Identifying Demand and Acceptance Drivers for User Friendly Urban Air Mobility Introduction

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Abstract. This research aims to develop an assessment framework to analyze the user friendliness of Urban Air Mobility (UAM), a future mode that enables autonomous inner-city, on-demand transport in passenger drones. The relevant demand and acceptance drivers are derived from a meta-analysis of urban mode choice factors and studies on UAM mode choice and acceptance specifically. By applying this framework, the potential of UAM is analyzed in terms of users' new options in their daily travel behavior, fostering seamless inter- and multi-modal mobility. Considering the factors relevant for gaining users' confidence, three different operational concepts [UAMaaS (UAM as a service), UAT (Urban Air Taxi) and UAM platinum] are assessed, showing that the concepts answer different user segments' needs.

Keywords: Urban Air Mobility · Demand drivers · User acceptance · Mode choice · Assessment framework · Operational concepts

1 Introduction

Technological progress in battery storage, electrical power transmission and distributed propulsion systems [1] together with progress in communication, sensor and data science technologies are leading to the consideration of applying commercial, aerial services in highly populated urban areas, also known as Urban Air Mobility (UAM). Currently, more than 100 companies worldwide are working on flying demonstrators covering well-known companies from aviation like Airbus, Boeing, Embraer, Bell, or ground mobility like UBER as well as a large number of startups like Volocopter, Lilium or Ehang.

The principle of UAM is not new. It all started in the 1950s with the broad availability of helicopters. Their passenger services were called air taxi, personal air transportation, or on-demand air mobility. Until today a small niche market for helicopter-based passenger

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transportation on a charter basis exists in numerous metropolises and cities. Companies such as VOOM or Blade still offer helicopter flights within New York, Sao Paulo and more recently Mexico City. VOOM cooperates with Audi. As a strategic partner, the German automobile company handles road transport to and from the landing sites to be able to offer a closed door-to-door mobility service.

The above stated technological developments now enable a new era of UAM, which is assumed to be a fully autonomous, on-demand transport service with passenger drones, focusing on intra-city applications. Yet, the predominant question is whether this transport service can add to the existing urban transport portfolio and whether UAM is an option to enable user-centric and seamless mobility.

Thus, this chapter aims to develop a framework for assessing the benefits of UAM. For that, demand drivers of urban mobility, in general, are determined in a meta-analysis of 52 studies. Specific consideration of mode-choice factors and demand drivers for UAM and closely related novel transport modes shed light on factors that are specific to this novel transport offer. The third part of the literature review focusses on acceptance drivers, relevant socio-demographics and attitudinal questions that foster early adoption of UAM. As a conclusion, the predominant factors for a user-centric UAM introduction is summarized and potential user groups are introduced. The identified factors serve as the basis for the assessment framework, which is applied to three different operational concepts. The three operational concepts can be seen as different scenarios depicting different time frames for UAM introduction. Potential market shares and costs differ substantially, as well as the targeted passenger group. These operational concepts are assessed with regard to the identified relevant factors for user-centric UAM offers.

2 Determining Relevant Factors for UAM Demand

In order to assess different operational concepts with regard to their user friendliness, relevant demand and acceptance drivers for UAM have to be identified. This chapter gives insight into findings for UAM but also for related modes of transport. Research on UAM is still limited; it thus is useful to find analogies to related modes of transport. Mostly this research will refer to work that has already been conducted in the field of autonomous vehicles (AV) and shared autonomous vehicles (SAV).

In the following, urban mobility mode choice factors in general will be described and a meta-analysis of 52 studies will give an overview over relevant mode choice factors that have been identified by the literature. The subsequent part will dig deeper into factors specifically influencing UAM mode choice, while transferring some finding from the AV literature. The chapter will close with providing information on UAM adoption and related relevant factors.

2.1 Mode Choice Factors of Urban Mobility

The first step to understand UAM usage and adoption is to gain a general knowledge on current and former mode choice factors for urban mobility (UM). For that purpose, a meta-analysis of 52 studies [2–53] looking into factors influencing mode choice for UM is conducted. In doing so, the essential mode choice factors can be identified and understood in more detail without conducting own, costly research. In scope are day-to-day commuting trips, and leisure trips and the time frame considered here is from 1980 to 2017. This period is used as it allows a comparison of results between decades and to depict developments or changes of the main factors over time. Besides, the transport system from 1980 seems still be comparable to today's UM. Regions in focus are mainly Europe, Asia, and North America. The two most frequently applied research methodologies within studies in scope are the logit model and the regression analysis. Journal papers, conference papers, and PhD dissertations around this research topic are collected using various scientific literature online databases and search engines (such as Google Scholar) and scanned systematically. If results are suitable, a study is considered further in this analysis.

