested individuals to engage effectively with the local tech community. The absence of a cohesive platform results in missed opportunities for participation in events, collaboration with startups, and involvement in student clubs. Consequently, there is a pressing need for a solution that consolidates this information into an easily accessible and user-friendly format.

1.2. OBJECTIVES

The objective of this project is to design and develop a user-friendly mobile application that centralizes information about tech events, startups, student clubs, and tech communities in Buea, Cameroon. Specifically, the application aims to:

- **S**pecific: Provide comprehensive details about each event, startup, and club, including descriptions, locations, schedules, contact information, and activities.
- **M**easurable: Ensure that users can easily access and retrieve information about tech-related activities and organizations within the city of Buea.
- **A**chievable: Leverage existing technologies and design principles to create an intuitive and accessible platform.
- **R**elevant: Address the current gap in information dissemination within the local tech community, enhancing connectivity and participation.
- **T**ime-bound: Prioritize the user-centered design of primary features, such as event notifications and detailed organization profiles, ensuring a timely and effective rollout of essential functionalities.

1.2.1. SPECIFIC OBJECTIVES

A. Information Consolidation

To gather and centralize information about tech events, startups, and student clubs in Buea, including details such as event schedules, locations, descriptions, and contact information.

B. User Engagement

To create an intuitive and user-friendly interface that allows users to easily navigate and access the information they need.

C. Real-Time Notifications

To design a notification system that alerts users about upcoming events, workshops, hackathons, and competitions, ensuring they stay informed and can participate actively

D. Networking Opportunities

To provide contact details and profiles of key administrators, organizers, and startup founders, facilitating networking and collaboration within the tech community

E. Promotion of Local Start-Ups

To highlight the services and products offered by local startups, thereby promoting their visibility and encouraging support from the tech community

1.3. RESEARCH QUESTIONS

A. Information Access

What are the current barriers to accessing information about tech events, startups, and student clubs in Buea?

B. User Needs

What specific features and functionalities do tech enthusiasts in Buea require in a mobile application to effectively engage with the local tech community?

C. Content Integration

How can information about tech events, startups, and student clubs be effectively consolidated and presented in a user-friendly format?

D. User Experience

How can the design of the mobile application enhance user engagement and satisfaction?

E. Impact on Community

How will the availability of a centralized information hub influence the participation and collaboration within the tech community in Buea?

2. LITERATURE REVIEW

2.1. Related works

Designing an app focused on providing information about tech startups, tech student clubs, and tech events entails several key considerations. Such applications typically aim to enhance user experience through intuitive interfaces, relevant content organization, and effective information retrieval mechanisms. User-centered design principles are crucial in ensuring the app meets the needs and expectations of its target audience [8]. This involves conducting thorough user research to understand user behaviours, preferences, and pain points, which can inform features and functionalities that are most valuable to users [9].

In terms of content organization, apps like these often utilize categorization and filtering mechanisms to help users navigate through vast amounts of information effectively. Chen et al. (2021) emphasize the importance of clear and logical information architecture to facilitate seamless browsing and searching experiences [10]. Moreover, incorporating social features such as user reviews, ratings, and social media integration can foster community engagement and user-generated content [11].

Visual design plays a critical role in engaging users and communicating the app's brand and purpose. Design guidelines suggest that visual elements should be aesthetically pleasing yet functional, ensuring readability and ease of use across different devices and screen sizes [12]. Furthermore, the use of interactive elements such as maps, calendars, and personalized notifications can enhance user interaction and satisfaction. Key considerations in app design include navigation and information architecture. Intuitive card-based layouts and hierarchical menus are employed to streamline access to startup profiles and event details. These designs not only facilitate quick information retrieval but also enhance user experience by minimizing cognitive load through clear visual hierarchies.

Accessibility considerations are also pivotal in designing inclusive apps. Ensuring compliance with accessibility standards and guidelines can expand the app's reach to users with diverse needs and disabilities [13]. Research highlights the importance of responsive design principles and accessibility features such as text-to-speech capabilities, alternative text for images, and high contrast interfaces for users with disabilities. This involves implementing features like scalable interfaces and alternative navigation options that cater to varying user needs.

Designing an app for tech-related information involves synthesizing insights from user-centered design principles, effective content organization, engaging visual design, accessibility considerations, and robust technical implementation. By drawing upon these aspects from existing literature and app designs, one can develop a comprehensive design framework that aligns with user needs and expectations in the tech community.

2.2. Conceptual Framework

Designing applications like touristic aids tailored to the tech ecosystem involves integrating several conceptual frameworks that guide the development process to ensure a user-centric and effective solution. Following are the various conceptual frameworks that guide the design of applications

2.2.1. Design Thinking

This conceptual framework emphasizes deep empathy with users to uncover their needs and preferences. By immersing themselves in the user's context, designers gain insights into how tech enthusiasts interact with information about startups, student clubs, and events. This understanding forms the foundation for ideation and prototyping phases, where innovative solutions are conceptualized and tested iteratively [14]. Design Thinking's iterative nature ensures that the app evolves based on continuous feedback, enhancing usability and aligning closely with user expectations.

2.2.2. User-Centered Design

This another crucial framework that prioritizes usability and user satisfaction throughout the design process. By conducting usability testing and incorporating user feedback at each stage, UCD ensures that the app's interface and functionalities are intuitive and easy to navigate [15]. This approach not only improves the overall user experience but also increases engagement with the app's content, such as detailed profiles of tech startups, upcoming club activities, and industry events.

2.2.3. Agile Methodologies

further enhances the development process by promoting flexibility and responsiveness to changing user needs and technological advancements [16]. Agile's iterative approach allows for frequent updates and enhancements, ensuring that the app remains relevant and competitive in the dynamic

tech landscape. This methodology fosters collaboration among cross-functional teams, facilitating rapid design cycles and quick adaptation to emerging trends in tech tourism.

2.2.4. Information Architecture frameworks

This is very essential for organizing and structuring content within the app to facilitate efficient navigation and information retrieval [17]. By employing principles of information architecture, designers can create intuitive pathways that guide users to relevant information about startups, club activities, and tech events. Clear categorization and hierarchical structures ensure that users can easily discover and explore the diverse offerings of the tech ecosystem.

2.2.5. Accessibility Standards

such as the Web Content Accessibility Guidelines (WCAG) ensures inclusivity by making the app accessible to users with disabilities [18]. Designing with accessibility in mind such as providing alternative text for images, ensuring keyboard navigation, and accommodating screen reader technology enables all users, regardless of their abilities, to access and benefit from the app's resources.

By integrating these conceptual frameworks designers can create a comprehensive strategy for developing a touristic aid app that effectively serves the needs of tech enthusiasts and stakeholders in the industry.

2.3. Theoretical frameworks

Designing applications like touristic aids for the tech sector involves leveraging theoretical frameworks that underpin various aspects of user interaction, information dissemination, and technological integration. These theoretical frameworks provide a solid foundation for understanding and addressing the complexities involved in designing such applications.

2.3.1. Activity Theory

Offers a theoretical lens to understand how users interact with technological artifacts within their socio-cultural contexts. It emphasizes the interconnectedness between users, their activities, and the tools they employ, such as touristic aid apps for tech startups and events [19]. By applying Activity Theory, designers can analyse the roles and goals of different user groups and design interfaces that support their activities effectively.

2.3.2. Technology Acceptance Model (TAM)

Explores how users perceive and adopt new technologies based on perceived usefulness and ease of use [20]. For touristic aid apps, TAM guides the design process by focusing on enhancing perceived usefulness such as providing comprehensive and accurate information about tech events and ensuring ease of use through intuitive interfaces and seamless navigation.

2.3.3. Unified Theory of Acceptance and Use of Technology (UTAUT)

integrates various models of technology adoption to predict and explain user acceptance and use behaviour [21]. This framework helps in designing touristic aid apps by considering factors such as performance expectancy, effort expectancy, and social influence, thereby optimizing user acceptance and engagement with the app.

2.3.4. Contextual Design

focuses on understanding the context in which users will interact with the app, including their goals, tasks, and environment [22]. By conducting contextual inquiries and creating rich user personas and scenarios, designers can tailor the app's features and functionalities to meet specific user needs in the tech tourism domain.

3. METHODOLOGY

This chapter outlines the systematic approach employed to develop the mobile application designed to centralize information about tech events, startups, student clubs, and tech communities in Buea, Cameroon. The methodology encompasses several critical phases: requirement gathering and analysis, tool selection, design strategy, hardware specifications, constraints, and assumptions.

3.1. REQUIREMENT GATHERING

In the world of software development, the success of a project relies heavily on a crucial yet often overlooked phase: Requirement Gathering. Requirements gathering is a crucial phase in the software development life cycle (SDLC) and project management. It involves collecting, documenting, and managing the requirements that define the features and functionalities of a system or application. [2] For our project to showcase tech startups and student clubs in Buea, it was essential to understand the specific needs and expectations of our users. To achieve this, we employed the design thinking approach, which emphasizes user-centered design and iterative feedback.

The design thinking approach allowed us to deeply engage with our users, ensuring that their insights and feedback were integral to the requirements gathering process. As part of this approach, we identified and engaged with key users who acted as sponsor users. These sponsor users provided valuable, ongoing insights that helped us shape and refine our requirements.

3.1.1. REQUIREMENT GATHERING PROCESSES

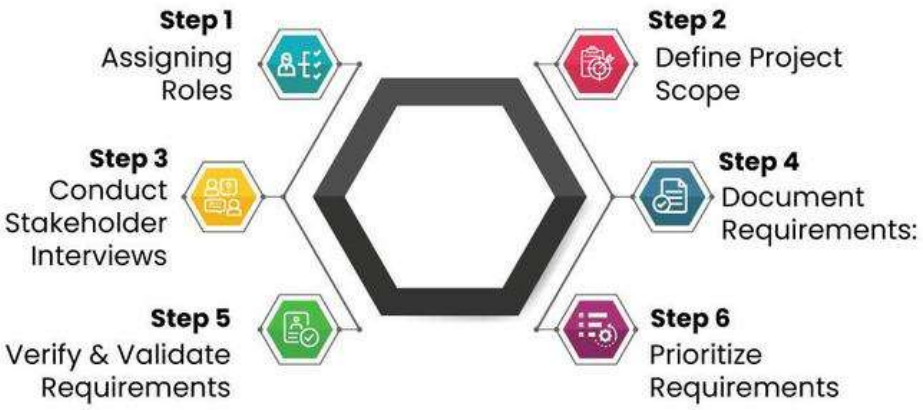


Figure 1: requirement gathering processes

3.1.1.1. Assign Roles

Identify and engage with all relevant stakeholders. Our identified stakeholders consist of:

- Tech Enthusiast: involving students, Engineers, and any other individual having a passion for tech-driven activities and events
- Start-ups
- Student Clubs and tech communities

3.1.1.2. Define Project Scope

The scope of this project encompasses the development of a mobile application designed to centralize information about tech events, startups, student clubs, and tech communities in Buea, Cameroon. The project aims to address the challenge of accessing accurate and up-to-date information for tech enthusiasts in the region.

General Objective

Develop a comprehensive mobile application that provides centralized information on tech events, startups, student clubs, and tech communities in Buea, Cameroon.

Boundaries

1. **Geographical Focus**: The application is specifically tailored for the tech ecosystem in Buea, South West region of Cameroon.
2. **User Demographic**: The primary users are tech enthusiasts, students, and professionals interested in tech events and communities in Buea.
3. **Content Scope**: The application will only include information related to tech events, startups, student clubs, and tech communities, excluding other unrelated sectors.
4. **Platform**: The application will be developed for both Android and iOS platforms using React Native.

Limitations

1. **Data Availability**: The accuracy and comprehensiveness of the information depend on the availability and reliability of data provided by event organizers, startup founders, and club leaders.

2. **Internet Dependency**: Real-time updates and notifications require reliable internet connectivity, which might be a constraint in certain areas.
3. **Resource Constraints**: Limited budget and time constraints may impact the scope of features that can be implemented within the initial release.
4. **User Adoption**: The success of the application depends on user adoption and continuous engagement from the tech community in Buea.
5. **Technical Challenges**: Potential technical challenges include ensuring cross-platform compatibility, managing data synchronization, and maintaining application performance under varying network conditions.
6. **Security Concerns**: Ensuring the security and privacy of user data, as well as protecting the application from unauthorized access and cyber threats, is crucial.

3.1.1.3. Conduct Stakeholder interview

To gain deeper insights into the needs and perspectives of our target users, we conducted interviews with a diverse group of people from both tech and non-tech backgrounds. These interviews were a crucial part of our requirements gathering process and provided valuable information that shaped our understanding of the user landscape.

Interview Process

We reached out to individuals from various demographics and professional backgrounds, ensuring a balanced representation of tech enthusiasts, students, professionals, and everyday citizens. The interviews were conducted both in person and virtually to accommodate different preferences and schedules.

In addition to the general interviews, we also engaged more deeply with our sponsor users. These sponsor users were key individuals who provided ongoing, detailed insights throughout the project. Their involvement allowed us to explore the needs and challenges of our target audience more thoroughly.

Key Questions

1. Do you know about any tech startups or student clubs in Buea? If so, how many can you name?

2. How do you typically find information about tech startups, student clubs, and events in Buea?
3. What challenges do you face in trying to learn about or connect with local tech startups and student clubs?
4. What kind of information would you find most useful in an app that lists local tech startups and student clubs?

Findings

The interviews revealed a significant gap in knowledge about local tech startups and student clubs. To our surprise, most interviewees could not name more than one or two startups or clubs, and some could not name any at all. This confirmed our initial assumption that there is a widespread lack of awareness about the tech ecosystem in Buea.

Reasons for the Gap

When asked why they were not aware of local startups and clubs, many respondents mentioned that they did not know where to start looking for this information. They expressed frustration at not even knowing the names of startups or clubs to search for online. This highlights a critical need for a centralized source of information that can introduce users to these organizations and provide detailed, accessible information about them.

User Reactions and Additional Insights

After expressing their difficulties in finding information, we introduced our concept of an app that would provide real-time information about tech startups and student clubs in Buea. The respondents reacted very positively, with some describing it as a "data bank of the tech community in Buea."

When asked about desired features for the app, they suggested:

- Constant notifications about upcoming events and updates from startups and clubs.
- Reminders for events and updates.
- A platform for startups and clubs to post opportunities for internships or employment.
- A comprehensive directory with up-to-date information on services, events, and developments within the tech community.

Sponsor Users' Contributions

The sponsor users provided more detailed and ongoing insights compared to the general interviews. They emphasized the importance of real-time updates and the ability to connect directly with startups and clubs through the app. Their feedback highlighted the need for features such as notifications, reminders, and opportunities postings, which were echoed by the broader interview responses.

These insights reinforced the importance of our project's objective and provided clear direction for the features and functionalities that our app should include. The feedback from these citizen interviews, especially the in-depth contributions from sponsor users, was instrumental in defining our user personas and ensuring that our app addresses real user needs and pain points.

3.1.1.4. Document Requirements

Systematically document the gathered requirements. This documentation can take various forms, such as user stories, use cases, or formal specifications. Clearly articulate functional requirements (what the system should do) and non-functional requirements (qualities the system should have, such as performance or security).

3.1.1.5. Verify and Validate Requirements

Once the requirements are documented, it’s crucial to verify and validate them. Verification ensures that the requirements align with the stakeholders’ intentions, while validation ensures that the documented requirements will meet the project’s goals. This step often involves feedback loops and discussions with stakeholders to refine and clarify requirements.

3.1.2. REQUIREMENT GATHERING TECHNIQUES USED

3.1.2.1. WORKSHOPS

During our workshop sessions, all team members being present and actively participating, we began by defining the project’s objective; to create a centralized app that provides comprehensive information about tech startups and student clubs in Buea. This objective was clearly communicated to all participants, and everyone was encouraged to think creatively and come up with potential solutions.

We employed the "Five Why" method, a design thinking technique, to uncover the underlying problem. This method involves asking "why" multiple times (5x) to peel away the layers of

symptoms and get to the root cause. Through this process, we identified that the main issue was the lack of a central source of information about tech in Buea, leading to significant gaps in knowledge among tech enthusiasts and other users. With this core problem in mind, we moved on to identifying the stakeholders of our system, in order to go next to the gathering of their needs and expectations regarding such system, and the impact it can have in this locality.

3.1.2.2. SURVEYS AND QUESTIONNAIRES

Distributing surveys and questionnaires to a broad audience to collect information on a larger scale. This technique is useful for gathering feedback from a diverse set of stakeholders and can be particularly effective in large projects.

3.1.2.3. USE CASES AND SCENARIOS

Developing use cases and scenarios to describe how the system will be used in different situations. This technique helps in understanding the interactions between users and the system, making it easier to identify and document functional requirements.

3.1.2.4. DOCUMENT ANALYSIS

Reviewing existing documentation, such as business process manuals, reports, and forms, to extract relevant information. This technique provided us with insights into the current processes and helps identify areas for improvement.

3.2. REQUIREMENT ANALYSIS

3.2.1. Key Findings

1. Interest in Technology:
    - Approximately 47% of respondents had been interested in technology for one to three years.
    - About 20% were new to the tech field.
2. Awareness of Tech Startups and Student Clubs:
    - Less than 57% of respondents knew 5 tech startups.
    - Around 60% knew less than 3 student clubs.

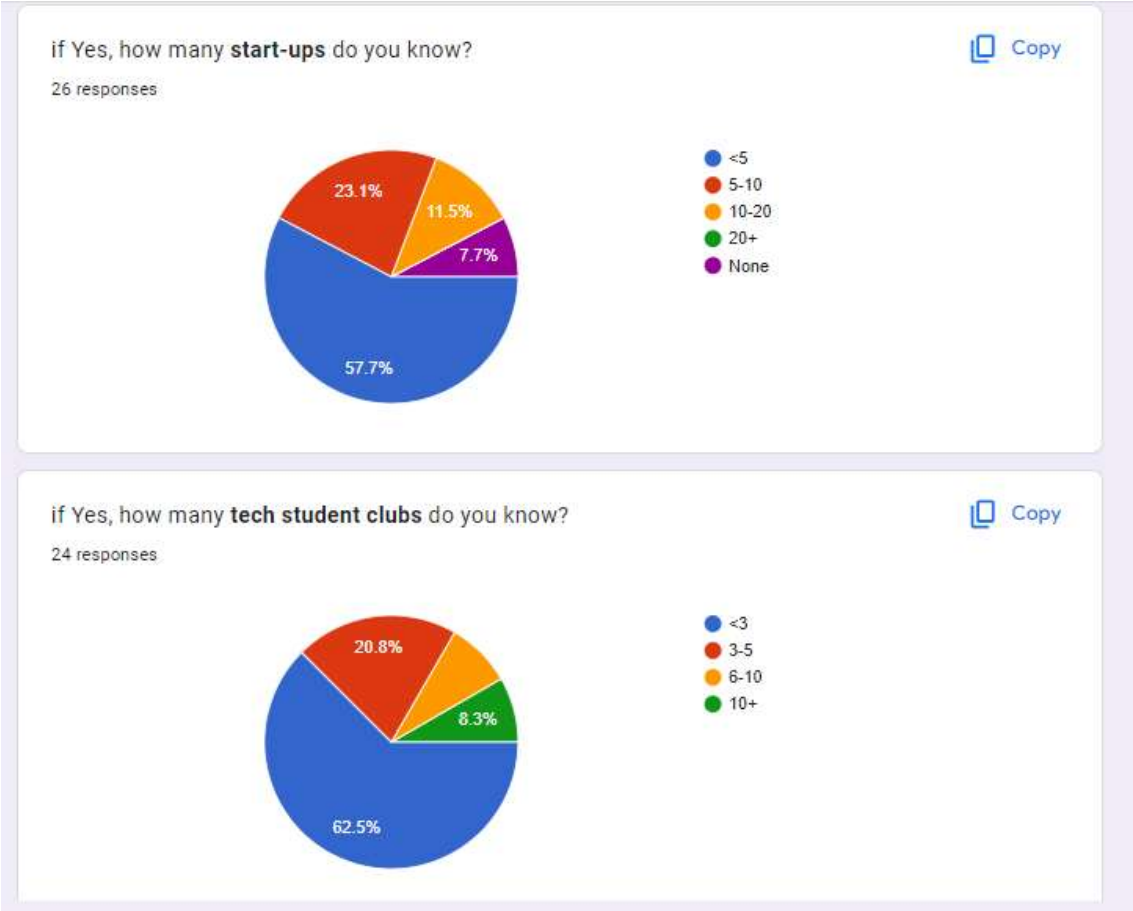


Figure 2: requirement analysis 1

3. Desire for Information:

   - 100% of respondents expressed a desire to know more about local tech startups and student clubs.

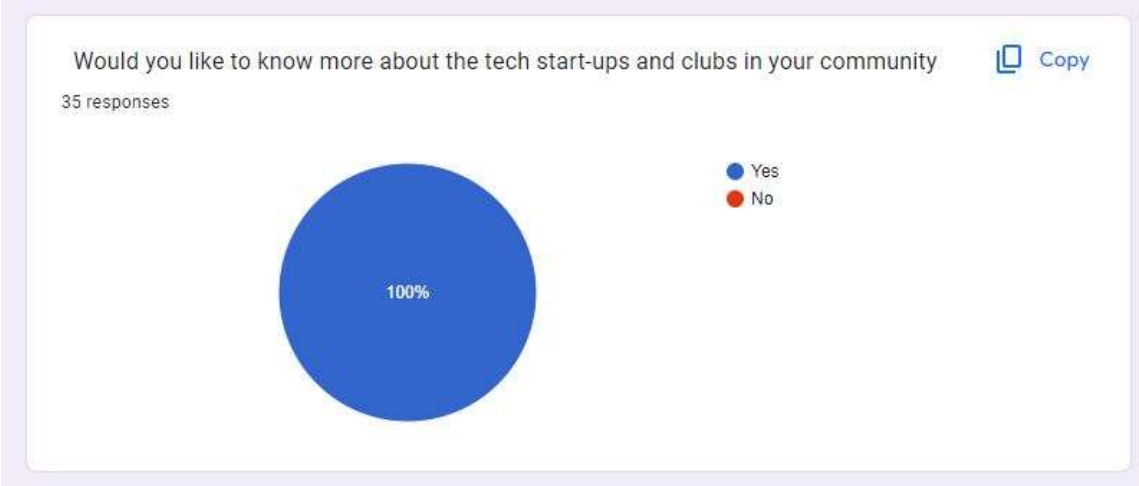


Figure 3: requirement analysis 2

4. Information Preferences for Tech Startups:

- About 68% were interested in knowing the services offered by these startups.
- 60% wanted details about the apps they have developed.
- 50% were keen on learning about the startups' events and other activities.

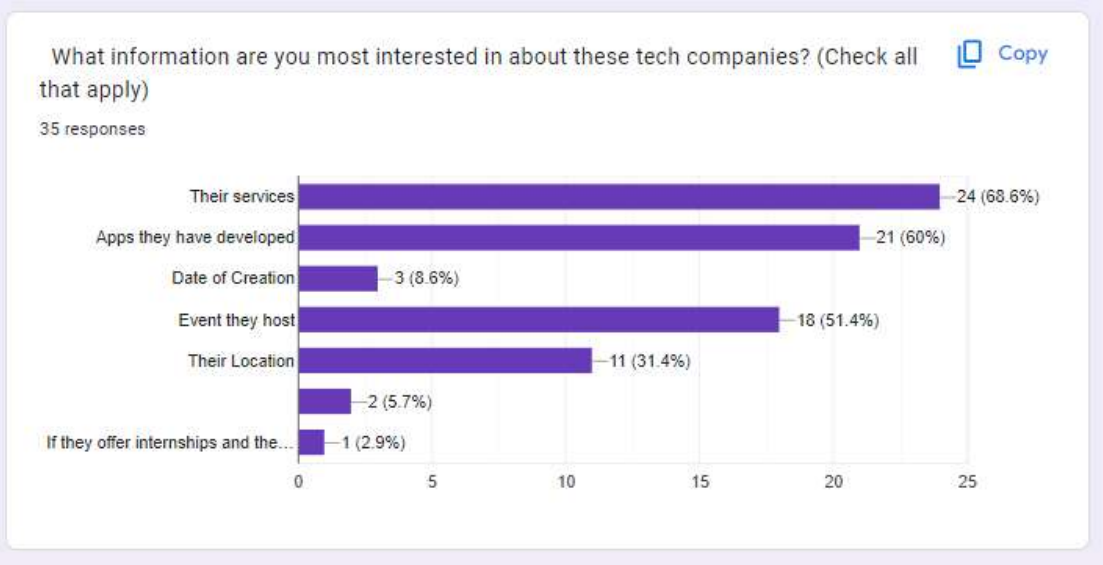


Figure 4: information preferences for start-ups

5. Information Preferences for Student Clubs:

- Approximately 76% of respondents wanted to know more about the activities and projects of student clubs.

- They also showed interest in the clubs' objectives and the events they organize.

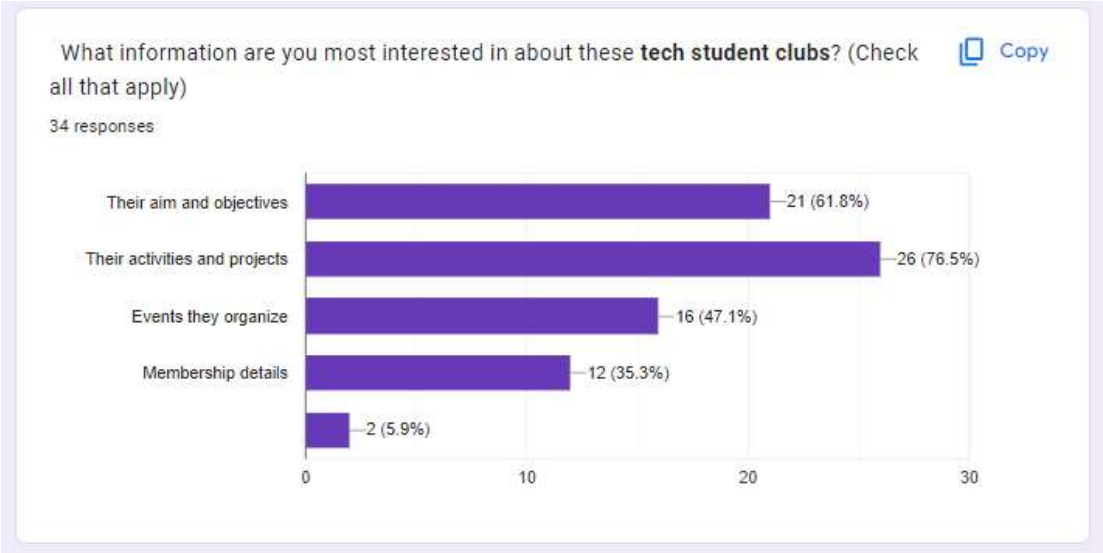


Figure 5: information preferences for student clubs

6. Challenges in Finding Information:

- Respondents reported various challenges such as:
  - Lack of reliable sources to provide accurate information.
  - Not knowing where to start looking for information.
  - Concerns about the legitimacy of some startups.

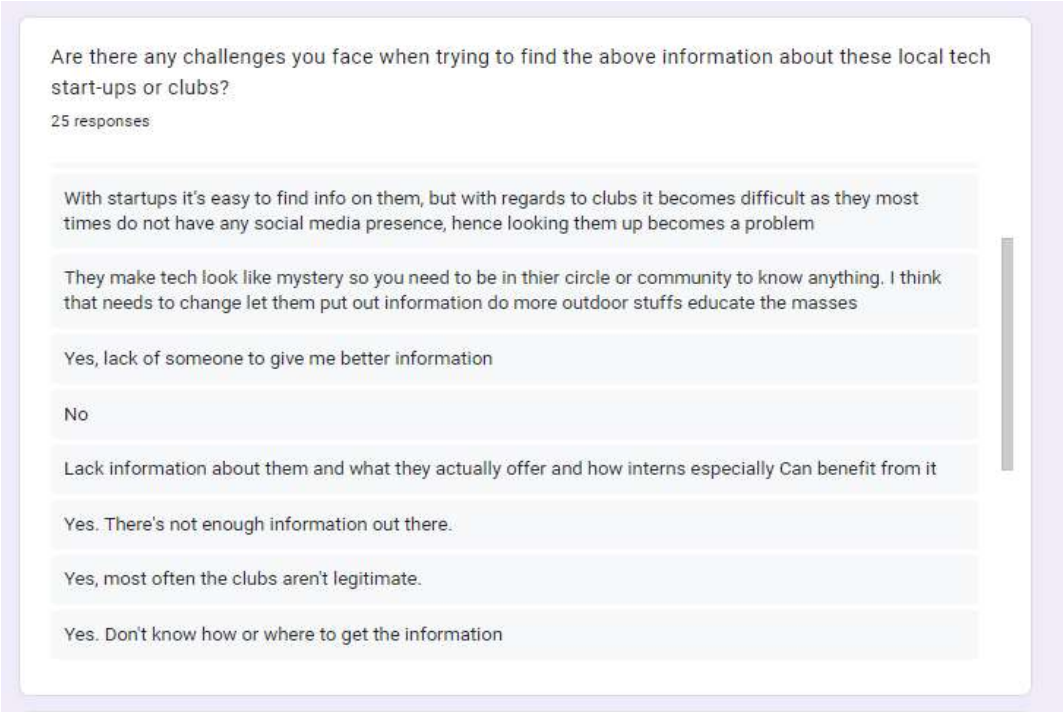


Figure 6: Challenges faced in finding information

7. App Usefulness

- About 86% of respondents believed an app that centralizes information about tech startups and student clubs would be useful.
- A minority expressed doubts about the need for such an app.

