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AIRLINES FIGHTING CLIMATE CHANGE

A Comprehensive Study on Sustainable Transformation Strategies and Initiatives in European Airlines

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Management in Sustainable Business
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Management in Sustainable Business Abstract
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Subject Airlines fighting climate change: a comprehensive study on sustainable transformation strategies and initiatives in European airlines.
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The primary objective of this thesis is to analyse the various strategies and initiatives adopted by the airlines in Europe to enhance their sustainability practises and contribute to sustainable transformation of the airline organizations. This thesis aims to comprehensively study initiatives, challenges and opportunities in sustainable transformation of European airlines, with emphasis on CO2 emissions reduction, organizational development, and competitive advantage.

Flying is one of the major individual contributors to climate change with estimated 3.5% of total emissions produced by aviation. Airlines are committed to carbon neutrality by year 2050 but there is nearly 30 years of airline operations that will require sustainable transformation before that. Therefore, the airline industry could benefit from sustainability research and its findings in becoming more sustainable and attracting new environmentally aware customers while convincing investors of the more sustainable future of the aviation industry.

This thesis sheds light on the airline industry in Europe and its ways to fight climate change. Climate change and emissions produced by the airline industry are the drivers for sustainable transformation needs that are re-enforced by various rules, regulations and societal trends creating external pressure on European airlines. Sustainable transformation efforts are reviewed from CO2 emissions reduction, organizational development and competitive advantage perspectives utilising theories from climate change, Fiedler´s contingency and Porter´s competitive advantage theory. Key findings are reflected in the theoretical framework and applied to the research results produced with mixed method research including qualitative airline expert interviews and thematic content analysis of sustainability reports.

The outcomes of this research include forming a holistic picture of airline sustainability in Europe, revealing innovative initiatives, insights and best practises. Practical recommendations are made and tools to support sustainable transformation process are introduced. The author believes that this research can empower European airlines to enhance their sustainability and contribute to greener flying already today.

As emphasized throughout this study, the sustainability investments made today by European airlines are fundamental in securing long-term business viability, attracting the future customers and environmentally conscious investors, while guiding the pathway to achieving carbon neutrality by 2050.

Keywords Climate change, sustainable transformation, airline sustainability, European airlines, sustainability creating competitive advantage

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1 Introduction

1.1 Research background

Flying stands out as a major individual contributor to climate change. As mentioned in the article about climate change and flying (Ritchie, 2020), the airlines are responsible for around 2.5% of global CO2 emissions and even as high as 3.5% when non-CO2 impacts are also taken into account. Therefore, it's important to research this topic further and provide suggestions and best practises on sustainability initiatives that could support airlines in their sustainable transformation towards greener flying.

Air travel dominates a frequent traveller's individual contribution to climate change. There are many ways to approach more sustainable travel and this study concentrates on the airline perspective to sustainability rather than the passenger point of view. Often airline contribution to climate change is only seen as CO2 emissions but there are many more aspects to it than only the emissions. Airlines can improve their sustainability in their organizations, supply chains and partner networks covering the whole airline eco-system including customers, investors and regulatory bodies that can contribute to airline´s ongoing sustainable transformation process.

Airlines are committed to carbon neutrality by year 2050 that is expected to be enabled by new type of zero-carbon aircraft made available by the aircraft manufacturers. Carbon neutrality by 2050 is also coming as regulation part of the European Green Deal from European Union (EU) and as initiatives from airline industry organizations. One of the initiatives is from IATA (International Air Transport Organization) and it is called Fly Net Zero, started at the 77th IATA Annual General Meeting in Boston, USA, on 4 October 2021 (IATA, n.d.-b). This pledge brings air transport in line with the objectives of The Paris Agreement to limit global warming to 1.5°C (The Paris Agreement, 2015).

Since 1950, aviation emissions have increased almost seven-fold and since 1960 they’ve tripled as stated in Ritchie´s (2020) article about climate change and flying. According to ICAO (International Civil Aviation Organization) the total number of air passengers carried on scheduled services globally rose to 4.5 billion in 2019 pre pandemic era. Air passenger number is forecasted to reach 4 billion by 2024 and 6 billion by 2030 (IATA, n.d.).

