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University of Applied Sciences Ltd.

Passenger attitudes towards regional electric aviation and the anticipated changes in the customer journey

Pia Brandt

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Author(s)
Pia Brandt

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Nordic Countries have taken a strong initiative to become forerunners in sustainable aviation. One pathway to a greener future of aviation is the use of electric aircraft, meaning airplanes powered by battery-operated electric engines.

Aviation stakeholders anticipate that electric aircraft will start operations on regional Nordic routes earliest from 2026 onwards. Electric aircraft will enable better regional connectivity, but they will also introduce some changes to the customer journeys. The biggest changes include flights from smaller regional airports, more frequent flight schedules, and passengers having to travel light due to limited space for baggage.

This thesis aimed to find out what motivates and demotivates the residents of Finland to choose electric aviation over aviation powered by fossil fuels and what is the passenger readiness to adapt to the aforementioned changes in their customer journey.

The scope was limited to the Finnish residents' attitudes towards regional electric aviation, as electric airplanes will initially operate on the shortest regional routes up to 400 kilometres.

A single case study was chosen as the research design and semi-structured interviews as the data collection method. The interviewees were selected using purposive sampling to enable diverse opinions and views on the subject of study.

Data collection was conducted during September-October 2021. The diverse group of 11 interviewees ranged from 23 to 55 in age, 55% being females and 45% males. 5 interviewees were from the metropolitan area and 6 from other parts of Finland.

Knowledge of electric aviation turned out to be limited as 5 out of 11 interviewees did not know about it before the interview. Interviewees saw electric aviation as just another transportation mode among others, despite its' clear environmental advantages. To build their trust towards this new travel mode, 9 out of 11 interviewees wanted to learn more about the technological and safety aspects of electric airplanes. Although interviewees insisted on their willingness to make compromises to fly "greener"', their answers revealed that pricing, practicality, and convenience of travel nevertheless win over environmental benefits. The interviewees considered traveling light on short distances convenient, welcomed smaller airports for a smoother airport experience, and had positive attitudes towards more frequent flight schedules between smaller cities, but only if compatible with people's timing-related needs as the current hub and spoke model seldom seems to serve the needs of those living outside the metropolitan area.

Keywords
Electric aviation, sustainable aviation, regional connectivity, customer journey, adaptation to new technologies, environmental awareness

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Glossary

BPC	Battery Plug-in Charger
BSS	Battery Swapping Station
DMU	Decision-Making Unit
FAIR	Finding innovations to Accelerate the Implementation of electric Regional aviation
FGEA	First-Generation Electric Aircraft
GHG	Greenhouse Gas
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
Long-haul flight	Flight exceeding 4000 km
Medium-haul flight	Flight between 1500 km and 4000 km
NEA	Nordic Network for Electric Aviation
NISA	Nordic Initiative for Sustainable Aviation
RAM	Regional Air Mobility
SAF	Sustainable Aviation Fuel
Scandinavia	Synonym for Nordic countries, although according to some interpretations the term refers only to Denmark, Norway and Sweden, or even just the Norwegian-Swedish peninsula
Short-haul flight	Flight up to 1500 km
The Nordics	Nordic Countries, i.e. Denmark, Finland, Iceland, Norway and Sweden including three autonomous territories: the Faroe Islands (Denmark), Greenland (Denmark) and Åland (Finland)
Wh	Watt-hour, a unit of energy equivalent to one watt of power expended for one hour of time.

1 Introduction

In 2019, before the outbreak of the Covid-19 pandemic, global aviation was one of the fastest-growing origins of greenhouse gas emissions, responsible for approximately 2% of human-originated Carbon Dioxide (CO_2) emissions and 12% of CO_2 emissions produced by the transportation sector (European Commission s.a.; ATAG 2020). International Civil Aviation Organization ICAO (2019) forecasted that in the worst-case scenario aviation emissions could triple by the year 2045 compared to 2015 levels. To address its impact on global warming aviation industry has set an ambitious goal of carbon-neutral growth from 2020 onwards and to half carbon emissions based on 2005 figures by 2050 (IATA 2021).

One pathway to a greener future of aviation is the use of electric aircraft, meaning aircraft powered by battery-operated electric engines. Nordic countries have taken a strong initiative to become forerunners in regional electric aviation, which is reasonable since according to a German study on the development of aviation emissions short-haul flights are the least environmentally efficient flights as they produce twice the amount of CO_2 emissions per ton kilometre compared to long-haul flights (Grimme & Jung 2018). Collaboration platforms such as Nordic Network for Electric Aviation, NEA, and Finding innovations to Accelerate the Implementation of electric Regional aviation, FAIR, have been set up to support the early introduction of electric aviation in the Nordic region (Fossil-free Aviation 2045; Kvarken Council 2020).

Whereas Nordic countries undoubtedly have the technical prerequisites to lead the way towards electric air travel, understanding of passenger attitudes towards electric aviation is still limited. Although passengers' growing environmental awareness is likely to motivate them to use electric aviation, knowledge of passenger willingness to adapt to the new aircraft technology and the evident changes electric aviation will bring on their customer journey, e.g. operations from smaller regional airports and limited space for baggage, need to be obtained to craft desirable value propositions for the passengers as well as feasible business models for the airlines.

Therefore, this thesis aims to gain an understanding of the passenger attitudes towards electric aviation, as well as the passenger readiness to adapt to the anticipated changes electric aviation will bring on their customer journey.

2 Objectives

The following subchapters introduce the objectives for the thesis, explain why more profound knowledge of passenger attitudes towards electric aviation is needed and set a scope for the study.

2.1 Problem statement and research questions

To the author's best knowledge previous research on the passenger attitudes towards electric aviation has been mainly (if not entirely) quantitative, concentrating on the passengers' environmental attitudes and perceived risks. Although these studies have indisputably provided important information on the passenger perceptions regarding electric aviation, the current customer understanding is nevertheless limited. As electric operations are likely to bring changes to the existing customer journeys and business models within the industry, knowledge especially on the passenger readiness to adapt to these changes will provide a customer-centric basis for building value propositions and service concepts that are both desirable for the customers and feasible for the aviation stakeholders. Therefore, this thesis aims to gain a more profound understanding of the passenger jobs, gains and pains that electric aviation stakeholders need to address.

Research questions are:

- What motivates and demotivates residents of Finland to choose electric aviation over aviation powered by fossil fuels?
- What is the passenger readiness to adapt to the anticipated changes electric aviation will bring on their customer journey?

2.2 Scope

Scope is limited to the residents of Finland and their attitudes towards regional electric aviation, as according to the Nordic Council of Ministers (2020, 58) electric airplanes will operate initially on the shortest regional routes up to 400 kilometres.

3 Sustainable aviation in the Nordics

Nordic countries are supporting sustainable air mobility as one of the pathways to the joint vision of becoming the most sustainable and integrated region in the world by 2030, as well as climate-neutral by 2050 (Nordic Council of Ministers 2021; Nordic Council of Ministers 2020, 7).

Various aviation stakeholders including Nordic airlines, airport operators, aviation industry organizations and authorities, International Air Transport Association IATA as well as aircraft manufacturers Airbus and Boeing, have formed a cooperation platform Nordic Initiative for Sustainable Aviation, NISA, to enable a more sustainable aviation industry within the region. NISA is involved in numerous projects such as the development of Sustainable Aviation Fuels (SAF), electric aircraft, electro fuels, sustainable airports, and other similar initiatives. (ICAO s.a.)

3.1 Emission reduction strategies

According to the Nordic Council of Ministers (2020, 24), which is an intergovernmental cooperation body within the Nordics, Greenhouse Gas (GHG) emissions from aviation are reduced with the following three measures divided into further sub-categories:

- Reducing air transport (passenger and tonne-kilometres)
- Improving energy efficiency by:
    - having more passengers or freight per flight
    - technical development of aircraft and aircraft engines
    - better air traffic management and operations
    - having less fuel-consuming aircraft among existing aircraft types
- Replacing fossil jet fuel with substitutes having less climate impact via:
    - fuels with lower life cycle GHG emissions
    - electric propulsion instead of conventional combustion engines

The Nordic Council of Ministers argues that from an operational point of view SAF such as bio-jet fuels produced from biomass and e-jet fuels, i.e. synthetic kerosene, which is produced by using electricity to produce hydrogen from water which is then converted to fuels, is probably the most efficient way of reducing GHG emissions in the near future. This is because the long economic lifetime of aircraft slows down the deployment of fuel-saving technologies in new aircraft and the deployment of new propulsion systems such as electric propulsion. (Nordic Council of Ministers 2020, 25-26.)

However, the Nordic Council of Ministers also acknowledges that electric aircraft hold a great deal of potential in the coming years particularly for small aircraft on short-haul and

medium-haul routes. In addition to the aircraft powered by pure-electric propulsion, meaning propulsion typically based on battery-pack as the only energy source onboard, aircraft with hybrid-electric propulsion, meaning electric propulsion coupled with another energy resource, could be a relevant option to bring down emissions on medium- and long-haul flights. In hybrid-electric propulsion architectures, the other energy source is a fuel processed either by a power generation system, which usually consists in a fuel cell module (oxidizing hydrogen), or a thermal engine accompanied by an electric generator (burning hydrocarbon fuel). (Nordic Council of Ministers 2020, 6, 10, 26-27; Trainelli, Salucci, Riboldi, Rolando & Bigoni 2021,1.)

3.2 Nordic and national cooperation on electric aviation

Nordic cooperation on electric aviation involves a wide network of both governmental and corporate initiatives. As shown in Figure 1, The Nordic Council of Ministers supports electric aviation projects such as Finding innovations to Accelerate the Implementation of electric Regional aviation, FAIR, and Nordic Network for Electric Aviation, NEA (Nordic Innovation 2021a; Kvarken Council 2020).

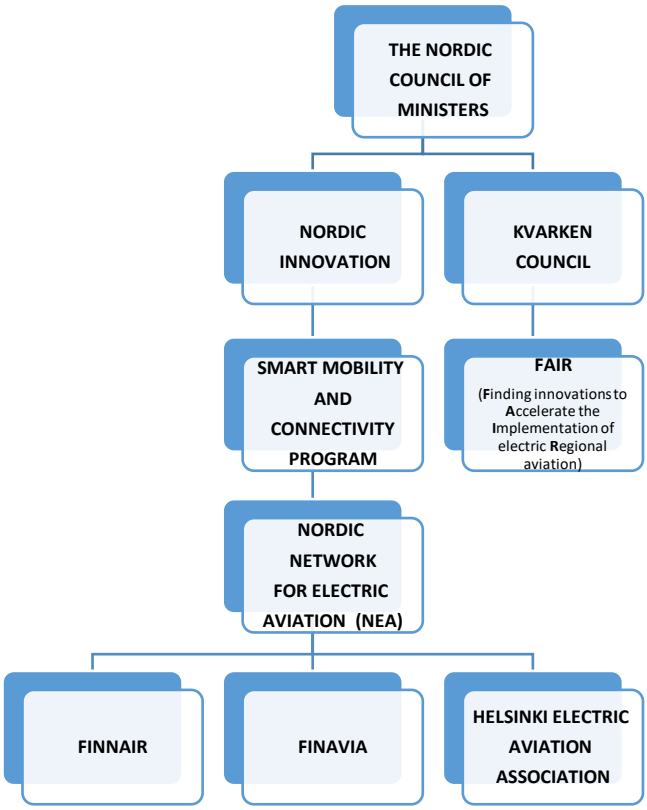

Figure 1. Nordic and national cooperation on electric aviation

Kvarken Council is an official cross-border operator funded by the Nordic Council of Ministers, as well as the European Union and various municipal and private sponsors. The aforementioned FAIR is one of its projects supporting the commercialization of electric aviation in the Kvarken region, that is in the counties of Ostrobothnia, South Ostrobothnia, and Central Ostrobothnia in Finland and the county of Västerbotten and municipality of Örnsköldsvik in Sweden. The project aims to increase knowledge of the regional effects of electric aviation, to suggest potential flight routes within the Kvarken region, to map out possible financing options, to build new concepts and business models to support early implementation, and to raise public awareness to promote demand and to speed up the application of electric aircraft. (Kvarken Council 2020.)

Nordic Innovation is an organization under the Nordic Council of Ministers with the objective of making the Nordics a pioneer for sustainable growth, and one of its three programs is the Nordic Smart Mobility and Connectivity Program**.** The program develops sustainable and innovative solutions to move people and goods within the Nordic countries and is currently funding the aforementioned NEA project. NEA works to standardize electric air infrastructure within the Nordics, to create business models for regional point-to-point connectivity, to design aircraft technology for Nordic weather conditions, and to set up a collaboration platform for European and global stakeholders. (Nordic Innovation 2021a; Nordic Innovation 2021b; Fossil-free Aviation 2045.)

Another electric aviation initiative, which is independent of the Nordic Council of Ministers but cooperating with NEA, is Green Flyway between Norwegian and Swedish stakeholders including local aviation industry representatives, research institutes, universities, and manufacturers. Green Flyway is an international test arena for future aviation (electric aircraft and drones) offering opportunities to fly point-to-point in airspace dedicated for testing purposes, inclusive of two international airports as well as several other airports between Sweden and Norway. It offers temporary test permits and charging facilities with renewable electricity, as well as develops and tests optimal design for airport infrastructure, charging equipment, hangars, and workshops. (Green Flyway 2019.)

Scandinavian Airlines SAS and aircraft manufacturer Airbus have also recently collaborated on a joint research project to enhance knowledge on the operational and infrastructure opportunities and challenges for the large-scale introduction of hybrid and full electric aircraft to commercial passenger traffic (Airbus 2019).

In Finland, Helsinki Electric Aviation Association and the Finnish airport operator Finavia have been testing and developing a two-seat electric aircraft Pipistrel Alpha Electro, which

took its inaugural flight in 2018, and airline company Finnair has signed a letter of interest for ES-19 electric aircraft developed by Swedish Heart Aerospace. (Finavia 2021; Finnair 2021). Finnair and Finavia are both members of NEA and cooperate closely to promote the early introduction of electric aviation in Finland.

3.3 Electric aviation as an enabler for increased regional connectivity

According to a report by the Nordic Council of Ministers (2020, 53), electric aviation has many environmental benefits including lower CO^2 emissions, local air pollutants, and noise levels, particularly in the case of fully electric airplanes using electricity based on renewable energy.

Grimme and Jung (2018) argue that short-haul flights are the least environmentally efficient flights because they produce twice the amount of CO_2 emissions per ton kilometre compared to long-haul flights: This is due to variables such as relatively lower load factors and the fact that energy-intensive take-off and climb phases take place more frequently over shorter flight distances. Another recent study shows that replacing conventional regional aircraft with electric aircraft would be most beneficial for the Scandinavian countries, and the United Kingdom, because these countries have the highest gas pollution caused by regional aviation within the EU (Brdnik, Rok, Marksel &, Božicnik 2019, 11). In the light of the aforementioned studies, there seems to be a rationale for advocating regional electric aviation in the Nordics.

A study conducted by the University of Jyväskylä and Griffith University predicts that the current First-Generation Electric Aircraft, FGEA, under development could be carrying up to approx. 20 passengers for approx. 400-1000 kilometres by the year 2025. The study found that electric aircraft could outperform current aircraft both in terms of emissions and real travel time as well as outperform current cars, both conventional and electric, on routes exceeding 170 kilometres. If fuelled exclusively with renewable energy sources FGEA could even outperform current trains on routes exceeding 170 kilometres. (Baumeister, Leung & Ryley 2020,1.)

One such electric aircraft currently under development is the previously mentioned ES-19 by Heart Aerospace. The Swedish start-up aims at having the aircraft certified for commercial operations by the year 2026. ES-19 is a fully electric 19-seater with an operating range of 400 kilometres and will initially offer regional point-to-point connectivity. In July 2021 United Airlines ordered 200 ES-19 aircraft for its regional branch United Express, which offers feeder services to United Airlines' bigger hubs in short and medium-

distance routes. Nordic airlines – including SAS (Scandinavian Airlines), BRA (Braathens Regional Airlines) and Finnair – have also shown their support for Heart Aerospace and the development of ES-19. (Heart Aerospace 2021; Flygtorget AB 2021.)

