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Empowering Student Housing Searches in Cork, Ireland: How Can the Development of a Comprehensive Accommodation App Improve Access, Authenticity, and Affordability for University Students?

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1. INTRODUCTION

With increasing concerns regarding student housing in Cork, Ireland. It has become a topic of debate in recent years for students searching for a place to stay. The issue, however, proves challenging because more students may be looking for more housing options to stay in for the duration of their studies, but the restricted supply and rising rents provide a barrier. These continual struggles have necessitated the establishment of innovative efforts to assist students in finding safe and cheap locations to stay.

Students are facing challenges finding a suitable accommodation in Cork for the duration of their studies. The lack of houses and the increasing demand is driving the prices to increase making it even harder for students to afford the place. The increase of prices have had a negative impact on the students' academic journey.

With implications like this, exploring the option of applying technology to the sector of student accommodation is one way to solve this issue of finding a suitable student housing. This report reveals the details of the performing process of a full digital app design which intends to deliver a comprehensive accommodation service for students. This app attempts to improve three critical areas for university students in Cork: the access to housing information, an examination of the accommodation legitimacy, and the options for desirable housing at an affordable price. With such a solution in place, it would help students with the current challenges being faced with house haunting.

BACKGROUND

Cork, the second biggest city in Ireland, located on the south coast of the country, pushing its population to 210,000, is considered to be the home of more than a hundred multinational corporations across different sectors including but not limited to pharmaceuticals, technology, financial services, attracting many students to the city in efforts to secure a place working in one of the companies.¹

¹ "Economic Facts and Figures," Cork City Council, accessed April 25, 2024, <https://www.corkcity.ie/en/doing-business-in-cork/economic-profile/economic-facts-and-figures/>.

Its unique feeling of urbanity and nature as well as historical reputation and cultural vibrance are what makes the city a promising place of studies for any student.

At the same time Cork has a rich educational landscape with two of Ireland's major institutions:

- Placed in the southeastern city of Cork since its creation over a century and a half ago is University College Cork (UCC). UCC was established in 1849 as an esteemed place of higher education among Ireland's oldest universities.² Welcoming today more than 24,000 students coming from over a hundred nationalities from all over the world; were international enrollment comprises around more than 5%.³ UCC is renowned as the intellectual home that nourished George Boole, the founder of Boolean logic, which underpins digital technology. It has developed on the pioneering foundations created by visionaries like Boole to emerge as a global leader pushing technical growth and innovation.⁴
- Similarly, Munster Technological University (MTU) has gradually expanded since its roots took place in the technical colleges of Cork during the 1970s.⁵ Then, known as Cork Institute of Technology (CIT), it was officially redesignated as Munster Technological University (MTU) in 2021 with its student population approaching 17,000, positioning it as one of Ireland's most expansive multi-campus technological universities. MTU draws students from diverse backgrounds through its reputation for applied research and collaboration with industry.⁶

RESEARCH PROBLEM

The main issues in this report fall into the category of problems concerning inefficiencies and inadequacies inherited in the current situation of student housing in Cork. Despite the production of digital platforms to facilitate accommodation searches, students continue struggling with

² "History," University College Cork, accessed April 25, 2024, <https://www.ucc.ie/en/discover/history/>.

³ "Fact Book," University College Cork, accessed April 25, 2024, <https://www.ucc.ie/en/regsa/factbook/>.

⁴ "George Boole 200," George Boole 200 | George Boole Bicentenary Celebrations, accessed April 25, 2024, <https://georgeboole200.ucc.ie/>.

⁵ Cit, "Mtu Cork Campus," Cork Institute of Technology, accessed April 25, 2024, https://www.cit.ie/freedomofinformation.model-publication-scheme.a_-information-about-the-institute.

⁶ "Munster Technological University (MTU)," MTU for international students, accessed April 25, 2024, <https://www.educationinireland.com/en/where-can-i-study-/view-all-universities-colleges/munster-technological-university-introduction.html>.

fragmented information, and lack of transparency. The research focus is on the creation of a complete accommodation app that eases the housing problem in Cork while helping students in searching for lodging for the period of their studies.

Given Cork's student housing and its limited housing options, the monthly rent for a student, ranges from €400 to €1000 per month.⁷ As a result, an accommodation app that can help solve the housing crisis in Cork allowing students to filter and customize their searches for a more favorable results that would suite their criteria would be a favorable solution to this issue.

One of the major concerns that arise from a growing imbalance between supply and demand, increased costs of rental rates, and vulnerability to cheating and scams is that the process of house searches can be made more transparent and secure. The accommodation app can be built in a way that will highlight the authenticity of the listings, also provide a secure communication channel with property managers or landowners and give the student the ability to view rental prices of the accommodation listed, thus safeguarding the student and decreasing the risk of scams.

OBJECTIVES

The objective of this report is to assess the following for a specifically Cork student-dedicated accommodation app:

1. Pinpoint the prime issues and obstacles which students face when they search for a place to live in Cork,
2. Consider the challenges and limitations faced by students in efforts of finding a suitable place to stay in.
3. To look at what students want in an accommodation app, in terms of functionalities and features that would help them in their search.
4. Evaluate and explore the technologies that could be used in developing such a solution.
5. The impact of housing on students' capacity to excel in their studies.

⁷ Costs of going to college, accessed April 25, 2024, <https://www.ucc.ie/en/sfsa/budgeting/costs/>.

SCOPE AND LIMITATIONS

It is important to consider the limitations for developing such a project, and set expectations, exploring what improvements could be done in the future.

Certainly, setting up a suitable testing and debugging environment would be considered as a limitation for this project. This is due to the lack of test devices and environments to thoroughly test the application. Consequently, resulting in an inadequate testing and debugging processes.

At the end of the day, the entire project's success also depends on adoption by the intended users, students, and proprietors alike. Factors like user interface, functionality, and overall value of this experience will highly influence the level of participation. However, overcoming initial resistance to innovative technologies and ensuring widespread use among a diverse student population and proprietors, remains a great challenge.

Another key element that is still to be addressed is the legal and regulatory issue. Compliance with data protection and privacy laws and in particular, private information handling as well as Irish housing laws should be the first concern in the process of business development.

2. PROJECT OVERVIEW

This project titled "Empowering Student Housing Searches in Cork, Ireland: How Can the Development of a Comprehensive Accommodation App Improve Access, Authenticity, and Affordability for University Students?" aims to place solution for the current housing crisis involving college students in Cork. Given the growing number of students looking for accommodation and the limited availability of relatively inexpensive options, there is an absolute necessity for the development of an innovative solution for the purpose of helping students to find good housing during their study courses which, in turn, will have a positive effect on the quality of their educational experience.

Initially, the platform that will be built will depend on the mobile devices presented in the market. Since the app is aimed to be distributed directly to students holding either iOS or Android, it is essential that we understand the markets as each of them is characterized by unique technologies and development methods. This step will also help us focus on wide user audience and generate a good user experience. In view of this, thorough market research to find out the ratio of iOS and Android devices among students is important since it will be the factor which determines the framework for development and eventually contribute to the app's success.

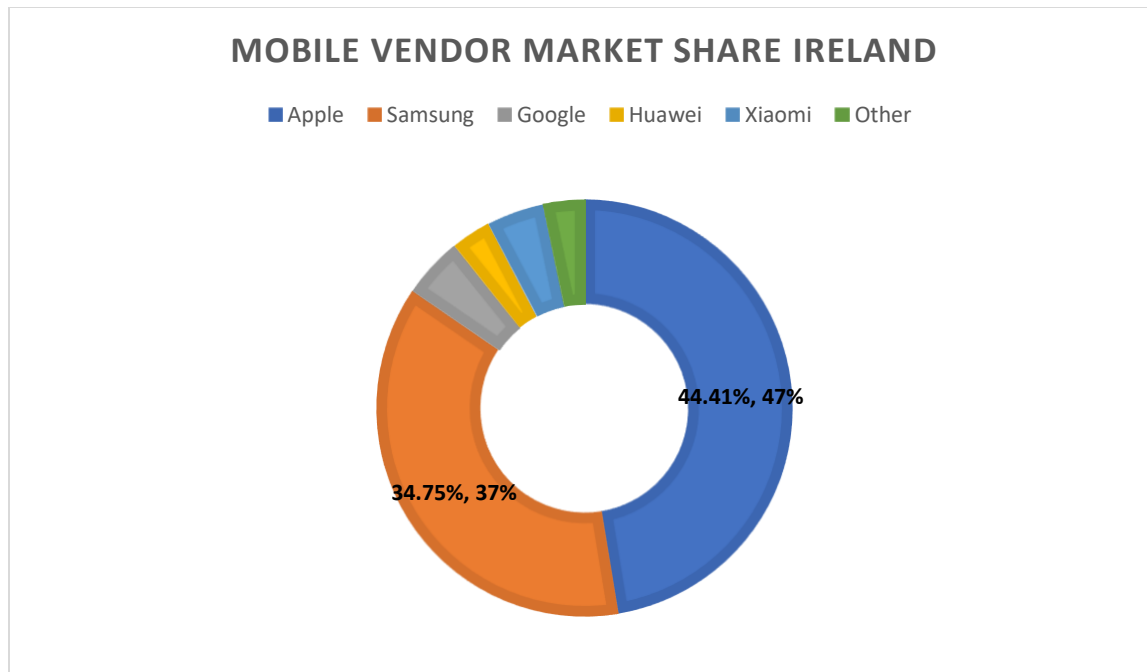


Figure 1: Mobile Vendor Market Share in Ireland⁸

Due to the fact that mobile operating system market share in Ireland is split between iOS and Android OS, and because these platforms utilize different technologies and frameworks, it is essential to familiarize ourselves with the market and its trends allowing us to make an informed decision on which technology to support. According to the statistics demonstrated in figure 1, the market is evenly distributed between Apple and Android operating systems (OS), with Apple containing a 44.4% market share, indicating that developing an app that targets iOS alone will miss the other half of Android users leading to the loss of a considerable amount of students.

At the same time, Android is also widespread, high in share worldwide where Samsung alone has a 34% of market share. As a result, the Android market makes a huge portion of the Irish market with an approximate 46% of market share.

As a result, we decided to build a mobile application that supports both iOS and Android users. This way, the app would cover a larger range of audience helping students find a suitable housing at an affordable price when wanting to study in Cork.

⁸ Mobile vendor market share ireland, accessed April 25, 2024, <https://gs.statcounter.com/vendor-market-share/mobile/ireland>.

DEVELOPMENT METHODOLOGY

Now when it comes to software development, and how I will be building the app, there are a handful of methodologies to plan and realize the development of an app, with Agile and Waterfall being two of the most famous methods.⁹ The Agile methodology approach is defined by continuous iterations and flexibility of teams constructively working together in all phases of development that are adjusted to changing requirements and situation through different iterations.¹⁰ On the contrary, the Waterfall methodology is more of impulse, a sequence of stages having no overlapping which starts from requirements, design, development, testing and deployment.¹¹

However, developing the accommodation app, I adopted the waterfall model which deploys these features in a structured and planned development process with every stage having a defined milestone and output.

Following the Waterfall methodology, I can be sure that the development process goes in a linear way and each phase is completed before moving to the next one. This method allows for the development within the constraints of resources with a structured and managed approach, thus granting clear control of over the project timeline.

⁹ Avantika Shergil, Top app development methodologies to choose in 2024, January 11, 2024, <https://www.topdevelopers.co/blog/app-development-methodologies/#waterfall-methodology-for-app-development>.

¹⁰ Avantika Shergil, Top app development methodologies to choose in 2024, January 11, 2024, <https://www.topdevelopers.co/blog/app-development-methodologies/#waterfall-methodology-for-app-development>.

¹¹ Avantika Shergil, Top app development methodologies to choose in 2024, January 11, 2024, <https://www.topdevelopers.co/blog/app-development-methodologies/#waterfall-methodology-for-app-development>.



Figure 2: Waterfall Methodology¹²

TECHNOLOGY

There are two primary approaches to choose while developing the app. The first approach is a cross-platform language that makes use of the language or framework that can be written once and be deployed on both iOS and Android environments with a single source base. Here lies the power of cross-platform approach, as it gives efficiency benefits to writing code just once and maintaining it in a common code base regardless of the target platform. In framing processes such like Flutter and React Native are popular choices in cross-platform development with a great diversity of features and tools accessible to shorten the development process.

Alternatively, another way to develop both applications, student and admin, is by building the iOS and Android versions of the applications independently. In this method, it will require us to write code using languages and frameworks natively for each operating system. The language used for developing iOS will be Swift and Objective-C models.¹³ While the languages used to develop Android operating systems would be Kotlin or Java or any other similar frameworks.¹⁴ This approach may often take more time and resources than is required in developing a cross-platform

¹² “What Is the Waterfall Software Model? Development Sequence?,” Software development - offshore service, accessed April 25, 2024, <https://bap-software.net/en/knowledge/what-is-the-waterfall-software-models/>.

¹³ Apple Inc., “Swift,” Apple Developer, accessed April 25, 2024, <https://developer.apple.com/swift/>.

¹⁴ “Application Fundamentals : Android Developers,” Android Developers, accessed April 25, 2024, <https://developer.android.com/guide/components/fundamentals>.

approach, but you get more control over the specific features of the platform and the best possible performance.

Apps built with Flutter vs React Native

Table 1: Flutter vs React Native

Flutter ¹⁵	React Native
<ul style="list-style-type: none">• Google Classroom• ByteDance• Google Wallet• NuBank• eBay• eCampus	<ul style="list-style-type: none">• Instagram• Facebook• Discord• Airbnb• Tesla

In the context of our project, it is fundamentally important to get why I have settled on going for the Flutter technology for the student accommodation application, although there are some well-known apps developed in React Native. Firstly, the accommodation app was thought of to be incorporated in the eCampus app, developed by DigiRoad, an application which has the goal of digitizing student ID cards, going from physical to virtual form of identification that features NFC technology.¹⁶ This vision of the accommodation feature was to execute a seamless, comprehensive app to students searching for, booking, and payment once they get accepted into their university.

