

LUT- Open and Collaborative Innovation 2023

TELANTO CHALLENGE: HUAWEI QUICK APP

TEAM 3

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1. Introduction

As part of the assessment structure for the Open and Collaborative Innovation Course, a Tel-anto challenge was issued to the students. The challenge accepted by this group was to explore the area of mini/quick applications in mobile phones and identify use cases that would leverage the benefits of the technology.

1.1. Initial Ideation

At the beginning of the project the group undertook a brainstorming exercise to begin the ideation process and consider what areas would be well served by a mini app. A mind map was developed within the group to develop some of the initial ideas (Appendix A). It became clear that the group saw the benefits of the quick app as being focused in supporting people as they go about performing common tasks that can be improved with technology. For example, some of the ideas included an application to support someone when visiting the supermarket to do their grocery shopping; other ideas supported people coming to a city as a visitor to get access to supporting information about transport or places of interests, while another idea was based around helping people when visiting the hospital.

1.2. Idea Selection

From the initial ideation process, the team discussed the ideas further and decided on pursuing applications that would either support visiting an airport, being a tourist in cities or aiding with prescribed medication. These ideas were refined to consider the pain points that were being addressed by the application and presented to the project partner. As part of this process, the team scored the application ideas based on some fundamental aspects: the commercial potential of the application and how many different revenue ideas were proposed; the feasibility of developing the app, both technically and practically (i.e. considering access to certain types of data); the uniqueness of the idea and how novel it was. Based on the feedback given by the partners during the presentation and subsequent discussions within the group, it was decided to select the application to support passengers when transitioning through an airport.

1.3. Methodology

To develop the idea and identify a series of value proposition, extract and develop software requirements, and outline the business practicalities, the following methodology was undertaken (Figure 1). Initially, research was conducted to understand the current situation regarding airports and the potential areas of focus when regarding pain points experienced by passengers. This was followed by some consideration over how to identify and develop the needed requirements for the application, namely by leveraging user centred design through the development of personas, which are based on the research and the results of a developed survey. The personas are then used to identify a series of use cases and related requirements. These requirements are then formulated into a series of UI designs to better convey and visualise the ideas. Finally, a deployment method and business model are identified to outline how the idea could be brought to life commercially.

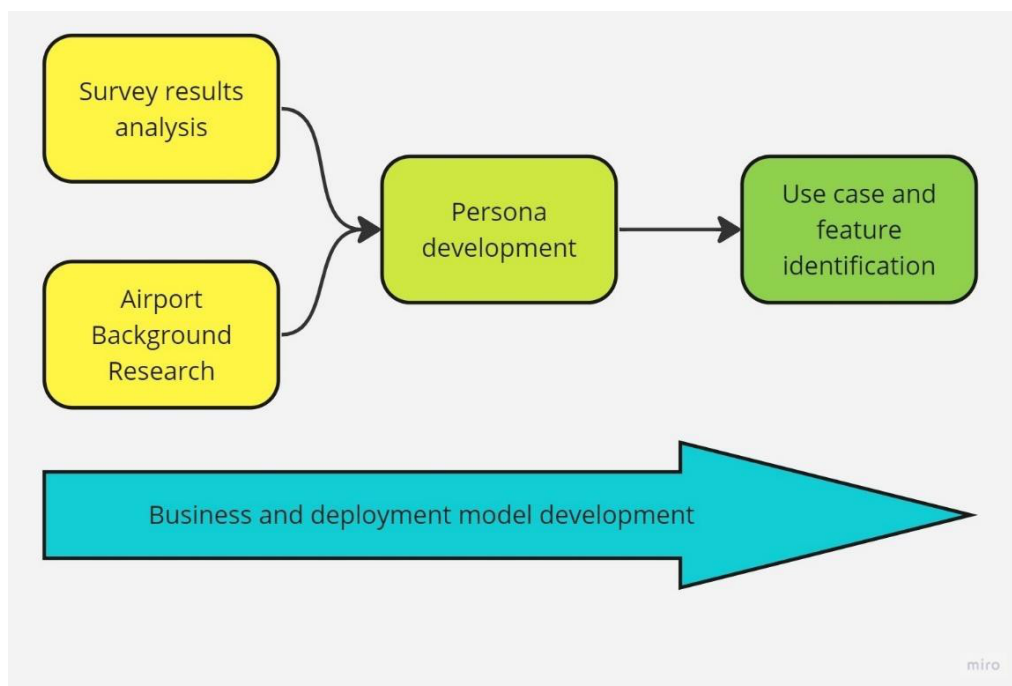


Figure 1: Conceptual framework for quick app development

2. Data Gathering

2.1. Literature Review

2.1.1. Airports and Passenger Pain Points

Airports are highly complex ecosystems with a lot of moving parts. From a passenger point of view, airports can be understood through several theoretical perspectives. Among those theories, passenger experience is a key element to discover more. From the perspective of the passenger, the airport experience entails several different tasks and procedures, such as check-in, security, boarding, baggage handling, dining and shopping, navigating, and ground transportation. These operations can significantly affect how passengers are treated at the airport and are necessary for passengers to get to and from chosen destinations. Processes that are effective and streamlined, open communication, and high-quality facilities and services can all assist in enhancing client satisfaction and adding enjoyment to an airport journey. Passengers may also enjoy a faster and more efficient journey thanks to technological and digital advancements. Through this use case, we are trying to describe the integration and advantages of Quick app or mini-app technology usage in the Airport to enhance the passenger experience.

Based on the background research performed regarding this use case, there are many research papers that mention the challenges passengers face while traveling through airports. Before considering the pain points identifying the main activities at the airport is essential. An airport has various facets of operation, including airport operations, passenger experience, infrastructure, safety and security, and sustainability. Airport operations entail regular management activities like scheduling flights, baggage handling, air traffic control, and terminal operations (International Air Transport Association. 2019). The passenger experience refers to the traveler's encounter with the airport, starting from check-in, security, boarding, and luggage handling. Infrastructure includes physical aspects such as runways, terminals, parking garages, and cargo facilities. Safety and security activities encompass security screening, emergency response, and air traffic control to ensure the well-being of travellers and airport staff (Airports Council International. 2018).

For passengers, flying can provide a variety of difficulties. Long lines for security, boarding, and check-in can be frustrating and stressful. Passengers may find it challenging to navigate large, complicated airport layouts (Airport Cooperative Research Program. 2018), especially if

they are first-time visitors. Travel arrangements can be upset by flight delays and cancellations. Particularly if travellers are carrying vital or valuable items, lost, delayed, or damaged luggage can be a significant annoyance (Dvorakova, T., Svitek, M., Voracova, S., Rehor, V., and Vittek, P. 2022). During the busiest travel times, airport terminals can be crowded and have a lack of seating. Having no access to facilities like clean restrooms, charging stations, or food options during protracted layovers may be very annoying (Chen, S., Mai, Y., Ma, B., & Li, Z. 2016). Body scans and other security procedures, such as screening, can be intrusive and time-consuming.

2.1.2. Application Requirements Development

To make sure that the app meets the needs of its target users, the requirements for the app must be developed using a combination of user-centred design concepts and technical expertise. The formulation of requirements for app development can be guided by several theoretical frameworks. User-centred design is one of the frameworks that we can use to gather user requirements. Also, it is a design philosophy that places a strong emphasis on the necessity of understanding the users' needs, objectives, and behaviours during the design stage (Norman, D. A. 2013). To aid in the identification of user needs and pain points, surveys are a popular tool in requirement engineering for gathering data. User requirements and preferences for a product or service can be determined using surveys, which are intended to collect information about users' opinions, preferences, and habits (Creswell, J. W., & Creswell, J. D. 2017).

