'Itinerise' Mobile Application Meant to Alleviate Travel Stress and Reduce Pre-travel Anxiety

Olivija Guzelyte

Student No.: 160421859

BSc Computer Science

Supervisor: Dr Lindsay Marshall

Word Count: 15454

Abstract

Nowadays, it has become quite common to associate the "busy" mentality with being successful. In result of which, a large amount of stress and anxiety is introduced in many peoples' lives. Many find themselves scurrying from one meeting to another, juggling multiple jobs and priding themselves in hard work as a coping mechanism.

Travelling is often considered the ultimate remedy to the problems above and, therefore, is the common choice of many experiencing burnout. However, travelling brings its own set of negative experiences, can be detrimental, and cause irreversible harm to relationships. Prospective travellers report feeling anxiety and pressure caused by having to plan their trips, and stress during the trips that eventually leads to arguments with their significant others. Due to these reasons many are forced to delay or disband the trip altogether.

The aim of this dissertation is to create a tool that would ultimately generate custom day-to-day travel itineraries. The tool would also provide all secondary information relating to the customised trip. This would potentially relieve people of the need to stress about the organisational aspects of their travels.

Declaration

I declare that this dissertation represents my own work except where otherwise stated.

Acknowledgements

I would like to thank Professor Lindsay Marshall for his guidance, support and feedback through this project.

I would also like to thank my family for being supportive and motivating.

Acknowledgements

Table of Contents

Table of Figures

1 CHAPTER 1: Introduction

1.1 Project Purpose

An American travel company (Wyndham Vacation Rentals) conducted a survey in 2017 asking travellers (around 1000 people) about their recent travel experiences [1]. The results were shocking – 67% admitted experiencing stress due to "information overload", and thus were increasingly anxious about planning their trips. Travels also placed a strain on their relationships – 67% argued with a significant other during the vacation. Post-trip nearly a quarter of the respondents broke up with their significant other. Nearly half of the respondents admitted that having a ready-made day-by-day itinerary would greatly reduce travel stress and assist with planning.

It is important to point out that travel companies can be used to mitigate the problems mentioned above. However, these services are costly and are the preferred choice of "cash-rich, time-poor clients" [3]. This means that only the wealthy people tend to have access to such services. Moreover, travel agents earn commission on the trips they sell [3], therefore the recommendations received might not always be objective or tailored to suit the traveller's specific requirements. Travel agents also usually place bigger emphasis on the more expense-oriented aspects of travel i.e. hotel or plane bookings, rather than tackling stress, helping alleviate anxiety levels. Studies show that the agent-made itinerary suggestions are based on an "intuitive, fast-thinking decision process", trusting their personal experience more than external, relevant marketing [3]. This signals that they are less likely to take into account client's requirements and thus produce erroneous, frustrating itineraries.

Lastly, they usually ignore the roughly 50 million customer sized market of people with disabilities who are very sceptical of travel agents as they do not possess the knowledge of what disabled people really need [2].

1.2 Dissertation Structure

- **CHAPTER 1 – Introduction – Scene Setting**

Flaws of travelling are exposed and some people groups that are often overlooked in travel are mentioned. Initial hypothesis on solving these problems are provided alongside with project aims, and objectives. Furthermore, I go over the project timeline and elaborate on how I intend to execute it. Lastly, changes that have occurred over the project's duration are introduced.

- **CHAPTER 2 – Background Research**

In this chapter I elaborate on people groups that are either overlooked by travel agents or are prone to face more issues whilst travelling. I offer some insight into travel history. I compare similar systems and tools used for trip planning, note down desirable and undesirable features. Analyse and find out how the "information overload" is created and how to avoid that in my proposed application solution. Finally, an evaluation and results from a survey regarding peoples' travel experiences are provided.

- **CHAPTER 3 – Tools and Development Methodologies**

In this section I reason my chosen project management, planning, surveying, design, development, testing tools, software. I provide software alternatives and explain the advantages of my chosen tools over them. I also give a list of frameworks, programming languages used and rationalise their usage.

- **CHAPTER 4 – System Development**

System development section concerns the design and implementation of the project from start to finish. The write-up is guided by relevant UML diagrams and code snippets. At the end of the section the GUI view is introduced and discussed.

- **CHAPTER 5 – Results, Evaluation**

This section critically assesses the paper's objectives, aim, chosen technologies and work plan. It is a retrospective evaluation about how fitting the chosen technologies were, what objectives were delivered, and whether the aim was satisfied. The section also includes a user survey, which provides help and insight into the final outcome.

- **CHAPTER 6 – Conclusion**

This part briefly goes through the personal experience with the project. It includes an assessment on what went well and worse, what could have been done better or be better in the future.

1.3   Hypothesis

The final hypothesis is based on personal experiences, beliefs, and observations, survey results from Wyndham Vacation Rentals [1], and responses to own survey (Appendix A):

"Provided with a customised day-by-day itinerary on a comfortable hand-held interface, people would experience less stress during their trips and have more pleasant memories. Including secondary information tailored for said itinerary i.e. checkbox packing list, would decrease the pre-trip anxiety and relieve travellers of negative emotions and worries before their trips."

The above-mentioned realisation was confirmed by Wyndham Vacation Rentals survey [1], in which 48% of the respondents agreed a ready-made itinerary to follow would help alleviate travel stress. I observed similar results in my own survey (Appendix A), in which nearly 42% participants voted positively to such idea, and roughly 37% replied with a "maybe". To sum up, nearly 80% of the people questioned would be willing to give the idea a chance.

1.4   Project Aim

"Build a mobile app allowing users to create custom day-by-day vacation itineraries to improve their travel experience, reduce stress and pre-travel anxiety."

The project aim is to build a mobile app that would possess a powerful filtering feature allowing to provide the user with a personal travel experience. It would filtering for special groups like: the elderly, people with disabilities, parents with children, business people, athletes etc. The app would then build a daily schedule allowing the user to strictly follow it as that would provide constant distraction – routine emulation – effective means to tackle anxiety [5].

1.5   Objectives

1. **Research current travel planning apps/tools and evaluate their flaws, probability to induce pre-travel anxiety.**

   This will allow a better understanding of the travel industry and what the regular traveller is experiencing when prompted to plan a trip. Moreover, it will be an indication of features I should include in my own app alongside with features I should avoid. I will have achieved this objective when I finish analysing Tripadvisor, Inspirock and Tripit.

2. **Conduct market research through anonymous questionnaires to determine demand and necessary features.**

   I will need to conduct a survey via suitable tool addressing current stress/anxiety concerns and confirming my hypothesis that travel stress is apparent and leads to many negative experiences. This objective will be achieved after survey creation and adequate answer amount (50-60).

3. **Build a mobile app allowing the user to randomise/build an all-inclusive travel itinerary according to custom, painstaking filtering process.**

   The minimal functionality of the app is to create a powerful travel scheduling tool scraping multiple travel sites in order to find the best user recommendations. This objective will be achieved upon delivery of this functionality.

4. **Utilise machine learning to suggest alternative activities if the user is not following the travel itinerary.**

   Context-aware feature detecting when a user is not following a schedule and suggesting alternative arrangements. This would work as a stress detective functionality (enforcing routine emulation [5]) assuming that if a user is not following the schedule an argument or something unexpected might have ensued.

5. **Organise a user group/beta testing to determine the usefulness of the implemented model.**
   This will serve as an indicator whether the app lived up to peoples' expectations and whether I successfully interpreted survey results and implemented them accordingly. Success of this objective will also mean there is a market for travel scheduler apps and could provide possibility in business.

1.6   Project Schedule

1.6.1   Initial work plan
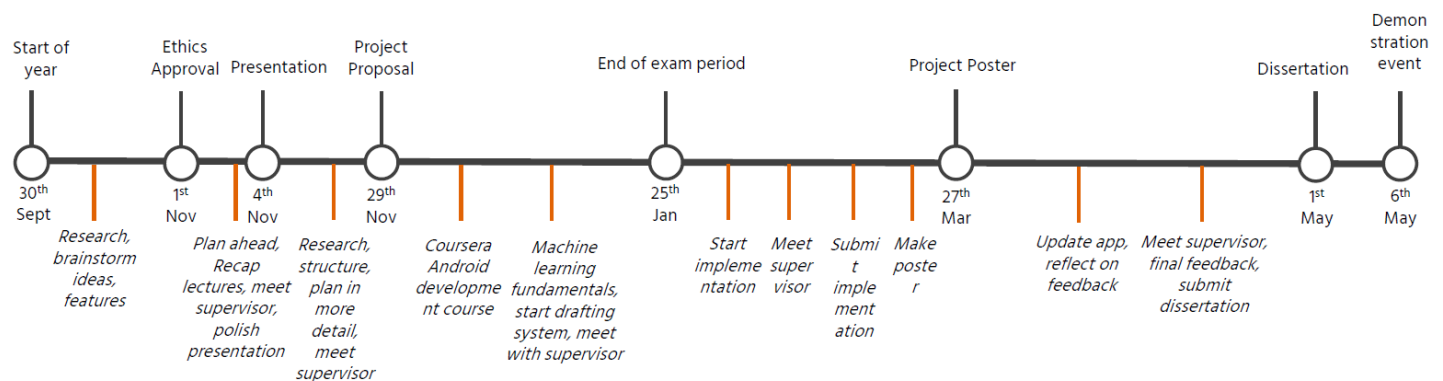
Figure 1.1 Initial work plan

1.6.2   Revised work plan from December 2019 – 6th May 2020
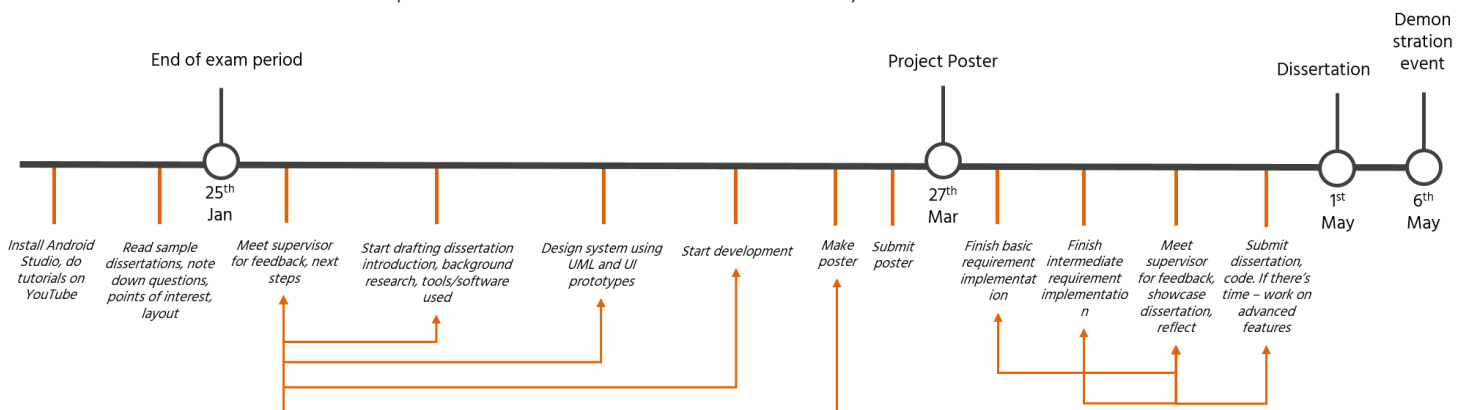
Figure 1.2 Revised work plan with corrections

1.6.3   Explanation of Schedule

Figure 1.1 shows my initial work plan that I devised at the start of the first term. Figure 1.2 shows changes made due to certain technology limitations and overestimation of work speed.

Plan structure/layout

The work plan is deadline and feedback focussed. I am following the Agile methodology and trying to minimise feedback loops by requesting feedback each time a feature/section of my dissertation is complete. I then reflect on it and improve my work.

Explanation of changes

- *Initial plan did not show feedback requests accurately*

I included back and forward arrows to denote feedback requests after finishing certain features. The initial work plan showed these very inconsistently and did not fully capture the concept of Agile and my chosen method.

- *Android Studio runs slowly on personal laptop*

Due to this limitation it is very hard to get any work done using Android Studio on my personal laptop. Therefore, I was not able to finish the full Coursera Android development course. I will also have to develop my application using the campus machines that run a slightly older version of Android Studio, however, that should not hinder my development.

- *Overestimated my work speed, scheduled work during holidays, and exam time*

Even though I anticipated to do more work during holidays and thus have a head start at the start of second term, I underestimated spending time with family, and the rest time I needed. I also underestimated the time I would need to prepare for exams. Thus, most of the holiday scheduled work ended up re-scheduled until after the end of exams.

1.7   Project Changes

Project changes will be addressed at each chapter and specifically in the last two chapters: Evaluation and Conclusion. Most of them were contingency measures reacting to the COVID-19 outbreak.

2 CHAPTER 2: Background Research

2.1 E-Tourism and Why It Is Stressful

"Also known as travel technology or "e-travel", e-tourism refers to a phenomenon and research area in which the adoption of information and communication technology (ICT) by tourists and businesses transforms the processes and the value chains in the tourism industry." [10]

Companies have come a long way since using physical card systems to manage airline reservations or hotels tracking inventories through different coloured tapes on the walls [11]. Nowadays, airlines use digital systems featuring some of the most complex dynamic pricing algorithms. The ticket price differs for the same flight, even for nearby seats and can change up to seven times in the same day [12].

Consumers have also adopted web and mobile technologies at their disposal. Ten years ago more than 80% of US tourists were expected to use a search engine for their travel plans [11]. It can only be assumed that this figure is nearing a 100% at this time. A typical tourist might be using a different website for each step of the travel: Booking.com [13] for accommodation, Skyscanner [14] for hotel or car hire, Tripadvisor [4] for travel planning. Moreover, following the emergence of ubiquitous mobile technologies, travellers can easily track, plan, and monitor each of their holiday steps on the go. For example: flight tracking, viewing destination, attraction guides, using live translators. These technologies introduced convenience, efficiency, safety and gave tourists the ability to compare services and save money. However, all of this information generation creates "big data" [11], and whilst that might be a positive term in Computing Science, it becomes a challenge to structure and display it in a smart way without overburdening the user and fuelling the negative aspects of travel.

2.2 Main Traveller Groups

- **Budget travellers**

These are usually young people: students or recent graduates. Their travel goals coincide with adventure travel – exploration or educational travel.

Travel niches of interest: cooking, languages, photography, adventure, gap year, career break, walking, cycling, cultural, road tripping.

- **Family travellers**

Family travel is very diverse, given the big gaps in traveller ages, needs and requirements. Each family member will try to fulfil their wishes whilst avoiding activities they dislike [24]. The challenge is for the travel industry to create a safe environment for the whole family to explore their interests.

Travel niches of interest: theme parks, cruises, cultural, adventure, active.

- **Luxury travellers [29]**

These are the wealthy travellers that often enjoy luxury accommodation, golf, sailing or shopping. This group is made of businessmen, entrepreneurs, investors, or stakeholders. An expanding amount of luxury travellers are experienced, and thus opt for exotic, remote locations.

Travel niches of interest: wine, culinary, exotic, off the grid, expensive, sailing, surfing, golf, skiing, shopping.

- **Baby boomers [29]**

These are the children of the post-World War II era, and are currently nearing retirement age. This traveller group is rather wealthy, healthy, and interested in adventurous activities that were once seen as "unsuitable" for their over-60 year old age group.

Travel niches of interest: sailing, surfing, golf, skiing, scuba diving, mountaineering, high pointing (hiking, climbing), nature and wildlife.

- **Travellers with disabilities**

Arguably the most misunderstood traveller market. This is a 50 million sized customer group, which is very sceptical of travel agents as they seem to be ignorant of the needs of people with disabilities [2].

Travel niches of interest: therapy and healing, nutrition, psychology, beauty and rehabilitation, spa tourism, holistic, spiritual, and cultural.

- **Business travellers**

Davidson and Cope [27] describe business travel as "all trips whose purpose is linked with the traveller's employment or business interests". However, this type of travel is considered a pleasant experience, as it includes cultural programmes, social events, spa visits, long weekends, networking events.

Travel niches of interest: weekend tourism, spa, cultural, educational, city breaks.

- **Sports travellers**

This group includes elite athletes, and sports players. They have strict schedules, and often rely on physical body performance. Travel fatigue and jet lag have to be avoided due to the adverse effect on athlete performance [28]. Scarce time for travel activities.

Travel niches of interest: weekend, spa travel, city breaks.

- **Elderly travellers**

This group engages in slow, leisurely activities. Ability to travel, remain physically active improves pensioners' emotional state, and psychological well-being [24].

Travel niches of interest: cultural, spa, holistic, spiritual, medicine, therapy and healing, walking, trekking, hiking.

- **Solo travellers**

Individuals in this travel group act anonymously, devoting "themselves to the selfish pleasures of the journey" [24]. They do not need to compromise with others, therefore travel stress originating from failing relationships does not apply here. However, the common issue of this group is loneliness and isolation from the absence of relationships.

Travel niches of interest: culinary, educational, spiritual, holistic, nature, cultural, hiking, trekking, religious pilgrimages etc.

- **Volunteers [29]**

People from this group are joined by philanthropic interests. These travellers devote their time and money to volunteer in less privileged or recently affected areas of the world. These individuals need to be made aware of the issues/dangers concerning the area travelled to.

Travel niches of interest: nature and wildlife, genealogy, rural and village, off the grid, religious pilgrimages.

- **Young backpackers [29]**

This travel group prefers overseas travel, longer stays (as opposing to weekend, week-long). Just as budget travellers they tend to travel frugally, however, prefer to splurge on active ventures such as scuba diving. They are keen on adventure, and set the path for unexplored, unpaved destinations.

Travel niches of interest: adventure, wellness, music, road tripping, hiking, climbing, off the grid, scuba diving, surfing, skiing.

2.3 Why Do People Travel?

Motivation is best described as "psychological/biological needs and wants, including integral forces that arouse, direct and integrate a person's behaviour and activity" [16]. Many models have been developed to explain motivation, out of which the "push-pull" approach [17] is the most popular due to its simplicity. People tend to be pushed by multiple intrinsic, uncontrollable needs to travel and pulled by external forces, attractions that satisfy the "push" desire. Pull factors help people decide where to go, whilst push factors are psychological and awaken the desire to travel.

There exist many "pull" destinations, such as: cultural activities, nature, climate, landscapes, outdoor life etc. However, I will only list the main "push" factors as these relate to the human psyche and help to later understand how they influence travel stress and pre-travel anxiety [18]:

- **Desire to relieve everyday stress and frustrations**

People that seek "sunlust", conform to the escapism ideology and desire to relax/escape from their lives [19].

- **Novelty seeking**

People that seek "wanderlust" – explore cultures and different environments, experience uncommon, novel feelings, emotions [19].

- **Relationship strengthening**
- **Self-development**
- **Mental health improvements**
- **Autonomy**
- **Nostalgia**
- **Romance**
- **Recognition**

2.4 Pre-travel anxiety

In response to the overwhelming complexity born from the modern day travel, many people feel travel anxiety in early stages of their trip. Anxiety (according to Oxford dictionary) is a feeling of worry, nervousness, or unease about something with an uncertain outcome. However, travel anxiety (possibly due to its fleeting nature) is not recognised as an official mental health condition, therefore it is often times ignored by health professionals or travel agents. Travellers themselves tend to dismiss this condition, thus it is only noticeable by its consequences: avoidance to book travel tickets, made-up excuses [20].

Travel-associated fear and anticipation is normal. However, refusal to acknowledge it might lead to "severe anxiety and phobias leading to avoidance of travel or anticipatory dread of it" [21]. This

intense fear affects travellers emotionally and physically. It feeds into cardiac problems and "accounts for 15% of in-flight emergencies but more than half of in-flight deaths" [21]. Travel agents are mostly focussed with the profitable aspect of travels, and therefore rarely address these issues [22]. The situation has improved over the years, and external sickness, outbreak information is often present on brochures, however, scarce emphasis is placed on mental health.

2.4.1 Common Causes of Pre-trip Anxiety

- **Fear of flying**
    - *Flight delays*

    Most common source of anxiety as reported by a 1992 study [22], with above 50% respondents reporting anxiety. It can only be assumed that nearly two decades later and tourism industry becoming more wide-spread and fast-paced this score would be even higher.

    - *Luggage handling*

    Rated as being "often" or "always" a source of anxiety by the largest percentage of travellers (11% and 10%, respectively) [22].

    - *Customs inspections*
    - *Security clearances*
    - *Take-off and landing*
- **Horror stories**

Commonly attributed to media portraying "worst case" scenarios. Daily news reports of war, kidnapping, dangerous diseases subconsciously makes prospective travellers paranoid about leaving [20].

- **Running out of money**

Being alone in a foreign country or city without any money is a frightening ordeal [23]. Inability to speak a foreign language and unfamiliar surroundings may also make it hard to communicate this to others.

- **High expectations**

Due to often-times nostalgia-fuelled tourism [6], people raise their expectations and hope to relive some pleasant memory of the past. There is also the financial aspect of travelling, which makes people hope for "worthwhile" experiences. Depression and existential dread follows unmet expectations.

2.5 Travel Stress

Stress is defined by Oxford dictionary as a state of mental or emotional strain or tension resulting from adverse or demanding circumstances. People on the move are vulnerable to tension due to completely foreign circumstances. Travellers, especially women, are subject to a "broad array of sensory experiences" [24], which can evoke very strong memories of the past. This can be a positive experience as well as negative. There is a strong duality between that, which is personal, experienced, and that, which is external, routinely and needs to be taken care of. This duality can create friction between relationships

Many travellers from more vulnerable, restricted or conditional travel groups are almost guaranteed to experience travel stress. Medical, disabled, elderly travellers might be reminded of the activities

they cannot perform, and their caregivers have to constantly worry about their condition. Solo travellers may worry for their safety, and business travellers about work.

2.5.1 Common Causes of Travel Stress

- **"Demands and stresses of relationships" [24]**

Holidays are said to "test the quality" [24] of couples' or families' relationships. Grayling [25] defines modern family life as a "species of intermittent anaesthesia", which is a sort of numbness after living together sharing routinely tasks and responsibilities as a working parent/spouse. A lot of pent up anger and annoyance builds up during these years and replaces positive emotions, causing negativity, arguing and worst case scenario – break ups or divorces.

- **Dissatisfying social life**

This applies to solo travellers. Negativity is created by feeling lack of time to get to meet/know locals, dealing with obnoxious behaviour of newly met people or a group (if travelling with one) [24].

- **Overbearing leisure and recreational life**

This concerns package or group tours that tend to exert too much control over a traveller's life. Dissatisfaction manifests as a fear of missing out due to too many activities of a certain type being introduced at the destination forcing the tourist to miss out on the important ones [24].

- **Guilt and worry regarding family life**

Creating separate travel plans from the family whilst travelling together or not being able to get in touch with one another [24].

- **Local art and culture**

Monolingual people may have a hard time communicating with locals due to language barrier, or have a hard time accepting local culture [24].