Since eCampus had been developed using Flutter already, it only makes sense to work with that framework to develop the student and admin app. This way the integration of all items is reached and all of them are designed in a way that they work together properly and do not bring further unnecessary complications when integrating both technologies. Through Flutter I can simplify the development, minimize possible compatibility problems and also make it easy to do future updates and upgrades.

¹⁵ Showcase - flutter apps in production, accessed April 25, 2024, <https://flutter.dev/showcase>.

¹⁶ eCampus, accessed April 25, 2024, <https://digiroad.co/eCampus>.

Besides that, the fact that I would be building both the apps using Flutter means that there are many benefits that come with this such as improved efficiency in development, and support for multiple platforms. Fast feedback and hot reload feature in Flutter allows for super-fast iteration and testing, and the tool's expressive and natural UI kit ensures that well designed and fluid interfaces could be created for both platforms: iOS and Android are among the most popular operating systems of these devices. On top of that, Flutter single codebase approach helps minimize efforts on maintenance because the code changes made in the codes influencing both mobile platforms without the need to make any alterations on those respectively.

APP REQUIREMENTS & ANALYSIS

The first step to building an app is identifying the requirements in which the app got to have. As a result, I will be discovering the different features and services that the app will be offering to students helping them in finding a suitable lodging.

- Search and discovery: The application needs to have an easy-to-use search feature for students to explore accommodation options for the duration of their studies. The listings would need to be descriptive, giving the student a full insight of what the room offers and its different amenities that the place offers as well.
 - Type of room
 - Type of Booking
 - Amenities being offered
 - Location
 - Price
 - Deposit
 - Description
 - Other related rooms
- Listing Filtration: The filtration process is an important factor of the app, allowing students to filter their lodging choices to suite their own budget and requirements. As a result, it is necessary to have the following filters:
 - Price
 - Min

- Max
- Type of Property
 - Private Student Accommodation
 - Public Student Accommodation
 - House
 - Room
- Booking Options
 - Instant Booking
 - Self-Check In
- Check In-type
 - Digital
 - Manual
 - Any
- Amenities required
 - Bedroom and Laundry
 - Private bathroom
 - Washer
 - Bed linens
 - Iron
 - Entertainment
 - TV
 - Heating and Cooling
 - Air conditioning
 - Heating
 - Internet and Office
 - Wifi
 - Kitchen and dining
 - Kitchen
 - Dishwasher

- Bookings and reservations: This feature allows students to easily book or reserve their rooms depending on the listing. After students have found their choice of room, they would be able to book the room or reserve it directly from the app for convenience.
- Payment integration: The app should also facilitate in-app payments for booking and securing a room, allowing students to pay their deposit and rents. This way I can make sure that both students and homeowners are at ease ensuring a secure and hassle-free transaction. Also, supporting in-app payments allows us to intervene in case of any issues.
- Mobile Credentials: A unique selling point which will increase the value of the app is its digital access card, where students would be able to use their phones to enter their rooms, of course if the property offers it. However, it is great to be fully invested in the student's journey from booking their place to getting into their rooms.

Furthermore, I will need to develop an Admin Portal app, designed specifically for accommodation owners and administrators to manage their listings and transactions.

The features that the admin portal app will include are the following:

- Account verification: One of the advantages of our app is its rigorous verification process ensuring the homeowner are who they say they are and not scammers targeting student's deposits. This way, students would feel safe on booking their lodging without hesitations through the app directly.
- Listing Management: Accommodation owners can add, update, and remove listings from the app, including details such as rooms availability, pricing, deposit and amenities if need be.
- Rent and deposit collection: The app will ensure to collect the payments made by students and are paid to the rightful owner.
- Student admission: Homeowners need to have the option to accept or decline students based on fit. This would give the homeowner the complete control on who occupies the rooms being offered.

As a result, the aim of our application is to combine all steps of the accommodation process into one seamless experience for students, starting with the initial search for their ideal room and ending with providing them with secure access to their rented room. With the clear layout and the capability to customize the search based on their needs, our app will offer the students to browse the available listings really quickly and to easily find the apartment that suits them most based on the location, amenities, price, etc. After they have come across a desirable place, our platform plays a bridging role in the smooth transition by providing secure online booking and payment options. Other than the booking process our app provides students with needed information about their rented accommodation including a list of the details, pictures, and reviews about this facility from previous tenants. On the last, making check-in hassle-free, by pressing the check in button which allowing the student to check in directly from the app and depending on the type of check in that the property offers, students would be able to obtain a digital version of the keys or by collecting it from reception. Thus, ensuring a stress-free process from a start to finish.

SYSTEM DESIGN

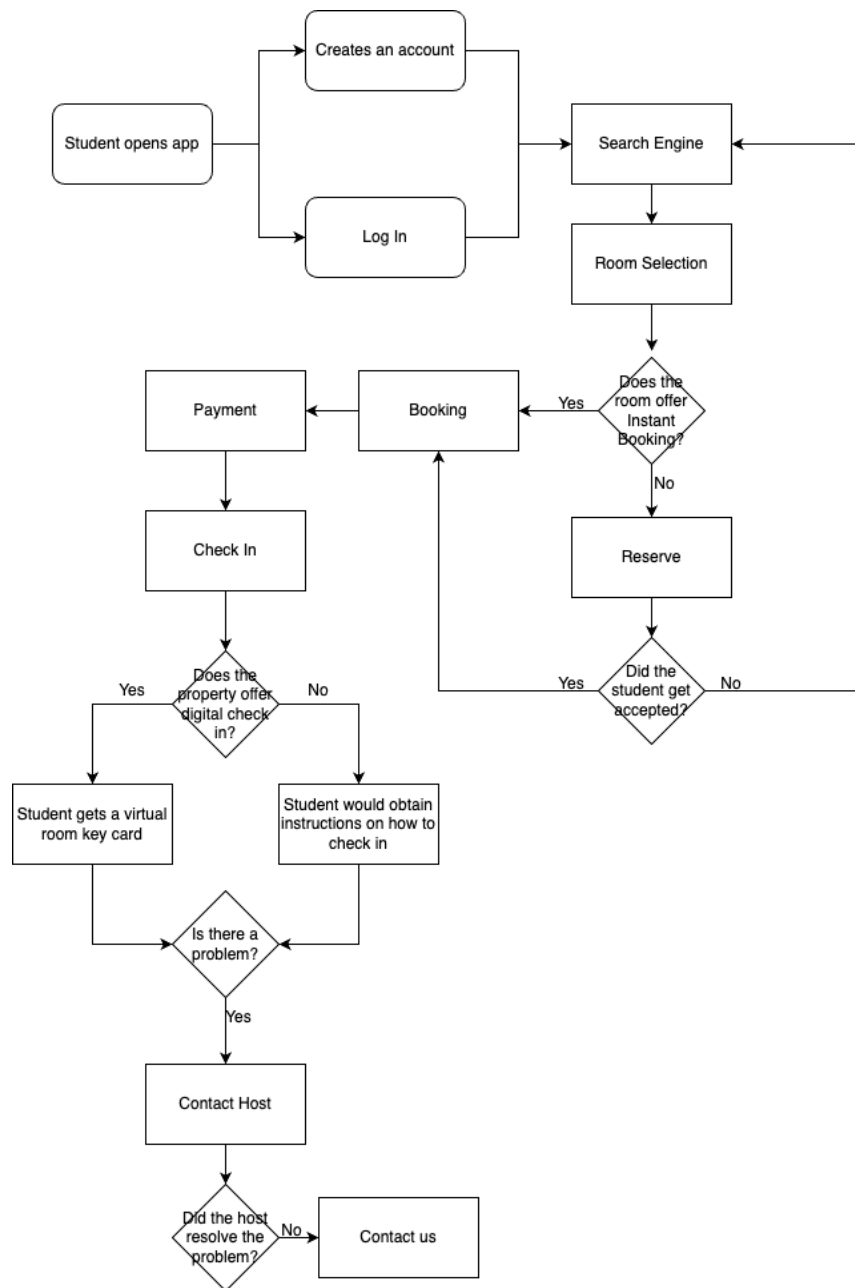


Chart 1: Student App Flowchart

The student app flow diagram shows that the application has all the necessary information on the listing page for the student to make an informed decision on booking or reserving the room, as well as the reservation and access to the accommodations after a successful booking. The flowchart

of easy-to-use interface is going to be started when they first open the app, allowing the student to familiarize themselves with the various stages such as creating an account, searching for accommodation as per their preference, checking out the details of the listings along with their photos and reviews, and then making the bookings. Furthermore, via the flowchart, one can see which functionality is the core of the app, a fact that stresses the user-oriented design of the app, which is characterized by the simplicity and the efficiency with which the whole accommodation procedure for students is handled.

APP INFRASTRUCTURE

Researching and developing student accommodation application requires a very comprehensive study with different infrastructures to be considered. Among the popular options that have been chosen by most developers are Google Cloud Platform (GCP), Amazon Web Services (AWS), Microsoft Azure, and Firebase among others. Within this space all the platforms present their own various web of instruments and services to build, deploy and manage mobile applications.¹⁷ Nevertheless, Firebase distinguishes itself by its user-friendliness, large variety of features, and integration capability with Google's extensive set of solutions.

Using Firebase, a Google Cloud Platform (GCP), developers can take full advantage of the services provided for both mobile and web application development. Thus, among the reasons why Firebase is widely considered among developers and the technology that powers eAccommodation is because of the following:

1. Ease of use: By using the powerful, yet easy to set and suitable for developers, Firebase, developers can easily set up and take advantage of authentication, control storage and analytics.¹⁸
2. Integration with Google services: Being a Google product, Firebase helps users to integrate with the other Google platforms like Google Cloud Storage, Google Analytics, and Google Maps so that it becomes simpler and easier to function.¹⁹
3. Security: By default, Firebase is equipped with a secure element such as the Firebase security rules that serves as a tool to restrain access to data as well as protect user data. Besides all of this,

¹⁷ It infrastructure, accessed April 25, 2024, <https://www.accenture.com/lu-en/insights/cloud/it-infrastructure-index>.

¹⁸ Firebase - Introduction, July 15, 2021, <https://www.geeksforgeeks.org/firebase-introduction/>.

¹⁹ Firebase - Introduction, July 15, 2021, <https://www.geeksforgeeks.org/firebase-introduction/>.

it is with the Firebase Authentication service that one will be safe from the security threats and that also supports Two Factor Authentication (2FA).²⁰

Furthermore, Firebase provides a pricing model that is friendly for students due to its flexibility.²¹ Among the most important benefits that Firebase offers, is the free tier that helps developers create and deploy the app without paying until the traffic reaches a certain threshold.²²

Considering the mentioned benefits, Firebase is an ideal tool to be used for building a secure and feature-packed student accommodation app that will serve the purpose of filling the gap between universities and appropriate housing for university students in Cork.

2.1 TECHNOLOGY AND HOUSING SOLUTIONS

With technology being integrated into the housing market, the process of individuals to search, purchase and maintain properties has completely changed. What used to be a simple data collection and manual tour for a property, technology has since gone from using advanced data analytics, virtual reality tours to smart home devices, blockchain-based transactions and smart contracts having an enormous improvement on every aspect of the housing industry.²³ In addition, this technological disruption has not only brought the ease of transaction and transparency of home purchases, but has as well rendered it possible for renters to learn more and get multiple alternatives in a single browsing session. With the continuous technological dynamic changes, the future is bright in terms of opportunities to include technology in every process, bringing affordability, and looking for solutions tackling emerging challenges. With the emergence of rapid technological advancement in the market, leads every player including buyers, sellers, developers, and policy makers to understand the effects and potential use of the technology in the housing market.

²⁰ Doug Stevenson, "What Is Firebase? The Complete Story, Abridged.," Firebase Developers, October 25, 2018, <https://medium.com/firebase-developers/what-is-firebase-the-complete-story-abridged-bcc730c5f2c0>.

²¹ Firebase - Introduction, July 15, 2021, <https://www.geeksforgeeks.org/firebase-introduction/>.

²² Firebase - Introduction, July 15, 2021, <https://www.geeksforgeeks.org/firebase-introduction/>.

²³ Adam Redolfi, "Council Post: The Future of Real Estate Transactions on the Blockchain," Forbes, November 9, 2022, <https://www.forbes.com/sites/forbesbizcouncil/2021/10/27/the-future-of-real-estate-transactions-on-the-blockchain/?sh=70207fd14938>.

The emergence of Airbnb represents the effective use of technology to fill a big void in the realm of housing. Previously, travelers dealing with the issue of finding accommodations had no other option but to put up with the existing order with hotels being the primary lodging option available in the market. However, Airbnb recognized an untapped market opportunity, the range of buildings that could be brought into circulation, that could be used as a medium to exhibit the volume of unique and affordable accommodations for tourists.²⁴ Indeed, Airbnb's online platform that links up with hosts and guests is what powered the hospitality sector transformation, offering people who own a space, including homes, apartments, or just spare rooms, a chance to welcome visitors who want to have room experiences that go beyond the norm. Airbnb made the process of booking the properties simplified and convenient through its user-friendly website and mobile app. This in turn encouraged smooth transactions and paved the path for better communication between hosts and guests to create a sense of community. With this innovational solution, people not only changed their travel style, but also it was able to demonstrate the power of new-style technology in different spheres of people's life.

The merging of technology with student housing is the expansion of what Airbnb brought to the wider housing market, a continual trend in leading to ingenuity. Students with special needs used to have problems ranging from extreme lack of apartment options in the areas they wanted to rent in, to the high prices they had to pay for accommodation and the unfair rental processes. Thus, leveraging tech-driven solutions, imitating the concept of Airbnb, can provide profound change into the student housing area and make the experience an unmatched transformation. Envision a situation in which students can quickly search for their desired room or apartment, get detailed listings with pictures and reviews, and ultimately make a booking on such a user-friendly platform or mobile app. In the same way, student housing sector can be utilized to create accessible, affordable, and convenient spaces for students by using technology. This gives students the advantage to make housing options that suit them in career pursuits. This dissection of housing and technology can bring the student housing experience a long way with the use of these technological innovations that can make the experience more organized, understandable, and student oriented.