In this project, we have used both a user-centred design framework by creating personas and survey development to identify the key user requirements during the application design process.

2.2. Survey Development

The primary aim of the survey was to gather data on the experience of passengers at airports. The data collected from this survey has been used to identify areas for improvement to enhance the overall passenger experience. The survey was issued using Webropol and respondents were able to access that by using a link or QR-code. This survey was made anonymous, and it had 11 questions. A total of 36 answers were received and the respondents' ages were 18-25 (2,8%), 26-34 (69,4%), 35-45 (13,9%), 46-55 (2,8%), and 56-65 (11,1%). Appendix B contains the full

list of questions and results in a graphical format. The following is a summary of the key findings.

2.2.1. Airport Challenges

Survey questions 2, 3, 7, 8, 9 and 10 focused on finding the pain points at airport and how passengers experience the overall transaction at the airport by answering various statements.

- In question 2 the respondent was asked which they find time consuming at the airport. This was multiple choice question and respondent was able to select multiple choices. The answer options and their answer percentages were baggage drop off (61%), security check (83%), using services (3%), finding the discounts for store products (14%), finding the right gate (33%), finding the airport staff (3%), understanding signage and layouts (31%) and what else (3%) with the answer check in process and boarding the flight.
- Question 3 asked is it challenging to find your way around the airport. According to our survey 20 people (56%) responded as yes and 16 people (44%) replied no.
- Question 7 asked have you ever encountered long waiting times or queues for airport security or baggage check-in. This question got 31 people (88,6%) saying yes and 4 people (11,4%) saying no.
- In question 8 the respondent was asked have you ever encountered language barriers while navigating through airport facilities or interacting with airport staff. 14 people (38,9%) stated that yes and 22 people (61,1%) stated that no.
- In question 9 the respondent was asked to rank in the scale 1 to 5, where 1 is bad and 5 is good, the accessibility of airport facilities for individuals with disabilities. Option 1 received zero answers (0%), option 2 received five answers (13,9%), option 3 received 13 answers (38,9%), option 4 received 14 answers (38,9%) and option 5 received four answers (11,1%).
- Question 10 was an open-ended question where the respondent was able to write his/her own words. Question was what improvements or changes would you suggest to enhance the overall passenger experience of the airport? This question reviewed a total of 14 responses. These were to have important information easier to find, clear reception service would be good, make signs simple and readable, changing the terminals or finding the right gate is difficult especially when there is a language barrier in the country, staff

along the way or clear instructions indicating the gate would be more helpful, some assistance helping if needed (elders, mothers travelling with baby), assistance to new flyers specially in migration sections and also assistance or translator to those who don't speak the specific language of that nation, language barrier, easinesses for navigating through airport, searching gate, airport layouts should not be complicated because most of the passengers at the airport are new to the environment, increase the number of staff, fast internet, boarding the flights is often frustrating and requires a lot of waiting around, lower prices in stores and restaurants, if I would know about some offers I could use them and more offers.

2.2.2. Activities at the airport

The following questions focused on identifying types of activities that passengers prefer to undertake during their visit to the airport.

- In question 4 the respondent was asked what activities do you typically engage in while waiting for a flight. This was multiple choice question and respondent was able to select multiple choices. The answer options and their answer percentages were shopping (78%), dining (47%), drinking (53%) and using airport amenities (28%).
- In question 5 the respondent was asked to rank in the scale 1 to 5, where 1 is low and 5 is high, the importance of shopping when traveling through airports. Option 1 received four answers (11,1%), option 2 received six answers (16,7%), option 3 received five answers (13,9%), option 4 received 18 answers (50%) and option 5 received three answers (8,3%).
- Question 6 was asking does respondent normally check on offers when shopping at airports. 22 people (61,1%) answered yes and 14 people (38,9%) answered no.
- Questions 11 was asking would you use an app to help improve the experience and provide special offers at an airport? 50% stated that they strongly agree, 39% stated that they agree, 8% stated that they disagree and 3% stated that they strongly disagree.

2.3. Competitor Analysis

The focus for analysis regarding competition in the market was centred on the provision of mobile applications to support air travel. Currently, the available options fall into two broad

categories: applications developed by the airport operator and independent applications developed by third parties. It is difficult to get measure of how many mobile applications exist, since there is not specific category for this type of application in the Google Play Store and sifting through the results takes a prohibitive amount of time.

Applications developed for airports are usually provided by third parties who leverage flight data APIs available to create applications. However, the quick app format provides a unique set of benefits that can provide a more effective use case for the consumer as they can target the specific functionality they would like.

2.3.1. Airport Operator Applications

While not all airport operators have these, there are many airports that retain their own application. These often include detailed information about the airport, such as maps and support, along with the usual features like flight data. These applications provide access to retail and other commercial opportunities in the airport, while also offering additional functionality such as allocating parking spaces. Generally, the apps are free to download although some have additional features behind a pay wall.

2.3.2. Third-party Applications

Typically, these applications are designed support travellers and are airport agnostic. This means that they cannot provide any specific features related to activities that go on in airport, such as commercial opportunities. Instead, they leveraged accessible data about flight information and package that with other features to support passengers in general. Typical features include flight tracking, arranging trips, access lounges and check-in. Some of these applications are free to download, while others have subscription fees or in app purchase opportunities.

2.3.3. Implications

The wide variety of applications that are available suggests a saturated market, which requires a compelling value proposition for the quick app. A notable element missing from most of the competitors is functionality to support bottleneck reduction. Additionally, it is claimed that many passengers do not use the applications provided by airports (Mehra, 2023), highlighting an opportunity for an application to prosper in the space, if it is done well.

3. Application Development

In this section we discuss the details of application development process.

3.1. Personas

The creation of personas is a crucial phase in the development of airport apps since it aids the development team in understanding the requirements, habits, and tastes of various user groups. The team can better understand the wide spectrum of travellers that use the airport and develop an app that meets their unique needs by developing personas. Without personas, the app development team could make assumptions about their users' needs that are not supported by facts or studies, which could result in a design that is neither user-friendly nor effective. Personas make it possible for the app design to be user-centred and to consider the wants and preferences of actual users (Norman, D. A. 2013). Personas build a common language and understanding of the demands of the user by developing personas that are based on data and research. This can lead to more effective communication and collaboration. The development of design solutions that meet the objectives and goals of various user groups is made possible by the creation of personas by designers (Cooper, A., Reimann, R., & Cronin, D. 2007).

Based on the passenger types, which we identified through background research, we created personas to extract further the user requirements to consider when building the app. In persona development, we consider the user's personality, background, goals, and challenges they face while traveling. Some of the challenges directly influence a feature in the app and some can be indirectly addressed, e.g., via information, etc.

We created a total of five different personas. By considering the different user stories, we identified their key requirements, and based on that we defined the features that we include in our application. The example of persona creation is shown in Figure 2 below and other personas for different user types are attached (see Appendix C).