- **Work during travel**

This applies to travelling business people or working professionals. Worries include having to be responsive to work calls, be nearby an internet signal, not having enough time for leisure or not being productive [24].

- **Health and safety**

This includes worries about various outbreaks, hygiene of the visiting country. It commonly includes fears of weight gain and recent terrorist or criminal activity [24].

- **Overspending and financial concerns**

Many people (especially budget travellers) have to carefully monitor their expenses during trips. Consumerism and impulse purchases originating from novel emotions of the new destination cause travellers to be wary of their finances [24].

- **Spiritual vacuum**

Nature travellers seek to visit areas of spiritual significance and exhilaration. Absence of these make people regret the money and time wasted. [24]

- **Intellectual concerns**

Some people travel for educational purposes, to learn more about the area, visit museums or theatres. Absence of these services creates negative emotions [24].

- **Culinary concerns**

Not having a good enough variety of food to choose from or having to pick from unfamiliar food items and beverages can cause negative emotions for picky eaters. [24]

- **The self**

Not having enough time to explore and do things by oneself is a problem to some tourists. The opposite is also an issue – with many solo travellers feeling bored or lonely during their travels [24].

- **Travelling with an ill person or as an ill person**

Medical travel is known to make patients feel more normal and works as a mechanism to cope with illness. However, high cost of treatment, worries about time of surgery, its outcomes, various diseases affects the patient, his/hers family or caregiver financially and psychologically. "Medical problems generally lead to stress and anxiety for the person because of both physiological and treatment-related problems" [26].

2.6 Existing systems

2.6.1 Tripadvisor

Overview

Tripadvisor [4] is an online travel company that largely features vast user-generated content, competitive price comparison tools, and online bookings/reservations.
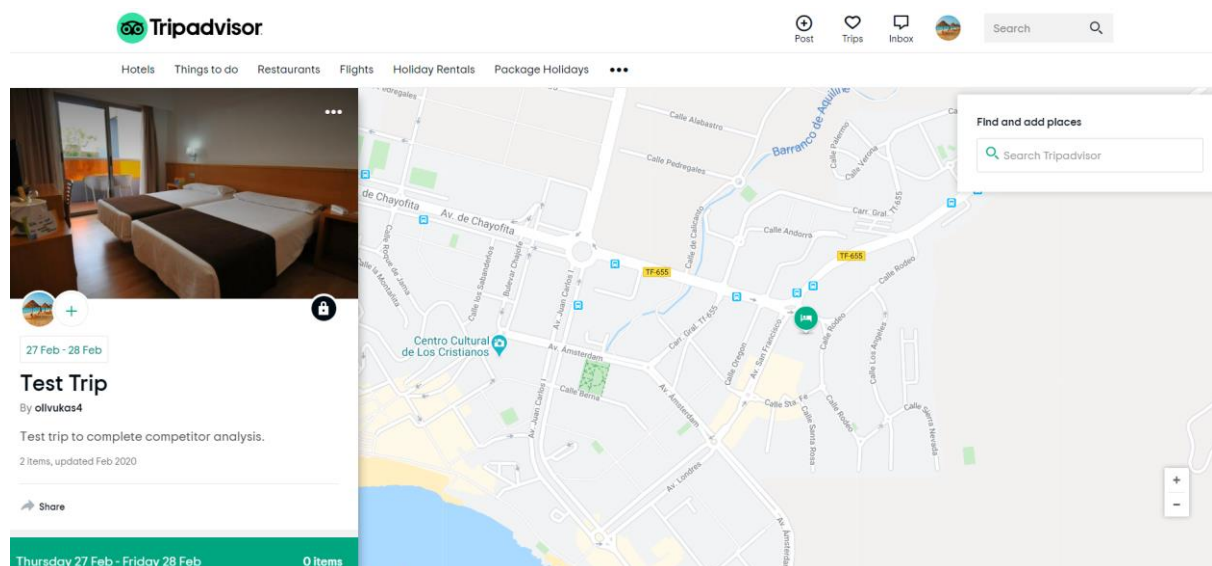
Figure 2.1 Trip interface provided by Tripadvisor

Key Features

1. Shows recommended destinations based on past interests.
2. Features extensive user-generated content: reviews, images, comments, feedback.
3. Showcases a vast library of things to do at a specified location for a specified purpose.
4. Each activity has an overall ranking and is rated based on specific properties (i.e. price, service, value).

5. Allows hotel, activity, tour, flight, restaurant, package holiday bookings with competitive price comparison and analysis alongside with complex filtering functionality.
6. Allows basic manual creation of trips (public or private), adding notes and activities from the library it provides (Figure 2.1).

2.6.2 Inspirock

Overview

Inspirock [41] is a free travel planning tool specializing in generating complete day-by-day travel itineraries based on custom preferences, allowing users to manage them, make online reservations.
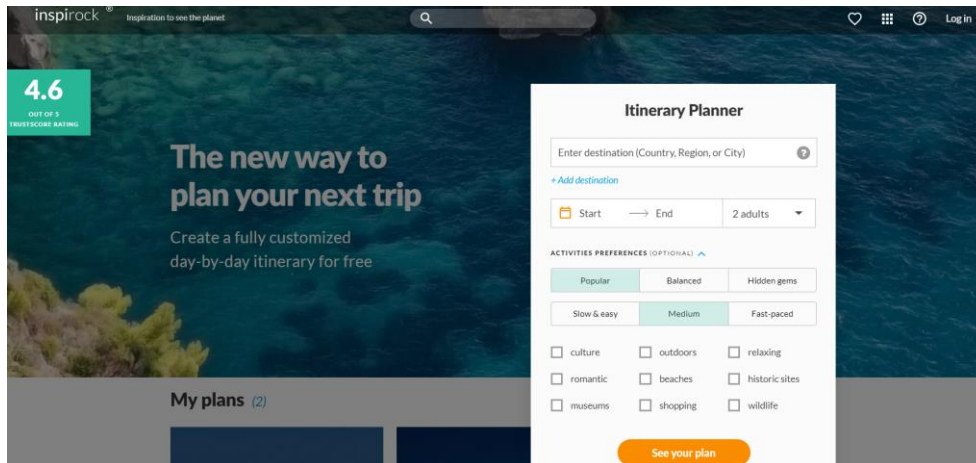
Figure 2.2 Inspirock homepage showcasing activity preferences

Key Features

1. Generates a day-by-day customised travel itinerary for the full trip, following specified desires, interests and pace of trip (Figure 2.2).
2. Allows editing, deleting activities within the itinerary and exchanging with alternative ones found in the system or custom ones created by the traveller (Figure 2.3).
3. Supports a hotel booking functionality (based on sending the user to an external site). It also allows importing external bookings into the itinerary.
4. Allows itinerary sharing through social media, e-mail and adding co-travellers to the same account in order to edit, view the itinerary collaboratively.
5. Supports importing itinerary to calendar of choice.
6. Offers customer support, travel agent help.
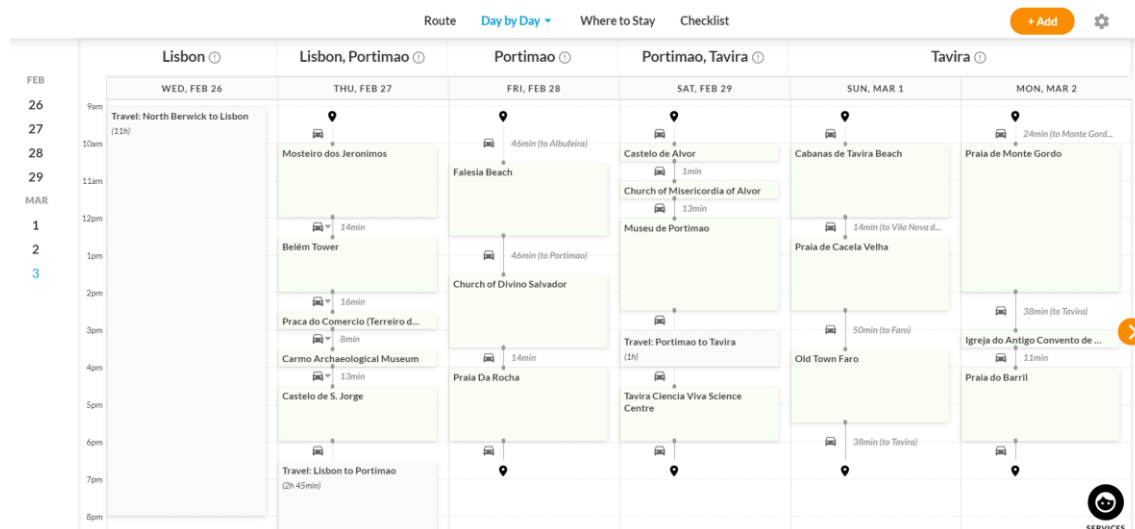
Figure 2.3 Calendar themed trip overview

2.6.3   TripIt

Overview

TripIt [42] is a travel organising tool that builds a master itinerary overview based on multiple confirmation e-mail imports: flight itinerary, hotel confirmations, travel agent bookings, relevant cruises, events, restaurants, even movies.
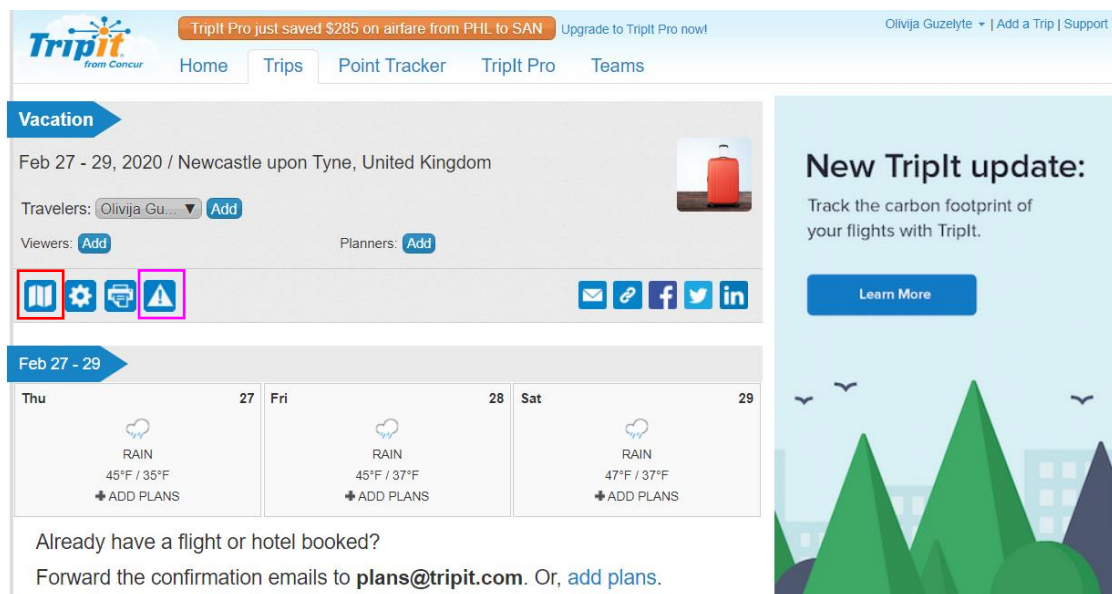
Figure 2.4 TripIt "Trips" interface

Key Features

1. Allows organising trip information from many different sources (Figure 2.4).
2. Allows offline itinerary access.
3. Pro (paid) version allows real-time alerts and notifications (Figure 2.4 pink square).
4. Provides statistical travel information (i.e. distance covered, cities visited), calculates carbon footprint.
5. Has a web as well as a mobile version.
6. Allows seeing in which place of the world your network resides at a given moment.
7. Shows safety score of neighbourhoods being visited.

8.   Provides maps of airports and terminals (Figure 2.4 red square).
9.   Allows plan sharing and calendar synchronisation.

2.6.4   Desirable Qualities Comparison Table

The following table provides an overview of desirable features within the competitor systems.

Feature	Competitor		
	Tripadvisor	Inspirock	TripIt
1. clean	✗		
2. easy to navigate	✗		
3. intuitive			✗
4. aesthetics			✗
5. mobile version		✗	
6. exporting results on paper	✗		
7. generates a personalised itinerary	✗		
8. complex filtering capabilities (i.e. for people with disabilities)	✗	✗	✗
9. shows activities based by preferences			✗
10. activity reviews, comments			✗
11. creating custom activities	✗		✗
12. trip customisation, editing			
13. hotel reservation system			✗
14. importing external hotel reservations	✗		
15. adding travel notes			✗
16. some (i.e health, safety, local law) info on destination	✗	✗	
17. useful trip preparation tips (i.e. packing checklist)	✗	✗	✗
18. some form of 'to do list' to complete trip (i.e. 'book a taxi', 'book hotel')	✗		✗
19. customer support/travel agent help			
20. itinerary sharing			
21. importing itinerary to calendar of choice	✗		
22. allows co-travellers to be added, view and edit trip	✗		
23. best things to do in chosen destination			✗
24. notifications	✗		
25. machine learning: suggesting users alternative activities if they are not following the plan	✗	✗	✗
26. calculating carbon footprint emissions from trip	✗	✗	
27. offline access			

Figure 2.5 Desirable Qualities Table

2.7   Questionnaire

This chapter will cover the analysis and results of a survey conducted online throughout February 2020. It is important to mention that online questionnaires are completely voluntary and anonymous, thus users are more eager to "abuse" them and skew the data. To protect from that I allowed only five daily responses from the same IP address and included a reCAPTCHA V2 spam protection. The questionnaire form can be found in Appendix A, and its results in Appendix B.

2.7.1   Software Used

The software used to build the questionnaire is called the "Form Builder" [30]. The main reasons why I chose this tool over others were its short learning curve, no price cap, unlimited responses, relative flexibility with survey creation, report generation, and Newcastle University's branding.

Alternative tools included "Online Surveys" [31], "Ombea" [32], and "Survey Monkey" [33]. The first two were dismissed due to the need to apply for licenses causing inconvenience and slowness.

"Survey Monkey" was left out because its basic free plan had limitations like allowing only ten questions per survey. The free plan had other analytical restrictions that I did not want to face [34].

2.7.2 Reason for Use

The goal of the survey was to determine travel stress and pre-trip anxiety levels, as well as what people believe causes them. Additionally, I opted to find out which tools/methods people use to prepare their travel itineraries, or whether they outsource it. Lastly, I asked some questions about Tripadvisor and Inspirock to gauge the respondents' knowledge and opinion on these tools.

The survey was shared through various social media: "Facebook" [35], "Reddit" [36], "LinkedIn" [37] and dedicated survey websites: "Survey Circle" [38], "Survey Swap" [39], and "Poll Pool" [40]. The survey ran for nearly a month and collected 61 responses.

2.7.3 Demographics

The purpose of this survey was to capture responses by travellers' of various ages (Figure 2.7) and
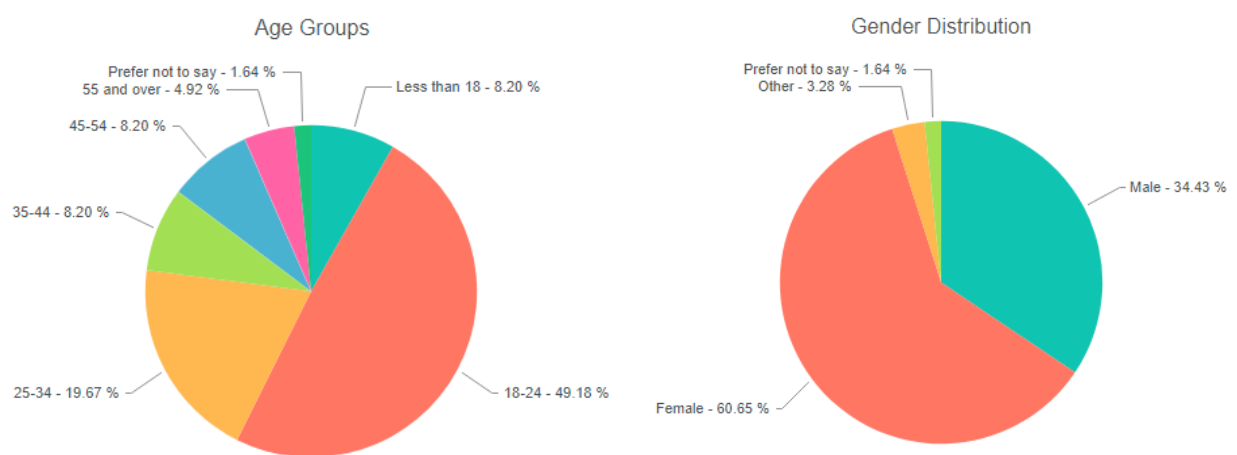
Figure 2.7 Age group distribution

Figure 2.6 Gender distribution

sexes (Figure 2.6).

Regarding age, the overwhelming majority of responses (49.18%) were from 18-24 year olds. This group falls into the "student, backpacker" category and whilst it is one of the most prone to travel groups it is also the most active group on social media. However, the other 41% of respondents were people of ages 35 and over, even including 5% of elderly travellers whose responses are important for my project.

Regarding gender distribution, the overwhelming majority of responses (60%) came from females, whilst only 34% were men. This may be due to the fact that females are more active on social media and more eager to participate in surveys.

2.7.4   Results

2.7.4.1   Pre-trip Anxiety

The majority (69%) of the respondents reported experiencing pre-trip anxiety (Figure 2.8). In the survey form I defined pre-trip anxiety as follows:

"Pre-trip anxiety is a form of anticipatory anxiety. It's not a specific phobia, such as a fear of flying or fear of driving, although these phobias can contribute to the anxiety felt by someone with pre-trip anxiety. Symptoms may include a sleepless night before a trip, an upset stomach, or feelings of dread."

The results suggest that travellers are able to identify and understand these symptoms. I initially hypothesised it would be hard to notice or confirm their existence. Men (62%) were slightly less likely to experience pre-trip anxiety than women (71%).

Figure 2.8 Pre-trip anxiety results

2.7.4.2   Travel Stress

Travel stress is arguably the most important indicator in my study. Nearly all the respondents reported feeling stressed during their travels. A staggering 77% of travellers confirmed they felt stress whilst travelling, despite it being known as a relaxing activity (Figure 2.9). If we consider the respondents that answered "Maybe" as those who could have experienced stress but are not inclined to acknowledge or admit it, it brings the total percentage to nearly 87%. This means that almost everyone travelling is prone to stress.

Arguing

A slightly more variety in responses could be noticed when respondents were asked if they argued with their

Figure 2.9 Travel stress results

travel partners because of stress. The majority of people responded "Yes" (57%), however an almost equally big part (41%) answered "No". In conclusion, travel can often cause issues between travel groups, however it can equally be avoided.

Suspected Causes

The answers to this question were varied, and respondents were allowed to select more than one indicator (Figure 2.10). However, planning, safety, air travel, packing, and financial concerns seemed to be the biggest concerns for most people. This conforms to researched material and confirms the same trends hold in 2020. Some respondents entered their own answers reporting worries about family, homesickness, or catching illness when flying, delays, missing connections (air travel), or organising, keeping track of a group (meeting the needs of travel companions).

Figure 2.10 Travel stress causes

2.7.4.3   Travel Itineraries

Unsurprisingly, the vast majority of respondents (nearly 89%) prepare their own itineraries, whilst the remaining 11% either use travel agents or do not plan at all.

However, when asked if it feels overwhelming to do all the planning by themselves, the participants are split almost evenly. 57% reported not feeling overburdened by the vast information sources, whilst 43% reported being affected. This result negates my initial predictions.

Methods/Tools Used

To my surprise, "Skyscanner" was only used by roughly 10% of respondents. Another surprise was "TripIt" (flexible travel organising tool) - had absolutely 0 users. "Google Maps" were used the most – 31.35% - which proves it is most efficient to have travel planner tools on mobile as people often look for directions. "Tripadvisor" and "Pen and Paper" were the most used out of travel planning apps. This indicates that people like viewing recommendations in a centralised domain (Tripadvisor) and having the option to access schedules on paper (Pen and paper).
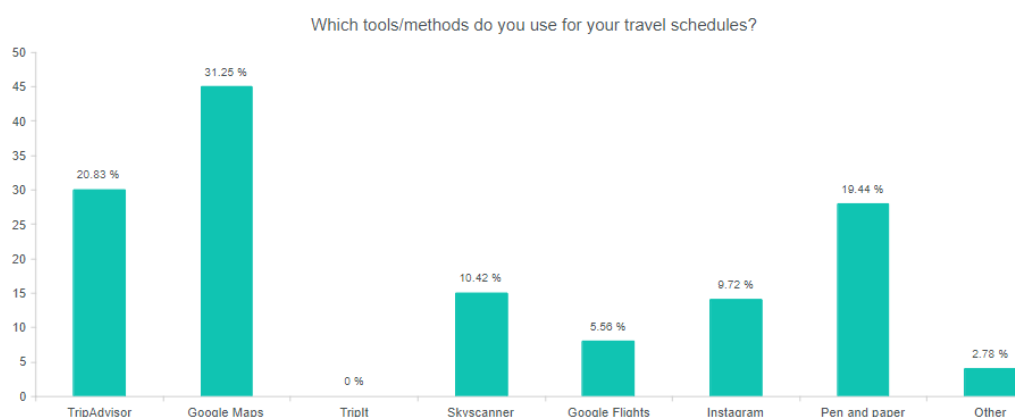
Figure 2.11 Methods/tools used results

2.7.4.4   Competitor Overview

Tripadvisor

Contrary to my expectations, only 16% of respondents confirmed they use Tripadvisor to plan their journeys and make online bookings. However, nearly half (44%) admitted to be using this tool

sometimes, which, I believe, is a more honest evaluation, as it can be seen in Figure 2.11 Methods/tools used resultsmethods of trip preparation are very complex and varied.

Another thing I wanted to determine about Tripadvisor was whether people felt it suffers from information overload and has a messy interface. My assumption was that most of people will not pay attention to irrelevant information on Tripadvisor, thus they would not feel it is cluttered, which is reflected by 14% of respondents answering "Prefer not to say". However, nearly half of the participants (42%) agreed to it being convoluted, with the rest (44%) disagreeing. This result proves my assumption and encourages the need of a clean, condensed user interface.

Inspirock

Inspirock is a free day-by-day personalised itinerary planner tool. I will be basing my mobile design and functionality on this tool as it is almost a web-based equivalent to my project. However, before this dissertation I have never heard of it and my suspicion was that not many people have either. This is reflected in the survey results with no one (0%) reporting using this tool. As I had anticipated, slightly more than half of the participants (67%) said they have never heard of this tool before and the remaining third said they do not use it at all.

2.7.4.5   Personalised Travel Itinerary Generation

The question asked at the end of the survey was meant to serve as a reflective call and gauge users' interest in a day-by-day travel planner tool (Figure 2.12). Nearly half of the Wyndham Vacation Rentals clientele (48%) agreed a ready-made itinerary would help cope with travel stress. My survey participants showed similar trends with 41% responding positively to such an idea. Moreover, slightly more than a third of the respondents (37%) replied with a "Maybe", therefore I can conclude that a total of 78% would be willing to entertain the idea and capabilities of such a tool.