²⁴ Rebecca Aydin, "How 3 Guys Turned Renting Air Mattresses in Their Apartment into a \$31 Billion Company, Airbnb," Business Insider, accessed April 25, 2024, <https://www.businessinsider.com/how-airbnb-was-founded-a-visual-history-2016-2>.

2.2 SIMILAR ACCOMMODATION APPS: A REVIEW

To meet the requirements of educational institutions, there are many accommodation systems developed for universities by the leading brands like StudentPad, Door Loop, StarRez, Lavanda, Ellucian Housing, and others to name a few.²⁵ However, each of these tools enriches the other one due to their different features and functionalities, but the goal remains the same in all of them, to help universities to cope with the accommodation management. Mostly, the systems serve as a bridge between university administratives and its different bodies in the accommodation department, as it helps universities to eliminate paperwork by streamlining the housing operations for its students from managing applications to settling them in ensuring a smooth operation of university housing services. Nevertheless, their area of intervention rarely goes beyond the administration of higher educational institutions which is a different issue and does not cover the range of services provided by external organizations. It does not matter what a university costs or what kind of housing is available, the aim is still the same and that is to make sure students are secure, convenient, and organized as far as accommodation is concerned.

Whereas, for StarRez, it provides a scalable and flexible platform on the housing management that is thoroughly oriented to the specific characteristics of college campuses and university systems. The software developed by them simplifies the whole housing cycle, from room reservation, roommate matchmaking, to maintenance issues and inspections.²⁶ The versatility of the platform affords for customization to comply with different campus residential buildings and regulations; hence, the system is simple to understand and use for the students and administrators. Through modules like digitized forms, lease processing, and occupancy tracking, StarRez puts state universities in a comfortable positive situation to handle their dormitories effectively and offer high occupant value.²⁷ However, one of its downfalls is that it does not offer

²⁵ “Studentpad Alternatives,” Best Studentpad Alternatives & Competitors, accessed April 25, 2024, <https://sourceforge.net/software/product/Studentpad/alternatives>.

²⁶ Housing Software for Student Property Managers (PBSA), accessed April 25, 2024, <https://www.starrez.com/solutions/student-property-management-pbsa>.

²⁷ Housing Software for Student Property Managers (PBSA), accessed April 25, 2024, <https://www.starrez.com/solutions/student-property-management-pbsa>.

mobile application for students to install, as its solely a web based platform, and this can affect the user experience.

On the other hand, the main job of StudentPad is to be an online service that advertises student accommodation, especially university and private landlords.²⁸ While it presents a convenient avenue for students to quickly find and search for accommodation options, the scope of StudentPad may be quite limited in comparison to what comprehensive housing management solutions can provide. The site works by connecting students to off-campus housing resources and does not have functionality that involves real-time marketplace integration or reservation management.

As a result, what makes us unique from other college dorm management tools is the fact that we take an approach that is much broader than just making lodging available. On the other hand, platforms like StudentPad and others tailor their inclusions to university-sponsored housing. On the other hand, in addition to the campus housing, I will be covering multiple off-campus shelter options. I created a system that would bring together the listings from many different sources, so that the students have a wide choice, including rooms in off-campus apartments, shared houses, homestays, and other options.

Each of the platforms have unique services that can help to expand the marketplace, but eAccommodation stands out for being the most comprehensive, incorporating marketplace integration as well as identity management, the demand for which varies between students and university administrations.

²⁸ Student accommodation software - studentpad ireland, accessed April 25, 2024, <https://www.studentpad.ie/solution>.

Table 2: Product Comparison

<i>Company</i>	<i>Access Control</i>	<i>SaaS/Web Supported</i>	<i>Training</i>	<i>Offers API</i>	<i>Integrations</i>
<i>CBORD</i>	Yes	No	No	No	2
<i>Lavanda</i>	No	Yes	Documentation Only	No	1
<i>StarRez</i>	No	Yes	Yes	Yes	7
<i>Studentpad</i>	No	Yes	Yes	No	0

Besides, our integration with eCampus allows another feature on convenience and functionality as well. By unifying the whole new platform with the student IDs, we speed up the whole process of choosing listings, order placement, and booking accommodation. It not only compels the user experience to a singularity but also integrates security and verification processes.

Overall, our system has the advantage of being a single source for all types of accommodation while leveraging technology to increase reachability, comfort, and security during the whole process of searching for appropriate room moving with the student through the entire journey.

2.3 STUDENT ACCOMMODATION CHALLENGES

Surely, the establishment of a new housing project offering an alternative method of student accommodation will not come without any risks. These complications may include not only the technical aspects, but also challenges related to accessibility, legal compliance, data security, privacy and integration problems that often come with different accommodation systems.²⁹ These obstacles can sometimes look to be overpowering, but this is actually one of the indicators of how ambitious the project is to not only streamline, but to elevate the student housing experience. The project, however, tackles the issues by designing an affordable, user-friendly, and scalable solution that promotes inclusivity, transparency, and efficiency. Therefore, although the undertaking can be tough, the prospects of improved accessibility, compliance adherence, data protection, and

²⁹ Top challenges of real estate app development & solutions, February 2, 2024, <https://www.solutionanalysts.com/blog/real-estate-app-development-solutions/>.

system integration aside, promise such a robust setting, matter of fact a new era of convenience and effectiveness for students, administrators, and institutions does emerge in student housing if the smart technology is adopted.³⁰

ACCESSIBILITY

It is of quite importance to consider the wide range of students and their special needs. When it comes to providing a student accommodation app, the degree to which inclusivity and accessibility are considered for everyone, including people with disabilities, is of fundamental importance. This may include both the simple availability of the app in the manner that suits varied individuals as well as assisting the search for the adequate types of housing.

Users with visual impairments may need to have an app that is compatible with a screen reader, there can be alternative text for images and definitely, there should be large font and high contrast.³¹ For example, the app must include captioning of videos and visual warning for notifications and alerts for the users who have issues with their hearing.³²

With regard to the accommodation searching, the app needs to have the functionality of a filtering process that lets a user define their accessibility criteria. For example, the services may cater to those wheelchair users by providing accessibility structures like ramps, proximity to public transport, elevators and among other facilities. Through the facility provided by the app to search for accommodation with the features they wish, the app needs to empower students with disability to find correct matches with the index catering to their unique needs and inclinations. Therefore, allowing for an inclusive and accessible design that addresses both the functionality and the user experience as a whole will put the app at the forefront of embracing every type of user, thus creating a sense of belonging and sense of empowerment.

SECURITY & PRIVACY

³⁰ Top challenges of real estate app development & solutions, February 2, 2024, <https://www.solutionanalysts.com/blog/real-estate-app-development-solutions/>.

³¹ “5 Tips for Creating an App with Accessibility in Mind,” Mobile App Development Agency, Manchester, May 18, 2022, <https://www.digitalworkroom.co.uk/blogs/five-tips-for-designing-an-app-with-accessibility-in-mind>.

³² “5 Tips for Creating an App with Accessibility in Mind,” Mobile App Development Agency, Manchester, May 18, 2022, <https://www.digitalworkroom.co.uk/blogs/five-tips-for-designing-an-app-with-accessibility-in-mind>.

Taking into account the robust data security and privacy measures is indispensable in working the student accommodation management app beyond the level where important and sensitive information might be exposed. Considering that we are to collect personal data of the students and residents of European Union, we need to adhere to the privacy principles of the GDPR.³³ Data protection will be achieved through strong encryption protocols, access controls, and periodical security reviews. Furthermore, customer' privacy policies will be provided transparently, detailing whose data is acquired, used, and protected.

As a result, Firebase serves as the frontline of defense when it comes to information security for the student accommodation app. By using the rich security functionality of Firebase, which includes the authentication, data encryption and access control, I am ensuring the app's safety from unauthorized access and data leakage. Firebase Authentication acts as a firewall securing users' login details, implement high-end data protection mechanisms, and encrypting it so that hackers have a difficult time obtaining sensitive data. Furthermore, databases in Firebase and cloud storage services encrypted data transmission and storing the data extends data security. With the help of Firebase's advanced security rules and data monitoring systems, it allows me to manage access permissions of every specific user, ensuring their roles and permissions maintaining the security of the app from unauthorized access. Firebase's security controls provide the certainty to our users that their data and information are secured using the best measures for security and privacy that include authentication, access authorization, and encryption.³⁴

Whereas when it comes to the security standards and compliance with required regulations for financial transactions we've integrated Stripe, a well-known and reliable payment processing system that implements high-level security. Besides we use Stripe's inherent security as a foundation to ensure the security of our financial information, as well as distancing ourselves from the risk of responsibility in any transaction.³⁵ By using Stripe, both students and tenants can avail the latest financial technologies which include the incredibly efficient Stripe platform that has such

³³ Citizensinformation.ie, "Overview of the General Data Protection Regulation (GDPR)," Data Protection, February 17, 2023, <https://www.citizensinformation.ie/en/government-in-ireland/data-protection/overview-of-general-data-protection-regulation/>.

³⁴ "Privacy and Security in Firebase," Firebase, accessed April 25, 2024, <https://firebase.google.com/support/privacy>.

³⁵ "Security at Stripe," Stripe Documentation, accessed April 25, 2024, <https://docs.stripe.com/security>.

fundamental features such as easy money processing, anti-fraud mechanisms, and dispute resolution, which guarantee a secure and reliable financial bridge for all parties.³⁶

INTEGRATION

The other problem we have is that there are multiple systems that the dormitories use to manage their halls or student accommodations. Each accommodation may choose different software or management systems that match their varying needs and processes.³⁷ Addressing such a wide range of systems and services, the implementation of our student accommodation management app will be a big technical challenge. I must develop powerful management with communication packages, which able to pullout and transmit data from these information-systems consistently while keeping their data integrity. Identifying, understanding, and adjusting to the different data formats, APIs, and protocols of each system is what this entails.³⁸ Such a job crosses addressing the problems of the compatibility and conflicts as well. As such our target is making one universal platform that will have the ability to pull up data from multiple home management systems; it will be one all-encompassing and seamless experience not only to the students but also the accommodation providers. I will tackle this integration problem by creating a versatile and interoperable system that can be adjusted to the accommodation definitions of different institutions while delivering the user a good experience to use.

2.4 LEGAL CONSIDERATIONS

According to Citizens Information web portal, it is the responsibility of landlords to register their rental property annually with the Residential Tenancies Board (RTB) on their website and notify RTB of any changes to the tenancy information.³⁹ This is a stipulated requirement under the residential tenancies' act, this Act applies to the majority of privately rented properties, including those leased by approved housing bodies and designated for students.⁴⁰ Nonetheless, the reference

³⁶ "Stripe Payments: Payment Methods, Features, & More," Stripe Payments | Payment Methods, Features, & More, accessed April 25, 2024, <https://stripe.com/ie/payments/features>.

³⁷ <https://www.solutionanalysts.com/blog/real-estate-app-development-solutions/>

³⁸ <https://www.solutionanalysts.com/blog/real-estate-app-development-solutions/>

³⁹ <https://www.citizensinformation.ie/en/housing/renting-a-home/landlords-rights-and-responsibilities/registering-a-tenancy/#77c7cc>

⁴⁰ <https://www.citizensinformation.ie/en/housing/renting-a-home/landlords-rights-and-responsibilities/registering-a-tenancy/#77c7cc>

for these laws is made for other areas, primarily for owner-occupied accommodations like renting a room in the landlady's primary residence.⁴¹ If an accommodation is owner-occupied, the owner is exempt from registering their house in the RTB, the rental board stops to exercise the oversight of the landlord-tenant agreement. Therefore, there exists a defined framework, which means that the regulations encompass the variety of rental arrangements, hence residential tenancy is secured to ensure that landlords, and tenants are protected.⁴²

Furthermore, the Rent a Room Tax Relief Scheme is a great proposition available to homeowners in Ireland to utilize their extra space in the property within the house. This policy aims at allowing net income tax free up to €14000 per annum by private tenants in leasing a room on any owner-occupied home with no tax liabilities.⁴³ Through the implementation of this scheme, the private sector can deliver a powerful motivation to the homeowners to generate revenue by providing the empty rooms the functionality of additional sources of income. Using the Rent-a-Room Strategy doing the trick, more homeowners are paving way for future tenants by opening up their houses, which is in turn widening the option of accommodations for students. The extra rental units made available to students by the building of the complex will definitely improve their search for accommodation, because it will widen the scope of housing options. Lastly, the idea of rent a room tax relief scheme is not only on focusing to use of the residential properties more effectively but also to provide accommodation accessibility to students studying in Ireland.⁴⁴

⁴¹ "Registering a Tenancy," Landlords' rights and responsibilities, February 19, 2024, <https://www.citizensinformation.ie/en/housing/renting-a-home/landlords-rights-and-responsibilities/registering-a-tenancy/#77c7cc>.

⁴² "Registering a Tenancy," Landlords' rights and responsibilities, February 19, 2024, <https://www.citizensinformation.ie/en/housing/renting-a-home/landlords-rights-and-responsibilities/registering-a-tenancy/#77c7cc>.

⁴³ "Rent a Room Tax Relief Scheme," Owning your home, March 12, 2024, <https://www.citizensinformation.ie/en/housing/owning-a-home/home-owners/renting-a-room-in-your-home/#:~:text=Rent-a-room%20relief%20lets,flat%20or%20a%20converted%20garage>.

⁴⁴ "Rent a Room Tax Relief Scheme," Owning your home, March 12, 2024, <https://www.citizensinformation.ie/en/housing/owning-a-home/home-owners/renting-a-room-in-your-home/#:~:text=Rent-a-room%20relief%20lets,flat%20or%20a%20converted%20garage>.