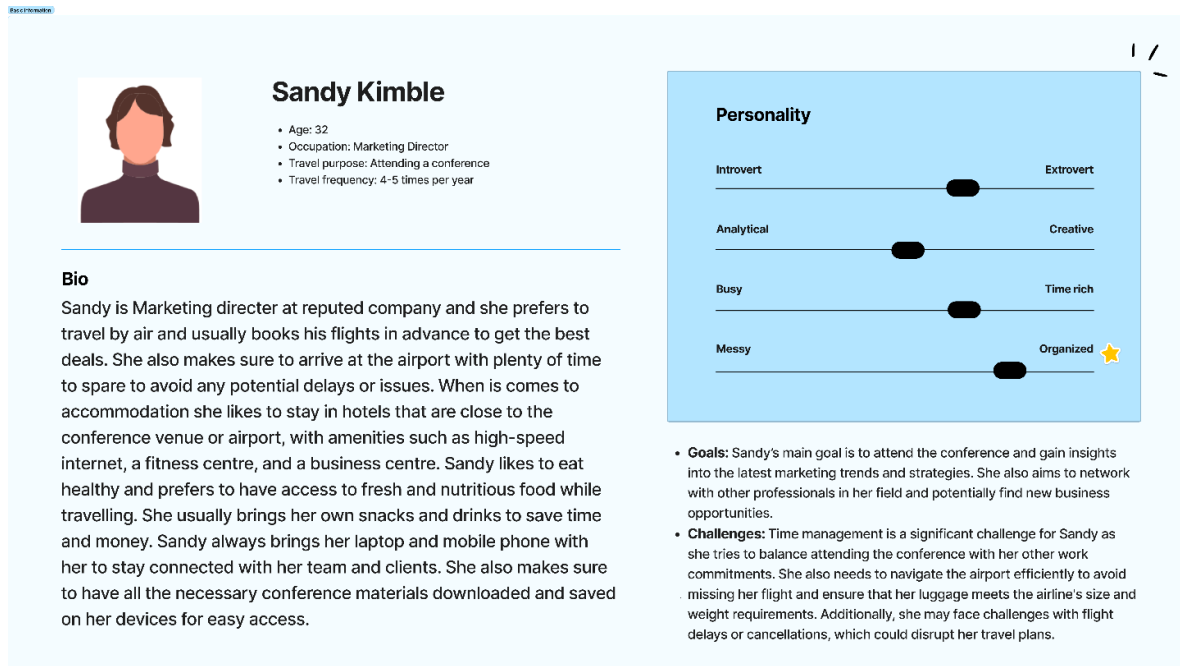


Figure 2: Business Traveller Persona

From each persona we extracted the requirements starting from Sandy Kimble who is a business traveller. Her main requirements are travel efficiencies and locating desired retail opportunities. The features that we can offer through our app are streamlined airport processing such as access to specific retail and dining facilities; additional services like hotel booking, car hire, etc. Secondly, we have Emilia Clarke a leisure traveller. She requires access to special offers and means of saving money. Features that we can offer to her support with airport directions (exits, baggage collection, taxi ranks when traveling to new locations). Our third person is Maria Carey who is traveling with children. For her most important is to get the right directions to relevant airport services such as finding play areas for children's or baby changing/feeding facilities; up-to-date flight information; support during bottlenecks since waiting in long queues with children is a stressful task for parents. The fourth person is Steve Johnson who is a traveller with special needs. His key requirements are support services to aid in boarding and processing when necessary. For him, we can provide guidance to relevant airport services and aid transition through the airport. Lastly, John Davis is a retired accountant who mostly travels to visit his family. As the main requirement, he needs access to mobility assistance and supports with directions. From an application like this, we can provide services to aid transition through the airport with easy-to-use instructions and access maps. Also, can provide accessibility features such as reading aloud airport signs or directions.

3.2. Architecture

According to Pillai (2017), software architecture quality characteristics are modifiability, testability, scalability, performance, security, and deployability. Based on scope of the study testability and performance mechanisms cannot be devised for the said application. Based on quick application characteristics, **resource limit** is an added requirement, and airport environment demands to solve **complex functions** like handling maps and **communicating** with airport management to ask assistance and relay information was needed.



Figure 3 Architecture characteristics of the Airport App

Security is required for handling secure messaging and payment handling as discussed in later Section 3.3. **Deployability** is discussed more in 4.1. The app is **modular** in nature, and its modularity is discussed in Section 3.3. **Scalability** means scalable to different airport sizes and other environments than airports such as theme parks. Modularity and scalability collectively make this architecture flexible, but modularity has other benefits to offer as well such as saving

resource and flexibility to develop new features. The proposed architecture's characteristics are depicted in Figure 3.

3.3. Use Cases

In this section we describe modular use cases of our app. Each module can be downloaded and integrated to services based on choices made by user on runtime. Modularity in the case of Huawei quick apps is very important because it will limit the downloaded code and overhead of the app while tailoring services for each user as discussed in Section 3.2. This app has a main page which will provide basic information provided by the airport and four possible modular blocks inferred from our data analysis.

UC 1. Commercial – Help user find nearby offers and payments

This module of the app takes care of all the commercial aspects. Users can get all the nearby offers and discounts while waiting at the airport. Not only this module has the capability to integrate the offerings within the premises but also online entertainment services, etc. Moreover, this module is mainly responsible for handling all secure payments. Not only this module eases payments for the customers but also streamlines the queuing at the restaurants and food points. Summarizing, the module will support the following:

- UC 1.1. On premises Advertising
- UC 1.2. On premises Offers
- UC 1.3. Online Offers for air-passengers and particular airport

UC 2. Processing Module – Reduce evident bottlenecks

This app module will address the stress points of the air passengers as reported in the survey. It is loaded with all the functionalities to support air passengers with smooth check-in to boarding processes. This means that it is capable of estimating queues and guiding the passenger appropriately with minimum effort to pass all the security and checkpoints. This module will be implemented in collaboration with airport management to ensure, e.g., separate queues in rush hours for the App users. It will make it easier for passengers to check-in, baggage drops, and security and will store all the necessary information in encrypted form and can share whenever needed. Summarizing this will take care of the following:

- UC 2.1. Streamlining bottlenecks at security
- UC 2.2. Checking-in
- UC 2.3. Boarding

UC 3. Flight Module – Helps users with all the flight related aspects

This module takes care of all the flight-related issues and information. It can relay all the information and urgent announcements to the user. For example, expected or unexpected delays and boarding changes such as gate changes will be immediately relayed to the passenger for convenience. The module can streamline the boarding process by announcing the right turn of passengers to board. Boarding passes could be shown via QR code, etc. In a similar fashion, departures, and transfers are handled by relaying all the related information. It takes care of the following tasks:

UC 3.1. Arrivals

UC 3.2. Departures

UC 3.3. Delays

UC 3.4. Appropriate Details: exceptional circumstances

UC 4. Support Module – Supports users in Airport premises

This module is for passengers with need of support from airport management staff. Passengers will mark all the medical conditions, single parents with children, parents with small children, disabled, and elderly people. The module can assess if the airport can offer immediate assistance or generate a warning for people with certain medical conditions in case, they need any assistance later. Secondly, this module will help air passengers with all the accessibility issues. The module takes care of the following:

UC 4.1. Accessibility features

UC 4.2. Passenger assistance

UC 4.3. Maps and GPS

3.4. UI Design

Our team has created mock-ups to show the work of the modules more accurately. The main functions of our quick application should be demonstrated to help understand how it works. The example is shown in Figure 4.

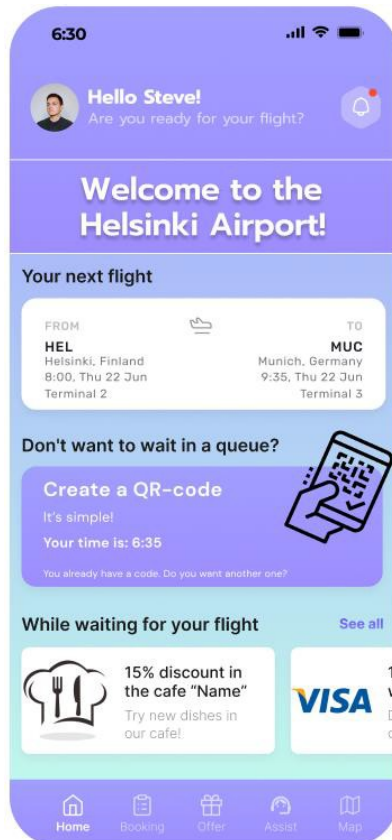


Figure 4: Quick App Homepage Design

The most important element of our quick app is the homepage, which contains basic information about the modules that were selected during the first launch. Depending on which airport a person is arriving at, he will see everything he might need.