Do you believe a personalised travel itinerary would help you have stress-free holidays?

Prefer not to say - 1.64 %
Maybe - 37.70 %
Yes - 40.98 %
No - 19.67 %
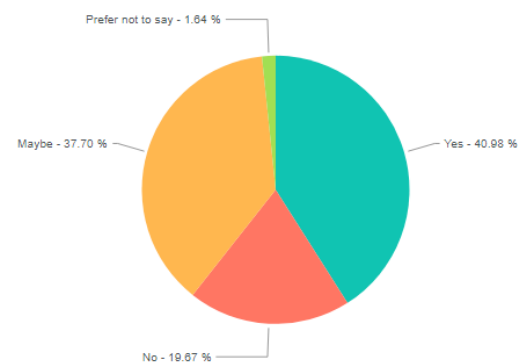
Figure 2.12 Interest in a day-by-day itinerary tool

3   CHAPTER 3: Methodology

3.1   Requirements

Below are the snippets of functional and non-functional requirements:

3.1.1   Functional

Requirement	Priority (H, M, L)	Delivery (full, partial or will not be delivered)
1. The user will be able to register with Itinerise.	H	Full
2. The user will be able to login and view all the created trips.	H	Full
3. The user will be able to edit the trip.	H	Partial (only trip deletion supported)
4. The user will be able to generate a trip based on custom requirements.	H	Partial (some customisation options not functional)
5. The user will be able to see transport options between start location to the destination and back.	H	Full
6. The user will be able to see transport options and time between different destination locations.	H	Full
7. The user will be able to choose to either travel to a country or a city.	H	Full
8. The user will be able to access the trips with no internet access.	H	Partial (currently only works for unregistered, anonymous users)
9. The user will be able to print trips.		
10. The user will be able to view suggested activities and see their rating, some information.	H	Full
11. The user will be able to see activity reviews, comments.	L	Not Delivered
12. The user will be able to edit the trip.	M	Partial (currently only the name can be customised)
13. The user will be able to see and book available hotels.	M	Not Delivered
14. The user will be able to view trip safety information and news.	L	Not Delivered
15. The user will be able to share itineraries.	L	Not Delivered
16. The user will receive notifications about an upcoming trip.	L	Not Delivered
17. The user will have a 'to do list' before a trip.	M	Not Delivered
18. The user will be able to see custom packing information.	M	Not Delivered
19. The user will be suggested alternative things to do if trip route is not being followed.	M	Not Delivered

Figure 3.1 Functional Requirements

3.1.2 Non-functional

Requirement	Priority (H, M, L)	Delivery (full, partial or will not be delivered)
1. The code will be clear and easy to understand.	H	Partial (some code is wordy and congested due to unfamiliarity with technology)
2. The app will be scalable and flexible towards an enlarged user base.	H	Full
3. The app will be easy to use for all ages and technological proficiencies.	H	Full
4. The app's design will follow Google's material design guidelines.	H	Full
5. The trip recommendations will be unbiased.	H	Full
6. App will be robust and have low response time.	H	Partial (trip generation takes a while due to multiple HTTP requests)
7. The app will not require internet connection for core functionality.	H	Full
8. The user will be able to access the trips with no internet access.	H	Partial (currently only works for unregistered, anonymous users)

Figure 3.2 Non-functional Requirements

3.2 Tiers

Based on the amount of time and development speed, a set of tiers was devised for this project. For satisfaction with the outcome of the app, the base tier functionality has to be provided. If either intermediate or advanced functionality is provided I will conclude great success on this project and substantial mastery of the tools and technologies used.

3.2.1 Base

The base functionality will be delivered if:

- The application GUI is clean, intuitive, and easy to navigate.
- The application generates a personalised itinerary based on custom requirements.
- The application shows transport options to and back from destination.
- The application has support for offline access.
- Transport options between multiple destinations are provided.
- The trip suggestions are unbiased and retrieved from a couple of sources.
- User can register, login and access generated trips across devices.

3.2.2 Intermediate

Intermediate functionality will be delivered if the base functionality is provided and:

- The user can customise a created trip and add travel notes.
- There is a hotel finding, booking functionality.
- Some packing information and a 'to do list' is provided.
- Application has a printing functionality.

3.2.3 Advanced

Advanced functionality is provided if base, intermediate are completed and:

- Application sends various notifications to the user.

- Application suggests alternative activities if user not following the plan.
- Health and safety information for a particular trip is displayed.
- Application calculates carbon footprint emissions for trip.
- Application shows activity reviews, comments.
- Application allows customised activities and activity editing.

3.3 Tools/Software

3.3.1 Application

3.3.1.1 Existing Software

The current market is dominated by Android [43] and iOS [44] smartphones. Each of the above platforms have their respective integrated development environment (IDE): Android Studio [45] and Xcode [46]. Aside from user base and market share, these platforms are very different and thus have their own strengths and weaknesses.

Android Studio

Google app store [50] has a simple app acceptance process, loosened and fast quality assurance, which favours new creators and eliminates big upfront costs. Android Studio runs on Java [47], therefore the application is hardware independent. It officially supports two languages – Java and Kotlin [48], which are interoperable and very widely used. Big community and documentation. However, Android is an open-source product and suffers from many security pitfalls, meaning that app creators have to take user security in their hands with complex encrypting. Moreover, the range of Android operating systems is massive. Only a small minority of users are at the most recent, updated versions of Android, and the biggest percentage - 17% is still at version 6.0 Marshmallow [51]. Since the Android market is so fragmented, many manufacturers create additional layers on Android to diversify their produce creating changes in functionality and failing apps. The lack of an industry standard and major diversification creates many problems for application developers.

Xcode

Apple store has an expensive and strict app acceptance process allowing only high quality products through, which results in a whopping 66% of users willing to pay for apps (twice the Android amount). Apple has strict standards, therefore developing applications is a smooth and seamless process. Xcode IDE provides a helpful interface, and allows convenient testing features. However, as iOS only runs on Apple products, Xcode is only available on iOS platforms, which is a big limitation. It uses the Swift programming language that is very Apple-specific and it is a much smaller online community with a lack of coding examples and other useful materials.

Chosen Software

'Itinerise' was thought of to encourage global movement. Android is overwhelmingly dominating the global smartphone market share with 87% [52] and its open-source software is being adopted by more brands each year, therefore the initial platform of choice was Android Studio with Kotlin. However, past experience proved that Android Studio requires a lot of computational power to run efficiently and would prove to be extremely slow on a laptop. The resolution was to use the USB's powerful stationary computers. However, due to COVID-19 pandemic and university closure, I had to resort to changing the whole software development model. After further research, I discovered Ionic [53] - mobile app development platform that allows the creation of cross-platform mobile apps using its pre-made components and TypeScript-based Angular [54]. This platform allowed rapid development, fast compilation and instant creation of an Android, iOS app and a PWA. Furthermore, due to personal familiarity with Web technologies rather than Mobile, I was able to grasp the

concepts faster, which helped me complete the 'base' functionality even after losing time due to the current global outbreak.

3.3.2   Management

3.3.2.1   Tools

Overview

There is a wide variety of project management tools. These include task management, version control, and storage software. Due to this being a solo project and potential copyright issues, the consensus was against GitHub [55] usage. The main management software was storage, communication and micro-task management applications.

Chosen Tools

- Dropbox [56]

Lightweight file hosting service that was chosen due to ease of use and long-time familiarity. It was mainly used for small paperwork file storage.

- Google Drive [57]

File storage and synchronisation software that found its use for larger, editable file storage and served as application back-up.

- Agantty [58]

Simple and clean Gantt chart software used for long-term goals, milestones and meeting deadlines amidst other module submissions.

- Any.do [59]

Productivity platform used for accountability and daily, micro task management. It is available for mobile devices, and guards against forgetfulness.

- Microsoft Office Suite [60]

Bundled set of productivity applications used for presentational, written submissions and communication.

3.3.3   Prototyping

3.3.3.1   Existing Tools

Application planning and design is arguably more important than the actual development. There is a wide array of available design, prototyping, modelling tools to assist with that. The prototyping design space is clearly dominated by Sketch [65], which is used by companies such as Facebook [61] and Google [62]. A worthy competitor is cross-platform Adobe XD [63] used by the likes of Microsoft [64] and Dropbox. Wireframing software, such as Balsamiq [66] exists as an alternative to the mentioned services focussing more on UX than the UI. However, Balsamiq's wireframing software is colourless and as the focus of this project is stress management – Adobe XD and Sketch were proved to be more suitable.

Chosen Tools

- Adobe XD

Powerful and easy-to-use design platform with transition and animation support that is available on Windows and Apple devices unlike Sketch, which is limited to Apple. Adobe XD

features many popular UI kits (such as Google Material Design [15]) enforcing rapid prototyping and conforming to design guidelines.

- Adobe Photoshop [67]

Industry standard graphics editing software that was used for project poster creation, logo and other design work. It was chosen for its reputation and wide plethora of editing, exporting functionality.

- Draw.io [68]

Open source free to use UML tool featuring cross-platform support, helpful extensions, fast modelling, PDF export and support for UML 2.x meta-model and all diagrams. Used by Google, Facebook, Apple among others.

- Camtasia [69]

Easy-to-use screen recording and video editing software featuring an intuitive UI, drag and drop interface. Used for representative demo video creation.

3.3.4 External Libraries and APIs
- Firebase Authentication [70]

User authentication service provided by the mobile and web application development platform – Firebase. This feature is used within 'Itinerise' to register and authenticate users in the app.

- Firebase Cloud Firestore [71]

Flexible, scalable NoSQL database provided by the platform Firebase. It keeps data in sync across app instances through real-time listeners. Within 'Itinerise' this storage is used to store trip information in JSON format.

- Amadeus for Developers [72]

Amadeus is a computer reservation system offering its services via various APIs for flight, hotel, and destination content or trip information. In 'Itinerise' it is used to find flight offers to and from the chosen destination.

- Yelp API [73]

Yelp is a recommendation service, which publishes crowd-sourced reviews about businesses and events. It offers local business data through its Yelp Fusion API that is used within 'Itinerise' to source various unbiased activities and events based on custom queries.

- Google Places API [74]

Google Places API is part of a set of APIs developed by Google, which can be used to find information about many places around the globe. Within 'Itinerise' this API is used to find a list of most popular cities in a given country, autocomplete queries, fetch destination activities data based on custom queries.

- Google Maps API [75]

Google Maps API is also part of the Google API offerings and is most commonly used to customise and create dynamic maps. Within 'Itinerise' this API is used for its Directions Service, which calculates the distance and modes of transport between destination cities (if destination is a country object).

- IATAGeo API [76]

Simple API used to retrieve IATA codes for a given latitude and longitude. In 'Itinerise' this is used to get the IATA codes for Google Place objects and fed to the Amadeus API whose Flight Offers Service only supports IATA codes.

- BlaBlaBus API write [79

An API for BlaBlaBus services. Used within the app to fetch bus fares.

3.4 Methodology

3.4.1 Overview

There exist many project execution and management methodologies, out of which the most widespread is Agile and the somewhat obsolete Waterfall model. Agile is based on interactive, and responsive development, whilst Waterfall is sequential and does not allow going backwards in phases. One of the more interesting development methodologies is RAD, which favours rapid prototyping and minimal planning. Another one is the Iterative model, which was created as a response to Waterfall's weaknesses allowing to cycle between different project phases.

3.4.2 Chosen Methodologies

Initially the Agile approach seemed feasible and most effective. Organising weekly meetings with the supervising professor was an easy and convenient process due a relatively relaxed schedule and ability to meet face to face. The initial process allowed to minimise feedback loops and produce better thought through deliverables.

Due to the global events and COVID-19 pandemic, which led to university closures, time loss and leaving university's premises – the development methodology switched to a mix of Waterfall and Iterative models. The development could not begin until design, and background research were fully completed. This was done to gauge demand, user interest, and attempt to minimise the development time. However, software tool and project requirement changes were made due to no access of better development hardware, which conforms to the Iterative model.

4   CHAPTER 4: Software Design/Implementation

4.1   System Architecture (Diagram)
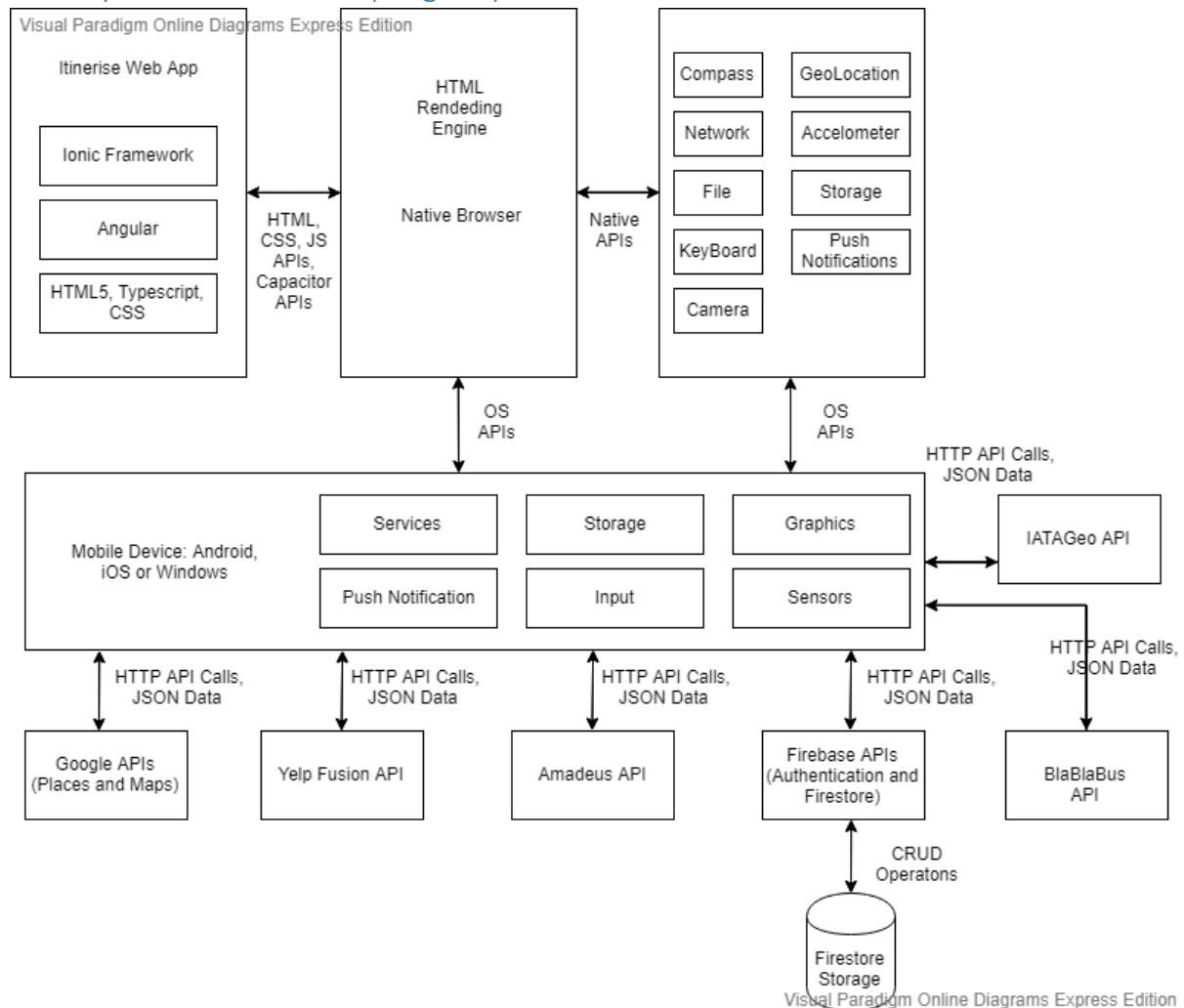
Figure 4.1 Diagram 1: Architecture Diagram

Diagram in Figure 4.1 Diagram 1: Architecture Diagramrepresents the underlying architecture of 'Itinerise'. The architecture diagram showcases the principal work done by the Ionic cross-platform runtime 'Capacitor'. It creates a container out of the 'Itinerise' Web app and provides constant access to Native APIs for every platform the app runs on. This makes the app accessible natively on mobile, desktop and the web.

Whilst the initial target device for which the app was modelled for was an Android phone, this application can extend to work cross-platform on iOs, Android, Windows or Web app.

The application performs extensive JSON CRUD operations using various APIs. Google Places API is used for planning trip activities and customisation auto-fill feature. Google Maps is useful for transport options generation. IATAGeo API is used for finding IATA codes and feeding them into the Amadeus API for flight offer searches. Alternatively, BlaBlaBus API finds bus schedules. Finally, Firebase Authentication API is used for the register/login functionality, whilst the Firestore API is used for cloud storage.

Some of the HTTP requests are done using the Axios open source library. A few others make use of Angular's HttpClient module, which uses the RxJS library to handle asynchronous requests. The rest are done via NPM packages. This was done purely for experimental purposes

4.2   High Level Overview of Functionality (Component Diagram)
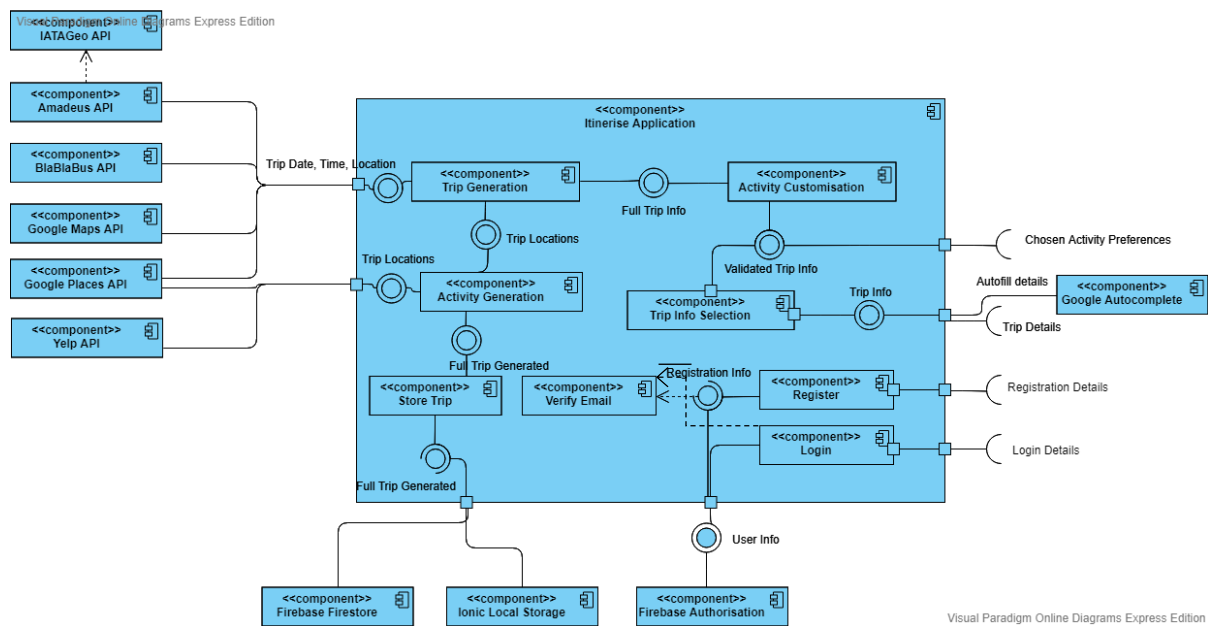
Figure 4.2 Diagram 2: Component Diagram

The app flow in the component diagram (Figure 4.2) goes right to left. For clarity, registration and login functionality is demonstrated separately from Trip Generation.

The above diagram showcases the overall functionality of individual parts of the application. The complexity of the application comes from the multiple API calls that happen simultaneously whilst generating a trip. This adds on to the dynamism and intelligence of the app, however, creates a considerable delay on the user's side.

To begin with, Trip Info Selection represents the functionality of collecting and validating user form data, which arrives via form fields and autofill details provided by the Google Autocomplete Service. Next, the Activity Customisation component validates trip customisation choices represented by radio and checkbox buttons and appends them to the Validated Trip Info.

After the user-facing components have run, Trip Generation service takes care of transportation (transport to and from destination, between destination cities), and destination filtering (splitting destination country to cities) procedures. Validated Trip Info and Chosen Activity Preferences now become Full Trip Info and are extracted to be used in API calls to Amadeus, BlaBlaBus, Google Maps, and Google Places APIs. Amadeus is dependent on IATAGeo API, which provides IATA codes for HTTP requests.

Finally, the generated trip is stored as either local offline storage or Firebase Firestore. If the user is logged in, the trip is stored on the cloud, otherwise Ionic Storage is used for local saving. Ionic Storage uses a variety of storage engines picking the best option available depending on the platform used. When ran as a native app, Ionic Storage will prioritise SQLite, otherwise it will attempt to use IndexedDB, WebSQL and others.

Separately from trip generation, the Register component takes in the email, full name and password of a new user and stores it within Firebase storage. It also sends this information to the Verify Email component, which is responsible for verifying the user's identity. The Login Component takes user email and password and depends on the Verify Component's outcome to authenticate the user.