Another similar project is currently taking place in Norway between Rolls-Royce and Widerøe regional airlines, as they are developing an all-electric passenger aircraft P-Volt in cooperation with the Italian aircraft and component manufacturer Tecnam. P-Volt is based on the 11-seat Tecnam P2012 Traveller aircraft and is ideal for Widerøe's extensive domestic network, where 74% of the flights equal a distance of fewer than 275 kilometres and the aircraft's capability for short take-offs and landings is useful in the mountainous landscape. This aircraft is also expected to be ready for service by 2026. (Rolls-Royce 2021; Surgenor 2021.)

A report on sustainable aviation by the Nordic Council of Ministers claims that the Nordics are a particularly suitable region for electric aircraft for the following reasons:

Firstly, geographically the Nordics have many islands as well as coastal and remote areas most conveniently accessed by aircraft. There are also a large number of airports located close to each other as well as short flight routes within and between the Nordic countries. Many of these routes are so-called public service obligation (PSO) routes with a few passengers and thus make a good fit with small electric aircraft suitable for short-distance flying: For instance, in Finland, there are currently 8 origin airports and 14 destination pairs with routes that are equal to or shorter than 200 kilometres. The airports located close to each other have currently very little or no traffic at all due to insufficient demand, but with the use of small electric aircraft, these routes could become economically sensible to establish. This could lead to increased business collaboration, shorter work travel for people, and a possibility to test out the new technology. In addition to several possible domestic routes, examples of possible routes from Finland include Åland-Gothenburg, Vaasa-Umeå, and Vaasa- Skellefteå. (Nordic Council of Ministers 2020, 57, 59-60.)

Secondly, the Nordics are also a well-suited region for the early introduction of electric aircraft because of the relatively low electricity prices compared to the other EU countries as well as the high and increasing share of electricity produced from renewable energy sources. Since electric motors are also more energy-efficient than combustion engines, most analysts conclude that energy costs will under normal conditions be lower for electric aircraft than conventional aircraft of similar size. And since electric engines are also simpler than combustion engines, they most likely require significantly less maintenance.

This strengthens the case for electric aviation, as it gives battery-electric aircraft a cost advantage compared to similar-sized conventional aircraft and contributes to making lifecycle emissions of regional aviation lower. (Nordic Council of Ministers 2020, 56-57, 59.)

All in all, electric aviation could enable increased regional growth and collaboration in the Nordics by creating a whole ecosystem around new opportunities for work and leisure-related travel patterns, logistics routes, eco-tourism, cross-border cooperation on health and education as well as business and cultural collaboration. As previously discussed, it could also make travel particularly to remote areas faster and more convenient, and enable the introduction of regional mini-hub airports since electric aircraft can operate from shorter runways and make less noise, thus making it possible to build airports close to urban areas. The silence factor also makes electric aircraft suitable for night-time flying, enabling an improved economy of each aircraft and flying for logistics purposes, as these aircraft could also be utilized during the less-busy night hours. (Nordic Council of Ministers 2020, 60-61.)

4 Changes to aviation ecosystem and customer journeys

Although electric aircraft have many environmental advantages, they also introduce certain challenges for the aviation ecosystem from airport infrastructure and operations to customer journeys. These will be briefly discussed in the following subchapters.

4.1 Infrastructure, technical and operational challenges

Future aircraft concepts, such as electric aircraft, should not be evaluated only against aircraft efficiency, but also against their compatibility with airline operations, airport infrastructure requirements and ground handling procedures, because these all affect the aircraft concept's overall performance (Schmidt, Paul, Cole & Ploetner 2016, 107). In other words, an aircraft's efficiency contributing to more sustainable operations does not guarantee its successful entry into service if infrastructure, technical, and operational elements do not support the aircraft concept.

There are around 20 airports and 60 uncontrolled aerodromes, that is airfields without a control tower or with an inoperative control tower, which could be utilized for electric aviation purposes in Finland (Ilmailuliitto 2021). Although a potential network of airports and aerodromes already exists in Finland for electric operations, building supportive infrastructure as well as adapting airport operations to service electric aircraft will require extensive investments. According to a study by Trainelli & al. (2021, 2), the current airport framework is not designed to support electric aircraft operations: an adequate ground infrastructure – particularly for battery charging - needs to be established, and reconfiguration of existing airports also entails an increased need for electricity supply as well as additional costs in a form of electricity prices and the acquisition and maintenance of battery chargers.

Although electric aircraft has numerous environmental and operational advantages – such as the availability of large and increasing quantities of electricity, competitive prices of electricity from renewable resources, and electric propulsion being more energy-efficient than turboprop or jet engine propulsion – they also present certain technological challenges. Firstly, there is the challenge of battery energy density, which needs to be significantly higher than it is today: Current batteries in the innovation stage have around 300 Wh/kg, but similar batteries for electric aircraft use should have an energy density of at least 500 Wh/kg to be suitable for aviation purposes. Secondly, there is the question of the limited supply of minerals such as lithium and cobalt that are needed for battery production. (Nordic Council of Ministers 2020, 54.)

The existing technological challenges for ground recharging facilities can be overcome with either Battery Plug-in Chargers (BPCs) or Battery Swapping Stations (BSSs). Whereas BPCs are similar to fuel-refilling stations and the charging of land electric vehicles, BSS allows recharging batteries unplugged from the aircraft. However, both recharging methods present challenges: The central question in the diffusion of BPCs is the standardization of the charging systems as those are currently confined to a few models. Also, in the case of a bigger aircraft BCP would require an unacceptably long recharging time. What it comes to BSS, logistical issues of transporting and storing batteries as well as acquisition costs of adequate numbers of battery rechargers need to be considered. (Trainelli & al. 2021, 2.)

From an operational point of view, the issue of reasonable turnaround time, meaning the time an aircraft stays on the ground between flights, needs to be addressed. According to a report by the Nordic Council of Ministers (2020, 54) time for charging an electric aircraft might become a barrier if it cannot be done relatively quickly: conventional passenger aircraft normally have a short turnaround time to optimize aircraft utilization thus enabling reducing capital costs invested in the aircraft. Therefore, smoothly flowing supply between aircraft and recharging facilities need to be ensured as well as new ground support equipment and processes for efficient battery loading and unloading need to be developed (Schmidt & al. 2016, 116).

4.2 Anticipated changes in the customer journey

The research literature on the anticipated changes electric aviation will introduce to customer journeys is practically non-existent at the time being (in 2021). However, as already discussed in chapter 3.3., National Aeronautics and Space Administration NASA agrees with the Nordic Council of Ministers on the fact that Regional Air Mobility (RAM) should be built upon existing airport infrastructure using the smaller currently underutilized airports. According to NASA, RAM could be enabled with community-compatible aircraft using mainly electrified propulsion and typically carrying less than 20 passengers (or an equivalent amount of cargo in weight), as these aircraft could operate physically close to communities due to their low emission and noise levels, their ability to operate from short runways as well as their steep climb and descent profiles that reduce nuisance factors. Nasa argues that community-compatible electric aircraft could also enable more frequent flight schedules as they are restrained neither with runway quantity and length nor noise restrictions that limit the operations of the current conventional aircraft. (NASA 2021, 4-5.)

Anders Forslund, CEO and Founder of Heart Aerospace start-up developing ES-19 electric aircraft, agrees with the aforementioned as according to him electric aircraft will

initially be used for the shortest haul flights to cut emissions and to invigorate local economies in the Nordics. Forslund argues that electric aircraft will enable flying small airplanes at unit economics similar to larger planes as well as with zero emissions and low noise levels. According to Forslund electric aircraft will not only replace some current regional fleets but will also create a totally new market. New infrastructure in the form of small airports enabling flights between smaller towns and cities will eventually mean a shift away from the traditional hub and spoke model, in reference to the system in which big hub airports provide trans- and intercontinental flight connections with connecting flights from smaller regional airports to these hubs. Forslund also points out that passengers are expected to travel light, as electric aircraft will have limited space for heavy luggage. (Finnair 2021; Holloway & Humphreys 2012, 399.)

As already discussed in chapter 3.3, electric aircraft also have the advantage of relatively low Nordic electricity prices combined with the energy efficiency of electric motors. The simpler electric motors most likely also require less maintenance than combustion engines. If, as suggested by the report by the Nordic Council of Ministers (2020, 62), joint Nordic incentive schemes (e.g. financing for charging infrastructure, joint tax exemptions or reductions on landing and/or passenger fees) would be developed to enable economically beneficial operating conditions for electric aviation, all of the aforementioned facts could contribute to electric airplane tickets being sold at competitive prices compared to those of conventional airplanes.

So, implications of the previously discussed facts are the following potential changes to passengers' customer journey:

- Traveling light (no heavy luggage)
- Competitive ticket prices
- Flying from smaller and less congested airports closer to urban areas
- Flight destinations covering greater geographical areas, particularly previously un-serviced destinations in remote and challengingly accessible places
- Lower noise levels
- Possibility of more frequent flight schedules

This thesis aims to find out what is customer readiness for the aforementioned changes in their customer journey.

5 Theoretical framework

In the theoretical framework, the concepts of value proposition design and customer journey are defined and discussed. Also, environmental awareness and flight shame influencing passenger attitudes towards electric aviation, are introduced. Finally, the diffusion of innovations theory on adaptation to new technologies, as well as findings on passengers' perceived risk and product knowledge on electric aviation, are addressed.

5.1 Value proposition design

A value proposition can be defined in many ways: Lanning and Michaels (1988, 3) see value proposition simply as the company's promise of value for customers. According to Osterwalder, Pigneur, Bernarda, Smith and Papadakos (2014, 6) value proposition is the description of the customer benefits that can be expected from the company's products and services. Payne, Frow and Eggert (2017, 467) think of value proposition as a strategic tool, which is used to communicate how a company intends to provide value for its customers. Although the definitions come in many forms, the central function of value proposition seems to be undisputed: To let customers know how exactly the company proposes to provide value for them.

5.1.1 Sustainable and user-driven value proposition design

Debruyune and Tackx (2019, 1-3) argue that to create customer value companies should develop an outside-in approach to the market: This means combining customer-centricity with innovation orientation, that is crafting innovations in response to unmet – or even unconscious or latent – customer needs rather than in a random attempt to find market opportunities.

A recent study of the influence of value proposition design on the disruptive potential of sustainable technologies argues that a customer perspective is indeed important for sustainable innovations: Although the general assumption is that such innovations automatically create value, customers often fail to appreciate this. The study suggests that innovative business models can assist in making inferior technologies attractive, as well as disruptive, in the existing markets. And since value proposition is a key part of any business model, it plays a vital role in the process. (Khan & Bohnsack 2020, 1.)

The aforementioned study suggests that value proposition design can increase the attractiveness of sustainable technology, which is often considered inferior to incumbent technology in people's minds: Based on the emphasized customer values, technology can be positioned as a low-end, high-end, or new market focused. Value propositions based

on performance and hedonism seem to appeal more to high-end customers and value propositions based on utilitarian aspects seem to attract more low-end customers and new markets. However, too complex value propositions, so-called “all benefits value propositions” with mixed attributes, can decrease the attractiveness of innovation and even result in a negative attitude towards the technology, as potential customers often find them unclear and therefore less appealing. All in all, the study concludes that value proposition design can help to translate technological aspects of inferior sustainable technology to commercial success if done in a customer-centric manner with the involvement of lead users. (Khan & Bonsack 2020, 9.)

Baldassarre, Calabretta, Bocken and Jaskiewicz (2017, 175) agree with the aforementioned and argue that the problem with current sustainable innovation efforts is that companies tend to excessively focus on business growth and financial objectives instead of concentrating on the key drivers of sustainable innovation such as understanding customer needs: By focusing on the customer needs they could achieve a better fit between technological efficiency and customer benefits and thus encourage more sustainable consumption patterns.

In their study Baldassarre & al. (2017) combine principles from sustainable business model innovation and user-driven innovation to design sustainable value propositions, meaning offerings that address a sustainability problem and create shared value not only for the environment and society but also for multiple stakeholders including customers, suppliers, shareholders, and partners. As a result, solutions that are developed are both meaningful for the people and profitable for the company in question. In the sustainable value proposition model companies systematically involve customers and other stakeholders in the design process to discover new perspectives to the sustainability problem as well as unexpected connections with other kinds of problems and stakeholders. (Baldassarre & al. 2017, 175, 182-183.)

To change the customer perception of innovation’s technical inferior position without the need to change the technology itself, the study by Bohnsack and Pinkse (2017, 88, 90) suggests three reconfiguration tactics for crafting value propositions for disruptive technologies:

- Compensating tactics, being the most intuitive option for reconfiguration, focus on mitigating disadvantages of the disruptive technology compared to the main attributes of the incumbent technology, intending to make customers perceive the disruptive technology as a reasonable choice.
- Enhancing tactics attempt to target customer values that the incumbent technology does not address yet, intending to reach beyond the existing status quo in the industry

for example by providing value-added services or entirely new value currently non-existent in the industry.
- Coupling tactics utilize the disruptive technology to penetrate entirely new markets by for example looking for partners outside its industry to couple value elements not yet exploited.

It is worth noting that these aforementioned tactics have a different degree of effect on the company's business model: Compensating tactics have the least influence on the business model causing only moderate changes to it. Enhancing and coupling tactics have a strong influence on the business model, with enhancing tactics causing substantial changes in the value network and coupling tactics causing a deviation from the economic logic. (Bohnsack & Pinkse 2017, 89.)

Electric aviation stakeholders could benefit from the aforementioned user-driven and sustainable value proposition design, as it seems that the efforts have so far been put mostly in solving challenges related to infrastructure, technical and operational aspects. However, as Khan and Bohnsack (2020, 1) previously argued, the assumption that sustainable innovations automatically create customer value is misleading. Therefore, value propositions for sustainable technologies, such as electric aircraft, should be based on researched customer needs, which is what this thesis aims to accomplish: to gain an understanding of what exactly are the customer jobs, pains, and gains that electric aviation needs to address to make it a desirable option for passengers.

5.1.2 Tools for creating compelling value propositions

To craft compelling value propositions companies can use a value proposition map, which is a tool for describing the features of a specific value proposition in a business model. The map breaks down the value proposition into 1) products and services the proposition is built around, 2) gain creators describing how the company's products and services create customer gains and 3) pains relievers describing how the company's products and services relieve customer pains. (Osterwalder & al. 2014, 8.)

As demonstrated in Figure 2, customer segment profile is used in conjunction with the value map to describe a specific customer segment in a business model by breaking down the customer into customer jobs (things customer is trying to achieve), pains (risks, obstacles and undesired outcomes related to customer jobs) and gains (the concrete benefits and outcomes customer is trying to achieve). All the aforementioned elements should be ranked according to their importance, severity, or relevance for the customer. Gains should also be evaluated against their type: Whether they are required gains (gains without which a service or product would not work), expected gains (gains that people

automatically expect a service or a product to have), desired gains (gains that people do not expect from a service or a product, but would love to have) or unexpected gains (gains that go beyond customer expectations). The value map and the customer profile achieve a fit when the company's products and services create gains and relieve pains for the customer segment in question. (Osterwalder & al. 2014, 9, 16.)