Thanks to the flight module, the user has access to information concerning his or her flight. Also, if there are any flight delays or schedule changes, the user will be notified. If it is necessary to clarify or change data regarding their flight, the app should perform these tasks without problems.

The processing and the support modules are combined into one on the main screen. It is possible to create a QR code in order to go to the airport without waiting in a queue and it is also possible to choose whether it is necessary to get help from the employee. This may be useful for people with limited possibilities and those who are new to this airport and do not know where to go. The support module should also provide navigation within the building area and create a path that a person can navigate. If the capabilities of a quick app can allow it, we include an augmented reality feature. Thus, if the map is not enough, the user can build his own path through the camera on the mobile device.

There is also access to the commercial module on the homepage. The application will automatically offer various promotions from for example different stores and cafes inside the airport. There are also various possible tips on where a person can go and what they can buy. This module can also be combined with the flight module if, for example, the user needs to buy a new plane ticket.

Appendix D contains more information about how our team represents the work of the quick app.

4. Commercial Considerations

4.1. Deployment Model

The quick app provides a unique value proposition that can be leveraged for airport passengers who require a specific service that they can access quickly and without hassle. Since the nature of an airport is so complex, managing all the varying actors required to bring different modules of the app together would be difficult. Therefore, it is logical to instead target the application at the airport operator level. This is because they manage the different entities within the airport and would have the necessary contacts and access to build the relationships required. This would require a model where the basic quick app infrastructure would be provided as a platform and an airport operator could add their own specific content to a framework. This would present the opportunity to provide the necessary customisability without having to deliver bespoke applications to each individual customer.

Platform as a Service (PaaS) is a deployment model that allows for the development of customised applications through the provision of all the necessary software tools and underpinning hardware infrastructure required (IBM, n. d.). The upshot of this model is that customers using the platform do not need to consider the underlying complexities and are free to customise and deploy the quick app to suit their individual needs. This addresses the issues around the complexity and variation across different airports. It also means that updates to can be deployed uniformly across different environments.

In this model, airports can manage the basic building blocks required to deploy the mini app for their airport. By leveraging the modular design, airports can develop content that suits their own size or needs, thus expanding the potential customer base.

4.2. Business Model

A business model is defined as the method by which an organisation identifies how they are going to create and deliver value for the target customer base (Osterwalder et al., 2010). When it comes to providing a business model for a PaaS operation, challenges can exist due to the multisided nature of the business (having customers, who also have customers) and assigning specific value propositions in this type of scenario (Giessmann & Stanoevska-Slabeva, 2012). However, a business model Canvas is a useful means to examine closely the different aspects of the business model and identify in a more granular fashion how these come together to create value for the end-user (Osterwalder et al., 2014). The following list provides a breakdown of each of the elements involved in the business model canvas and the rationale behind each regarding the case of the mini-app; the canvas itself is attached as Appendix E.

Customer Segments are identified as the target organisations that the mini app development would be trying to reach.

- Since this report considers the key use case of an airport for the deployment of the mini-app, airport operators would be the key customer segment identified. However, the generic nature of the pain points addressed by the proposed application (queueing, accessing directions and support so on) means that there are additional application opportunities for other areas where this type of functionality is required. For example, different event operators, such as theme parks, shopping centres or music festivals would have similar needs when trying to streamline and track individuals accessing the services.
- Additional customer segments could come from other stakeholders, such as those interested in advertising via the platform or beneficiaries of the kind of data that is produced.

Value Propositions focus on the specific value that is created for the end customer.

- For an airport leveraging the platform, they would have a much-reduced resource commitment, should they wish to build and maintain their own application. This is because they would not need to concern themselves with the necessary hardware setup, nor acquire the skill set to develop and maintain their own app. Having an application that helps streamline the movement of passengers in an optimal way will reduce bottlenecks and improve their overall satisfaction. There is also the potential for airport operators

to access a series of commercial benefits through engagement with retail partners to create increased sales while providing increased customer satisfaction with support mechanisms to aid those who require support when transitioning through the airport. The data that the application would produce could also reveal additional valuable insights to the airport, that would allow them to further enhance the experience for passengers through, for example, improving the layout to better address passenger needs. This could be related to the repositioning of, for example, amenities that are required in a specific area, such as family-friendly zones.

Channels are how the value of the product is communicated to the targeted customer segments.

- One key channel would be relevant industry events. In the case of an airport, this would be targeted at conferences for airport operators. Other channels may be more specific to PaaS forums, where the platform and its concept are more broadly marketed. Additional channels would include the usual market and sales channels such as an online and media presence.

Customer Relationships establish the ways in which customers are retained and involved with the product.

- Developer networks could be established through support platforms where best practice could be discussed and shared, while providing feedback and improvement suggestion mechanisms. There would also be an opportunity here for value co-creation between the supplier and customer as opportunities are found for clients to actively suggest and develop new modules or other value adding properties for the service.

Revenue Streams describe the ways that the value offered by the product can result in sources of income.

- Primarily, cloud service providers generally offer subscription-based models as the chief source of revenue. This could be based on a scaling model whereby customers could subscribe to access the development resources for one or multiple modules. Contractually, users of the platform could also be required to give shares of any transaction that takes place, and there may be opportunities for accessing and revenues by inviting others to advertise on the platform. Other opportunities lie around servitization, where

training and certification could be provided to developers on the platform. Opportunities also exist in the provision of the software in its entirety, where applications are tailored according to specifications provided by the customer, and the maintenance and development are performed in-house.

Key Resources are the most important assets required to deliver the offering.

- The resources required to enable this model include the teams responsible for managing the necessary hardware infrastructure used to host and run the software, along with the development team required to create and maintain tools that allow for customising and deploying the Quick app. Additionally, a team will be required to aid with the training and support for using the application, while the usual sales and marketing functions will also be required.

Key Activities are defined as the main activities which will need to be the most important activities an organization needs to perform well.

- The main activities that will be undertaken will be the maintenance of the provided infrastructure, which includes both the hardware and software stacks. Other key activities include the management of the financial aspects and customer accounts, while a program for training and even accreditation could be required.

Key Partnerships are those partners and any external resources, including suppliers, that are key to the activities involved.

- The number of partners involved is dependent on the amount of development that is done in-house. Resale partners would be required to help access sales opportunities globally, while third party application developers could be involved to create some of the software required to power the platform. Partners around supplying the necessary hardware to develop the cloud offering would also be required.

Cost Structure relates to the costs involved to power the business model

- A significant portion of the cost is brutal to the development of the platform, both the hardware and the software, along with its operation and maintenance. On top of that costs would also be incurred to enable the sales and marketing functions and project the necessary financing arrangements.

5. Conclusions

Despite their being a plethora of applications to support passengers transitioning through the airport, there persists a series of pain points being experienced by passengers, primarily due to the delays experienced at various bottleneck hotspots.

The quick app model allows passengers to quickly download and run a temporary application to suit their needs. In the case of the airport application, the quick app could address acute processing, commercial, support, or other needs, without the additional hassle of downloading, installing, and registering on a native app. Primarily, an opportunity may exist to address the issues around passenger bottlenecks by providing a scheduling architecture that provides users with an informed and streamlined journey through key touchpoints, such as security, check-in, boarding, and luggage collection.