4.3 Package and Class diagrams (dependencies between components)
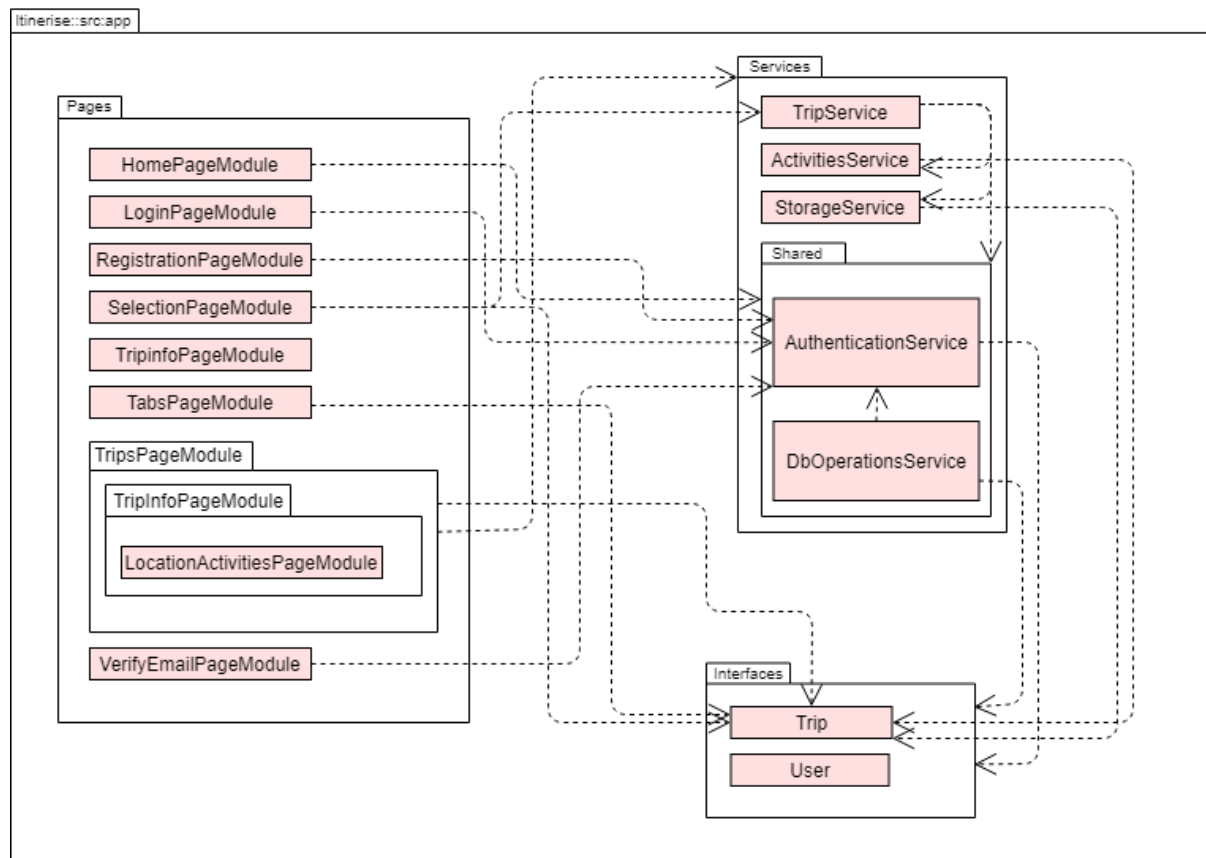
Figure 4.3 Diagram 3: Package Diagram

The above diagram (Figure 4.3) showcases the arrangement of 'Itinerise' application.

Ionic project structure is fairly straightforward – separate folder for pages, services and interfaces. This helps to separate UI front-facing views (pages) from providers (services) and template files (interfaces). Each page in the 'pages' folder has its own pre-created HTML5, SCSS, typescript, routing, module and testing files. Each service has a pre-created typescript service code file and a testing file.

The Pages package contain all user-facing modules. HomePageModule, LoginPageModule, RegistrationPageModule, VerifyEmailPageModule depend on the AuthenticationService to authenticate a logged in user and other authentication-related operations, such as: registering, verifying email. SelectionPageModule, TripinfoPageModule send trip preferences to the trip generation services: TripService and ActivitiesService. These generate and combine a trip using the given properties. TripPagesModule package holds a TripInfoPageModule, and a LocationActivitiesPageModule within the latter one. All of these combined with the Angular router showcase the created trip.

The Services package contains providers without a visual GUI. TripService depends on all the other services to create and store a trip, whilst ActivitiesService and StorageService only depend on the Trip Interface. The Shared services depend on the Trip and User interfaces to gather information about the current user and their trips. DbOperationsService relies on AuthenticationService to find out whether user is logged in.

4.4   Home View (Class Diagram)
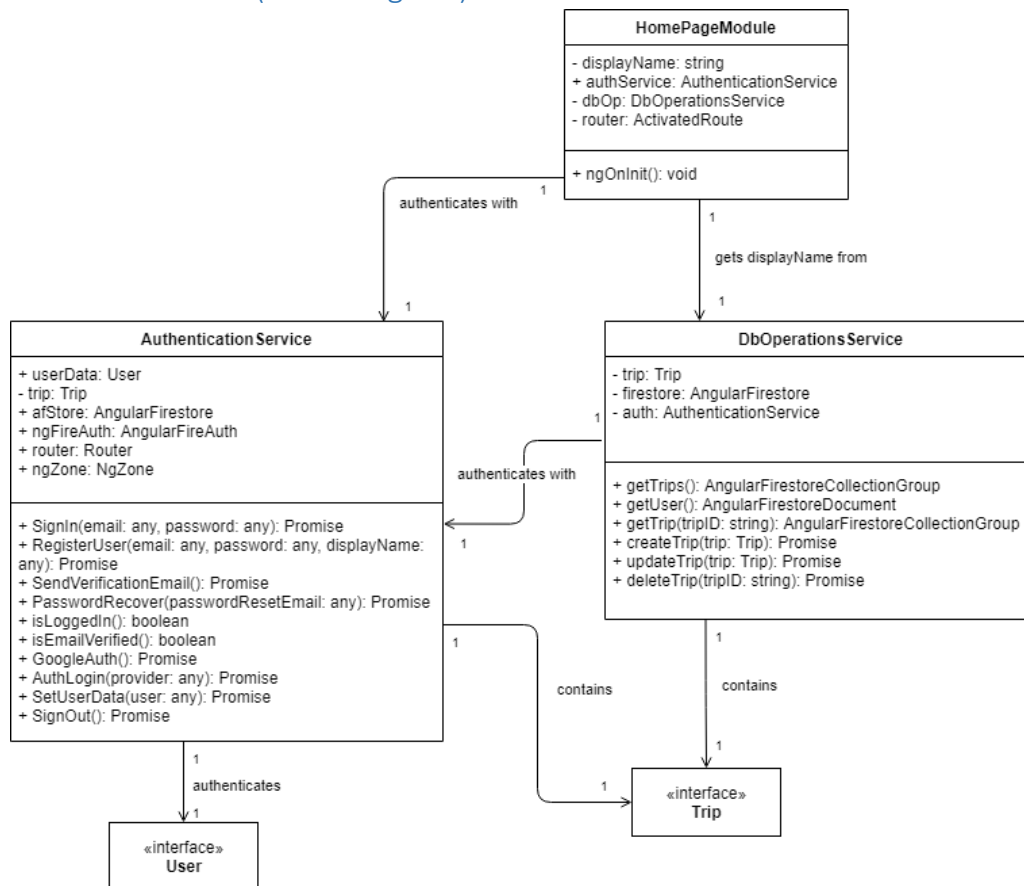
Figure 4.4 Diagram 4: Home Class Diagram

The HomePageModule acts as a landing view for the user (Figure 2.1Figure 4.4). It detects whether the user is logged in and either displays the user's displayName and 'LOG OUT' button, or displays the 'LOG IN' button alongside a text offering the user to generate some trips.

ngOnInit() function gets called on initialisation and the HomePageModule uses AuthenticationService's isLoggedIn() method, which returns a Boolean value depending if it finds a user object in the localStorage and the object's emailVerified field is true.

Afterwards, if the user is logged in, the HomePageModule subscribes to DbOperationsService's getUser() method, which searches in AngularFirestore for a given user object and returns an Observable. If the user is found, its displayName is displayed.

4.5   Trip Selection (Class Diagram)

TripinfoPageModule
+ temp: number + startDate: string + currentYear: number + endDate: string + startTime: string + endTime: string + travellerCount: number + different: boolean + notSelected: boolean - GoogleAutocomplete: google.maps.places.AutocompleteService - Places: any + autocomplete: { input: string } + autocompleteItems: any[] - startLat: number - startLng: number - isCity: boolean + autocompleteEnd: { input: string } + autocompleteItemsEnd: any[] - endLat: number - endLng: number + notSelected2: boolean + autocompleteDestination: { input: string } + autocompleteDestinations: any[] - destLat: number - destLng: number + notSelected3: boolean + infovalidate: FormGroup - zone: NgZone - fb: FormBuilder - router: Router
- datevalidate(): void + onSubmit(): void + updateSearchResults(): void + updateEndSearchResults(): void + updateDestinationResults(): void + selectSearchResult(item: any): void + selectEndSearchResult(item: any): void + selectDestinationResult(item: any): void + getLocation(item: any, type: string): void + hideEndCity(): void

sends data to

SelectionPageModule
+ trip: Trip + allowance: Interface + travellers: Interface + travelTypes: Interface + diet: Interface + pace: Interface + preferences: Interface + interests: Interface + infovalidate: FormGroup - tripService: TripService - route: ActivatedRoute - router: Router
+ onSubmit(): void + requireCheckboxesToBeCheckedValidator(minRequired: number): ValidatorFn

1

assembles

1

«interface» Trip

Figure 4.5 Diagram 5: Trip Selection

TripinfoPageModule is used to get the initial descriptive information about a trip (Figure 4.5). It uses the current date and time as placeholder values for the inputs. It also uses a GoogleAutocomplete service from the Places library to aid the user in selecting start city, end city and destination.

The method onSubmit() adds all the trip information as a NavigationNextras object for Angular's router to carry over to SelectionPageModule.

All the updater methods use the GoogleAutocomplete service for different locations: start, end city and destination. GoogleAutocomplete service uses method getPlacePredictions to send a request to the Places API using the autocomplete data and place type. Place type can be of type "(cities)" for end and start cities, and type "(regions)" for the destination. The methods get input data via the (ionInput) property existing on the <ion-input> tag. It binds and reads the dynamic input information using Angular's [(ngModel)] and assigns it to the autocomplete class variables.

Select methods are called when the user taps on one of the GoogleAutocomplete suggestions, which assign the selected items to relevant class variables, change notSelected Booleans to false (for the 'next' button to activate), and call getLocation(). Consequentially, it then calls GooglePlaces again to get more details about the selected place and extract its latitude and longitude.

All the collected trip starter data is sent via Angular router to the SelectionPageModule. The module uses Angular's ActivatedRoute to get an Observable of the sent Trip object. It makes a Trip skeleton with the data and presents user with further trip preferences to choose. It uses the validation function to make sure the user selects at least one checkbox from the given options and makes sure

all the options with radio buttons are selected. It then fires the onSubmit() method and sends the trip to the TripService to be generated.

4.6   Trip Creation (Class Diagram)
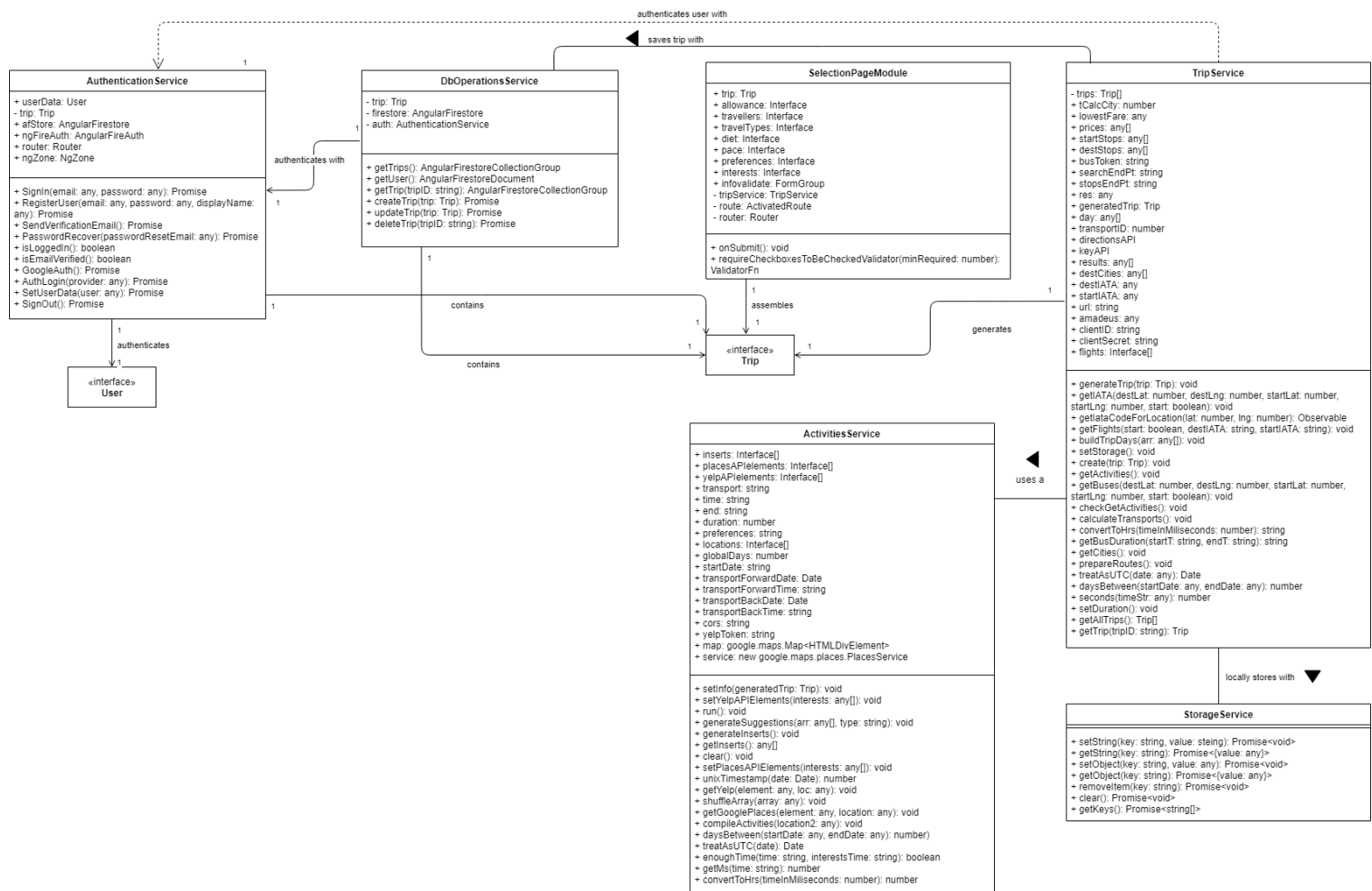
Figure 4.6 Diagram 6: Trip Creation

Trip creation (Figure 4.6) happens with SelectionPageModule sending full trip information to the TripService when calling the generateTrip() method. TripService then calculates the start and end transportation alongside with other trip related information and sends trip locations to the ActivitiesService. The service generates activities for given locations. The activities are then sent back to the TripService to assemble the final trip and store locally using the StorageService or remotely using the DbOperationsService if the user is logged in (verified with the AuthenticationService).

generateTrip

TripService's main method is the asynchronous generateTrip method. It sets the class's trip, its title, calls the setDuration, getBuses, getIATA (for flight search) methods depending if trip destination is city or country.

getIATA

getIATA method is responsible for returning an observable from the IataGEO API used for Amadeus flight search. The method calls getFlights upon iata code retrieval.

getFlights

getFlights method then uses Angular's HttpClient module to authenticate with Oauth and make a call to Amadeus servers retrieving flight offers for a specific location, departure date, passenger count and limited response number. Upon retrieval of offers the method then checks whether the search was for the start or end of the trip and logically checks whether the returned offer fits within the trip's time boundaries. It then selects the cheapest option and pushes it to the trip's route transport array.

getBuses

getBuses method behaves similarly to the getFlights method, except the API call has to be configured differently. Firstly, the BlaBlaBus API is used to find bus stops in a 30km radius between the start and end destinations using the latitude and longitude of said destinations. This is done to filter out if the buses operate in given destinations and if they do, to pick the bus stop IDs in order to retrieve bus offers. The method then loops through all the start and end destinations and adds these to an array of observables. It then uses the in-built forkJoin method to do subscribe to all of them one after another and find bus trip offers. The cheapest fare gets added to the trip and depending on user preferences is showcased in trip information as primary or alternative transport.


```
forkJoin(observables).subscribe(
  (res) => {
    console.log(res);
    let lowest = Number.MAX_SAFE_INTEGER;
    for (let i = 0; i < res.length; i++) {
      if (res[i] != null) {
        res[i]["trips"].forEach((element) => {
          if (start) {
            if (
              element["departure"].slice(11, 16) >=
                this.generatedTrip.startTime.slice(11, 16) &&
              element["price_cents"] < lowest
            ) {
              lowest = element["price_cents"];
              this.lowestFare = element;
            }
          } else {
            if (
              element["departure"].slice(11, 16) <
                this.generatedTrip.endTime.slice(11, 16) &&
              element["price_cents"] < lowest
            ) {
              lowest = element["price_cents"];
              this.lowestFare = element;
            }
          }
        });}}
    if (this.lowestFare != undefined) {
      let startT = this.lowestFare["departure"].slice(11, 19);
      let endT = this.lowestFare["arrival"].slice(11, 19);
      let busDuration = this.getBusDuration(startT, endT);
      let transport = {
        start: start,
        type: "Bus",
        startTime: this.lowestFare["departure"].slice(11, 16),
        endTime: this.lowestFare["arrival"].slice(11, 16),
        price: this.lowestFare["price_cents"] / 100,
        currency: String(this.lowestFare["price_currency"]),
        duration: busDuration,
        operators: ["BlaBlaBus"],
      };
      this.generatedTrip.route.transport.push(transport);
```

Figure 4.7 Using forkJoin to Subscribe to Many Observables


```
let observables: Observable<any>[] = [];

for (let k = 0; k < this.startStops.length; k++) {
  for (let l = 0; l < this.destStops.length; l++) {
    let body = JSON.stringify({
      origin_id: this.startStops[k]["id"],
      destination_id: this.destStops[l]["id"],
      date: this.generatedTrip.startDate.slice(0, 10),
      passengers: passengers,
    });

    observables.push(
      this.http.post(this.searchEndPt, body, h2).pipe(
        map((res) => res),
        catchError((e) => of(null))
      )
    );
  }
}
```

Figure 4.8 Pushing Many Observables

getCities

getCities method gets called if the chosen destination is not a city, meaning that the destination is a country or region. The method executes a call to the Google Places API using its textSearch method and, which finds cities for a given destination. Trip's destCities array is populated with the results, getBuses and getIATA are called as well. The method also calls the prepareRoutes and calculateTransports methods.

prepareRoutes

prepareRoutes method assigns weight for each found city of a given region. As Google Places API returns results based on popularity or provenance, the cities in the destCities array are in a descending order of popularity. First city is given 30% of the whole trip, the second one is given 20%, while the rest are given 10%.

calculateTransports

calculateTransports method only gets executed if the destination is a region. It calculates driving and transit transport options between different cities. It uses the Google Maps API's Directions Service to make GET requests for each of the travel types and adds the results to the trip's route's location's transport array.

buildTripDays

buildTripDays method is only called upon finished call to the ActivitiesService. It populates the trip's locations day's activities array combining the results retrieved from Yelp Businesses, Google Places, Yelp Events results. These results are previously combined and retrieved from the Activities Service as an array of inserts. This method is also responsible for storing the trip locally or remotely using the setStorage or create methods, respectively.

getActivities

getActivities method calls the setter methods on the ActivitiesService. It sets Yelp and Google Places call parameters based on user interests. It also defines trip information forwarding the current trip via the setInfo method. Then, it calls the asynchronous ActivitiesService run method, which generates activity suggestions using the Yelp, Google Places services, shuffles the resulting arrays and combines them into an array of inserts. After that, the buildTripDays method is called to build the final trip and store it.

```
    url = "https://api.yelp.com/v3/businesses/search";
}

let config = {
    headers: { Authorization: "Bearer " + this.yelpToken },
    params: params2,
};

return new Promise(
    function (resolve, reject) {
        Axios.get(this.cors + url, config)
        .then((response) => {
            let res;
            response.data.businesses != undefined
                ? (res = response.data.businesses)
                : (res = response.data.events);

            if (res != undefined && res.length > 0) {
                for (let i = 0; i < res.length; i++) {
                    loc.toDo.push(res[i]);
                }
            }
            resolve(response);
        })
        .catch((err) => {
            resolve(err);
        });
    }.bind(this)
);
}
```

Figure 4.9 Snippet of Yelp Calls to Generate Activities

Helper Methods

convertToHrs – takes time in miliseconds and converts to hours and minutes, returns as string.

getBusDuration – gets duration between given start and end time strings.

treatAsUTC – returns UTC date for a given date.

daysBetween – gets days between given start and end date.

seconds – gets seconds for a given time string.

setDuration – sets trip duration based on its start and end date.

getAllTrips, getTrip – getter functions creating copies and returning all trips or specified trip.

Comments

The trip creation process greatly increased in complexity and code got cluttered with all the features added. It would be much cleaner to separate different processes to different services. For example, branch out finding buses and flights to their own services, and create a separate service for helper functions. However, due to wanting to deliver base functionality despite lack of time and experience with Typescript's observables and promises I decided to sacrifice code clarity for functionality.

4.7   Trips View\Trip Information View\Trip Activities View (Class Diagram)
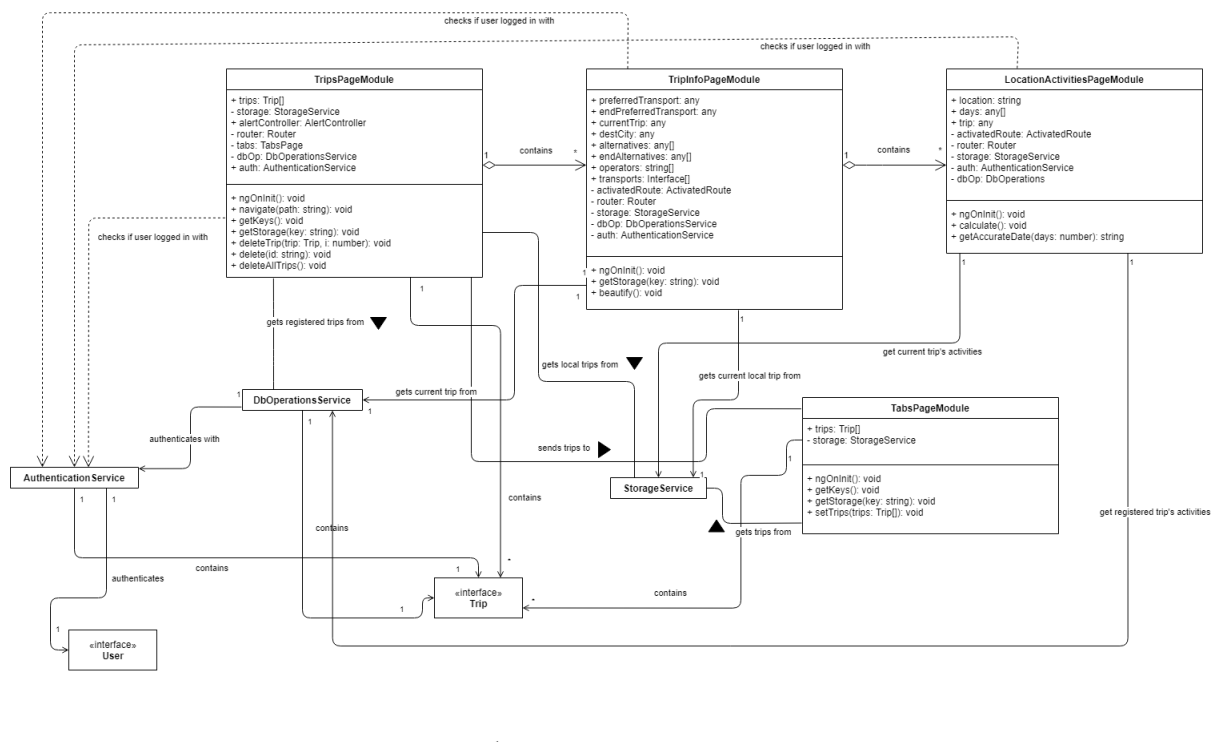
Figure 4.10 Diagram 7: Trips Views

The TripsPageModule, TripsInfoModule, LocationActivitiesPageModule all serve as trip viewing pages for the user (Figure 4.10).