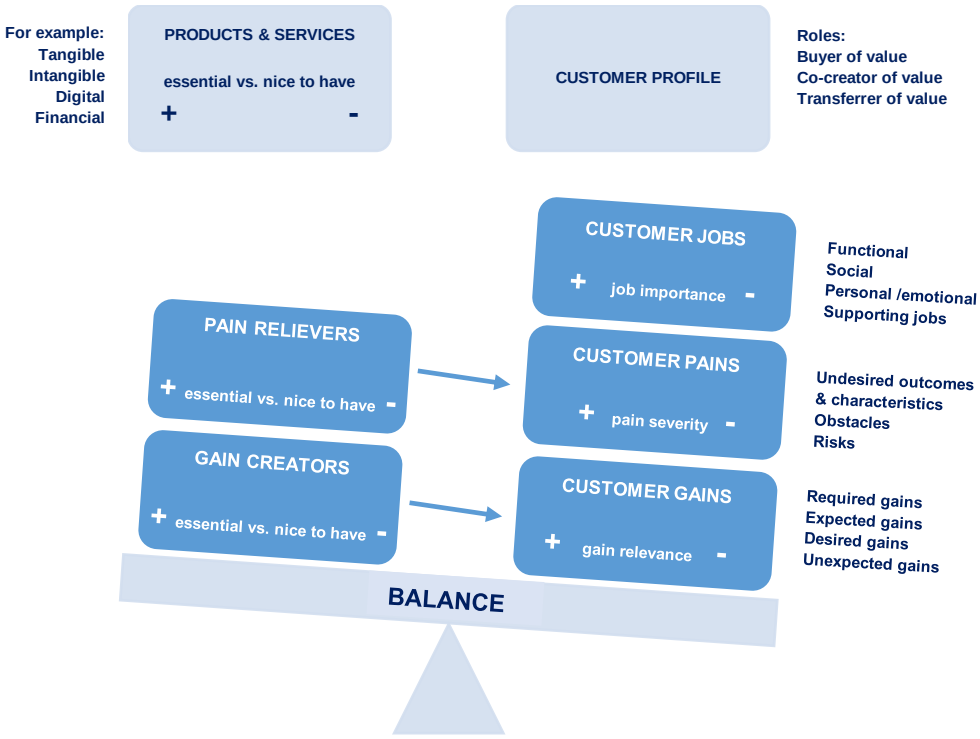

Figure 2. Value proposition and customer segment fit (based on Osterwalder & al. 2014)

As shown in Figure 2, Osterwalder & al. (2014, 12) argue that there are four types of jobs that customers are trying to get done in their lives:

- Functional jobs: A specific problem or a specific task customer is trying to perform or complete, e.g. to fly from point A to point B.
- Social jobs: Jobs describing how the customer wants to be perceived by other people, e.g. wanting to be accepted by others or to gain status. An example of this would be a need to be seen as an innovative individual traveling on an electric aircraft.
- Personal/emotional jobs: Jobs to reach a specific emotional state, e.g. a feeling of being a good person and a responsible citizen flying with an eco-friendly electric aircraft.
- Supporting jobs: Jobs that customers perform when purchasing and consuming value arising from three different customer roles:
    - 1) Buyer of value, meaning jobs related to purchasing value such as comparing alternatives, deciding which service to use, and completing the purchase.

- 2) Cocreator of value, meaning jobs arising from cocreation of value with the company such as giving feedback or making service review.
- 3) Transferrer of value, meaning jobs in the value proposition life cycle's end such as transferring, disposing, or reselling a product.

This thesis aims particularly at finding out what possible functional and emotional jobs passengers might have regarding electric aviation.

5.2 Customer journeys

In research literature customer journeys are typically seen as a way to take customers' point-of-view and to get insights on their experience, that is to understand the customer experience. The term customer journey is used to describe a path, process, or sequence via which customers access or use a service, and these descriptions usually highlight customer-centricity in the perspective-taking. (Følstad & Kvale 2018, 206-207.) For example, Kankainen, Vaajakallio, Kantola and Mattelmäki (2012, 221) define customer journey as "the process of experiencing service through different touchpoints from the customer's point of view". Patrício, Fisk, e Cunha and Constantine (2011, 182) describe the customer journey as a "series of touchpoints, involving all activities and events related to the delivery of the service from the customer's perspective". Lemon and Verhoef (2016, 74, 76) see customer journey as "stages of the total customer experience" and refer to customer journey as the "customer experience process", which is iterative and dynamic. Finally, Debruyune and Tackx (2019, 105) describe customer journey as a linear map illustrating the steps that a customer undertakes to acquire and use the right product or service to accomplish a certain goal, portraying the overall experience that a customer has with a company.

5.2.1 Varying scopes of customer journeys

All in all, customer journey approaches vary in scope both in terms of what is included in the customer journey, for instance whether the journey is considered to start already when the customer shows initial interest for service or with the first actual contact with the company, and the degree to which the customer journey spans over multiple channels, touchpoints and service providers, ranging from analysing customers interactions with a single company versus analysing customer interactions encompassing a variety of channels and service providers taking part in the customer's journey (Følstad & Kvale 2018, 208).

As illustrated in Figure 3, Lemon and Verhoef (2016, 74, 76) understand the customer journey, which they refer to as a customer experience process, to encompass three stages:

- The pre-purchase stage entails the customer's entire experience before the purchase from recognizing a particular need, impulse, or goal to satisfying that particular need, impulse, or goal with a purchase. Marketing literature has typically suggested this stage to include behaviours such as need recognition, search, and consideration.
- The purchase stage includes all customer interactions with the company and its environment during the purchase event. Marketing literature typically suggests this stage to encompass behaviours such as choice, ordering, and payment.
- The post-purchase stage entails customer interactions with the company and its environment following the actual purchase, which according to marketing literature includes behaviours such as usage and consumption, post-purchase engagement, and service requests.

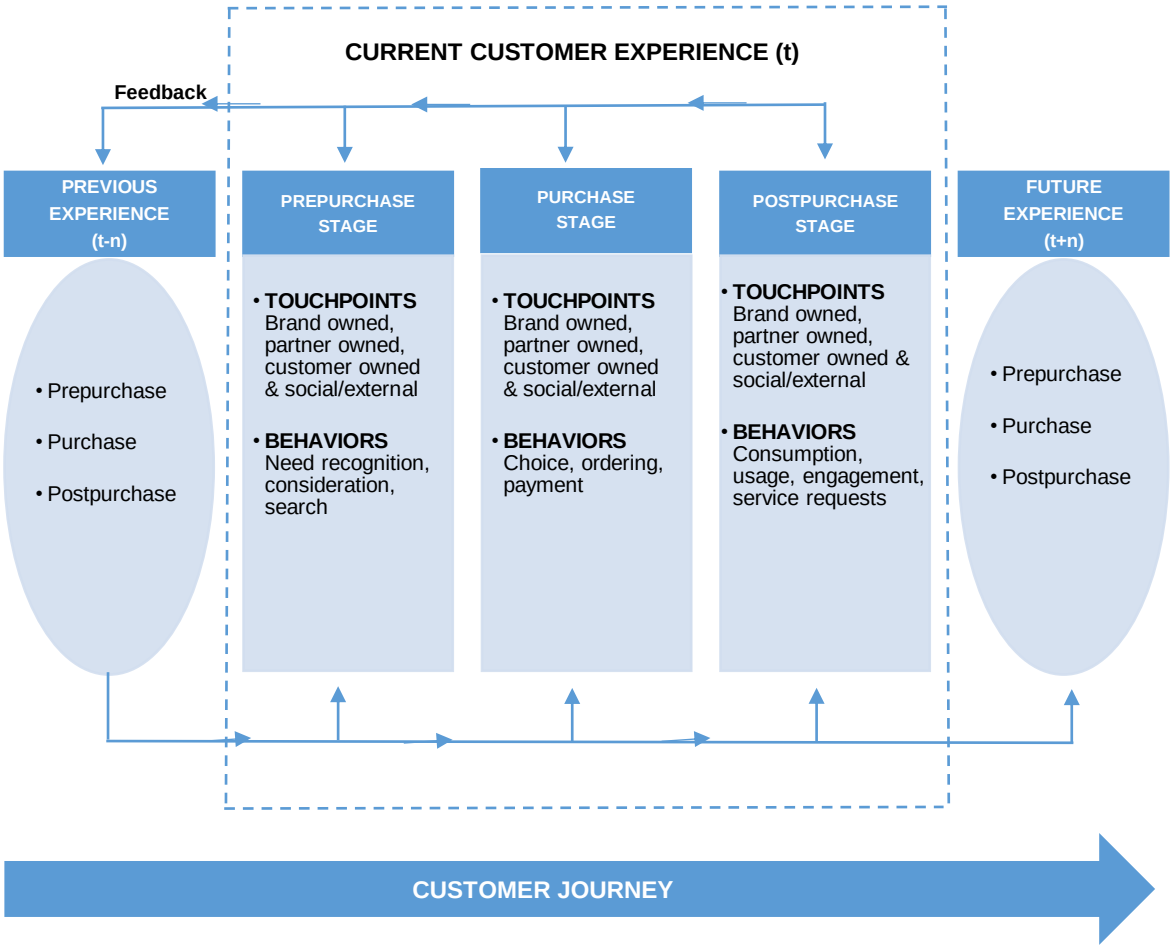

Figure 3. Customer journey and experience process model (Lemon & Verhoef 2016)

According to Lemon and Verhoef (2016), the customer journey process is affected by customers' past experiences, as well as external factors. In each stage of the journey, customers experience touchpoints, which may or may not be under the company's control. These touchpoints are categorized as brand-owned touchpoints (customer interactions managed by the company), partner-owned touchpoints (customer interactions managed or controlled together with the company and its partners), customer-owned touchpoints (customer actions which are part of the customer experience but not influenced or controlled by the company or its partners, e.g. choice of payment) and social/external touchpoints (e.g. interactions with other customers and peer influences). Depending on the service or product, the importance of these touchpoints may vary in each stage. The idea is to identify the most critical touchpoints in each stage for each customer, and then determine how these touchpoints can be exploited. (Lemon & Verhoef 2016, 76-78.)

Another example of the customer journey process is one by Jeavons (2020, 70) and it includes five stages as shown in Figure 4: discovery, research, purchase, delivery, and devotion. These are discussed in more detail in the following paragraphs.

Figure 4. Customer journey model for electric aviation (modified from Jeavons 2020)

In the discovery phase customers neither realize that there is a problem to be resolved nor are aware of the existence of a particular organization that could help to achieve their

goals. Therefore, it is of utmost importance to understand who exactly the company's potential customers are and to learn about them to build approaches to help these customers discover the company. (Jeavons 2020, 71.)

In the research phase, customers want to be emotionally reassured before the decision to move forward with the purchase. Therefore, this phase is all about responding to customers' questions and concerns in a manner that helps to build customer motivation to move ahead with their purchase intentions. (Jeavons 2020, 95.)

In the purchase phase company's focus should be on the "pain of change" the customer feels when planning to purchase a new or changed product or service. Since change always comes with possible risks and difficulties, the main task of the company is to help alleviate the pains and mitigate the risks, and to help the customer move forward with the purchase. (Jeavons 2020, 115.)

In the delivery phase, operational excellence is important. Quality of delivery is critical whether dealing with new or existing customers, as they expect to be delivered exactly what they paid for. If the company manages to add something above the customer expectations to the service delivery, that is to surprise or delight the customer in an unexpected way, they are most likely to become long-lasting devoted customers. (Jeavons 2020,145, 150.)

Finally, in the devotion phase, it is important to build devotion with a customer to enable repetitive purchases. This can be achieved with cyclical value-adding along the life cycle of a customer's journey, considering the root causes and deeper reasons for customer interactions with the company, and providing sustained surprise and delight based on solid customer understanding. (Jeavons 2020, 153, 155, 157.)

In their article on passenger experience enhancement through integrated self-service opportunities, Barich, Ruiz and Miller (2015) emphasize the need for aviation stakeholders to improve airline passengers' customer journey throughout the entire air travel experience in integrated effort. According to the article, IATA's widely used sequential 14-step passenger journey shown in Figure 5 is partly breaking down, because mobile technologies enable many of the functions typically performed in a specific step of the journey to be performed in various steps and with various means both in off-airport and on-airport locations. (Barich & al. 2015, 49, 52.)

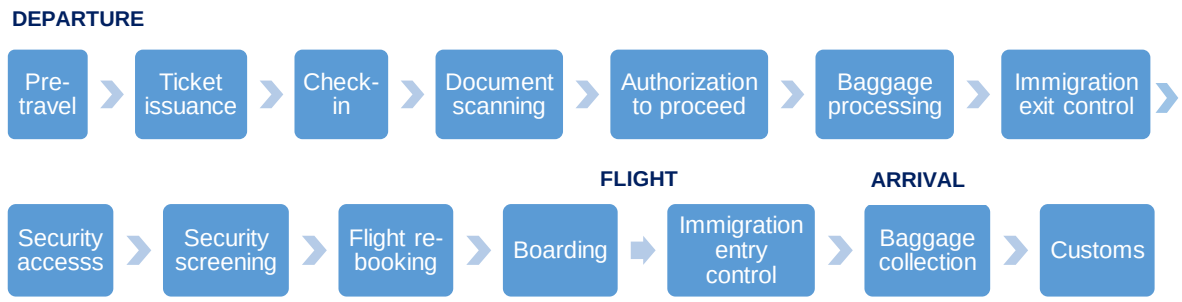

Figure 5. IATA's sequential 14-step passenger journey (Barich & al. 2015, 51)

Barich & al. (2015) argue that innovative technologies and passengers' need to self-customize and personalize their travel experience is speeding up the evident change from associating a certain passenger transaction with a specific location into having a more simplified view of the passenger journey by concentrating on fewer process areas, as well as on more opportunities for passengers to choose themselves where and when to execute these transactions along their customer journey. The aforementioned process areas may vary, but as illustrated in Figure 6 they typically include pre-arrival, landside, security, airside, boarding, and inflight. Within these process areas, all aviation stakeholders have a significant role in providing one seamless passenger experience, even though these services are usually offered by different entities. (Barich & al. 2015, 52, 54.)

Figure 6. Process areas of the passenger journey (Barich & al. 2015, 54)

5.2.2 Outcome-driven and social customer journeys

Whatever form the customer journey takes, customer journey mapping is a useful organizing tool for identifying value creation opportunities. By focusing on the activities that customers perform when searching, selecting and using a product or service, new ways of creating value can arise. The aim is to focus on each touchpoint of the customer journey and to consider the opportunities to help customers achieve 1) a better outcome,

2) lower customer costs, and 3) lower customer risks and uncertainty. Lowering customer costs does not mean only concrete costs along the customer journey, but also non-monetary costs such as time. Customer risks also come in different forms and include financial, performance, time, social and psychological risks. (Debruyune & Tackx 2019, 109-110.)

An outcome-driven perspective to customer journeys can prove useful, as it helps to see the customer journey from the customer perspective and to understand what role the company's product or service has in the customer's life. It also helps to see beyond the functional customer benefits, that is to understand what possible other jobs customer wants to get done with the company's product or service. The aim is to help a customer achieve his goal(s) efficiently with reduced risks and uncertainty and to provide a solution to the customer's problem. (Debruyune & Tackx 2019, 104.) In other words, the outcome-driven perspective to customer journey has a special focus on the previously discussed social and personal/emotional customer jobs, thus enabling a deeper understanding of customer motivations and needs than concentrating solely on the more obvious functional jobs.

A research article on the social aspect of customer journeys argues that today's customer journeys are highly social, even more so now that digital technology and different online platforms have magnified the context within which people can socialize. Social influence has therefore an important role throughout the customer decision-making process. The article suggests that social others influence customer decision-making throughout a six-step customer journey of motivation, information search, evaluation, decision, satisfaction, and post-decision sharing. In return, the social others are influenced by the customer in question, thus highlighting the reciprocal nature of social influence. (Hamilton, Ferraro, Haws & Mukhopadhyay 2021, 68-69, 71.)

The aforementioned research article introduces the concept of social customer journey highlighting the important role of social others throughout a customer's journey. Social distance is defined by the authors as "a continuum by a preponderance of factors that make a social other proximal or distal". As illustrated in Figure 7 proximal social others are close members of the customer's in-group and usually provide specific articulated inputs to the customer's journey. Distal social others refer to larger out-groups or even the whole of society, whose members might not even be individuated and known to the customer, but affect the customer's journey for example via social media channels or specific review platforms. (Hamilton & al. 2021, 72-73.)

