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The World's First 'Pop-Up' Urban Airport: A User-Centred Design Approach to Understanding the Customer Journey.

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Abstract. Urban Airport is a transportation infrastructure for electrically powered Vertical Take-Off and Landing (eVTOLs) aircrafts, or so-called flying cars. It is one of the emerging solutions for improving urban environments in terms of sustainability and traffic. This paper explores how adapting a human-centred design approach enhances passengers' journey through the future Urban Airport. In order to deliver a user-friendly experience, accessibility, comfort and efficiency are vital. Understanding users' journey throughout the Urban Airport will help us comprehend how the infrastructure should be designed for targeted user groups with different characteristics and expectations. This paper presents three user personas and associated storyboards to provide insights into the spectrum of goals, needs and frustrations of the Urban Airport potential users.

Keywords: Urban Air Mobility infrastructure · user experience · flying cars

1 Introduction

1.1 What is an Urban Airport?

One of the most exciting developments in emerging future transport is the concept of Urban Air Mobility (UAM). UAM is an industry term for on-demand, passenger, or cargo-carrying air transportation services as a solution for improving urban environments. Recent advances in aviation technology have given rise to electrically powered Vertical Take-Off and Landing (eVTOLs) aircraft, also known as flying cars. These air transportation services are a solution towards growing demand for more sustainable and efficient forms of mobility in the future. With growing congestion in urban cities, UAM could help augment conventional mass transit services [1]. Within the Air-One project we are developing and testing the "world's first pop-up airport", an ultra-compact structure known as "Urban Airport" or "Vertiport", which is a key component in supporting electric aircrafts that take off and land vertically. Urban Airport is a space-efficient, portable, multi-functional and rapidly deployable structure that can be transported in

conventional haulage containers to any location. The Air-One programme exploits a major gap-in-the-market – lack of appropriate UAM infrastructure. Furthermore, Urban Airport supports the concept of a zero-emissions hub for future modes of travel while being a small foot-print infrastructure with minimal impact on the environment. One central question pertaining to the development of Urban Airport is how should it be designed to improve travellers' experience?



Fig.1. 3D visual of Urban Airport in Coventry, UK.

1.2 Why a user-centred approach is necessary to improve the usability and efficiency of Urban Airports?

Optimising the usability and accessibility of Urban Airport is of paramount importance to ensure it is efficient, accessible and user-friendly, as it is expected to serve a large population with different characteristics. Indeed, UAM infrastructures are designed to meet future demand for inner-city/regional business travel, with business travellers accounting for 12% of airlines' passengers, and 23% of business passengers travel domestically on direct air routes solely within the UK [2]. The biggest age groups of business passengers are 35 to 44 and 45 to 54. The most common activities for business passengers is to attend a meeting or provide a service [2]. For non-business passengers, the most common airport activities include check-in, security and passport control, as well as carrying luggage [3]. Therefore, understanding users' journey throughout the UAM will help us to understand how the infrastructure should be designed for targeted user groups with different characteristics and expectations.

1.3 How can a user-centred approach inform the design of Urban Airport?

The present study explores how adopting a user-centred design approach enhances individuals' journey through this future UAM infrastructure. Contemporary airports can be operated at the minimum level of passenger experience (i.e., what passengers require), complying with different regulations, but not delivering top-quality in terms of what passengers expect and value [4]. Another aspect of passenger experience in Urban Airport is the level of stress generated during a journey [4]. These levels can be used as a framework to identify passengers changing needs and expectations via the red, amber

and green “pain points” and “exciters” of personal air travel [5]. These pleasure and pain points can be illustrated by personas and storyboards to envision possible situations that cause different levels of stress in a generic airport environment. This paper will present three user personas and associated storyboards to learn about the spectrum of goals, needs and frustrations of the UAM potential users.