The TripsPageModule makes use of the AuthenticationService to identify if the user is logged in or is anonymous. If the user is logged in – DbOperationService's getTrips method is called and subscribed to. The method returns all saved trips for the current user. If the user is not logged in, StorageService's getKeys and getObject methods are called, which retrieve locally stored trips in the Ionic storage.

The TripsPageModule also provides a trip deletion feature, which creates an Ionic alertController. It asks you for confirmation. If you confirm to delete the trip, a check is made whether the user is logged in or not. Depending on the result, either the local or remotely stored selected trip is deleted.

TripsInfoModule is used once the user clicks on a particular trip. On initialisation, the module takes the ID from parameters of the activated Angular route. It fetches the trip from either local or remote storage. Then it calls the beautify method, which runs through the fetched trip information and makes choices about how to display it. It makes sure user's preferred transport method results are displayed first, whilst the others get shown as alternatives, and cleans up other results so that the HTML does not get cluttered with Angular's directives.

LocationActivitiesPageModule is used once the user clicks on a particular location/destination of a trip. Such as the previous trip viewing modules, it gets the trip ID alongside with the desired location from the activated Angular route. It fetches the selected trip (local or remote) and calls the calculate method, which extracts this location's daily activities or if there is none – writes 'No activities found'.

4.8   Register (Class Diagram)
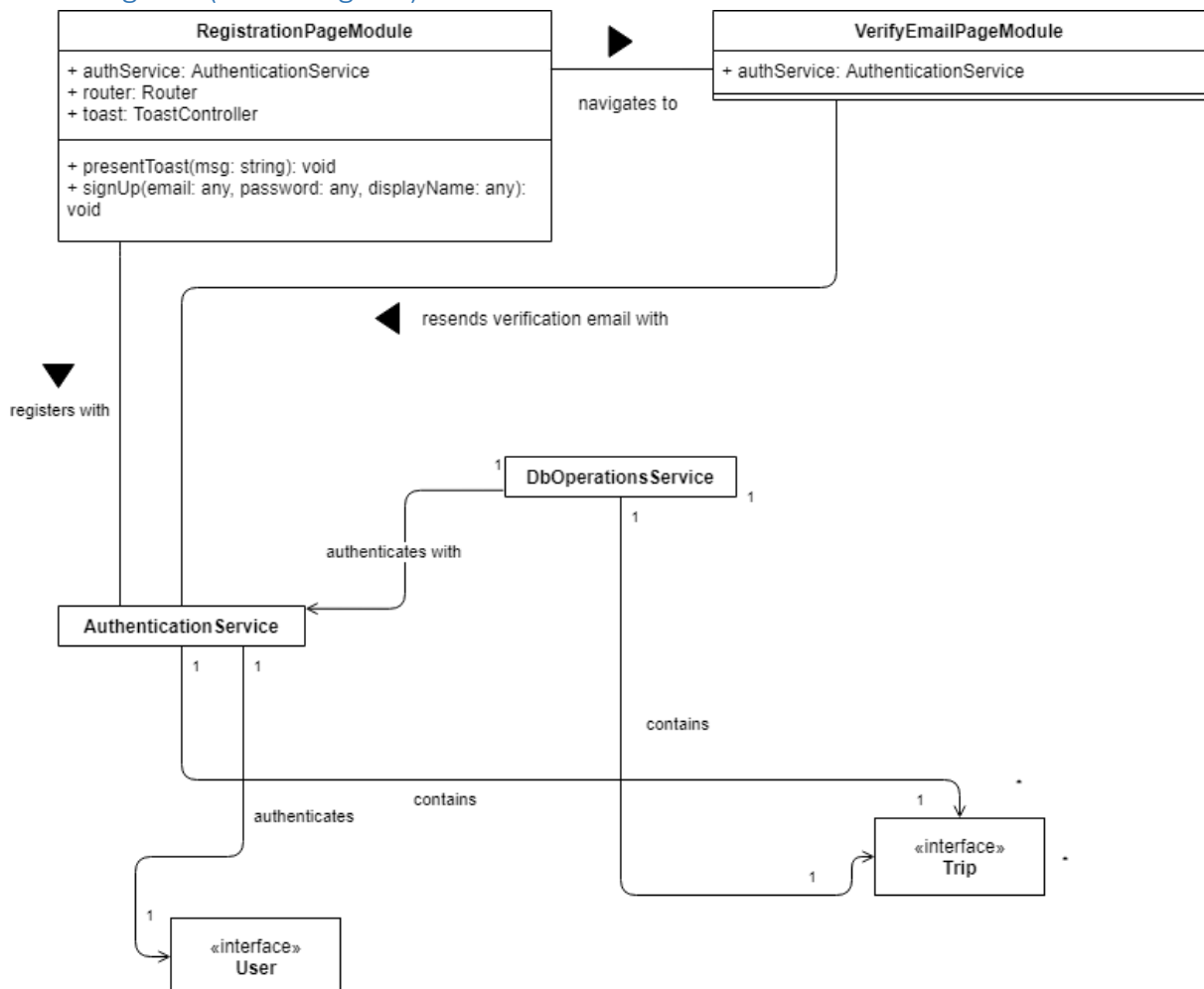
Figure 4.11 Diagram 8: Registration View

RegistrationModule uses the AuthenticationService's RegisterUser method, which registers the user using Firebase pre-defined methods (Figure 4.11). The said method returns a Promise, after which the user is navigated to the VerifyEmailPageModule. User is then expected to verify the registration by heading to email and clicking on a verification link. The functionality is provided by Firebase.

The module also uses Ionic's ToastController, which emulates the Toast feature often seen in smartphones as an informational notification. The Toast is used to present errors happening during registration or inform of successful registration.

4.9   Login (Class Diagram)
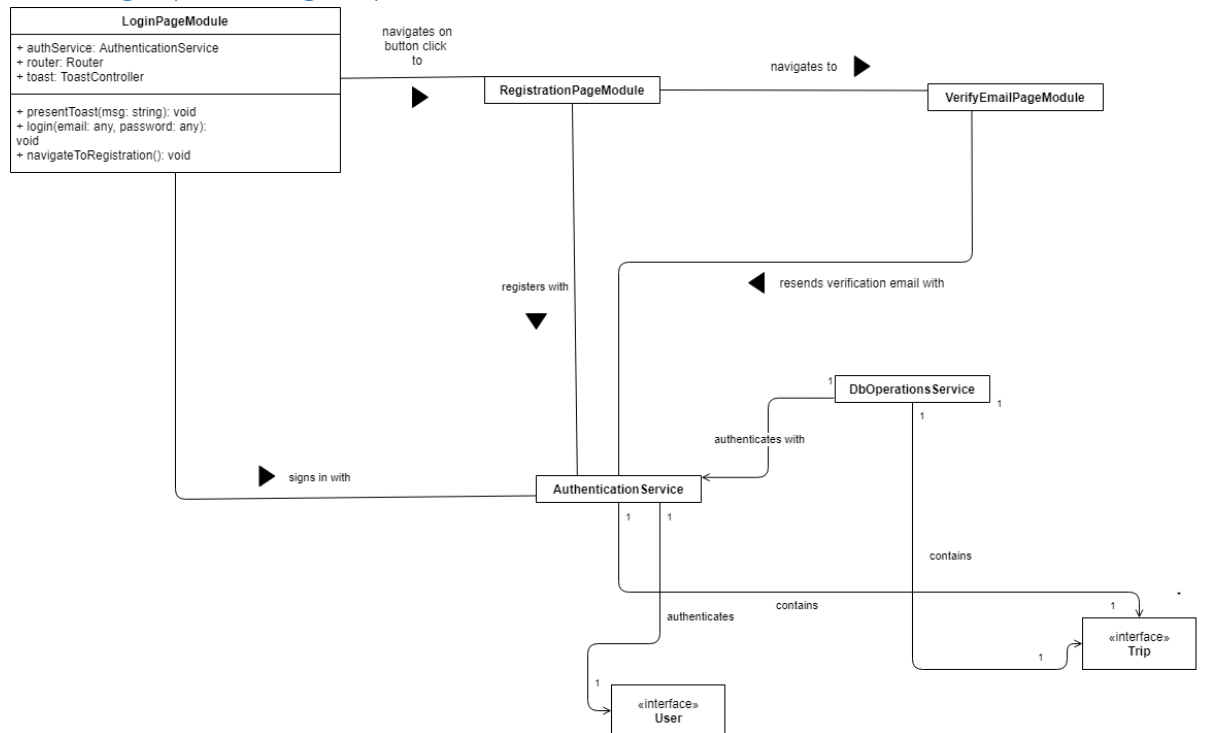
Figure 4.12 Diagram 9: Login

The LoginPageModule can either sign up an anonymous user or upon button click navigate to the RegistrationPageModule (Figure 4.12). The signing up happens via pre-defined AuthenticationServices SignIn method, functionality provided by Firebase. Upon successful signing up the user is automatically taken to the home page. presentToast method defines and creates a ToastController object, which lasts 3 seconds and is used to display any success or error messages.

4.10 Tabs (Class Diagram)
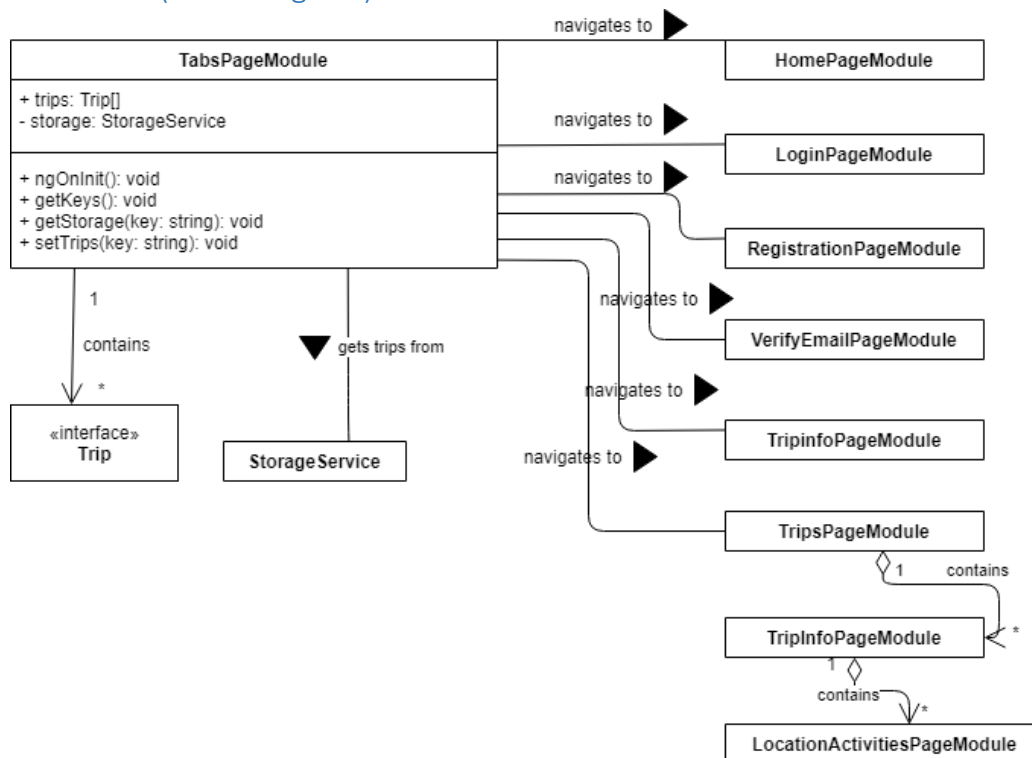
Figure 4.13 Diagram 10: Tabs Component

The TabsPageModule is mainly used as a routing outlet for the modules (Figure 4.13), which have the bottom tab navigation bar. The routing is achieved with the <ion-tabs> component, in which <ion-tab-bar> and <ion-tab-button> buttons are defined. These pre-defined components are provided by Ionic framework and are emulating the standard smartphone navigation bar. The navigation happens on click of the <ion-tab-button>, on which the 'tab' property links to an Angular route. The routes of modules which need to have the lower navigation bar have to be defined in the tabs-routing.module instead of the app-routing-module.

The TabsPageModule also retrieves remote or local trips on initialisation. This is done in order to show the number of existing trips via the <ion-badge> component. The component is embedded on the <ion-tab-button>, which navigates to the TripsPageModule.

4.11 System Sequence Diagram
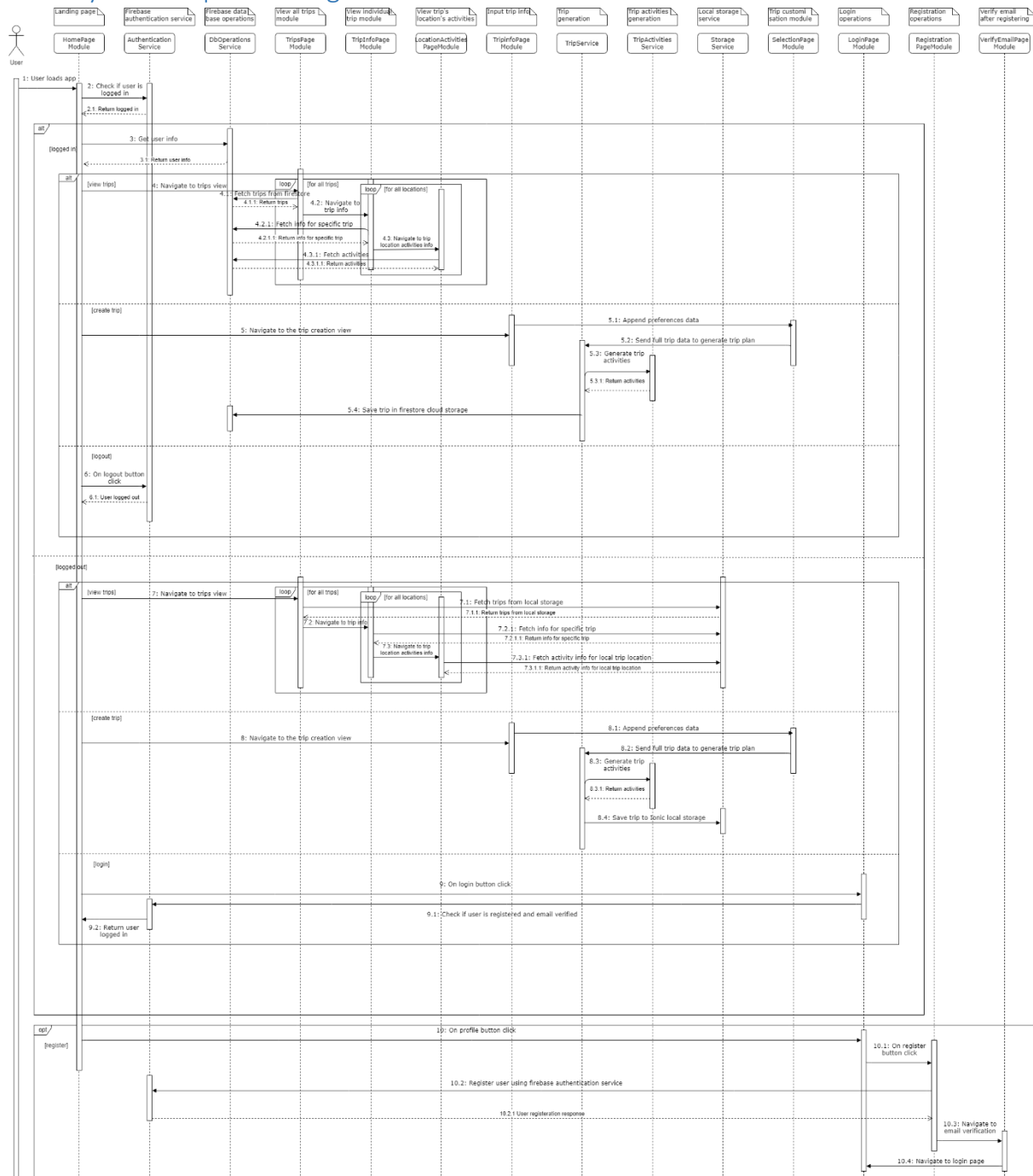
Figure 4.14 Diagram 11: System Sequence Diagram

The above sequence diagram displays the dynamic flow of communication between system components (Figure 4.14).

To begin with, the user is presented with the HomePageModule upon loading the app. The module uses AuthenticationService, which determines whether a user is logged in. Then the following app flow depends on the Boolean isLoggedIn value returned from the AuthenticationService.

4.11.1 User Logged In

If the user is logged in, there are three paths to consider: viewing trips, creating a trip or logging out. If the user selects to view trips, the app redirects to the TripsPageModule, which communicates with the DbOperationsService and fetches a list of trips. The TripsPageModule loops around all the

existing trips and upon a click on a trip loads a TripInfoPageModule, which displays all the information about the trip. The content of TripInfoPageModule is dynamic and depends on the selected trip. The said module also contains one or more locations, on click of which the user is navigated to the LocationActivitiesPageModule, which displays a set of activities for a given location.

If the user chooses to create a trip, app navigates to the TripInfoPageModule, which is a set of form fields. After completing those, the user is navigated to SelectionPageModule, where the user selects trip preferences. Then, the trip skeleton is sent to the TripService for initial calculations, and then to the ActivitiesService for activity list generation. Finally, the trip is stored in Firestore using DbOperationsService.

If the user wishes to log out, it can be done by clicking the 'Log Out' button on the HomePageModule, which uses a Firebase method located in AuthenticationService, logs the user out and redirects back to the HomePageModule.

4.11.2 User Logged Out

Alternatively, when the user is generating trips anonymously, there are only a few slight differences in the usage of 'Itinerise'. The user can also choose between viewing trips, creating trips and logging in. The main differences are related to trip storage. When the user views trips, they are fetched from the StorageService as this service deals with Ionic local storage operations. When the user creates and stores trips, it also communicates with StorageService instead of DbOperationsService. Lastly, if the user wishes to log in, the app navigates to the LoginPageModule, takes login input data, sends it over to the AuthenticationService, and upon successful login operation redirects the user to the HomePageModule.

4.11.3 Registration

Registration is an optional fragment as 'Itinerise' does not require registration for trialling. The user clicks a profile icon on the HomePageModule and is taken to the LoginPage, where on register button click, the app navigates to RegistrationPageModule and the user can fill a registration form. Then the app communicates with AuthenticationService and uses pre-defined Firebase methods to register the user. Upon successful registration, the user is redirected to VerifyEmailPageModule. Finally, the user can choose to navigate to the LoginPageModule or resend verification email.

4.12 GUI, Human Interface Views

4.12.1 Introduction

The GUI is one of the most crucial and commonly overlooked components of software development projects. It can elevate or destroy a business. People nowadays have really short attention spans and according to research done by the Sterling Research group nearly 80% try other sites if they quickly do not find what they are searching for on a particular site, whilst 52% said that a bad mobile experience made them less likely to further engage with a company [77].

Due to shortage of time and the Iterative software development model, design made for 'Itinerise' is fully completed, however, the actual app development is not. The implemented design does not correspond to the GUI design. The content and the features of the implemented model will be accessible through tapping the GUI elements, gestures were not implemented.

4.12.2 Design Choices

Google's Material Guidelines [15]

'Itinerise' GUI was created with Material Design in mind. Material Design is a visual language, whose goal is to unify cross-platform user experience while retaining customisation, good design and technological innovations. It is inspired by the real, physical world, textures and shadows. Its

ultimate goal is a natural user experience. It provides guides on typography, layouts, colours, navigation and more.

Colours

As 'Itinerise' is meant to reduce stress its colour scheme had to be soothing. Throughout history colour has proven to be an effective stimulant or therapeutic tool. In 1990, the American Association for the Advancement of Science successfully used blue light to cure many psychological disorders, whilst red proved to be effective against headaches, and cancer [78]. The pink colour has been found to have a tranquilizing and calming effect alongside with blue. Colour therapy is useful to those, who are stressed and it can change a person's mental, physiological and emotional state.

Pink was chosen as the primary colour for 'Itinerise', whilst variants of blue chosen as secondary. Both colours are proven to have soothing effects [78], however, as pink is the mixture of red and white it is more fitting for a travel app, which also encourages movement and exploration.

Font

The font was picked using the Material Guidelines. The headline and body font was chosen to be 'Roboto' – for consistency and clarity.
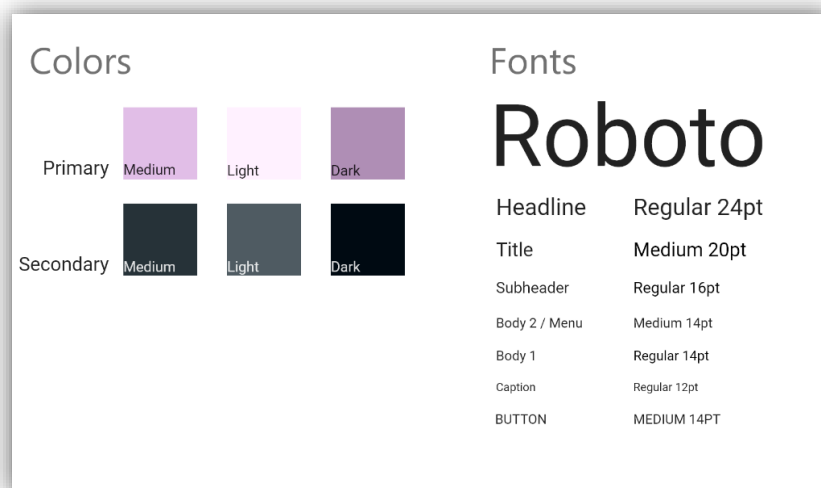
Figure 4.15 System Colours and Typography

4.12.3 Component Design

4.12.3.1 Home

The home page is meant to load up the upcoming trip and allowing to expand on it. It should also show trip preparedness statistics, showcasing how much still needs to be done. Additionally, it should show the CO_2 footprint for the trip. At the top navigation bar there is a search icon allowing to search throughout the whole app and on the bottom there is the navigation footer allowing seamless navigation through the whole app. The user is prompted to create a new trip on click of the floating action button.
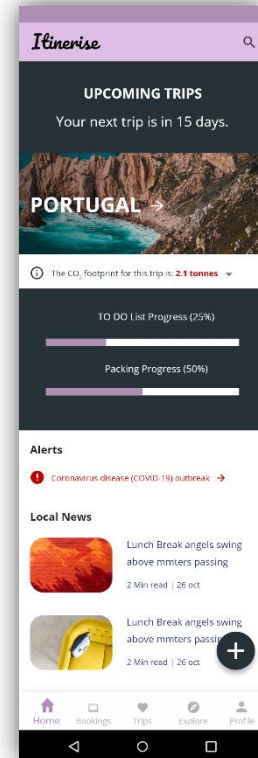
Figure 4.16 Home Design

4.12.3.2 Profile

Profile page should show the chosen background picture, profile picture and some travel statistics, such as: countries, cities visited, total carbon footprint. It should show a travel map with pinned locations of places visited. The top bar should have a back navigation arrow, whilst the bottom navigation bar allow for flexible navigation.