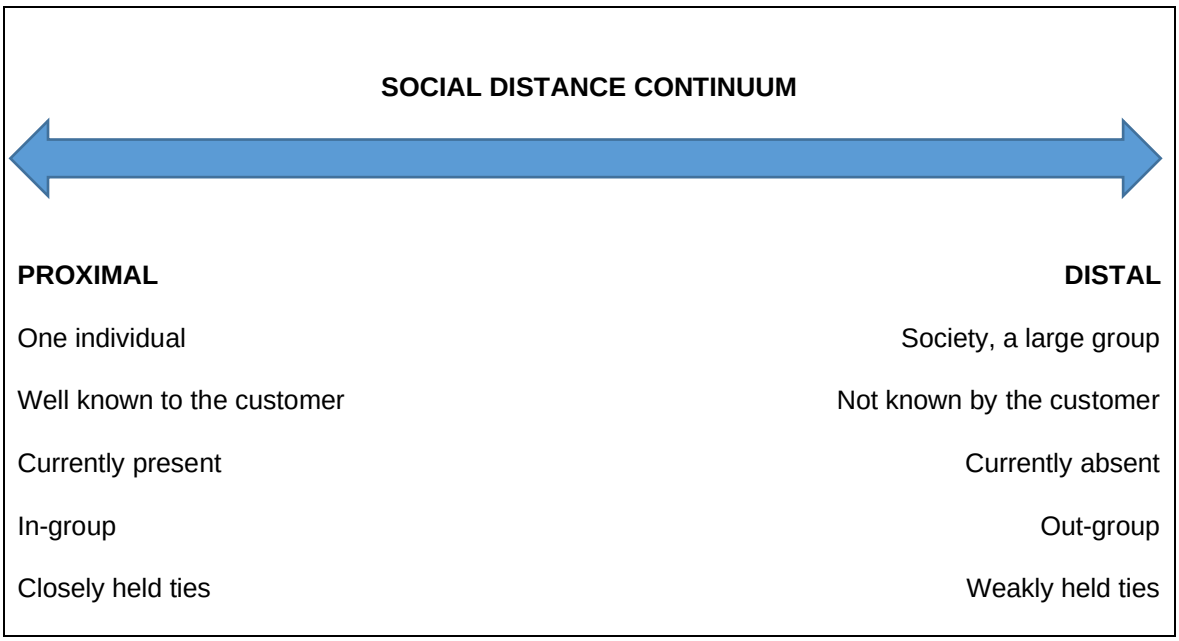

Figure 7. Social distance references for the social customer journey (adapted from Hamilton & al. 2021)

The social distance distinction leads to differences in the extent of social influence on a customer's journey. Usually the more proximal the social other is, the more influence he has on the customer's journey. However, some research suggests that under certain circumstances distal influences can be even more meaningful than proximal influences. The extent of social influence can also be affected by changes in perceived social distance, for instance because the customer perceives distal social other, e.g. e reviewer or a blogger, to be similar to him thus narrowing down the perceived social distance. (Hamilton & al. 2021, 72-73.)

Customers tend to be motivated to affiliate with others by matching consumption patterns. They also tend to engage in identity signalling by consuming brands, products, and services that can be associated with certain traits, aspirations, or status. These consumption choices can also be made to differentiate from others in an attempt to convey one's identity. From the viewpoint of electric aviation social influence might prove to have focal importance in decision making to favour electric aircraft as a means of transportation, as the aforementioned article suggests that even if customers are motivated to purchase a product or service for its functional benefits, they may also use the consumption as an opportunity to signal their identity and to affiliate with like-minded. (Hamilton & al. 2021, 76.)

5.3 Environmental awareness and flight shame

A study by Han & al. (2019, 12) on customer willingness to use electric airplanes shows that the passenger perceptions of airline company's environmental social responsibility influence significantly airline image, and have a critical role in activating passengers' sense of moral obligation and eventual intention to use the airline in question. However, according to a study by Chiambaretto & al. (2021, 1) people tend to have somewhat distorted perceptions of the environmental impact of air travel, as approx. 90% of the survey respondents overestimated aviation's contribution to global carbon emissions and nearly all underestimated the efforts of the aviation industry to reduce its environmental footprint

Nevertheless, a growing number of people seem to be concerned about the environmental impact of aviation. This has resulted in the development of "flygskam," a Swedish term meaning flight shame. Flight shame initiated in 2018 with Swedish teenager Greta Thunberg's "school strike for climate" outside the Swedish parliament and incited the global Fridays for Future youth movement. The organization emphasizes personal accountability for greenhouse gas emissions, especially in the context of air travel. Since 2018 shame of flying as a phenomenon has received attention on social networks and the press, and has created worldwide public pressure to reduce flying. (Gössling 2019, 1; Chiambaretto & al. 2021, 1.)

Flight shame refers to a person's unease to engage in energy-intense and climatically problematic consumption. It views air travellers as people engaging in socially undesirable activity, an adaptive behaviour described with the Swedish term "smygflyga ", which means "flying in secret". Flight shame questions the long-established view of air travel being associated with social status, or even with defining one's identity. People feeling flight shame see air travel as morally dubious and question the legitimacy of people's travel motivations. (Chiambaretto & al. 2021, 1; Gössling 2019, 1; Gössling, Humpe & Bausch 2020, 8; Gössling, Hanna, Higham, Cohen & Hopkins 2019, 3.)

This new debate on aviation's contribution to climate change has shifted the social discussion of decarbonization from a production-focused angle into a consumption-focused one and has raised the question of the role of social norms in judging what is justifiable, desirable, and "normal" to consume. Social norms can be described as informal rules guiding and governing people's behaviour in social groups. Although flying is still considered to be more or less a social norm, meaning that it is considered to be normal and acceptable behaviour, it can't be disregarded that a growing number of people demand responsibility in decisions to fly. Indeed, flight shame has to do with the changing

social norms related to flying and the moral concern people tend to feel when their interest conflicts with these new norms. This has been perceptively described as a “flyers’ dilemma”, meaning a conflict between personal consumption patterns and environmental concerns related to flying. (Gössling 2019, 1-2; Gössling & al. 2019, 3; Higham, Cohen & Cavaliere 2014, 462.)

The evolution of the aforementioned social norms, in this case regarding the desirability of air travel, can be conceptualized as shown in Figure 8: First, the old social norm of air travel being associated with social status is questioned by the ongoing flight shame debate. This leads to a situation in which personal interpretation of air travel is reconsidered against several personal factors such as early cognitions, current moral motivations, perceptions, values, beliefs, attitudes, habits, and intentions. Contextual factors, such as peer perspectives as well as availability and cost of alternative transport, also affect the evolution. Finally, the aforementioned personal and contextual factors determine the outcome: Both in terms of attention paid to the problem as well as in terms of a possible change in social practice (e.g. decline in the use of air travel) and political views (that could shift to favouring stricter climate policies). (Gössling & al. 2020, 2-3.)

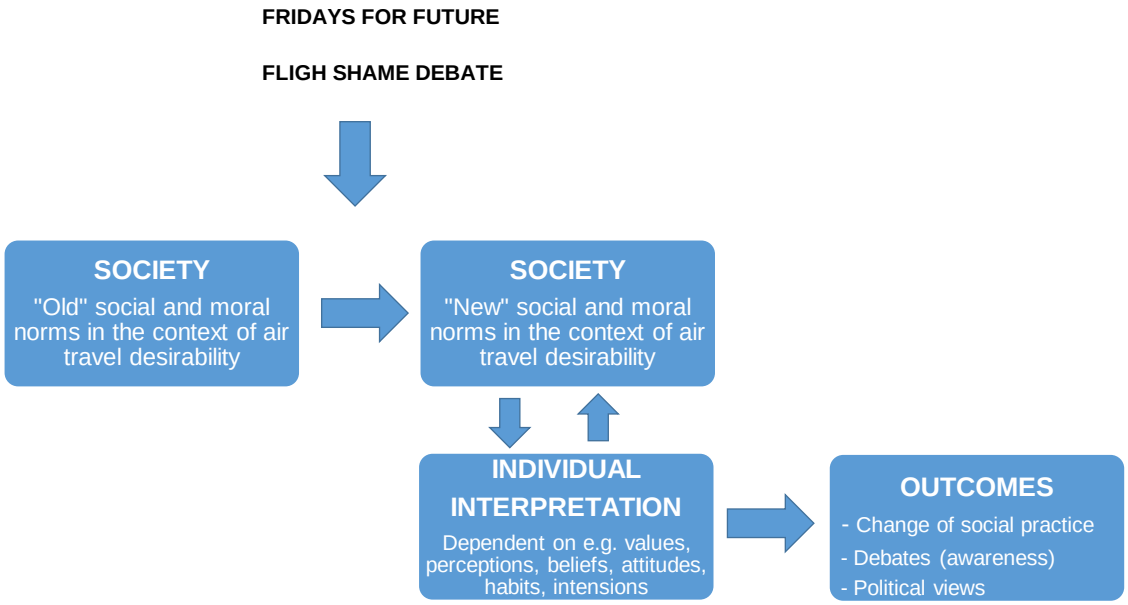

Figure 8. A conceptual model for the evolution of social norms (Gössling & al. 2020)

To the author’s best knowledge, Finnish residents’ environmental awareness specifically in the context of electric aviation has not been studied before. Therefore, one aim of this thesis is to find out whether the environmentally responsible image of electric aviation builds passengers’ moral obligation to use it.

5.4 Adaptation to new technologies

People adapt to innovations at different paces, as can also be expected in the case of electric airplanes. Everett M. Rogers has studied the diffusion of innovation for several decades. According to Rogers diffusion is “the process by which an innovation is communicated through certain channels over time among the members of a social system”. Innovation is defined as an idea, object or practice which is perceived as new by an individual or a group of adopters. So, the innovation does not need to be objectively new, but rather the newness of innovation is defined in terms of knowledge, persuasion, or individual’s decision to adopt it. (Rogers 2003, 11-12.)

Although the diffusion of innovation is a personal process of seeking and evaluating information on innovation’s advantages and disadvantages for an individual’s particular situation and is affected by individual’s personal characteristics, Rogers points out that is also a social process occurring in a social system, which can facilitate or impede the diffusion process (Rogers 2003, 21, 25-26). For example, social image has proven to be a strong determinant of behavioural intention to adopt innovations (Lu, Yang, Chau & Cao 2011, 400).

5.4.1 Innovation’s rate of adoption

Rogers argues that innovation’s rate of adoption depends on two factors, an individual’s innovativeness and the characteristics of innovation.

Based on an individual’s innovativeness, meaning the degree to which he is relatively earlier in adopting new ideas compared to other members of a social system, people can be divided into 5 adopter categories: Innovators, early adopters, early majority, late majority and laggards. Research shows that the earlier adopters differ from the later adopters especially in socioeconomic status, personality variables and communication behaviour. As a generalization can be said, that the earlier adopters tend to have a higher social status and be more educated, they tend to have a more favourable attitude towards change and a greater ability to cope with uncertainty, and they are socially more active and prone to seeking information than the later adopters. (Rogers 2003, 37, 287, 298.)

According to Rogers (2003, 15-16), the other factor affecting innovation’s rate of adoption is the characteristics of an innovation, including:

- A relative advantage the innovation provides compared to previous idea or object

- Compatibility to potential adopters' values, experiences and needs
- Perceived complexity to understand and use innovation
- Trialability, meaning the extent to which innovation can be experimented
- Observability, meaning the extent to which the results of an innovation are visible and thus subject to peer discussion and evaluation

Of the aforementioned characteristics, especially relative advantage and compatibility have given the most constant explanation for customer intention to adopt new technologies (Lu & al. 2011, 399-400).

5.4.2 The innovation-decision process

As shown in Figure 9, the innovation-decision process of an individual or a social system consists of five consecutive stages: knowledge, persuasion, decision, implementation and confirmation. In other words, a decision-making unit (DMU) consisting of an individual or a group of people, seeks information at the various stages of the process to decrease uncertainty about the expected consequences of the innovation in question. At the decision stage, DMU finally decides to either adopt or reject the innovation. If deciding to use the innovation DMU moves into the implementation stage, in which it takes the innovation in use and moves from covert behaviour of thinking and deciding into overt behaviour of putting the innovation into practice. Finally, at the confirmation stage, DMU seeks reinforcement for the made innovation-decision, as well as seeks to eliminate or reduce the possible state of dissonance. Even at this stage, the DMU can still decide to discontinue using the innovation. (Rogers 2003, 37, 179, 189.)

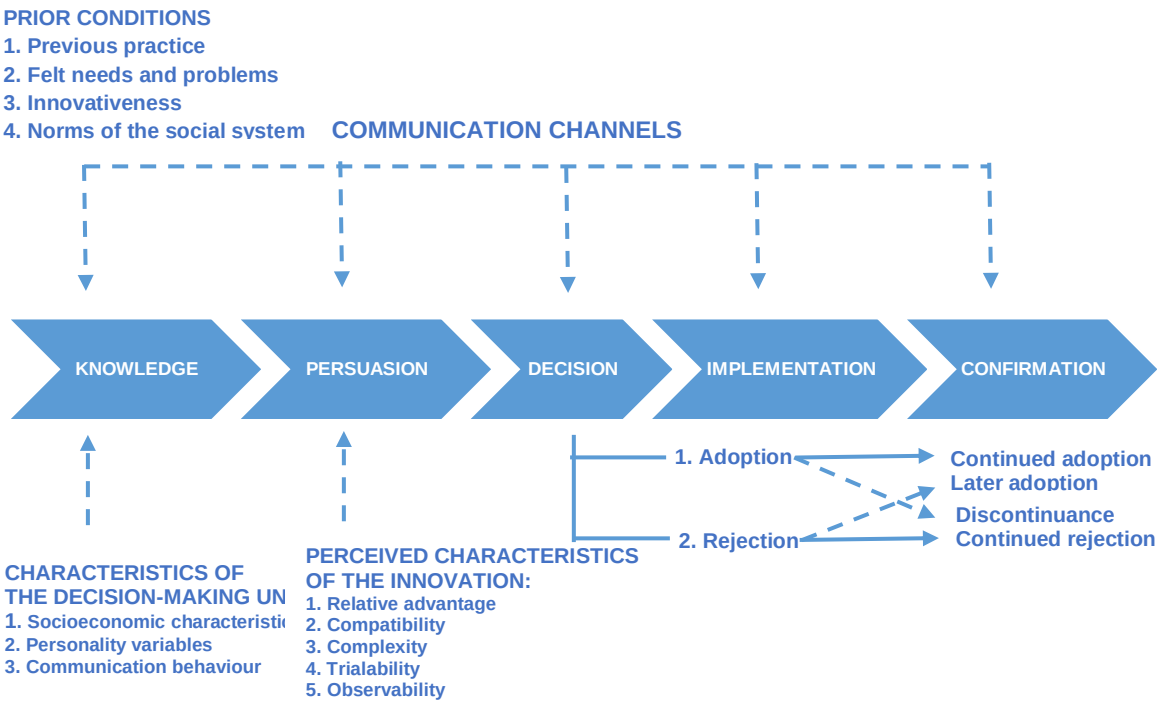

Figure 9. Five stage innovation-decision process model (Rogers 2003)

In reference to the diffusion of innovations theory, this thesis aims to find out how eager, or innovative, residents of Finland are to adapt to electric aviation as well as how well aware they are about the existence of electric aviation in the first place.

5.5 Passengers' perceived risk and product knowledge

An electric airplane is also a highly technical innovation, and technology has often two components: hardware and software. The hardware aspect consists of the tool embodying the technology as a physical object, and the software aspect consists of the information basis for the tool. Although the software component is not always so apparent, its importance in the diffusion process is indisputable. (Rogers 2003, 13-14.)

Indeed, a study assessing the effect of travellers' perceived risk, attitude, and new product knowledge on electric aircraft shows that it is of utmost importance to reduce customers' perceived risks as well as to increase their product knowledge to enhance trust and positive attitude towards electric aircraft, and ultimately readiness to fly and pay for flying on them (Han, Yu & Kim 2019, 33).

The aforementioned study argues that customers' perceived risks include four risk categories: performance/functional, physical, psychological, and financial risks. Performance/functional risk refers to a product or service not performing or functioning up to customers' expectations, physical risk refers to a product or service posing a potential threat to customers' health or well-being, psychological risk refers to possible psychological discomfort that a product or service might cause influencing customers' mental well-being, and financial risk refers to potential monetary loss caused by buying a product or service that is not worth the price paid for it. (Han & al. 2019, 34-35.)

According to the study, physical and functional/performance risks proved to be the strongest factors affecting customer willingness to use electric aircraft. In other words, customers worry that traveling on an electric aircraft could pose a threat to their physical well-being and safety as well as could lead to a low-quality travel experience. Thus, the study argues that although electric aviation offers advantages such as lower carbon emissions and cheaper airfares, customers see problems in electric aviation because of the potential risks such as an explosion of batteries, lengthy charging times, and performance changes in low temperatures. (Han & al. 2019, 33, 39-40).

The study also highlights the importance of new product knowledge as a means to increase positive attitudes and trust towards electric aircraft and urges aviation

stakeholders to increase customer knowledge of electric aircraft (e.g. characteristics and technology) and traveling on them (e.g. product and service attributes for passengers). In other words, customers need to be reassured that the probability of electric operations leading to physical, functional, psychological or financial risks is very low, thus enhancing a chance that they form a favourable attitude and higher level of trust towards electric aviation. As the customers taking part in the study had received information on electric aviation primarily from the internet but also from broadcast news, print media, electric word of mouth (e.g. blogs, social media posts, online reviews), and traditional word of mouth (e.g. friends, co-workers), these aforementioned channels are suggested to be used to increase the much-needed customer knowledge on electric aviation. (Han & al. 2019, 40-41.)