Figure 7: App usefulness statistics

8. Desired Features for Startups and Highlighted Information

- Respondents representing startups wanted to showcase their services and products prominently.
- Detailed presentations of their offerings were seen as essential.
- Information to highlight included the startups' services, products, and key achievements, as shown in the survey responses.

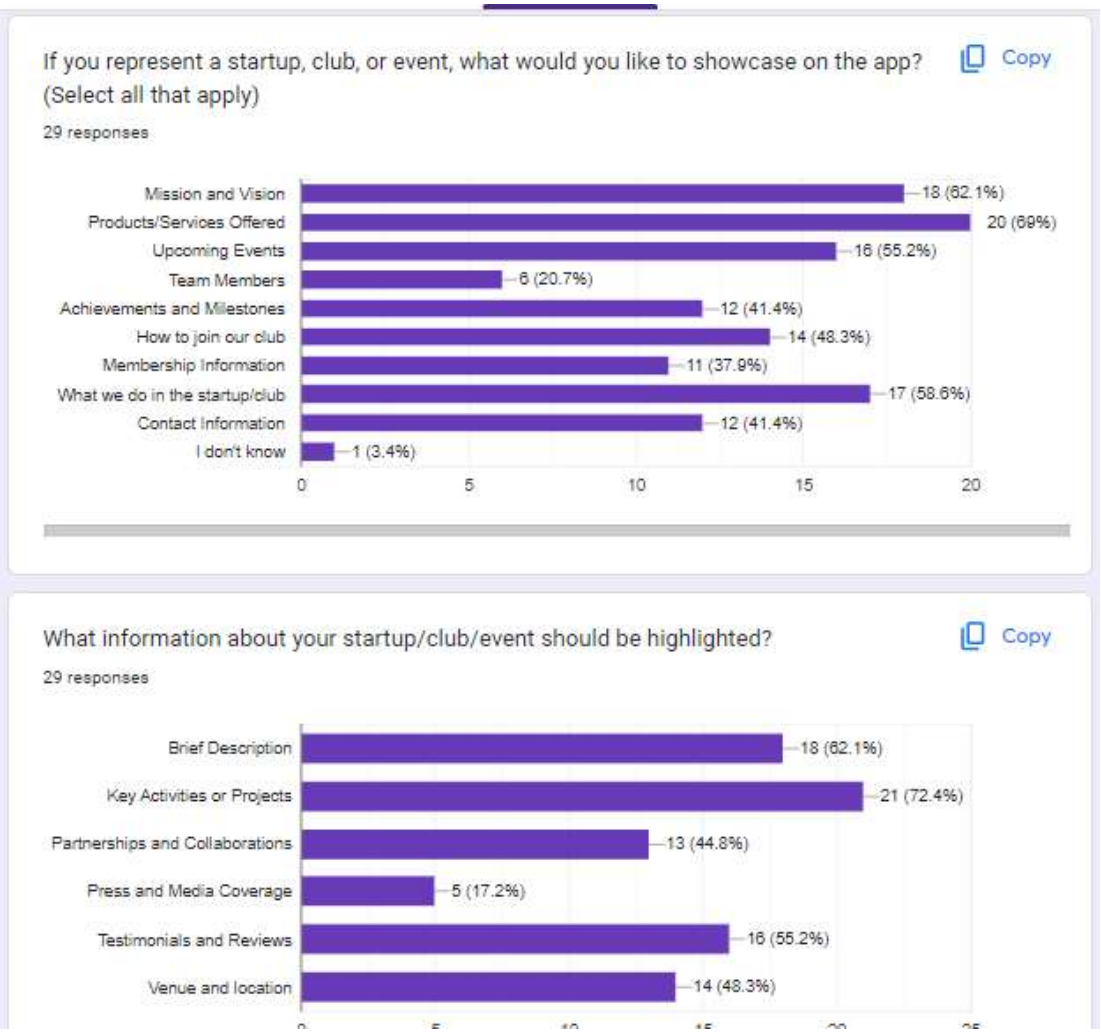


Figure 8: Desired features expected by start-ups and highlighted information

9. Notification Preferences

- 100% of respondents expressed a desire to receive notifications about upcoming events, updates, and other relevant information.

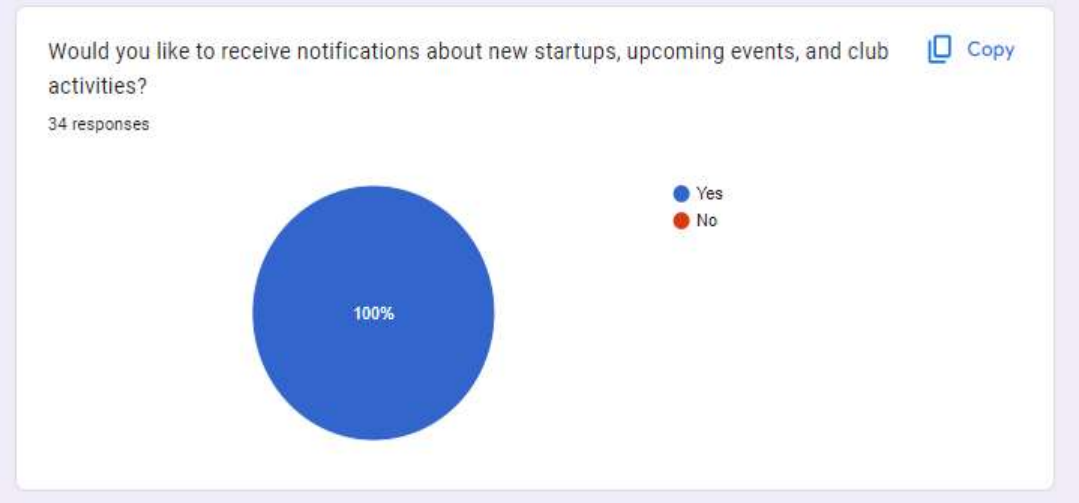


Figure 9: Notification preferences

10. Improving User Experience

- Many respondents suggested that a better user interface would significantly enhance their experience with the app.

Figure 10: suggestions on UX improvement

The survey responses provided critical insights that helped us understand the needs and preferences of our target users. These insights, along with the detailed contributions from our sponsor users, guided also for the development of clear user personas and problem statements, ensuring that our app design effectively addresses the real-world needs of our users.

3.2.2. Analysis and Categorization

After completing the requirements elicitation through brainstorming sessions, citizen interviews, and surveys, we moved to the analysis phase. This phase involved a detailed examination and categorization of the gathered requirements into functional and non-functional categories. Additionally, we prioritized these requirements using the SMART criteria (Specific, Measurable, Attainable, Relevant, and Time-bound).

The team convened for another brainstorming sessions to systematically analyze each requirement. We used the SMART approach to assess the feasibility and relevance of each requirement. Requirements that were specific, measurable, attainable, relevant, and could be achieved within the project timeline were prioritized and categorized accordingly. Those that were deemed unfeasible within the current project scope were documented as future recommendations.

3.2.2.1. Functional Requirements

1. Viewing Information of Clubs and Startups

- **Description**: Users should be able to view detailed information about tech startups and student clubs in Buea.
- **Details**:
  - ✓ **For Tech Startups**:
    - Services they offer.
    - Date of creation.
    - Apps they have developed.
    - Events they host.
    - Location of the startup.
  - ✓ **For Student Clubs**:
    - Aim and objectives.
    - Activities and projects they have carried out or are currently undertaking.
    - Events they organize (monthly, annually, etc.).

        - Membership details for joining the clubs.
    - ✓ **Priority**: High

2. Registration and Management of Startups and Clubs
    - ➢ **Description**: Startups and clubs should be able to register and manage their profiles.
    - ➢ **Details**:
        - ✓ Registration by startups/clubs initiated via a form.
        - ✓ Admin confirmation required to complete the registration process.
        - ✓ Ability for startups/clubs to update, upload, delete, and edit their profile information and events.\
        - ✓ **Priority**: High
3. Event Management
    - ➢ **Description**: Admins, startups and clubs should be able to manage events.
    - ➢ **Details**:
        - ✓ Manage events, including posting events not organized by startups/clubs (e.g., government or organizational tech events).
        - ✓ **Priority**: High
4. Notifications and Updates
    - ➢ **Description**: Users should receive real-time notifications about updates and upcoming events.
    - ➢ **Details**:
        - ✓ Notifications for new events, updates from startups/clubs, and general tech community updates.
        - ✓ **Priority**: high
5. Opportunities Posting
    - ➢ **Description**: Startups should be able to post opportunities such as internships or job offers.
    - ➢ **Details**:
        - ✓ Section for startups to list available opportunities.
        - ✓ Notifications to users about new opportunities.
        - ✓ **Priority**: low

By employing the SMART criteria, we ensured that all the requirements listed above are specific, measurable, attainable, relevant, and time-bound. This helps in maintaining a focused approach towards the development and successful implementation of the app.

3.2.2.2. Non-Functional Requirements

1. Usability
    - ✓ Description: Ensure the app is easy to navigate and user-friendly, with a clear interface design.
2. Performance
    - ✓ Description: The app should load quickly and handle multiple users simultaneously without lag.
3. Security
    - ✓ Description: Implement robust security measures to protect user data and ensure safe transactions.
4. Scalability
    - ✓ Description: Design the app architecture to support future growth and additional features.
5. Reliability
    - ✓ Description: Ensure the app is consistently available and performs reliably under various conditions.
6. Compatibility
    - ✓ Description: Ensure the app works seamlessly across different devices and operating systems.

3.3. REQUIREMENT GATHERING TOOLS

3.3.1. Google Forms

Google Forms is a simple form authoring tool that can be used to poll students and generate quizzes. Forms automatically save to Google Drive and can be easily shared with students. With multiple question types and mobile compatibility, Forms are a great tool for gathering real-time insights into learner understanding

3.4. DESIGN STRATEGY

The design strategy focused on user-centered design principles to ensure the application is intuitive and engaging. Key aspects of the design strategy included

1. Collaboration Strategies

- **Surface Issues**: Identify potential challenges and concerns early in the project to address them proactively.
- **Gauge Attitude**: Assess the attitudes and expectations of team members to ensure alignment and a positive collaborative environment.
- **Empathy Building Across the Team**: Facilitate activities and discussions that help team members understand and empathize with each other first, then with the users' needs and experiences.
- **Depicting the Team's Ecosystem**: Map out the roles, responsibilities, and relationships within the team to optimize collaboration and communication.

2. Designing Research Plans

- **Define Research Objectives**: Clearly outline what the team intends to learn about the users, their needs, and their behaviours.
- **Research methods**: Determine the research methods to be used, such as surveys, interviews, focus groups, and observation.
- **Data Collection**: Plan how the team will gather, record, and analyse data to ensure it is actionable and relevant.

3. Requirement Gathering

- **User Interviews**: Conduct interviews with potential users to gather insights into their needs, expectations, and pain points.
- **Surveys and Questionnaires**: Distribute surveys to a broader audience to quantify user needs and preferences.

- **Observation**: Observe users in their natural environment to understand their interactions and challenges with current solutions.

4. Prioritization Grid and To-Be Scenario Map

- **Prioritization Grid**: Categorize features and requirements based on their importance and feasibility. Use a matrix to plot these aspects and prioritize accordingly.
- **To-Be Scenario Map**: Create scenarios that depict the desired future state for users, illustrating how the proposed solution will improve their experience.

5. Evaluate Ideas

- **Idea Evaluation**: Assess the feasibility, desirability, and viability of different ideas generated during brainstorming sessions.
- **Selection Criteria**: Use criteria such as user impact, alignment with objectives, and resource requirements to choose ideas for prototyping and testing.

6. Wireframing and Prototyping

- **Wireframing**: Create low-fidelity wireframes to outline the basic structure and layout of the application. Wireframing is like creating a blueprint of our app. It helps us plan out the structure and layout before we start building it. Think of it as a rough sketch that shows where everything will go, like buttons, text, and images.

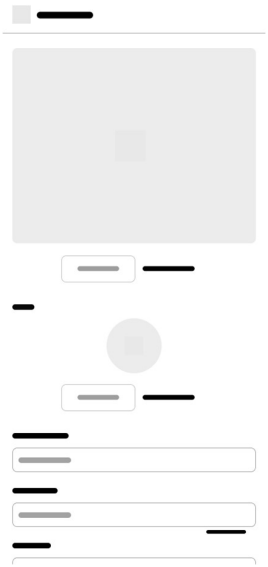


Figure 13:wireframing 1

Figure 12: wireframing 2

Figure 11: wireframing 3

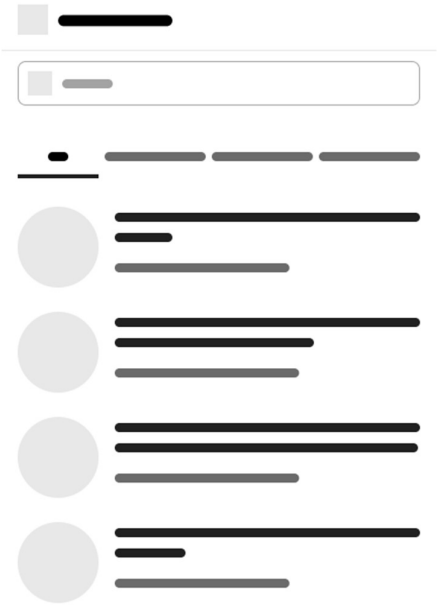


Figure 15: wireframing 4

Figure 14: wireframing 5

- **Prototyping**: Develop high-fidelity prototypes to simulate the final product, allowing for interactive testing and feedback.

7. Imagined Future State

- **Vision Casting**: Depict an ideal future state for users through detailed scenarios, storyboards, or journey maps.
- **Concept Development**: Flesh out ideas by visualizing how users will interact with the solution in their daily lives, highlighting key benefits and improvements.

8. Experience-Based Roadmap

- **Break Down Long-Term Goals**: Divide the overall user experience vision into manageable phases, focusing on immediate, short-term, and long-term objectives.
- **Milestones and Deliverables**: Set clear milestones and deliverables for each phase to ensure continuous progress and measurable outcomes.

9. Guiding Conversations

- **Identify Gaps**: Ask questions like "What's missing from the near-term user experience?" to identify areas needing improvement.
- **Align with Research**: Ensure that the proposed plans align with insights gained from design research. Ask, "Does this plan align with your design research insights?"

10. Feedback from Testing

- **Prototype Testing**: Test prototypes with real users to gather feedback on usability, functionality, and overall user satisfaction.
- **Feedback Collection**: Use various methods such as usability tests, user surveys, and feedback sessions to collect comprehensive feedback.

11. Reflecting and Improving

- **Organize Feedback**: Categorize and prioritize feedback based on its importance and relevance to user needs and project goals.
- **Reflect and Align**: Conduct team meetings to discuss feedback, reflect on its implications, and align on necessary improvements.
- **Implement Changes**: Iterate on the prototype, incorporating feedback to refine and enhance the solution.

12. Documentation and Communication

- **Document Decisions**: Emphasize the importance of documenting design decisions, feedback, and changes to maintain a clear project history.
- **Transparent Communication**: Foster transparent communication within the team and with stakeholders to ensure everyone is aligned.

13. Continuous User Engagement:

- **Regular Check-ins**: Establish regular user check-ins throughout the project lifecycle to ensure ongoing alignment with user needs.
- **User Workshops**: Conduct workshops with users to co-create solutions and validate

3.5. HARDWARE SPECIFICATIONS

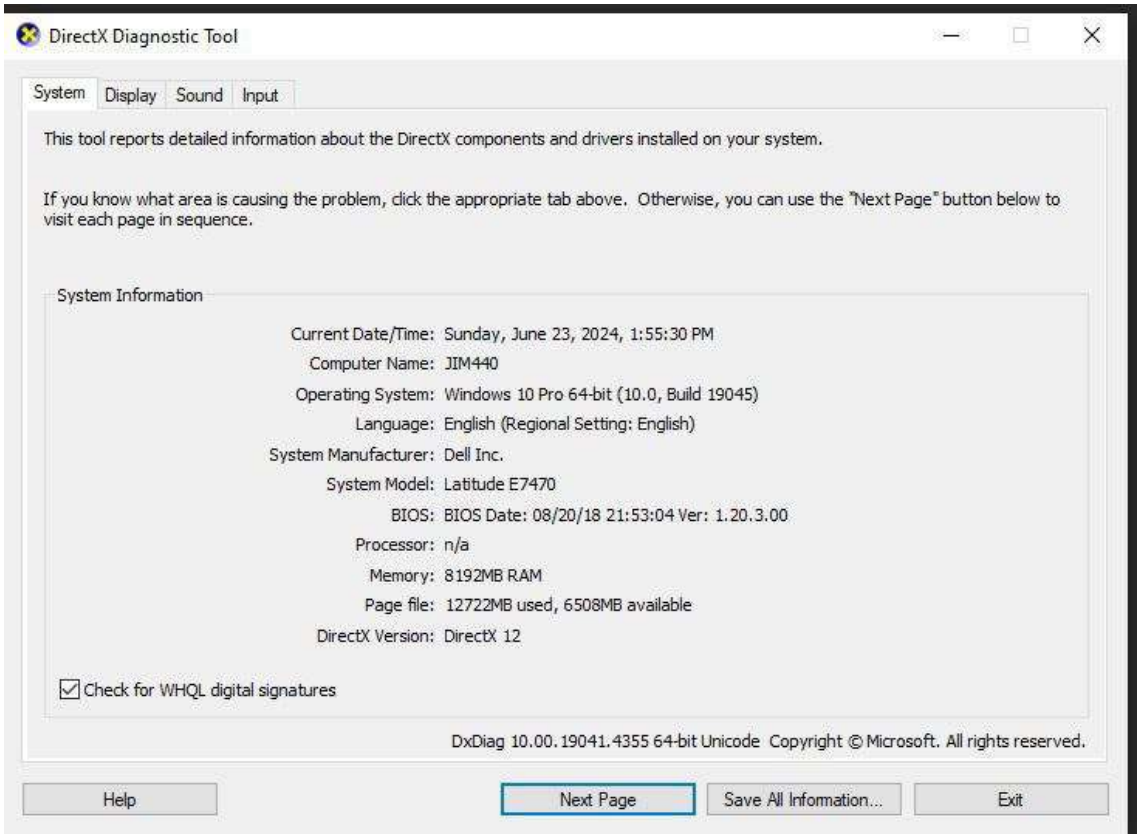


Figure 16: hardware specifications

3.6. CONSTRAINTS AND ASSUMPTIONS

Constraints

The project faced several constraints, including:

- **Limited Budget**: Financial limitations affecting the choice of tools and technologies.
- **Network Issues**: Slow internet connectivity impacting the download and use of required libraries and tools.
- **Time Constraints**: A rescheduled deadline that necessitated prioritization of primary features for timely delivery.

Assumptions

Several assumptions were made during the project:

- **User Access to Smartphones**: It was assumed that the majority of target users have access to smartphones capable of running the application.
- **Reliable Internet Access**: The application relies on users having reliable internet access to receive real-time updates and notifications.
- **Stakeholder Engagement**: Continuous engagement and feedback from stakeholders were assumed to ensure the application remains relevant and useful.

4. RESULTS

4.1. DESIGN DIAGRAMS AND DESCRIPTIONS

4.1.1. CONTEXT DIAGRAM

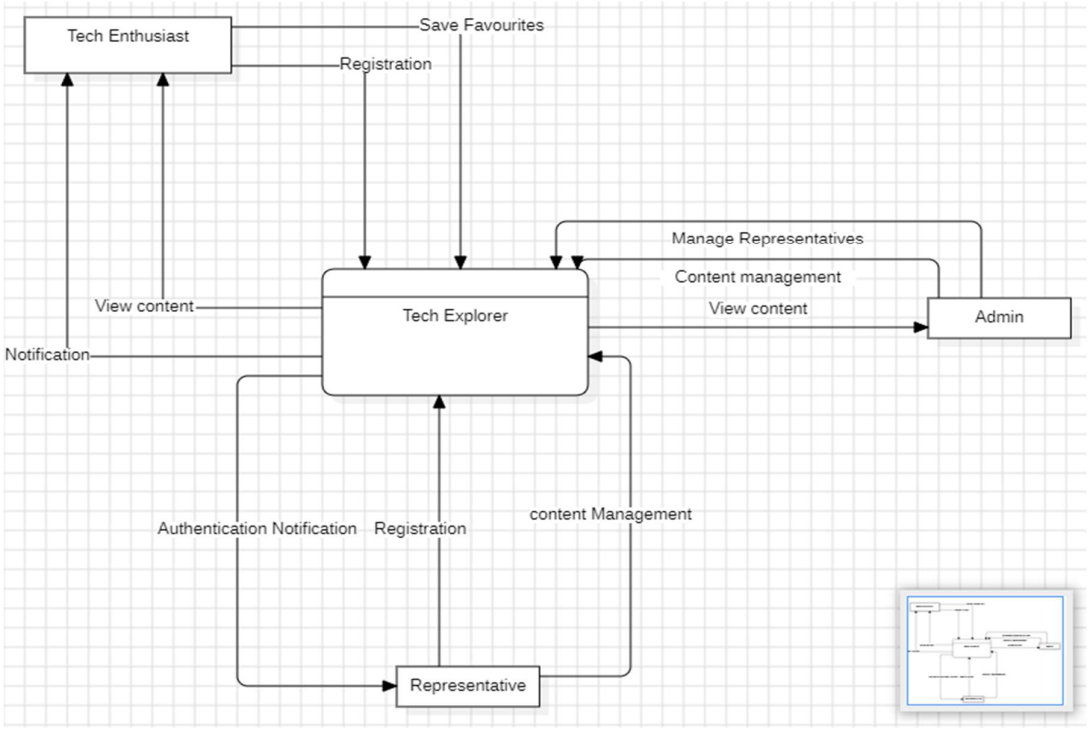


Figure 17: context diagram

Description

Tech Enthusiasts: They interact with the system by providing registration data and data on their preferences. They can view tech startups, student clubs, and events and receive notifications based on their saved preferences.

Representatives**:** Provide registration data to the system, and create, update, and delete startup/student club profiles or events. They get confirmation messages from the system if they have been successfully verified.

Admin**:** The admin can manage the profile of tech startups or student club; manage events and they can view the content of the system.

4.1.2. USE CASE DIAGRAM

General description: Tech-explorer is a mobile application used by tech-enthusiast in order to get an idea about the different startups and student clubs in Buea.

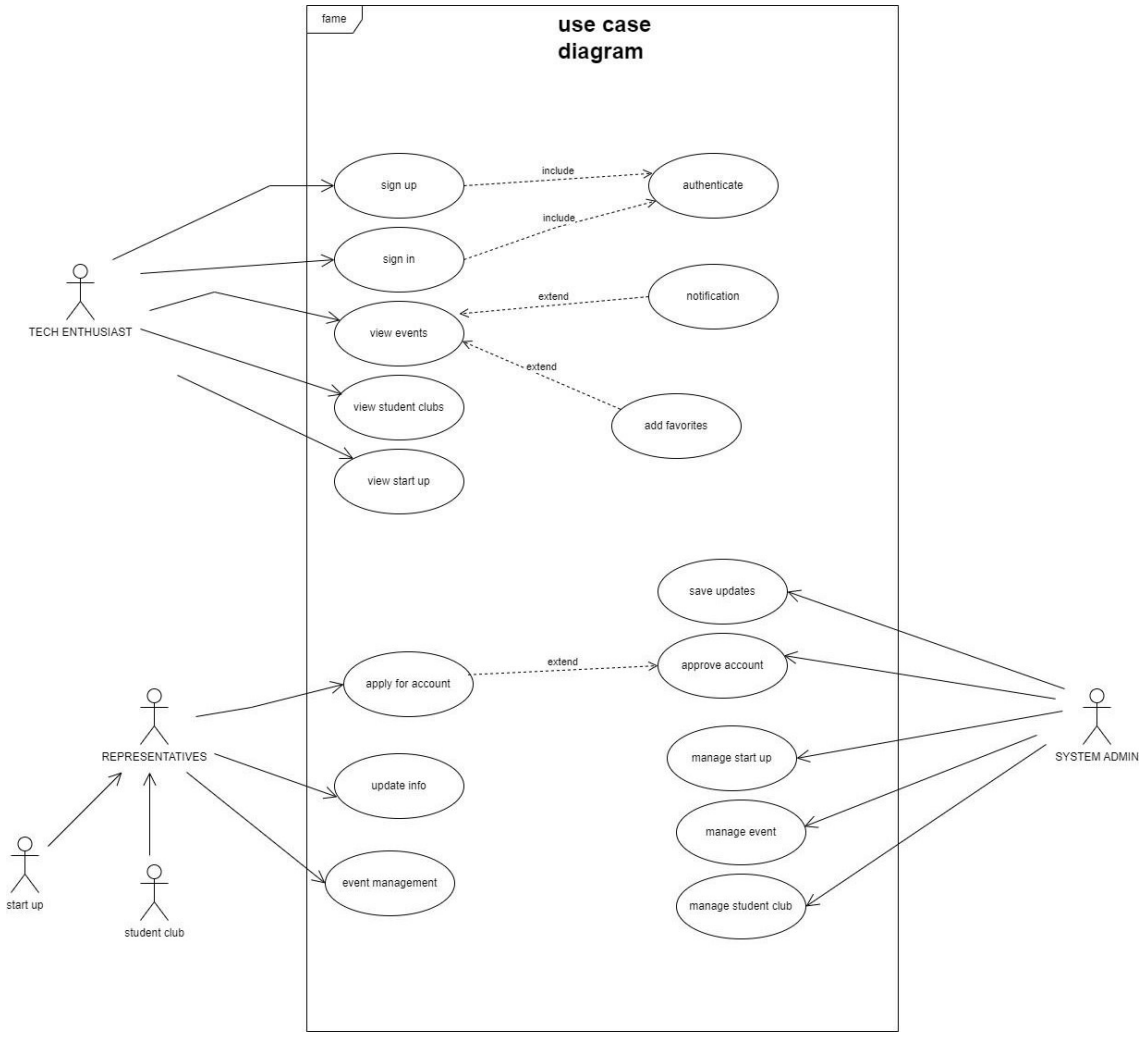


Figure 18: Use case diagram

Actors:

Tech-enthusiast: These are the main users of the application; they are the ones **interested** in **discovering** the different tech-structures in **Buea**.

Representatives: These are the structures wishing to show-case themselves through our application in order to be visited by the tech enthusiast in case they are interested in the different activities offered by them. They are generalizing **startup** and **student club.**

- **Startups:** These are structures offering some **tech-solutions** to the general public. They sometimes sponsor or organize events.
- **Student club:** These are groups of **students** coming together in order to facilitate their navigation into tech-sector.

Administrator: His role is to oversee the system and manage the different aspects as events, startups and student clubs of the system.

Use cases:

Sign-up: This use case is made for tech-enthusiast **not yet having an account** and wishes to get some information about the tech-environment in Buea and it include an **authentication** in order to confirm the **identity** of the user.

Sign-in: This use case is performed by tech-enthusiast or representatives who **already have an account** in the application and wish to get access to the account. This use case also includes an **authentication** in order to **confirm the identity** of the user demanding access to his account

View events: This involves seeing **information (including a link to social media post)** about the **upcoming** and **past** events posted by the different **representatives**. This action can be extended by **adding to favourite** or asking the application for **notification** of any update about the event.

View student clubs: This involves seeing **information** (Including the link to their respective social media pages) about the different **student clubs** present in the tech-environment of Buea.

View startups: This involves seeing **information** (Including the link to their respective social media pages) about the different **startups** present in the tech-environment of Buea.

Apply for an account: This involves startups which are new to the mobile application, they will fill an application form in order to demand for their account creation. The aim of this is to verify that the startups are legit.

Update information: This is the process of updating the information present on the profile of the different startups and student clubs and this can only be performed by the respective representatives.

Event management: This involves the posting and maintenance of the events posted by the different student clubs and startups. They may modify the information, add information about the event or even delete the event.

Approve account creation: After the new startups and student clubs apply for an account, the administrator will verify the information entered by the different representatives in order to be sure that fake accounts should not be created.

Manage Events, Startups, and student clubs: These are roles played by the administrator in order to oversee the overall system.

4.1.3. USER FLOW DIAGRAM

A user flow diagram is a visual representation that outlines the steps a user takes to accomplish a specific task within an application.

For our app, we created user flow diagrams to visualize the paths taken by the various user personas: Admin, Startup Representative, and General Users. Each user flow was designed to ensure that the app meets the specific needs and expectations of these personas, providing an ideal and user-friendly experience.

1. Admin User Flow

- **Registration/Login:** Admin registers or logs into the app.
- **Home Page:** Upon successful login, the admin is directed to the homepage, from here he can visit the various pages listed below.
  - ✓ **Search:** he can access the search page.
  - ✓ **Notifications:** from the home page, the admin can access the notifications page where he can view the notifications and updates.
  - ✓ **Profile:** from the home page, the admin can access their profile page.
    - **Manage Startups:** from the home page, the admin can access the manage startups section, where they can go to the startup details page and also go to add startup page (redirects back to the homepage upon completion).