'Edit Profile' button should allow to change the background, profile image, preferred e-mail, first name and start city (for trip generation).
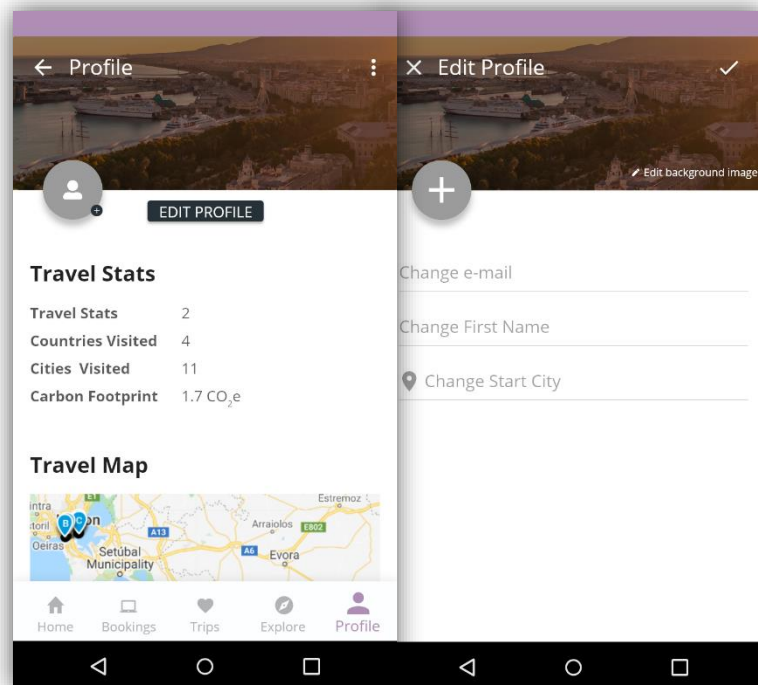
Figure 4.17 Profile Design

4.12.3.3 Settings

The settings should follow a clear and concise look. Some of the most important features are the System settings. They would allow user to select a preferred currency, and measuring units. The settings would also provide a 'Calendar Sync' function allowing the user to synchronise trip activities to a preferred calendar to get timely reminders. The 'Notifications' setting would have multiple toggles allowing the user to select whether to be notified about an upcoming trip, trip suggestions, or alternative local activities (if travelling and not following trip plan). The settings should also enable the user to change password, sign out, delete account, read the privacy policy or toggle dark mode. The settings should be easily searchable via the top search bar.
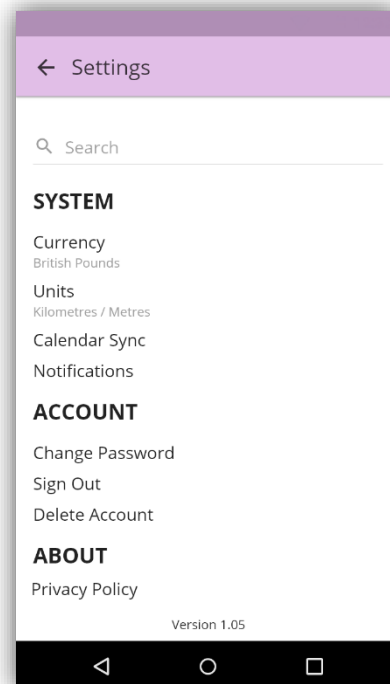
Figure 4.18 Settings Design

4.12.3.4 Trips

The trips page should show all the generated trips and display the title, travel date, overall readiness percentage, last updated time, co-travellers (invited people that are allowed to amend or view the trip), total CO2 consumption and tags. The top navigation bar should show the total trips number and the search icon. At the bottom there should be the app navigation bar and the floating action button for new trip creation. On click on each of these trips the user should be taken to the Trip Information page.
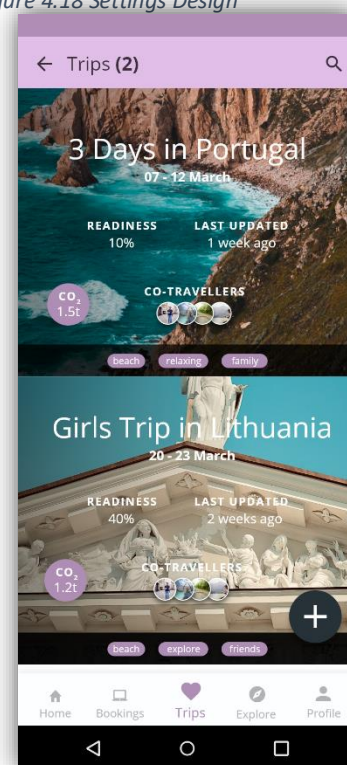
Figure 4.19 Trips Design

4.12.3.5 Trip Information

Trip information page is the most feature-intense component of the app. It showcases the trip in various views, provides editing functionality, secondary information about the trip, means and suggestions on how to prepare for it.

Trip Overview

The main trip information view shows its Title, overall readiness for the trip and co-travellers. It is followed by segments consisting of: overview, day by day, to do list, information, packing, activities, hotels and flights. Below the segments, the skeleton information about the trip is shown. Start location, destinations, and transport between these. The downward arrow should allow to change the selected transport method. The triple dots at the top right should allow various interactive options, such as: share, print, delete, edit trip.
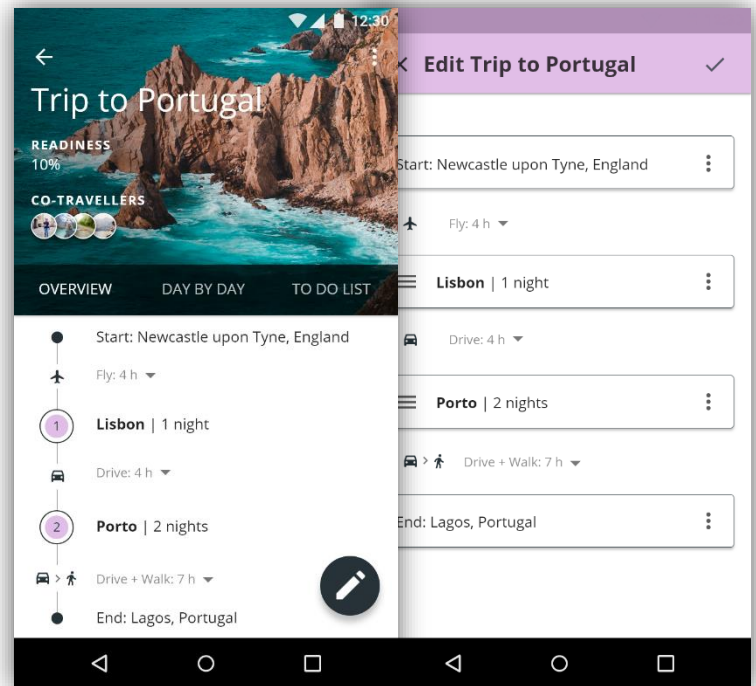
Figure 4.20 Trip Overview Design

Day by Day

The 'Day by Day' view shows in-depth trip itinerary showing hotels, transportation, and activities for all the destinations. On each information card there is a triple dot interactive button allowing to edit, change, append the event. On some cards there are interactive buttons to buy tickets, rent cars, book hotels etc. Alternatively, the 'Day by Day' component can be viewed as an interactive Google map displaying a travel list. This feature can be selected by pressing the maps icon at the top right of the screen. Next to the maps icon, there is a calendar icon allowing trip exporting to a preferred calendar.
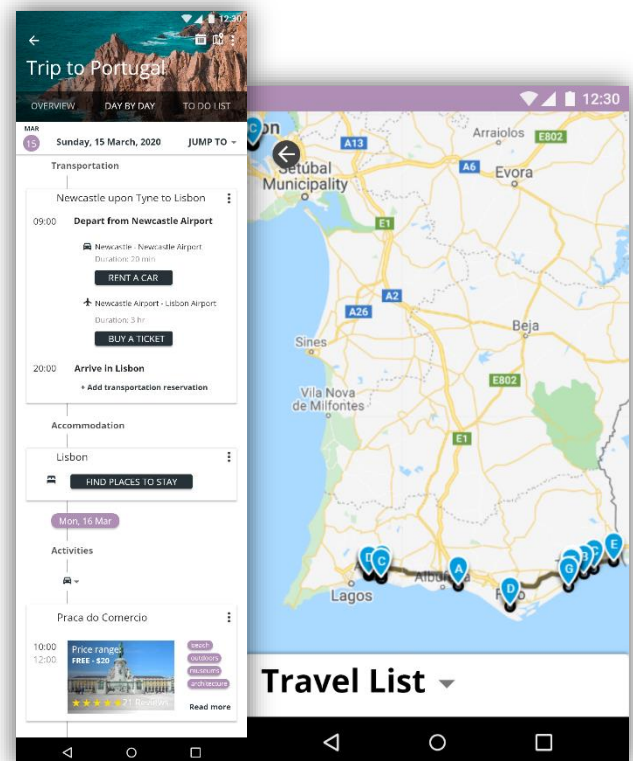
Figure 4.21 Day by Day Design

To Do List

The 'To Do List' segment is a smart view that is created dynamically based on a particular trip. It looks at the destinations, and activities to determine transportation, accommodation and activity tickets needed. These recommendations can also be edited, deleted or added to using the floating action button. At the bottom of the view there is a progress bar indicating overall completion.

Information

The 'Information' segment shows the calculated CO_2 footprint for the trip based on the preferred transport. This is only an estimated value and can be offset. The segment should also show local alerts based on the destinations being travelled to. Lastly, the segment should include a snippet of important local news.

Packing

'Packing' segment, similar to the 'To Do List' calculates what needs to be packed for a particular trip. Each packing recommendation shows why it was selected and can be edited, or deleted. The recommendations are ordered by: necessary, recommended and optional. This list is only provisional, but it might help remember essential items and reduce pre-trip anxiety. Again, there is a static progress bar indicating completion of the packing list and floating action button to create custom packing items.

Hotels and Flights

'Hotels' and 'Flights' segments search for hotel and flight offers based on your trip input and dynamic filtering, sorting selection. These segments use various APIs to provide offers and contain clickable links to make purchases. After purchase these bookings/reservations can be added to the trip.
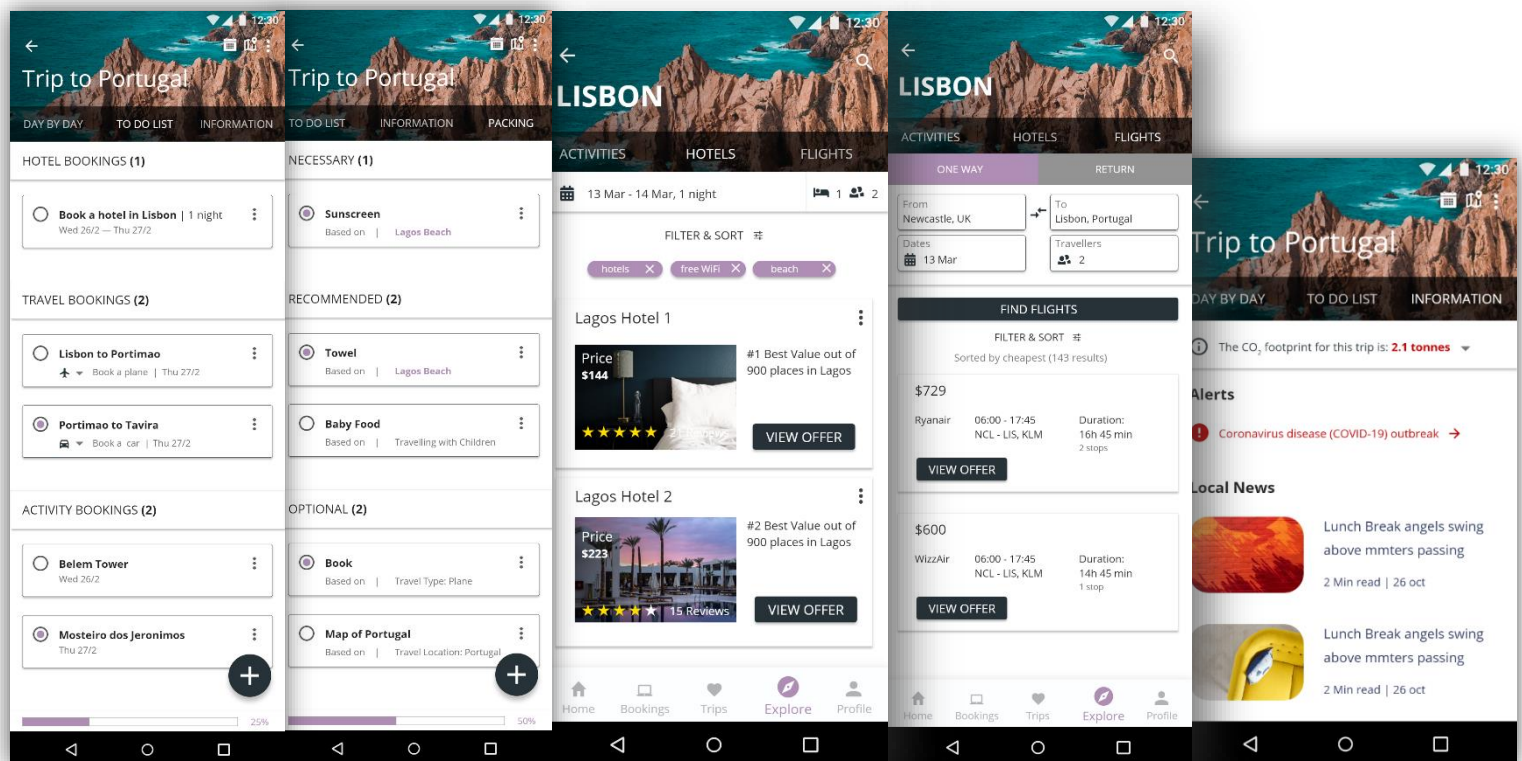
Figure 4.26 To Do List Design   *Figure 4.25 Packing Design*   *Figure 4.24 Hotels Design*   *Figure 4.23 Flights Design*   *Figure 4.22 Information Design*

4.12.3.6 Explore

The 'Explore' page shows only the countries/cities that correspond to the created trips. If there are no trips created, the 'Explore' page is empty. This is to protect the user from information overload. This page exists just as a narrowed down activity searching space in case the generated activities do not suit the user's needs. The activities shown are based on the user's preferences, however, can be filtered or sorted dynamically. The user can then read more about the activity in the activity details page, which will show rating, user reviews, contact information, pricing and tags. If desired, the user can then add this activity to the trip or replace an existing one.
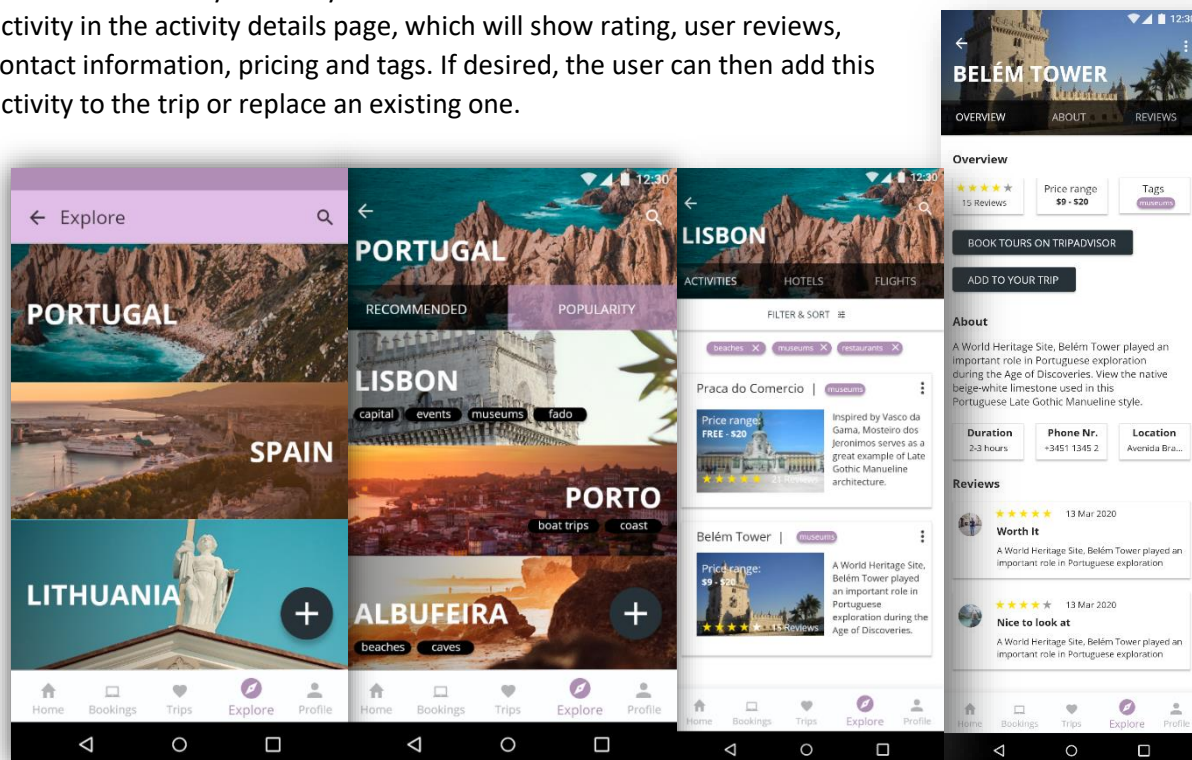
Figure 4.27 Explore Design

4.12.3.7 Bookings

The 'Bookings' page showcases bookings for all generated trips in one place. The top bar with trip title and date is a sticky bar, which stays at the top to signify, which bookings are being viewed. The floating action bar allows the user to create or import a new booking. This page exists as a well-organised, convenient one-place storage for all trip bookings. Reduces stress and saves time when having to find tickets/bookings.
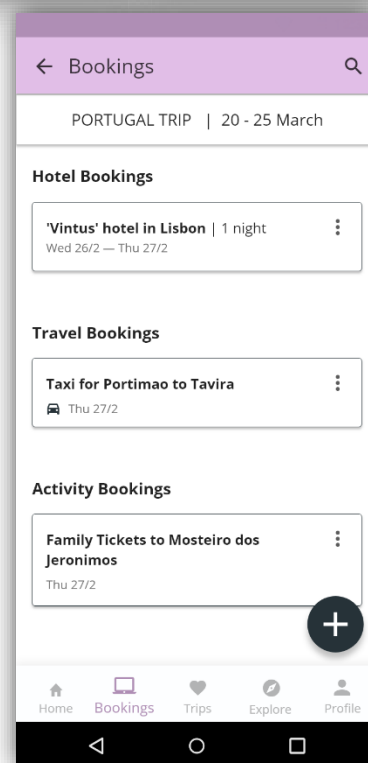
Figure 4.28 Bookings Design

4.12.3.8 Trip Generation

The 'Trip Generation' view allows user to input skeleton data about the trip, including start, end city, destination, start, end date, and passenger count. Optionally, user can also add more destinations. Following that, the app then asks some preference questions, which after supervisor feedback were re-designed to be a list of radio, checkbox questions instead of multiple pages one question per page. Finally, 'Itinerise' starts generating a trip and navigates user to the generated trip 'Trip Information' page.
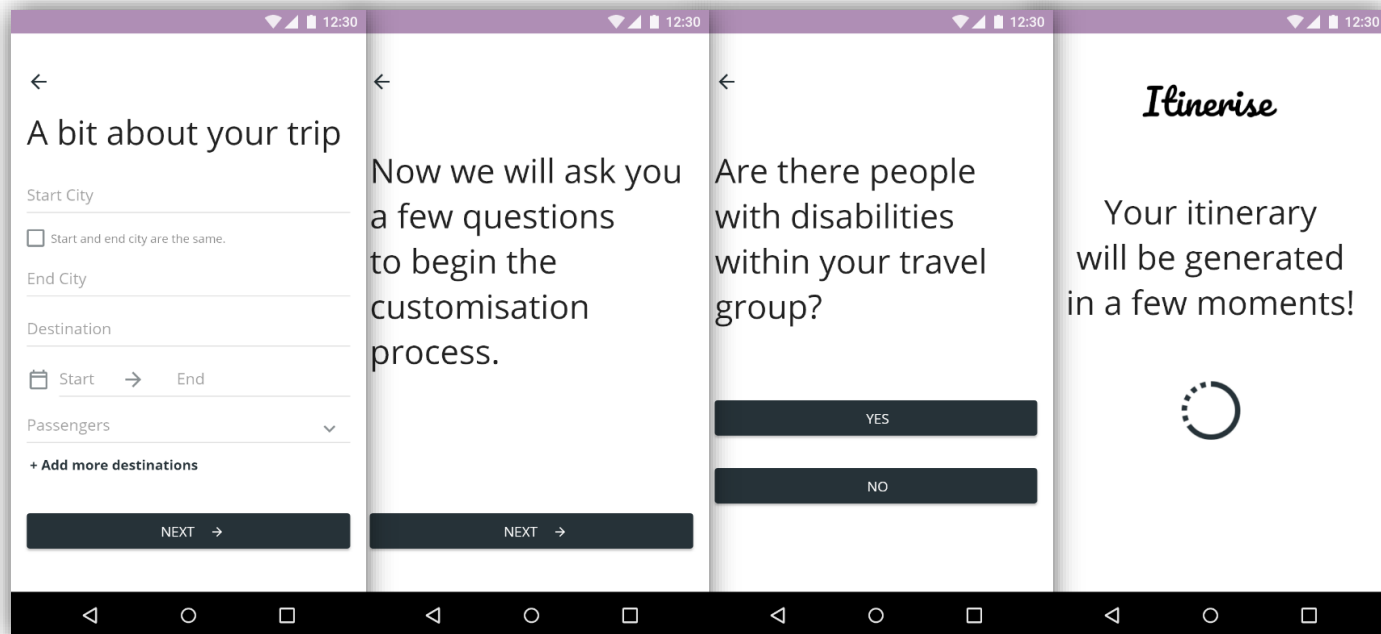
Figure 4.29 Trip Generation Design

4.12.3.9 Login/Register

Logins are required in 'Itinerise' solely for convenience - cross-device trip access. The user should be able to register and login with 'Itinerise' clicking the 'Register' button, or for convenience authenticate with Facebook/Google.
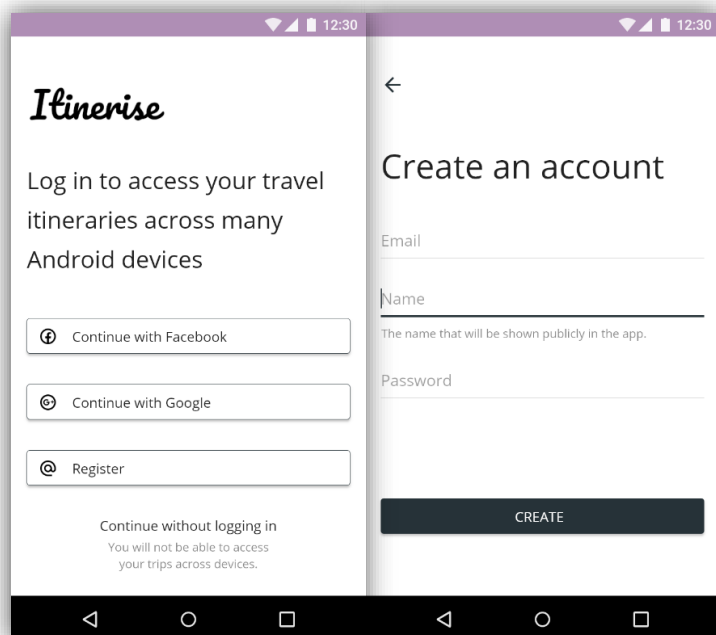
Figure 4.30 Login/Register Design

5   CHAPTER 5: Testing

5.1   White Box Testing

As the development environment was a browser, White Box Testing was done by dissecting as many conditions and testing them, printing out variables using the console via the console.log method. All tests were done knowing the inner implementation of the application and expecting certain code behaviour. Below are the test conditions that have to pass for various features of the application:

5.1.1   Tabs Feature

The feature concerns TabsPageModule, which is used mainly for bottom tab bar navigation.