So, although electric aircraft arguably offer a range of benefits for the passengers, these benefits are not necessarily obvious for them. Therefore, airline stakeholders need to ensure that the previously discussed software component of electric aircraft, that is the information basis, is available for the potential adopters and their perceived risks are reduced to enable and speed up the diffusion process of electric aircraft.

5.6 Summary of the theoretical framework

In summary of the previous chapters, the introduction of electric aircraft to the public should be scrutinized from a customer perspective because sustainability in itself does not necessarily create value for customers. As new technologies, such as electric aircraft, are often considered inferior to incumbent technology in customers' minds, the tactics for crafting compelling value propositions for disruptive technologies introduced in chapter 5.1.1 (compensating, enhancing, and coupling) can prove useful for airline stakeholders as the function of these tactics is to make the new technology a reasonable – and even desirable – choice in comparison to incumbent technology.

As discussed in chapter 5.1.2, value propositions should be crafted based on researched customer jobs, pains, and gains. However, it is worthwhile to remember the fact that people make consumption decisions based not only on getting the more concrete functional jobs done in their lives but also based on fulfilling the more inconspicuous social and personal/emotional needs they have. Therefore, companies could benefit from crafting outcome-driven customer journeys introduced in chapter 5.2.2 that focus on customer perspective and seek to understand the exact role company's service has in a customer's life.

As mentioned in chapter 5.2.2, social influence and constantly evolving social norms have a growing importance in customers' decision-making process, a good example being flight shame discussed in chapter 5.3, which has gained momentum as a phenomenon in recent years and has created social pressure to reduce flying. Due to the emergence of the flight shame phenomenon, the environmental discussion on aviation's contribution to climate change has gradually shifted from a production-focused perspective into a consumption-focused one especially in the Nordics.

Roger's (2003) diffusion of innovations theory introduced in chapter 5.4 sums up the adaptation process to new technologies by pointing out that the new technology's rate of adaption depends not only on the characteristics of innovation but also on an individual's innovativeness. The 5 introduced adopter categories (innovators, early adopters, early majority, late majority, and laggards) adapt to innovations at a different pace and differ in characteristics such as socioeconomic status, communication behaviour, and personality.

What it comes to characteristics of an innovation, the rate of adaptation depends on product/service variables such as relative advantage, compatibility, perceived complexity, trialability, and observability. All in all, an individual's or larger decision-making unit's innovation-decision process is all about seeking information to reduce uncertainty about the expected consequences of the innovation.

As pointed out in chapter 5.5, it is important to reduce customers' perceived risks and to increase their product knowledge to enhance trust and positive attitudes towards electric aircraft: according to the study by Han & al. (2019) customers worry most that electric aircraft pose a potential threat to their physical health and well-being (physical risk) and do not perform up to their expectations (performance/functional risk). To increase product knowledge, the aforementioned study highlights the importance of increasing customer knowledge on the characteristics and technology of electric aircraft, as well as on product and service attributes of electric operations.

6 Methodology

In this chapter, the different research methodologies are first introduced, and reasons for choosing a qualitative approach are addressed. Then chosen research design and data collection method, exploratory single case study and semi-structured interview, are reasoned.

6.1 Research approach: Qualitative

According to Creswell & Creswell (2018, 250), a research approach means the plan and the procedures for research, including decisions from broad philosophical assumptions to detailed data collection methods and data analysis.

There are three distinct research approaches: quantitative, qualitative, and mixed methods. Quantitative research tests objective theories by examining the relationship among certain variables: these variables are measured to produce numerical data, which is analysed using statistical procedures. Methods used in quantitative research include for example surveys and experiments. (Creswell & Creswell 2018, 3-4, 147.)

According to Creswell & Creswell (2018, 4), qualitative research explores the meaning individuals or groups give to a social or human problem: Its research process involves collecting data in the participants' setting, inductive data analysing, building from specifics into general themes, and interpreting the meaning of the data.

Hennink, Hutter & Bailey (2020, 10) point out that qualitative research is a broad term covering a variety of philosophies and techniques and is therefore hard to define. However, according to Stake (1995, 47), Yin (2016, 9), and Hennink & al. (2020,10), the common features of qualitative research include:

- It is holistic, empirical, interpretative, and empathic in nature
- Issues are identified from the views and perspectives of the study participants
- People are studied in their natural settings and real-world roles
- Real-world contextual conditions, as well as influences on the research issues, are acknowledged
- Insights from existing or new concepts are contributed to help explain social behaviour and thinking

Mixed methods research combines quantitative and qualitative research, and involves collecting and integrating the two forms of data with the assumption that the combination of these two yields additional insight for the study in question (Creswell & Creswell 2018, 4, 249). In other words, to be called mixed methods research the study must keep its

consistency as a single study by addressing such research questions that purposively require qualitative and quantitative evidence and methods that complement one another (Yin 2016, 306).

Qualitative research was chosen as the most appropriate research approach to study passenger attitudes towards electric aviation because it is a useful approach for exploring new and complex topics such as electric aviation, and to explain people's opinions, beliefs and interpretations given to a particular object, event, or behaviour. In other words, the focus of a qualitative study, such as this particular one on electric aviation, is on learning the meaning that the study participants give to an issue rather than on the meaning that the researcher brings to the study. (Hennink & al. 2020, 11; Creswell & Creswell 2018, 182).

As discussed in the theoretical framework of this thesis, electric aviation is not only about introducing the public to new aircraft technology and new operational aspects affecting their customer journey, but It also involves convoluted social and normative issues that can be approached only with qualitative research methods that allow understanding people's views by providing "depth, detail, nuance and context" to the research conducted (Hennink & al. 2020, 11).

Qualitative research can be conducted using different research designs and the choice of using a case study is discussed in the following chapter.

6.2 Research design: Single case study

According to Creswell & Creswell (2018, 11), research design refers to a type of inquiry within quantitative, qualitative, and mixed methods approaches that gives a specific direction for the study procedures. It is a logical blueprint involving links between the research questions, the data to be collected as well as the data analysing strategies, ensuring that the study findings address the intended research questions. Qualitative research designs include for example ethnographies, grounded theory, and case studies. (Creswell & Creswell 2018, 13-14; Yin 2016, 83.)

This particular study is an exploratory single case study. Yin (2014, 237) describes a case study as an in-depth study investigating a contemporary phenomenon in its real-world context. According to Stake's (1995) definition, it is "the study of the particularity and complexity of a single case, coming to understand its activity within important circumstances", highlighting the bounded, yet complex nature of case studies as well as

the acknowledgment of the contextual influences. This particular case study investigates prevailing passenger attitudes towards a novel aircraft technology in electric airplanes.

Exploratory in this context means that the purpose of the case study is to identify the procedures or the research questions to be used in a subsequent research study – whether the subsequent study is a case study or not (Yin 2014, 238). This particular case study enables further research on what would be feasible business models for aviation stakeholders and desirable service concepts for the passengers in the context of electric aviation and is therefore exploratory.

Yin (2014,15, 31, 240) defines a single case study as a study concentrating on a single case, referring to the main subject of study which is usually a concrete entity such as a person, small group, organization, community, or program. Stake (1995, 2) adds to the definition that the case is “a specific, a complex, functioning thing”, describing it as a bounded and integrated system as well as an object rather than a process. In this particular study, the case is limited to the residents of Finland as one of the objects of the study is to encourage further research on possible business models and service concepts for electric aviation within Finland.

Yin (2014, 2, 10) argues that case study is the most appropriate choice of a method when the main research questions are “why” and “how” questions, or exploratory type of “what” questions, such as the research questions of this particular study (see chapter 2.1), that seek to explain some present situation. Yin (2014, 12) adds that a case study is also a preferred choice when the study deals with the type of contemporary events that cannot be manipulated, which is what this study aims to do: To find out about Finnish residents’ genuine attitudes, opinions, and needs towards electric aviation.

6.3 Data collection method: Semi-structured interview

Qualitative research uses data collection methods such as interviews, focus group discussions, content analysis, observation, visual methods as well as biographies and life histories to examine people’s experiences in depth (Hennink & al. 2020, 10).

A semi-structured interview was selected as the most appropriate data collection method because an interview is a useful data collection method when the purpose is to identify people’s perceptions and beliefs or meanings that people attach to certain experiences. Interviewing involves acquiring verbal information from the study participant, it is conversational in nature and guided by the mental agenda of the researcher. (Hennink & al. 2020,117; Yin 2014, 239).

Interviews come in many forms, but all of them fall more or less in-between the following continuum: On one end of the continuum, interviews script the interaction between an interviewer and an interviewee in detail, both in terms of a formal questionnaire listing every question to be asked, and a scripted role and behaviour of the interviewer that is uniform in all interview encounters. On the other end of the continuum, interviews resemble guided conversations rather than structured inquiries: There is neither scripted interaction between an interviewer and an interviewee nor does the interviewer adopt a scripted role and behaviour for the interviews to be conducted. (Yin 2016, 140-142; Yin 2014, 110.)

Case study interviews, such as the one in this study, are the kind of interviews where an interviewer and an interviewee usually conversationally discuss a specific topic, allowing the researcher to gain detailed insight into the research issues from the study participants' perspectives. The interview has a clear purpose and is guided by a semi-structured interview guide that prompts the data collection. Asked questions are open-ended ones, meaning questions that are formed to allow interviewees to answer based on their own experience, feelings, and knowledge, rather than in an attempt to lead them to answer in any particular way. (Hennink & al. 2020, 116-117, 329.)

As electric airplanes involve new aircraft technology as well as new operational aspects that many people have none or very little knowledge of, the conversational manner and the possibility to use topical probes, meaning written reminders on the interview guide to ask on a particular topic to get more detailed information on the question (Hennink & al. 2020, 331), was considered to make the semi-structured interview the most relevant option for understanding passenger attitudes towards electric aviation.

6.4 Validity and reliability of the study

According to Yin (2014, 45-46), the following tests are relevant in judging the quality of an exploratory case study such as this particular study:

- External validity
- Construct validity
- Reliability

External validity refers to the extent to which the case study findings are analytically generalizable to other situations outside the original study, which can be accomplished by basing the study findings on relevant theoretical concepts or principles (Yin 2014, 237-238).

Construct validity means the accuracy with which the measures of a case study reflect the concepts that are being studied. Construct validity can be ensured for example by using multiple sources of evidence and by establishing a chain of evidence. (Yin 2014, 45, 238.) Using multiple sources of evidence refers to deliberately collecting different kinds of evidence that converge on the same findings (Yin 2016, 337). To strengthen the reliability of the information in a case study, a chain of evidence should also be maintained. This can be accomplished by showing how the findings derive from the original research questions and the collected data, in a way that an individual case study reader can trace the steps either from research questions to conclusions or vice versa. (Yin 2014, 127, 237.)

Reliability means demonstrating that the study procedures are consistent and repeatable with the same results, with the goal of minimizing errors and biases in the study. In other words, the aim is to ensure that if another researcher follows the same procedures and conducts the same study again, he will make the same findings and conclusions. This can be accomplished by documenting the procedures used in the earlier study for example by creating a database inclusive of all relevant data for possible later retrieval of evidence. (Yin 2014, 45-46, 48-49, 238, 240.)

To enhance the validity and reliability of this study following measures were taken in different phases of the study implementation:

- Interview questionnaires (Appendices 1 and 2) were designed keeping in mind the so-called mental line of inquiry, meaning that the interview questions were grouped based on the concepts introduced in the theoretical framework, which then guided the interviewer's thinking in executing the verbal line of inquiry, in reference to the actual words the interviewer uses to ask the questions from the interviewees (Yin 2014, 239, 241). It was reasoned that this way the study findings could be more logically based on the concepts of the theoretical framework on the final report.
- The interview questionnaire was evaluated by a person specialized in qualitative research methods as well as pretested to make sure that the questions are understandable and make sense to the study participants.
- Probes and proactive asking for clarifications were used according to the interviewer's best capabilities during the interviews to make sure that issues were understood as intended by the interviewees.
- Although a novice interviewer, the interviewer attempted to pay attention to minimizing reflexivity, meaning the interplay between the interviewer and the interviewee whereby both parties are influenced by each other's presence and actions. During the research process, the interviewer also made a conscious effort to acknowledge the so-called researcher's lens through which a researcher implicitly interprets events, meaning one's personal traits and roles that might affect the study and its outcomes. (Yin 2016, 45, 339.)
- Study participants were asked for feedback on the understandability and flow of the interview questions after their interviews so that adjustments could have been made if needed.

- Interview recordings and transcriptions were gathered to a single database, from where they are easily retrievable for possible re-evaluation.
- Study participants' verbatim quotes are used in the thesis report to show that the interpretations made by the researcher can be connected to what the interviewees actually said.

7 Data collection and data analysis

In this chapter decisions regarding interview design, implementation, and analysis as well as sampling criteria are discussed, and the demographics of the study participants are presented.

7.1 Data collection instrument design

An interview guide is a list of questions used by the interviewer as a memory aid. It can be more or less structured depending on the research questions, used fieldwork approach, and the purpose of the research. In an exploratory study such as this particular study, the guide is usually semi-structured. (Hennink & al. 2020, 118-119.)

As illustrated in Figure 10, a typical interview guide consists of an introduction, opening questions, key questions, and closing questions, which each have a distinct function and purpose (Hennink & al. 2020, 119).

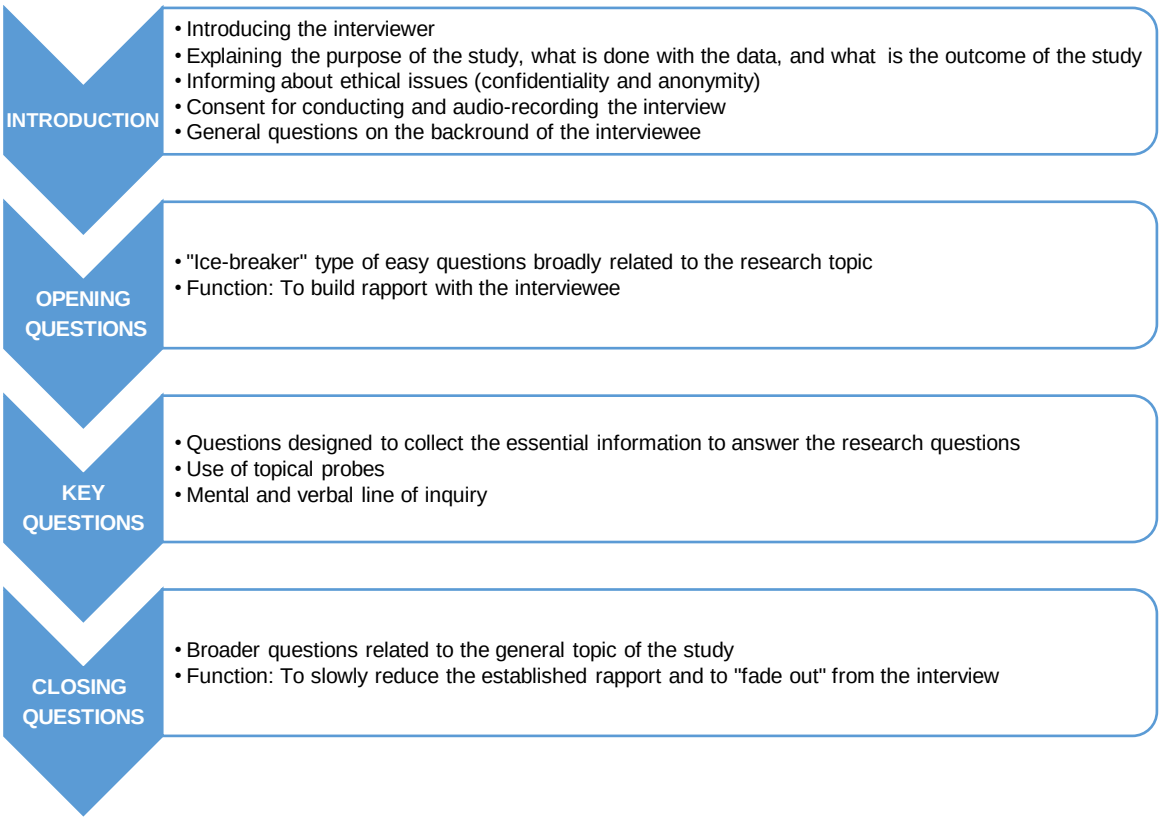

Figure 10. Structure of a typical interview guide (Hennink & al. 2020; Creswell & Creswell 2018; Yin 2014)

The interview guides in English and Finnish for this particular study (Appendix 1 and Appendix 2) were designed according to the aforementioned structural guidelines, which are discussed in more detail in the following paragraphs.