There is nearly 30 years of airline operations to carry on until the zero carbon emissions target becomes reachable with the help of more advanced aircraft technology enabling carbon neutral flying. Therefore, the airline industry could benefit from a comprehensive sustainability research and its findings to support the airlines in their efforts in becoming more sustainable already today. In light of the current technological barriers, the airlines cannot become fully sustainable today but they can transform their operations into more sustainable direction and this way contribute positively in efforts to fight climate change.

Movements like ´flight shaming´ are arising and could cause decline in air travel growth in Europe and around the world. According to article ´Will flight shaming influence the future of air travel? ´ flight shaming has become a popular trend and is making air travel look socially unacceptable. This is mainly due to high carbon footprint of the airline industry that still heavily depends on fossil fuel usage (Flaherty & Holmes, 2020).

Air travel has advantages, as it has been a catalyst for positive economic growth and cultural exchange. Tourism accounts 5% of the world´s gross domestic product and it employs a total of 6-7% of world´s population. Global tourism is enabled by air travel as is the whole modern global economy and lifestyle that requires effective air travel. During COVID-19 pandemic there was disruptions in air cargo including life-saving pharmaceuticals and interruptions to major cultural and sport events around the world. (Flaherty & Holmes, 2020).

Flying is not going to stop after the pandemic and movements like flight shaming are not going to make air travel to discontinue in the near future although some areas are not expected to recover to the pre pandemic level like business travel. Therefore, it is important to find innovative approaches and best practises that can be applied in sustainability initiatives. Sustainability suggestions for European airlines would not fully solve the problem but they could support the airlines in their transformation towards more sustainable entity and this way contribute to overall sustainability goals that airlines are facing from regulatory bodies like European Union. Due to geographical different rules and regulations of the global aviation business, this study is concentrating on sustainability matters in European Union and airlines affected by them in according to EU standards and regulations (European Commission, n.d.).

This thesis could inspire future research as there is limited scientific research available on sustainability strategies, innovative approaches and best practises from the airline industry perspective aiming to improve airline sustainability. Airline industry is considered as a major individual contributor to climate change. Therefore, the airline industry has substantial

potential to make a significant difference with minor changes what comes to contributing positively to the critical issue of climate change.

This research will be conducted only in Europe due to the regional sustainability regulations and the resources available to this research. This research could be expanded to other regions such as Asia, Americas, Middle-East and Africa comparing the findings from other regions to findings made from Europe. Another interesting approach would be to repeat this research in mid-term future 2030 - 2035 as a follow-up to learn whether the sustainability targets set to 2030 have been reached and are 2050 sustainability targets still valid and reachable.

The objective of this thesis is to analyse the various strategies and initiatives adopted by the airlines in Europe to enhance their sustainability practises and contribute to sustainable transformation of the airline organizations. This thesis aims to comprehensively study successes, challenges and opportunities related to sustainable transformation process of European airlines, with emphasis on CO2 emissions reduction, organizational development, and competitive advantage.

The research will be conducted as a mixed method research including qualitative interviews to airline industry experts and thematic content analysis of European airlines´ sustainability reports. This research intends to shed light on the current situation of airline sustainability in Europe as well as introduce innovative approaches and best practises in order to improve airline sustainability.

This research is seeking answers to following research question:” What are the initiatives, challenges, and opportunities in the sustainable transformation of European airlines, with emphasis on CO2 emissions reduction, organizational development, and competitive advantage?”.

Sustainability improvements in the airline eco-system will be reflected in the social, economic and environmental aspects leveraging ´The Sustainable Business Model Canvas´ (Threebility, n.d.) for the European airlines. This section includes sustainable business model example as author´s compilation that could be applied to any airline in Europe, introducing an additional tool to assist in the ongoing sustainable transformation process.

In this mixed method research, in-depth qualitative interviews are conducted to airline industry experts in Europe in order to gain valuable insights on sustainability initiatives that

European airlines are currently taking or planning to take. The interview findings will be analysed and combined with theories, literature and sustainable business model suggestions presented in this thesis. Qualitative interviews will be conducted to sustainability experts of European airlines and airline industry organizations in selective manner.