Across all regions, factors related to travel time and travel costs are the two most relevant aspects for urban travellers with regard to their mode choice. Socio-economic factors are also highly relevant, such as income, gender, age, and household composition. Other top mode choice factors are car ownership, the education level, access time, and commute distance. Some of these factors seem to be interlinked, such as the income and the education level. Figure 1 illustrates the frequency of identification of the top 10 mode choice factors within studies in scope. It needs to be mentioned that 20 factors only appear once or could not be assigned to a broader mode choice factor. Hence, those are not included. Moreover, ten mode groups are generated from the meta-analysis, whereas most studies focus on mode choice factors for the use of cars and public transport services. Car sharing as a new transport concept occurred in 2008 for the first time.

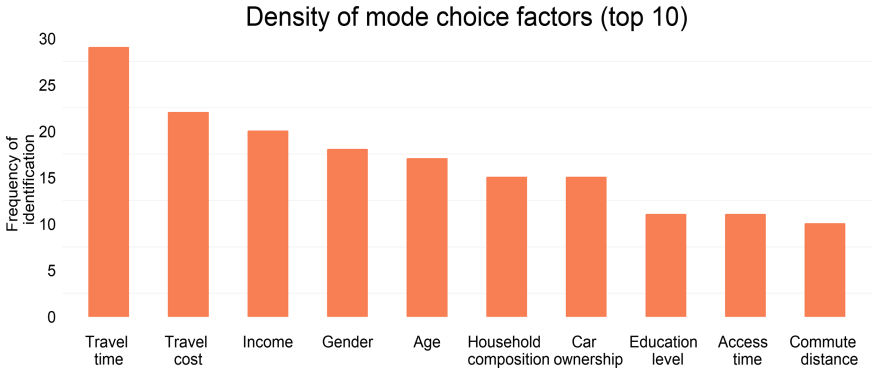

Fig. 1. Density of mode choice factors (top ten; excluding 20 original factors, which cannot be assigned (i.e. nationality of traveler, weather, policies etc.) [own depiction]

Looking at different decades, one can observe a shifting focus in the research landscape. As seen within the results, generally, before the year 2000, not many studies have

been conducted on mode choice factors for urban mobility. Since 2011, socio-economic factors have gained importance, such as seen in a study by Heinen and Ogilvie from 2016 [13]. However, across all years in scope, travel time has always been one of the top two mode choice factors. Examples can be found in the work from Train [43], Wardman [46], and Gossling [12].

2.2 Mode Choice Factors of UAM

To evaluate the demand driver of novel transport services, understanding the choice behavior concerning current existing urban transportation modes and new transport modes provides input to develop a comprehensive urban mobility model aiming at understanding the operational environment of novel transport modes [54]. Enhancing the above described meta-analysis to specifically address novel modes of transport the following section will describe mode choice factors of UAM and due to the strong relatedness those of AV and SAV. According to a handful currently existing choice behavior studies concerning the adoption of AV, SAV and UAM, as well as several recent market studies on UAM, the mode choice factors can be generally categorized into the following three groups: transportation service factors, individual-specific factors, and attitudinal/psychological factors. The ten most analyzed factors for urban mobility mode choice identified by the meta-analysis of Sect. 2.1 can be mainly assigned to the group of transportation service factors and individual specific factors.

2.2.1 Transportation Service Factors

Cost- and time-related attributes also have been considered as significant influencing factors in most of the relevant studies for novel transport modes. For instance, TU Delft conducted a stated preference experiment and developed logit models to study mode choice behaviors concerning SAVs in the Netherlands [55]. Among the travel time-related attributes, waiting time for SAVs has been found insignificant. On the contrary, other studies [56, 57] estimated the value of time (VOT) and willingness to pay of AVs and SAVs, showing that waiting time is a critical service attribute of SAV operations. Similarly, the recent preliminary mode choice study based on a stated preference survey concerning UAM has concluded that travel time and travel cost might be the significant determinants of UAM adoption [54]. To understand individuals' willingness to pay for travel time savings, the VOT measures have shown that potential users tend to be willing to pay more for using autonomous transport services, especially for using UAM, than for car and public transportation (PT). Nevertheless, further research is expected to provide insights into the impact of waiting time and access and egress time, which might be relevant concerning various operational concepts of UAM [54].