An introduction includes reminders for the interviewer to tell certain things at the beginning of the interview: The interviewer introduces himself, explains the purpose of the study, what is done with the collected data as well as outlines the outcome of the study whether it is a report, an article or a thesis. The interviewee is also informed about ethical aspects such as confidentiality and anonymity issues. Following the introduction, the interview guide usually includes some general, easy-to-answer background questions such as questions on the age and the educational background of the interviewee. (Hennink & al. 2020, 119.)

In addition to the aforementioned issues, the introduction of this particular interview guide includes the notion that the interviewees do not need to possess any prior knowledge of electric aircraft. The questions on the interview guide are designed so that the interviewees are provided with the necessary information to answer the questions within the question itself. For instance, when asking about interviewees' opinions on how they feel about being able to have only light baggage with them when traveling on electric aircraft, they are also informed about the fact that electric aircraft will have limited space for baggage within the question itself.

Opening questions are ice-breaker types of questions that have the function of building rapport and making the interviewee feel at ease in the interview setting. These are usually questions that are broadly related to the research topic. (Creswell & Creswell 2018, 191; Hennink & al. 2020, 119.) For instance, in this particular interview guide opening questions address the interviewees' air travel habits and frequency.

The key questions are the ones that Stake (1995, 65) refers to as "issue-oriented questions". These questions are the ones that are designed to collect the essential information to answer the research questions. In this phase interviewer usually uses probes, discussed in chapter 6.3, to get more detailed information as well as to understand the issues from the interviewee's perspective. (Hennink & al. 2020, 120.)

When asking the key questions, the interviewer needs to operate on two levels: Firstly, he follows his mental line of inquiry, meaning the research questions and topics that guide the researcher's thinking while doing the interview. Secondly, he asks the actual conversational questions in a friendly and non-threatening way: This is called a verbal line of inquiry, meaning the actual choice of words in the interview situation. (Yin 2014, 110,

239, 241.) The key questions of this particular interview guide were themed according to the topics of the theoretical framework to make the flow of the interview logical as well as to make sure that the interview questions cover the main topics introduced in the theoretical framework.

Finally, the closing questions are broader general questions usually related to the general topic of the research and have a function of slowly reducing the established rapport and "fading out" from the interview (Hennink & al. 2020, 120). In this particular interview guide, the closing questions addressed the interviewee's overall feelings and thoughts about electric aviation after the interview.

The interview guide was carefully scrutinized before the actual interviews were conducted. First, the interview questions were evaluated by a person specialized in qualitative research, and modifications were made according to his suggestions. Then the interview guide was tested with the target group representative both in terms of the understandability of the questions as well as the length and the flow of the interview. Approximately a third of the original questions were left out or modified to make the interview reasonable in length and more understandable for the interviewees.

7.2 Sampling criteria

In this study, purposive sampling was used to select the study participants. Purposive sampling is non-probability sampling specifically used in qualitative research and involves knowingly selecting participants with certain characteristics to provide data richness as well as sample diversity. (Hennink & al. 2020, 330).

Study participants were limited to the residents of Finland, meaning both the citizens of Finland as well as people permanently living in Finland whether they have citizenship or not. The selection criteria also included participants having to be fluent English and/or Finnish speakers as the interviews were conducted in these languages.

Study participants were also selected purposefully among people that have experience of regional travel by airplane and/or other means of transportation. Since the study aims to find out about passenger attitudes towards electric aircraft in the context of regional travel it was reasoned that participants having regional travel experience would bring additional insights into the discussed research issues.

In the participant selection process attention was also paid to gender and age balance as well as the city of residence, in order to have a versatile group of people living in different parts of Finland.

People working within the aviation industry were excluded from the sample to avoid biased results. This decision was made because it was anticipated that aviation industry professionals, due to their professional background as well as due to being more familiar with the latest developments within the aviation industry, might have overly favourable attitudes towards electric aviation compared to the attitudes of the average residents.

Sampling decisions were also considered from the viewpoint of the sample size. The number of study participants was considered to be adequate only after reaching the saturation point, in reference to the point in data collection when the data begin to repeat and provide neither new issues nor add understanding of the already emerged issues, thus making further data collection unnecessary (Hennink & al. 2020, 108, 330).

7.3 Demographics of the study participants

As shown in Table 1, altogether 11 people with varying demographic backgrounds were interviewed.

Table 1. Background information of the study participants

Date and interview implementation mode	Gender	Age	Educational background and Profession	Place of Residence	Nationality
28.9.2021 Video-meeting	Male	55	Datanome (Vocational Degree in Data Processing) Service Manager	Kokkola	Finland
29.9.2021 Video-meeting	Male	54	Master of Science Consultant & Entrepreneur	Lieksa, Koli	Finland
1.10.2021 Video-meeting	Male	44	Master of Arts Lighting Designer, Visual Artist	Rovaniemi	Finland
5.10.2021 Face-to-face	Female	40	BBA, International Business Office Worker	Porvoo	Finland

8.10.2021 Video-meeting	Male	42	Programming Studies Software Engineer	Espoo	USA Resident of Finland
8.10.2021 Video-meeting	Male	33	MBA, Marketing & Business Administration Executive Position, Banking	Helsinki	Finland
12.10.2021 Video-meeting	Female	29	Bachelor's Degree, University of Applied Sciences Dental Hygienist	Joensuu	Finland
13.10.2021 Video-meeting	Female	24	Student of Social Sciences, University Intern at Defence Forces	Helsinki	Finland
14.10.2021 Video-meeting	Female	23	Student, Medical School	Helsinki	Finland
25.10.2021 Video-meeting	Female	24	BBA Student, University of Applied Sciences Café Worker	Kurikka	Finland
26.10.2021 Video-meeting	Female	42	Master of Science University Lecturer and Academic Coordinator	Helsinki	Finland

The number of interviewees was deemed adequate already after the 8th interview when the saturation point, discussed in chapter 7.2 on sampling criteria, was reached. In other words, from the 8th interview onwards the interviews did not provide any new information or add any new understanding to the already emerged issues. Nevertheless, all agreed interviews were conducted after reaching the saturation point.

To enable sample diversity and data richness study participants were carefully selected by using purposive sampling discussed in chapter 7.2 on sampling criteria. Both genders are more or less equally represented, 55% being females and 45% males. What it comes to the geographical diversity of the sample, 45% of the interviewees are from the Helsinki metropolitan area and 55 % from other parts of Finland. As shown in Figure 11, having participants from different age groups was also considered and therefore the interviewees range from the age of 23 to the age of 55.

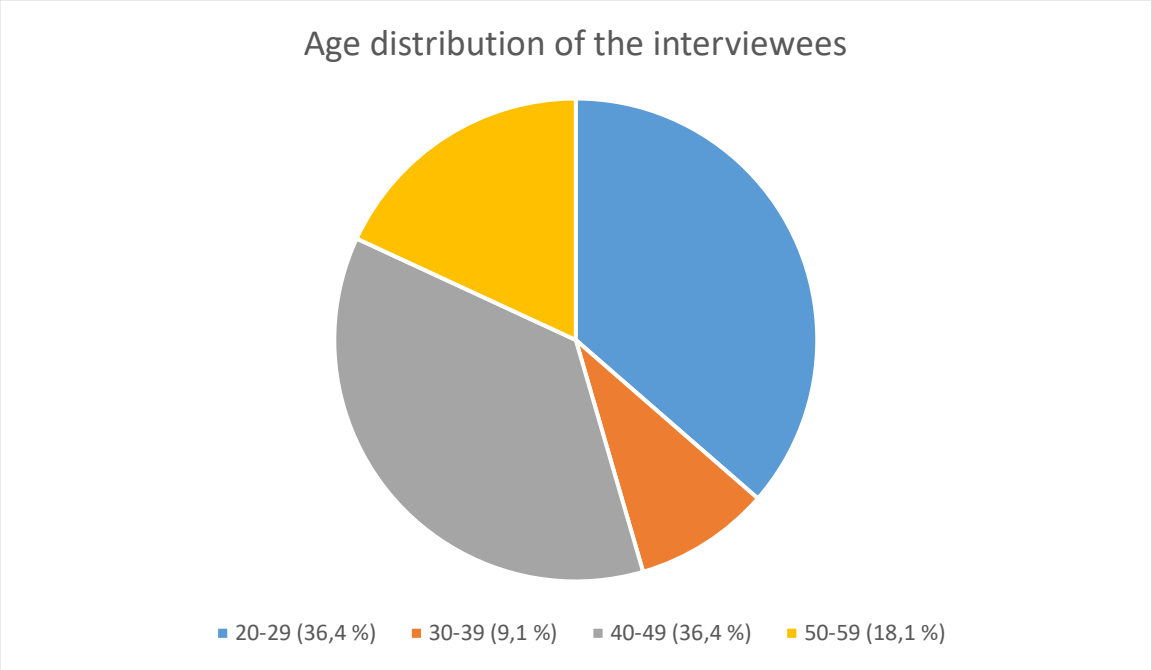

Figure 11. Age distribution of the interviewees

As previously explained, one criterion for being selected to take part in the study was that one needs to have at least some experience of regional travel by airplane and/or by other transportation modes. The majority of the selected study participants, that is 8 out of 11, are people who travel regularly (weekly, monthly, several times a year) on regional flight routes either on business or leisure. The rest of the study participants are people who fly on a more irregular basis (a few times a year, less than once a year), but have nevertheless regional travel experience by other transportation modes.

7.4 Interview implementation

Data collection was conducted within one month in September-October 2021. Study participants were interviewed either via video-meeting (10) or face-to-face (1), whichever was more convenient for the person being interviewed. Interviews were recorded for transcription purposes. All except one of the interviews were done in Finnish because it was reasoned that being able to speak one's native language would provide more depth and nuance to the answers when the topic in itself was assumed to be quite unfamiliar to the respondents. For the same reason, one interview was done in English as it was the interviewee's native language. Interviews lasted on average 20 minutes.

Ethical issues were considered from the viewpoints of anonymity and confidentiality. Anonymity refers to the act of ensuring that an individual study participant cannot be identified from the interview transcript or any quotations based on it. Confidentiality, however, is a more problematic concept in qualitative research, as it refers to not disclosing information exchanged between the interviewer and the interviewee. Yet in qualitative research, such as this study, it is challenging to ensure complete confidentiality, because the researcher often reports the study findings by using participants' own words in a form of quotations. (Hennink & al. 2020, 79.)

To protect their rights, study participants were informed about the confidentiality and anonymity issues as well as the nature of the study before the interviews via email. They were explained how and by whom the information they provide will be used, and they were reassured that their anonymity will be protected. Study participants' consent for recording the interview was also confirmed before starting the actual interviews.

7.5 Data analysis

According to Yin (2014, 132) analysing case study evidence is challenging because the techniques for doing the analysis are not well defined: Therefore, to get started with the analysis Yin suggests that one should "play" with the data and look for promising insights, concepts, and patterns to define one's priorities for what to analyse.

Data analysis of this particular study was initiated by watching and listening through all the interview recordings. Attention was paid not only to verbal communication but also to the non-verbal communication (body language, facial expressions, reactions) of the study participants because it was considered to be essential additional information in helping to interpret the acquired data correctly. The interviews were transcribed and notions on non-verbal communication were added to the transcripts. Then the interview transcripts were read several times and codes were developed based on the emergent topics and issues present in the data (Hennink & al. 2020, 218). Each transcript was coded inductively simply by highlighting the text with different colours representing the emergent issues as it was deemed unnecessary to have any additional steps in the process or to use any software programs as assistance due to the relatively small amount of data to be analysed. Then the data were categorized, meaning that individual codes with similar attributes were grouped together into a category that represents a broader topical concept. Finally, the data was conceptualized, meaning that relationships between

different categories were considered in an attempt to develop a broader understanding of the studied phenomenon. (Hennink & al. 2020, 247.)

7.6 Limitations of the research

What it comes to the limitations of this study, a multiple case study, meaning a case study organized around two or more cases (Yin 2014, 239), would undoubtedly have provided a more valid case than concentrating on a single case of Finnish residents, but due to limited resources as well as time constraints, it was decided that the study is limited to a single case.

Also, as the author of this thesis is a novice in doing both case studies and interviews, it must be admitted that a more experienced researcher may have been able to get more out of the interviewees by more informed questions and more advanced probing techniques, and therefore the quality and depth of the data provided by the interviews may have been affected.

The majority of the interviews were done via video connection, which at least on a few occasions complicated the interaction between the interviewer and the interviewee due to technical challenges with voice or picture. Also, video-enabled interviews clearly made reading the interviewees' non-verbal communication more challenging compared to if the interviews were done face-to-face.

Finally, as 10 out of 11 interviews were done in Finnish, the quotes used in this thesis had to be translated: Since the author is a not professional translator, the quality of the translations may have been affected. However, special consideration was given to making the translations as precise as possible.

8 Outcomes

This thesis aimed to find out what are the motivational and demotivational factors for Finnish residents to choose electric aviation over aviation powered by fossil fuels, as well as to find out what is Finnish residents' readiness to adapt to the anticipated changes that electric aviation will bring on their customer journey.

The emergent issues are discussed in the following subchapters.

8.1 General attitudes towards electric aviation: From innovators to laggards

In reference to Rogers's (2003) diffusion of innovations theory presented in chapter 5.4, the study participants were asked how would they feel about being among the first ones to fly on electric airplanes. The answers ranged from "Absolutely, I would definitely go, no problem!" to "Definitely not among the first ones. Period." Based on the study participants' reactions it can be anticipated that among the sample there are people that will fall into all Rogers's adopter categories: Innovators, early adopters, early majority, late majority, and laggards.

Whereas those having more favourable attitudes towards electric aviation had confidence in the aviation industry's capability to ensure that nothing unsafe enters passenger traffic, those being more sceptical admitted that although they are aware of the strict safety standards regulating the aviation industry, they still have doubts about the technical aptitude of electric airplanes.

Typical comments included:

> My first reaction would probably be "Oh, how interesting!" and I would be really excited, but then the next day I would probably start thinking that "what have I said yes to again?" (laughs). I would start hesitating: first being excited and then thinking too much. I would still probably go among the first ones.
>
> - Female, 42

> I would certainly think about the battery durability and things such as lightning and the impacts that the climate brings along. It's quite cold up there and if I think about the impressions that I have about current batteries, how they function when you bring the climate factor along (…) I definitely know that everything is carefully thought over before the passengers are let in, but still…
>
> - Female, 40

> I greatly trust in science and research, that they (electric airplanes) stay in the sky and have enough range. I have always been the kind of (person), how would I say, who doesn't think too much beforehand about possible faults, dangers, and things like that. I trust that they (electric airplanes) function and that it is safe traveling.
>
> - Male, 55

As Rogers (2003) points out people adapt to innovations at a different pace and even though the electric engine is not a new innovation in itself, especially those study participants who were more sceptical of electric aircraft confirmed Rogers's notion that innovation does not need to be objectively new, but the newness of innovation is defined by people's perceptions of that newness and affects their adaptation decisions accordingly.

8.2 Need to learn more especially on technology and safety aspects

Knowledge of electric aviation turned out to be surprisingly limited: 5 out of 11 study participants were unaware of the existence of electric aviation initiatives prior to being invited to participate in the interview.

Typical comments included:

> "I actually didn't think they (electric airplanes) would ever be a thing considering how limited electric cars are with their range."
>
> - Male, 42

> “Well, it hadn’t really crossed my mind that airplanes would function with electricity because I’ve always been told that they function with fuel… So yes, this was a totally new thing for me.”
>
> - Female, 23 years

The rest of the study participants could be divided into those who are technically oriented people having “an engineer mindset” (3) as described by one of the interviewees, and those who have come upon information on electric aviation more or less randomly (3).