2.5 APP WIREFRAMES

ADMIN APP

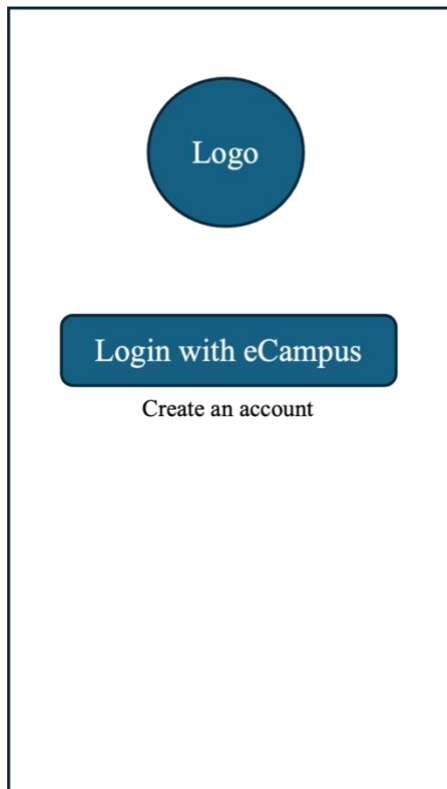


Figure 4: Welcome Page

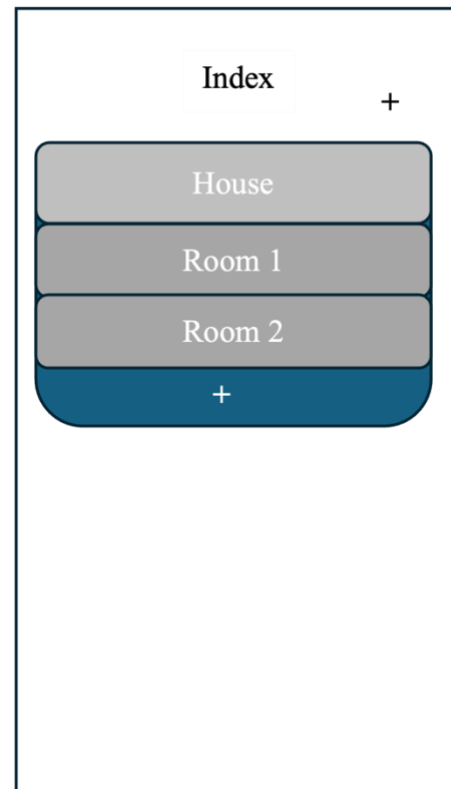


Figure 5: Home Page

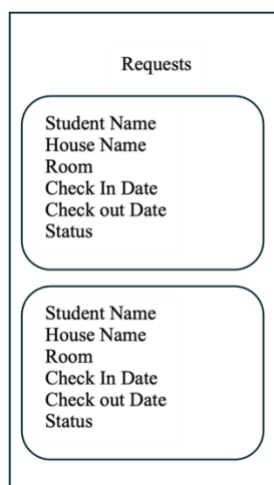
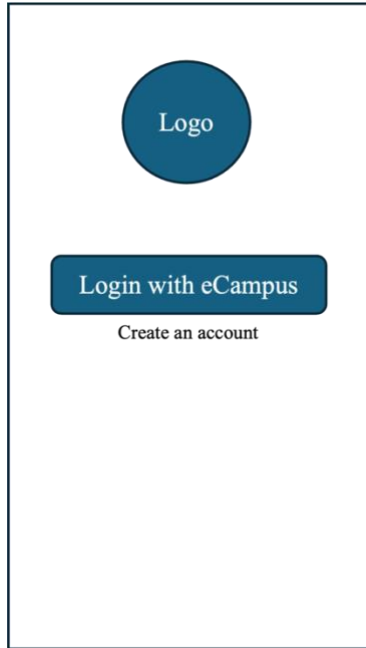


Figure 3: Requests Page

STUDENT APP

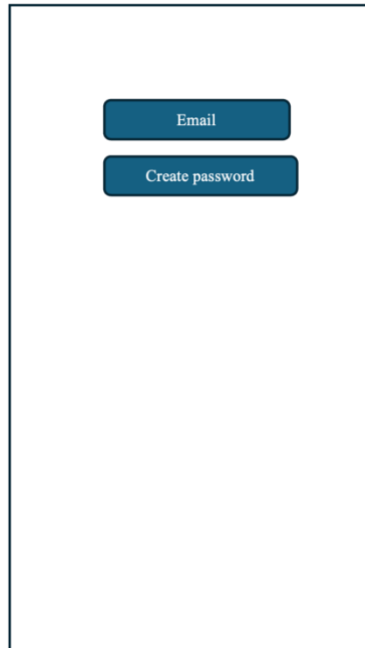


Logo

Login with eCampus

Create an account

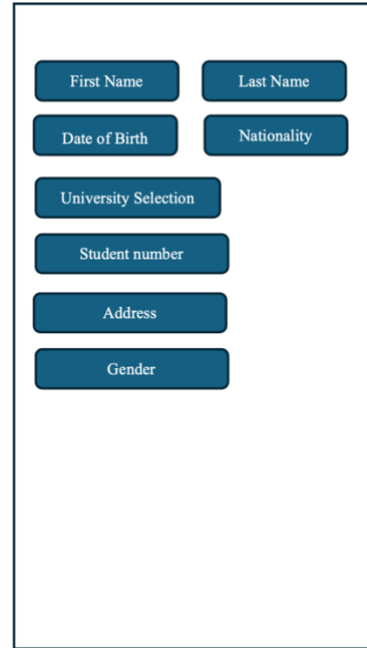
Figure 11: Welcome Page



Email

Create password

Figure 10: Registration Page



First Name Last Name

Date of Birth Nationality

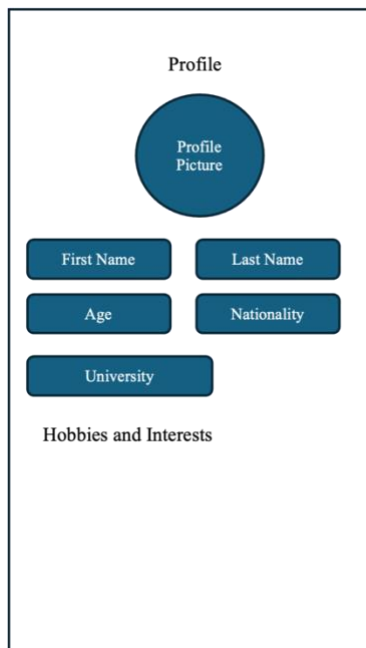
University Selection

Student number

Address

Gender

Figure 9: Know Your Customer (KYC) Page



Profile

Profile Picture

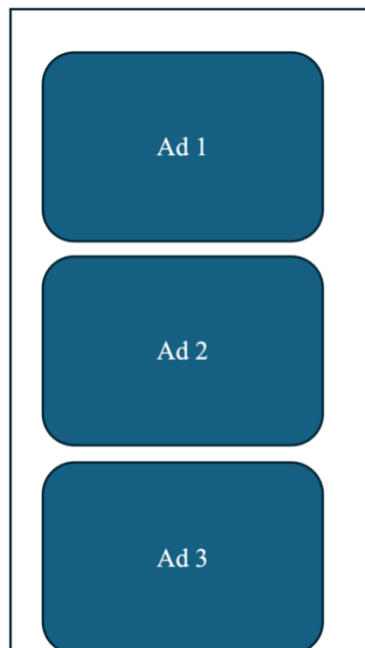
First Name Last Name

Age Nationality

University

Hobbies and Interests

Figure 6: Profile Page

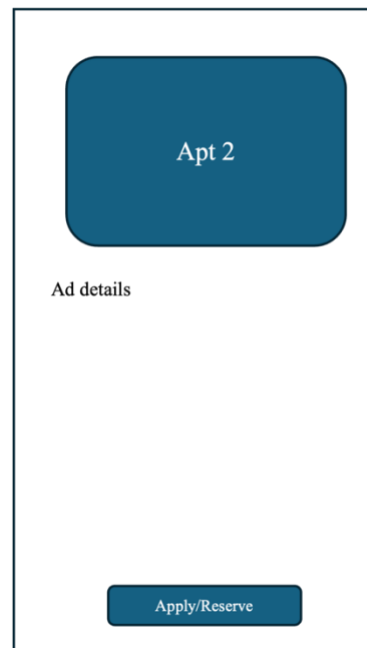


Ad 1

Ad 2

Ad 3

Figure 7: Listing Page

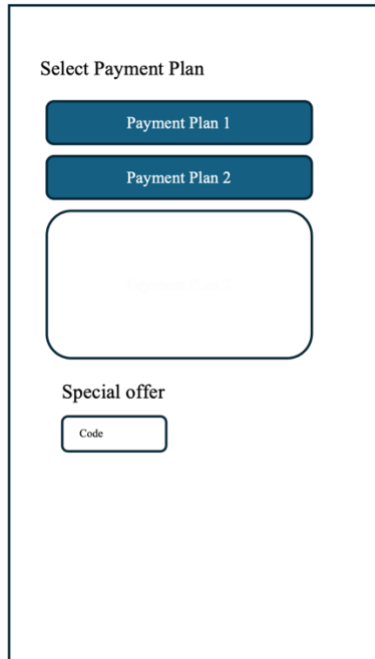


Apt 2

Ad details

Apply/Reserve

Figure 8: Room Page



Select Payment Plan

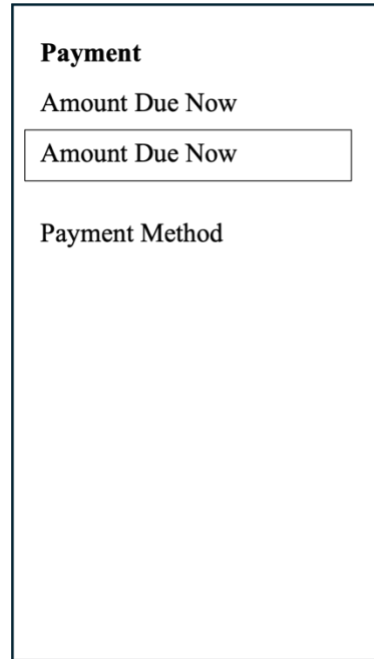
Payment Plan 1

Payment Plan 2

Special offer

Code

Figure 16: Reservation Page



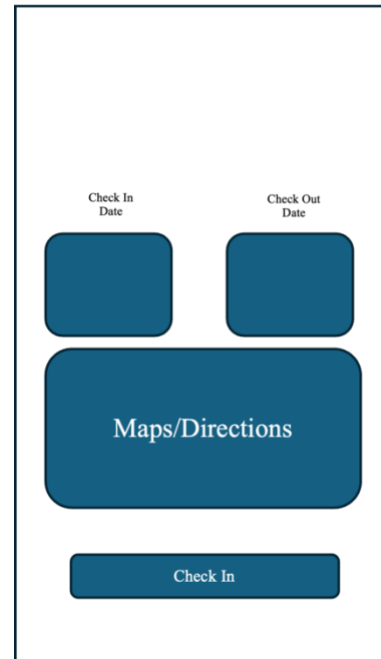
Payment

Amount Due Now

Amount Due Now

Payment Method

Figure 15: Payment Page



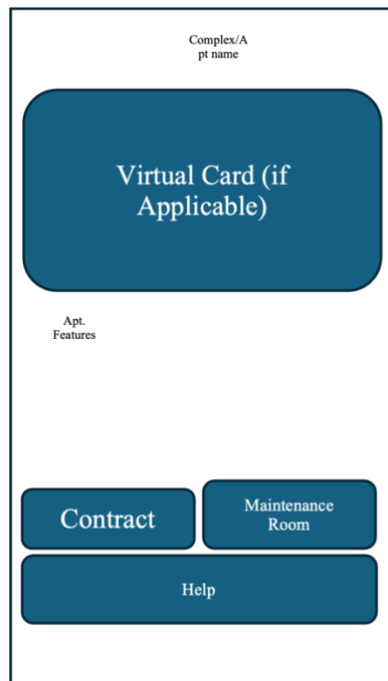
Check In Date

Check Out Date

Maps/Directions

Check In

Figure 14: Check-In Page



Complex/Apt name

Virtual Card (if Applicable)

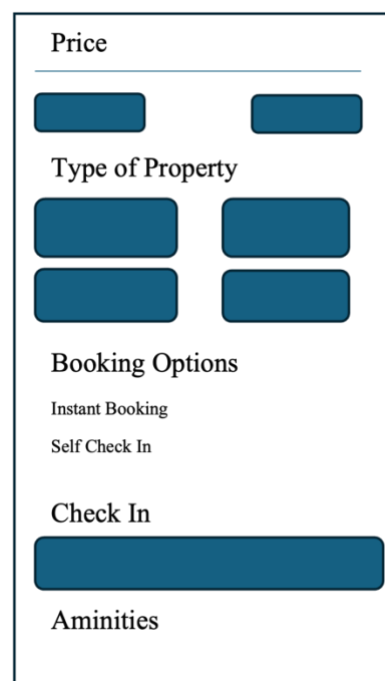
Apt. Features

Contract

Maintenance Room

Help

Figure 13: Virtual Card Page



Price

Type of Property

Booking Options

Instant Booking

Self Check In

Check In

Aminities

Figure 12: Filter Page

3. RESULTS

In order to investigate the importance of a student accommodation app, it was necessary to dive in and learn more about the underlying reasons behind what students look for in those kinds of dwellings and the hurdles that they face upon searching for an appropriate place to live in. Consequently, individual interviews were used to gain insight into how students select where to live in Cork for their courses. Also, I have been conducting an additional set of interviews with students in order to obtain a better insight into what difficulties students have with accommodation and what part of the housing search seems challenging. Thus, this research goal of developing an accommodation app that not only the listings would be presented but would be a comprehensive platform that students would trust and use.