- **Manage Student Clubs:** from the home page, the admin can access the manage student clubs' section, where they can go to student club details and also go to add new student club page (redirects back to the homepage upon completion).
- **Manage Events:** from the home page, the admin can access the manage events section, where they can go to the view event details and also add event page.

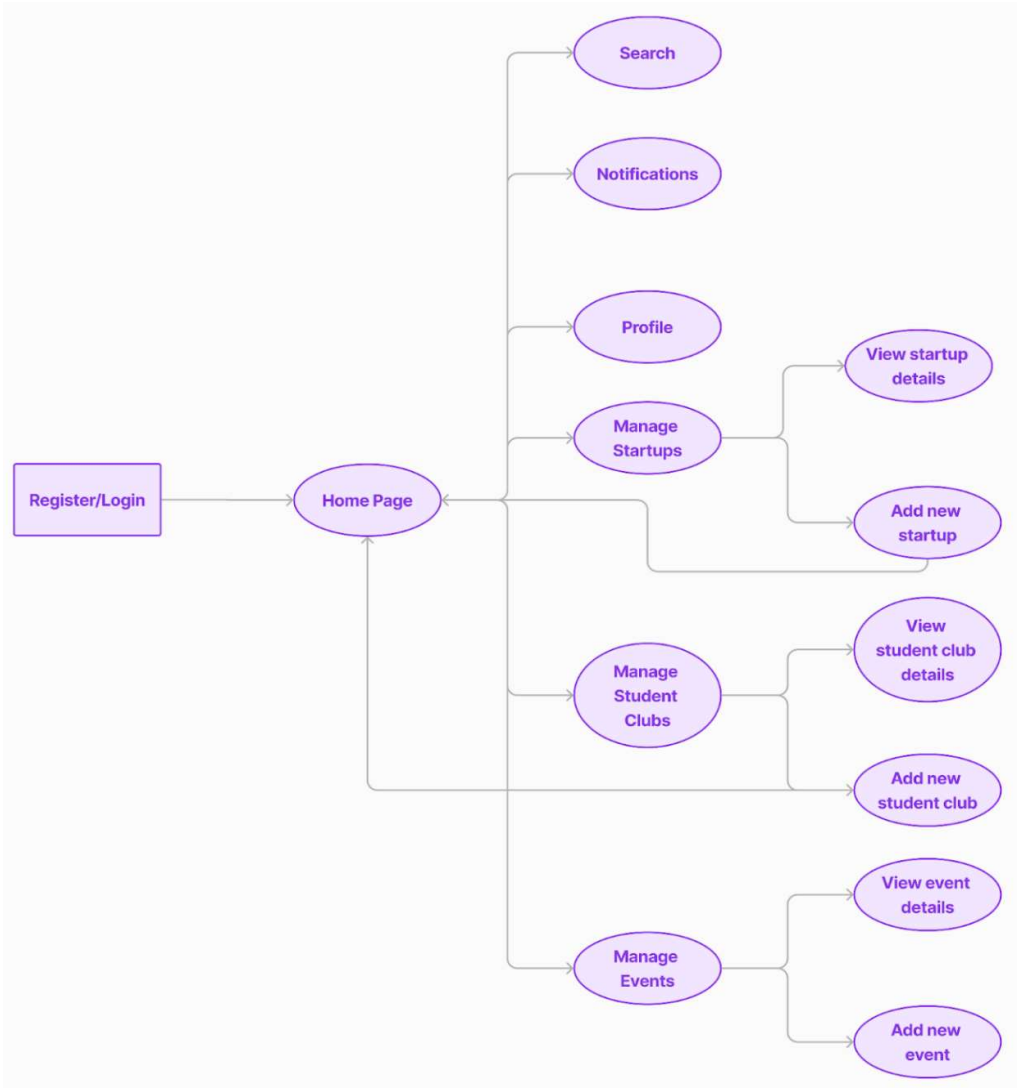


Figure 19: user flow diagram 1

2. Startup Representative User Flow

- **Login:** Startup representative logs into the app.

- **Home Page:** Upon successful login, the representative is directed to the homepage.
  - ✓ **Search:** from here representative can use the search functionality.
  - ✓ **Notifications:** from here representative can view notifications and updates.
  - ✓ **Startup Profile:** from here representatives can go to add products page and also edit profile information.
  - ✓ **Startups Page:** from here representatives can view profiles of all startups.
  - ✓ **Events:** from here representatives can view event details and go to add a new event page.
  - ✓ **Student Clubs:** from here representative can view profiles of all student clubs.

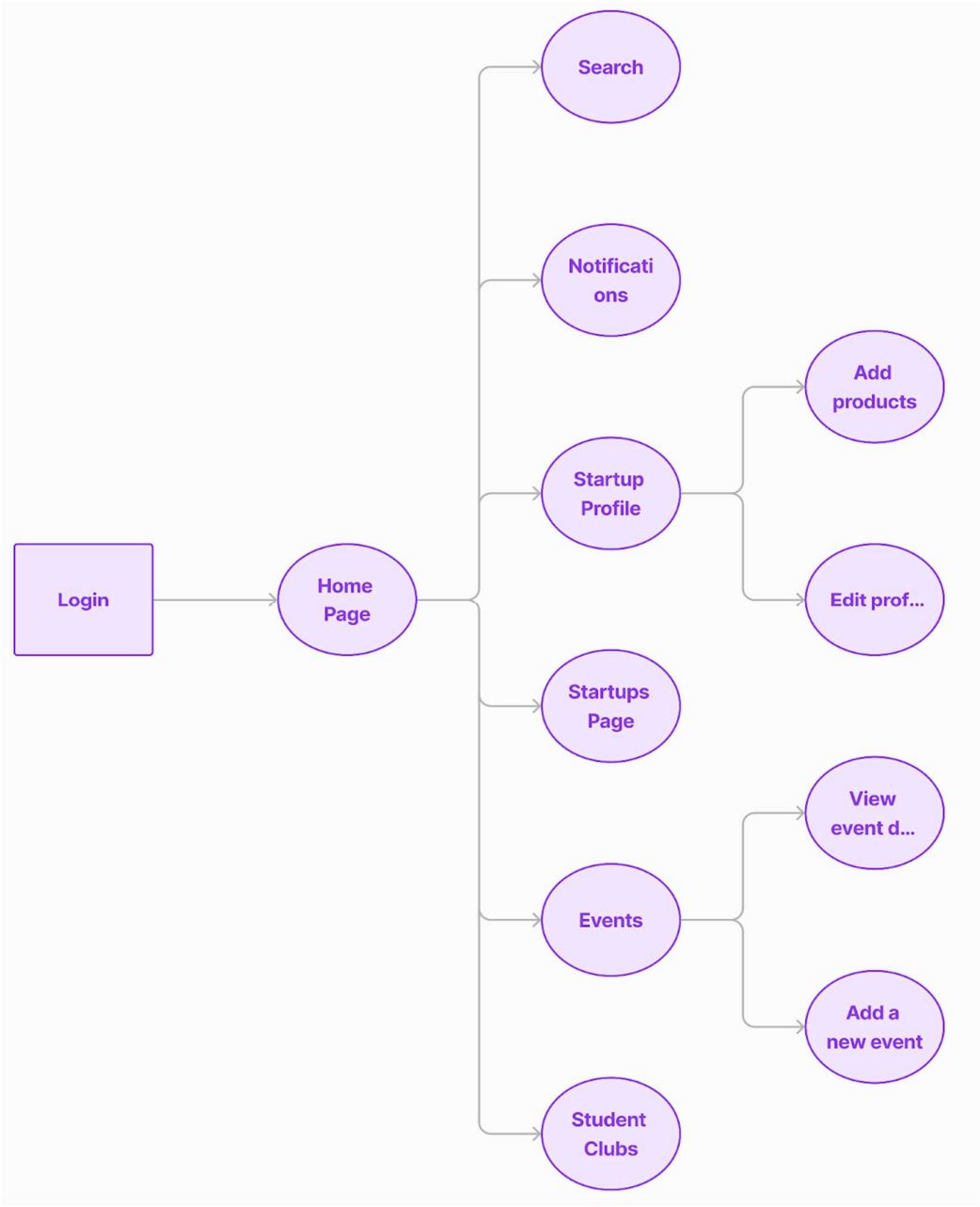


Figure 20: user flow diagram 2

3. General Users Flow

- **Login:** General user logs into the app.
- **Home Page:** Upon successful login, the user is directed to the homepage where he can access the following pages:

- ✓ **Register Startup/Student Club:** from home page, users can access the registration page for startup/student club and after filling the form, the user is redirected back to the homepage.
- ✓ **Search:** from home, users can access the search page.
- ✓ **Notifications:** from here, users can view notifications and access profiles of startups, student clubs, or events mentioned in notifications.
- ✓ **Events:** from home page, users can go to events and also details.
- ✓ **Student Clubs:** from here users can go to the profiles of the various student clubs.
- ✓ **Startups:** from here he can view startup profiles, startup details, navigate to the map or product details page.

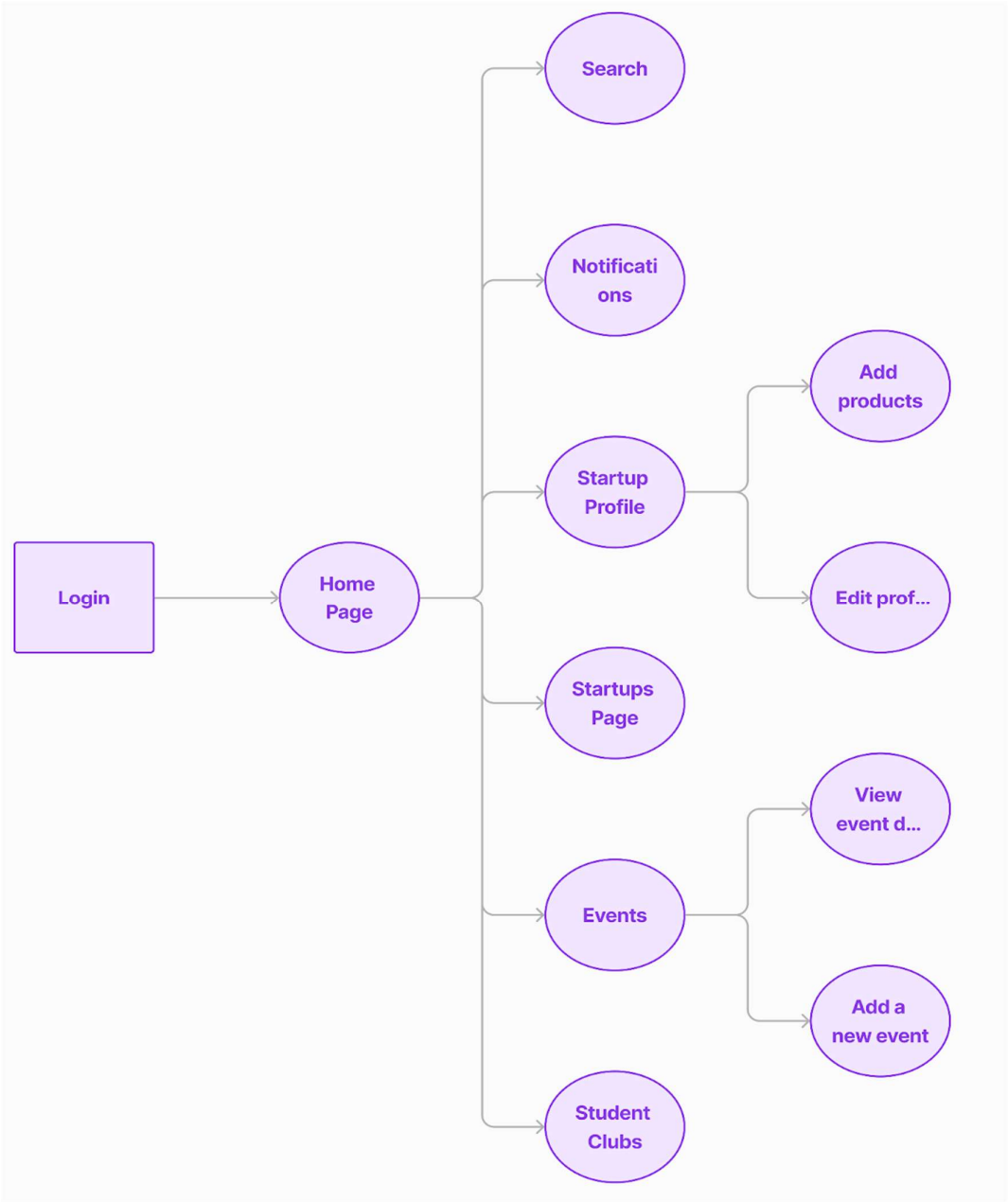


Figure 21: user flow diagram 3

4.1.4. SEQUENCE DIAGRAM

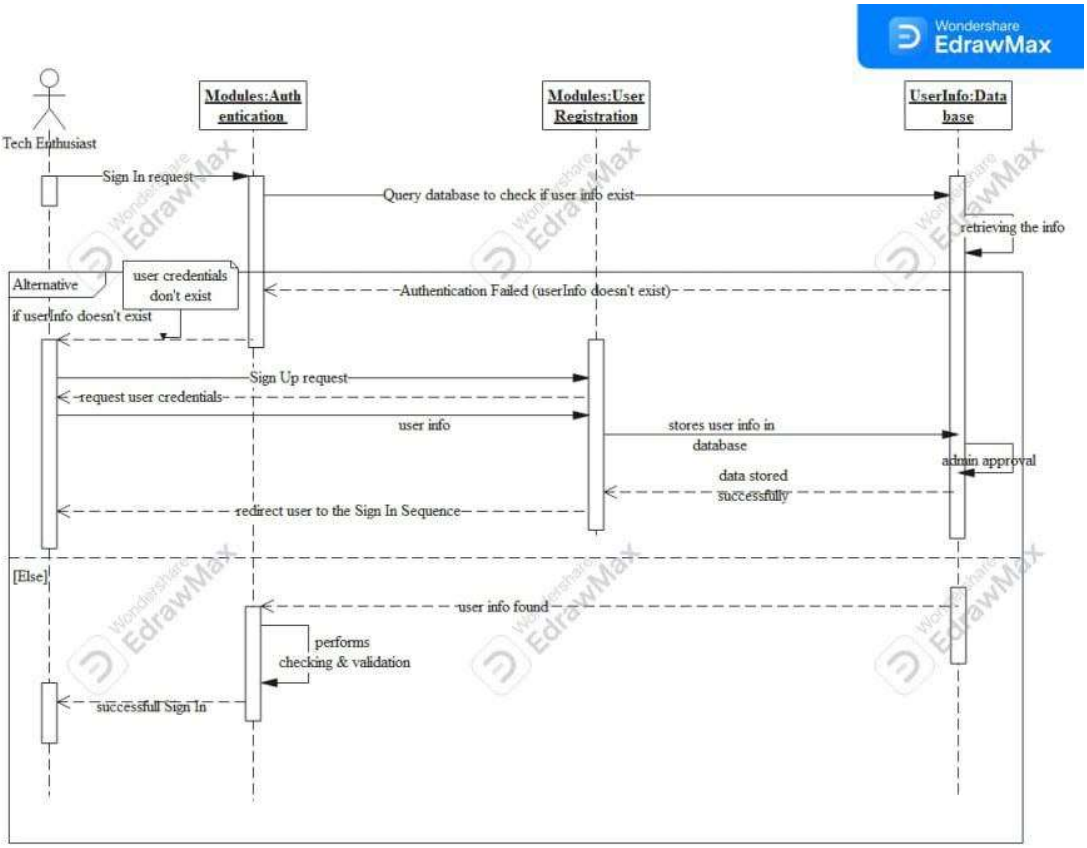


Figure 22: sequence diagram 1

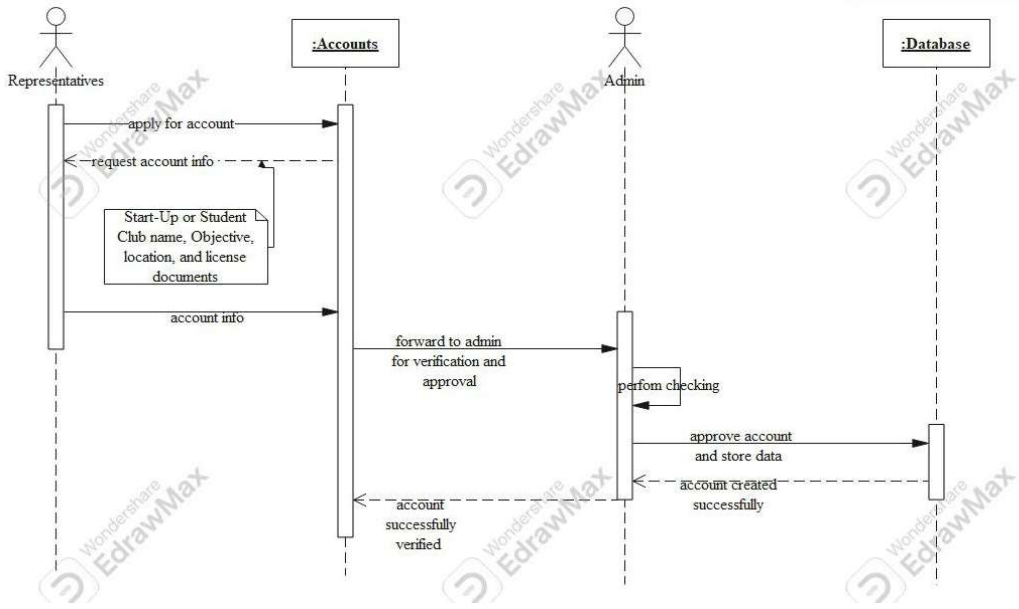


Figure 23: Sequence diagram 2

4.1.5. ACTIVITY DIAGRAM

4.1.5.1. Activity Diagram for Admin Processes

The activity diagram below outlines the key processes that an admin performs or undergoes to accomplish a particular functionality. He is involved in approving requests, managing events and profile updates within the tech explorer app.

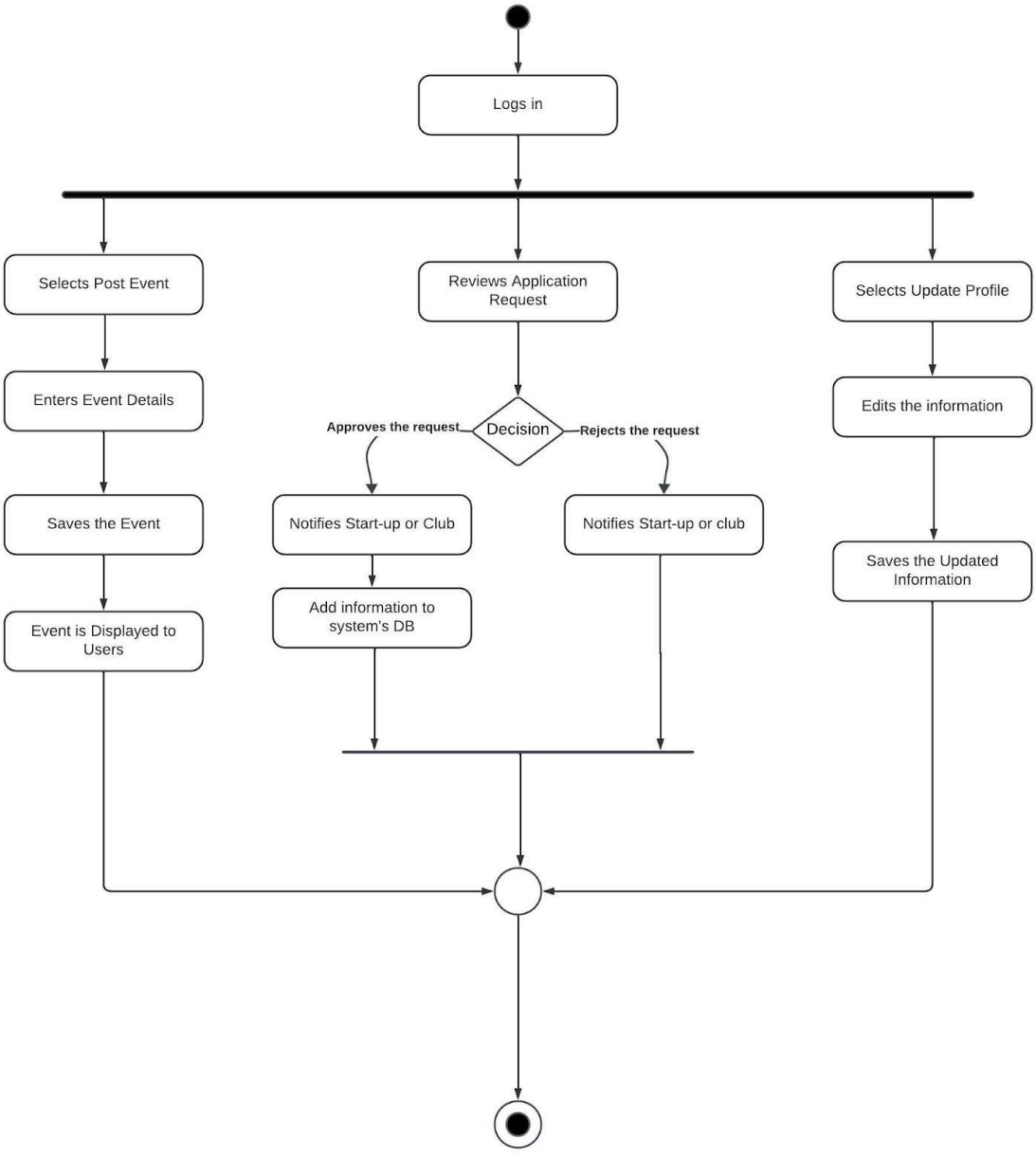


Figure 24: Activity Diagram 1

Actors

1. **Admin**

Main Activities

1. **Log in**
2. **Post Event**
3. **Review Application Request**
4. **Update Profile**

Diagram Flow

1. Log in: This is the starting point of the activity.
2. Main Decision Branch: After logging in, the admin can choose from three main activities:
   - Posting an event
   - Reviewing an application request
   - Updating a profile
3. Post Event: Follows a linear flow from selecting the post event option to displaying the event to users.
4. Review Application Request: Involves a decision point where the admin can approve or reject the request, leading to different outcomes.
5. Update Profile: Similar to posting an event, it follows a linear flow from selecting the update profile option to saving the updated information.
6. Activity End: The process concludes after the selected activity is completed.

Detailed Description

1. Log in

- Activity Start: The process begins when the admin logs into the system.

2. Post Event

- Selects Post Event: The admin selects the option to post a new event.
- Enters Event Details: The admin enters the necessary details for the event.
- Saves the Event: The admin saves the event details in the system.

- Event is Displayed to Users: Once saved, the event is displayed to all users on the platform.

3. Review Application Request

- Reviews Application Request: The admin reviews the application requests from startups or clubs.
- Decision: The admin makes a decision to either approve or reject the application request.
  - ✓ Approves the Request:
    - Notifies Startup or Club: The system notifies the startup or club about the approval.
    - Add Information to System's DB: The approved information is added to the system's database.
  - ✓ Rejects the Request:
    - Notifies Startup or Club: The system notifies the startup or club about the rejection.

4. Update Profile

- Selects Update Profile: The admin selects the option to update a profile.
- Edits the Information: The admin edits the necessary information for the startup or club profile.
- Saves the Updated Information: The updated information is saved in the system.

4.1.5.2. Activity Diagram for Start-Up/Club Processes

The activity diagram below outlines the key processes that Startups/Clubs can perform within the Tech Explorer App.

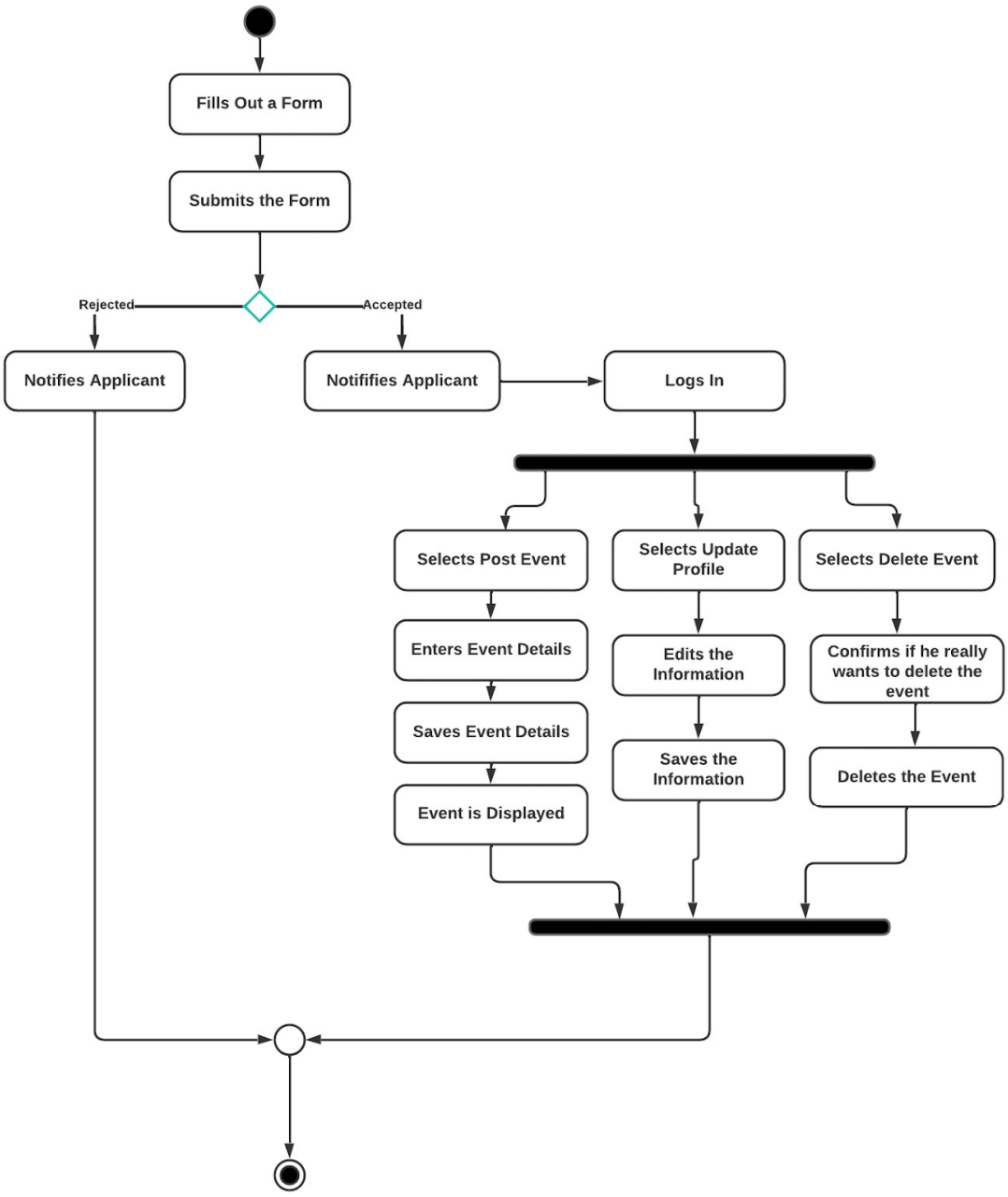


Figure 25: Activity Diagram 2

Actors

- Start-Ups / Clubs

Main Activities

1. Fills Out a Form

2. Submits the Form

3. Logs In

4. Post Event

5. Update Profile

6. Delete Event

Diagram Flow

1. Fills Out a Form: The applicant fills out a form with the necessary information.

2. Submits the Form: The applicant submits the filled-out form.

3. Decision: The form is either accepted or rejected.

- Rejected: If the form is rejected, the system notifies the applicant.
- Accepted: If the form is accepted, the system notifies the applicant and logs them in.

4. Logs In: After the form is accepted, the applicant is logged into the system and has the ability to choose between 3 main activities

- Selects Post Event: The applicant can create and save a new event that will be displayed to users.
- Selects Update Profile: The applicant can edit and save changes to their profile information.
- Selects Delete Event: The applicant can delete an existing event after confirming the deletion.

Detailed Description

1. Fills Out a Form: The applicant fills out a form with the necessary information required to apply as a startup or club.

2. Submits the Form: The applicant submits the filled-out form to the system.

3. Decision:

- Rejected: If the form is rejected, the system notifies the applicant about the rejection.
- Accepted: If the form is accepted, the system notifies the applicant and logs them into the system.

I. Logs In: After the form is accepted, the start-up/club is logged into the system.

II. Posts Events

- Selects Post Event: The start-up/club can choose to post an event on the platform.
- Enters Event Details: The start-up/club provides the details of the event they want to post.
- Saves Event Details: The event details are saved in the system's database.
- Event is Displayed: The posted event is then displayed to all users on the platform.

III. Updates Profile

- Selects Update Profile: The start-up/club can choose to update their profile information.
- Edits the Information: The start-up/club edits the necessary information in their profile.
- Saves the Information: The updated profile information is saved in the system.

IV. Delete Event

- Selects Delete Event: The start-up/club can choose to delete an event they had previously posted.
- Confirms if they really want to delete the event: The system prompts the start-up/club to confirm if they want to delete the event.
- Deletes the Event: If the start-up/club confirms, the event is deleted from the system.