Except for the technically oriented study participants who had purposefully sought for information on electric aviation, interviewees had learned about electric aviation randomly from their peers, media (printed media, internet, television), and specific marketing materials such as an article in an inflight magazine during their air travel.

When asked what would the study participants possibly like to know about electric aviation, especially two issues emerged: 9 out of 11 were interested in learning more about the technological and safety aspects of electric airplanes. In addition to the aforementioned issues, participants mentioned the interest to learn more about environmental impact as well as practical issues related to flying with electric airplanes.

Typical comments included:

> I would like to find out about everything because it’s a new thing for me. I would think that safety would be the biggest issue, that you could be sure that you have the courage to board the plane. That you could convince yourself to go.
>
> - Female 40, flies approx. every second year on leisure

> (I would like to know) how many people it (electric airplane) accommodates and how it delimits the traveling, what kind of distances you can fly with it and how long the flight will take. Is it like much slower than the normal plane and such things… Sure enough, I’m also interested in the environmental aspects, whether you can cut your emissions by favouring electric aviation, and such things.
>
> - Female 24 years, flies approx. twice a month on leisure

> Well, I'm interested in everything, both in the technology itself and what are the environmental aspects, how has the electricity used in the plane been produced and why not also what is special about the safety in it.
>
> - Male 54, flies approx. twice a month on business

The aforementioned need to learn more about the technological and safety aspects of electric airplanes goes hand in hand with Han & al.'s (2019) findings presented in chapter 5.5. on passengers' perceived risk and product knowledge, as according to their study physical and functional/performance risks proved to be the strongest factors affecting customer willingness to use electric airplanes in the future. In other words, the majority of the study participants, despite their stance or the level of trust in electric airplanes, clearly wanted to be reassured that electric airplanes perform and function up to their expectations and do not pose threat to their health or well-being.

The participants of this particular study also verified Han & al.'s (2019) finding that easy access to the so-called "software aspect" of innovation, meaning reliable information on the innovation, is important in motivating passengers to choose electric aircraft as their travel mode in the future. The participants of this particular study preferred to learn about electric aviation mainly from the internet and social media channels as well as via targeted information and marketing materials provided by the airlines.

8.3 Pricing, practicality, and convenience of travel over environmental benefits

As pointed out by Khan and Bohnsack (2020) in chapter 5.1.1 on sustainable and user-driven value proposition design, the participants of this particular study verified the finding that even though the assumption often is that sustainable innovations such as electric aircraft automatically create customer value, customers often fail to appreciate this.

Although 8 out of 11 study participants insisted on their willingness to make compromises on travel convenience to fly in a more environmentally friendly way, the clear message conveyed by their answers was that the practicality and convenience of travel nevertheless win over the environmental benefits. This was the case especially among those who fly regularly on business as they all seemed to see flying as something they are "forced" to do, not something they look forward to doing.

Typical comments included:

> I'm not a propulsion racist, I'm just a convenience and effectiveness-driven passenger. In other words, I'm totally indifferent to, well the environment and things like that interest me to some extent, but not at the expense of my own convenience so-to-say.
>
> - Male, 33, flies approx. twice a month on business

> Well, I'm ready to make compromises, ideologically ready that is. But in the practical sense, if I think for instance a year or two years back in time when I travelled a lot, then you definitely tried to optimize the length of the trip to the minimum… The ecological aspects have a great weight for me, in other words I have an environmental angle to our existence, but if it (electric aviation) is more expensive or takes more time, then it becomes tricky.
>
> - Male, 44, flies approx. forty times per year on business

Pricing and reasonable travel time were something that came up in 10 out of 11 interviews and these two factors were considered as important trade-offs in deciding whether to choose electric aircraft as a travel mode.

Study participants commented:

> Usually, my choice of travel mode depends on distance and the cost… If it was a longer distance I'm more inclined to accept a greater cost if it would be less time involved. But if it's, say for example a 2-3-hour equivalent train ride versus like a 30-minute plane ride, I'm going to choose the cheaper of the two options.
>
> - Male, 42, flies 2-3 times a year on business or leisure

> I would think that from the customer point-of-view it's pretty much the same what kind of plane you take, the main thing is that you get from point A to point B in a certain time frame and with a certain price, those are the parameters that matter.
>
> - Male, 33, flies approx. twice a month on business

As previously mentioned environmental benefits had surprisingly light weight among the study participants' motivations to choose electric airplanes as their travel mode. The majority of the study participants seemed to see electric aviation as just another transportation mode among others, with practical issues and smoothness of travel winning over environmental aspects.

However, it could be seen that especially the younger generation has increased concerns about the environment and therefore see electric airplanes as one potential way of reducing their environmental footprint in the future.

Typical comments included:

> These days environmental issues are a hot topic and in that sense it would be interesting to know whether electric flying is environmentally friendlier (than flying with conventional airplanes). I think that many people would be interested in that. I know that quite many of my friends try to avoid flying because it generates so much environmental harm.
>
> - Female, 23

> I look forward to the day it (electric aviation) becomes more common. I don't know if it's young people in general, but personally I've looked into environmental issues quite a lot because of my work. Soon you notice that the more you read about it, the more anxious you become, and then you start thinking if there's anything to be done anymore, if it's just pointless (…) In my opinion a change like this, that electric aviation would become common and it would be brought to people's everyday lives, that not only well-off people could travel ecologically but that it would be possible for everyone, and that it would become a mainstream way of traveling, that would be a great change in the future.
>
> - Female, 24

Younger study participants' answers revealed that they seem to see aviation's contribution to climate change, as discussed in chapter 5.3 on environmental awareness and flight shame, increasingly from a consumption-based angle rather than solely from a production-based one: They contemplate what is justifiable and normal to consume, yet the previously discussed matters such as convenience and practicality of travel tend to nevertheless win over the possibility to reduce their environmental footprint.

It can be concluded, based on Khan and Bohnsack's (2020) study findings presented in chapter 5.1.1, that since electric aviation is creating a totally new market within the aviation industry and disruptive technologies are often considered inferior in people's minds compared to incumbent technologies, value propositions for new market-focused sustainable innovations such as electric airplanes should indeed be based on utilitarian aspects: In this case on the pricing, practicality, and convenience of travel that proved to be the most important variables for the participants of this particular study.

The next subchapter discusses the study participants' attitudes towards the anticipated changes that electric aviation will bring on their customer journey, and deepens the understanding of what exact issues make traveling on electric airplanes a desirable option for the study participants from the viewpoints of practicality and convenience they are looking for.

8.4 Positive attitudes towards changes in the customer journey

As discussed in chapter 4.2, electric aviation will bring changes to the existing customer journeys within the aviation industry. The biggest changes include using smaller rural or urban airports, having to travel light as the first electric airplanes will have limited space for baggage, and more frequent flight schedules enabling increased regional connectivity. In addition to the aforementioned changes, electric airplanes can operate closer to urban areas as well as fly to remote and previously un-accessible places due to their lower noise levels and ability to operate from shorter runways. The ticket prices are also anticipated to be competitive due to factors such as the lower operation and maintenance costs of these aircraft.

8.4.1 Traveling light on short distances considered convenient

When asked about having to travel light and possibly being able to take only hand baggage on a flight, the study participants saw no problem with it when it comes to short business or leisure trips. However, longer trips or trips that require taking for example recreational gear on the flight were seen as more problematic in a practical sense.

Typical comments included:

> In my case it's quite ok. As a matter of fact, if we are going on a 3-day city getaway to Central Europe with my wife, we only have hand baggage anyway, we are used to traveling light. Same with the business trips, it's always been just hand baggage.
>
> -Male, 55

> Well, for business trips it (traveling light) suits me really well, I don't really need any (big) baggage, I only have my backpack and laptop. And if it's a 1-week trip then the backpack is just a bit bigger. Then the leisure trips are quite another story due to my sports repertoire: For instance, if I go to the Alps I have a snowboard or skis, or if I go to Central Europe to paddle I have at least my life vest, helmet, spare-paddle and some camping gear with me.
>
> - Male, 44

> I think a small suitcase (carry-on version) is even handier because I don't like to drag some giant bag in a bus or train at the destination. Besides, you don't have to wait for your suitcase at the airport when you have hand baggage, you can just grab the bag and go when you don't have to wait for suitcases to be offloaded.
>
> - Female, 23

> I guess it depends on the reason for travel and also the length of time. If I think short-term regional leisure for maybe a couple of weeks, I think that's perfectly doable with just hand baggage (…) For me personally I would think that environmental benefits are better than my own personal clothing and stuff like that, you know. I only have this one rock to live on for so much longer, and if we're not doing our part there won't be anywhere to travel to.
>
> - Male, 42

8.4.2 Smaller regional airports welcomed for smoother airport experience

The study participants saw traveling from smaller rural or urban airports as a positive thing as long as those are easily accessible. They were happy to compromise for instance on the number of services for the sake of a less congested airport environment and smoother departure and arrival procedures.

Typical comments included:

> I don't mind (using smaller regional airports), because I don't personally use that many services at the airport. I might just buy some coffee or something to eat, so I don't necessarily need that many services when going on a flight. People usually go to the airport so early because they are afraid of the queues and the crowds and how long it will take. But if it's faster (…) if it (airport formalities) goes faster then that's just better for me.
>
> - Female, 23, Helsinki

> I don't really care as long you get conveniently to the airport and the plane. As a commuter, I try to be at the airport about 45 minutes before departure and that's when the boarding usually starts about 15 minutes from my arrival to the airport. That's why it's important that everything goes smoothly in a sense that there aren't any stupid half an hour security check queues or problems with ticketing systems or something like that (…) It's pretty much the same to me if go to Helsinki-Vantaa, Malmi or some sand field in Sipoo, you know, as long as the distance (to the airport) remains more or less the same.
>
> - Male, 33, Helsinki

> I actually see it (using smaller regional airports) as a positive thing. I like even now smaller airports because running your errands there is so much faster compared to really big airports where you might have to change terminals or walk from one end to another and you have to have time for all that… I see it as a positive thing if you could reserve less time for going to the airport and if doing the formalities before the flight would be faster compared to what it is now.
>
> - Female 24, Helsinki

Some study participants also saw societal benefits in having regional airports around the country. They reasoned that regional airports could not only create much-needed new jobs and increased possibilities to work in remote places but these airports were also seen as an attraction for people to move to smaller currently depopulated municipalities.

Typical comments included:

> The flexibility of travel (…) That you don't necessarily need to live in the centre of a big city or near to a big airport (…) Now that physical presence (at work) is required a whole lot less, will it turn out to be so that people live in a middle of nowhere, or you know, all around the country? All this depends much on what kind of transportation modes people are serviced with: if we get smaller planes that can operate efficiently from smaller airports and closer to people then this sounds quite handy to me.
>
> - Male, 54, Koli and Lieksa

> I think it (operations from smaller regional airports) is a good thing because it would most probably provide new jobs for the people living in the area and would also bring added value to the town in question (…) If we take Kurikka as an example, and you know, people would be second-guessing whether to move to Kurikka or Teuva, they would probably end up in Kurikka if it had an airport. So, I see only good things in this.
>
> - Female, 24, Kurikka

> I think it (operations from smaller regional airports) would be fun! I personally like small things (laughs) and I'm all for the smaller regional airports having more use. I think it will only be positive progress if those (smaller airports) were also used for passenger flights.
>
> - Female, 42, Helsinki

8.4.3 Thumbs up for frequent flight schedules

The possibility for more frequent flight schedules, in timeframes compatible with people's timetables, was expectedly appreciated. Electric airplanes were seen as a worthy alternative for trains especially by those living outside the metropolitan area as according to the study participants the current train and flight schedules do not provide any remedy to people's timing-related challenges.

Typical comments included:

> Well, I could easily replace train with this (electric airplane) connection. If I think about my situation the train connection from Joensuu to Helsinki airport takes about 4,5 hours and you have to change the train once in Tikkurila (…) If this would also work with reasonable flight frequencies (with electric airplanes), now that would be tempting.

> And well, the two things that have held me from using the current flight connection from Joensuu, I have used it sometimes but a whole lot less than train or my own car… The other thing is that the schedules have been such that there are flight connections only really early and really late so that you are in Vantaa at 6 am and the return flight to Joensuu leaves at 10.30 pm. And well, that's not very tempting.

> And the other thing is my environmental thinking: it has made a difference to me if I can go with a low-emission train versus a flight with more or less the same service level – then why not take the train. In that sense, electric airplanes could solve both of these feeder traffic barriers for me.
>
> -Male, 54, Koli and Lieksa

> I travel to Southern Finland quite regularly and the current flight connections are a total misfit with my schedules in a sense that you can't even begin to consider that you would fly to the south on Friday and come back on Sunday.
>
> - Female, 29, Joensuu

> Well, my current work travel… I'm actually coming to Vantaa to have this lecture and because of this one lecture, I leave home at 7 am and I'm back home at 11 pm in the evening. The train schedules are pretty limited at the moment, so if it would be possible to choose this kind of travel mode (electric airplane) in either direction, or both, then absolutely… that would work for me.
>
> - Male, 55, Kokkola

The challenge that people living outside Helsinki metropolitan area often face is that direct flight connections especially on the east-west axis as well as for northbound trips are practically non-existent. As one of the interviewees hoped, electric aviation from regional airports between smaller cities could enable increased regional connectivity and provide a convenient exit from the traditional hub and spoke model discussed in chapter 4.2, as it seldom seems to serve the needs of people living outside the metropolitan area.

He commented:

> I was trying to think that what is it that we need more opportunities for and the fact of a matter is that you can't travel by any means across Finland from where we live. It's the same with a train, if we go to Mikkeli or Joensuu it takes a whole day: We have to go either via Helsinki or then go via Oulu or some other place like that. And all in all, if we decide to go up north to someplace without a train connection, then it's just total distress.
>
> - Male, 55, Kokkola

All illustrated by this quote, study participants living outside the metropolitan area saw the biggest potential of electric aviation in making their everyday lives easier by increased transportation options that do not rely on the current operational models within regional aviation. The study participants hoped that the customer voices would be heard and the electric aircraft flight schedules would be based on the actual timing-related needs people have, as the current flight schedules appear to be more or less a misfit to people's everyday life demands.

9 Conclusions

The following chapter first summarizes the main points and discoveries of this study, outlines the significance of the results, and suggests development opportunities. Then, the research limitations and potential for future research are discussed. Finally, evaluation of the thesis process and one's own learning are elaborated on.

9.1 Summary of main discoveries

This thesis aimed to answer the following research questions:

- What motivates and demotivates residents of Finland to choose electric aviation over aviation powered by fossil fuels?
- What is the passenger readiness to adapt to the anticipated changes electric aviation will bring on their customer journey?

As illustrated in Figure 12 below, the themes that emerged repeatedly in the interviews as the motivational factors for the study participants to use electric aviation in the future were competitive pricing and the practicality and convenience of travel. Environmental issues, although appreciated by the study participants, were seen as secondary benefits.

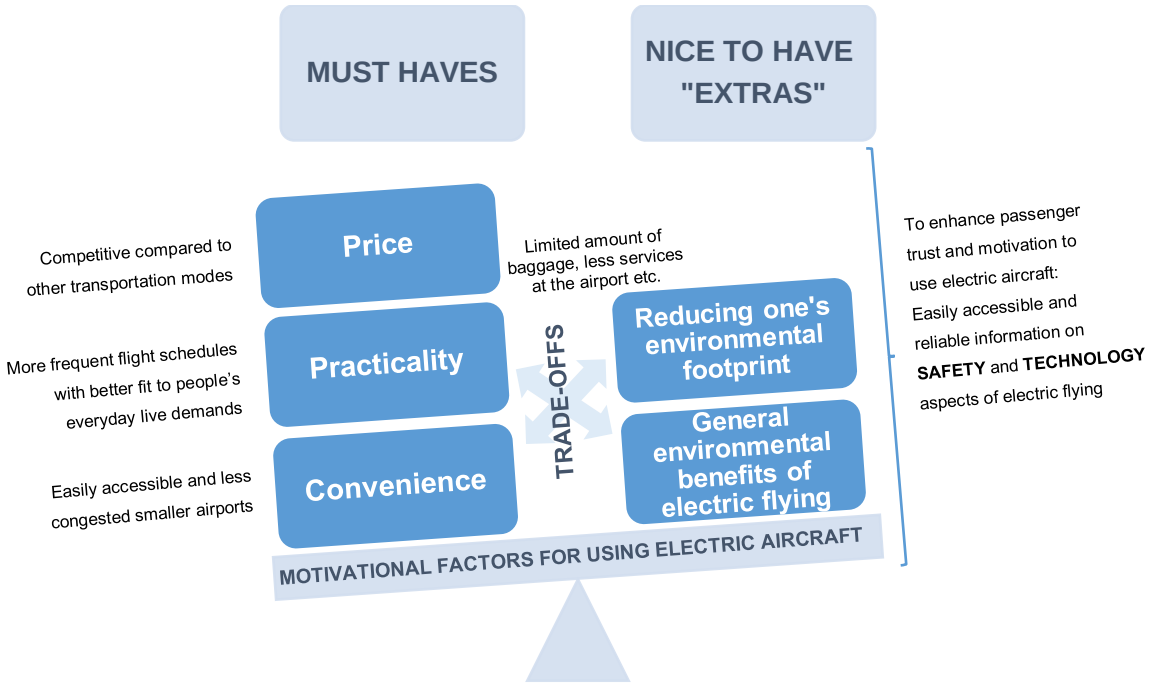

Figure 12. Study participants' motivational considerations for using electric aircraft

In other words, the study participants' answers conveyed a clear message that electric aviation is seen as just another transportation mode among others, despite its' environmental benefits. These environmental benefits were nevertheless recognized and appreciated, but not at the expense of the aforementioned issues. However, it could be seen that especially among the younger generation there is growing concern about environmental issues and electric airplanes were seen as one possible means of making one's environmental footprint smaller.

