

Acceptance of air taxis

A field study during the first flight of an air taxi in a European city

05th December 2019



Key Research Questions

- Individual Acceptance (Would participants use this technology and why / why not?)
- Societal Acceptance (Would participants accept others to use this technology and why / why not?)

1. Introduction

Due to rising urbanization, cities around the world are struggling with mobility and infrastructure problems. Electric vertical takeoff and landing (eVTOL) aircraft, or short air taxis, can potentially offer a local emission-free and infrastructure conserving solution to these problems. The German Start-Up Volocopter has already proven the technical feasibility in their Demo Flight in Dubai 2017. The technology develops increasingly fast towards market readiness. Even though there are technical and legal challenges, however, the success of air taxis will depend upon the widespread acceptance of this service by consumers and society. The aim of this study is to understand consumers' attitudes towards the technology and the factors that lead to either acceptance or rejection of air taxis. The key challenge is that most potential users are still unaware of these air vehicles or have very limited knowledge of their effects on mobility. In order to arrive at a valid prediction of the acceptance of air taxis, the research design employed a live demo flight open to the general public. From a research perspective, this is a rare opportunity in which a large sample of the population experiences a new transport technology for the very first time. The research design is aimed at explaining both the individual acceptance of consumers, as well as the societal acceptance.



2. Research Approach

This study is based on a paper and pencil data collection on the 14th and 15th of September 2019 during an initiative that showcased the first public flight of an air taxi in a European City. In this initiative around 20.000 guests had the opportunity to see and to take a seat in a Volocopter prototype. About 12.000 spectators could witness the unmanned flight of the Volocopter in downtown Stuttgart in short distance.

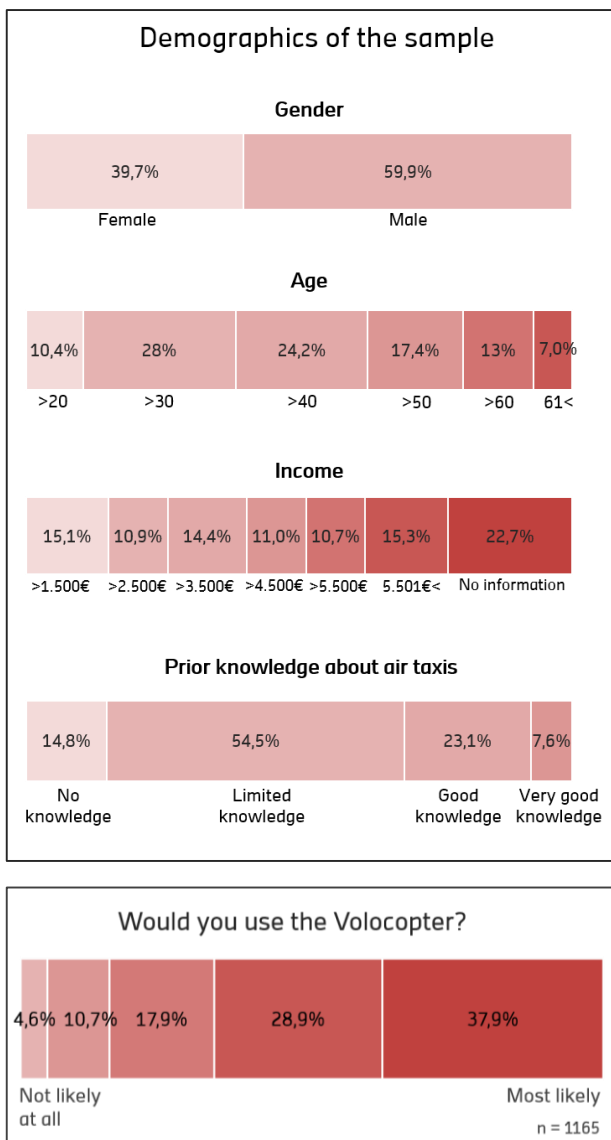
The questionnaire covered various thematic sections: Experience and prior knowledge, individual use and acceptance, societal effects on the location Stuttgart as well as the potential integration into the mobility concept and relevant demographic variables. In addition, questions relating specifically to the experience of the Volocopter flight have been included. The completed questionnaires were digitized (the resulting data is available upon request).