2.2.2 Individual-Specific Factors

Interestingly, the current existing research does not provide consistent findings concerning the influence of personal and household attributes on the choice to adopt AV and UAM. For example, Bansal et al. [58] found that younger individuals are more open to accept AVs, while Fagnant and Kockelman [56] stated that SAVs could constitute

an attractive mobility option for the elderly. In addition, Bansal et al. [58] and Kyriakidis et al. [59] observed a positive relationship between willingness to pay for an autonomous feature and income. Similar aspects have been recently highlighted in the studies concerning UAM acceptance. Castle et al. [60] showed that younger and more educated respondents are more willing to accept pilot-less aircraft. The mode choice study of Fu et al. [54] suggested that market penetration rate for UAM may be greater among younger-aged individuals and older-aged individuals with rather high income who also have a relatively high propensity to use AVs. Moreover, Cohen et al. [61] also revealed the greater excitement regarding UAM among upper middle-class households and younger and middle-aged respondents, as well as the respondents with higher level of educational attainment.

Besides socio-demographic variables, other factors, such as current travel patterns and trip purposes, have been found relevant as well. Krueger et al. [57] concluded that comparing to the current PT users, the private car users (drivers) are more likely to switch to use SAVs. Similar results have been indicated by Fu et al. [54] that switching to either autonomous taxi or UAM is less likely if the individuals currently use PT or soft modes (walking and cycling) most often. Moreover, similar to the findings of Fu et al. [54], the results of market studies implemented by Thompson [62], Garrow et al. [63] and Cohen et al. [61] indicated that individuals may be more interested in using flying taxi service, particularly for performing business and recreational trips.

2.2.3 Attitudinal/Psychological Factors

Attitudinal and psychological factors, such as comfort, flexibility, and convenience, have been found to be increasingly relevant to transport mode choice behaviors [15]. Haboucha et al. [64] summarized that the impact of perceived safety on AVs adoptions have been highlighted among the current existing literature. Individuals who tend to accept AVs or SAVs also show greater concern for the environment [64, 65] and stronger technological awareness [58, 66, 67]. Other factors, such as amenities and vehicle automation, have been considered influential as well [55, 65]. Similarly, safety is playing a crucial role in UAM acceptance [61, 68, 69]. The model estimation results of Fu et al. [54] indicated that people using both SAV and UAM expect the novel modes to be at least as safe as driving a car, while another study result shows that autonomous flying is slightly better perceived by the public than autonomous driving [70]. Another interesting finding is that piloted aircraft is generally preferred over fully autonomous flying vehicles [61].

Although the impact of attitudinal factors on UAM-related mode choice has not been thoroughly studied yet, the survey results of Fu et al. [54] and Haboucha et al. [64] imply that the group of younger individuals, who are more open to new technologies, are more likely to embrace novel transport modes.

2.3 Factors Affecting User Acceptance of UAM

The implementation of UAM faces several limitations regarding regulation, infrastructure availability, air traffic control, environmental impacts, but also acceptance [71]. To the best of the authors' knowledge however, very few studies have explored the user perception of UAM. To fill this gap, i.e. better understand the adoption and use of this novel

service, the findings of Al Haddad et al. [72] suggest the exploration of factors commonly affecting the adoption of technology and automation (ground and aerial vehicles). In their assessment, they conducted a novel stated preference survey, focusing on user perceptions rather than choice modelling. The survey results were analyzed using both exploratory factor analysis and discrete choice modelling; the former will be presented in the following.

2.3.1 Exploration of Factors Affecting Acceptance

Studies on the acceptance of automation, including ground autonomous vehicles, aerial vehicles, or technology in general highlighted the importance of factors in users' perceptions. Al Haddad et al. [72] identified prominent factors in the user acceptance of ground autonomous vehicles (in their different degrees of automation and models: shared or private), such as the perceived reliability of automation [73, 74], the perceived vehicle's safety [75, 76], the perceived locus of control [77], data concerns [78], the loss of job concerns [79], trip purpose [77], the value of time [76], the costs of automation [80], the willingness to be with a stranger [78], the perceived fun of driving [81], operation characteristics [82], the perceived comfort and cleanliness [74], the technology and/or automation awareness [82], and finally socio-demographics [77]. Studies on the acceptance of aerial vehicles mostly focused on risks associated with accidents [83], usage, lack of knowledge of the technology [84], trip purpose [85], trip costs, distance, accessibility [86], and noise [87].

The factors listed above were tested in the study by Al Haddad et al. [72], often in the form of latent or hidden Likert-scale attitudinal questions. The result of discrete choice models -multinomial and ordered logit models- in the study proved the importance of socio-demographics in the adoption of UAM (gender, education levels, employment status, commute behavior, income levels, and cultural background). Previous crash experiences played a significant role in the adoption intention. Also, attitudes towards automation, towards social media, and perception of costs (taxi range, and cost importance), of data concerns, of manufacturer reputation, of safety, and of travel times were highly influential as well. This showed that common factors in similar transportation services could also be highly significant for the adoption of UAM.