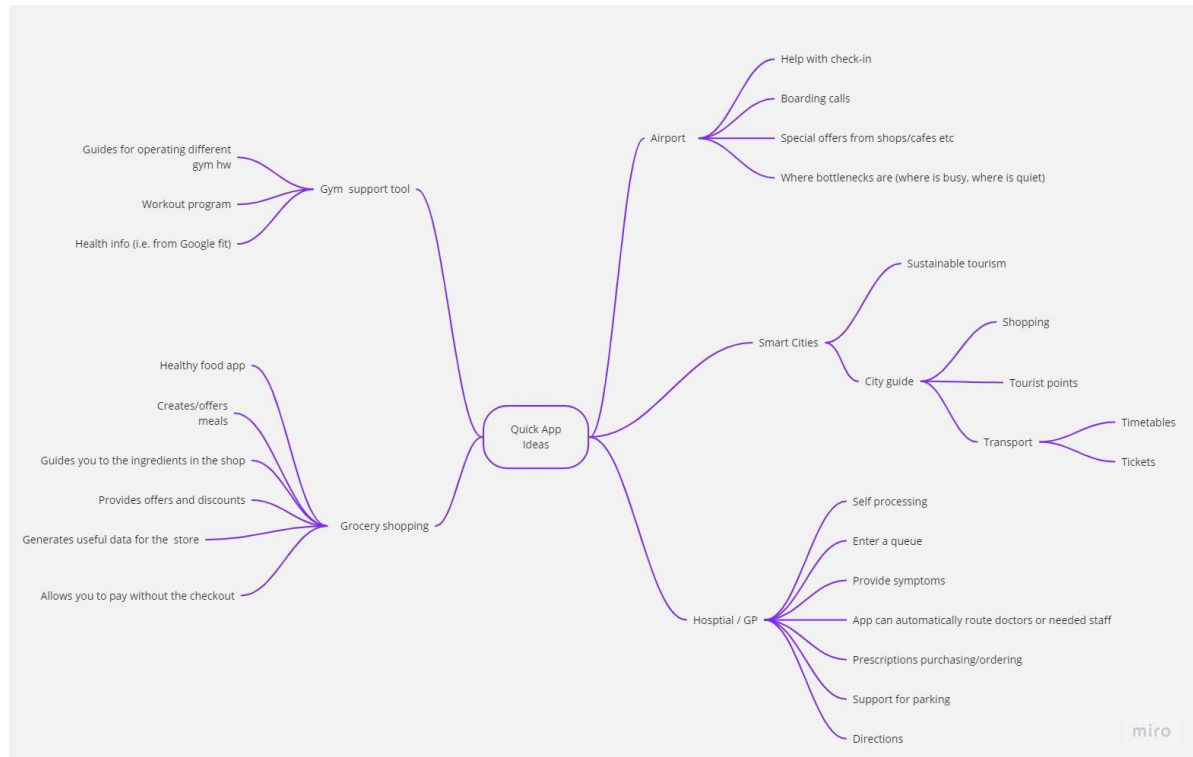
The nature of the airport ecosystem means that developing a rich feature set for the app would require engagement with multiple stakeholders. Therefore, the Platform as a Service model would allow airport operators to develop their own custom content, based on the nature of the amenities available in their facility. Alternatively, it could be possible to provide this as Software as a Service, where the application is tailored for the customer, based on their requirements. The nature of the modules presented for the application has applicability across several different primary use cases. The need for queueing/commercial/support functionality is prevalent across areas where there is a large volume of people present. An opportunity may exist in being able to provide customisable quick apps for many different sectors, including the entertainment and retail industries. Providing this platform also creates an opportunity for developers to create new use cases for quick app deployment. This is because the simplicity offered by the platform would enable users to apply different combinations of modules to address other unmet needs in the market. Making the creation and deployment of quick apps easier would open the technology to a broader set of customers. The modular architecture could allow for additional modules to be developed and, thus, different combinations could serve different use cases.

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Appendices

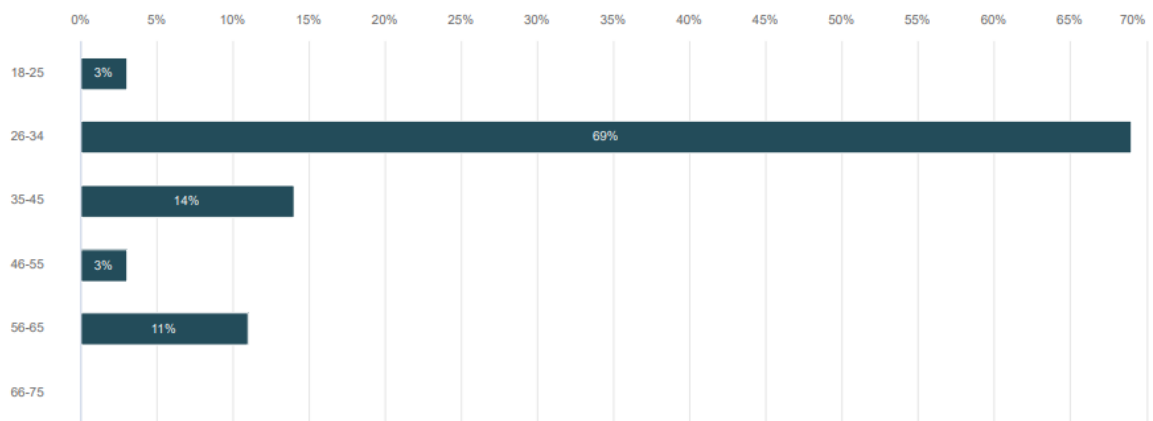
Appendix A: Initial idea mind map



Appendix B: Survey results

1. How old are you?

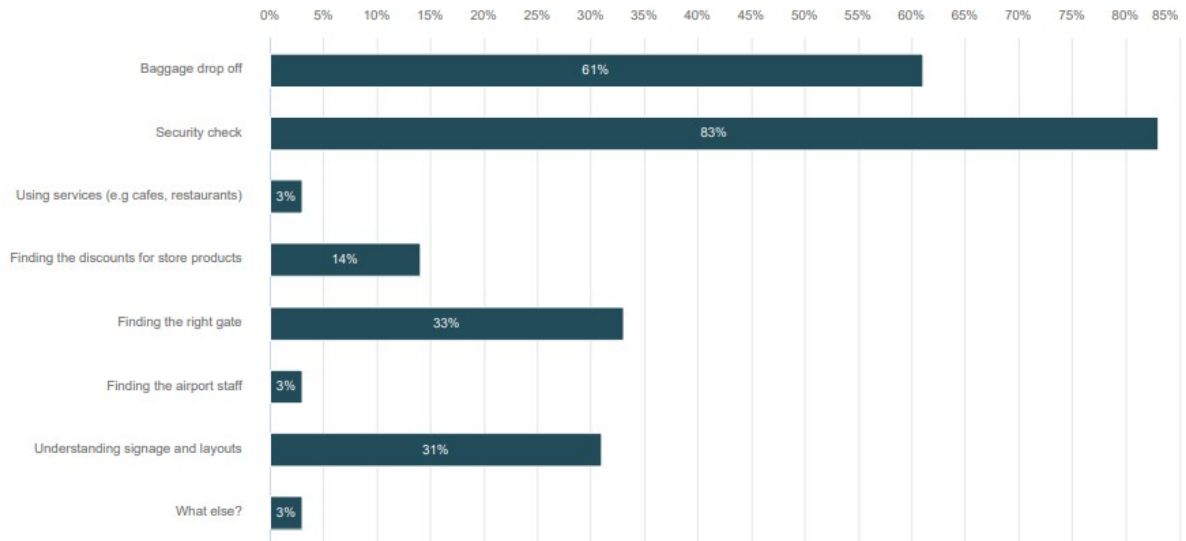
Number of respondents: 36



	n	Percent
18-25	1	2,8%
26-34	25	69,4%
35-45	5	13,9%
46-55	1	2,8%
56-65	4	11,1%
66-75	0	0,0%