Thematic content analysis will be performed on publicly available sustainability reports from European airlines, forming a solid foundation to this research. Content analysis findings will be complemented and intertwined with the interview findings in the analysis phase. As results of this research, invaluable insights and best practises are presented and practical recommendation are made together with tools to support the airlines´ sustainable transformation journey.

1.2 Airline industry in Europe

In this section, a brief historical overview of commercial aviation in Europe is presented, offering interesting context for the industry studied in this thesis and shed light to the journey of commercial aviation in Europe. This overview will also serve as a foundation for airline groups and alliances present in today´s commercial aviation industry in Europe.

The airline industry in Europe dates back to the early 20th century when the first commercial airline in Europe was established in 1919 by the Dutch airline KLM (Koninklijke Luchtvaart Maatschappij) which is still one of the oldest operating airlines in Europe. KLM was shortly followed by British Airways (Imperial Airways) that started in the United Kingdom in 1924. Lufthansa was first established in Germany in 1926 (current Lufthansa company in 1953) and Air France started its operations from Paris in 1933 (KLM, n.d.; Britishairways, n.d.; Lufthansa, n.d.; Airfrance, n.d.). The pioneering period of European commercial aviation continued until the World War II that suspended most of the European civil aviation operations.

New era rises in 1950s when air travel was revolutionized due to introduction of jet aircrafts like British Comet, Boeing 707, and Douglas DC-8 that became popular as they were faster, more efficient and cheaper to operate than previous aircraft types. Due to this invention, European airlines were able to expand their operations internationally connecting major European cities to destinations around the world (Britannica, n.d.).

Until 1980s the airline industry was heavily regulated and relied mainly on national flagship carriers of European countries. By 1990s many countries allowed the entry of new air

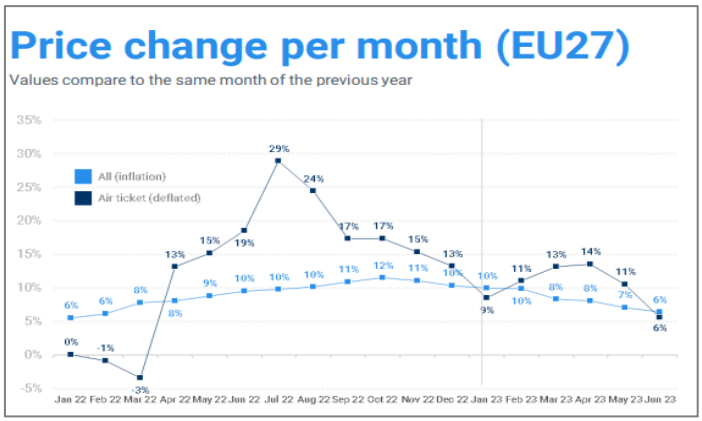
carriers which resulted in creation of new type of airlines called low-cost carriers such as Ryanair (1985), Norwegian (1993) and Easyjet (1995) that entered and disrupted the market with the introduction of low-cost air fares making the air travel affordable for many more passengers than before (Ryanair, n.d.; Easyjet, n.d.; Norwegian, n.d.).

Within the creation of European Union (EU) in 1993 and integration of economies between the member states, the airlines were allowed to operate freely across all EU member countries (European commission, n.d.). From 2000s the airline industry has witnessed consolidation of the industry through mergers, acquisitions and alliances such as Oneworld, SkyTeam and StarAlliance were established in order for airlines to share resources and expand and strengthen their networks globally (Oneworld, n.d.; Skyteam, n.d.; Staralliance, n.d.).

Currently there are over 100 commercial airlines operating in Europe (IATA, n.d.) and around 32.000 daily flights including overflights as recorded in July 2023 (EUROCONTROL, n.d.). Air transport is an important contributor to European Union economy with over 100 operating airlines, 400 airports and 60 air navigation service providers. Between 1.4-2 million people are directly or indirectly employed by aviation industry with around 4.7-5.5 million jobs (European Commission, n.d.-d).