2.3.2 Factor Analysis in Transportation Acceptance

The exploratory factor analysis is a statistical tool that is used with compatible datasets (similar scales) to reduce the dimensionality of the variables and reveal latent patterns behind them. In transportation studies, researchers used the exploratory factor analysis to analyze the perception of transportation systems [88, 89]. In the field of UAM, the study by Al Haddad et al. [72] has used exploratory factor analysis to reduce several attitudes into a fewer number of constructs. The results summarized several attitudes pertaining to the respondents' perceptions: value of time savings (a cluster of the importance given to different levels of time saving), affinity to automation (including the enjoyment of automation, trust of automation, and perceived usefulness of UAM), data and ethical concerns (fear of cyber-security, fear that data goes to a third party, and the concern of loss of jobs resulting from automation), safety concerns (necessity for an operator

on the ground, and of in-vehicle safety cameras). In this study, the social attitudes of respondents were grouped into affinity to online services (booking, banking, shopping), environmental awareness (including concern about global warming and readiness to spend more on environmental products), social media affinity (including Instagram, Facebook), and affinity to sharing (including BlaBlaCar, Airbnb) and the willingness to share. The extracted factors do not necessarily indicate a high relevance in mode choice contexts, but rather that they summarize a lot of attitudes as they share a big percentage of the dataset variance (cumulative variance above 52%, with each factor having a loading of higher than 10%, with one exception of a factor with 9% loading), and that they could be used in choice modelling in UAM contexts.

2.4 Identified Factors for User Centric UAM Introduction

The above given insights show that UAM demand and acceptance base on transportation service factors, individual-specific factors, and attitudinal/psychological factors. By summarizing all the findings, relevant characteristics of user segments can be derived and the predominant demand drivers can be identified. The demand drivers are the basis of the later described assessment framework.

2.4.1 Future Passenger Profiles

Sections 2.1, 2.2 and 2.3 provide valuable insight into factors affecting UAM adoption and mode choice. Individual-specific factors, and attitudinal/psychological factors that have been identified give guidance for the identification of relevant passenger segments for UAM. To illustrate potential customers of UAM concepts, future passenger demand profiles, developed by Kluge et al. [90], have been used as a basis here. These are possible future passenger types for the European transport market in 2035. They focus on passenger groups taking an air trip, however, as access and egress modes are also considered, they are adaptable to urban mobility. The Cultural Seeker, the Family and Holiday Traveller, the Single Traveller and the Digital Native Business Traveller have been identified to have the highest potential using UAM in the future. However, they differ in terms of income, age, travel party size, technological affinity, and other factors. For instance, the Digital Native Business Traveller is a new version of todays corporate passenger. This customer segment represents the digital-savvy and well-connected generation Y and generation Z in the workforce of tomorrow. Hence, the digital affinity (represented by the use of technical devices and respective retrieval of information) is very high. As shown in the literature review, younger people who are open to new technology are also more likely to embrace novel transport modes [54, 64]. At the same time, the main travel purpose is for business purposes and hence, the amount of transport expenditure is medium to high. In comparison, all other passenger profiles travel mainly for private reasons. The Family and Holiday Traveller is defined by the highest travel party size of two to three people, including children. Hence, they might have specific requirements towards the transport system to make travel with the family as stress-free and comfortable as possible. Their willingness to spend money on transport is medium, and their digital affinity is medium too. The Cultural Seeker and the Single Traveller are both travelling alone, or in case of the Cultural Seeker, in pairs. The amount for transport expenditure is medium to low and

their digital affinity is medium to high. An overview of all four passenger segments and respective characteristics are depicted in the infographics (see Fig. 2).