2. Please select which you find time consuming at the airport

Number of respondents: 36 , selected answers: 83



	n	Percent
Baggage drop off	22	61,1%
Security check	30	83,3%
Using services (e.g cafes, restaurants)	1	2,8%
Finding the discounts for store products	5	13,9%
Finding the right gate	12	33,3%
Finding the airport staff	1	2,8%
Understanding signage and layouts	11	30,6%
What else?	1	2,8%

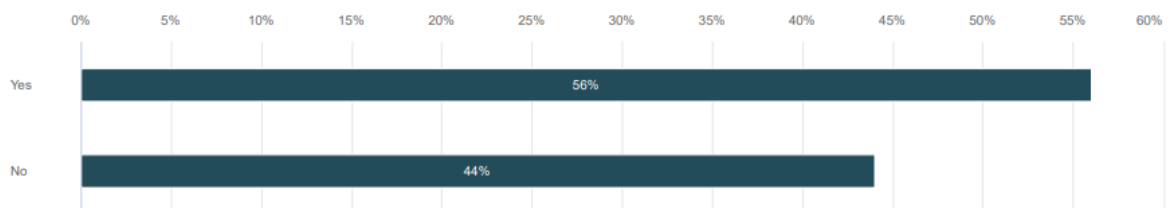
Answers given into textfield

Show all

Option names	Text
What else?	Check in process; boarding the flight

3. Do you find it challenging to find your way around the airport?

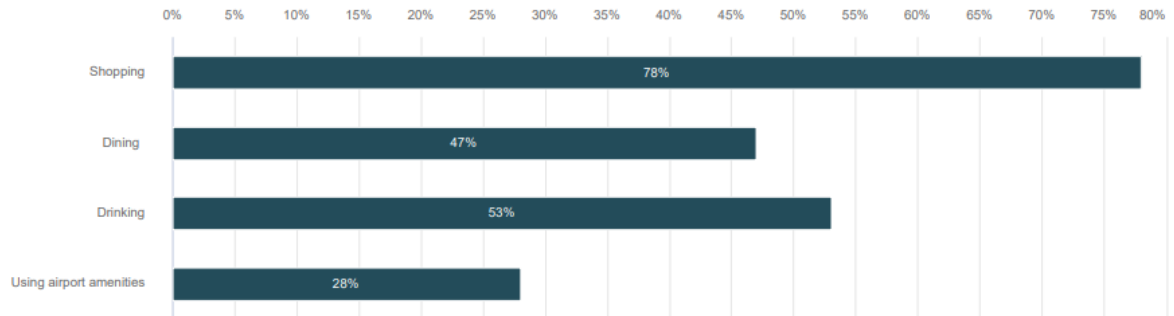
Number of respondents: 36



	n	Percent
Yes	20	55,6%
No	16	44,4%

4. What activities do you typically engage in while waiting for a flight?

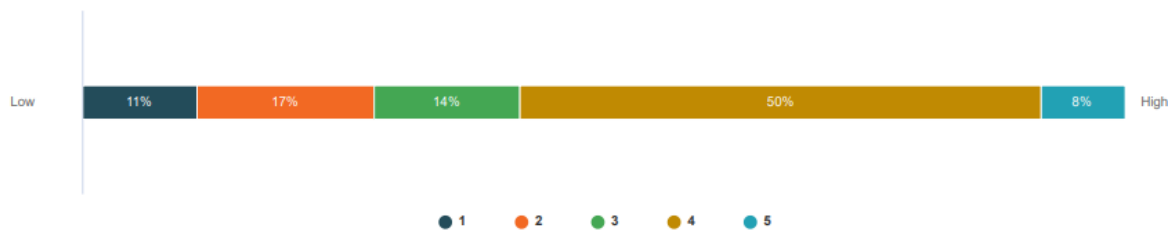
Number of respondents: 36 , selected answers: 74



	n	Percent
Shopping	28	77,8%
Dining	17	47,2%
Drinking	19	52,8%
Using airport amenities	10	27,8%

5. On a scale of 1-5, how important is shopping for you when traveling through airports?

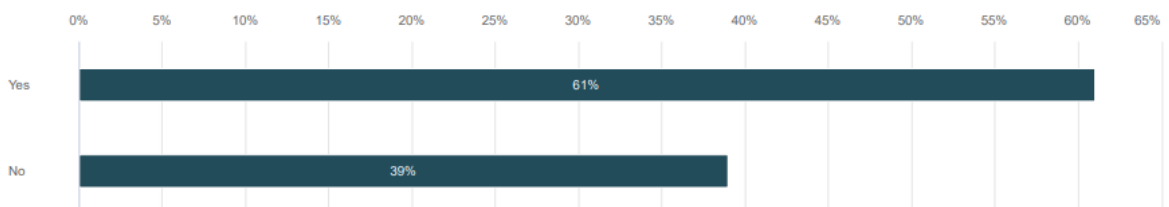
Number of respondents: 36



	1	2	3	4	5	Total	Average	Median
Low	4	6	5	18	3	36	3,3	4,0
	11,1%	16,7%	13,9%	50,0%	8,3%			
Total	4	6	5	18	3	36	3,3	4,0

6. Do you normally check on offers when shopping at airports?

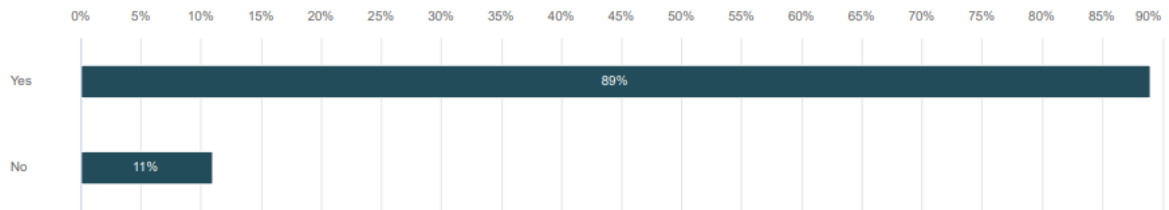
Number of respondents: 36



	n	Percent
Yes	22	61,1%
No	14	38,9%

7. Have you ever encountered long wait times or queues for airport security or baggage check-in?

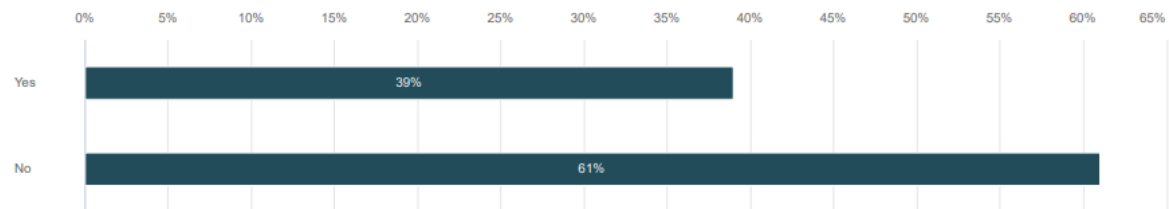
Number of respondents: 35



	n	Percent
Yes	31	88,6%
No	4	11,4%

8. Have you ever encountered language barriers while navigating through airport facilities or interacting with airport staff?