4.1.5.3. Activity Diagram for user processes

The activity diagram below outlines the key processes that a user performs or undergoes to accomplish a particular functionality. They can register, login, search for tech startups or groups. They can also search for tech events in town.

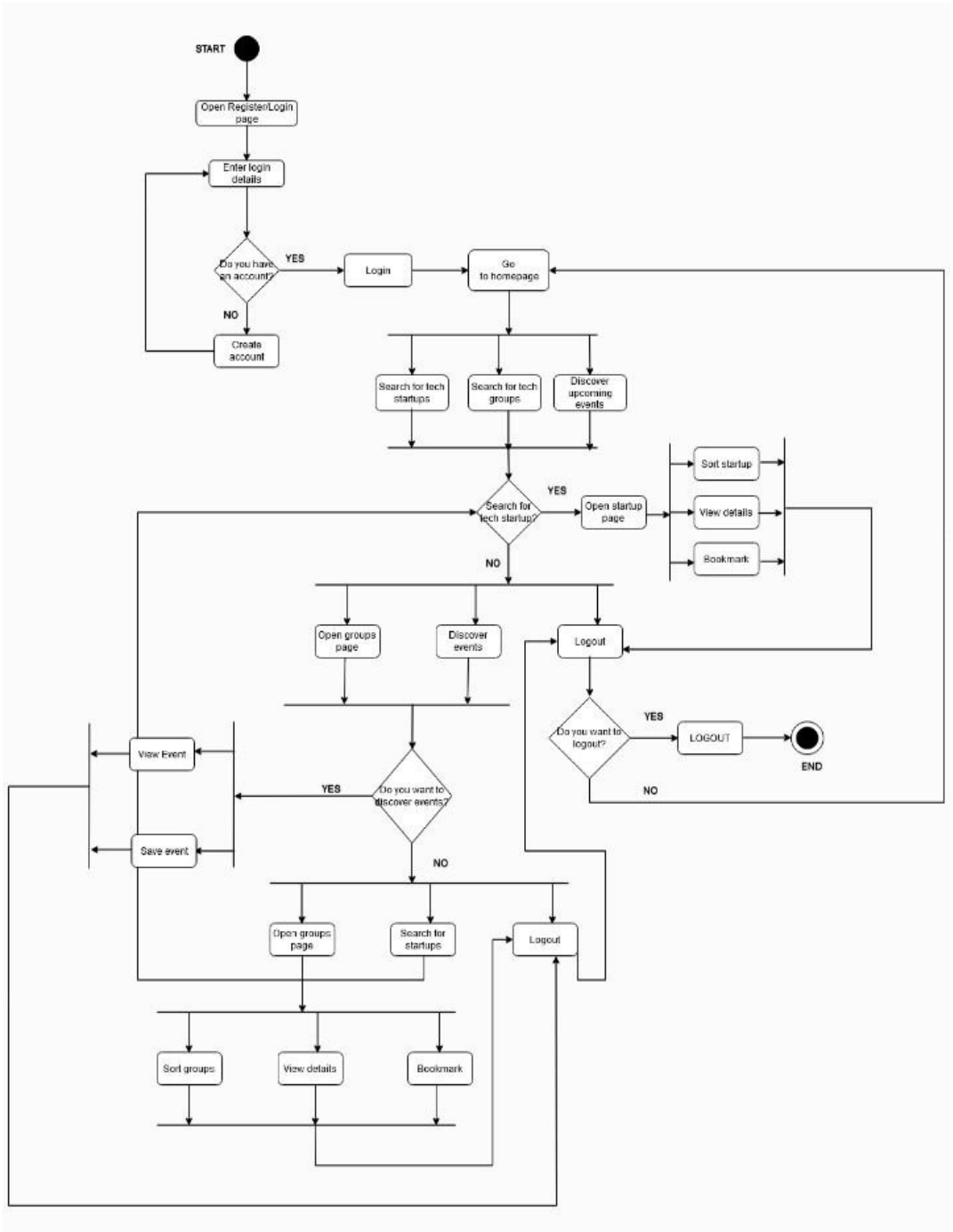


Figure 26: Activity Diagram 3

Actors

1. **Users**

Main Activities

1. **Register**
2. **Log in**
3. **Search for startups**
4. **Search for groups**
5. **Search for events**

Diagram Flow

1. Register/Log in: This is the starting point of the activity.
2. Decision Branch: You can proceed to login if you have an existing account or the system prompts you to create an account.
3. Search for tech startups: Follows a linear flow from selecting the search startup option to displaying the startup to users.
4. Search for groups: Follows a linear flow from selecting the search groups option to displaying the groups to users. You can either sort, view or bookmark.
5. Discover events: You can view and/or save events.
6. Activity End: The process concludes after the selected activity is completed.

Detailed Description

1. Log in/Register

- Activity Start: The process begins when the user logs into the system.
- Decision: The user decides what page they want to navigate to.

2. Search for Tech startups

- Sort startups according to preference.
- Go through details of the various startups.
- Bookmark a preferred startup for future preference.

- If the user decides not to search for startups, then they can either search for groups, discover events or logout.

3. Search for groups

- Sort groups
- View details
- Bookmark a group.

4. Discover Tech Events

- View events
- Save events

- logout.

4.1.6. ENTITY RELATIONSHIP DIAGRAM

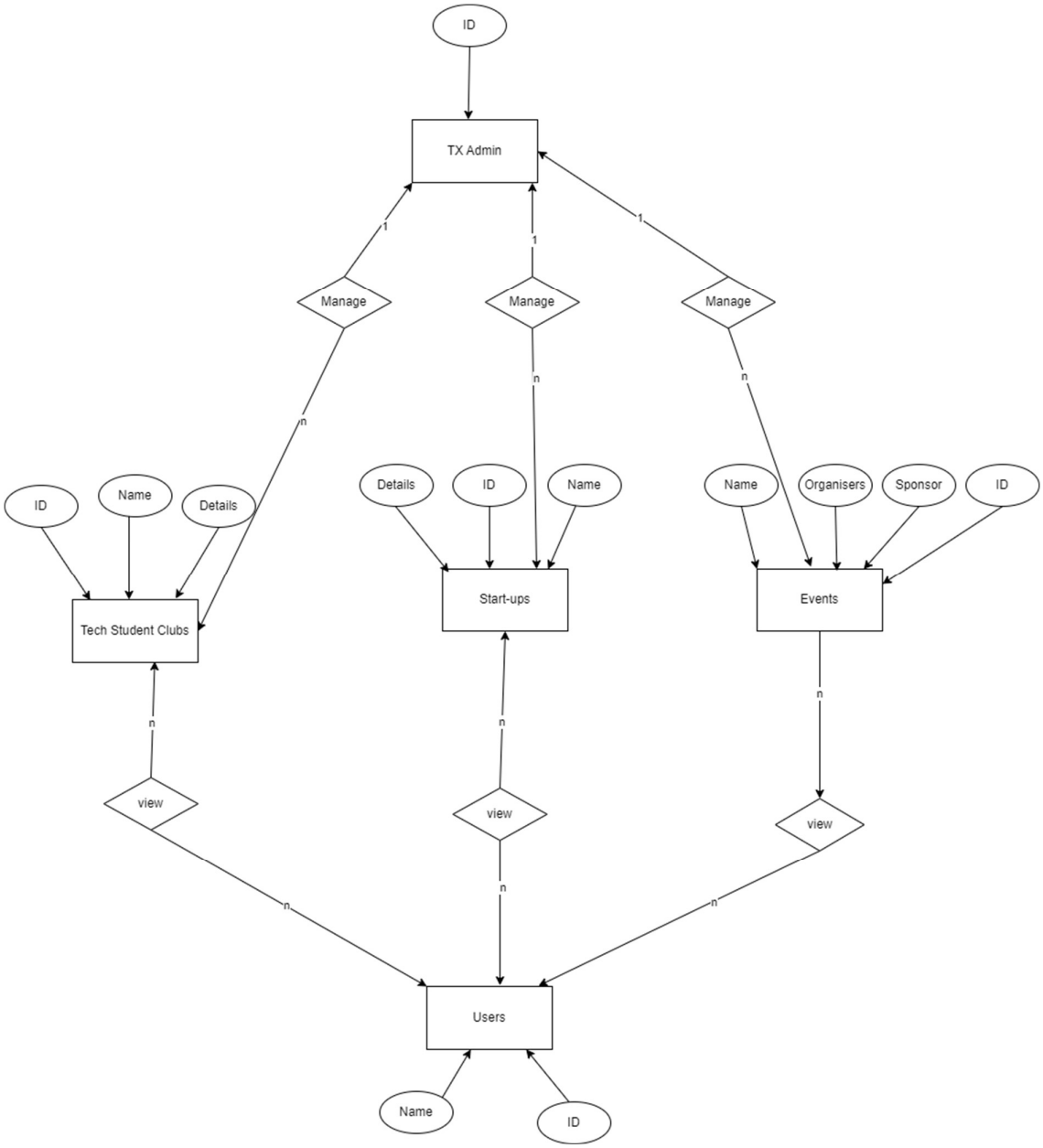


Figure 27: ER Diagram

Entities:

Admin: This represents a technically skilled user from the Tech Explorer team who manages the start-ups, events and club content.

Users: represents the audience of the app able to views the contents of Tech Student clubs, events, and tech start-ups.

Student Clubs: are managed by the admin and can upload content.

Start-ups: are managed by admin and upload contents.

Events: are managed by admin and upload contents.

Relationships:

One-to-many:

A single admin manages many start-ups, events, and students' clubs.

Many-to-many:

Many users can view the contents of many different start-ups, clubs and events.

4.1.7. CLASS DIAGRAM

The class diagram encapsulates the primary classes and their relationships within the system. The classes include Admin, User, Tech Enthusiast, Club, Startup, Event, and Product. Each class has specific attributes and methods that define its role and behaviour within the system

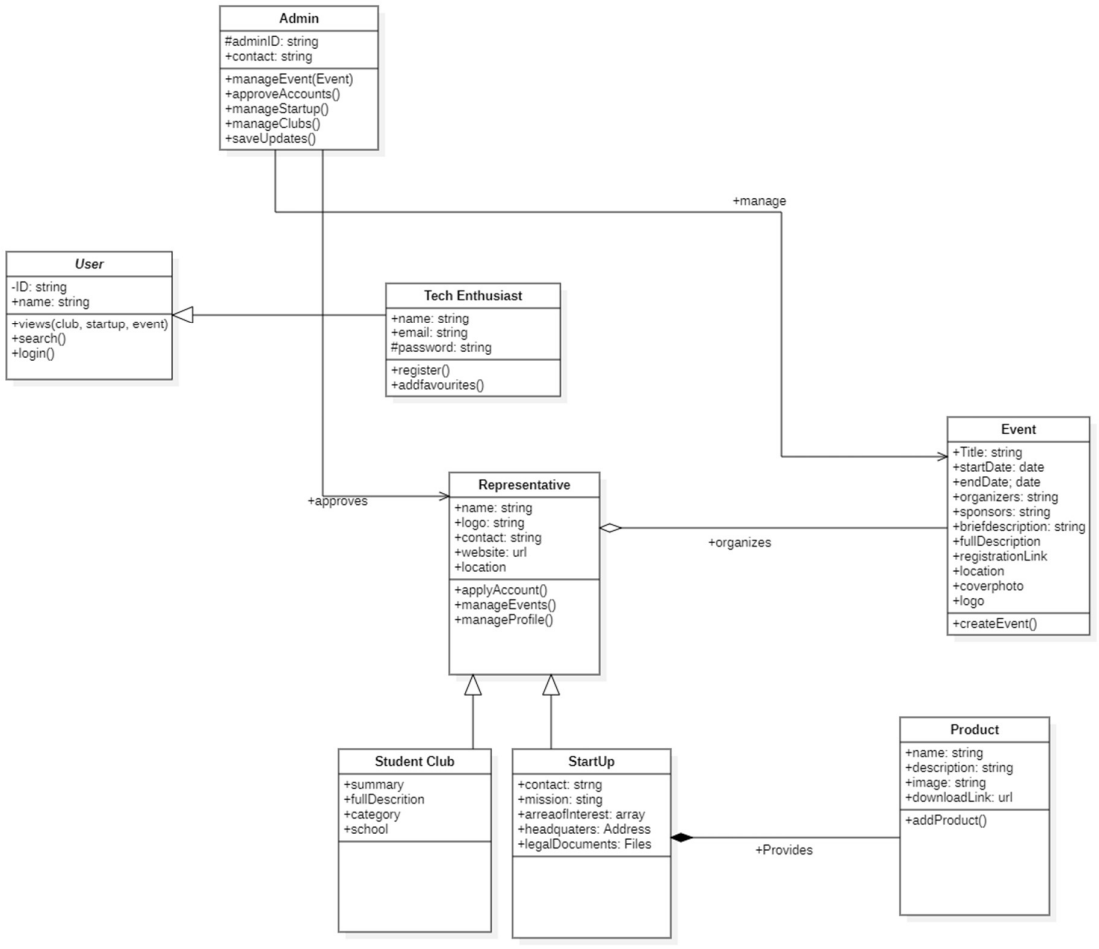


Figure 28: Class Diagram

Classes and Attributes

User

Attributes

ID: string: Unique identifier for the user.

Methods:

View (club, startup, event): Allows viewing of clubs and startups profiles, as well as updates on tech events.

Search (): Enable users to search within the system.

Login (): Handles user login.

Admin

Attributes

adminID: string: Unique identifier for the admin.

contact: string: The Admin's contact information.

Methods

manageEvent(): creates, updates and deletes events.

approveAccounts(): Approves new startup and student clubs accounts.

manageStartup(): Manages startup information that is, she can update and delete.

manageClubs(): Manages student clubs profile.

saveUpdates(): Saves updates to the system.

Tech Enthusiast

Attributes

name: string: Name of the tech enthusiast.

email: string: Email of the tech enthusiast.

password: string: Password for the tech enthusiast's account.

Methods

Register(): Register or sign up as a tech enthusiast.

AddFavourites(): Adds clubs and startups to favourite list.

Representatives

Attributes

name: string: Name of the student club or startup.

logo: string: Logo of the club or startup.

contact: string: Representatives' Contact information.

website: string: Website URL of the clubs' or startups' portfolio.

location: string: Location of the club or startup

summary: string: Brief description of their objectives and activities.

Description: string: Full description of the Club or startup works and objectives

Methods

ApplyAccount(): Applies for a representative user account.

ManageEvents(): Manage announcements for events they are contributing (organising, participating or sponsoring) in.

updateProfile(): Manage their profile information over time.

Start-Up

Attributes

mission: string: Mission statement of the startup.

interests: array: Areas of interest and measure activities for the startup.

headquarters: Address: Headquarters address and location of the startup.

legalDocuments: Files: Legal documents proving the startup exists.

Student Club

Attributes

school: string: School associated with the club.

category: string: Category of activities or interests of the club.

Methods

ManageProducts(): They can add products and services they provide and fully manage the reviews

Event

Attributes

title: Title of the event.

startDate: Start date of the event.

endDate: End date of the event.

organisers: string: Organisers of the event.

sponsors: string: Sponsors of the event.

Speakers: Measure speakers during the event

briefDescription: string: Brief description of the event.

fullDescription: string: Full description of the event activities.

registrationLink: url: link to register for the event.

location: string: Location where the event will take place.

logo: string: Logo or cover photo of the event.

Methods

createEvent(): Creates a new event

Products

Attributes

name: string: Name of the product.

description: string: Description of the product.

image: string: Image of the product's interface and advert.

link: string: Download link for the product.

Methods

createProduct(): To create a new product or service

Relationships

Generalisation

Tech Enthusiast, Admin and Representatives inherits from the User

StartUp and Student Clubs inherits from Representative

Direct Association

Admin Approves the accounts of representatives

Admins can manage start-ups' and clubs' profiles

Admins can update announcements on events

Representatives can manage events they are contributing in

4.1.8. DESIGN DIAGRAM TOOLS

4.1.8.1. StarUML

Figure 29: StarUML

StarUML is a software engineering tool for system modelling using the Unified Modelling Language, as well as Systems Modelling Language, and classical modelling notations. It is published by MKLabs and is available on Windows, Linux and MacOS.

4.1.8.2. Diagrams.net

Figure 30: draw.io

diagrams.net is a cross-platform graph drawing software developed in HTML5 and JavaScript. Its interface can be used to create diagrams such as flowcharts, wireframes, UML diagrams, organizational charts, and network diagrams. Draw.io was an essential tool for designing and documenting process flows and system interactions. Its intuitive interface and extensive library of shapes and icons made it ideal for creating detailed and accurate diagrams that supported our research and development processes.

4.2. UI/UX DESIGN PRINCIPLES

4.2.1. Typography

The selected font for our application is Outfit. It is characterised by its clarity, readability, and rounded curves, making it appealing and an excellent fit for our app's design.

Primary Font Family: Outfit

Applied throughout the app for all text elements to ensure consistency. It is clear, readable, and visually appealing.

Font Sizes and Weights:

Headings (H2): 20px, Semi-bold

Subheadings (H3): 18px, Semi-bold

Paragraphs and Buttons: 16px, Regular

Font Colours:

Primary Text Colour:

1. #212121: A shade of black that enhances readability and provides a strong contrast. It was used for main body text to ensure high visibility on a white background.

Muted Text Colour:

2. #666666: Used for secondary text to ensure hierarchy in the text placements. A medium Gray for less critical information.

Input Placeholder Colour:

5. #A3A3A3: Used for placeholder text in input fields. A light Gray that indicates input fields.

5.1.1. Colours

The colour scheme for Tech Explorer is designed to be minimalistic, ensuring a clean and simple interface. The primary brand colour is red, similar to YouTube, which is used to highlight important elements and notifications.

Primary Colour:

#FA0000 (Tech Explorer Red): Used for notification badges. Red is used to draw attention and also convey importance.

Secondary Colours:

#212121 (Shade of Black): Used for buttons, primary text, and other essential elements to provide strong contrast and visibility. Black conveys professionalism, making the interface look clean and modern.

#FFFFFF (White): Used for backgrounds to maintain a clean and uncluttered look. It represents simplicity and clarity, ensuring that the content is easy to read and the interface is user-friendly.

5.1.2. HCI Principles

Grids and Layouts

Grids and layouts ensure a structured and balanced design, enhancing the user experience by making the interface intuitive and easy to navigate.

Grid System:

- Four-Column Layout: since we started with a mobile design approach, each card (representing tech startups, student clubs, or events) spans at least three columns, providing enough space for content while maintaining a clean and organized appearance.
- Whitespace: white space was used to create a clean and uncluttered interface, allowing users to focus on content without distractions. Whitespace helps to separate different sections and cards, enhancing readability and visual appeal.

Principles

1. Unity: In Tech Explorer, unity is achieved by consistently using the same colours, typography, and grid structure across all pages. This creates a harmonious look and feel, making the app easy to navigate and visually appealing.

2. Hierarchy: Hierarchy is used to guide the user's eye to the most important elements first. In Tech Explorer:

- Headings were made larger and bolder to stand out.
- Paragraphs and short descriptions were made less visible to ensure that what needs to be seen or read first grabs the user's attention.

Figure 31: hierarchy structure

3. Rhythm: Rhythm involves the repetition of visual elements to create a sense of organized movement. In Tech Explorer, rhythm is achieved by maintaining consistent spacing, size, and shape for UI components like cards representing student clubs, startups, and events. This consistency helps users to quickly understand the layout and find information easily.

Figure 32: Rythmn structure

4. Harmony: it ensures that all design elements complement each other. In Tech Explorer, harmony is created by using a consistent colour palette and typography, ensuring that all visual components are visually pleasing and function well together.

5. Alignment: Proper alignment creates a clean, orderly design. In Tech Explorer: text and images are aligned to the left to create a structured and readable layout; this ensures that the UI is comfortable to use and visually balanced.

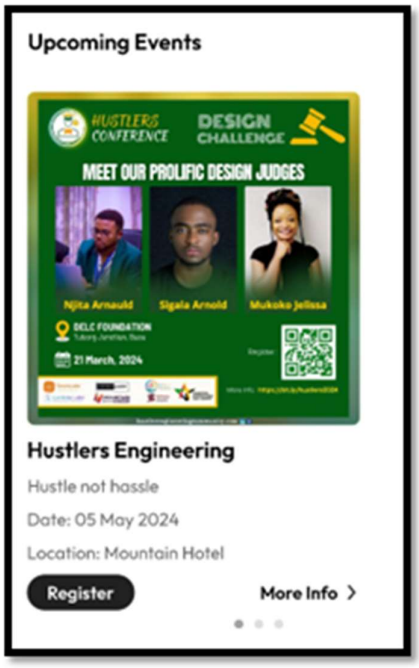


Figure 33: Alignment Structure

6. Gestalt Principles: Gestalt principles help in designing visual elements in such a way that they are seen as a single, unified entity rather than a collection of separate parts. In Tech Explorer, the following principles are applied:

- Good Figure: Objects grouped together tend to be perceived as a single figure. This principle simplifies the visual presentation, making it easier for users to understand and interact with the app. For example, cards representing related startups or events are grouped together within their respective columns, creating a unified perception of related information.

- Proximity: Grouping related items together, such as cards representing related startups or events if they are close to each other. Unrelated items are separated using white space. Only elements that can be seen as a group are close to each other.
- Similarity: Using similar colours, shapes, or fonts to indicate that items are related, maintaining consistency across the app.
- Continuation: Leading the user's eye along a path, such as guiding users through a sequence of related cards or information.

7. Balance

Balance involves distributing visual elements evenly to create a sense of stability. In Tech Explorer:

- A balanced layout is achieved by evenly distributing content across the screen such as a consistent gap of 56px between sections and a gap of 48px or 24px for space between cards.

5.1.3. Ergonomics

- Touch Target Size: Interactive elements such as buttons and icons in the Tech Explorer app are designed with a minimum size of 30px to ensure easy touch interactions, especially on mobile devices. This reduces the likelihood of accidental taps and enhances usability.
- Spacing between Elements: Spacing is maintained around interactive elements or call to actions to prevent accidental touches and improve user controls. This design approach improves usability and also contributes to a clean and organized layout.
- Ease of Navigation: The app features a clear navigation structure, including intuitive titles for navigation buttons. This ensures that users can easily locate and access information about startups, student clubs, and events in Buea's tech ecosystem.
- Accessible Navigation Elements: Navigation menus, buttons, and tabs (incorporating swipe gestures where necessary) are strategically positioned for easy access and visibility across different sections of the app. This ensures an easy navigation and enhances user experience by minimizing user effort in finding relevant content.

5.1.4. Accessibility Considerations

Accessibility allows users of all abilities to understand, use and enjoy the web. As designers, it is our responsibility to make sure we design in a way that is usable to all users irrespective of their situation, abilities or context. The first and foremost step to build an accessible product is to build empathy and install an inclusive design mentality. Accessibility is not confined to a group of users with some different abilities, for example, visual, motor, auditory, speech, or cognitive disabilities, rather it extends to anyone who is experiencing any permanent, temporary or situational disability,

e.g., having only one arm is a permanent condition, having an injured arm is a temporary, and holding a baby in one arm is situational — in each case the user is able to complete tasks with only one hand.

5.1.4.1. Content and Structure

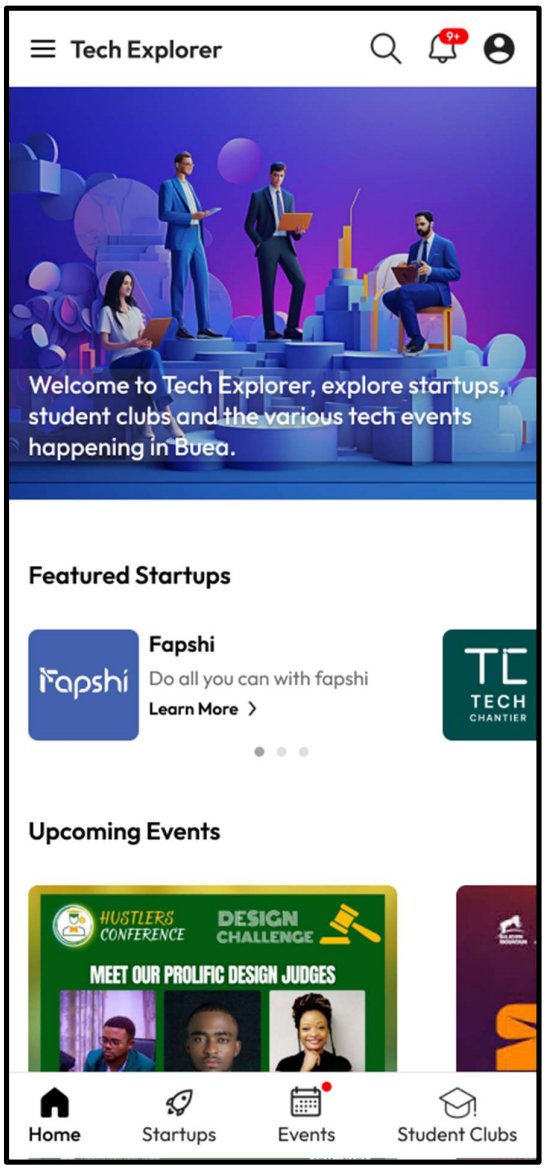


Figure 35: home Page

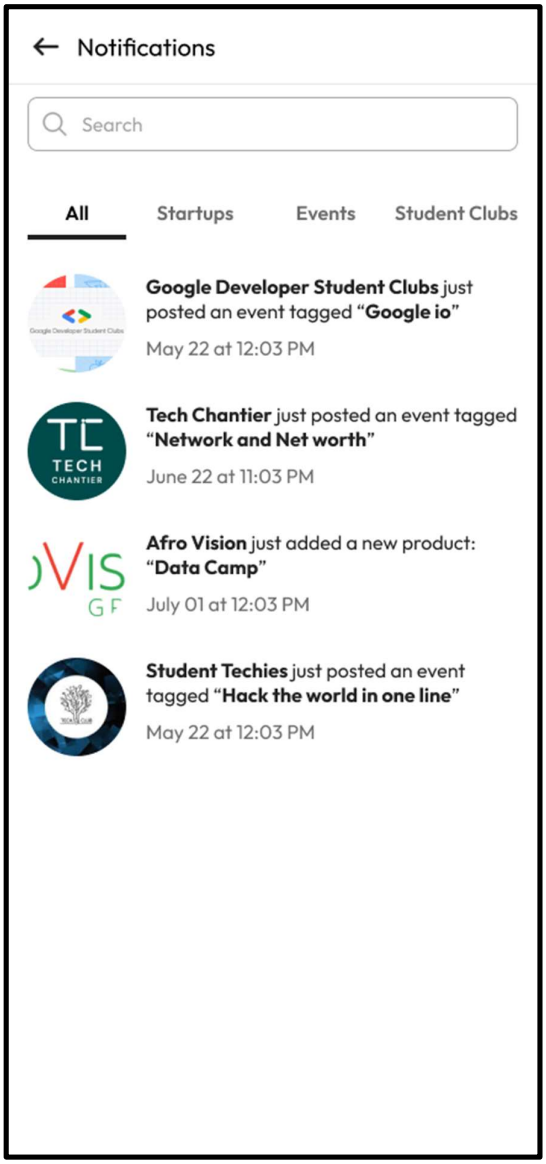


Figure 34: notification page

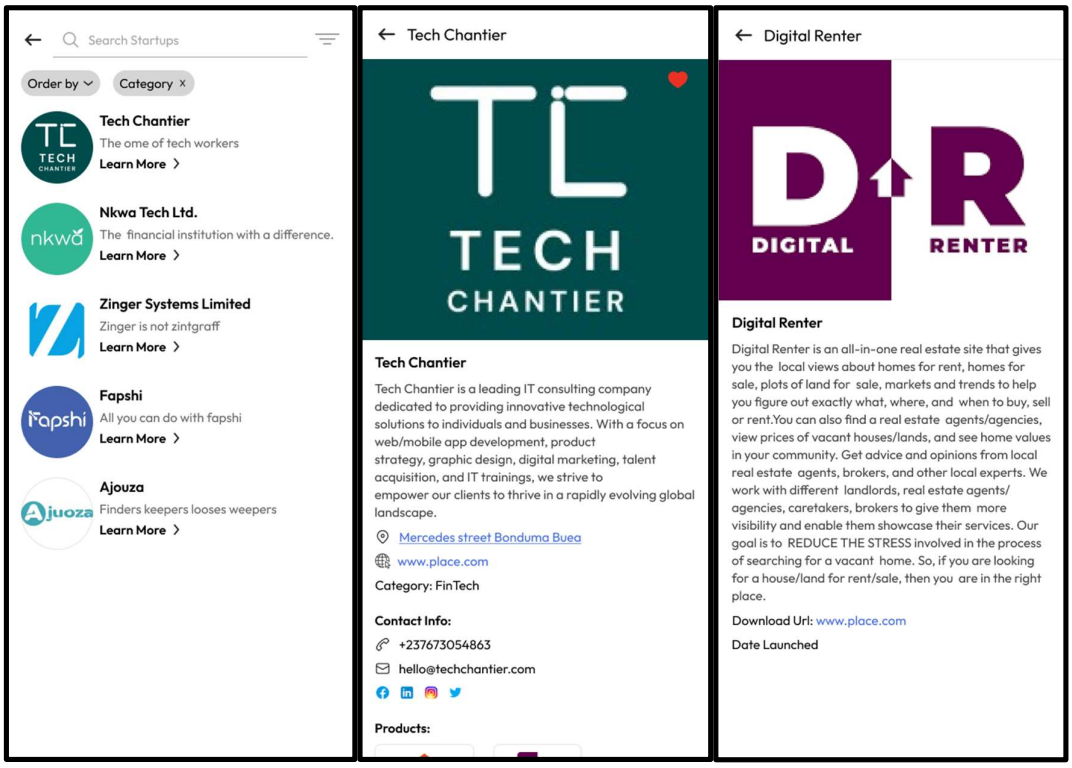
Avoid links that says 'Click here' or content-free text like 'More details' applied to a list of links.