1.4 What are personas and storyboards?

The personas method is widely used throughout the design process to describe archetype of users. It is mostly utilised at the beginning of a project for ideation to position the user at the centre of the design [6]. Other benefits encompass focusing on the most important user group, their goals and the potential issues they will face [7]. Personas also present typical users’ characteristics, identifies their potential behaviour and preferences [8]. Moreover, persona descriptions include a name, personality features, socio-demographics and often a photo accompanies the description [9], this helps to personalise them and give them a ‘voice’ in the design process. Although, personas were originally developed as a tool for design inspiration [10], today they are a representation of a targeted demographic in the broad range of potential users. It has also been summed-up in the following terms: *a persona is a representative of a user group, it is not the average of a user group* [6].

Personas can also be used in storyboards. Usually, storyboards represent expected situations in a determined environment in which individuals interact with a service, an object an environment or a combination thereof. A storyboard communicates a story through images displayed in a sequence of panels that chronically creates a whole story. This tool visually predicts and explores user’s experience with a product or service [11]. Storyboards place people at the heart of the design process and are combined with one or more user personas. Within this paper we also expand the traditional storyboard to indicate the Red, Amber or Green pain point or exciters for each scenario depicted, and based on the reviewed literature. This methodology attempts to ensure that we do not ‘design out’ those positive experience that air traveller’s value.

1.5 Aim of the study and research question

Eliciting the pros and cons of a journey from the user’s perspective, via personas and storyboards, has the potential to put usability and acceptance at the initial stages of the design process. This human-centred design aims to help designers in making the journey easier, more comfortable and more accessible.

To achieve this aim, the two following research questions will be addressed: *can we provide insights into who will be using UAM and what are the most important user’s need in an UAM?* We will try to answer these questions by designing storyboards and personas. The results will then be discussed to inform the design of Urban Airport.

2 Method

The proposed personas of anticipated users with associated storyboards are based on a guidance from the project partners' business model and a review of the relevant literature. The personas creation process was structured around the identification of the Urban Airport end users, along with their goals, frustrations and needs. The storyboards consist of a series of sketches illustrating the most relevant moments of a user interacting within a specified environment. In the present study, the storyboards describe the personas "pain points" and "exciters" during their journey through the Urban Airport. Combining personas and storyboards has been shown to be beneficial in the user-centred design process for future transport systems [12].

3 Results

Two personas (Fig.2 and 3) with their corresponding storyboards (Fig.4 and 5) are illustrated in this paper. These two personas have a photo, demographics, profile, as well as goals, frustrations, and needs. A third persona is presented without illustrations due to space limitation. The reason for these personas to travel in an Urban Airport is for work or business purposes. This paper presents the following personas: Emma who is a Passenger with Reduced Mobility (PRM); Jin is a frequent business passenger in his 50s; Vicky represents the younger generation (Gen Y) of modern business travellers.

PERSONA 1

Emma

AGE
41

STATUS
Married

OCCUPATION
Regional Manager

LOCATION
Birmingham

DESTINATION
Business Meeting

PROFILE

Emma has been recently promoted to a Regional Manager at one of the UK's largest supermarket chains. Her role requires to travel frequently to different stores to analyse regional market trends and discover new opportunities for company growth. Most of the time, Emma drives to different stores, but sometimes she would like to use different means of transport to avoid rush hours and make more use of her time.

GOALS

- To have unique and seamless passenger experience (Pain 302)
- To spend less time booking her business trip
- Link loyalty points/rewards to bookings to earn points

FRUSTRATIONS

- Feeling exhausted from constantly having to overcome issues caused by cumbersome and inaccessible public spaces (UserTask 205)
- She needs to plan her journey accordingly, considering her disability and a potential occurrence of a traffic jam
- Feeling anxious and frustrated when she receives poor level of special assistance from the staff (Pain 203)

NEEDS

- As a person with reduced mobility, she requires the booking to be accessible, as well as having some extra space to move around safely
- Emma would like to travel easily and confidently and not being isolated from other passengers (User 202)
- She wants to board a vehicle with less difficulty with the seats being more comfortable with the necessary support for mercy individuals with disabilities (UserTask 209)

Fig.2. Proposed persona of Passenger with Reduced Mobility (PRM).