In the online survey, the participants were asked to respond to some questions touching on their encounters, decisions and problems while looking for accommodation. The questionnaire had both multiple choices and open questions which were both quantitative and qualitative. This gave a complete picture of the problems faced by the students. In consequence, the questionnaire was separated into various parts covering different issues, such as demographics, accessibility, accommodation experience, user behavior and others. Such types of behavioral questions allows us to better comprehend the experience of finding accommodation, understanding that the experience varies from student to student based on different factors e.g. gender, age, academic standing, year of study and school of study.

3.1 SURVEY FINDINGS

As part of the investigation, I conducted an online survey of 14 University College Cork (UCC) students from various disciplines of study. These 14 responses gave me a clear image of a student population with diverse perspectives and experiences with house hunting. This number of pupils would represent a modest proportion of the student body.

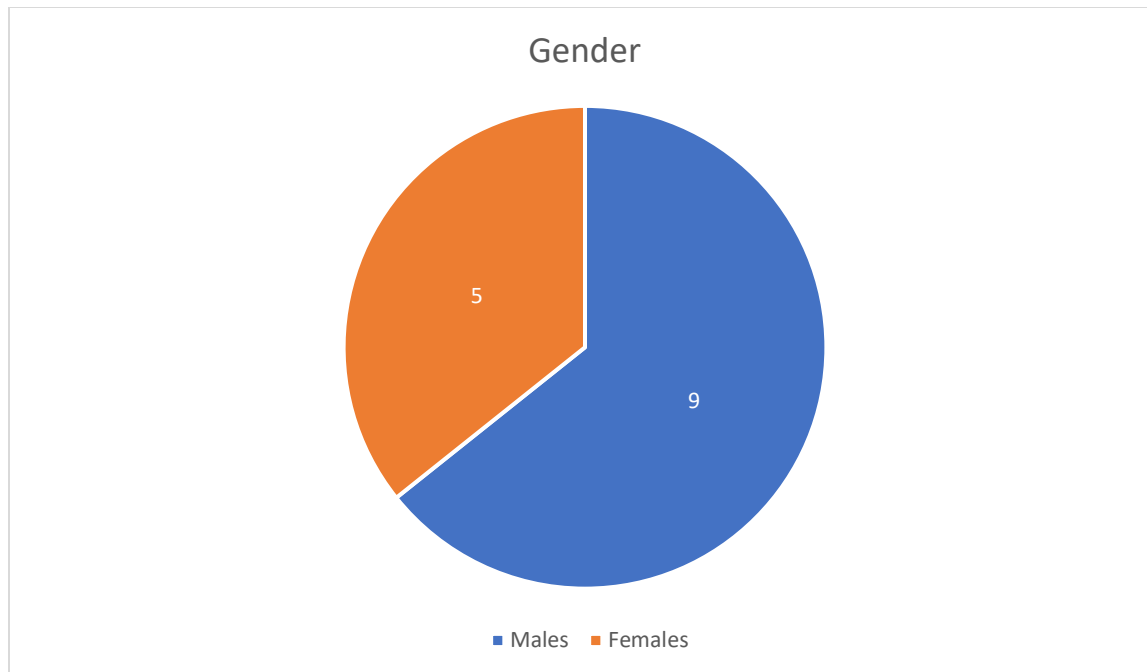


Figure 17: Survey Participants by Gender

In my study, 5 females and 9 males were among the 14 students who took the survey. The gender variety in our sample gave a balanced representation, so I gained information from both sides. I aimed to include students of various gender identities in order to ensure that our research was inclusive and thorough enough to reflect a significant portion of the UCC student body. This balanced gender strategy allowed me to align the student's preferences and issues considering the gender, as well as identify common concerns encountered while looking for the perfect housing.

In the survey, I also prioritized diversity from not only a gender standpoint, but also with regards to academic status as well. Therefore, the representation covered all the educational levels. Of those respondents, the collected data was then analyzed in subjects of different educational statuses, students pursuing their undergraduate degree to students seeking to obtain their postgraduate certifications. Additionally, we managed to gather feedback from our Erasmus students. Among our sample participants 11 were undergraduates, thus creating a window for the first-degree students in terms of required conveniences and challenges regarding accommodation exploration. Also, we engaged with 1 postgraduate student for diversification considering that the student pursuing her postgraduate degree might have a different experience from those pursuing their undergraduate degree. As well as that, the undertaking of the survey involved one Erasmus

student who is sharing their International University experience in Cork. It became apparent to us that different academic levels had different accommodation requirements and preferences; therefore, I think our representation of the students in different academic categories was so diversified and thus enabled us to understand better the students with different educational statuses.

As it turns out, the experience a postgraduate has when finding a place does defer to the experience an undergraduate student faces when looking for a place. Landowners tend to prefer postgraduate students over undergraduates due to their level of maturity making sure that the house will still be in good condition for the next tenant, not requiring serious amount of maintenance.

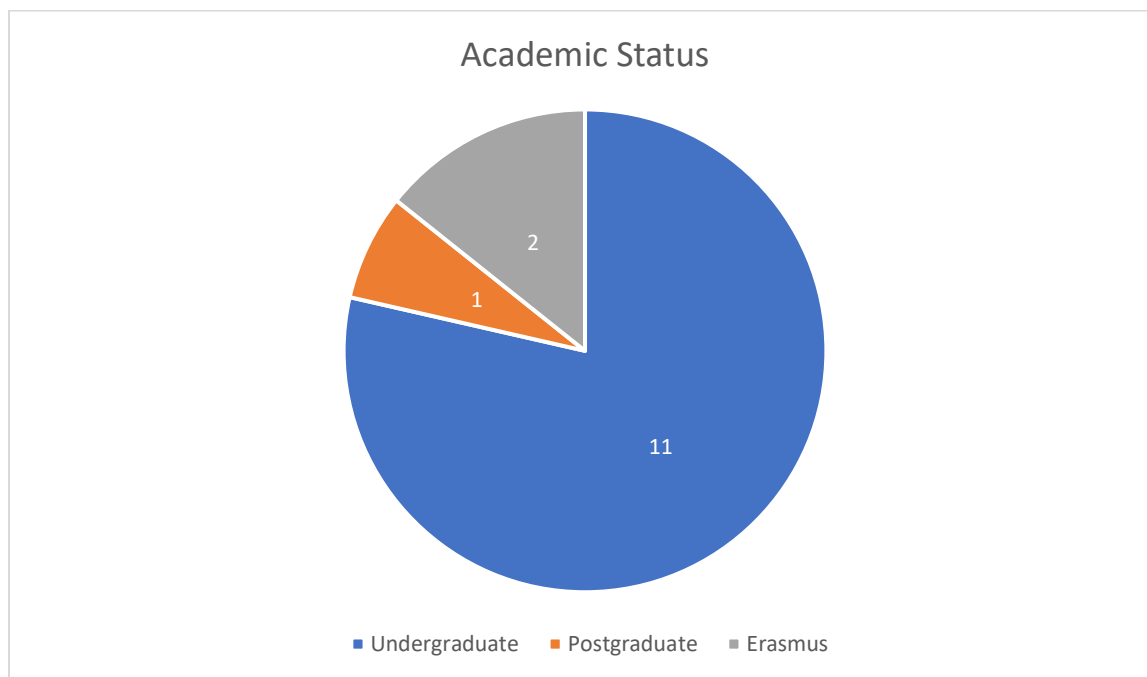


Figure 18: Survey Participants Academic Status

Furthermore, the survey clearly revealed that the availability of accommodation was a common issue used by the students to make informed decisions. Therefore, availability was found at the top of their list of choice factors. The reason of availability was given by a great number of the students, more specifically, by nine students, as the reason why they chose their current accommodations during their studies. What this means is that the supply of housing determines to a great extent whether a student will just enroll in a university program or search for accommodation elsewhere before enrolling. It outlines the various problems students face in

finding good quality housing that is affordable and readily accessible, thereby necessitating the development of diverse housing solutions for the students without any unnecessary complications. Students' choice of whether or not to pursue higher education becomes dependent on the availability issue more. Thus, the solution to the housing shortage and well-organized strategies to ensure effective accessibility to accommodation for students is of quite importance.

SEARCH METHODS

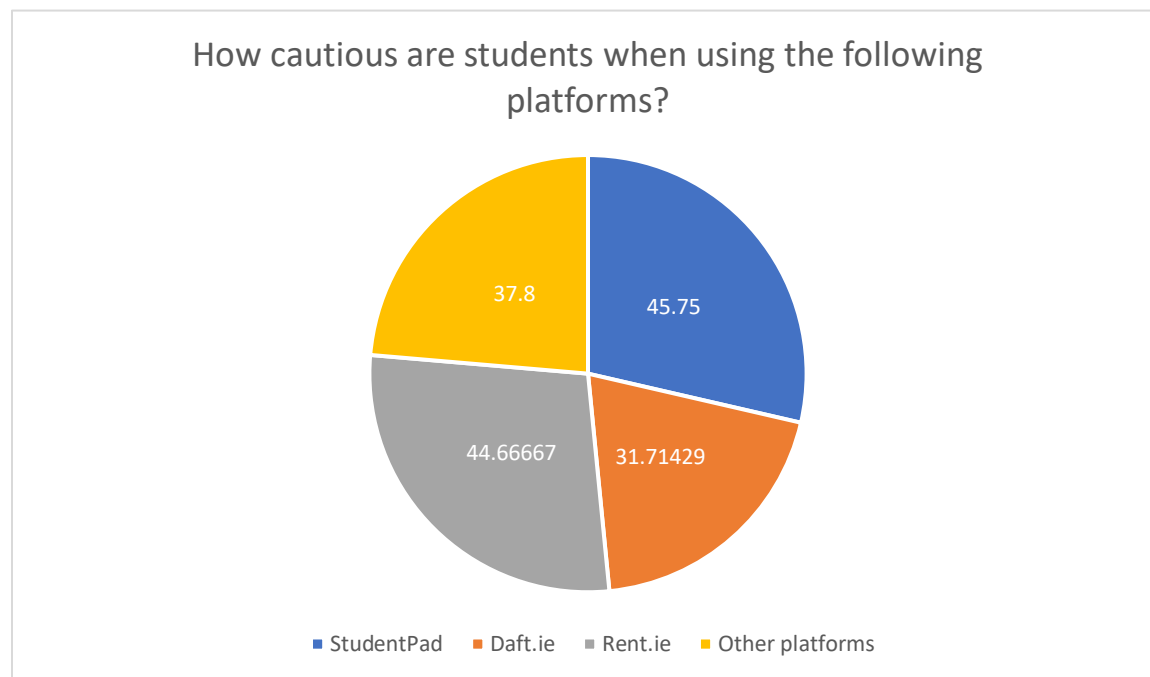
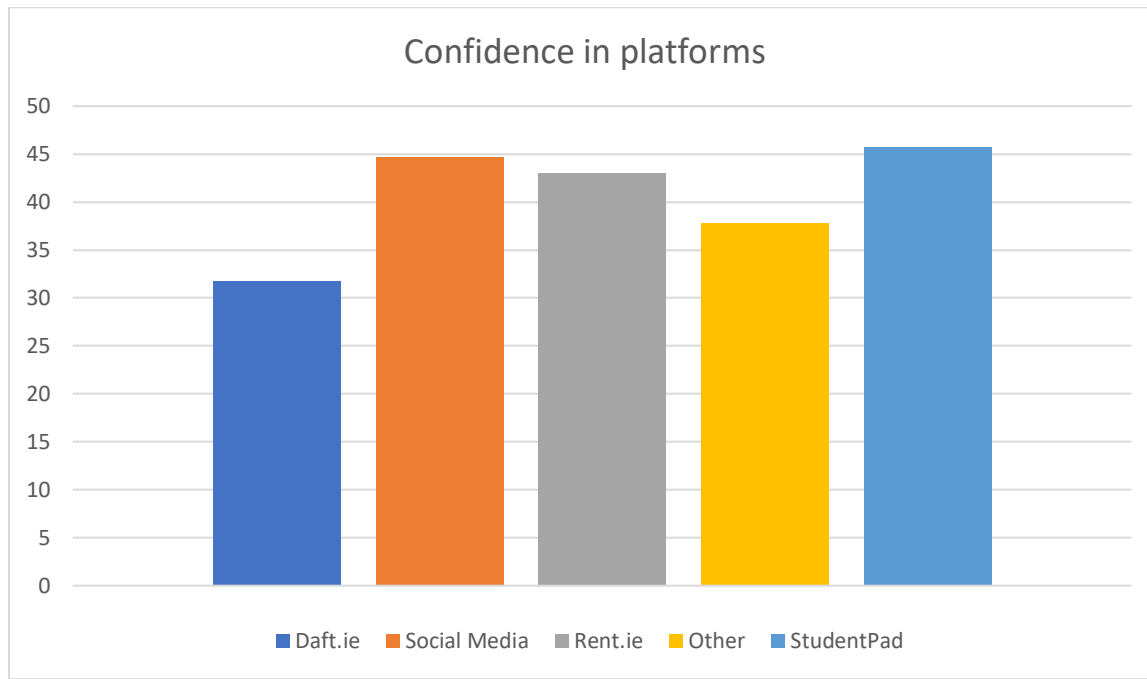


Figure 19: Trust in Platforms

When it comes to how students look for accommodation, online searches for rooms by students have been highlighted as the main method of accommodation hunting revealed by the survey. Students were asked to choose the method they would spend to finding their accommodation and 8 out of the 14 participants indicated online platform as their primary source of accommodation, were the rest either lived in their parent's house or owned their own house. That is consistent with student's more pressing dependence on smart apps and web pages than on printed materials from colleges to look for where to live. The outbreak of internet has made people search for accommodation online that satisfies them in terms of convenience and

accessibility, the availability of resources and gathering necessary information to them at one place as compared to paying a visit to the different travel agents to analyzing their prices and other service features.