Benefits: This would help users with motor impairments, cognitive limitations or visual disabilities by helping them to avoid unnecessary keystrokes to visit a content that is not relevant to them.

5.1.4.2. Consistent Navigation

Ensure that repeated components occur in the same order on each page of a site.

Benefits: It is helpful for users with cognitive limitations, low vision and intellectual disabilities as it becomes easier to predict where they can find things on each page.



5.1.4.3. Consistent Components

The consistent use of components with the same functionality helps people to identify components on different pages with desired functionality. People with difficulty reading text are highly benefitted from this. Keeping labels consistent also helps to achieve more predictable experience.

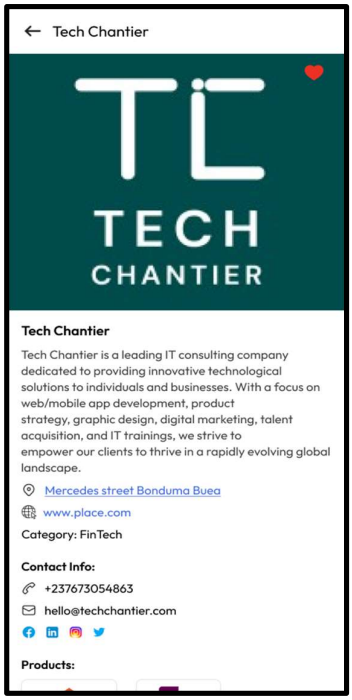


Figure 36: start-up description

5.1.4.4. Touch Target layout

It is helpful for users with mobility impairments such as hand tremors or have large fingers, users who use a mobile device in environments such as public transportation or users who access a device using one hand. Low vision users may better see the target.

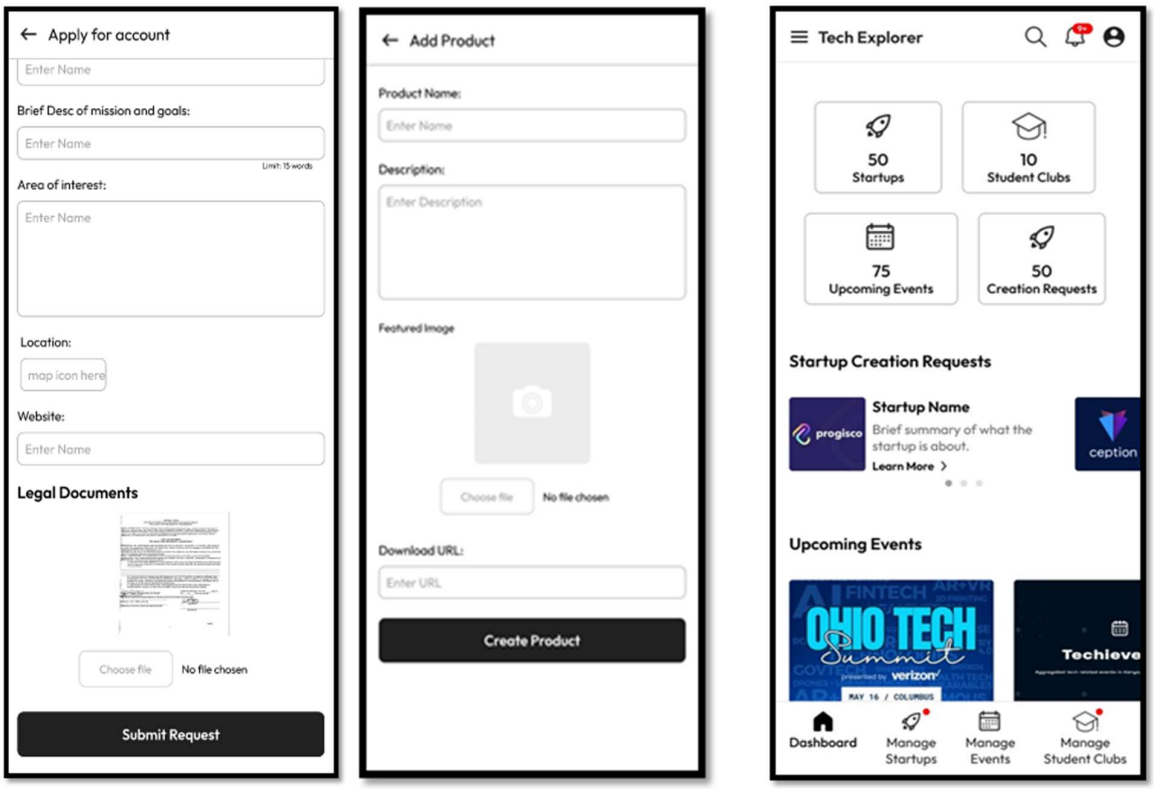


Figure 37: Admin Page

5.1.4.5. Media

Alternate text for images

This text is read by screen reader users. Images that don't convey any content and are used for decorative purpose should not be announced by the screen reader.

Benefits: This helps people who have difficulty perceiving visual content. Assistive technology can read text aloud, present it visually, or convert it to braille. People who are having trouble understanding audio information can read the text presentation.

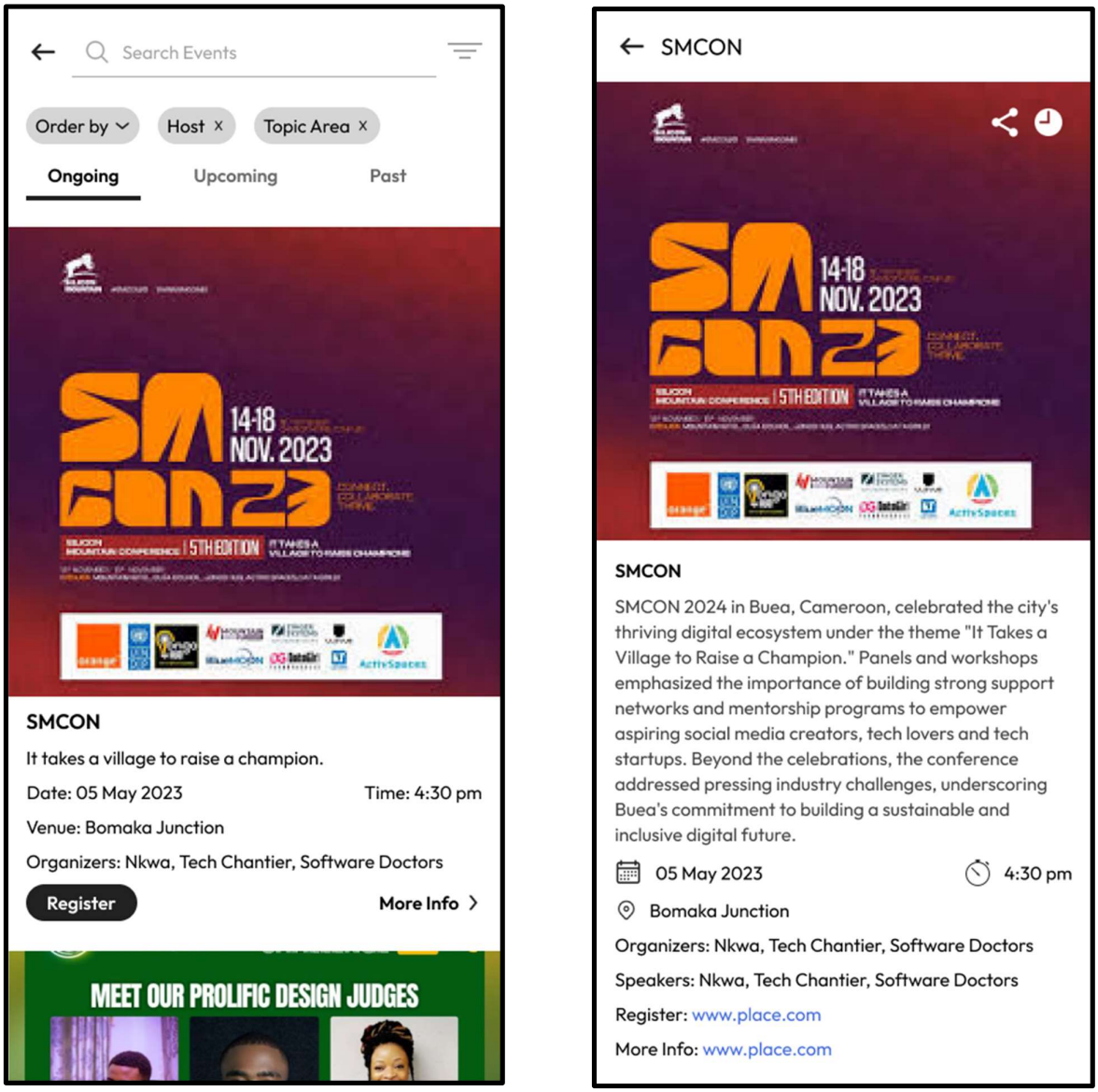


Figure 38: Event page

5.1.4.6. Avoid excessive animations

It can be tempting to include a lot of moving images in the design. This choice demands some careful consideration. It is advisable to include a mix of text and visual elements in the content so that all the users can interact with it in an equitable manner. Additionally, moving images particularly flashing images can be of concern to some individuals and should, therefore, be avoided.

5.1.4.7. Design Forms

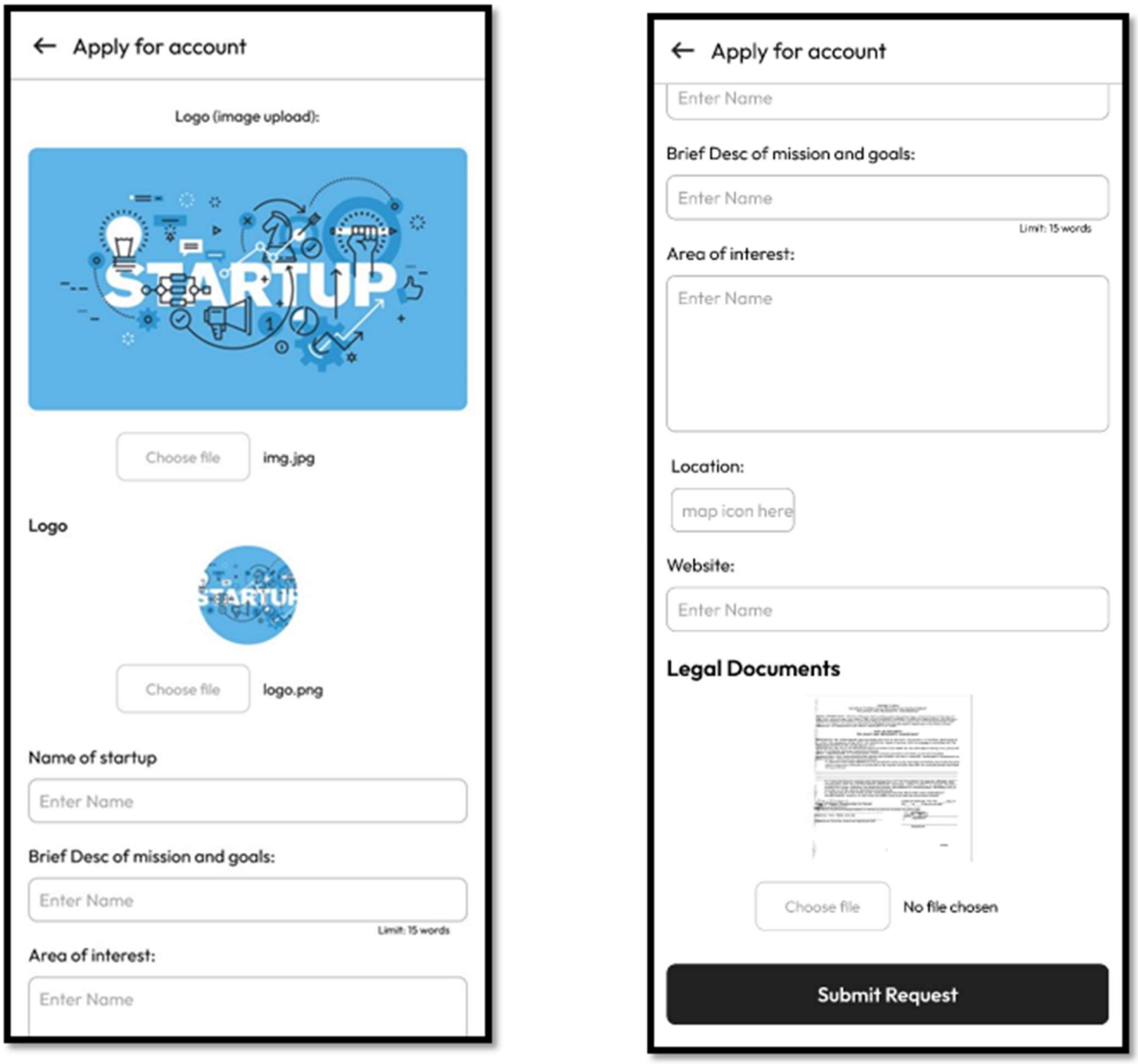
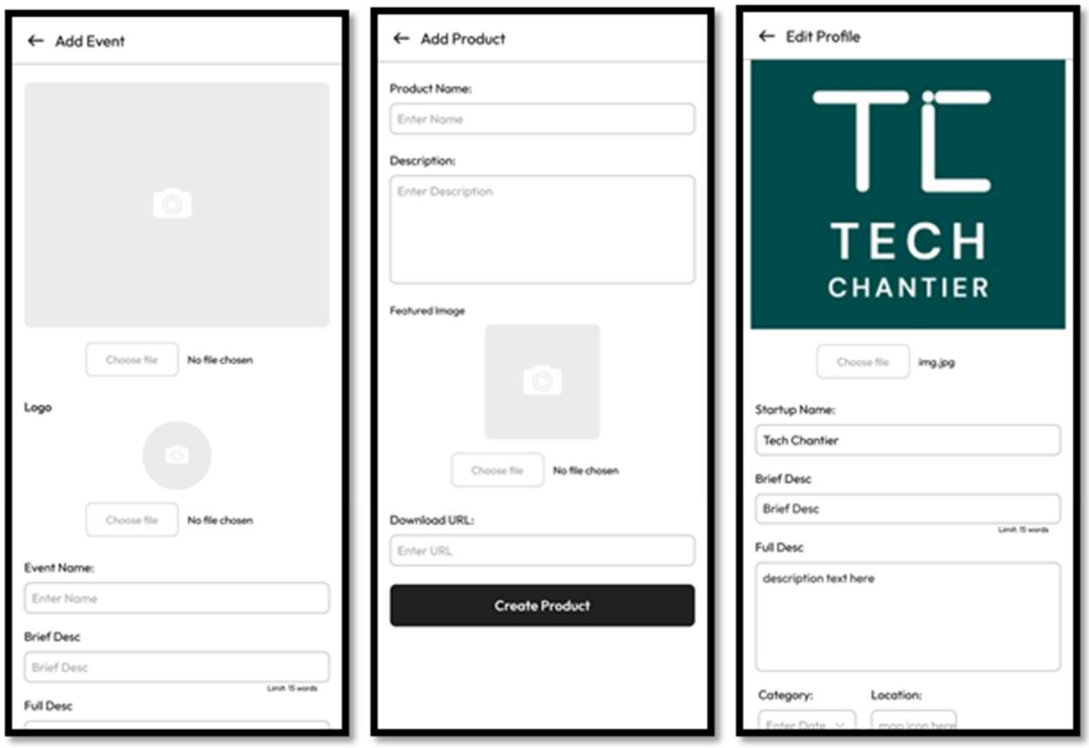


Figure 39:Apply for account page



5.1.4.8. Dark Modes

What is Dark Mode?

Dark mode is a display setting for user interfaces that uses a dark color palette, typically with light-colored text and graphics. It offers an alternative to the traditional light mode, which features dark text on a light background.

Why Include Dark Mode?

1. **User Comfort**:
   - Reduces eye strain, especially in low-light conditions.
   - Can be easier on the eyes during prolonged use.
2. **Energy Efficiency**:
   - Saves battery life on OLED and AMOLED screens, as these display technologies use less power for darker colours.
3. **Preference and Trend**:
   - Many users prefer dark mode for aesthetic reasons.
   - It's become a popular trend, and users expect it as an option.

Accessibility Benefits

1. **Reduces Glare**:

- Lower contrast between the screen and the surrounding environment, reducing glare and eye fatigue.

2. **Enhanced Readability**:

- Improves readability for users with visual impairments such as photophobia (light sensitivity).

3. **Focus and Concentration**:

- Dark mode can help users with attention deficits by reducing screen brightness and distractions.

Design Considerations

1. **Contrast**:

Ensure there is enough contrast between text and background. The Web Content Accessibility Guidelines (WCAG) recommend a minimum contrast ratio of 4.5:1 for normal text and 3:1 for large text.

2. **Color Choice**:

Avoid pure black (#000000) for backgrounds; use dark Gray instead to reduce eye strain. Be mindful of colour blindness and ensure that important information is not conveyed by colour alone.

3. **Consistency**:

Maintain a consistent look and feel between dark and light modes to avoid user confusion.

4. **User Control**:

Allow users to easily switch between dark and light modes. Consider system-wide preferences and provide an option to follow the device's theme settings.

Implementation Tips

1. **Testing**

Test your design in both modes to ensure that all elements are visible and usable. Get feedback from users, especially those with visual impairments, to make necessary adjustments.

2. **Dynamic Adaptation**

Use CSS media queries (e.g., `prefers-color-scheme`) to detect and apply the user's preferred color scheme automatically.

3. **Inclusive Design**:

Design with accessibility in mind from the start to create an inclusive experience for all users.