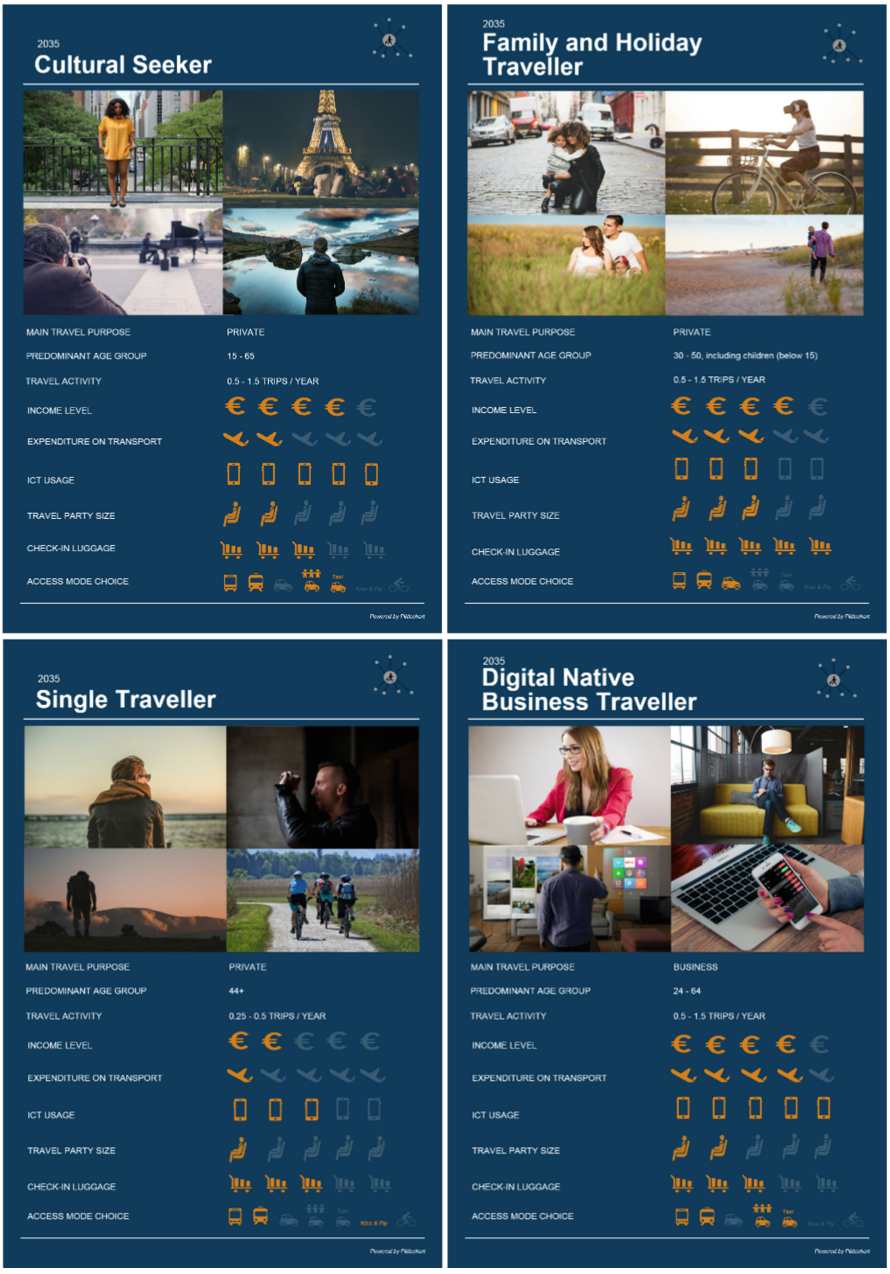

Fig. 2. Relevant future passenger profiles [90]

It is important to keep in mind that not all parts of society will have access to UAM offers. As a high level of digitalization is assumed, people without access to technology, which might mostly be older people, might have difficulties especially when booking these services. Besides that, equity issues might arise due to rather high price levels.

2.4.2 Relevant Factors

The literature discussed in Sects. 2.1, 2.2 and 2.3 shows that most of the important mode choice factors for urban mobility hold for UAM as well. Due to automation, pooling and UAM being aerial transportation the stated influencing drivers are assumed to include some additional factors. Especially the role of safety is important for the UAM environment. Besides that, automation and willingness to share are relevant demand drivers for UAM.

The following overview excludes some aspects that are stated to be relevant for urban mobility mode choice as shown in Sect. 2.1. This research aims at identifying user benefit maximizing UAM. Factors as weather conditions or the quality and supply of alternative transport modes can not be influenced by the UAM service provider and are very specific for different locations and are thus not the suited to answer the research question.

Table 1 shows an overview over identified relevant factors to answer user needs. There are different opportunities to respond to these identified needs. Possible options are also stated in Table 1. They are discussed in more depth in the following part of this book chapter.