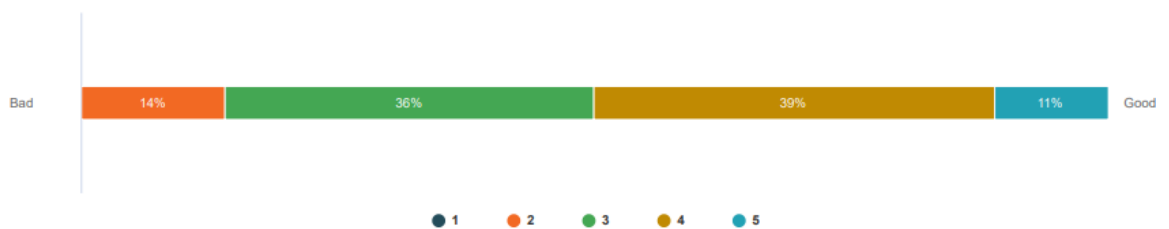
Number of respondents: 36



	n	Percent
Yes	14	38,9%
No	22	61,1%

9. How do you rate the accessibility of airport facilities for individuals with disabilities?

Number of respondents: 36



	1	2	3	4	5	Total	Average	Median
Bad	0	5	13	14	4	36	3,5	3,5
Good	0,0%	13,9%	36,1%	38,9%	11,1%			
Total	0	5	13	14	4	36	3,5	3,5

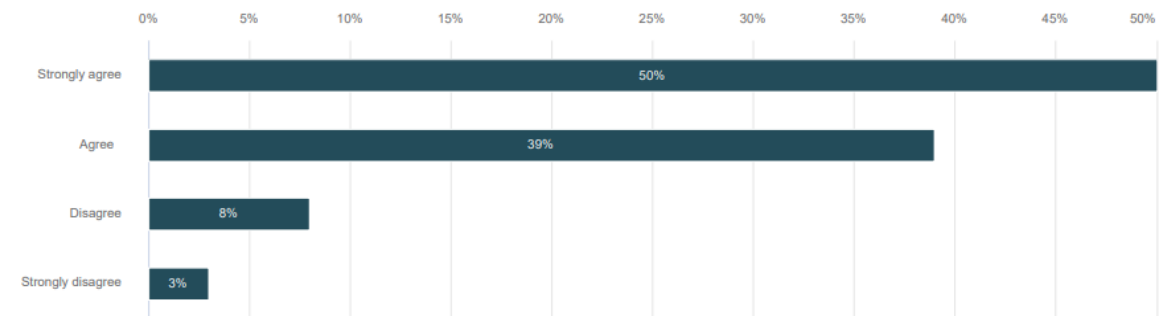
10. What improvements or changes would you suggest to enhance the overall passenger experience of the airport?

Number of respondents: 14

Responses
To have important information more easier to find
Clear reception service would be good
Make signs Simple and Readable
Changing the terminals or finding the right gate is difficult especially when there is a language barrier in the country. Staff along the way or clear instructions indicating the gate would be more helpful.
Some assitant helping if needed(elders, mothers travelling with baby)
Assistance to new flyers, specially in migration sections and also assistance or translator to those who don't speak specific language of that nation.
Language barrier, easinesses for navigating through airport, searching gate
Airport layouts should not be complicated because most of the passengers at the airport are new to the environment.
Increase the number of staff
- fast internet
Boarding the flight is often frustrating and requires a lot of waiting around
lower prices in stores and restaurants
If i would know about some offers, i could use them.
More offers


11. Would you use an app to help improve the experience and provide special offers at an airport?

Number of respondents: 36



	n	Percent
Strongly agree	18	50,0%
Agree	14	38,9%
Disagree	3	8,3%
Strongly disagree	1	2,8%

Appendix C: User personas



Sandy Kimble


- Age: 32
- Occupation: Marketing Director
- Travel purpose: Attending a conference
- Travel frequency: 4-5 times per year

Bio


Sandy is Marketing director at reputed company and she prefers to travel by air and usually books his flights in advance to get the best deals. She also makes sure to arrive at the airport with plenty of time to spare to avoid any potential delays or issues. When is comes to accommodation she likes to stay in hotels that are close to the conference venue or airport, with amenities such as high-speed internet, a fitness centre, and a business centre. Sandy likes to eat healthy and prefers to have access to fresh and nutritious food while travelling. She usually brings her own snacks and drinks to save time and money. Sandy always brings her laptop and mobile phone with her to stay connected with her team and clients. She also makes sure to have all the necessary conference materials downloaded and saved on her devices for easy access.

Personality


Introvert
Extrovert




Analytical
Creative




Busy
Time rich



Messy
Organized ★



- **Goals:** Sandy's main goal is to attend the conference and gain insights into the latest marketing trends and strategies. She also aims to network with other professionals in her field and potentially find new business opportunities.
- **Challenges:** Time management is a significant challenge for Sandy as she tries to balance attending the conference with her other work commitments. She also needs to navigate the airport efficiently to avoid missing her flight and ensure that her luggage meets the airline's size and weight requirements. Additionally, she may face challenges with flight delays or cancellations, which could disrupt her travel plans.



Emilia Clarke


- Age: 27
- Occupation: Graphic Designer
- Travel purpose: Vacation
- Travel frequency: Once or twice a year

Bio


Emilia is Graphic designer who loves to travel. She open to different modes of transportation and enjoys the journey as much as the destination. She often travels by air but is also comfortable taking trains or buses to explore different parts of the world. She likes to stay in unique and quirky accommodations that reflect the local culture and atmosphere, such as bed and breakfasts, boutique hotels, or even camping sites. Emilia loves to try new foods and drinks and often seeks out local markets or restaurants to sample the local cuisine. She also brings her own snacks and drinks to enjoy on the go. Emilia brings her mobile phone and a camera to document her travels and share her experiences with her friends and family. She also likes to stay connected with her social media accounts to share her adventures with a wider audience while travelling.

Personality


Introvert
Extrovert




Analytical
Creative



Conscious
Spontaneous



Hesitant
Adventurous ★



- **Goals:** Emilia's main goal is to experience new cultures and create memories that will last a lifetime. She is interested in immersing herself in the local way of life, trying new foods and activities, and meeting new people.
- **Challenges:** Emilia's main challenge is managing her budget and making the most of her time while travelling. She also needs to navigate the airport efficiently to avoid missing her flight and ensure that her luggage meets the airline's size and weight requirements. Additionally, she may face challenges with language barriers or cultural differences, which could make it difficult to communicate or navigate her surroundings.



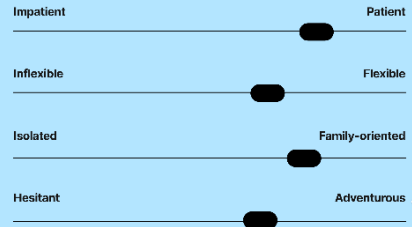
Maria Carey

- Age: 35
- Occupation: Homemaker
- Travel purpose: Family vacation
- Travel frequency: Once or twice a year

Bio

Maria is mother of 2 daughters with busy husband. She prefers to travel by air to save time and avoid the stress of driving long distances with young children. She usually books direct flights to minimize travel time and bring along books, games, and tablets to keep her children entertained during the flight. She looks for family-friendly accommodations such as resorts or vacation rentals that offer amenities such as swimming pools, children's activities, and on-site dining options. She also looks for accommodations that are located near popular tourist attractions and offer convenient transportation options. Maria brings plenty of snacks and drinks for her children to enjoy during the flight and while exploring the destination. She also looks for restaurants that offer child-friendly menus and accommodate dietary restrictions. Maria brings her mobile phone and a tablet to stay connected with her family and friends and keep her children entertained during the flight. She also looks for accommodations that offer Wi-Fi and other communication services to stay connected during her trip.

Personality



- **Goals:** Maria's main goal is to create fun and memorable experiences for her family during their vacation. She wants to expose her children to new cultures and experiences and create lasting memories that they can cherish for years to come.
- **Challenges:** Maria's main challenge is managing her children's needs and keeping them entertained during the flight and throughout the trip. She also needs to navigate the airport efficiently with her children and ensure that their luggage meets the airline's size and weight requirements. Additionally, she may face challenges with language barriers or cultural differences, which could make it difficult to communicate or navigate her surroundings.