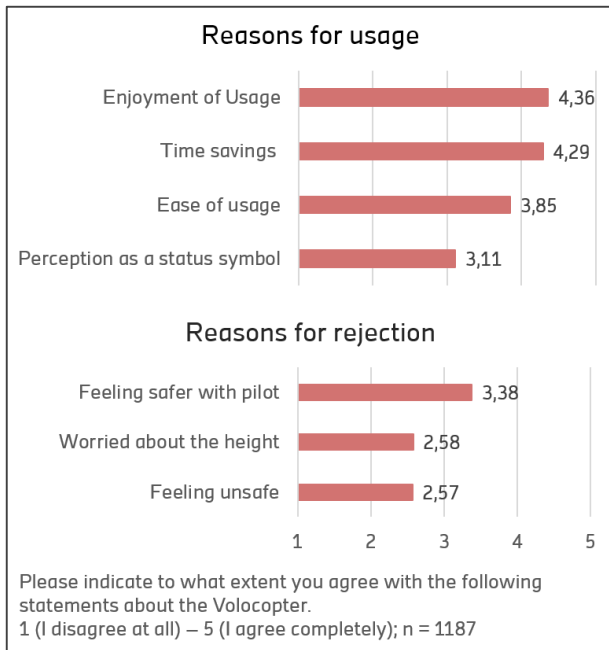
3. Sample

The total sample size is $n = 1.203$. The sample composition largely corresponds with the demographic distribution of the general population of Stuttgart. Deviances are mainly in gender, with 39,7% of the participants female and 59,9% male (0,3% are diverse). The age distribution covers all age groups, but is slightly skewed towards a younger target group. All income groups are equally represented in the sample and approximately 40% of participants are working in the automotive industry (corresponding to the high proportion of this sector in the region of Stuttgart). In terms of prior knowledge, air taxis are already widely known to the survey participants, only 14,8% said they had no prior knowledge on the subject.

4. Results: Individual Acceptance

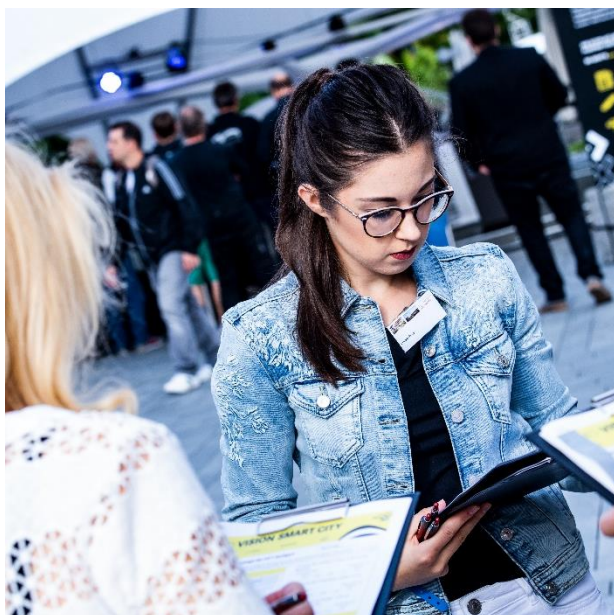
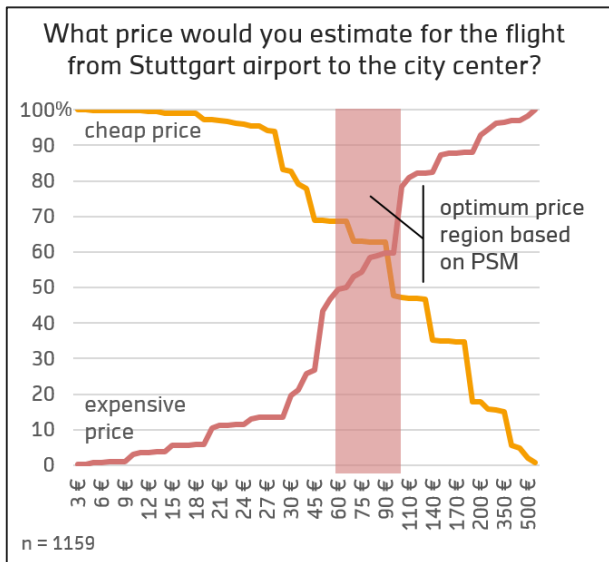
One main goal of this research project is to understand the individual willingness to use air taxis as a means of transportation. The results show that a large majority consider the use of the Volocopter to be probable to very probable (67%). This is a remarkably high result. At the same time, we asked participants if they believe that air taxis will become a part of their daily life. This question provides a somewhat less clear picture, with only 45% of the respondents agreeing. Generally, we found that a higher