The below conditions have to be fully or partially met for the feature to be functional:

1. Re-direct the user to "tabs/home" on click of <ion-tab-button tab="home">
2. Re-direct the user to "tabs/trips" on click of <ion-tab-button tab="trips">
3. Re-direct the user to "tripinfo" on click of <ion-tab-button tab="tripinfo">
4. Retrieve user trips and display the amount on the <ion-badge>
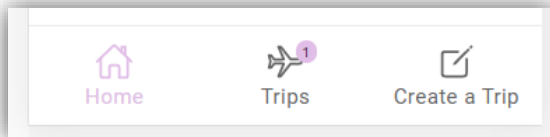
Figure 5.1 Tabs Feature Bottom Tab Bar

Results

Conditions 1, 2 and 3 are met fully and the navigation works flawlessly. However, the 4th condition has a small bug, where a newly logged in user has to navigate away for <ion-badge> to update.

5.1.2   Login

The feature concerns LoginPageModule, which is used to sign in a user.

The below conditions have to be fully or partially met for the feature to be functional:

1. All login errors are shown via Toast message lasting 3 seconds long
2. The Toast message shows errors for badly form inputs
3. The sign in will not happen for a not existing user
4. An existing user will be signed in
5. A user whose email is not verified will not be signed in
6. After successful sign in the user is re-directed to the homepage
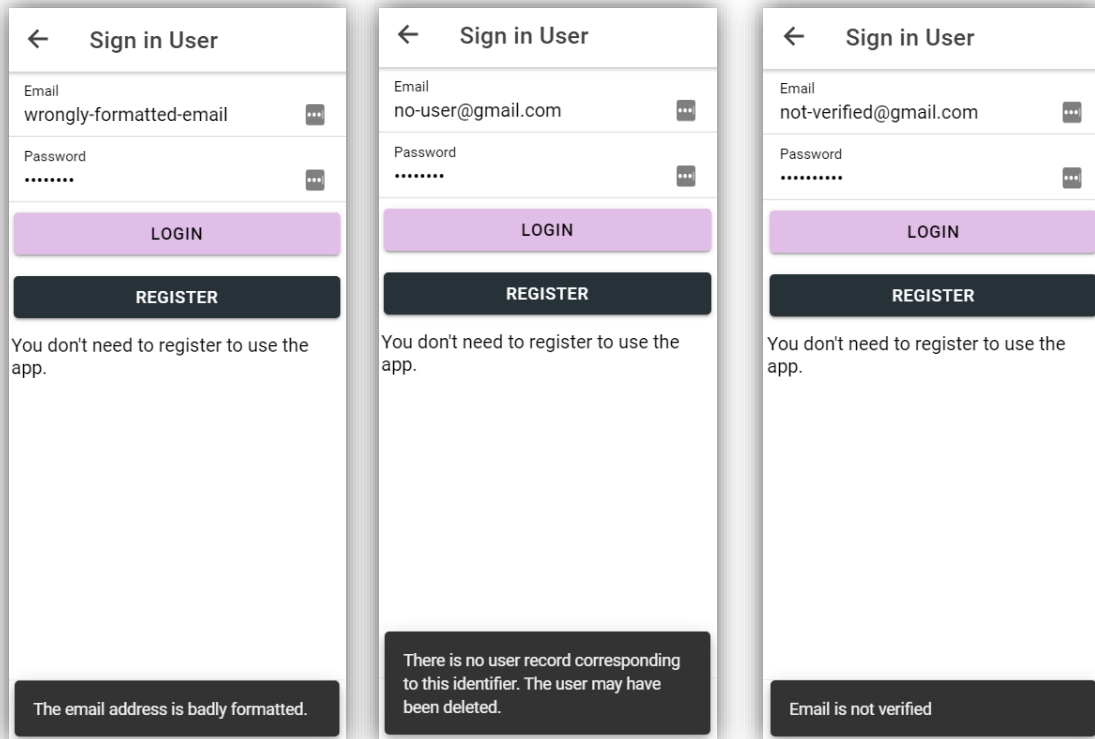
Figure 5.2 Login Toast Messages

Results

All the conditions execute successfully, therefore this feature is fully functional. However, after logging in the user is navigated to the homepage, which often takes a while to fetch from Firestore and display the displayName. This may be a Firestore free plan issue or an issue with written code.

5.1.3   Register
The feature concerns RegisterPageModule and VerifyEmailPageModule, which are used to register a user.

The below conditions have to be fully or partially met for the feature to be functional:

1. Password has to meet certain requirements, be more than 6 characters in length
2. The email address has to be well-formatted
3. Registered user has to be re-directed to the email verification page
4. Toast message has to inform about successful registration or registration errors
5. Email verification should send another verification email on 'resend verification email' click
6. It should not allow registration if email address is already used by a registered account
7. Email verification page should navigate user to the login page on 'login' button click
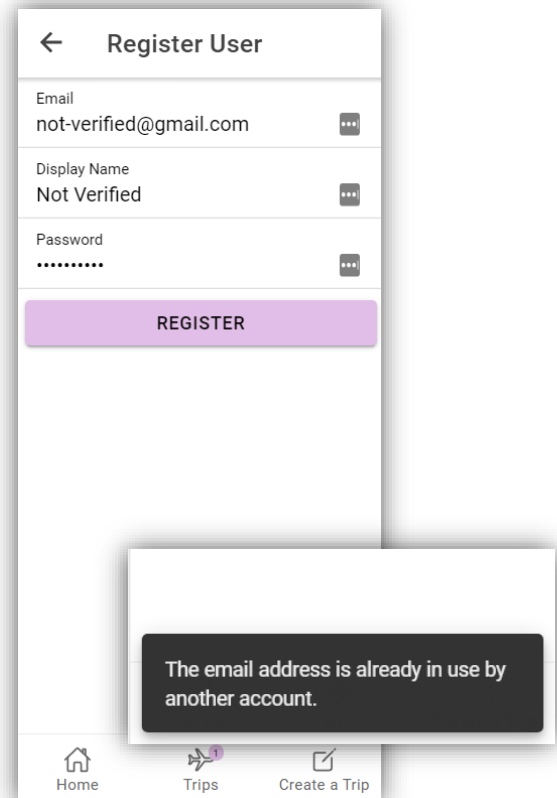
Figure 5.3 Registration Testing

Results

All the conditions are fully met. However, this testing revealed badly coded Angular router links from the registration page and email verification page. This was patched by updating Angular in respective modules. Another issue was Toast messages not showing after re-direction, which was also fixed by initialising Toasts right before the navigation rather than the vice versa.

5.1.4   Trips View\Trip Information View\Trip Activities View
The feature concerns TripsPageModule, TripInfoPageModule, TripLocationActivitiesPageModule, which are used to showcase a trip.

The below conditions have to be fully or partially met for the feature to be functional:

1. The trips page has to show all trips created by logged in user
2. The trips page has to show all trips created by anonymous user
3. The trips page has to automatically change when the user logs in or logs out
4. Deletion of individual trips on click of 'trash can' icon
5. Deletion of all trips on click of 'delete all trips' button
6. View trip information on click of trip
7. Correctly navigate backwards to trips page from trips information page
8. Show location information on click of particular trip information page location
9. Correctly navigate backwards to trips information page from trips location page

Results:

Almost all given conditions can be satisfied fully. The only feature not working is the 'delete all trips' functionality for Firestore stored trips. However, it is implemented for locally stored trips. This is a known bug and will not be patched due to time constraints. Another bug that was found and fixed was the number 3 condition. The trips page was not automatically refreshing between logged and anonymous user trips. Activated Angular Router had to be injected in order to execute a condition each time the trips page is loaded. The condition guaranteed the 3 condition was satisfied.

Figure 5.4 Trips Testing

5.1.5   Trip Creation
The feature concerns all the project's services and trip view pages, which are used for trip generation.

The below conditions have to be fully or partially met for the feature to be functional:

1. The trip is generated according to skeleton trip information input
2. Trip is generated based on user preferences in the SelectionPageModule
3. The trip destination can be either a city or a region/country
4. The services correctly find and take into account transport to and from the destination and the options fit in the time boundaries before planning activities
5. The trip activities are generated for a trip up to 21 days (3 weeks) long
6. Trip location activities information shows activities with tags, time of visit, rating, reviews, information about place
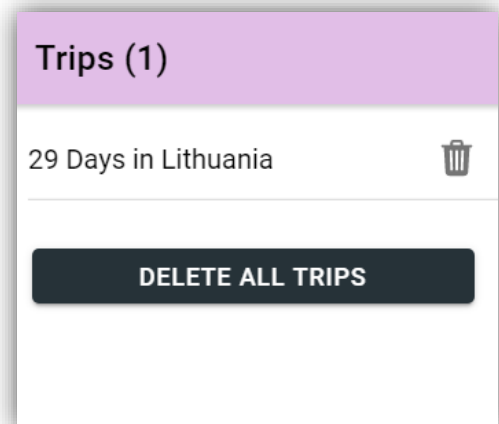7. Tourist attractions can only happen between 9am and 6pm each day

8. 'Alternative transport options' shows alternative 'to' and 'from' transport options

Results:

These conditions are satisfied partially. 1, 3, 7 are implemented fully. The second option works partially as not all trip preferences were implemented to be taken into consideration. Preferred means of travel, travel pace, preferred activity type, hobbies and interests were implemented. Trip allowance, people in the travel group, diet preferences do not influence any of the trip generation. This is a known missing implementation and whilst some of it was not hard to implement, it would add weight to the application and shortage of time did not allow consideration of these values.

The 4th condition works partially. The start transportation can be calculated into the trip and activities planned only after finish, however, backwards transportation is not as straightforward as there is no guarantee how long the transportation can take. Therefore, the 'end' transportation goes a bit beyond the time boundaries.

The 5th condition is not fulfilled as there are no restrictions on how long a trip should be.

The 6th condition is executed partially as the activity information displays time of visit, tags and rating correctly, however, no reviews or information about the place is displayed. The latter would not be complicated to implement, however, the former would require additional HTTP GET requests and add weight to the application. Neither can be developed due to time constraints.

The 8th condition was implemented and working correctly initially, however now there is a bug where 'alternative transport options' just duplicates the preferred transport option instead of showing the alternatives. This bug has no fix as of now due to shortage of time, but it probably is caused by bad TypeScript code and Angular Router causing the reload duplication.

5.1.6   Trip Selection
The feature concerns TripinfoPageModule and SelectionModule, which are used to select trip information.

The below conditions have to be fully or partially met for the feature to be functional:

1. Start city user input has to be selected from Google Place autocomplete items
2. End city user input has to be selected from Google Place autocomplete items
3. Destination user input has to be selected from Google Place autocomplete items
4. End date cannot be older than start date
5. There should be a limit for trip duration to be no longer than 21 days (3 weeks)
6. 'Start and end city are the same' checkbox allows the user to not fill the end city input field
7. The user should not be allowed to proceed until all form fields are filled
8. SelectionModule should not allow to proceed until all questions with radio answers have at least one selected and questions with checkbox answers have at least one selected

Results:

Almost all conditions are satisfied. 5th condition is not satisfied due to time constraints, therefore there is no limit on trip length and it should be enforced. The 6th condition is implemented on the GUI, however, it is not functional.

5.1.7   Home View
The feature concerns HomePageModule, which is used to display the logged in user and allow the user to log out.

The below conditions have to be fully or partially met for the feature to be functional:

1. When the user logs in user's display name has to be shown
2. If the user is not logged in an informational message needs to be shown
3. If the user is logged in, a 'Log out' button needs to be shown in the top bar
4. If the user is not logged in, a profile icon button needs to be shown in the top bar

Results:

All of the conditions are fully implemented for the homepage module. The only issue noticed is that immediately after signing in the display name takes some time to appear, sometimes it requires navigating to another page. It might be an issue with immediate re-direction after signing in and the AuthenticationService.
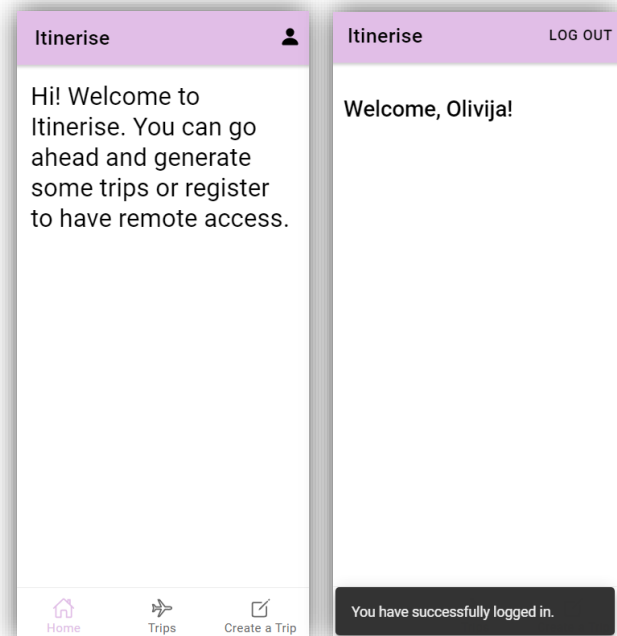
Figure 5.5 Homepage Testing

6   CHAPTER 6: Evaluation

6.1   Satisfaction of the Aim and Objectives

The aim of this project was to build a mobile application allowing users to create a custom day-by-day itinerary in an attempt to improve travel experience and most importantly reduce stress and pre-travel anxiety.

Objective One: Research current travel planning apps/tools and evaluate their flaws, probability to induce pre-travel stress.

Overall research into common traveller stress pain points was completed, the objective was fully delivered. Three travel planning tools were evaluated and dissected by their desired features and potential flaws. There was not a straightforward way to measure how an application's usage can induce travel stress, however, confirmation was obtained during anonymous user questionnaire that one of the analysed tools 'TripAdvisor' causes information overload, which in turn leads to stress. 42% reportedly felt overwhelmed.

Objective Two: Conduct market research through anonymous questionnaires to determine demand and necessary features.

User study was completed throughout February 2020. An anonymous questionnaire was organised through the 'Form Builder' platform and received 62 responses. This objective was fully delivered.

Objective fulfilment overview:

- Demand was determined with nearly half of the respondents (40%) confirming that a personalised travel itinerary would help people have stress-free holidays.

- Another indication of demand was the fact that 87% of the respondents plan their own travel itineraries. Moreover, 59% confirmed feeling pre-trip anxiety and 75% felt stress during travels, which proves the need of a travel planning tool.

- Necessary features were determined to be: travel planning, safety information, packing, air travel information and ability to plan trip according to budget. These features were determined by majority of respondents voting on what they believed causes stress during travels.

Objective Three: Build a mobile app allowing the user to randomise/build an all-inclusive travel itinerary according to custom, painstaking filtering process.

This objective was partially completed due to time constraints. The trip building functionality was provided but not all the custom filters considered and active.

Objective fulfilment overview:

- Mobile app created using the Ionic Framework, which runs cross-platform as an iOS, Android or web app.

- Filtering process allows trip customisation to a certain extent, however, certain important filters, such as: trip generation for different travel groups or for different budgets were not implemented due to shortage of time.

Objective Four: Utilise machine learning to suggest alternative activities if the user is not following the travel itinerary.

This objective was not satisfied. It was initially considered as an important feature allowing to fulfil project aim and experiment with machine learning. However, throughout the project it was decided that trip generation takes precedence. Whilst this remains an important feature providing 'routine emulation', which is useful for fighting stress, it might also be seen as an optional feature that can alternatively cause annoyance.

Objective Five: Organise a user group/beta testing to determine the usefulness of the implemented model.

This objective was satisfied fully, even though it was done partially via face-to-face meeting, and partially via Zoom calls due to the COVID-19 pandemic. During the Zoom calls respondents tested the system by issuing verbal commands and seeing the system response through a shared screen.

Objective fulfilment overview:

- User group ranged from all ages, and technological proficiency.

- User group was assembled physically and remotely.

- The system was tested using either verbal commands or physically entering inputs.

- The usefulness of the system was measured by mini feedback questionnaires after testing and GUI presentation (to showcase the potential system) and determining whether the users would continue using the system.

6.2   Evaluation of the Tools Used

This section will concern the evaluation of the tools chosen for software development process.

Management

Dropbox and Google Drive were correct tools for document storage. Dropbox provided convenient and rapid lightweight document storage and ensured none of the project documents got lost. Google Drive was used less often as it proved to be less necessary. In retrospect, it should have been replaced by GitHub for version control as the items stored on Google Drive were mostly project source files.

Agantty, Any.do were good choices for task management. Agantty was used less often in the second half of the study year as the tasks were more straightforward and planning was difficult due to the COVID-19 disruption. Any.do was continuously used daily until the end of the project providing convenient micro task management.

Prototyping

Adobe XD was a good choice for software design. With minimal experience in design tools, and principles it allowed creation of viable design prototypes in two weeks. It lived up to the expectations, was responsive and did not take up much random access memory.

Adobe Photoshop was retrospectively a time-consuming design tool. It has a steep learning curve and even though gaining experience with it is beneficial in the industry, it is a heavy application, runs slowly on the laptop and takes time to get used to. It should have been replaced by tools like Canva or PowerPoint.

Draw.io and Camtasia were both great choices of modelling and video editing tools. They both involved minimal learning before usage, had intuitive user interfaces and had great flexibility, and functionality.

External Libraries and APIs

There is not much liberation of choice when it comes to travel or transportation APIs that would either be open-source or have free limited usage plans.

Firebase authentication and Firestore were great choices for register/login/online storage functionality. Firebase is widely used and thus has great documentation with vast amount of tutorials. It took only a fraction of time to fully implement all the necessary functionality using these services.

Amadeus, Yelp APIs, BlaBlaBus were not that widely known and used and thus did not have that much user-generated content, tutorials apart from the default usage shown on their documentation pages. Regardless, all API calls were straightforward even though CORS and oAuth2 caused authentication problems initially, which took a while to solve. BlaBlaBus was especially inconvenient to use as API calls can only be made for existing bus stops and not by custom location.

Google Places and Maps APIs were both great choices due to being vast APIs and very widely used. Therefore, problems encountered were easy to fix/patch as many have encountered and documented those already.

IATAGeo API was very straightforward to use as it is a small, unpopular API with a convenient and well-explained call interface.

6.3 Time Plan Execution

Figure 5.1 demonstrates the revised work plan, which was drafted right at the start of second semester. Initially, the plan was successfully followed and the background research write-up, system design, UML UI prototypes finished with only a slight delay of roughly a week. However, around the time when the development had to be started, COVID-19 was declared as pandemic and for at least 2-3 weeks productivity level fell due to university closure, general disruption, packing, travelling across Europe to return home and going through rigorous, badly organised local forced isolation procedures. Therefore, the development only started after poster submission - at the time where it was initially thought that the basic implementation would be delivered. Only a month was left for development, testing and dissertation write-up.

Software development model adapted from Agile to Iterative. Attempting to first understand the system as a whole, research had to precede the design process, and the latter had to precede the development process. In retrospect, Agile should have been followed until the end. It would have encouraged to follow 'design one feature, implement, and test' cycles and create a more consistent, and coherent system. However, what happened was that there was sufficient time for designing purposes, but not enough for development. Therefore, the system was fully designed, however, only the bare basic implementation carried out. Following the Agile model would have allowed to better measure the complexity of each desired feature and plan project time better.
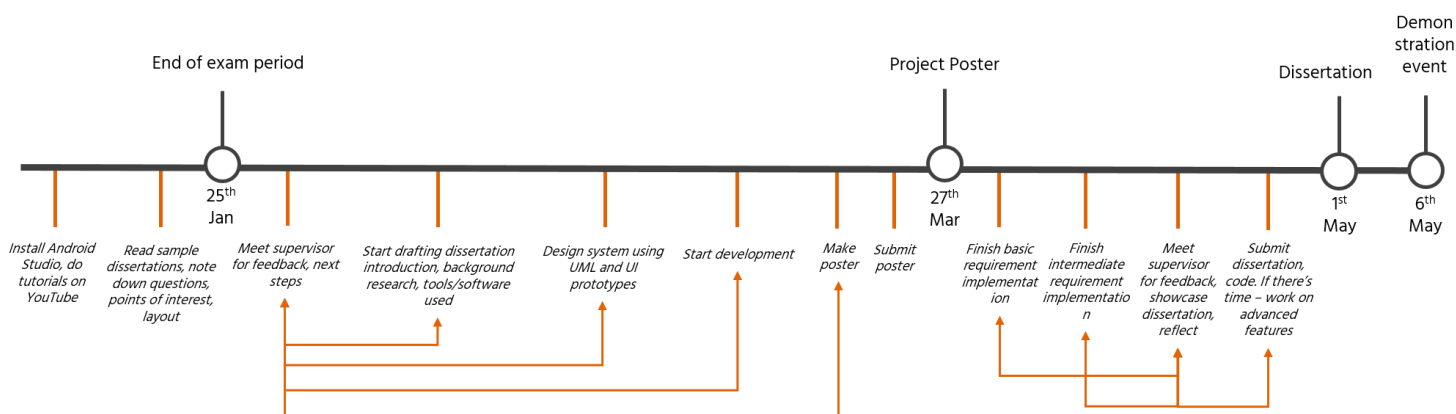
Figure 6.1 Revised Work Plan

6.4 User Group Evaluation

User group consisted of three people. Two were technologically advanced - knowledgeable about coding, design work, and one was of average technological proficiency. After a trial run of 'Itinerise' they were prompted to answer a quick survey (Appendix B). The overall consensus was that the final product is clean, and easy to navigate (100% agreement), whilst two out of three voted that the app is intuitive. All agreed that the application would help improve trip quality and reduce stress, whilst two of three said they would personally like to use the app. Lastly, the full GUI completion was shown to the user group as a continuation of this project. The GUI reached a 100% approval for aesthetics. Most also believed that hotels, flights search and booking section were the most necessary features to have (Figure 6.2).