Graph 1: Confidence in students using accommodation platforms

Regardless of the heavy dependency on online platforms used by students, according to the survey, students tend to be more suspicious towards the reliability and credibility of the platforms they use for renting a place. Students argue how online platforms tend to glorify the listing and give a false expectation of what the room or apartment looks like. Besides, these students are afraid of being involved in online scams or fraudulence which often tend to occur online. Students might doubt the authenticity and reliability of online listings which may discourage them from relenting to the extent of solely relying on online platforms for their search, hence they would be forced to seek for a house view before considering renting it. Daft scored the lowest when it came to how reliable that platform is when finding a suitable lodging for their studies with an average of 31% confidence score of students trusting the platform for finding a place, where in second, Rent.ie is another untrustworthy platform that students do not confide in when booking their place, where it scored an average of 43% when it comes to how cautious students are when choosing a place from their platform.

PAYMENT METHODS

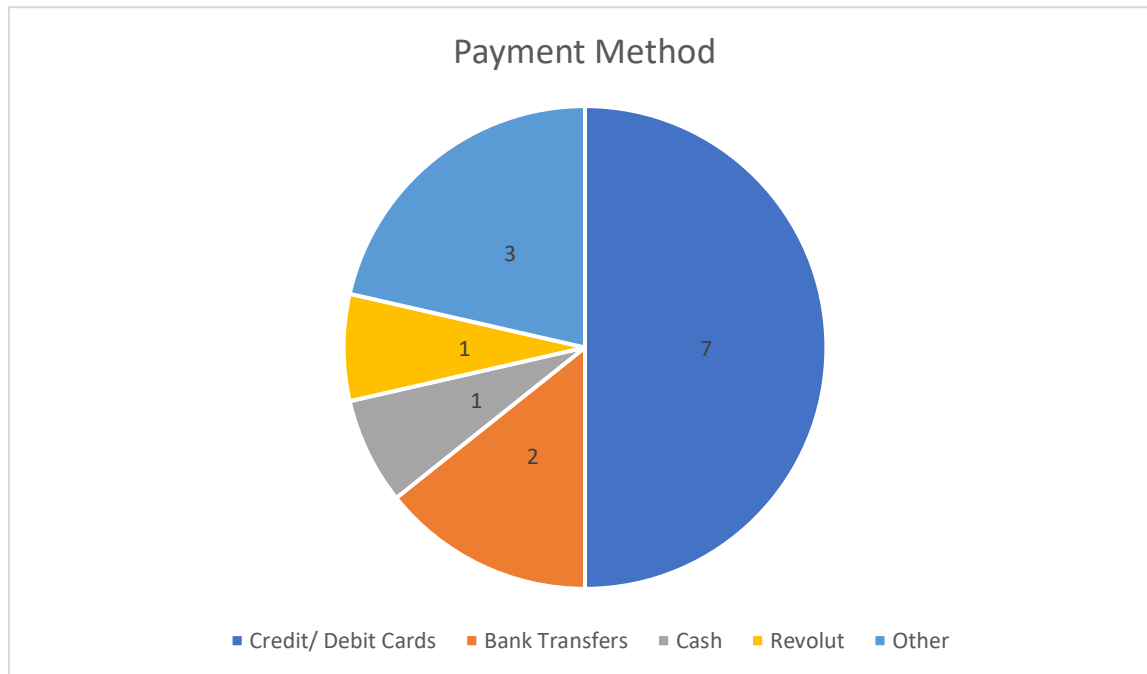


Figure 20: Payment Methods

The survey also demonstrated the preferred payment methods for landowners. According to the survey, 7 students that participated in the survey paid their rents using their debit/ credit cards. This is typically the preferred type of payment method for private or public accommodations where they allow students to pay online through the company's website or portal. The transition to digital payment channels provides the students and accommodation providers with the convenience and efficiency across the board. Through the use of bank cards students can conveniently track their payment records, remaining balance, and avoid the hustle of managing cash or other form of payment.

On the other hand, for the other group of participants, using cash or bank transfer seemed to be more relevant for various kinds of accommodation and landlords. As an example, students renting a room from a private landlord may face situations, especially when renting a room from individual who has no direct affiliation with an institution, where only a cash or bank transfers will be trusted. This would result from the lack of the infrastructure that landlords have to support processes of any other kinds of payments, that way traditional payments would be more convenient for both parties.

Similarly, students who use services like Revolut may have landlords who are also on the same platform, streamlining the whole payment process. Such methods are likely to be helpful for international students who may not be able to open a bank account locally or are just simply used to digital banking that involves such services as Revolut in their financial transactions.

3.2 INTERVIEW

Furthermore, an interview was carried out with an employee from the UCC Accommodation department to get some information concerning the services offered to students as well as the role of the UCC team in the allocation of appropriate student lodging. The staff mentioned some services that the department offer for instance providing some information and guidance which include room availability on and off the campus. They also raised the issue of their participation in helping the students to move in housing, giving advice on rent and listings verifying the originality of the rooms being offered and any issues that may be connected to their search for accommodation. Besides, during the interview it was mentioned about the department's use of StudentPad in efforts to plan, partnership with external partners such as landlords, accommodation providers to enhance students housing options and to have the safe and affordable lodging options.

During the interview, it was discussed how at the beginning college accommodations at the University College Cork were supervised by the university administration themselves. However, recognizing the fast-growing difficulties, the students had to find an appropriate alternative method of housing in Cork. As a result, the university decided to open an Accommodation Department. This area is essential for the success of our education institution by helping students with the accommodation problems during their learning process. The current scope of the Accommodation Department differs from the role it once played in administering the student services. It now serves as an advisory role, offering and providing students with guidance, advice, and support during the student's arrival both international and national. Services range from drop-in and telephone meetings where students can look for assistance in housing market search in Cork. Probably the major aspect of the school department's function is the cooperation with certain resources as Studentpad. The department also reaches out to landlords to open their houses to incoming students to increase the available rooms offered to students.

Additionally, two other interviews were conducted on students from various academic levels who also had taken part in the survey and were willing to be interviewed to share their experience about the challenges faced by them when looking for housing in Cork. The first interviewee, a female postgraduate student, spoke about her issues in connection with the housing not only satisfactory, but also cheap enough for her placement in Waterford. Moreover, she also highlighted the need for a female-only option accommodation, as some female students prefer to reside with other female students for a greater sense of safety and comfort. In this case, preferences and requirements of accommodation application's users are highlighted to take into consideration for a later development of the app.

The second interviewee, a male undergraduate student, also provided a valuable insight on the problems he encountered when looking for a place to stay in Cork for his studies. The students mentioned how the problem made him commute back and forth, from and to college consequently leading to a car accident causing him some injuries and a totally wrecked car. The example given here highlights the high price that students may face because of the absence of adequate housing, which in its turn can adversely affect their academic performance, thus proving the need to have in place an efficient and reliable system that will ensure that there is a solution to this issue.

4. TECHNICAL SCOPE

Flutter, a free open-source software development kit (SDK) developed by Google, is amongst the popular kits in the developing world. Flutter allows developers to code applications on different platforms with interoperability of different operating system models. Flutter is well known for its large community, thorough documentation, and wide library ecosystem. This type of development kit enormously helps applications as eAccommodation to be built with ease and speed.

This chapter will discuss the implementation of eAccommodation, covering flutter framework, architecture, design patterns, and the libraries and packages involved while developing this project. Through such an evaluation, we will also understand the technology that powered the app, keeping into consideration the ease and consistency based on the possibilities of Flutter and its framework.

4.1 FLUTTER FRAMEWORK

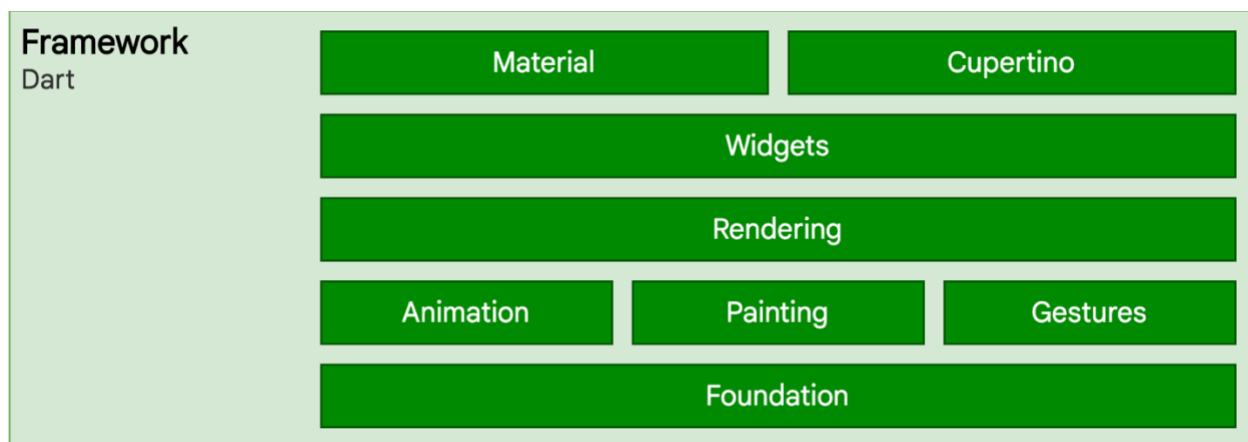


Figure 21: Flutter Architectural Layer⁴⁵

Flutter is an extensible development kit, built with flexibility allowing developers to add new features into the existing libraries, modify existing ones, or even integrate third-party libraries and tools depending on the project. As shown in the figure above, The Framework of flutter consists of widgets all relying on the basic building block of flutter's foundation library, containing all the required packages and libraries of developing a flutter application.⁴⁶ In flutter, everything is

⁴⁵ Flutter architectural overview, accessed April 25, 2024, <https://docs.flutter.dev/resources/architectural-overview>, <https://docs.flutter.dev/resources/architectural-overview>.

⁴⁶ Flutter Architecture, accessed April 25, 2024, <https://www.javatpoint.com/flutter-architecture>.

compromised to be a widget, which is a core concept of this framework.⁴⁷ Since, flutter is built for different operating systems, it contains specific design languages as, material design for Android and the Cupertino for iOS.⁴⁸ Whereas, the rendering layer is the software responsible for translating the UI code to the graphics displayed on the screen.⁴⁹

4.2 ARCHITECTURE AND DESIGN PATTERNS

The layered architectural model appeared to be the most suitable model to employ after extensive research and investigation of several architectural models. Since I had already used the Model-View Controller method in a previous development, it first appeared to be simpler to construct for eAccommodation. However, it was overly complicated, with each part tied to the models and controllers, making testing difficult and making it even more difficult to identify the source of the error. The layered architectural style was therefore ideal for this kind of accommodation app. Simultaneously, an architectural design of this kind is appropriate for simple applications like digital accommodations. Especially if there are plans to expand the app's functionality and features in the future.

Layered architecture are divided into 5 different layers:

1. Presentation Layer
2. Application Layer
3. Domain Layer
4. Data Layer
5. Infrastructure Layer

PRESENTATION LAYER

The presentation layer is responsible for the user interface of eAccommodation, and this includes responding to a wide range of user inquiries in a friendly manner and assisting them through the booking process. It is acting as the frontend of the app allowing the user to interact with the app's different functionalities and features.

⁴⁷ Flutter Architecture, accessed April 25, 2024, <https://www.javatpoint.com/flutter-architecture>.

⁴⁸ Flutter architectural overview, accessed April 25, 2024, <https://docs.flutter.dev/resources/architectural-overview>.

⁴⁹ <https://www.youtube.com/watch?v=vd5NqS01rIA>

In relation to eAccommodation, the presentation layer components of the app are divided to:

- **Screens:** Screens are the different types of views within the application that users navigate through when operating the app. As an illustration, the app is supposed to contain many screens. It is done to help the user to log in, look for an accommodation, choose it, book it and make the payment.
- **Widgets:** Widgets are UI element that make up an interface. Amongst these we have buttons, text inputs, lists, cards as basically all the other types of user interface elements there is.

APPLICATION LAYER

The application layer is considered to be of essence in the development process of an app as it bridges both the presentation to the data layer ensuring the flow of the app. This includes the principles of logic and variables that are required to make the application work. The process involves validating user input, structure planning rules, and interacting the data uploaded by the user.

In eAccommodation this is broken down to 2 components:

- **Bloc:** Bloc component contains the variables that directs and deals with users' activities and behaviors.
- **Router:** The router component on the other hand, does not have any extra functionality apart from providing a mechanism in the application for navigation through the links by jumping to the desired screen.

DOMAIN LAYER

On the other hand, the domain layer represents the basis of efficiency of the app's smart decision-making, core entities, business logic, and use cases by validating input data. For our application, this is achieved by creating a 'model' component that is entirely made up of the domain entities the data structure that are needed for the app to function.

DATA LAYER

Regarding these layers, the data layer would be in charge of data availability and manipulation through Firebase, as well as a quicker synchronization with external services like Stripe, a well-known platform that most developers and businesses use to support online payments.

INFRASTRUCTURE LAYER

The infrastructure layer, is to be considered the most important layer within the development architecture of the app. It is responsible for handling external dependencies and providing services to other layers.⁵⁰

In the case of eAccommodation, this is recognized through the creation of the provider component for application that provides state management facilities and dependency injection for the application. Provider presents as the abstraction layer for the applications that communicate between its components, and it also maintains the cycle management of shared resources.

4.3 KEY PACKAGES AND DEPENDENCIES

FLUTTER SDK

Flutter: The Flutter SDK provides the necessary tools and libraries for building cross-platform mobile applications.

UI COMPONENTS

‘cupertino_icons’: Cupertino icons is the package responsible for providing Cupertino icons for iOS.⁵¹

⁵⁰ Layered architecture: Building Scalable & Maintainable Software Systems, accessed April 25, 2024, <https://bitloops.com/docs/bitloops-language/learning/software-architecture/layered-architecture#:~:text=The%20infrastructure%20layer%20is%20responsible,authentication%20to%20the%20other%20layers.>

⁵¹ “Cupertino_icons: Dart Package,” Dart packages, April 16, 2024, https://pub.dev/packages/cupertino_icons.