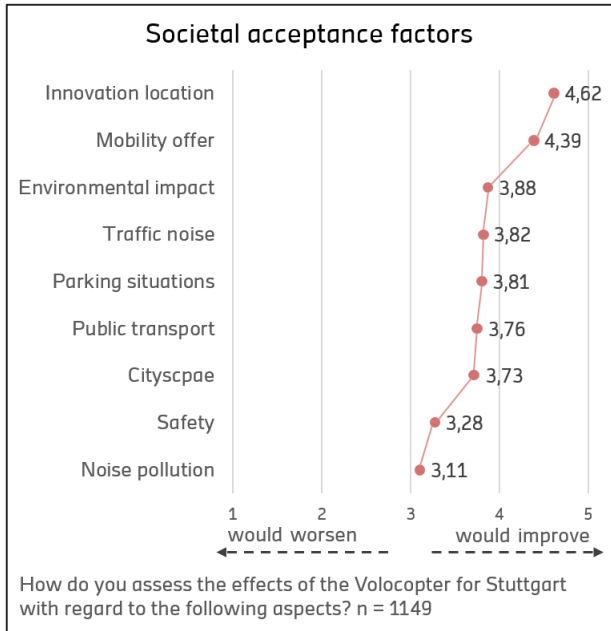
level of knowledge and information about air taxis significantly increases the willingness to use them. This can be seen as an opportunity to further increase knowledge in the population and thus creating even higher acceptance rates. To better understand the reasons for individual acceptance or rejection, we employed various statements covering the expectations and fears of using an air taxi. The core messages of these statements are based on different classical theories of technology acceptance such as TAM, by Davis (1989), UTAUT, by Venkatesh et al. (2003) and UTAUT 2 by Venkatesh et al. (2012). To create a common starting point for the evaluation of the statements, a scenario was developed. Respondents were prompted to imagine an air taxi commute from Stuttgart airport to Stuttgart city center (about 10km distance) within 15 minutes, autonomously and electrical.

The analysis of the corresponding data shows an overall very positive valuation. In particular, the *Enjoyment of Usage* and *Time Savings* emerged as the main factors. Especially for the younger generation, *Enjoyment of Usage* was by far the most important factor. On the other hand, statements concerning the safety of the Volocopter receive neither clear approval nor rejection. When comparing the different levels of knowledge to air taxis, it is noticeable that a lower level of knowledge can be an indicator of greater safety concerns. Regarding the question of the estimated price for one person on the route described above (autonomous one way distance about 10km from Stuttgart airport to Stuttgart city center), there is a large range of prices quoted. This is testament to the novelty of the service. Based on a shortened Price-Sensitivity-Meter (PSM) method, we asked the participants to name an expensive price and a cheap price for this route. By combining the cumulated values for "expensive" and "cheap" in one diagram, an optimal price corridor between approximately 60 and 100 Euro can be derived.