Figure 6.2 Features to Include

6.5   Aim

The system demonstrates partial completion of 'Itinerise' travel generator mobile app. The objectives were overall parti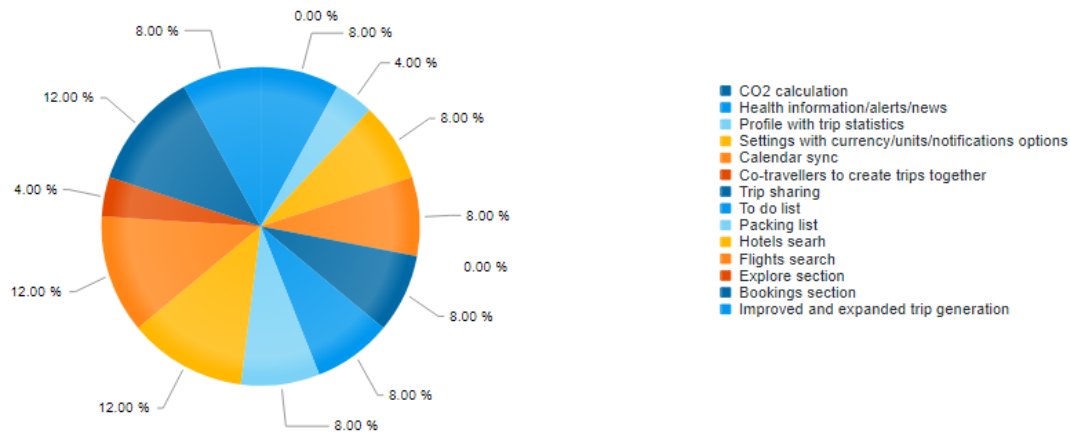ally implemented, with one being not implemented at all, and some showcasing full implementation. Therefore, the aim is partially satisfied.

7   CHAPTER 7: Conclusion

7.1   What Has Been Learnt

The project and current global situation taught about contingency plans and how to mitigate and adapt to changing situations. The project, its development plan and deliverables had to be adapted to the ever-changing COVID-19 situation.

The project gave an adequate understanding of the Ionic cross-platform Framework. Knowledge of TypeScript, npm packages, HTML, CSS, Angular and how to deal with asynchronous requests, promises and observables was another gain. Alongside the comprehension of the development framework, I also obtained considerable experience with some of the world's most popular APIs, such as Google API Suite and Firebase. The design stage allowed some familiarity with Adobe Suite, namely Adobe XD and Photoshop. Modelling stage provided substantial insight into UML modelling and the available tools.

7.2   What Went Well

The author believes that the development framework was perfectly selected for the aim of this project. Ionic cross-platform capability allows rapid development, creating one code for various different operating systems. It allows developing using a chosen code editor and rapidly testing on the web browser. This greatly improves the development as Android development is slow due to hefty compilation processes and expands it to fit other operating systems.

7.3   What Could Have Been Done Better

Some of the things that could have improve the project's outcome:

- Continue following Agile development model instead of Iterative. This approach would have allocated more time for the development process and allowed to implement more features.
- Instead of relying on survey results, interviews with travel agents, psychologists, travel guides could have been carried out. This would be done to get industry perspective on travellers' frustrations and the industry's strategy on mitigating travel stress. Psychologists could provide more facts-based information on how to tackle stressful situations.

- Would have started the development and development planning stage much more early in the project. A lot of frustration came from the fact that there is a limitation of free-to-use travel APIs and learning that early in the process would have helped to prepare and avoid potential delays.

7.4   Future Work

The future work is showcased and visualised in the GUI Design section (Chapter 4, subsection 10) of this paper. Refer to that section for functional future work ideas for 'Itinerise'. Non-functional future plan includes potentially taking a small commission from the activities/hotels/flights booked through the app.

References

[1] Travel Agent Central. (2017). Stats: Stress Causing 37 Percent of Travelers to Cancel or Delay Vacation. [online] Available at: https://www.travelagentcentral.com/running-your-business/stats-stress-causing-37-percent-travelers-to-cancel-or-delay-vacation [Accessed 24 Nov. 2019].

[2] Ray, N. and Ryder, M. (2003). "Ebilities" tourism: an exploratory discussion of the travel needs and motivations of the mobility-disabled. Tourism Management, 24(1), pp.57-72.

[3] Buckley, R. and Mossaz, A. (2016). Decision making by specialist luxury travel agents. Tourism Management, 55, pp.133-138.

[4] Tripadvisor. (2020). Tripadvisor: Read Reviews, Compare Prices & Book. [online] Available at: https://www.Tripadvisor.co.uk/ [Accessed 16 Feb. 2020].

[5] McIntosh, I., Swanson, V., Power, K., Raeside, F. and Dempster, C. (1998). Anxiety and Health Problems Related to Air Travel. Journal of Travel Medicine, 5(4), pp.198-204.

[6] Theobald, W. (2012). *Global Tourism*. Hoboken: Taylor and Francis.

[7] Wttc.org. (2020). [online] Available at: https://www.wttc.org/-/media/files/reports/economic-impact-research/regions-2019/world2019.pdf [Accessed 18 Feb. 2020].

[8] Merriam-webster.com. (2020). Definition of TOURISM. [online] Available at: https://www.merriam-webster.com/dictionary/tourism [Accessed 18 Feb. 2020].

[9] Condratov, I. (2013). E-TOURISM: CONCEPT AND EVOLUTION. Ecoforum Journal, [online] 2(1), p.10. Available at: http://www.ecoforumjournal.ro/index.php/eco/article/view/25 [Accessed 18 Feb. 2020].

[10] Buhalis, D. (2003). eTourism: Information Technology for Strategic Tourism Management. Gosport: Prentice Hall.

[11] Pan, B. (2015) E-Tourism.

[12] Abdella, J., Zaki, N., Shuaib, K. and Khan, F. (2019). Airline ticket price and demand prediction: A survey. Journal of King Saud University - Computer and Information Sciences.

[13] Booking.com. (2020). Booking.com: The largest selection of hotels, homes, and holiday rentals. [online] Available at: https://www.booking.com/index.en-gb.html?aid=397594;label=gog235jc-1DCAEoggI46AdIM1gDaFCIAQGYAQm4ARfIAQzYAQPoAQGIAgGoAgO4AtberfIFwAIB;sid=f6e85f15a29dce90ded142262bb9f031;keep_landing=1&sb_price_type=total& [Accessed 18 Feb. 2020].

[14] Skyscanner.net. (2020). Skyscanner | Find the cheapest flights fast: save time, save money!. [online] Available at: https://www.skyscanner.net/ [Accessed 18 Feb. 2020].

[15] Material Design. (2020). Material Design. [online] Available at: https://material.io/design [Accessed 30 Apr. 2020].

[16] Yoon, Y., & Uysal, M. (2005). An examination of the effects of motivation and satisfaction on destination loyalty: A structural model. Tourism Management, 26, 45–56.

[17] Dann, G. (1977). Anomie, ego-enhancement and tourism. Annals of Tourism Research, 4(4), 184–194.

[18] Hanai, T., 2016. Tourism meets psychology. J. Glob. Tour. Res, 1, pp.89-92.

[19] Gray, H. P. (1970). International travel-international trade. Heath Lexington Books.

[20] Calmclinic.com. (2018). Travel Anxiety: Causes and Cures. [online] Available at: https://www.calmclinic.com/anxiety/types/travel [Accessed 19 Feb. 2020].

[21] McIntosh, I., Swanson, V., Power, K., Raeside, F. and Dempster, C. (1998). Anxiety and Health Problems Related to Air Travel. Journal of Travel Medicine, 5(4), pp.198-204.

[22] Gorman D, Smyth B. Travel agents and health advice given to travelers. Trav Med Int 1992; 10,3:111-115.

[23] Healthline. (2020). Understanding and Dealing with Your Travel Anxiety: Tips to Try Today. [online] Available at: https://www.healthline.com/health/anxiety/travel-anxiety#causes [Accessed 19 Feb. 2020].

[24] Research, H., Uysal, M., Perdue, R., Sirgy, M. and Netherlands, S. (2020). Handbook of Tourism and Quality-of-Life Research - Enhancing the Lives of Tourists and Residents of Host Communities | Muzaffer Uysal | Springer. [online] Springer.com. Available at: https://www.springer.com/gp/book/9789400722873 [Accessed 11 May 2020].

[25] Grayling, A. C. (2005). The heart of things. Applying philosophy to the twenty first century. London: Phoenix.

[26] Luebbert, K., Dahme, B., & Hasenbring, M. (2001). The effectiveness of relaxation training in reducing treatment-related symptoms and improving emotional adjustment in acute non-surgical cancer treatment: A meta-analytical review. Psycho-Oncology, 10 (6), 490–502.

[27] Davidson, R., & Cope, B. (2002). Business travel: Conferences, incentive travel, exhibitions, corporate hospitality and corporate travel . Upper Saddle River: Prentice Hall.

[28] J Waterhouse, T Reilly & B Edwards (2004) The stress of travel, Journal of Sports Sciences, 22:10, 946-966

[29] Greaves D. (2008) Customer Segmentation Traveller Types and Their Needs in 2020. In: Conrady R., Buck M. (eds) Trends and Issues in Global Tourism 2008. Springer, Berlin, Heidelberg

[30] Forms.ncl.ac.uk. (2020). Shibboleth Authentication Request. [online] Available at: https://forms.ncl.ac.uk/index.php [Accessed 25 Feb. 2020].

[31] Services.ncl.ac.uk. (2020). Surveys & Forms | IT Service (NUIT) | Newcastle University. [online] Available at: https://services.ncl.ac.uk/itservice/core-services/software/licences/surveysforms/onlinesurveysformerlybos.html [Accessed 25 Feb. 2020].

[32] Services.ncl.ac.uk. (2020). Surveys & Forms | IT Service (NUIT) | Newcastle University. [online] Available at: https://services.ncl.ac.uk/itservice/core-services/software/licences/surveysforms/ombea.html [Accessed 25 Feb. 2020].

[33] Services.ncl.ac.uk. (2020). Surveys & Forms | IT Service (NUIT) | Newcastle University. [online] Available at: https://services.ncl.ac.uk/itservice/core-services/software/licences/surveysforms/surveymonkey.html [Accessed 25 Feb. 2020].

[34] Surveymonkey.com. (2020). SurveyMonkey Plans and Pricing . [online] Available at: https://www.surveymonkey.com/pricing/individual/details/?ut_source=pricing-teams-details [Accessed 25 Feb. 2020].

[35] Facebook. (2020). Facebook – log in or sign up. [online] Available at: https://www.facebook.com/ [Accessed 25 Feb. 2020].

[36] Reddit.com. (2020). reddit: the front page of the internet. [online] Available at: https://www.reddit.com/ [Accessed 25 Feb. 2020].

[37] Linkedin.com. (2020). LinkedIn. [online] Available at: https://www.linkedin.com/feed/ [Accessed 25 Feb. 2020].

[38] SurveyCircle. (2020). [online] Available at: https://www.surveycircle.com/en/ [Accessed 25 Feb. 2020].

[39] SurveySwap. (2020). Home. [online] Available at: https://surveyswap.io/ [Accessed 25 Feb. 2020].

[40] Poll-pool.com. (2020). PollPool | Find survey participants | Fast, easy and free of charge. [online] Available at: https://www.poll-pool.com/ [Accessed 25 Feb. 2020].

[41] Inspirock.com. (2020). Trip Planner: Plan & manage your vacation itinerary on Inspirock • Inspirock. [online] Available at: https://www.inspirock.com/ [Accessed 26 Feb. 2020].

[42] Tripit. (2020). TripIt - Highest-rated trip planner and flight tracker. [online] Available at: https://www.tripit.com/web [Accessed 26 Feb. 2020].

[43] Android. (2020). Android. [online] Available at: https://www.android.com/ [Accessed 29 Apr. 2020].

[44] Developer.apple.com. (2020). iOS 13 - Apple Developer. [online] Available at: https://developer.apple.com/ios/ [Accessed 29 Apr. 2020].

[45] En.wikipedia.org. (2020). Android Studio. [online] Available at: https://en.wikipedia.org/wiki/Android_Studio [Accessed 29 Apr. 2020].

[46] Apple Developer. (2020). Xcode - Apple Developer. [online] Available at: https://developer.apple.com/xcode/ [Accessed 29 Apr. 2020].

[47] En.wikipedia.org. (2019). Java (programming language). [online] Available at: https://en.wikipedia.org/wiki/Java_(programming_language) [Accessed 30 Apr. 2020].

[48] Kotlin. (2020). [online] Available at: https://kotlinlang.org/ [Accessed 30 Apr. 2020].

[49] Play.google.com. (2020). [online] Available at: https://play.google.com/store?hl=en [Accessed 30 Apr. 2020].

[50] Developer.apple.com. (2020). Swift - Apple Developer. [online] Available at: https://developer.apple.com/swift/ [Accessed 30 Apr. 2020].

[51] Statista. (2020). Android versions market share 2019 | Statista. [online] Available at: https://www.statista.com/statistics/271774/share-of-android-platforms-on-mobile-devices-with-android-os/ [Accessed 30 Apr. 2020].

[52] Statista. (2020). Android vs iOS market share 2023 | Statista. [online] Available at: https://www.statista.com/statistics/272307/market-share-forecast-for-smartphone-operating-systems/ [Accessed 30 Apr. 2020].

[53] En.wikipedia.org. (2017). Ionic (mobile app framework). [online] Available at: https://en.wikipedia.org/wiki/Ionic_(mobile_app_framework) [Accessed 30 Apr. 2020].

[54] Angular.io. (2020). Angular. [online] Available at: https://angular.io/ [Accessed 30 Apr. 2020].

[55] GitHub. (2020). Build software better, together. [online] Available at: https://github.com/ [Accessed 30 Apr. 2020].

[56] Dropbox. (2020). Dropbox Business. [online] Available at: https://www.dropbox.com/?landing=dbv2 [Accessed 30 Apr. 2020].

[57] Google.com. (2020). Free Cloud Storage for Personal Use - Google Drive. [online] Available at: https://www.google.com/drive/ [Accessed 30 Apr. 2020].

[58] Agantty free project management tool. (2020). Free gantt chart! Free Project Management Tool Agantty. Use it now →. [online] Available at: https://www.agantty.com/en/ [Accessed 30 Apr. 2020].

[59] Any.do. (2020). To do list app with Calendar, Planner & Reminders | Any.do. [online] Available at: https://www.any.do/ [Accessed 30 Apr. 2020].

[60] Office.com. (2020). Office 365 Login | Microsoft Office. [online] Available at: https://www.office.com/ [Accessed 30 Apr. 2020].

[61] En.wikipedia.org. (2020). Facebook. [online] Available at: https://en.wikipedia.org/wiki/Facebook [Accessed 30 Apr. 2020].

[62] En.wikipedia.org. (2020). Google. [online] Available at: https://en.wikipedia.org/wiki/Google [Accessed 30 Apr. 2020].

[63] Adobe.com. (2020). UI/UX design and collaboration tool | Adobe XD. [online] Available at: https://www.adobe.com/products/xd.html [Accessed 30 Apr. 2020].

[64] En.wikipedia.org. (2020). Microsoft. [online] Available at: https://en.wikipedia.org/wiki/Microsoft [Accessed 30 Apr. 2020].

[65] Sketch. (2020). The digital design toolkit. [online] Available at: https://www.sketch.com/ [Accessed 30 Apr. 2020].

[66] Balsamiq.com. (2020). Balsamiq. Rapid, effective and fun wireframing software. | Balsamiq. [online] Available at: https://balsamiq.com/ [Accessed 30 Apr. 2020].

[67] Adobe.com. (2020). Photo, image & design editing software | Adobe Photoshop. [online] Available at: https://www.adobe.com/products/photoshop.html?gclid=Cj0KCQjw7qn1BRDqARIsAKMbHDaXTt3hkotWDE81cGDXL2nuGi-Ysp5J0H1lcw89ONJKP2aK1FQ5pWoaAm46EALw_wcB&sdid=KKQIL&mv=search&ef_id=Cj0KCQjw7qn1BRDqARIsAKMbHDaXTt3hkotWDE81cGDXL2nuGi-Ysp5J0H1lcw89ONJKP2aK1FQ5pWoaAm46EALw_wcB:G:s&s_kwcid=AL!3085!3!394992217880!e!!g!!adobe%20photoshop [Accessed 30 Apr. 2020].

[68] Draw.io. (2020). Flowchart Maker & Online Diagram Software. [online] Available at: https://www.draw.io/ [Accessed 11 May 2020].

[69] En.wikipedia.org. (2020). Camtasia. [online] Available at: https://en.wikipedia.org/wiki/Camtasia [Accessed 30 Apr. 2020].

[70] Firebase. (2020). Firebase Authentication. [online] Available at: https://firebase.google.com/docs/auth [Accessed 30 Apr. 2020].

[71] Firebase. (2020). Cloud Firestore | Firebase. [online] Available at: https://firebase.google.com/docs/firestore [Accessed 30 Apr. 2020].

[72] Amadeus IT Group SA. (2020). Play, innovate and launch with Amadeus APIs quickly | Amadeus for Developers. [online] Available at: https://developers.amadeus.com/ [Accessed 30 Apr. 2020].

[73] Yelp.com. (2020). Yelp Developers . [online] Available at: https://www.yelp.com/developers [Accessed 30 Apr. 2020].

[74] Google Developers. (2020). Overview | Places API | Google Developers. [online] Available at: https://developers.google.com/places/web-service/intro [Accessed 30 Apr. 2020].

[75] Google Developers. (2020). Google Maps Platform | Google Developers. [online] Available at: https://developers.google.com/maps/documentation [Accessed 30 Apr. 2020].

[76] Iatageo.com. (2020). IATAGeo. [online] Available at: http://iatageo.com/ [Accessed 30 Apr. 2020].

[77] Think with Google. (2020). What Users Want Most from Mobile Sites Today. [online] Available at: https://www.thinkwithgoogle.com/advertising-channels/mobile-marketing/what-users-want-most-from-mobile-sites-today/ [Accessed 6 May 2020].

[78] Lubos, Lesley. (2012). The Role of Colors in Stress Reduction. Liceo Journal of Higher Edeucation Research

[79] Api.idbus.com. (2020). Blablabus API for developers. [online] Available at: https://api.idbus.com/ [Accessed 11 May 2020].

Appendices

Appendix A – Questionnaire

Mobile app meant to alleviate travel stress and reduce pre-travel anxiety

The purpose of this survey is to examine how/whether people feel pre-travel stress or anxiety during their travels. It will also be used to find out how travelers plan their itineraries and what tools they use for that. This survey is conducted through the University of Newcastle for my final year thesis. Your responses will be completely anonymous and will never be linked to you personally. Your participation is entirely voluntary. Thank you for your participation.

Please select your gender *

○ Male
○ Female
○ Other
○ Prefer not to say

Please select your age *

○ Less than 18
○ 18-24
○ 25-34
○ 35-44
○ 45-54
○ 55 and over
○ Prefer not to say

Have you ever experienced pre-trip anxiety? *

○ Yes
○ No
○ Maybe
○ Prefer not to say

Have you ever felt stressed during your travels? *

○ Yes
○ No
○ Maybe
○ Prefer not to say

Have you ever argued with your travel partner during the trip because of stress? *

- ○ Yes
- ○ No
- ○ Prefer not to say

What do you think causes stress before and during your travels? *

- ☐ I don't feel stressed before or during travel
- ☐ Foreign language
- ☐ Food options
- ☐ Financial concerns
- ☐ Planning
- ☐ Unrealistic expectations
- ☐ Safety
- ☐ Meeting the needs of travel companions
- ☐ Packing
- ☐ Air travel
- ☐ Not having access to various services/resources (i.e. traveling with children, due to disabilities)
- ☐ Other

Do you prepare your own travel itineraries? I.e. places to see, things to do/experience. *

- ○ Yes
- ○ No
- ○ Prefer not to say

If answered 'Yes' to the above, which tools/methods do you use for your travel schedules? It can be websites, blogs applications, travel agents etc.

- ☐ TripAdvisor
- ☐ Google Maps
- ☐ TripIt
- ☐ Skyscanner
- ☐ Google Flights
- ☐ Instagram
- ☐ Pen and paper
- ☐ Other

[   ]

Do you feel overwhelmed when picking travel itineraries? *
- ○ Yes
- ○ No
- ○ Prefer not to say

Do you specifically use TripAdvisor to plan your trips? *
- ○ Yes
- ○ No
- ○ Sometimes
- ○ Prefer not to say

If you use TripAdvisor, do you believe its interface is messy and/or suffers from information overload?
- ○ Yes
- ○ No
- ○ Prefer not to say

Do you use Inspirock to generate custom day-by-day travel itineraries? *
- ○ Yes
- ○ No
- ○ Have not heard of it
- ○ Prefer not to say

Do you believe a personalised day-by-day travel itinerary tailored to your special needs and interests would help you have more fulfilling and stress-free holidays? *

○ Yes

○ No

○ Maybe

○ Prefer not to say

I'm not a robot

reCAPTCHA
Privacy - Terms

Data Protection Statement

Data from this survey will be treated confidentially, and all responses are anonymous. The data will only be used for my dissertation and will only be accessed by me, my supervising professor, and a few other university academics (for marking).

Submit

Appendix B – User Group Survey

User Satisfaction
This form is to gauge the success of the developed variant.

What is your technological proficiency?
- ○ Beginner
- ○ Average
- ○ Advanced

Would you consider the application clean?
- ○ Yes
- ○ No

Would you consider the application easy to navigate?
- ○ Yes
- ○ No

Would you consider the application intuitive?
- ○ Yes
- ○ No

Do you think such application would improve your trip experience and reduce stress?
- ○ Yes
- ○ No

Would you use such an application?
- ○ Yes
- ○ No

Do you approve of the app aesthetics (full GUI consideration)? I.e. choice of color, font, widget placement, layout, components etc.
- ○ Yes
- ○ No

What features do you think would be most useful, necessary to include?

- ☐ CO2 calculation
- ☐ Health information/alerts/news
- ☐ Profile with trip statistics
- ☐ Settings with currency/units/notifications options
- ☐ Calendar sync
- ☐ Co-travellers to create trips together
- ☐ Trip sharing
- ☐ To do list
- ☐ Packing list
- ☐ Hotels searh
- ☐ Flights search
- ☐ Explore section
- ☐ Bookings section
- ☐ Improved and expanded trip generation

Data Protection Statement

Warning:

this form does not contain a data protection statement.

Submit