Emma (Fig.2) represents a broad group of business travellers aged 35 to 44. Considering Emma’s disability, she needs to plan her journey accordingly, therefore she expects her experience to be unique and seamless [13]. As a person with reduced mobility, Emma requires the Urban Airport to be fully accessible, so she can feel included and confident with the flying experience.



Fig.3. Proposed persona of frequent business traveller.

With respect to the persona Jin (Fig. 3), he is more concerned about planning and organising his trip with ease and efficiency without any surprises. Jin’s persona covers the largest group of business travellers aged 45 to 54. He is a frequent business passenger who travels 4-6 times each month for work. He arrives at the airport early enough, not only to avoid any stressful situations, but also to work whilst using airport facilities. The third persona, Vicky is a less frequent traveller representing the 25-34 age group. She often check-ins at the last minute, as she does not like spending much time at airports [15]. Vicky’s focus is to create a better work-life balance by combing business travel with leisure purposes, as well as to bring some of her family members on a trip [16].

The accompanying storyboards illustrate the “pain points” and “exciters” of Emma’s (Fig.4) and Jin’s (Fig.5) air travel. Green colour refers to the lowest level of stress, amber to moderate and red indicates the highest level of stress associated with a journey through Urban Airport. Each storyboard consists of six images identifying the most important touchpoints and their associate level of stress within Urban Airport.

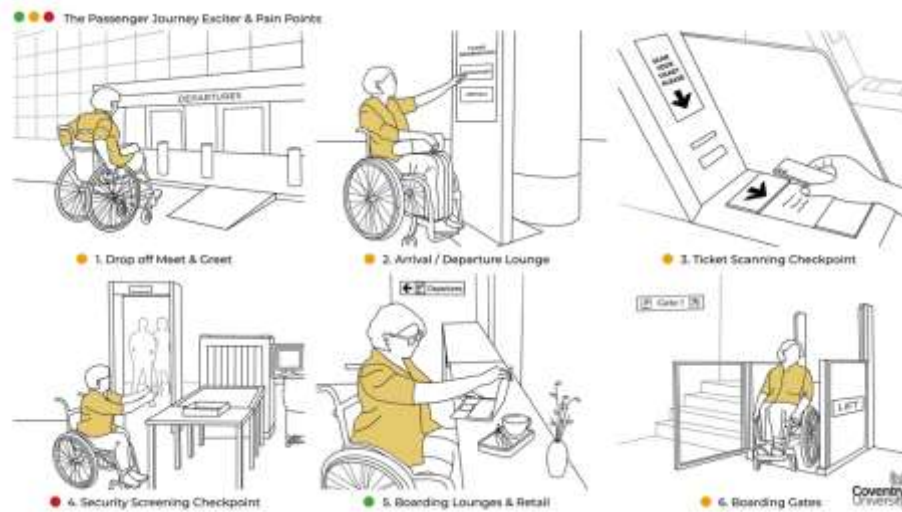


Fig.4. Proposed storyboard of Emma's journey.