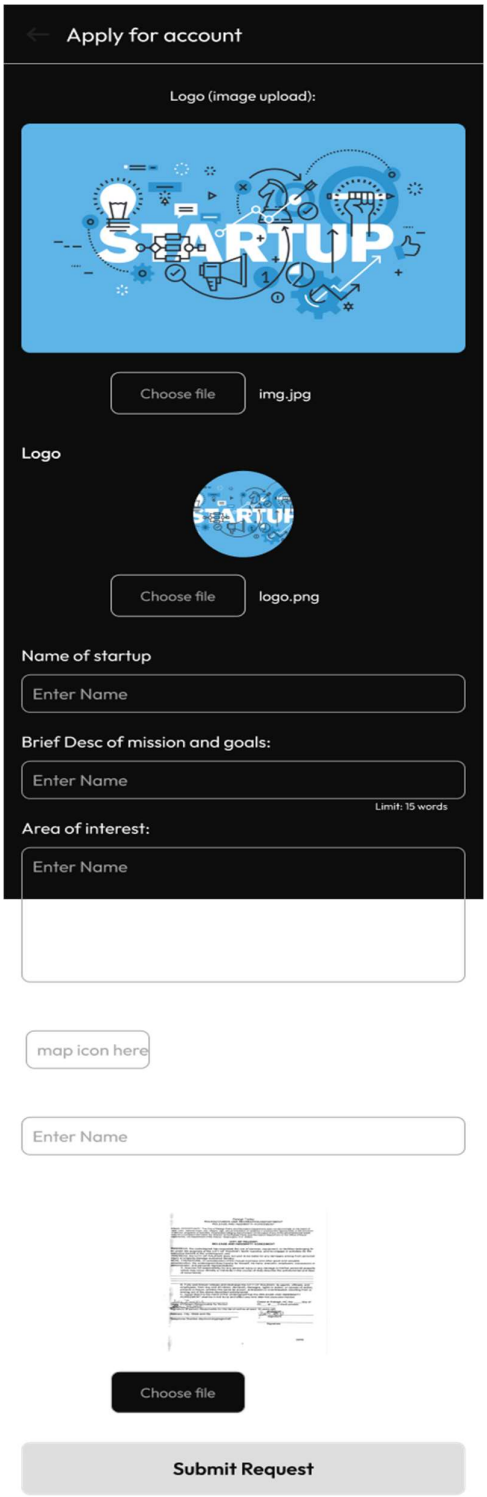


Figure 41:apply for account darkmode

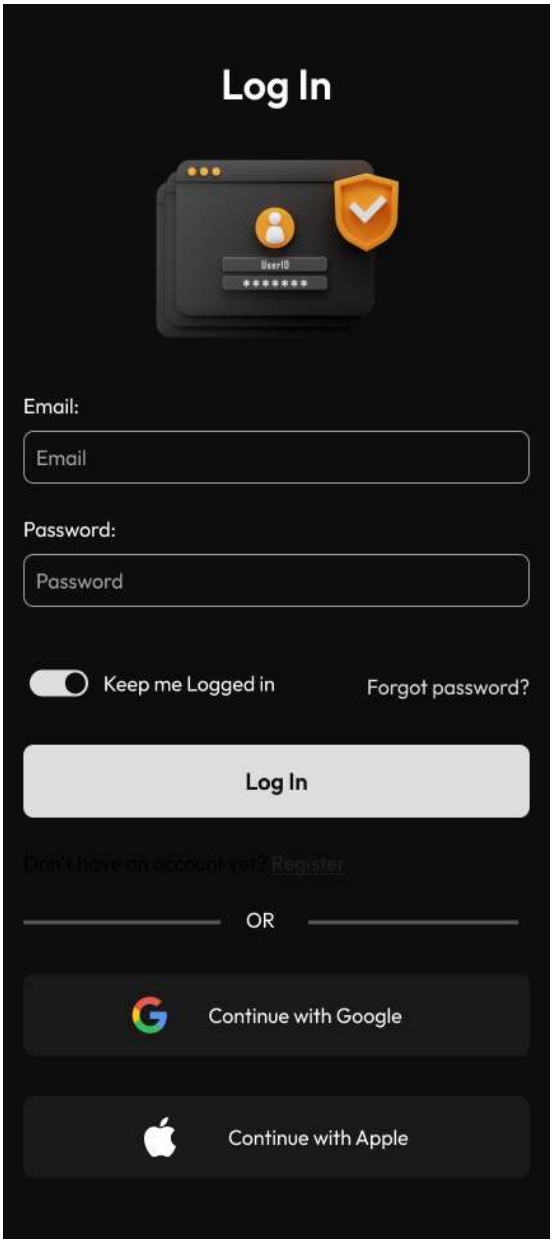


Figure 40: Login dark mode

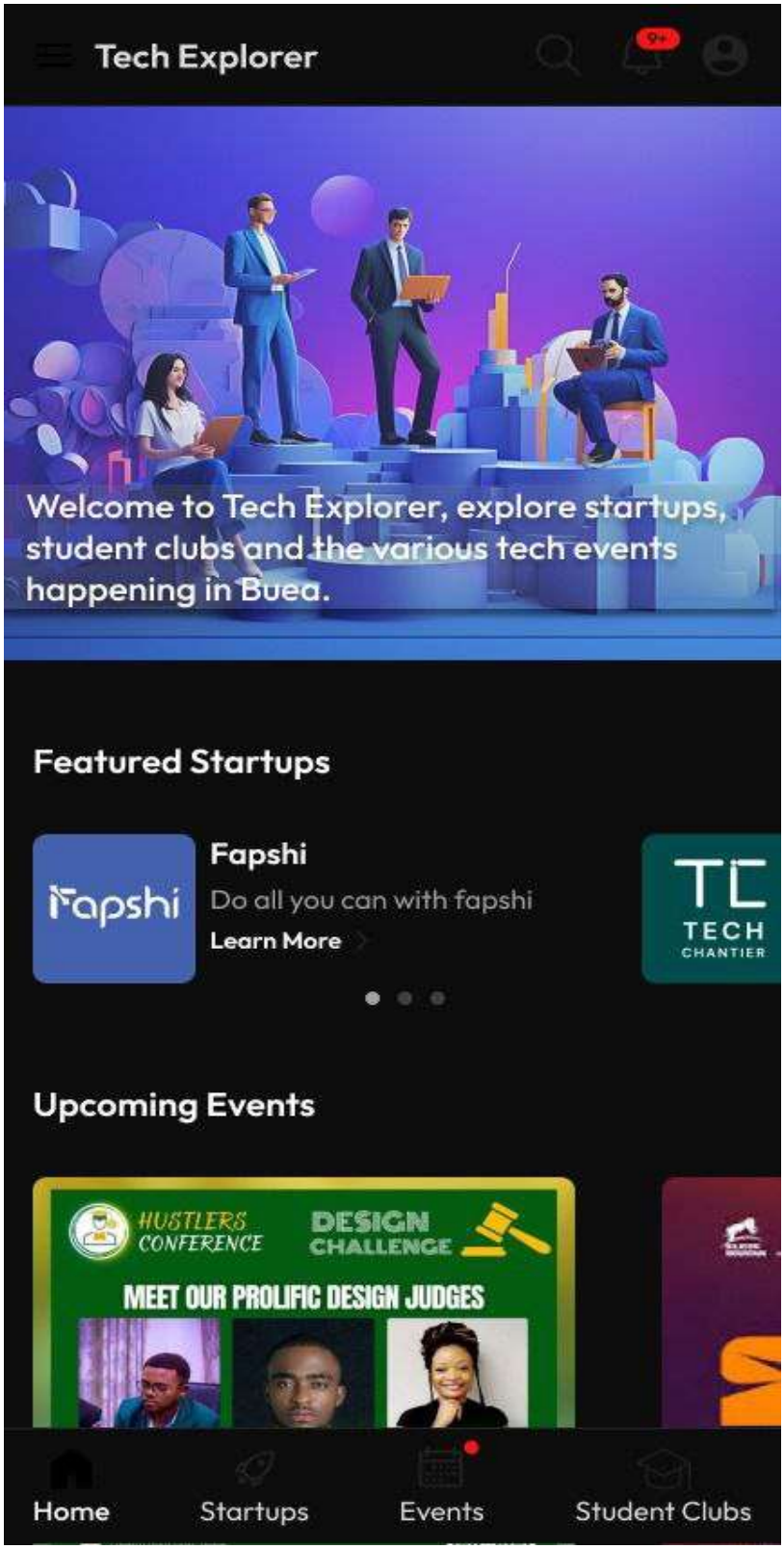


Figure 42:Home page darkmode

Figure 43: event page

Figure 44:event description

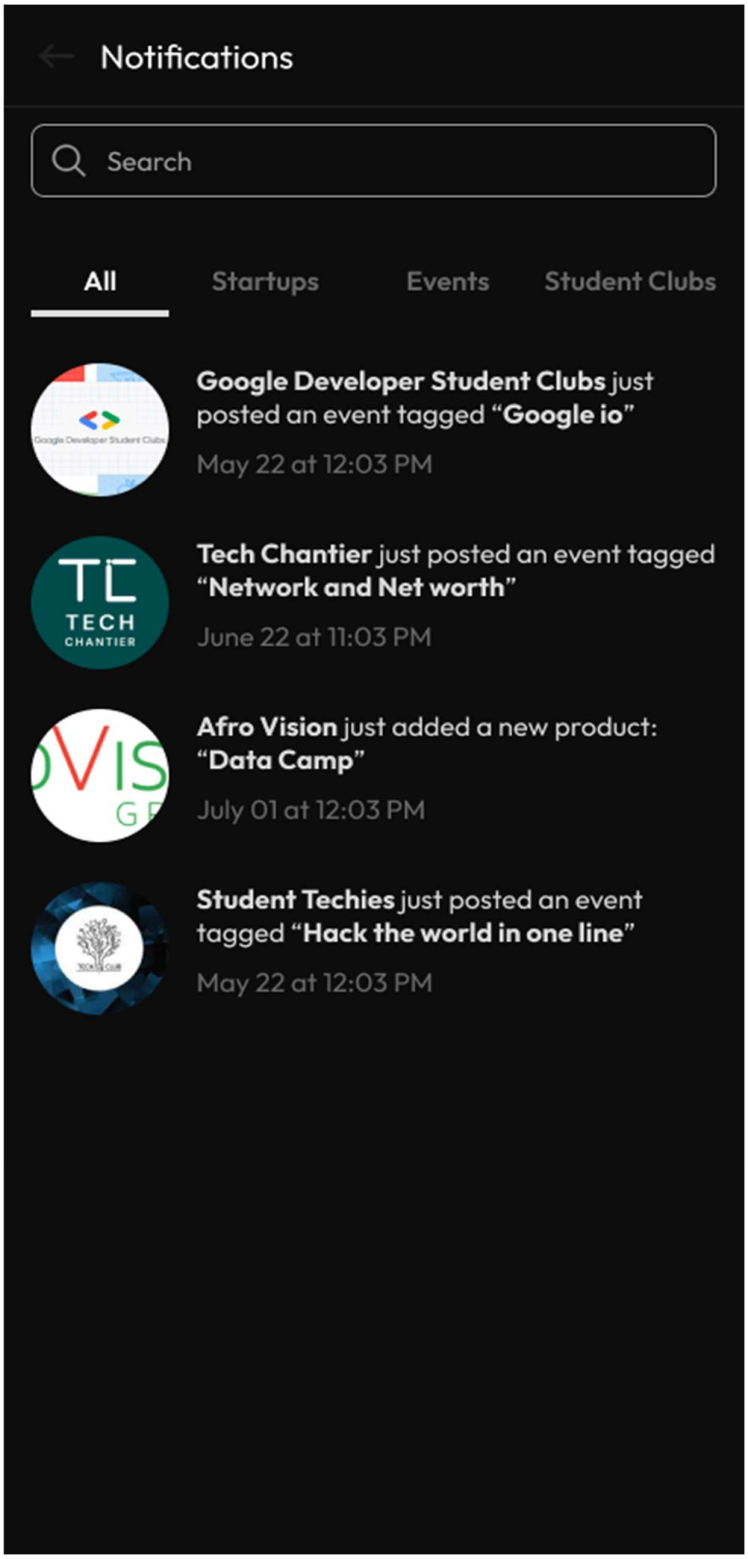


Figure 45:notification page darkmode

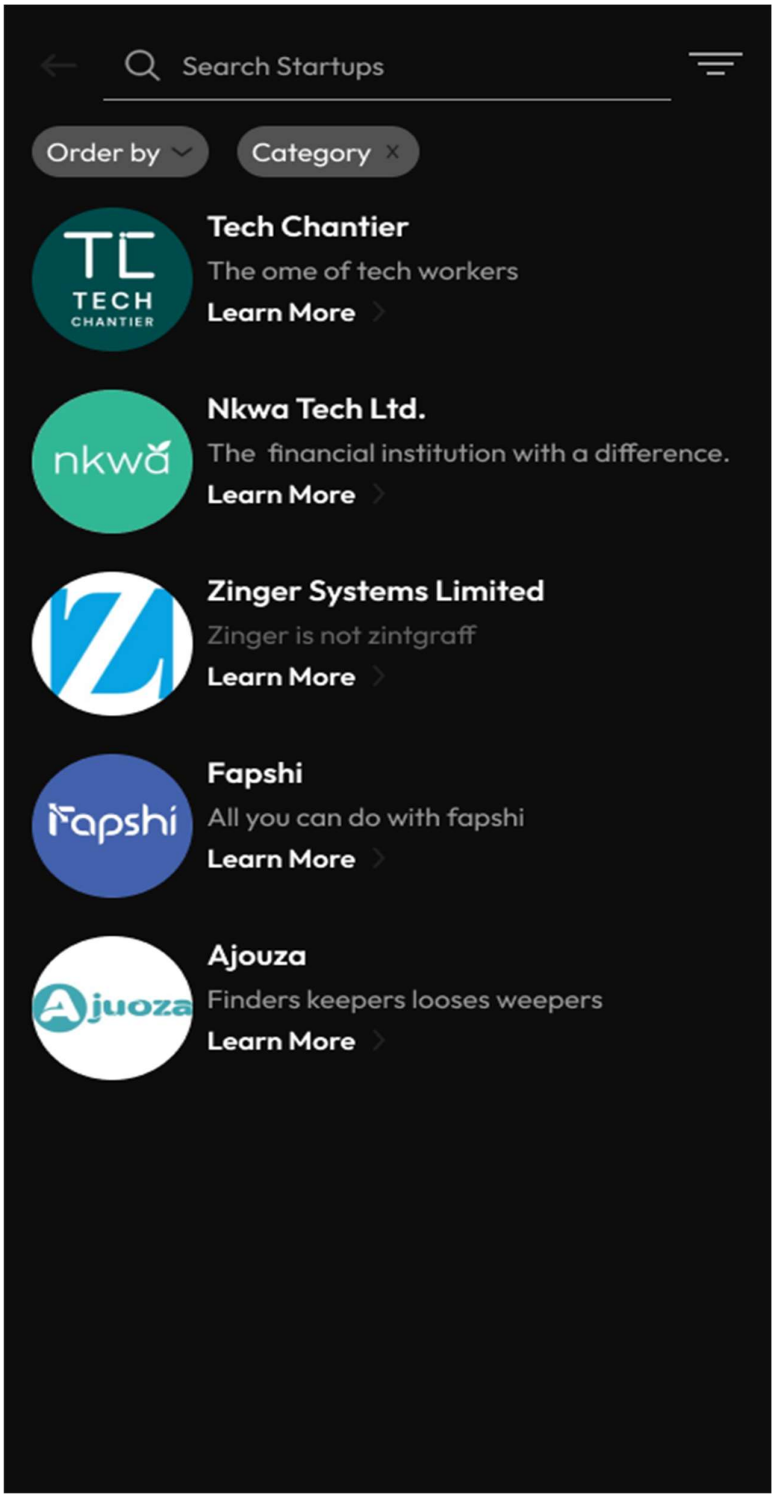


Figure 46: list of start-up pages darkmode

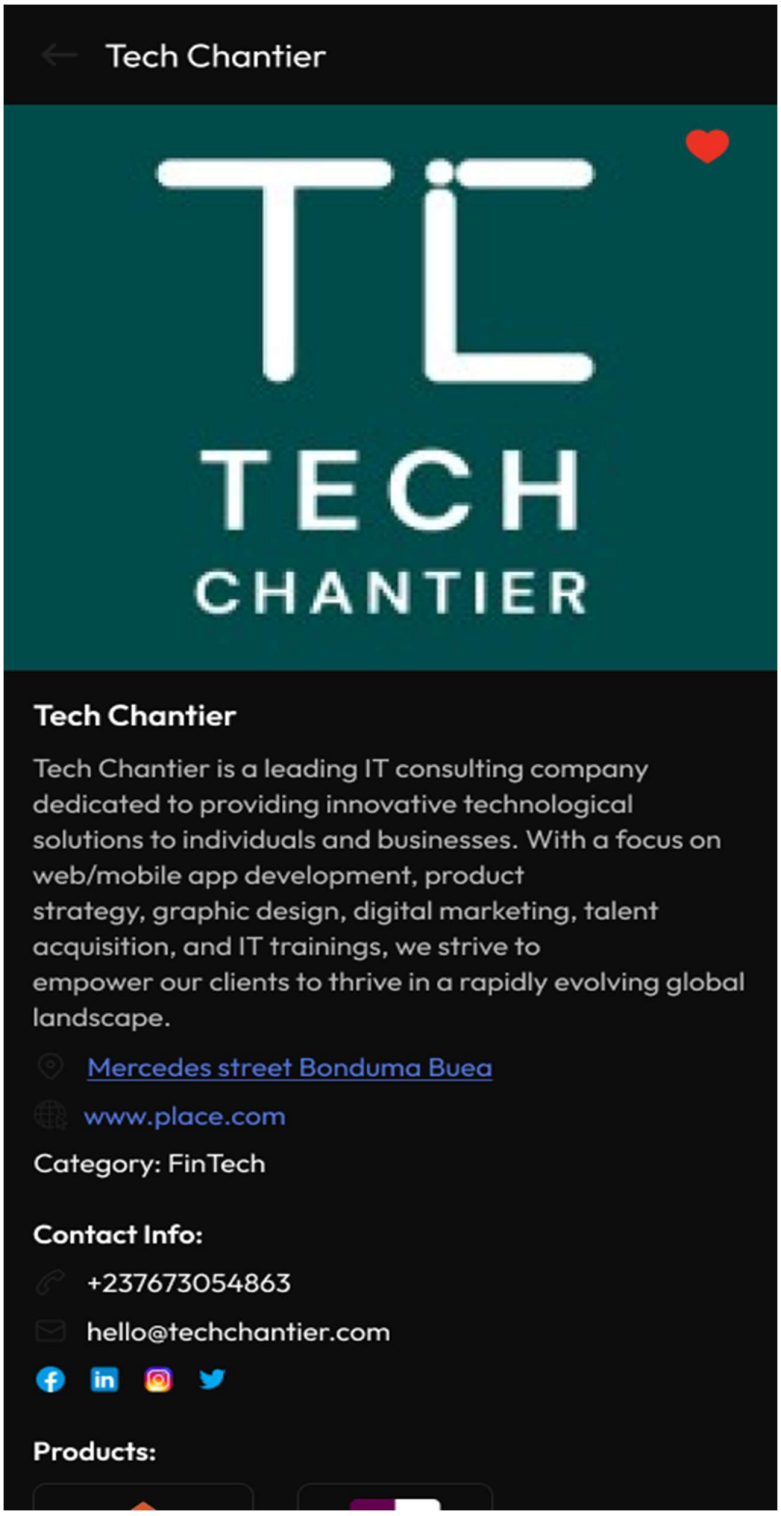


Figure 47: start-up description darkmode

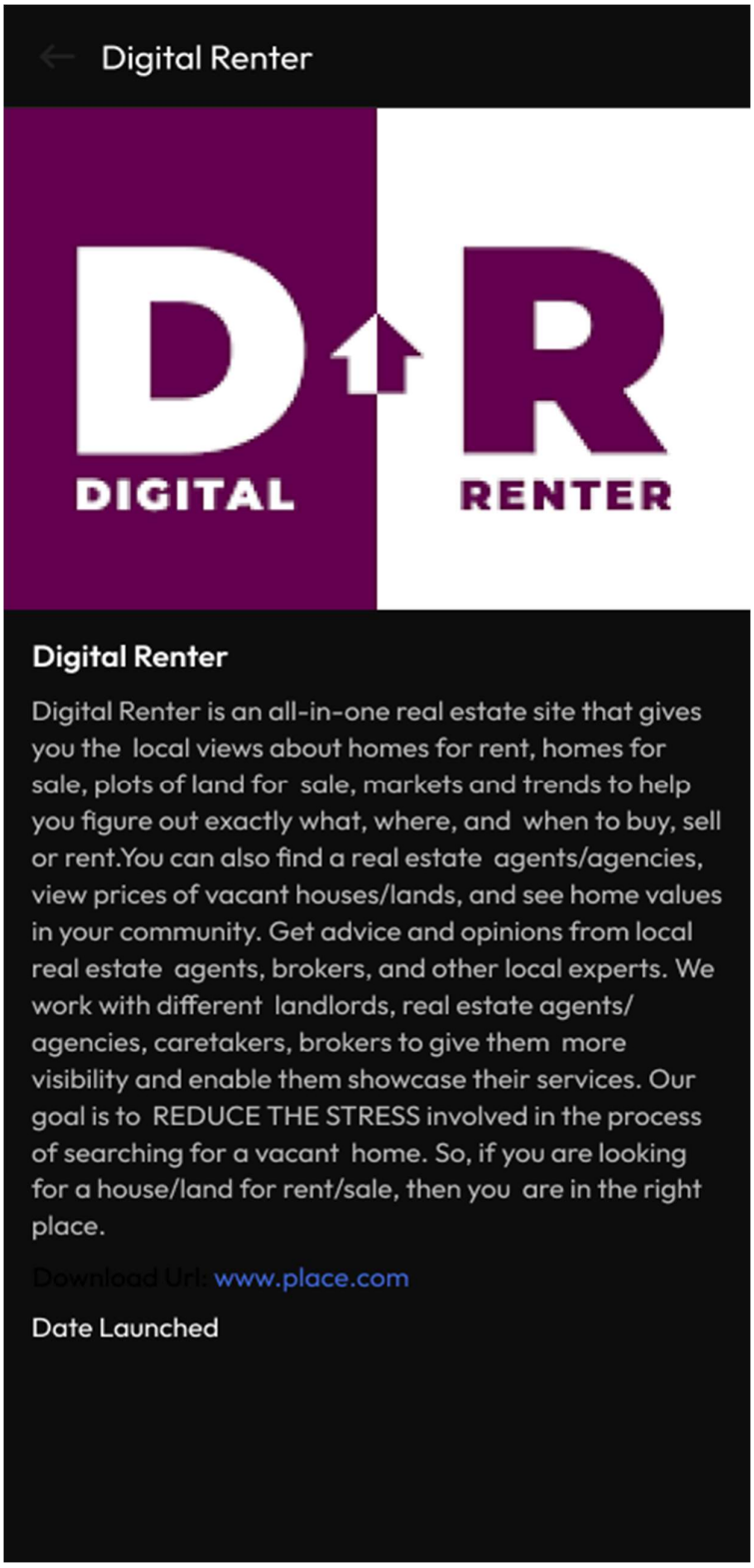


Figure 48:start-up product darkmode

Figure 49: Student clubs darkmode

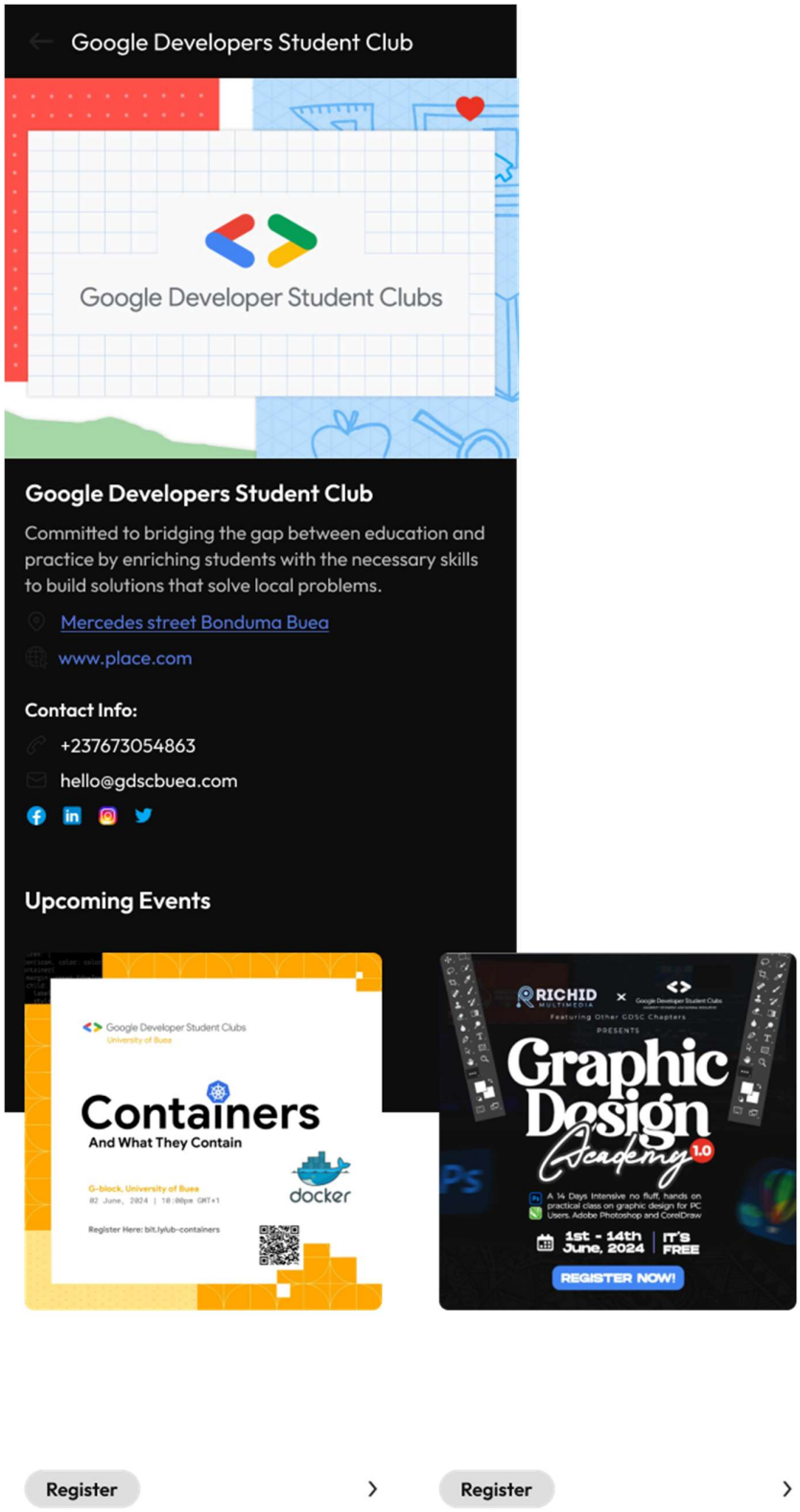


Figure 50: Student club description

5.1.4.9. Test with different Users

In any UX design project, user research and usability testing are of prime importance. This also holds true when it comes to the creation of accessible designs. At different stages in the design process, UI/UX professionals must test the product or service with different users. The users selected should have varying physical and cognitive needs, thus making sure that the input of a diverse range of users is being incorporated into the design

5.1.5. Aesthetics

Generally speaking, aesthetics refers to things that are pleasant to look at; in design, an aesthetic design is one that draws the attention of the user and results in a positive influence on how they feel. As you probably know, users make up their mind about a website or app within the first few milliseconds of using it; they want to feel an attraction to the design and an overall desire to continue using it. In addition, aesthetic designs:

Create an attractiveness bias

aesthetic designs appeal to a user's heartstrings and seek to create an emotional bond, which leads to users spending more time on the site, more traffic, and a lower bounce rate.

Can conceal initial usability issues

if users are distracted by beautiful designs, they might be more likely to ignore potential usability issues in favour of the aesthetic design.

Basics elements of aesthetic design

It's a known fact that good looking designs are more palatable, usually perceived as being better than their poorly-designed alternatives. But aesthetic designs aren't created overnight and usually consist of the following:

Hierarchy

The most important information must be highlighted in the design, drawing user attention to it initially and throughout their entire time interacting with your design. You can do this through differentiating colors or fonts, or simply by placing this information in a prominent location on the page.

Balance

The placement and space between elements on your design are crucial parts of the aesthetic design and symmetrical or asymmetrical spacing can help draw user attention to certain areas of the screen.

Scale

Using differently sized elements can help highlight specific areas; remember that in design, bigger isn't always better!

Repetition

Creating a cohesive brand voice is an essential part of UX/UI design and while you should mix up the different fonts, colors, and images you use, choosing a select view as your brand's image can help transmit a sense of confidence and trust.

Contrast

Another trick that can help guide your audience's eyes towards the most important areas of your page is to use contrasting elements, such as black and white colors or thick and thin lines.

Minimalism

Less isn't always more, but in design it definitely is. Choose the elements you want to include on your page carefully and don't overcrowd the page with information that isn't totally necessary.

5.1.6. User Personas and Pages

User pages, or user journey maps, are visual representations of the steps users take when interacting with a product. They help identify key touchpoints, user actions, emotions, and potential pain points throughout the user's interaction with the product.

5.1.6.1. General User Persona

These are the various pages of the tech enthusiast and how helpful they are.

1. Home Page: This page contains a summary of the entire app. It highlights featured startups, student clubs, and upcoming events to give users an overview of everything. Based on the citizen interview and UI testing, most users ended at the home page without navigating to the other pages, so having an overview of everything on the app will target that user problem.

2. Notifications Page: This page lists all notifications for the user. Notifications can include updates about upcoming events organised by startups or student clubs, announcements of new products by startups, updates on events, and notifications when new startups or student clubs join the platform. This keeps users informed about all activities and updates within the app.

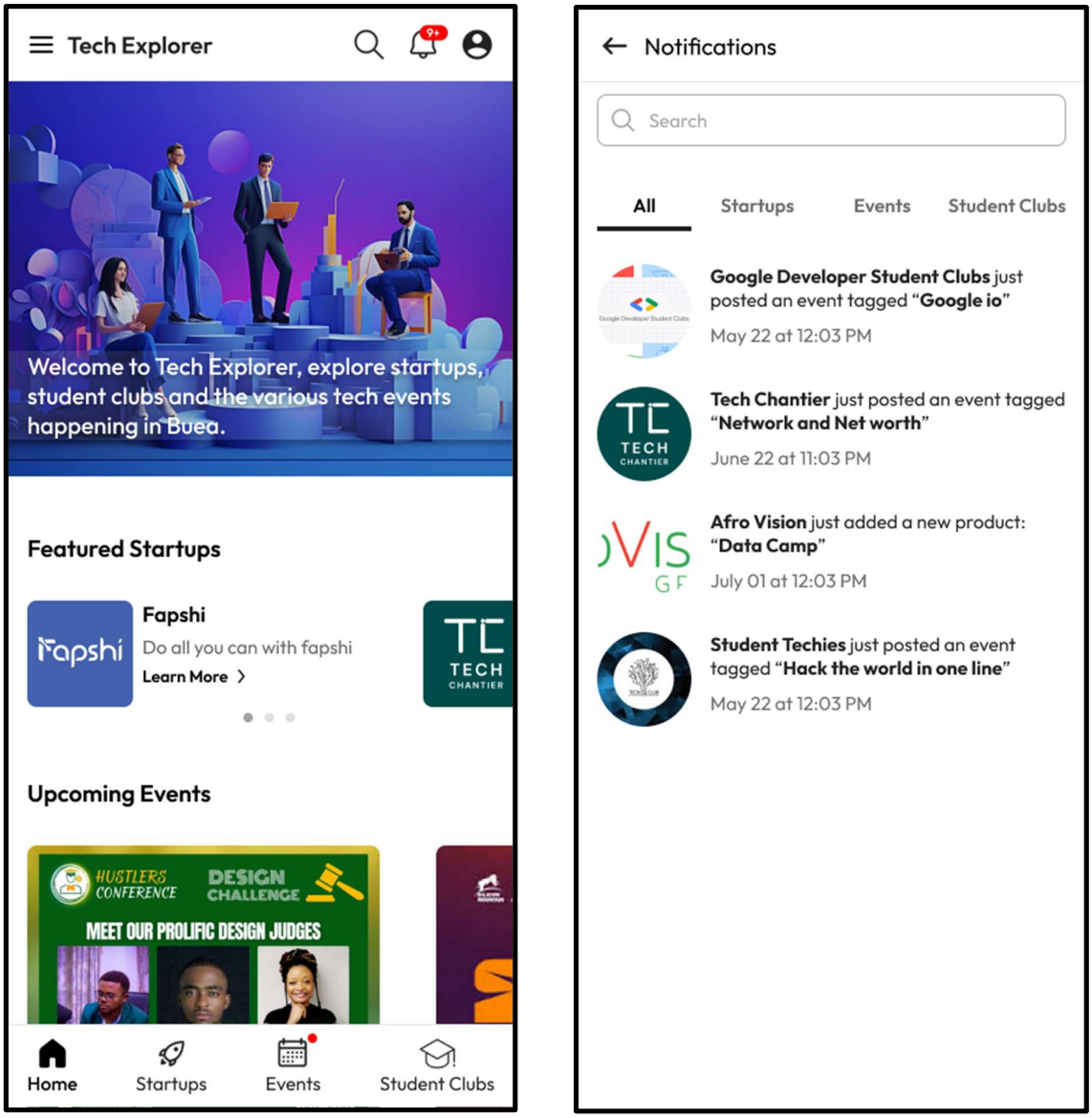


Figure 51:home and notification page

3. Events Page: This page contains a list of events related to startups and student clubs. Users can filter events by upcoming, ongoing, or past events to easily find what they are looking for. Users can view details of each event providing more information such as the event description, date, time, and location.

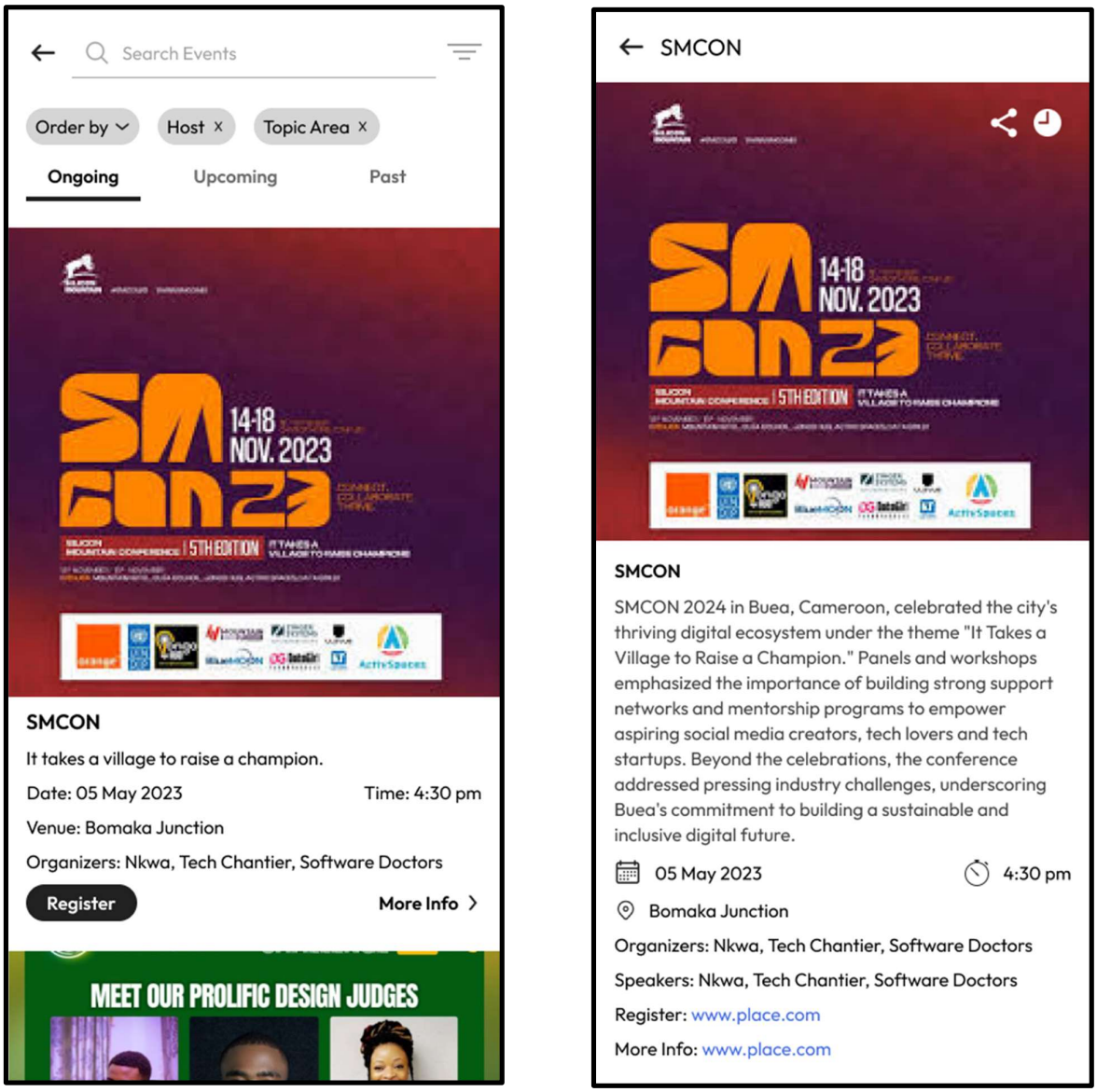
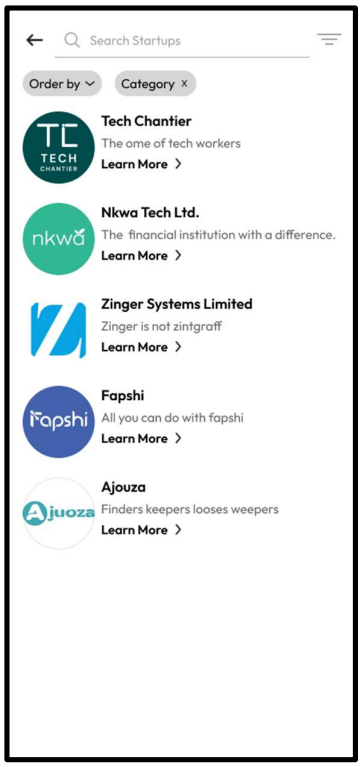


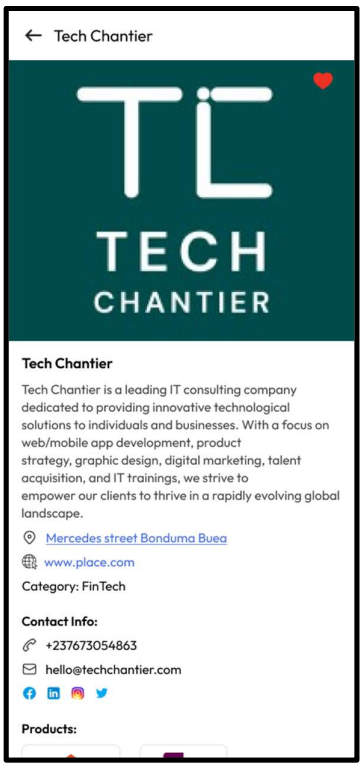
Figure 52: Event structure pages

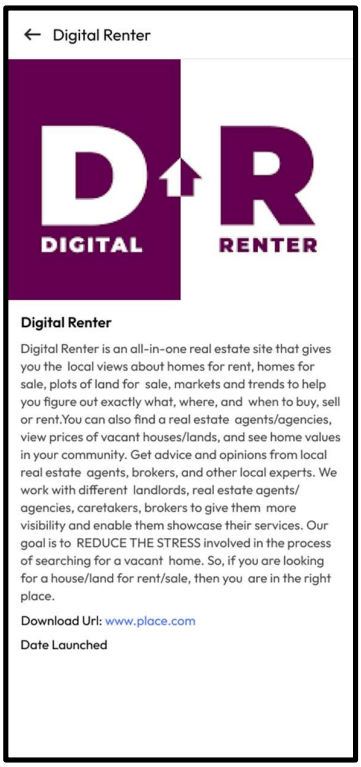
5.1.6.2. Student Club/ Start-up Representatives Persona

Startup Page

This page lists all the startups registered on the platform, providing a brief overview of each. Users can click on each startup to view details about the startup such as the startup's website, contact info, and the products they offer. Users can also view the various product details.