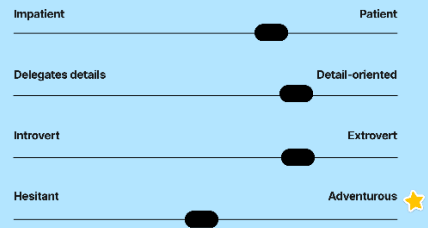
Steve Johnson

- Age: 47
- Occupation: On disability pension
- Travel purpose: Vacation
- Travel frequency: 2-3 times a year


Bio

Steve has active and positive lifestyle despite the fact that he is in a wheelchair. He prefers to travel by air, because it is most suitable for him. He is often willing to pay some extra to guaranteed to have smooth airport experience. Steve enjoy shopping and after security check he will be rushing to the tax-free shops. When it comes to accommodation he prefer to stay in hotels which are located in the city center. Accessibility is also important to him, which is why he does careful background work regarding his accommodation and destination. Steve is very active person in social media, so he will bring his mobile phone everywhere. Hi has popular Instagram account where he shares his experiences and travel tips for other disabled persons.

Personality



- **Goals:** Steve's main goal is to have smooth travel experience. Shopping is important to him and he will often select his destinations based on the shopping opportunities.
- **Challenges:** Steve's main challenge is accessibility. Because of his wheelchair, he is not able to access all places by himself. Steve is a solo traveler and it's important for him to survive traveling without extra help from others. He may also face some challenges because of him active use of mobile phone. He may come across places where it is not easy to charge the mobile phone.



John Davis

- Age: 70
- Occupation: Retired accountant
- Travel Purpose: Visiting his daughter in another state
- Travel frequency: Once in 2 month

Personality

Impatient Patient

—————●—————

Inflexible Flexible

●—————

Introvert Extrovert

●—————

Hesitant Adventurous ★

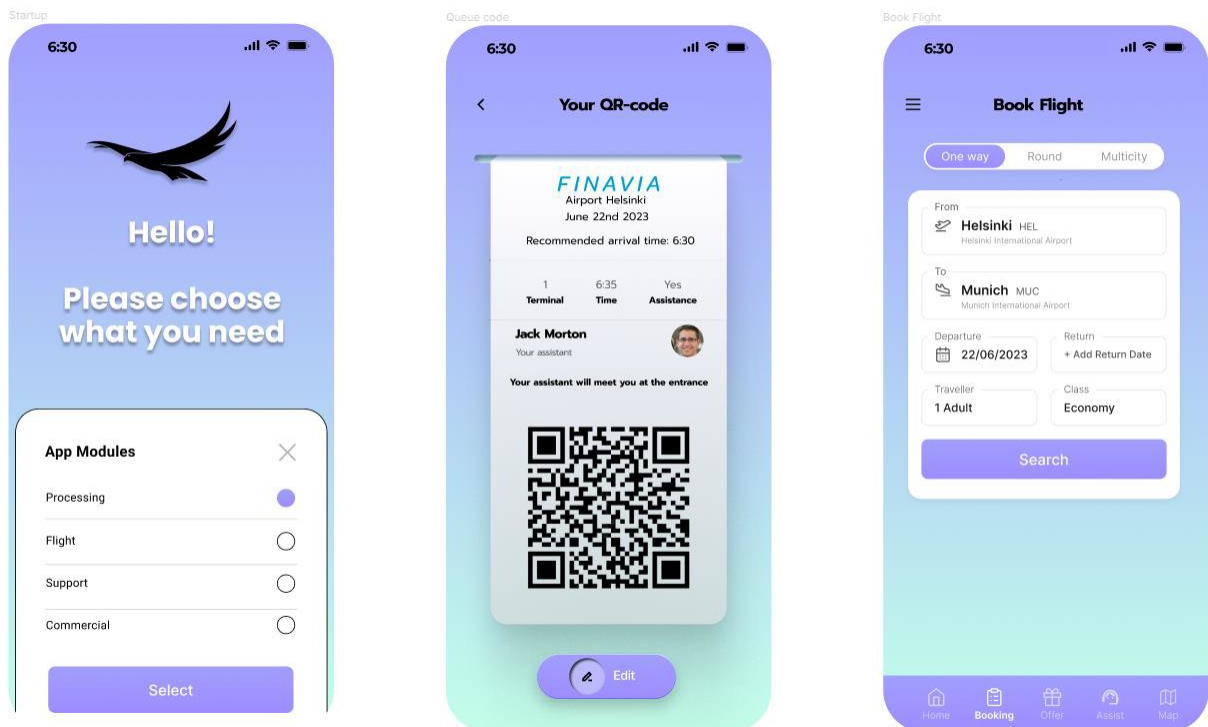
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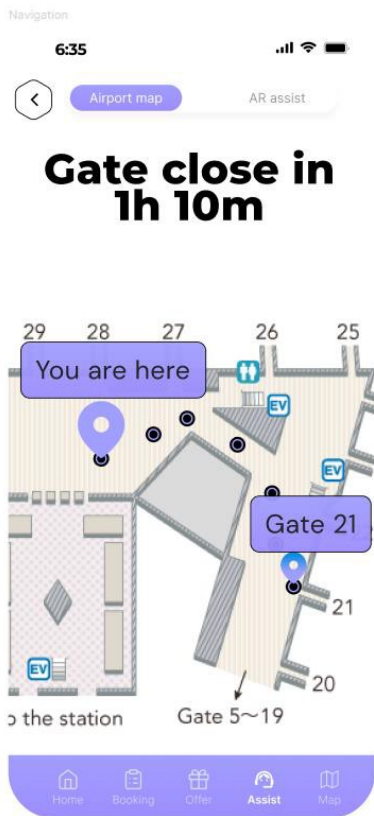
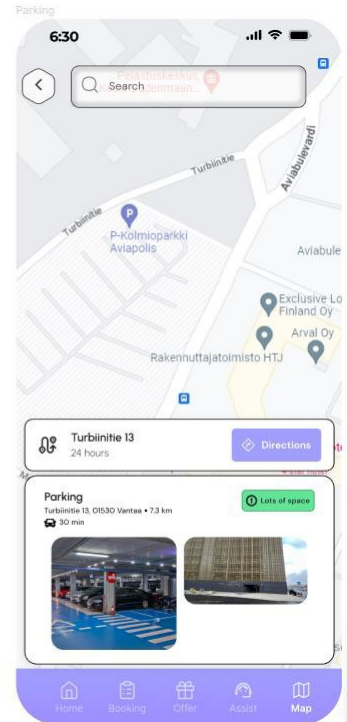
Bio

John is a retired accountant who loves to travel and visit his family who lives in another state. He is a frequent flyer but finds the airport experience overwhelming and confusing. John has some health issues that make it difficult for him to walk long distances or carry heavy luggage. He wears glasses and uses a hearing aid to help him with his sight and hearing. John is not very familiar with technology, but he has recently started using a smartphone to stay in touch with his family.

- Goals:** John's main goal is to have a stress-free and comfortable airport experience. He willing to use an app to help him navigate the airport and stay informed about his flight and receive assistance with luggage and navigating the airport if needed. Also, arrive at his destination on time and with all his belongings.
- Challenges:** John's main challenge is walking long distances or carrying heavy luggage. He has limited experience with technology. Fear of getting lost in the airport or missing his flight. He also has hearing and vision impairments and limited understanding of airport procedures and processes.

Appendix D: UI Design





Appendix E Business Model Canvas

The Business Model Canvas