Table 1. Most relevant demand drivers of UAM, their relevance and possible responses to these needs

Relevance	Identified factor	Possible response
High	Travel time	High travel speed, not affected by congestion on the ground, on-demand service, point-to-point
High	Costs	Adaption of pricing schemes, create a good value for money
High	Access time/waiting time	Efficient connection to existing transport modes, efficient fleet management, on-demand service
High	Value of time	Maximize options for efficient use of travel time
High	Safety	High safety standards
Medium	Comfort	Comfortable vehicle interior
Medium	Flexibility	On-demand service, all routes served
Medium	Automation	Fully autonomous
Medium	Willingness to share	Single rides vs. pooled rides
Medium	Trip purpose	Identify relevant target groups
Medium	Trip distance	Identify relevant target groups

3 Assessment Framework

The factors identified in Sect. 2 enable an understanding of demand drivers and relevant aspects of the UAM service for the passenger. Aiming at a user-centric UAM service offer we develop an assessment framework that provides the opportunity to analyze operational concepts and business models with regard to their user friendliness. The developed framework is applied to three exemplary operational concepts to show its functionality. The three analyzed concepts thus are not necessarily the three most likely scenarios but rather try to depict a large variety of possible UAM concepts and touch different time horizons and passenger segments.

3.1 Description of the Assessment Framework

The aim of this research is to assess in which way a UAM service has to be set up to maximize user benefits. In order to do so an assessment framework is developed that describes a generalized approach. Figure 3 shows the five steps that enable a ranking of different operational concepts with regard to their user friendliness.

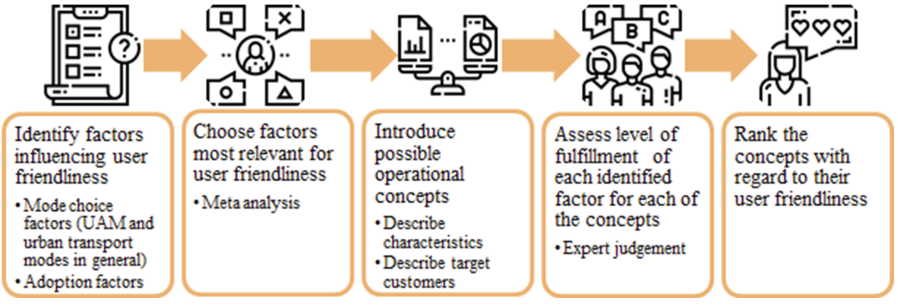

Fig. 3. Assessment framework [own depiction]

The first step of the framework is to get an overview over factors that influence the user friendliness of novel transport modes. In the scope of this chapter this has been done by looking into urban mode choice and adoption behavior with a focus especially on UAM (Sects. 2.1, 2.2 and 2.3). Findings from other modes of transport as e.g. AVs have been used as the literature on UAM is still limited. This step is followed by identifying the relevant factors by e.g. conducting a meta-analysis and excluding points that can not be influenced by a potential service provider (Sect. 2.4).

As this framework describes an approach to rank various concepts, the next step is to introduce and describe the relevant business models or operational concepts (here Sect. 3.2). By describing the characteristics the third step enables an assessment of these concepts in the next step. The fulfillment of each of the factors identified in step two is to be assessed in step 4. In this context this has been done in an expert workshop (Sect. 3.3). Other approaches can be applied. By comparing the values for the different key factors the various concepts can by ranked with regard to their user friendliness.

3.2 Development of Relevant Operational Concepts

The three operational concepts that will be compared with regard to their user friendliness are UAMaaS (Urban Air Mobility as a Service), UAT (Urban Air Taxi) and UAM platinum (a premium UAM offer). Following the above described assessment framework a thorough description of the scenarios will later on enable the assessment.

UAMaaS aims at depicting a long-term UAM deployment as one of many mobility services offered on a mobility platform. Integrated ticketing and booking is in place. UAM hereby is an on-demand and pooled service that is closely linked to other modes of transport not only physically, but also organizationally. As this scenario has a long-term perspective, it is assumed to have the lowest price level of the three scenarios, in approximately the price range of ride-hailing services as they are known today.

UAT is the mid-term scenario in this context. The operation is assumed to be similar to that of current taxi services, while requiring dedicated take-off and landing infrastructure, like all the concepts discussed here. Prices are assumed to be about the level of taxi services today, maybe a bit higher. The service is on-demand and only transports one travel group at a time. UAM trips are assumed to be booked on a separate platform. There is no integration with other modes of transport.

The most likely scenario for a short-term deployment is UAM platinum. Comparable to today's limousine services UAM platinum is a luxurious transport offer, with high prices, for separate travel groups. The missing integration with existing transport services is evened out be exclusive pick-up and drop-off solutions for the last mile. Figure 4 gives a summary of the described concepts.