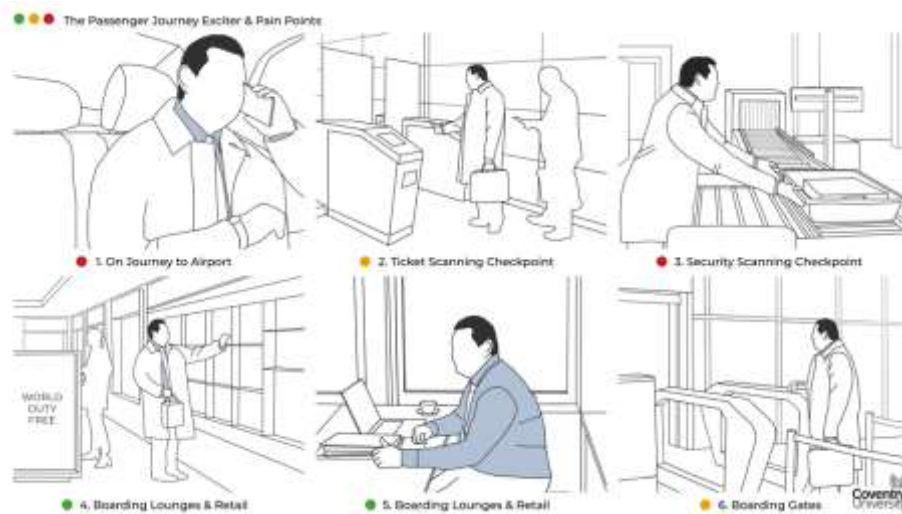


Fig.5. Proposed storyboard of Jin's journey.

4 Discussion

The present personas and storyboard study contributes to bridge the gap in the fairly unexplored field of user experience in Urban Air Mobility. It proves insights into who will likely be using UAM, with a focus on Urban Airport. It also addresses what are the

most important user's need in an UAM, with a focus on the touchpoints and their associated levels of stress.

The personas present three different types of users: the PRM, the frequent traveller and the less frequent business passenger. The latter wants their trip to become an experience, not only a mean to travel. Although these personas share a common goal, using the Urban Airport for a business trip in an urban area, their expectations, characteristics and goals diverge. Indeed, passengers with disabilities face numerous barriers when entering an airport. The building's cumbersome layout, design and navigation through different areas present challenges to passengers with mobility disabilities [14]. Frequent users seek reliability and efficiency of the service, and occasional travellers are looking for a premium service that stands out from the most common transport services.

The storyboard is useful to elicit where and when the pain and exciter points will occur throughout the journey in the Urban Airport. We can identify a linear increase in the frustration from the entrance into the infrastructure until the security screening control, the peak of the journey in terms of stress level. User experience could be enhanced significantly, by making this first part of the journey accessible (e.g. Emma), the entire control process fast (e.g. Vicky) and the waiting time comfortable for working while on-the-go (e.g. Jin). Another opportunity could be to present the traveller with a tangible "exciter" on immediate arrival at the Urban Airport, this can help alleviate the moderate to high stress levels associated with the wayfinding and check-in at airports.

A higher level of interpretation may allow comprehending which specific design features of the infrastructure improve user experience, despite personas' different needs and expectations. For instance, accessibility facilitates getting in, out and through Urban Airport. More specifically, it helps circulating around the UAM and going through the security control procedure. Ease of use relieves travellers from certain pain points, especially ticket scanning. Comfort improves user experience by mitigating the hassle of waiting in lounge areas. Altogether, accessibility, ease of use and comfort seem to be paramount to support inclusiveness, comfort and efficiency in Urban Airports.

The limit of this study is that personas and storyboards do not guarantee that people will behave similarly in the real world. They offer insights on how archetypes of users will interact with UAM infrastructures, which is a process closer to ideation than empirical observation. More research is needed to further our understanding of user-experience during UAM journeys. For instance, within this project the next step in user-centred research is to use a 3D model of the Urban Airport in virtual reality (VR) to allow users having an immersive experience with this infrastructure. In addition, the qualitative data collected from semi-structured interviews and focus groups would provide insights into public readiness and acceptance of urban air travel.

5 Conclusion

User-centred design helped identifying potential design issues related to the levels of stress that would otherwise be detrimental to the user experience. This is salient for new urban air transport infrastructures as the journey from the airport entrance to the boarding into the eVTOL may be stressful and unfamiliar. Accessibility, comfort and efficiency are three dimensions that should be implemented early in the design process to ensure a user-friendly and successful traveller experience for all.

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