Student Club Page

This page lists all the student clubs in Buea. Each student club details page includes a description of the club, contact information, and a list of events organised by that club.

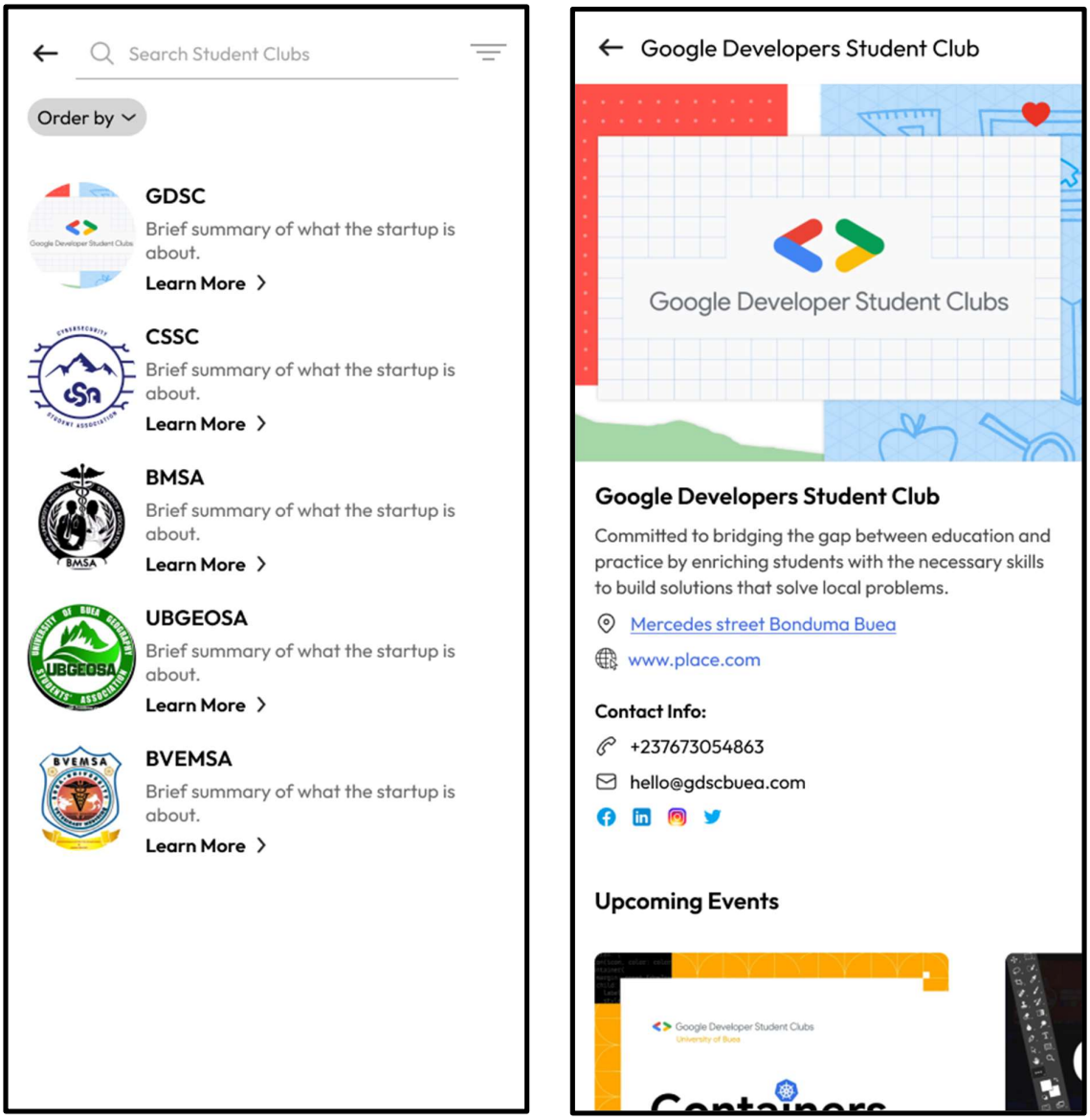


Figure 53: student clubs and description

Account Application Page

This page is for startups or student clubs that want to apply for an account on the platform. They can fill in their details and upload necessary legal documents. These applications are then sent to the admin for validation and approval.

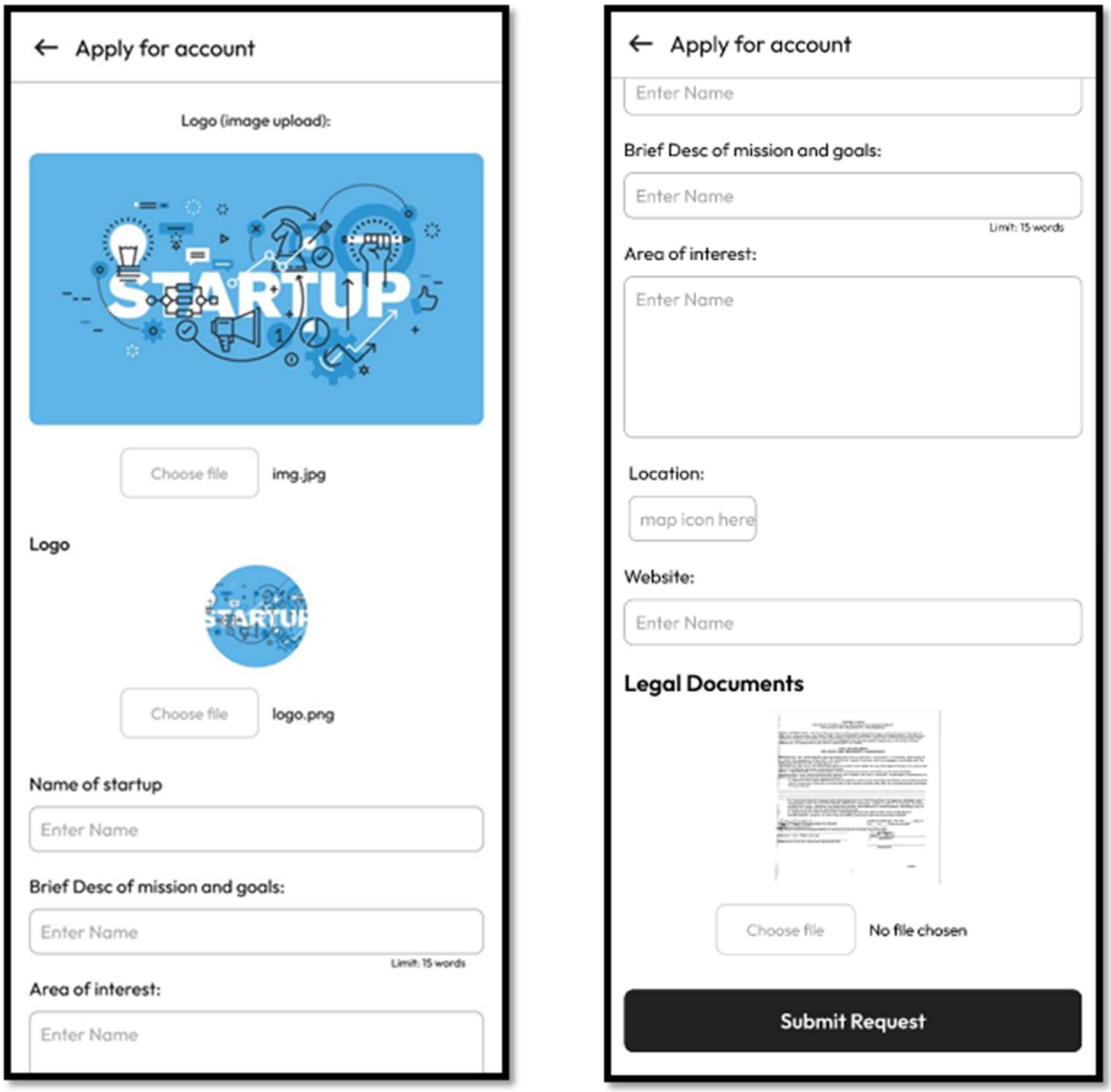


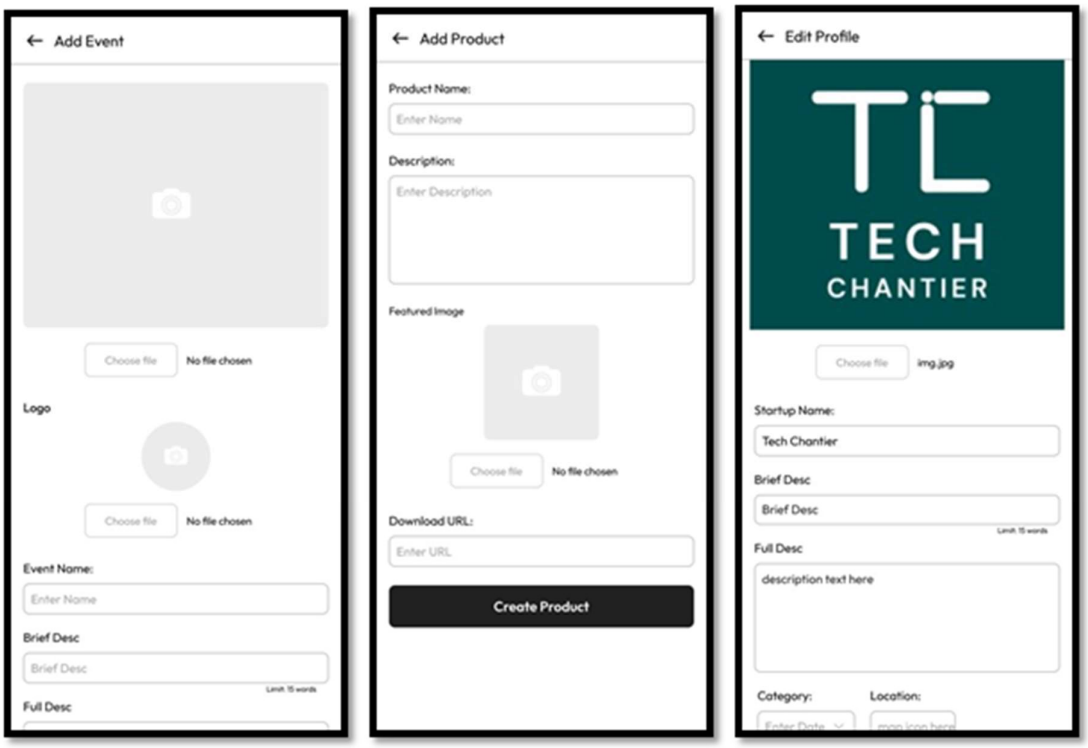
Figure 54:apply for account page

Startup/Student Club Representative Pages

The startup/student club representative has similar pages to the general user pages such as the home, startup and student pages. Below are a list of different pages and also the similar pages with extra content.

1. Events Page: this is similar to the events page in the tech enthusiast pages, but allows representatives to add events i.e. events organized by that startup.

2. Profile Page: This is the profile page for the startup or student club representative (similar to startup or student detail page in general user panel). It allows them to edit their profile details and add products. This page ensures that representatives can keep their information up-to-date.



5.1.6.3. Administrator Page

These are the various pages/screens of the admin in our application and what purpose they serve:

1. Home Page: This page acts as a dashboard for the admin, summarizing key metrics such as the number of registered student clubs and startups, pending requests, and upcoming events. It also provides an overview of recent activities and notifications about new startup/student club creation requests.
2. Manage Startup and Manage Student Club Request Pages: These pages contain lists of creation requests from startups and student clubs, as well as already approved ones. The admin can approve or decline these requests. There is also functionality for the admin to manually add new startups or student clubs to the application.

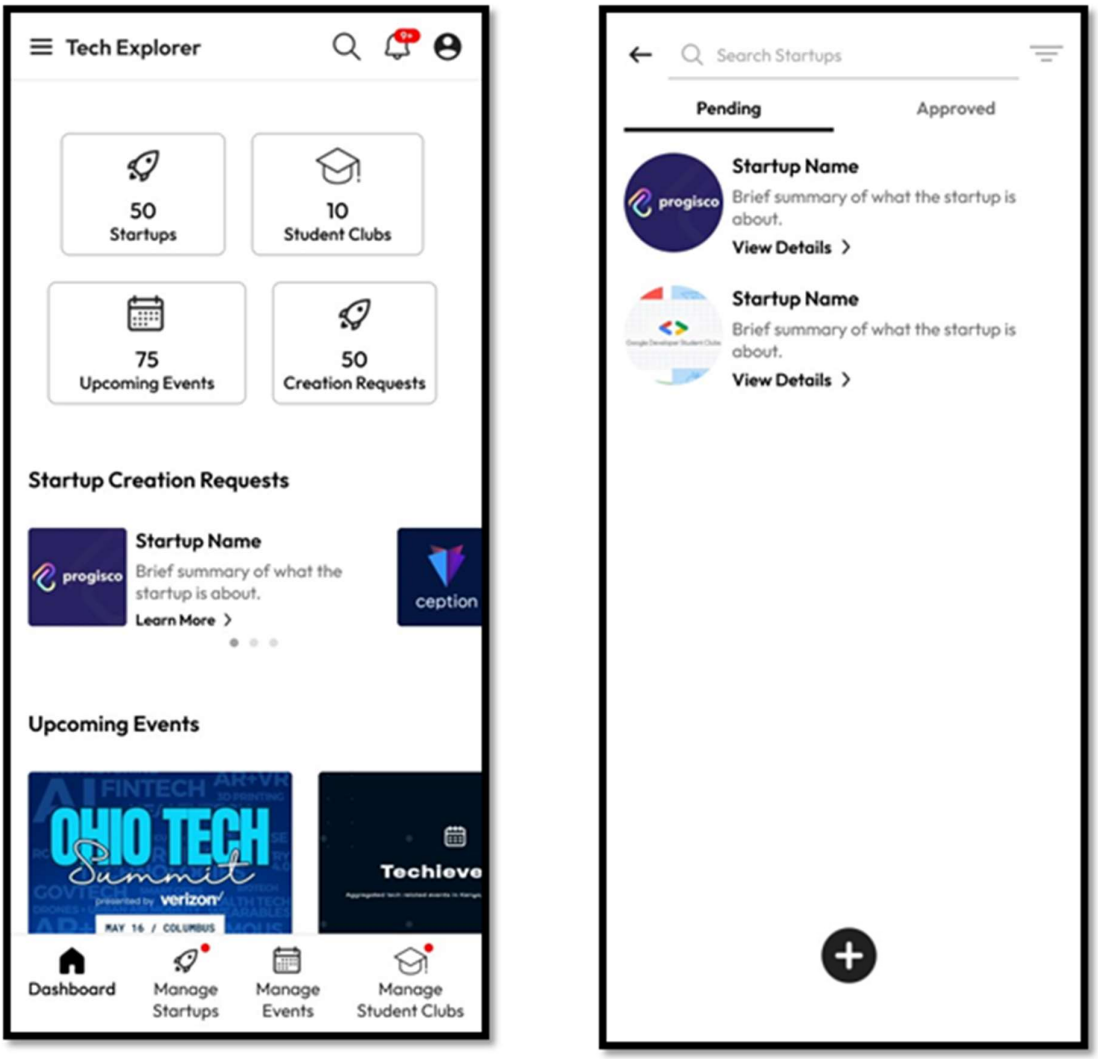


Figure 55: admin page

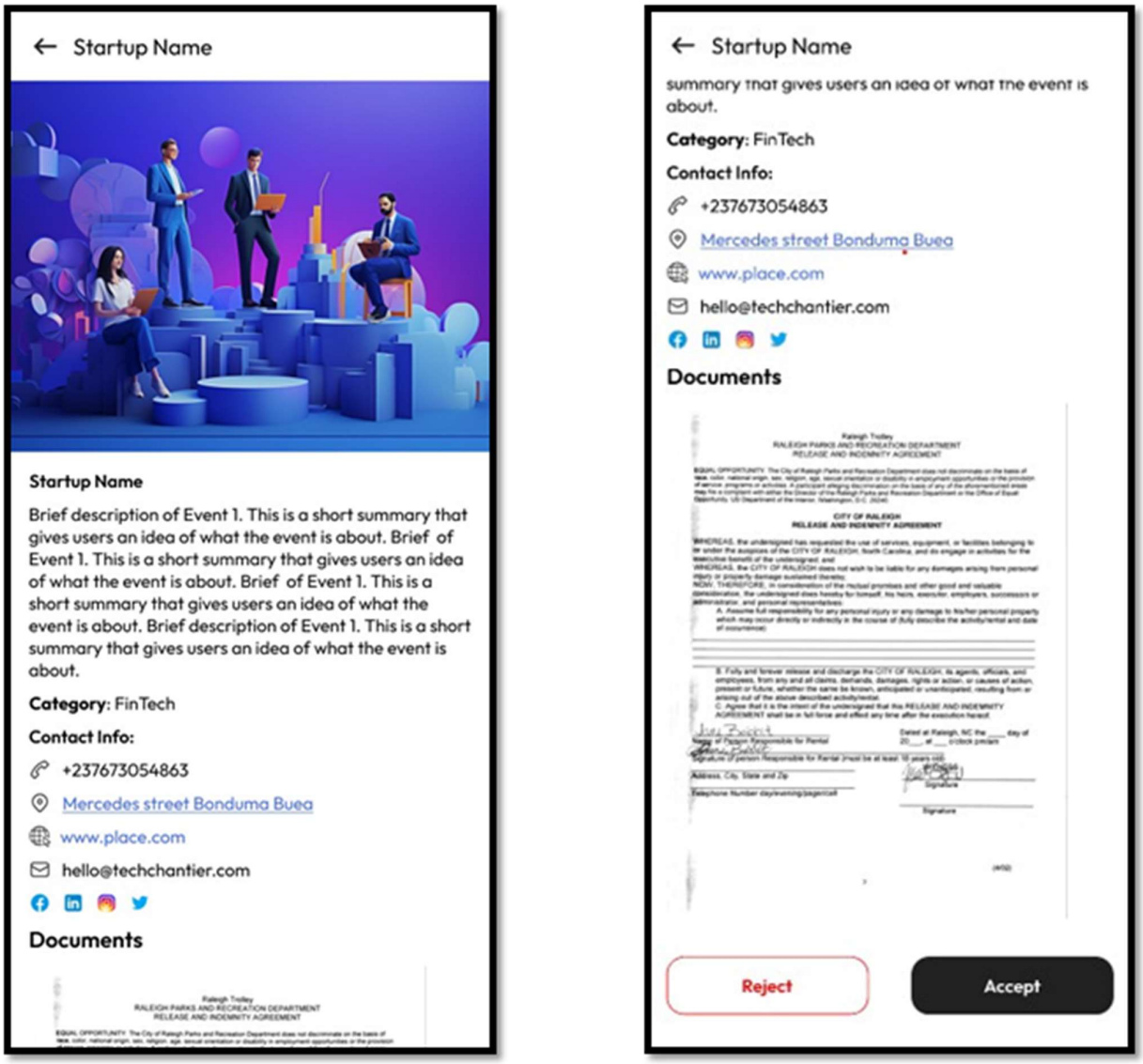


Figure 56: start-up description and approval

5.1.7. Design Tools

5.1.7.1. Figma

Figma is a collaborative web application for interface design, with additional offline features enabled by desktop applications for macOS and Windows. Figma's collaborative design environment facilitated the development of user interface (UI) prototypes, which were essential for gathering user feedback and improving our design iteratively. This tool was particularly useful in user experience (UX) testing phases.

5.2. DESIGN BRANDING

5.2.1. What's Branding all about?

Lately, the word "brand" has been commonly used as some trendy thing, especially in the fashion industry, so many people forget its true essence. According to Business Dictionary, a brand is a unique design, sign, symbol, words, or a combination of these, employed in creating an image that identifies a product and differentiates it from its competitors. In other words, a brand is a visual representation which people correlate with a company or a product. An effective brand identity is the one which customers' associate with a high level of credibility and quality.

However, powerful branding depends not only on aesthetic features of brand elements but on the details such as message and emotional appeal standing behind it. To create proper brand identity, designers need to get deep into the details about business goals as well as do research of the market and its target audience. Here we've divided a branding process into six essential stages which designers need to go through on the way of brand creation.

5.2.2. Business Goal Description and Personality

5.2.2.1. Business Model and Vision

Our organization is a non-profit dedicated to centralizing information about tech events, startups, student clubs, and tech communities in Buea.

5.2.2.2. Brand Personality

Before diving into the visual design, it's essential to identify the character our product wants to present. Designing a brand without understanding its personality is like drawing a portrait from a photograph—it might look accurate but will lack emotion and depth. To create a meaningful brand, we need to describe the essence of our organization.

Keywords Describing Our Business

- Tech Ecosystem
- Buea
- Centralized Information
- Mobile Application
- Design Thinking
- Tech Events
- Startups
- Student Clubs

These keywords encapsulate our mission and values, guiding the designers to create a brand that resonates with our goals and connects emotionally with our audience.

5.2.3. Logo Design

5.2.3.1. Market and User Research

Designers dig out the information about the market and potential competitors. It’s good to learn from someone’s experience be it good or bad. Having the necessary data experts can create a unique and efficient logo and build a brand identity that will stand out the competition. Designers and clients’ preferences should step aside to the needs of target audience. A brand needs to make a good impression on its potential buyers or users to gain their trust. User research helps to get deeper into preferences and psychological peculiarities of the target audience. The design is not a pure art. If you rely exceptionally on the sense of beauty and talent, there is a risk of failing the task. Research takes less time compared to doing the job over. A small experiment was carried out where a random phone screen was shown to different students and they were asked to indicate the icon that they noticed first and in most of the cases they chose the red icon (YouTube, gallery, Uba mobile).

5.2.3.2. Creative Stage

When all the core information is gathered, designers move to more artistic stage creative process itself. By the means of various experiments, they choose the style direction and colour palette which will work best for a brand.

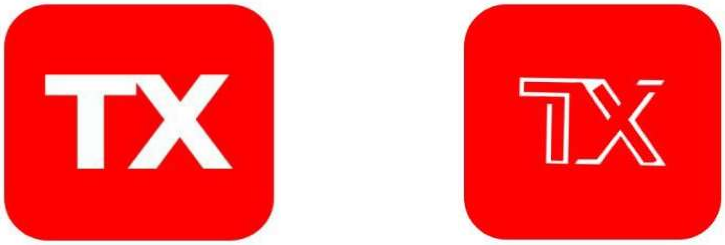


Figure 57:Logo design

After the logo is complete, designers start the testing part. The thing is that not everything looking good on a digital screen will be the same in a different environment or variety of surfaces. That's why it's vital to test the logo in all possible situations and placements to make sure there won't be an unpleasant surprise

5.2.4. Visual Elements of Brand

5.2.4.1. Name

We agreed on the application name to be **Tech Explorer** due to the fact that standing from our objectives, which aims to centralize information about Tech-driven activities, Start-ups, and service offered to a wide number of target audience (**Tech**-Enthusiasts) in the locality of Buea. Helping them in their digital journey motivated by a driven passion for tech, to **explore** and being exposed to new experiences

5.2.4.2. Tagline

"Discover. Connect. Innovate."

This tagline captures the essence of Tech Explorer by highlighting the discovery of tech events, startups, and student clubs, fostering connections within the tech ecosystem, and promoting innovation in the tech community of Buea.

Figure 58: Splash screens with logo and tagline

5.2.5. Tool used for Design Branding

Canva

Figure 59:canva

Canva is a graphic design platform that provides tools for creating social media graphics, presentations, promotional merchandise and websites. Launched in Australia in 2013, the service offers design tools for individuals and companies.

5.3. DEVELOPER CONSIDERATIONS

Frontend Implementation

Technology Choice

React Native

Figure 60: reactNative

React Native is an open-source UI software framework created by Meta Platforms, Inc. It is used to develop applications for Android, Android TV, iOS, macOS, tvOS, Web, Windows and UWP by enabling developers to use the React framework along with native platform capabilities.

Why React Native?

Cross-Platform Compatibility: React Native allows for developing a single codebase that works on both iOS and Android, reducing development time and effort.

Performance: React Native provides near-native performance by utilizing native components and optimizes rendering.

Large Community and Ecosystem: With a vast community and a rich ecosystem of plugins and libraries, React Native simplifies common tasks and accelerates development.

Reusability: Components can be reused across the application, ensuring a consistent UI and reducing development effort.

Key Considerations for Frontend UI/UX Design

Responsiveness: Ensure the design adapts seamlessly to various screen sizes and devices, providing a smooth user experience on both smartphones and tablets.

Accessibility: Implement accessibility best practices to make the app usable by individuals with disabilities, including support for screen readers and customizable text sizes.

User-Centered Design: Conduct thorough user research and usability testing to understand user needs and preferences, iterating on designs based on feedback.

Performance: Optimize assets such as images, scripts, and styles to ensure fast load times and a fluid user experience.

Dark Mode: Provide an optional dark mode to enhance accessibility and reduce eye strain in low-light environments.

Backend Implementation

Technology Choice: Node.js with Express.js

Figure 61:nodeJs and Express

Node.js is a cross-platform, open-source JavaScript runtime environment that can run on Windows, Linux, Unix, macOS, and more. Node.js runs on the V8 JavaScript engine, and executes JavaScript code outside a web browser. Node.js lets developers use JavaScript to write command line tools and for server-side scripting

Why Node.js with Express.js?

Scalability: Node.js is designed to handle a large number of simultaneous connections efficiently, making it suitable for high-traffic applications.

Performance: Node.js's non-blocking, event-driven architecture ensures high performance and responsiveness.

Large Ecosystem: A rich ecosystem of libraries and modules available via npm (Node Package Manager) speeds up development.

JavaScript Stack: Using JavaScript for both frontend and backend simplifies development, allowing for shared code and knowledge between teams.

Database Choice: MongoDB

Why MongoDB?

Figure 62: MongoDB

Scalability: MongoDB's ability to handle large volumes of data and high-velocity operations makes it ideal for growing applications.

Flexibility: Its schema-less nature allows for easy modifications as requirements evolve, accommodating the dynamic nature of tech event and startup information.

Performance: Optimized for read and write performance, making it suitable for real-time data retrieval and updates.

DevOps and Version Control

Docker

Figure 63:Docker

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Docker is a set of platforms as a service product that use OS-level virtualization to deliver software in packages called containers. The service has both free and premium tiers. The software that hosts the containers is called Docker Engine. It was first released in 2013 and is developed by Docker, Inc.

Kubernetes

Figure 64:kubernetes

Kubernetes is an open-source container orchestration system for automating software deployment, scaling, and management. Originally designed by Google, the project is now maintained by a worldwide community of contributors, and the trademark is held by the Cloud Native Computing Foundation

Git and GitHub

Figure 65:git and github

GitHub is a developer platform that allows developers to create, store, manage and share their code. It uses Git software, providing the distributed version control of Git plus access control, bug tracking, software feature requests, task management, continuous integration, and wikis for every project

Testing and Evaluation

Jest and Super test

Figure 66:Jest

For unit and integration testing to make sure all components and functionalities implemented work properly

Tools

IDE: Visual Studio Code editor

Figure 67:VS code

for coding, debugging, testing, deployment and version control throughout the SDLC.

OWAPS ZAP and an IDS Snort for monitoring traffic and finding vulnerabilities

Key Considerations for Backend Implementation:

Data Integrity and Consistency: Ensure robust data validation and error handling to maintain data integrity and consistency.

Security: Implement strong authentication and authorization mechanisms, encrypt sensitive data, and regularly update dependencies to mitigate security vulnerabilities.

API Design: Design RESTful APIs that are easy to use and maintain, providing clear and consistent endpoints for frontend communication.

Scalability: Architect the backend to handle increasing loads by implementing horizontal scaling, caching strategies, and load balancing.

Monitoring and Logging: Integrate monitoring and logging tools to track performance, detect issues, and facilitate debugging and maintenance.

5.4. DESIGN SECURITY

5.4.1. Authentication and Authorization

Strong Authentication

Implement multi-factor authentication (MFA) to enhance security of user accounts ensuring strong and unique password policies.

Role-Based Access Control (RBAC):

Defined user roles (startup, tech enthusiast, club, admin) with specific permissions to limit access to protected data and actions based on user roles.

5.4.2. Input Validation and Sanitization

Input Validation

Validate all user inputs to prevent SQL injection, cross-site scripting (XSS), and other injection attacks.

Sanitization: Sanitize inputs to remove any potentially harmful data before processing.

5.4.3. Secure Data Storage

Data Minimization

Only necessary data is demanded to minimize storage and ease data management, limit risk of data exposure and ensure trust.

5.4.4. Privacy Controls

User Consent

Obtain explicit consent from users before collecting personal data for instance the legal documents. Provide users with options to control their data for instance the startup must not necessarily report all products they have built.

Privacy Policy

Clearly outlined how user data will be collected, used, and protected for instance their legal documents will be visible only to the admins and nowhere else in the application.

6. CONCLUSION AND RECOMMENDATIONS

6.1. OBSTACLE FACED AND PROPOSED SOLUTIONS

- Network issues

  Poor network connectivity. To remedy to this challenge, we kept on switching on the network providers from MTN to Orange
- Unavailability of stakeholders to interview.