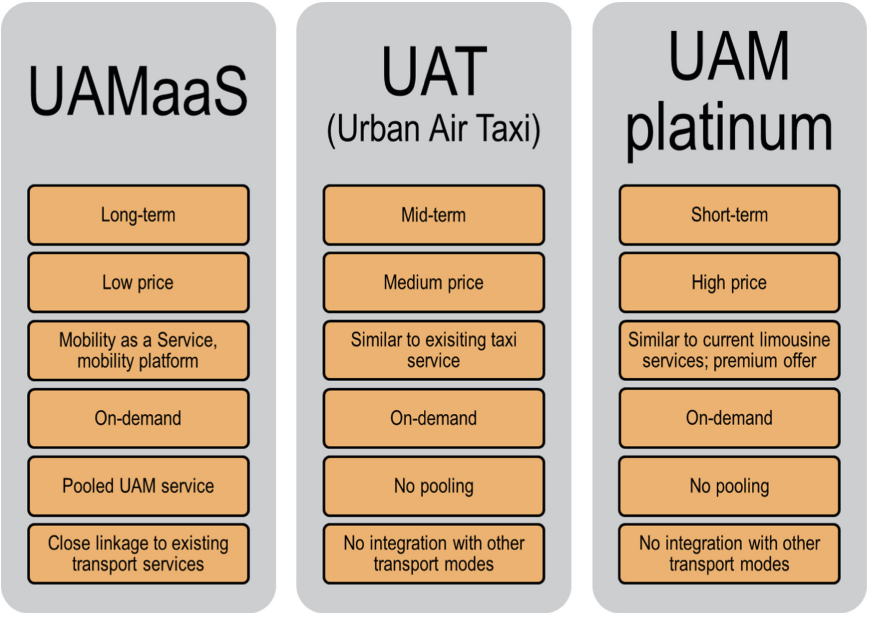

Fig. 4. Operational concepts for UAM [own depiction]

Every concept is assumed to have a certain customer group. UAM platinum mainly targets high-income people and business travelers with an affinity towards new technologies. Considering the passenger groups depicted in Fig. 2 one possible target group could be the Digital Native Business Travellers. UAT offers cheaper prices and by that attracts more potential passengers. This opens up the market to passenger groups like the Cultural Seeker. In the long-term, when UAM is fully integrated into the urban transport system, it will likely be used by different passenger groups and even attract Family and Holiday Travellers as well as Single Travellers. Figure 5 shows that the different scenarios target different user groups and the number of potential users increases over time.

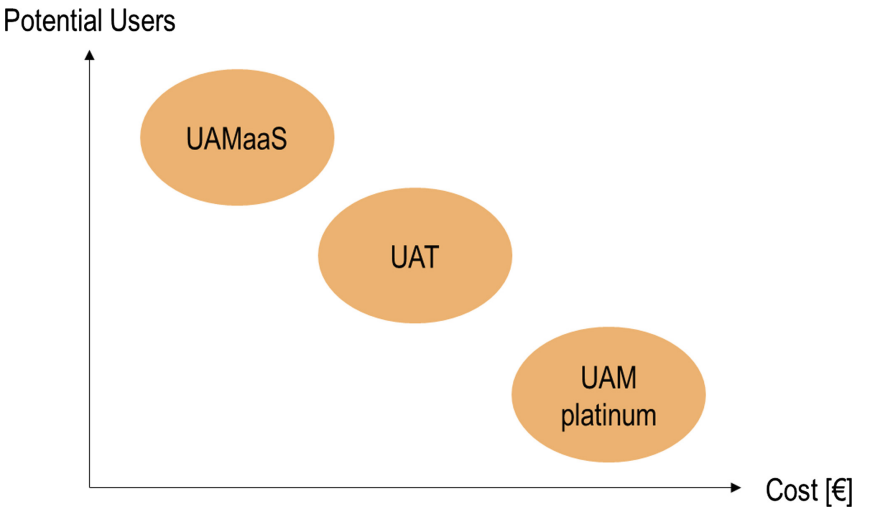

Fig. 5. Categorization of operational concepts for UAM with regard to cost and number of potential users [own depiction]

3.3 Assessing Added Value for Users

The three concepts, UAMaaS, UAT and UAM platinum, are assessed by evaluating how well they meet the user demand. An expert workshop has been conducted to carry out step four of the assessment framework. Figure 6 shows that the concepts strongly differ regarding the level of fulfillment of user needs except for some indicators. As travel time savings are the value proposition of all three concepts, are all expected to perfectly meet the user demand there. High safety levels were identified to be prerequisites for all operational concepts. The impact of the passenger's trip distance does not differ among the concepts either. However, all other indicators are met to different degrees by the operational concepts. While UAMaaS aims at attracting a large part of the population, has therefore lower price levels, tries to serve all trip purposes and provides shared services, UAM platinum attempts to create a high level of comfort and little access and

waiting times for the users. UAT seeks to achieve certain service levels for all indicators and by that does not score highest for any of these indicators.