`intl`: Internationalization and localization package provides a standardized format of dates, numbers, and currencies across the app.⁵²

`easy_localization`: The easy localization package helps the app in supporting multiple languages if needed.⁵³

STATE MANAGEMENT

`flutter_bloc`: Flutter bloc library allowed me to separate the presentation from the business logic. It what allows the app to be dynamic, as it makes the app to react differently according to the data given.⁵⁴

`provider`: As we have many different cards which makes the management of the data difficult with a long tree architecture as the data would be controlled from the top level. Instead, provider eliminates the tree shape layer.⁵⁵

DATA MANAGEMENT

`firebase_core`: Initiates the integration of Firebase services into the project.⁵⁶

`firebase_auth`: Firebase authentication regulates the authentication of users within the app.⁵⁷

`firebase_storage`: Where users media and files uploaded into the app are kept in Firebase cloud storage is Firebase storage.⁵⁸

⁵² "INTL: Dart Package," Dart packages, December 7, 2023, <https://pub.dev/packages/intl>.

⁵³ "Easy_localization: Flutter Package," Dart packages, April 22, 2024, https://pub.dev/packages/easy_localization.

⁵⁴ "Flutter_bloc: Flutter Package," Dart packages, March 24, 2024, https://pub.dev/packages/flutter_bloc.

⁵⁵ "Provider: Flutter Package," Dart packages, February 28, 2024, <https://pub.dev/packages/provider>.

⁵⁶ "Firebase_core: Flutter Package," Dart packages, April 23, 2024, https://pub.dev/packages/firebase_core.

⁵⁷ "Firebase_auth: Flutter Package," Dart packages, April 24, 2024, https://pub.dev/packages/firebase_auth.

⁵⁸ "Firebase_storage: Flutter Package," Dart packages, April 24, 2024, https://pub.dev/packages/firebase_storage.

MAP AND LOCATION SERVICES

``geocoding``: Integrates Google Maps services into the application.⁵⁹

PAYMENT PROCESSING

``flutter_stripe``: Flutter Stripe library allows integration with Stripe services to allow the app to take and handle payments.⁶⁰

CHAT FUNCTIONALITY

``flutter_firebase_chat_core``: Firebase chat core library leverages Firebase services to allow chat functionality within the app.⁶¹

NETWORKING

``http``: Offers support for making HTTP requests to fetch data from remote servers.⁶²

4.4 TESTING AND DEBUGGING

Testing and debugging were crucial stages of the app development. Whereas on each level, I had to test and debug the app's functionality as well as any mistakes that occurred throughout the compilation process. Debugging option allowed me to debug the code in real time. It was quite useful to understand what was going on with the code. This is due to flutter's feature called hot reload, which allows you to debug the code and performance alongside your simulator. However, because I was testing the program on my phone, I needed to ensure that all caches were cleared after each run, as they were interfering with the testing process. Furthermore, because Apple is a security-focused device, I needed to ensure that all entitlements were included in the info.plist file so that the program could function on an iOS device without any interruptions.

⁵⁹ "Geocoding: Flutter Package," Dart packages, March 13, 2024, <https://pub.dev/packages/geocoding>.

⁶⁰ "Flutter_stripe: Flutter Package," Dart packages, March 7, 2024, https://pub.dev/packages/flutter_stripe.

⁶¹ "Flutter_firebase_chat_core: Flutter Package," Dart packages, May 16, 2023, https://pub.dev/packages/flutter_firebase_chat_core.

⁶² "HTTP: Dart Package," Dart packages, February 15, 2024, <https://pub.dev/packages/http>.