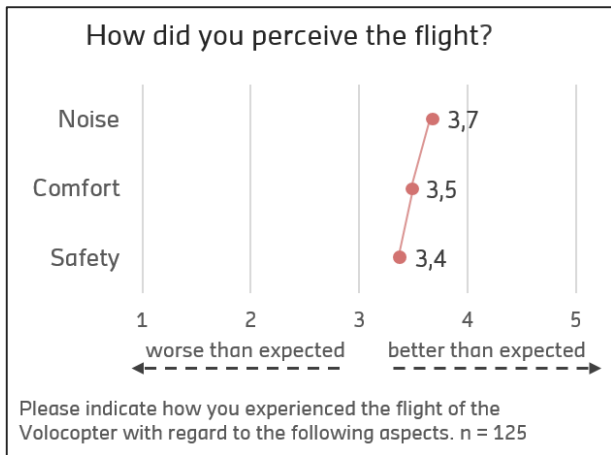


5. Results: Societal Acceptance

Referring to the second key research question, it can be summarized that a broad majority would support an offering of a Volocopter Service in Stuttgart (84%). Also, Volocopter is considered as a suitable transport solution for the city of Stuttgart. Again, knowledge about air taxis has a significantly positive influence on societal acceptance. In terms of the integration of Volocopter into the mobility offering, the majority prefers takeoffs and landings at the



Airport (86,3%) and *Railway Station* (75,4%). Followed by *Park & Ride Parking* (58,6%) and the *City Center* (54,0%). For respondents, these areas must be connected to the *Local Rail System* (85,4%) and the *Subway System* (66,1%). To better understand the societal acceptance of air taxis, we further evaluated how potential air taxi services would affect the cities landscape and shape its public image. In sum, the results show that from the participant's perspective, the introduction of Volocopter in Stuttgart would improve most of the covered aspects. A particular positive effect is expected on the *overall mobility* and the perception of Stuttgart as an *innovation hub*. Interestingly, participants do not expect any effect of air taxis on the city's *noise pollution* and *overall safety*. Also, regular car drivers expect a significant improvement of the *parking situation* and *traffic congestion*.



6. Results: After the flight of the Volocopter

A special feature of the study design is that visitors of the event could experience the first live demo flight of the Volocopter in an urban European area. A subset of the participants (n = 126) was interviewed before and after the flight as part of a repeated measurement design. By comparing the response behavior, it becomes clear that the experience of seeing the flight has not changed the generally high evaluation of this new transport technology. The results further show that the expectations of most respondents were exceeded, in particular, the noise level of the Volocopter is perceived as quieter than expected.

7. Conclusion & Implications

In sum, this study shows that there is a generally high level of both, individual acceptance and societal acceptance of air taxis in the public. Both topics are highly correlated, which means that a higher willingness to use air taxis results in higher acceptance of air taxi Services and vice versa. Generally, persons with more prior knowledge have a higher intention to use and at the same time fewer concerns regarding safety. Thus, by making the technology better known to the population, even higher levels of acceptance can be expected. The findings further suggest that the individual decision to use an air taxi is based on emotional factors, such as expected enjoyment of usage, as well as rational reasons, such as time savings. Consequently, potential air taxi services could profit from the emotional





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Image Sources

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benefits of flying, in order to differentiate themselves from other forms of public transport. For cities and municipalities air taxi services provide the opportunity to be seen as an innovative region, while at the same time citizens expect a benefit in the overall mobility offering.

8. Limitations & Outlook for further Research

This study is based on data collected during a large public event (field study). Naturally, this results in demographic, but also psychographic deviations from the population, which affect the external validity of the study. Due to the wide variety of spectators during the event, we expect this bias to be rather small. With the large sample size, we additionally ensured that also underrepresented fractions of the population could be analyzed in detail and their views be integrated. Compared to other research approaches, our study ensures the highest level of internal validity currently achievable, since the participants could realistically experience an air taxi flying in close proximity. Nevertheless, future studies will be necessary to include participants making a real in-flight experience, in order to understand how this experience shapes the continued usage decision.

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