All in all, the study participants had surprisingly limited prior knowledge of electric aviation as 5 out of 11 participants did not know anything about the subject of the study beforehand. It was clear that whatever the individual's level of knowledge or attitude towards electric aviation, reliable information especially on technological and safety aspects were considered important factors in building study participants' trust and motivation towards this new travel mode.

Study participants had generally positive attitudes towards the anticipated changes on their customer journeys.

Traveling light was not seen as a big problem and most of the study participants were used to traveling with hand baggage only on short distances. Timewise longer trips were naturally seen as more problematic, but most of the study participants were nevertheless ready to make some compromises on the amount of baggage – when possible in a practical sense that is.

The use of smaller regional airports was welcomed by the study participants. They were happy to compromise for instance on the number of services for the sake of a less congested airport environment and smoother departure and arrival procedures, as these issues were seen as challenging in the current airport operations. However, the accessibility of the smaller regional airports has to be made easy and convenient to make the study participants choose electric aviation. Possible societal benefits (e.g. increased job opportunities in small towns and municipalities as well as possibilities to work in and from remote places) were also appreciated among some study participants.

More frequent flight schedules in timeframes suitable to people's everyday lives were welcomed and hoped for, as the current flight schedules often seem to be a misfit to people's timetables. Electric airplanes were also seen as one possible way of enabling better connectivity between smaller towns and cities in an attempt to get away from the traditional hub and spoke model that often does not serve the needs of people living outside the metropolitan area.

9.2 Significance and meaning of the results

As mentioned earlier, to the author's best knowledge this was the first qualitative study on passenger attitudes towards electric aviation in the context of regional travel. Although it is fair enough to say that the research results were more or less predictable, the study nevertheless provided deepened understanding of Finnish residents' attitudes and expectations towards electric aviation.

Since this study is qualitative any statistical generalizations cannot be made. However, as already discussed in the outcomes chapter of this thesis, the study findings proved right several theoretical concepts or prior findings introduced in the theoretical framework, and can therefore be analytically generalized and extended beyond this case.

In the author's opinion, the biggest lesson learned from this study – verified by Khan & Bohnsack's (2020) prior findings showing that although the general assumption is that sustainable innovations automatically create customer value this is often not the case from the customer viewpoint – is that the study participants' answers indicated that sustainable innovations such as electric aircraft cannot rely solely on their sustainability to be considered a desirable option for the passengers.

The study findings strongly suggest that sustainable innovations, or service concepts based on sustainable innovations, should indeed be based on researched customer gains, pains, and jobs discussed on the theoretical framework of this thesis. This is the only way to make electric aviation a desirable option for the passengers, as the participants of this study clearly articulated that they see electric aviation as just another transportation mode among others. By making electric air travel practical and convenient from the customer point-of-view, not forgetting competitive pricing, it can become a worthy travel option in people's minds – especially when it also provides some much-needed ease for people's growing environmental conscience along the way.

9.3 Contributions and suggestions for future study

The contributions of this study are practical: The value of outcomes is in giving a clear direction for the electric aviation stakeholders to plan electric operations based on researched customer gains, pains, and jobs pinpointed by this study.

Although the findings of this study did not provide any groundbreaking new revelations, they gave aviation stakeholders a clear message not to rely extensively on the

environmental benefits of electric airplanes, but to dive deep into what exact issues from the viewpoints of pricing, practicality, and convenience of travel matter to Finnish residents living in different parts of Finland. Viable business models and service concepts for electric aviation demand a sound understanding of these customer needs as sustainable innovations such as electric aircraft, as discussed in the theoretical framework of this thesis, tend to have an inferior position in people's minds compared to incumbent technologies.

What it comes to future studies on the subject, it would be beneficial if a multiple case study was conducted, comparing passenger attitudes towards electric aviation between Finland and other Nordic countries including Sweden, Norway, Denmark, and Iceland. This would provide important information on the possible national differences in passenger attitudes towards electric aviation and thus help aviation stakeholders to consider these differences when planning and implementing electric aviation operations within the Nordics.

Also, future studies could benefit from diving deeper into what are the varying travel-related challenges that people living outside the metropolitan areas have, as electric aviation was specifically welcomed by these people to ease their everyday travel. It is important to understand what kind of scheduling and accessibility-related challenges people living in different locations in Finland face with the current transportation options and to build electric operations based on that existing gap in supply and demand.

So, future studies on electric aviation could benefit from finding answers to the following research questions:

- What are the differences and similarities in passenger attitudes towards electric aviation within Nordic Countries?
- What are the specific travel-related challenges that people living outside metropolitan areas currently have? How could electric aviation operations bridge the existing gap in supply and demand to make traveling easier for these people?

Getting answers to the aforementioned research questions could then enable some future researcher to conduct a practical study on feasible business models and service concepts for electric aviation.

9.4 Self-evaluation of the thesis process and one's own learning

The thesis process was both challenging and rewarding: When first starting to compose the theoretical framework on a supposedly unresearched topic and worrying about where to find interviewees during the ongoing Covid-situation, completing the thesis in a set timeframe seemed like an impossible task.

Luckily the aforementioned worries turned out to be unnecessary along the way: Scientific literature on electric aviation and the topics of the theoretical framework were quite easily found after receiving help from the school library on the searching techniques. Also, finding interviewees was surprisingly easy, although it required some out-of-the-box thinking and turning to several acquaintances to find suitable people. Being able to conduct the interviews via video-meeting helped in tackling scheduling-related challenges because the interviews could be made without having to meet face-to-face with people living in various parts of Finland.

The biggest learning happened during the interviewing process because intensive listening and staying on top of the interview agenda proved to be quite challenging for a novice. As mentioned earlier, the quality of the interviews might have been better if a more experienced interviewer had conducted them. It was occasionally hard for instance to keep the interviewee on the topic or to use successful probing to get the most out of the issues being discussed. However, if comparing the first interviews to the last ones, clear progress could be seen in the author's interviewing techniques, and in that sense she feels confident that many pitfalls can be avoided when possibly doing interviews in the future.

What it comes to timing-related objectives for the thesis, the whole process was planned to take 6 months and that is exactly how long it took, so the timing-related objectives for the thesis were reached.

All in all, the whole thesis process was a valuable learning process not only into electric aviation but also into doing qualitative research.

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Appendices

Appendix 1. Interview guide in English

INTERVIEW GUIDE

INTRODUCTION

This research is part of conducting my master's thesis at Haaga-Helia University of Applied Sciences, where I study aviation and business management. The research is conducted to learn about people's expectations and opinions on regional electric aviation, as electric airplanes are anticipated to start operating on regional flight routes within 5-10 years.

I'm interested in your opinions and views on electric aviation and I will be interviewing several other people on the topic as well. You do not need to have any prior knowledge of electric airplanes – you are simply expected to answer the interview questions according to your best knowledge and as truthfully as possible from a passenger perspective. Everything you tell me is confidential and will be used only for this particular research project. Your name will not be used and I will make sure that no one can identify you from any answers. Having told you all the aforementioned facts on the nature of this research, do you consent to the interview and the audio recording of our conversation? Do you have any questions before we start?

Background information

Name:
Age:
Sex:
Educational background:
Profession:
Place of residence:
Nationality:

OPENING QUESTIONS

1. How often do you travel by airplane?
   Probes: Weekly, monthly, times a year

2. What kind of flights are they usually?
   Probes: Domestic, regional, European, intercontinental / leisure, work

3. Do you have any preferences what it comes to airline company or aircraft type when you book a flight?
   Probes: If yes, what particular preferences, reasons for the preferences

KEY QUESTIONS

Questions on adaptation to new technology, new product knowledge, and perceived risk

1. What do you currently know about electric airplanes, if anything?
   Probes: information source

2. What (else) would you like to know about electric airplanes, if anything?
   Probes: technological aspects, operational aspects, safety aspects, other / information source

3. Electric airplanes are powered by battery-operated electric engines: What are your thoughts, as a passenger, on this technology?
   Probes: Trust/distrust, perceived risk

4. How would you feel about being among the first ones to fly on electric airplanes? Why?

Questions on the changes in the customer journey

1. Electric airplanes will have limited space for baggage: How do you feel about the fact that you would need to travel light, possibly with hand baggage only?

2. Electric airplanes will most likely operate from smaller regional airports: What are your thoughts on flying from airports close to city centers (e.g. Malmi airport in Helsinki) or rural airports (e.g. Enontekiö airport)?
   Probes: Pros and cons from the interviewee's perspective

3. What do you think about electric airplanes possibly having frequent flight schedules similar to bus or train schedules?
   Probes: Any effect on the choice of travel mode in the regional travel (instead of a bus, train, car)

Questions on the customer pains, gains, and jobs

1. Can you tell me what issues you consider most important when choosing a flight? (selection criteria)
   *Probes: **practical issues** e.g. price, travel convenience and smooth flight connections / **social issues** e.g. other people's opinions / **personal issues** e.g. fear of flying, **environmental issues** / **other issues***

2. What do you consider to be the most relevant issues that would make traveling on electric airplanes a desirable choice for you as a customer?
   Probes: Service aspects, operational aspects, environmental aspects, something else

3. Would you be willing to compromise on the convenience (e.g. not being able to take big bags with you) to fly in a more environmentally friendly *way?*
   Probes: What exact compromises willing to make

Closing questions

1. What are your overall thoughts and feelings on electric aviation after this interview?

2. Do you have anything to add, or to ask?

Thank you for taking the time for this interview!

Appendix 2. Interview guide in Finnish

HAASTATTELURUNKO

JOHDANTO

Tämä tutkimus on osa opinnäytetyötäni Haaga-Helia ammattikorkeakoulussa, jossa opiskelen ylempää ammattikorkeakoulututkintoa Aviation and Business Management -koulutusohjelmassa. Tutkimuksen tarkoituksena on selvittää ihmisten alueelliseen sähköiseen lentämiseen liittyviä odotuksia ja mielipiteitä, sillä sähkölentokoneiden ennakoidaan aloittavan operoinnin lähiliikenteen lentoreiteillä 5-10 vuoden sisällä.

Olen kiinnostunut mielipiteistäsi ja näkemyksistäsi koskien sähköistä lentämistä ja haastattelen aiheesta useita muitakin henkilöitä. Sinulla ei tarvitse olla aiempaa tietämystä sähköisestä lentämisestä – sinun yksinkertaisesti odotetaan vastaavan kysymyksiin totuudenmukaisesti ja parhaan kykysi mukaan matkustajan näkökulmasta. Kaikki mitä kerrot haastattelun aikana on luottamuksellista ja tietoa käytetään ainoastaan tämän tutkimuksen yhteydessä. Nimeäsi ei tulla käyttämään missään yhteydessä ja tulen varmistamaan, ettei sinua voi tunnistaa antamistasi vastauksista. Nyt kun olen kertonut edellä mainitut asiat tämän tutkimuksen luonteesta, varmistan vielä, että annatko suostumuksesi tähän haastatteluun ja sen nauhoittamiseen? Onko sinulla kysymyksiä ennen kuin aloitamme?

TAUSTATIEDOT

Nimi:
Ikä:
Sukupuoli:
Koulutustausta:
Ammatti:
Asuinkunta:
Kansalaisuus:

ALOITUSKYSYMYKSET

1. Kuinka usein matkustat lentokoneella?
   Viikoittain, kuukausittain, kertaa vuodessa

2. Minkälaisia lentoja ne yleensä ovat?
   Kotimaan sisäisiä, alueellisia, Euroopan sisäisiä, mannertenvälisiä /vapaa-ajan vai työmatkoja

3. Suositko yleensä jotain tiettyä lentoyhtiötä tai konetyyppiä lentoja varatessasi?
   Jos kyllä, mitä tiettyjä preferenssejä, syyt preferensseille

AVAINKYSYMYKSET

Kysymykset koskien uuteen teknologiaan sopeutumista, uutta tuotetta koskevaa tietoa ja miellettyä riskiä

1. Mitä tiedät tällä hetkellä sähkölentokoneista, jos mitään?
   Tietolähde

2. Mitä (muuta) haluaisit tietää sähkölentokoneista, jos mitään?
   Teknologia, operointi, turvallisuus, jotain muuta / tietolähde

3. Sähkölentokoneiden voimanlähteenä on akkukäyttöinen sähkömoottori: Mitä ajatuksia tämä teknologia herättää sinussa matkustajana?
   Luottamus/epäluottamus, mielletty riski

4. Miltä sinusta tuntuisi matkustaa ensimmäisten joukossa sähkölentokoneessa? Miksi?

Kysymykset koskien asiakaspolkuun liittyviä muutoksia

1. Sähkölentokoneissa tulee olemaan rajalliset matkatavaratilat: Mitä mieltä olet siitä, että voisit ottaa koneeseen vain kevyttä matkatavaraa, mahdollisesti ainoastaan käsimatkatavaraa?

2. Sähkölentokoneet tulevat todennäköisesti operoimaan pienemmiltä alueellisilta lentokentiltä: Mitä ajatuksia sinussa herättää se, että lentosi lähtisi lähellä kaupungin keskustaa olevalta kentältä (esim. Helsinki Malmi) tai maakuntalentokentältä (esim. Enontekiö)?
   Edut ja haitat haastateltavan näkökulmasta

3. Mitä mieltä olet siitä, että sähkölentokoneilla olisi mahdollisesti bussi- tai juna-aikataulujen tapaiset tiheämmät aikataulut?
   Onko vaikutusta matkustusmuodon valintaan alueellisessa liikenteessä (bussin, junan, auton sijaan)

Kysymykset koskien asiakkaan kipupisteitä sekä asiakashyötyjä ja -tarpeita

1. Voitko kertoa mitkä asiat koet kaikkein tärkeimmiksi lentoa valitessasi? (valintakriteerit)
   Käytännön asiat** esim. hinta, matkustusmukavuus ja sujuvat jatkoyhteydet/**sosiaaliset aspektit** esim. muiden mielipiteet/ **henkilökohtaiset asiat** esim. lentopelko, **ympäristöasiat / muut asiat

2. Mitkä ovat mielestäsi tärkeimmät asiat, jotka tekisivät sähkölentokoneilla matkustamisesta varteenotettavan vaihtoehdon sinulle asiakkaana?
   Palveluun liittyvät asiat, operointiin liittyvät asiat, ympäristöön liittyvät asiat, jokin muu

3. Olisitko valmis tekemään kompromisseja matkustusmukavuuden suhteen (esim. ei mahdollisuutta ottaa isoja matkatavaroita) matkustaaksesi ympäristöystävällisemmin?
   Mitä kompromisseja valmis tekemään

LOPETUSKYSYMYKSET

1. Mitkä ovat päällimmäiset ajatuksesi ja tunteesi koskien sähköistä lentämisestä tämän haastattelun jälkeen?

2. Onko sinulla vielä jotain lisättävää, tai kysymyksiä?

Kiitos kun käytit aikaasi tähän haastatteluun!