4.5 SCREENS

ADMIN APP

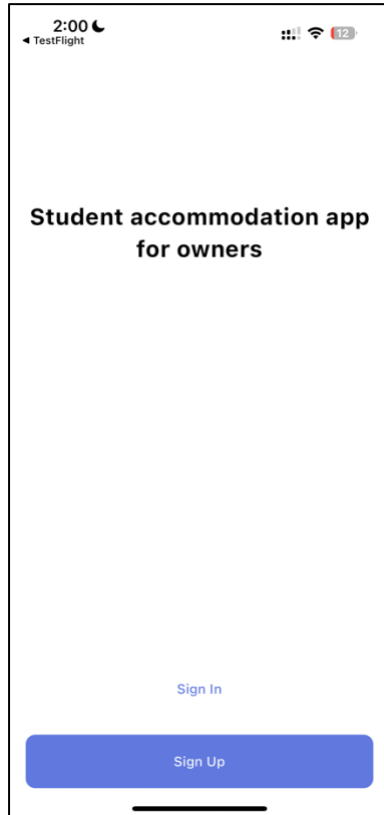


Figure 22: Welcome Page

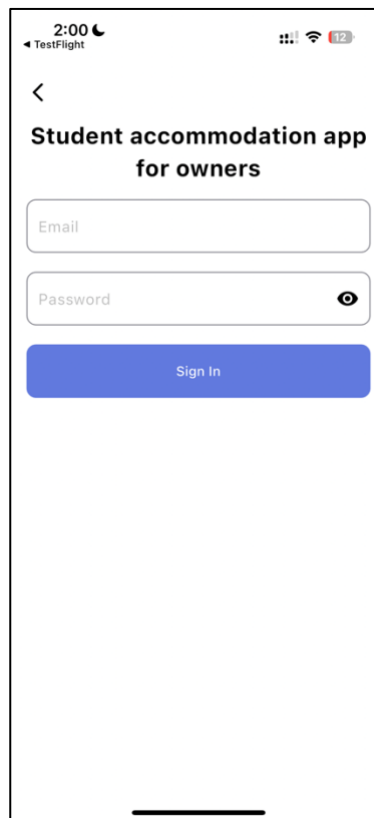


Figure 24: Sign In Page

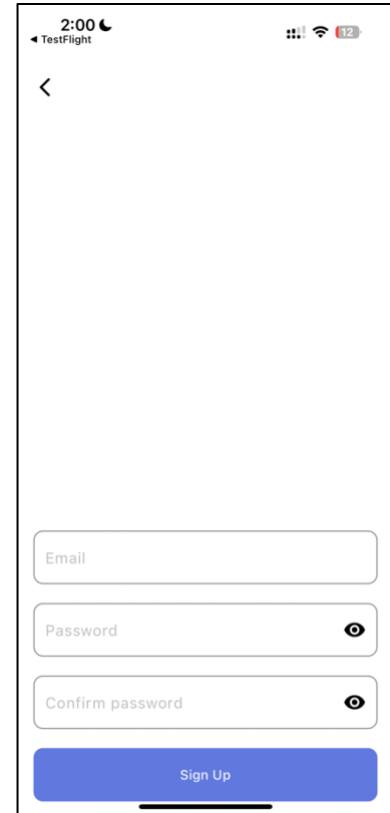


Figure 23: Sign Up Page

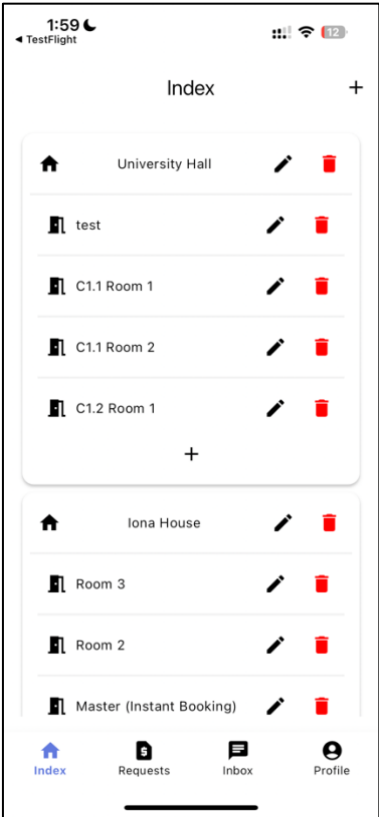


Figure 29: Home Page



Figure 28: Profile Page Admin view

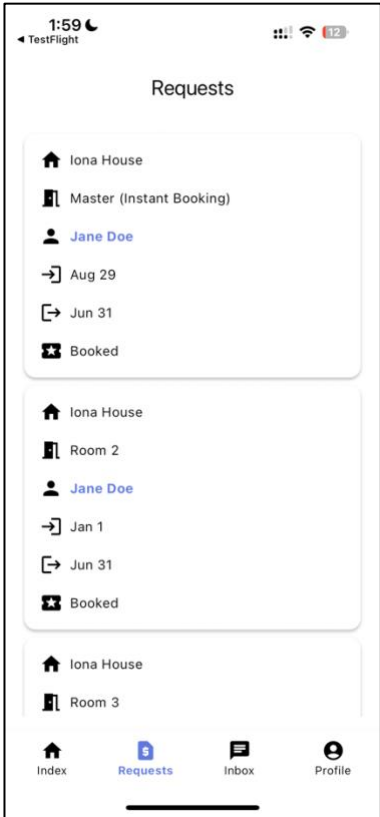


Figure 27: Requests Page

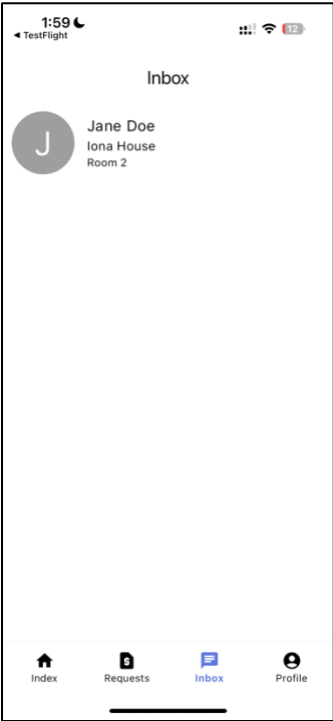


Figure 26: Chat Page Admin View

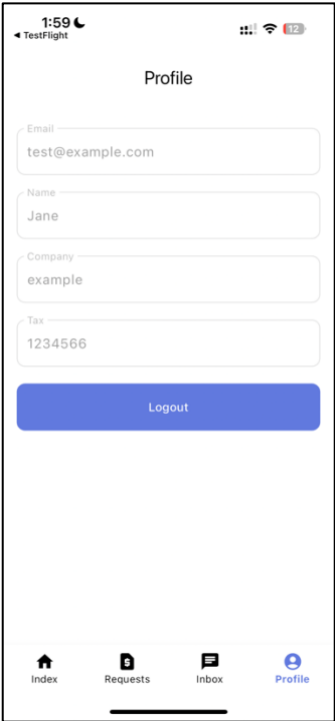


Figure 25: Admin Account Page

STUDENT APP



Figure 32: Welcome Screen

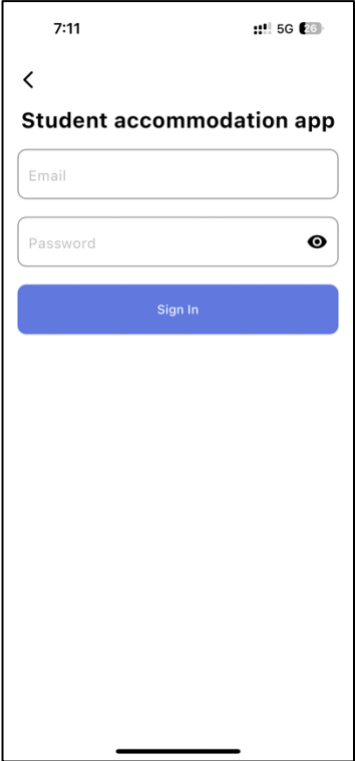


Figure 30: Sign In Screen

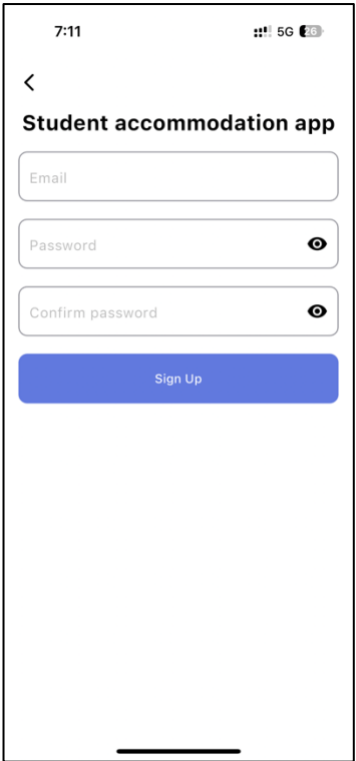


Figure 31: Sign Up Screen

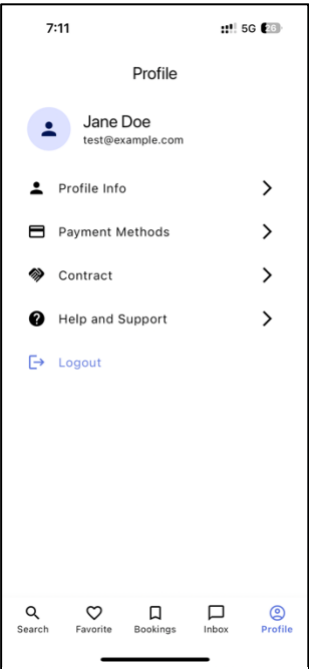


Figure 35: Account Screen

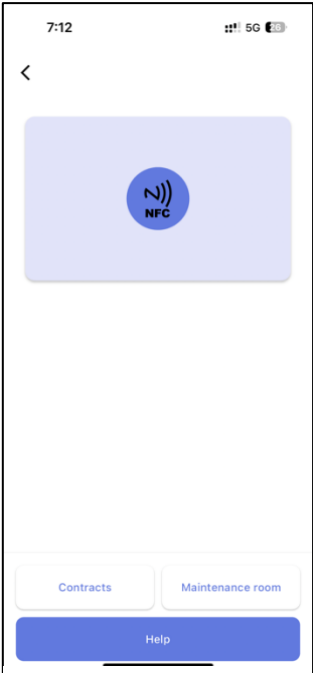


Figure 34: Digital Access Screen

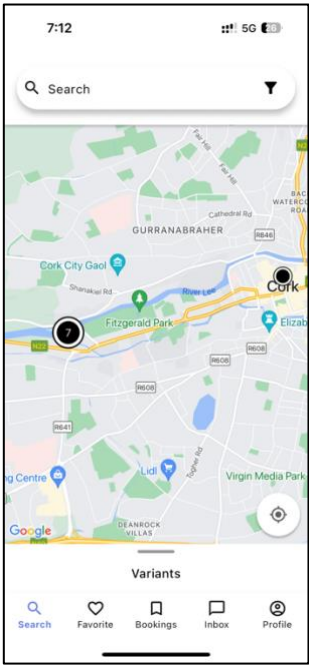


Figure 33: Home Screen Page

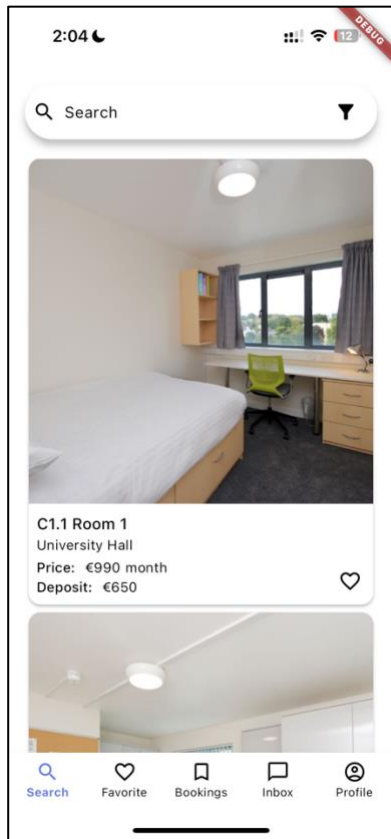


Figure 38: Home Screen

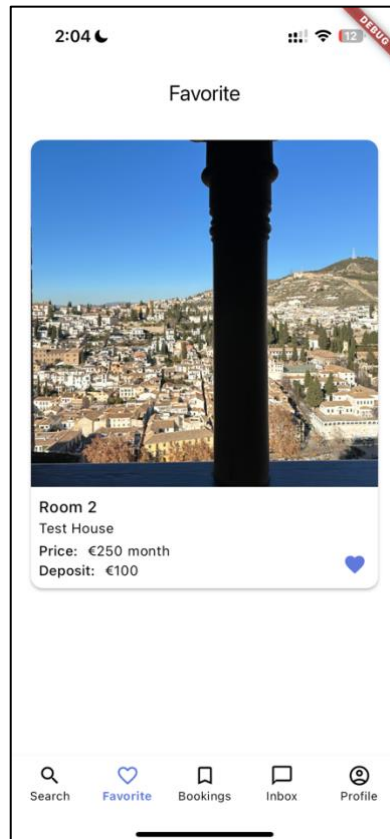


Figure 39: Favorite Screen

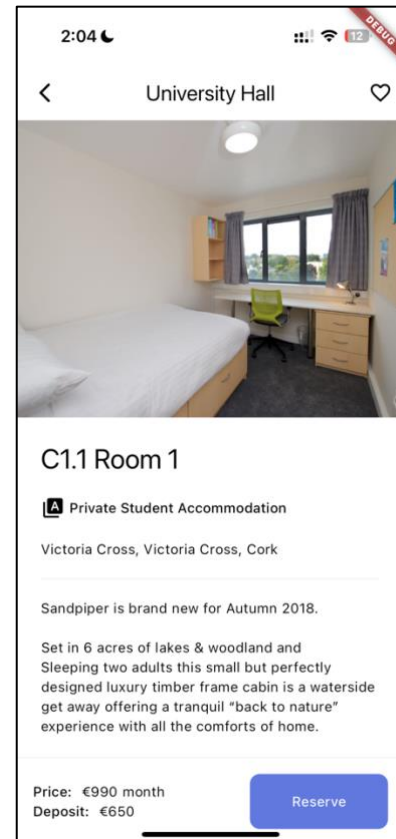


Figure 40: Room Info Screen

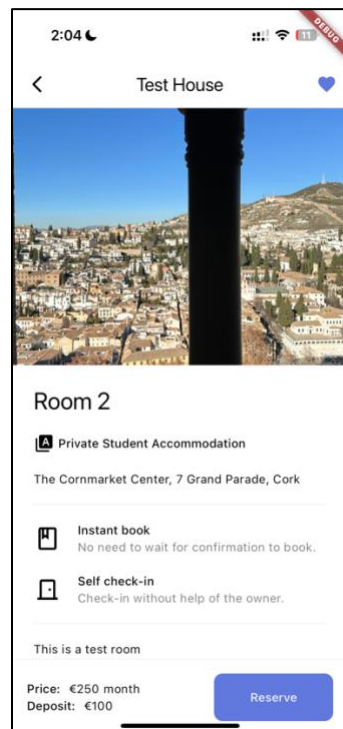


Figure 36: Reservation Screen

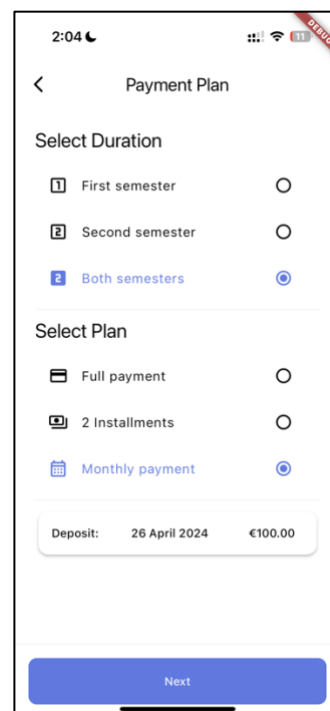


Figure 37: Payment Plan Screen

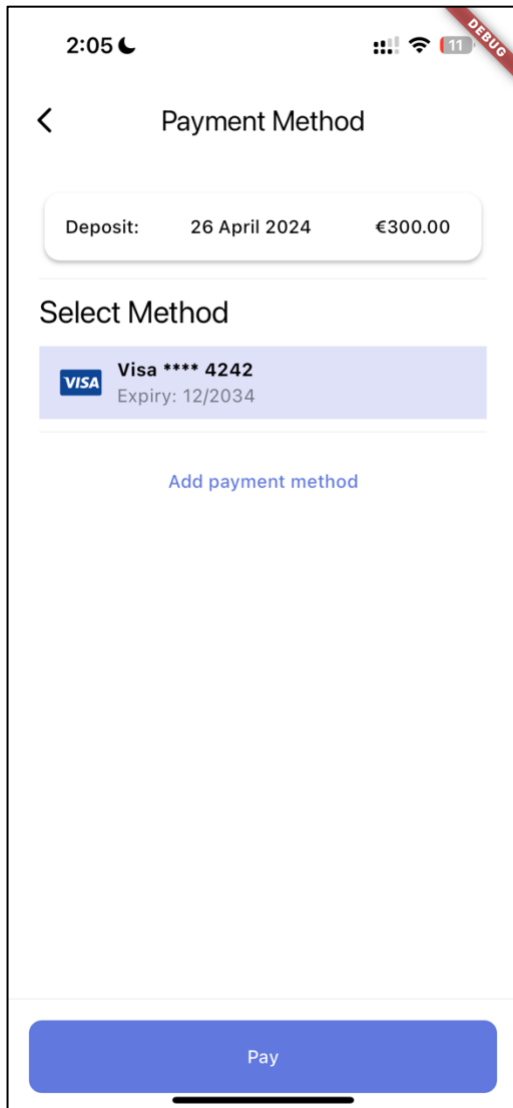


Figure 44: Payment Screen

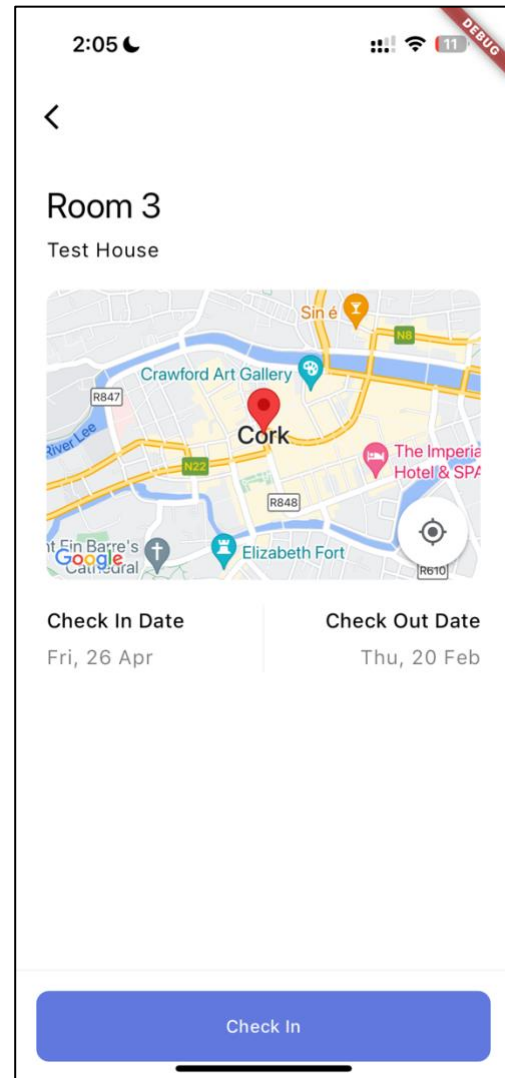


Figure 43: Check In Screen

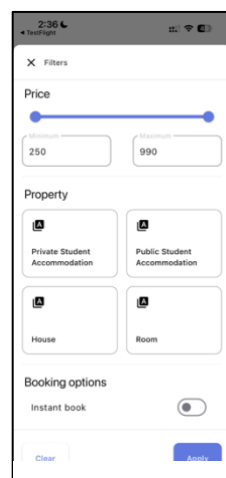


Figure 41: Filter 1

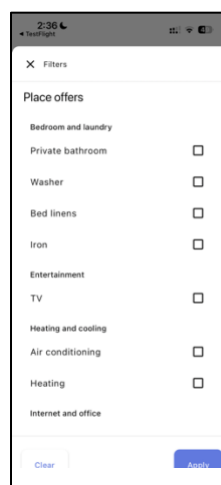


Figure 42: Filter Cont.

5. CONCLUSION

This paper on empowering student housing searches in Cork looked into the difficulties that students studying in Cork encounter when looking for a suitable place to stay throughout their studies. As a result, an analysis was conducted to determine how the creation of a comprehensive housing app can increase access, authenticity, and affordability for college/university students.

5.1 SUMMARY OF KEY FINDINGS

The interviews involving 14 students of which 5 female and 9 male students in different fields revealed that students use technology in identifying and selecting house or room that will be their home for the duration of their study. These platforms are as well considered to be unreliable. This is due to the fact that there are instances where some students who use them are afraid of being conned. Furthermore, the survey showed how many of the students paid using online debit/credit cards again this indicates that students that were surveyed majority came from public or private universities showing the infrastructure can integrate this means of payments making it transparent and secure for the company as well students that participated thus in case of any complaint, they can always look at the transactions that occurred.

On the other hand, students who completed the survey and agreed to an interview were also asked to state their own experience when trying to find a place to stay in Cork. The students interviewed described the events such as problems they faced when choosing a place to continue their education, which was useful proof of their insatiable thirst for knowledge. By way of illustration, a student who took part in an interview shared how, as a result of the lack of housing in Cork, they sometimes had to commute from and to their college and even got involved in an accident that nearly put their health and education to a risk. Further, another important part of the app development was the interviews, as these pointed out the problem of the absence of female students in certain rooms/apartments, so it was a definite feature that a filter by gender should be added.

5.2 DEVELOPMENT SUMMARY

Now, while creating eAccommodation, we had to focus on the platform that will be used for implementing the app. Since mobile Application Market is mostly share by the iOS and the android, It is very important here to decide the technology of both operating system to launch application on both platforms. After evaluating all the options flutter was decided to be the most suitable framework for developing the app. First, due to my earlier experience with Flutter, but also its support across various technologies, in addition to its vast library ecosystem and abundant documentation.

As a result, given that the app is a comprehensive housing app that will allow students to search, book, and even pay rent from a single spot, a safe and reliable infrastructure is required to store both student information and listings safely and swiftly. Furthermore, students should be able to execute safe transactions via the app, allowing landowners to accept a range of payment methods for the convenience of both the renter (student) and the landlord. As a result, the app must be supported by a robust, secure technology, especially when both the student and the landowner give private and sensitive information.

Firebase and Stripe are considered to be the project's backbone. Firebase provides services that are critical to the app's functioning while also ensuring its security and integrity. Services such as authentication, communication, and storage will be integrated into eAccommodation using Google's Flutter library, which was built and developed to take full advantage of the available services while attempting to eliminate the legal risks associated with building an app that aims to collect sensitive data, minding GDPR. Furthermore, using Stripe's payment gateway technology will help eliminate the risks associated with processing payments and establishing the necessary infrastructure.

5.2 REFLECTION ON PROJECT OBJECTIVES

All things considered; every project has its constraints. The allotted schedule for this project confined the app's functions, and the design was kept minimal to avoid taking longer to construct. At the same time, because the project was developed with numerous libraries, these libraries may have compatibility concerns with subsequent Flutter versions if the libraries and dependencies

were not routinely updated. And, most significantly, because there was no Android device to test with, the program itself was not tested for Android users.

In conclusion, eAccommodation demonstrates how innovation can help solve real-world problems, thereby improving the experiences and well-being of students looking for a suitable housing. At the same time, the app's success is dependent on its adoption by landowners and other housing complexes.

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