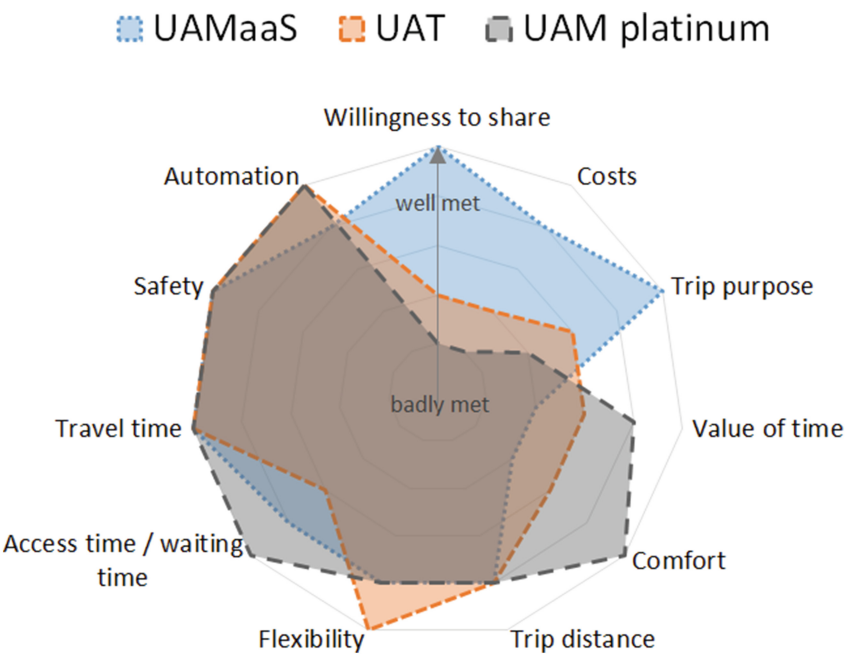

Fig. 6. Assessment of the proposed operational concepts with regard to the identified factors [own depiction]

Looking at the user segment of UAM platinum, one can see that the relevant indicators for this potential passenger group are well met. For potential UAM platinum users, costs are less relevant as they have higher incomes, and they prefer single rides and have a low willingness to share, while comfort and low waiting times are essential. UAMaaS aims to attract a larger part of the population and therefore minimize costs and offers a shared service. UAT is considered to be rather similar to existing taxi services and answers the demand of Cultural Seekers rather well.

Thus, UAMaaS can bring the largest benefits to the overall population. UAM platinum, in contrast, aims at attracting a very specific customer segment and does not answer the indicators that enable UAM to become a mass transport service. In general, the size of the area of the respective concept in Fig. 5 can serve as a proxy for the level of user-friendliness over the whole society.

4 Conclusion

This book chapter aims at assessing the user friendliness of different UAM concepts. This is done by following the five steps of the described assessment framework. First factors influencing user friendliness have been identified through a thorough literature

review. As UAM is not yet existent analogies to existing modes of urban transport have been drawn in Sect. 2.1. A meta-analysis of urban mode choice literature has shown that transportation service factors like travel time and travel cost are stated to be the most influencing factors of mode choice. Besides that the literature sees individual specific factors like e.g. age, income and gender as decisive for urban mode choice. Current studies explicitly focusing on UAM adoption and mode choice support these findings. Yet, similar to expected mode choice behavior for autonomous ground vehicle UAM usage is assumed to also be massively influenced by attitudinal and psychological factors. As shown in Sects. 2.2 and 2.3 factors like automation awareness and trust in the new technology are key factors for UAM adoption. Summarizing the findings from Sects. 2.1, 2.2 and 2.3 the most relevant factors have been identified in Sect. 2.4. Travel costs, travel time, access and waiting time, value of time, safety, comfort, flexibility, automation, willingness to share, trip purpose and distance massively influence UAM demand and acceptance. The identified individual specific factors have been used to identify potential user segments of UAM.

Three operational concepts (UAMaaS, UAT and UAM platinum) have been developed. A thorough description of each concept and their potential target customers (step three of the assessment framework) are done in order to assess each concept's user friendliness in the next step. It can be seen that all concepts place the user at the center to various extents, but the benefits of each concept differ strongly. While UAMaaS tries to deliver large benefits to all parts of society, UAT and especially UAM platinum only target certain customer segment with special needs and preferences. Inter modality which is often seen as key enabler for user-centric urban transport is only implemented in UAMaaS.

This research gives a first insight into prerequisites for user friendly UAM. Yet, future work should enhance this discussion by incorporating specific business models and finding data sources in order to assess the user friendliness levels of the different concepts.

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