  To remedy to this challenge, we persisted and did our best to get on touch with them on-site in order to get remarks and feedbacks
- Electricity Shutdown

  Instable electric conditions in town especially at some specific sites. To remedy to this, we moved from one-site to another for the sake of the task completion
- Difficulties in finding the relevant documentations for peer reviewing of existing projects. Hopefully, the provided resources from the instructor were of great help.

6.2. FUTURE UPDATES

- Incorporate event registration
- Showcase Start-up Job and internship opportunities
- Designing a Web-based application for the system
- Diversify our target audience
- Web administration Pannel for an efficient integration viewing and management

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8. APPENDIX

8.1. QUESTIONNAIRES

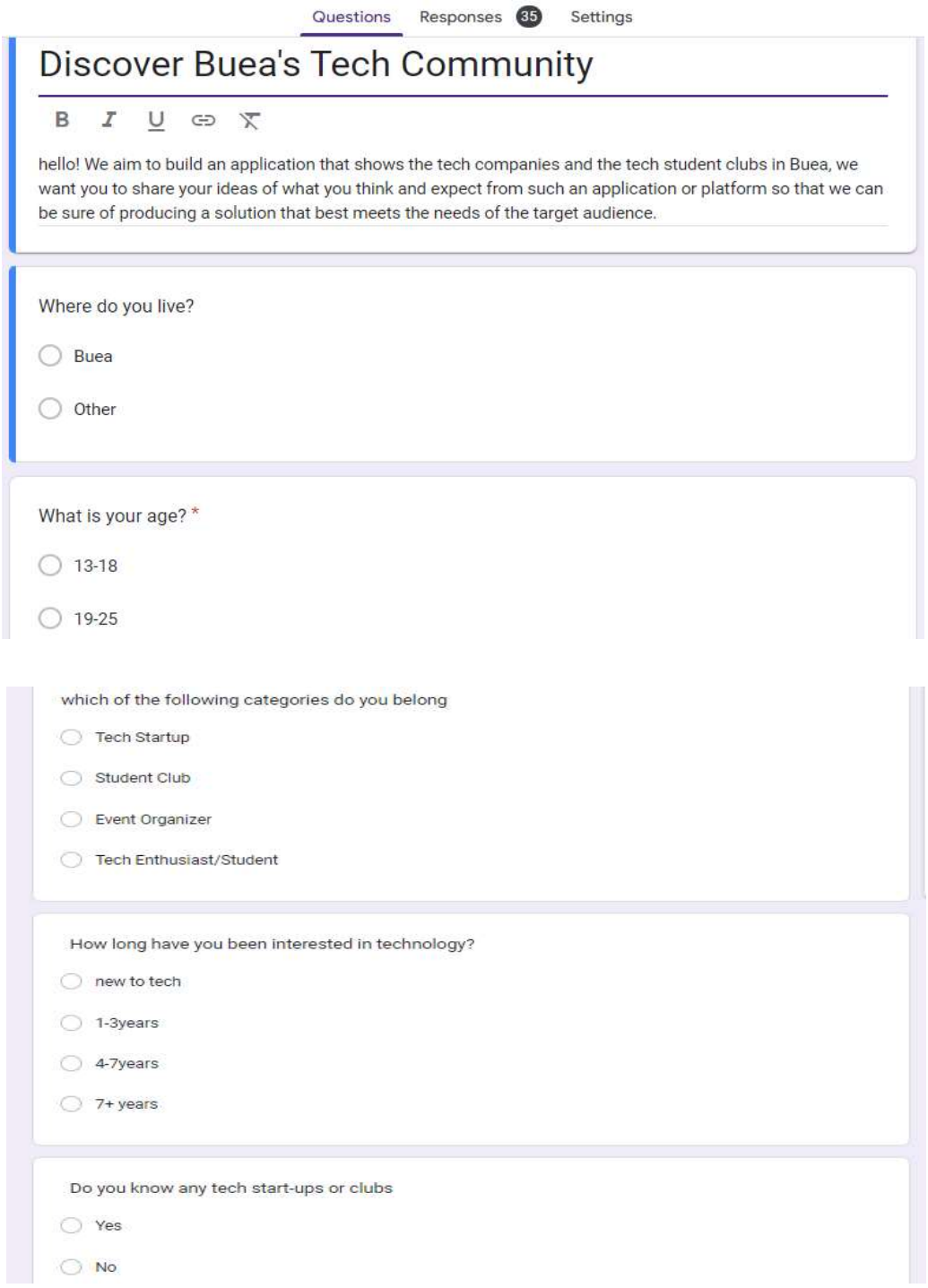

Figure 68:Questionnaire 1

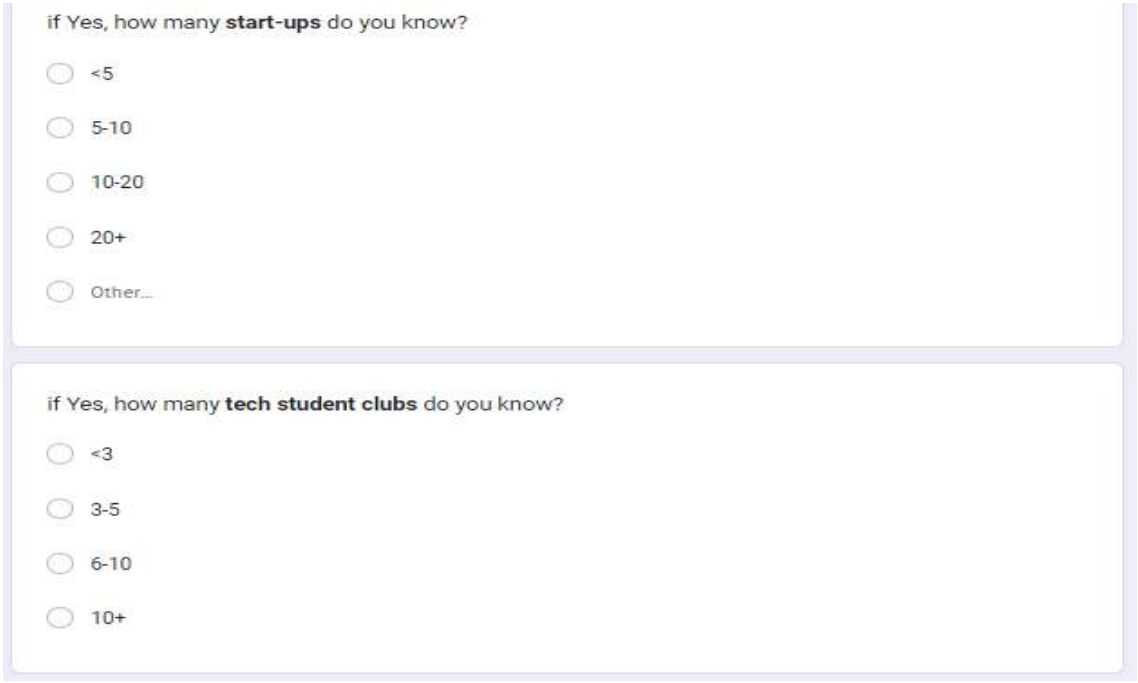

Figure 69:Questionnaire 2

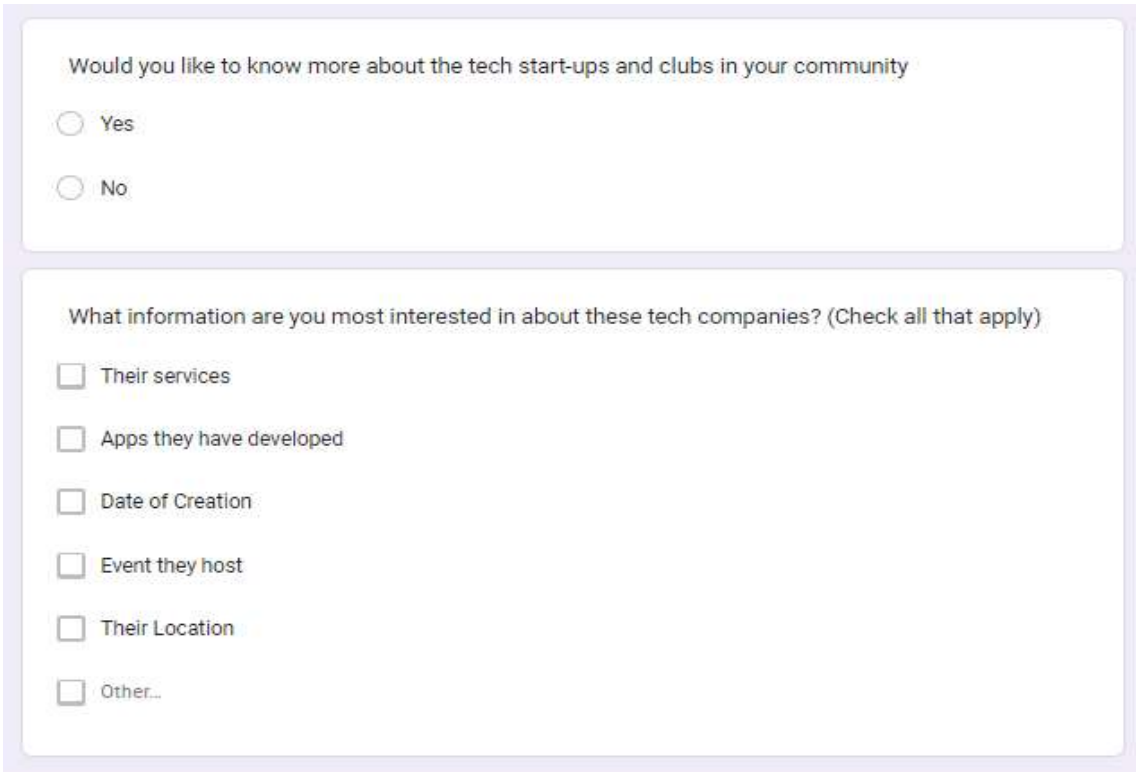

Figure 70:Questionnaire 3

What information are you most interested in about these **tech student clubs**? (Check all that apply)

- [ ] Their aim and objectives
- [ ] Their activities and projects
- [ ] Events they organize
- [ ] Membership details
- [ ] Other...

Are there any challenges you face when trying to find the above information about these local tech start-ups or clubs?

Long answer text

Do you think creating a mobile app to help discover start-ups, clubs and events, will help streamline the process and better the experience of discovering these start-ups, clubs and tech events?

- ○ Yes
- ○ No

Figure 71:Questionnaire 4

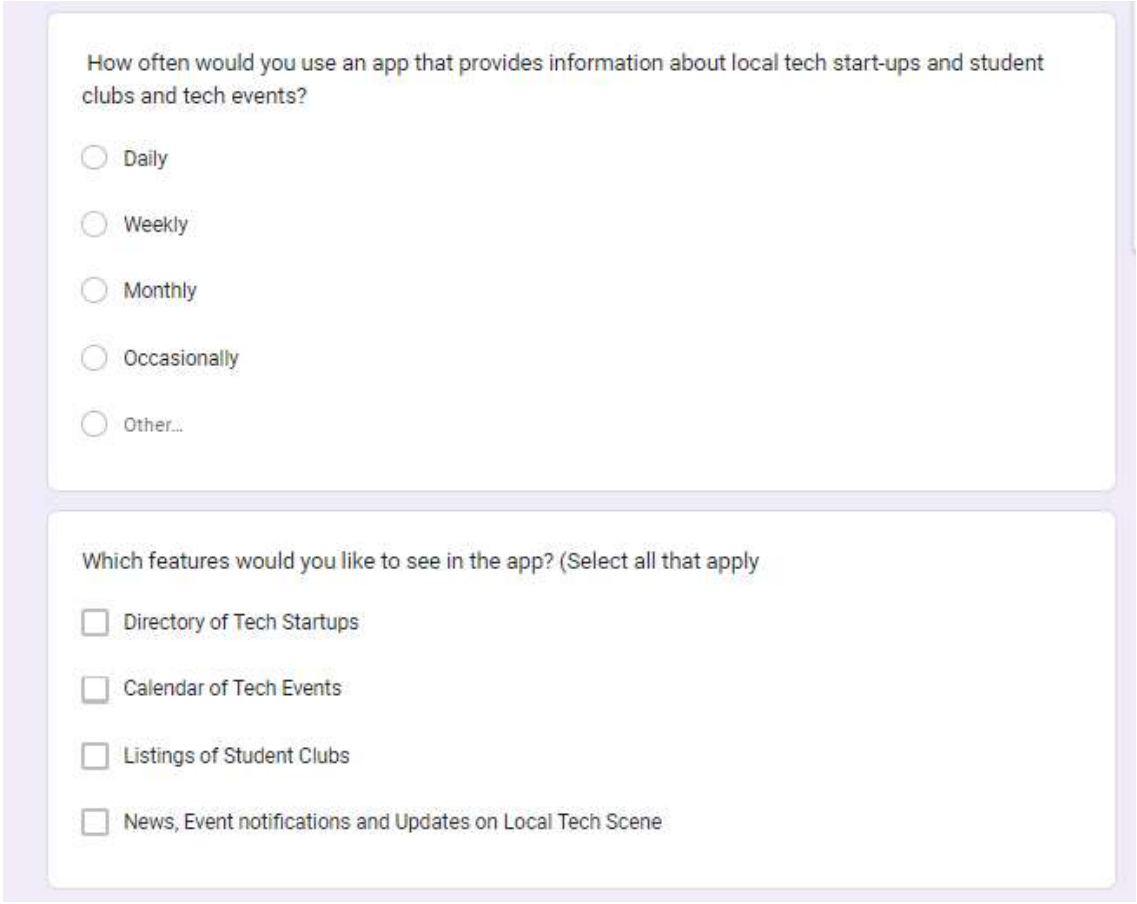

Figure 72:Questionnaire 5

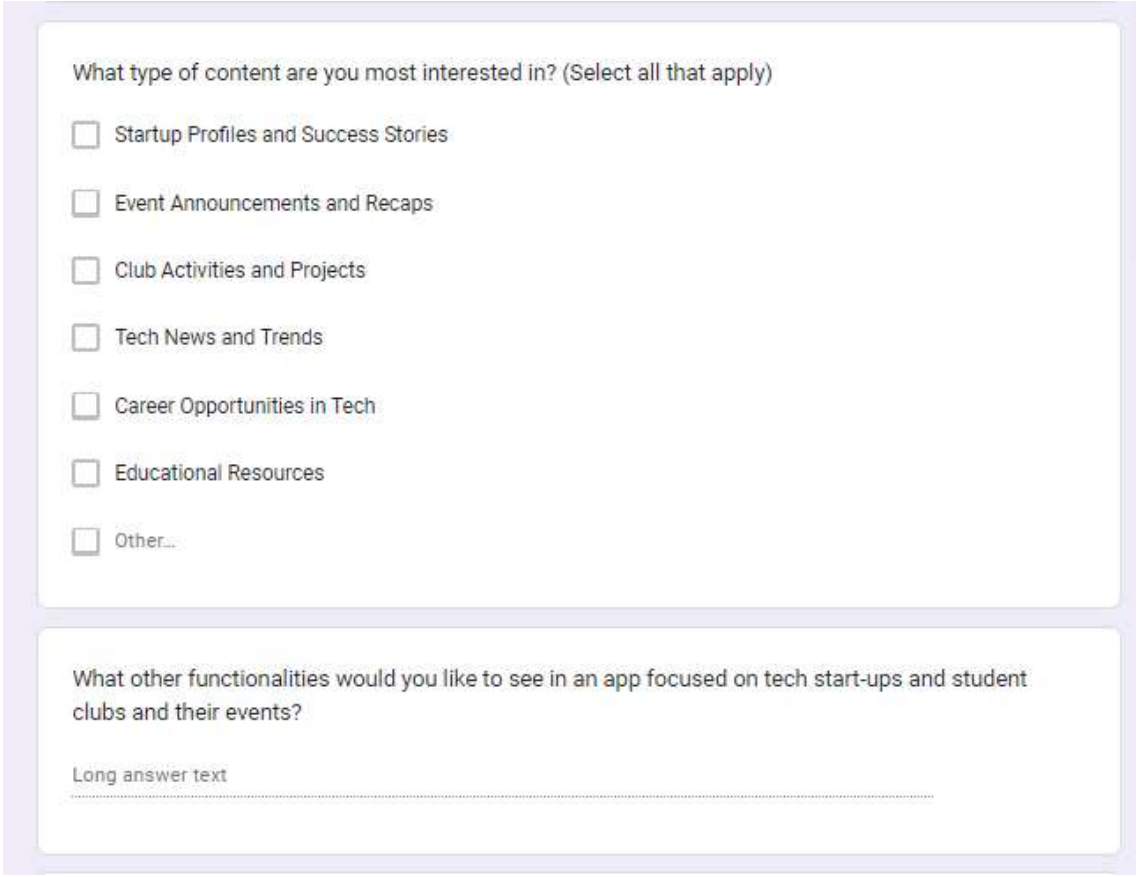

Figure 73:Questionnaire 6

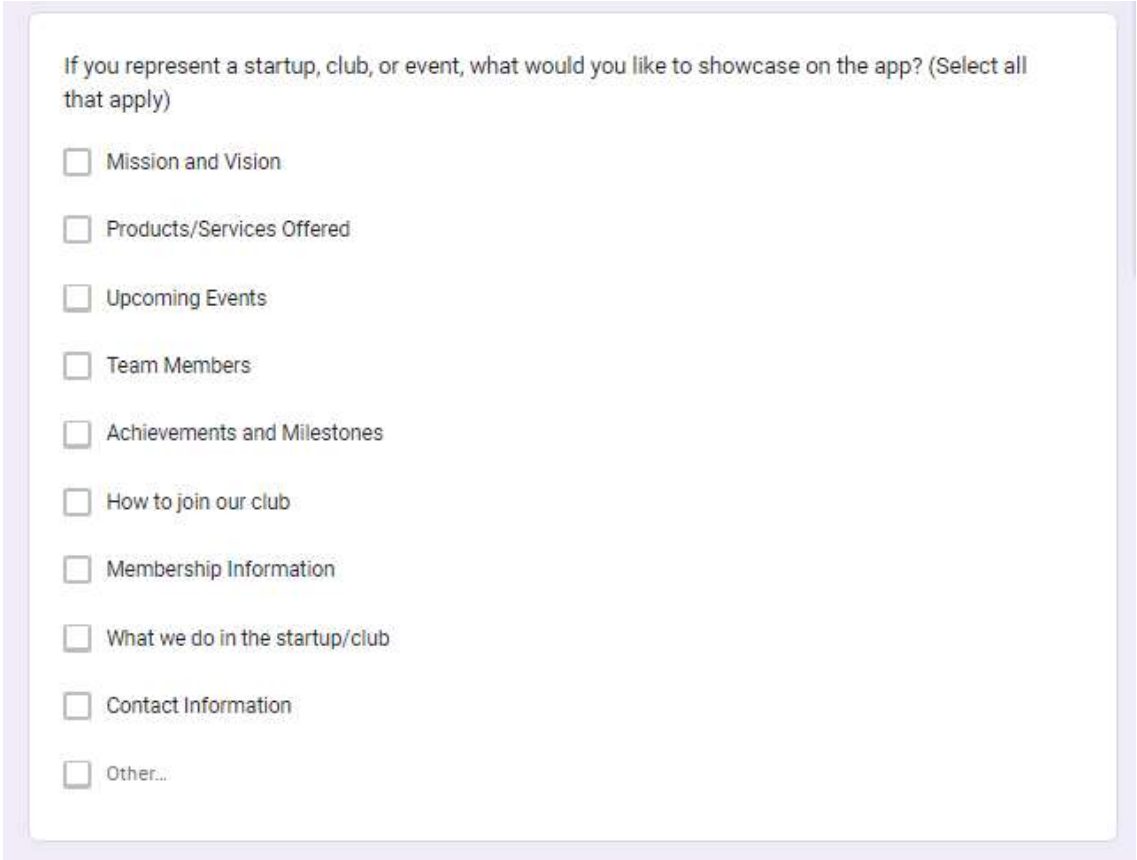

Figure 74:Questionnaire 7

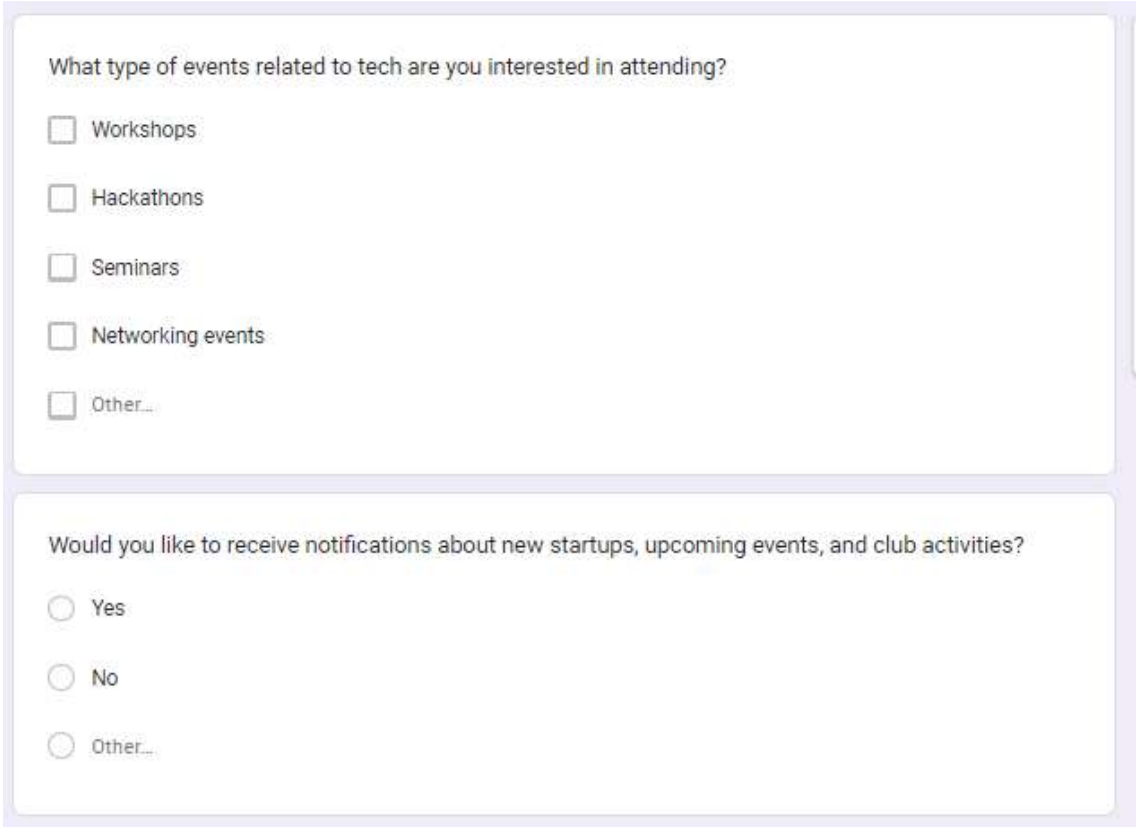

Figure 75:Questionnaire 8

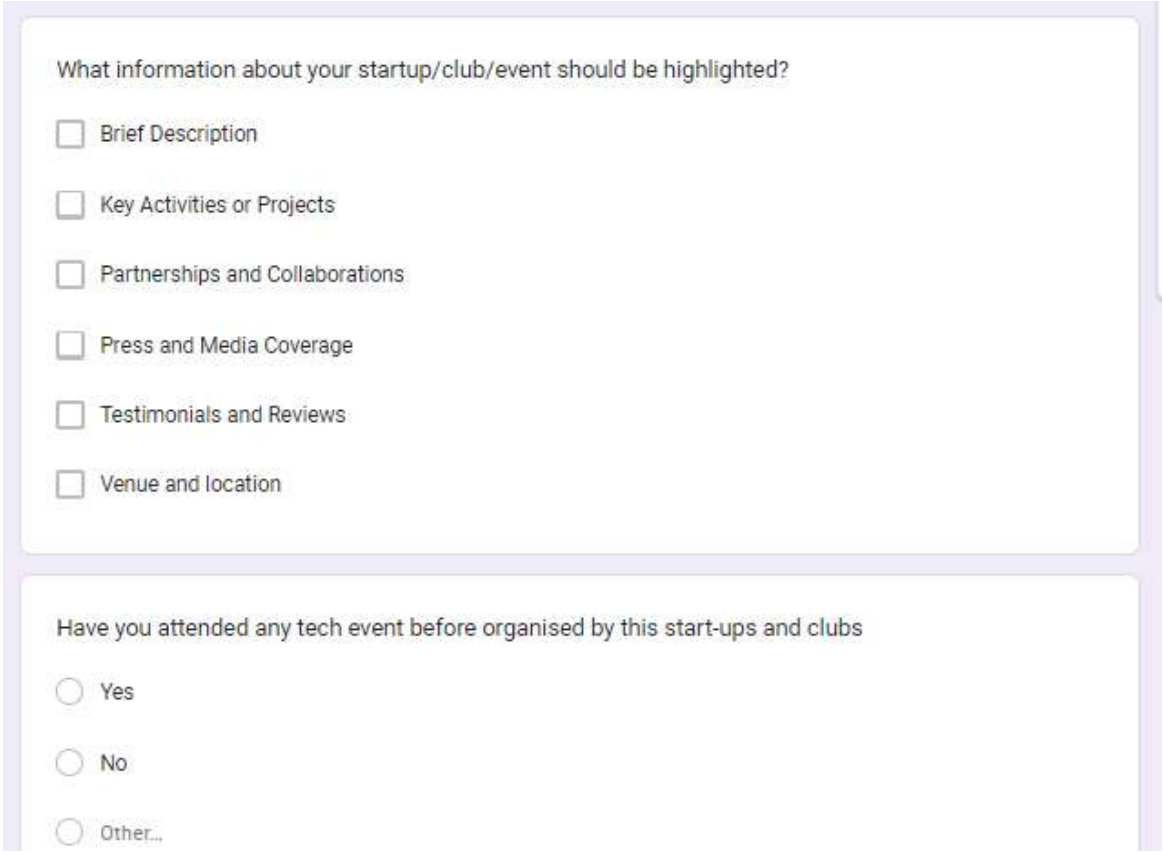

Figure 76:Questionnaire 9

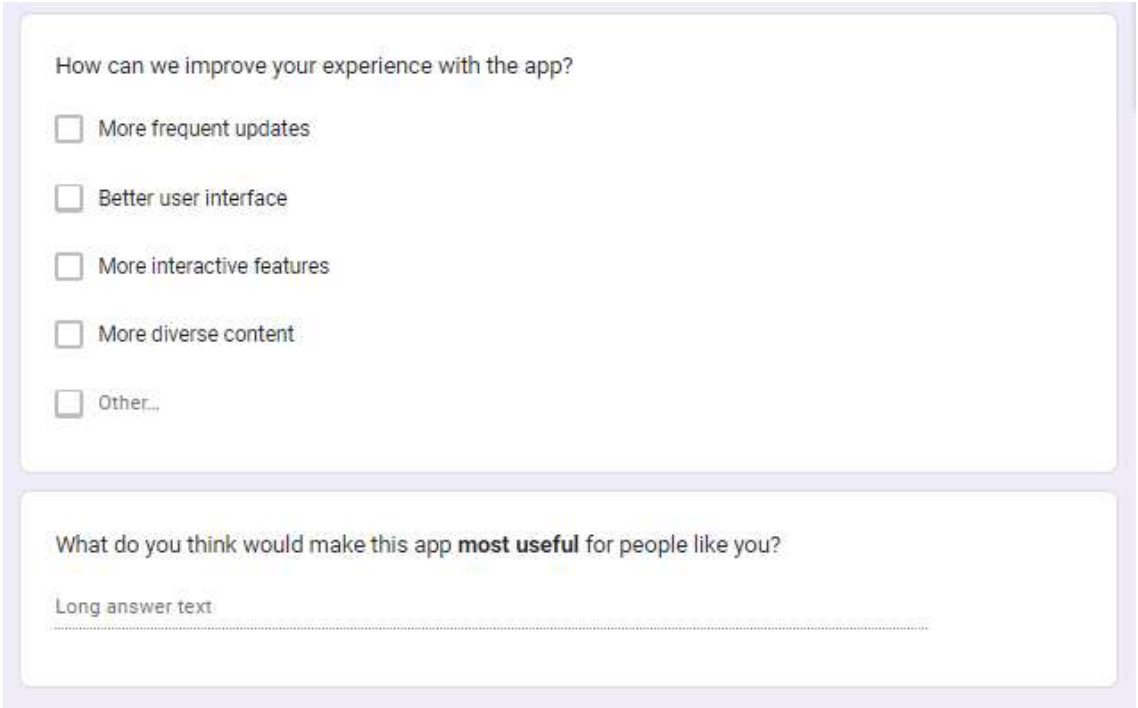

Figure 77:Questionnaire 10

8.2. URL TO QUESTIONNAIRES

https://docs.google.com/forms/d/e/1FAIpQLSeXAAJq0vksDes5CeUzR1yv7a8CeEZ5FwwYG_ceynqXItMHpg/viewform?usp=send_form&usp=embed_facebook

8.3. GROUP PICTURE

Figure 78: group picture 1

Figure 79: group picture 2