During the recent years the airline industry has experienced many economical, geopolitical, terrorism and pandemic downturns that has severely impacted the air travel demand, COVID-19 pandemic as the most recent example of nearly halting the airline operations in Europe. Challenges and increased sustainability requirements, increase of SAF fuel (Sustainable Aviation Fuel) usage reflects to flight ticket prices as seen on the figure from Eurostat presented on EUROCONTROL´s European Aviation Overview report below.

Figure 1. Air ticket price change per month (EUROCONTROL, 2023).



Information from Eurostat in the above figure shows that in June 2023 ticket prices increased 6% above inflation compared to same period in June 2022 whereas the increase was as high as 29% in July 2022. This reflects a temporary relief on growing ticket prices together with lower jet fuel prices (EUROCONTROL, 2023). Anticipating the future with new sustainability requirements, regulatory changes and evolving customer preferences we can assume that the ticket prices will continue to rise again in the future.

The future of the European airline industry will be shaped by technological advancements from the aircraft manufacturers including new materials like ultra-light metal alloys, repairable composites and hybrid- and smart materials. New engine technologies like quiet engines, ultra-high bypass ration turboprops, open rotor engines, scramjets, new wing designs, longer and thinner fuselage structures. New inner designs made from bionic structures, self-cleaning spaces and energy harvesting adaptable aircraft seats. Hybrid rocket technology and finally all electrical aircraft (Inalhan & Pasaoglu, 2015), that anticipate the future of airline industry in the light of current technological knowledge.

Focus on sustainability will mark the following decades of the airline industry in Europe. According to EUROCONTROL´s thirty-year forecast (2022 – 2050), aviation can become more sustainable contributing to 2050 carbon neutrality targets by: aircraft engine development, new aircraft technologies like electric and hydrogen-powered aircraft, improved air traffic management and aircraft operations, increasing use of sustainable aviation fuels (SAF) and market-based carbon capture (EUROCONTROL, 2023).

Consumer preferences in choosing the preferred transport mode may change in the future as well. EUROCONTROL forecasts that there will be around 16 million yearly flights by 2050 which is up to 44% over flights in 2019 (EUROCONTROL, 2023). There will be more choice for the consumer to transport and replace short-distance flights like: vertiports, heliports, high-speed trains and new technology platforms where passengers can choose their optimum way of transportation easily by providing their requirements and constraints (Inalhan & Pasaoglu, 2015). In order for the European airline industry to remain competitive, it needs to adapt to changing market situations, new technologies, global events and changing regulations to meet the needs and requirements from the future travellers.

In the following chapter, the most commonly used airline industry terminology will be defined. Term ´airline industry´ is used when describing only the part of the aviation industry concerning commercial flights. According to ‘European Airline Industry - Analysis, Share - Aviation Market’ the aviation industry consists of three areas: commercial aviation, military

aviation and general aviation (Mordor Intelligence, n.d.). This study concentrates on commercial aviation within Europe geographical area. Term ´European airlines´ is used when referring to this definition.

Term ´airline´ is used for a company that provides air travel and includes equipment, routes, operating personnel, and management. It can also be described by the meaning of words ´air´ and ´line´ that means a straight line through the air between two points. In this study term ´airline´ is used when referring to a commercial company providing flights to its´ customers (Merriam-Webster, n.d.).

´IATA´ is an abbreviation of International Air Transport Association that supports aviation with global standards for airline safety, security, efficiency and sustainability. Term ´IATA´ is used in this study when referring to International Air Transport Association (IATA, n.d.).

´ICAO´ is used when referring to International Civil Aviation Organization. ICAO is funded and directed by 193 national governments to support their diplomacy and cooperation in air transport as signatory states to the Chicago Convention 1944. According to ICAO website it is defined as a United Nation´s Specialized Agency for uniting aviation (ICAO, n.d.).

´EUROCONTROL´ is used when referring to Eurocontrol that is defined as s a pan-European, civil-military organisation dedicated to support European aviation and committed to the European Union’s vision for a Single European Sky. Support is provided to civil and military stakeholders: air navigation service providers, airspace users, airports and aircraft- and equipment manufacturers. This is a joint effort to improve safety, efficiency, cost-effectiveness and environmental impact of aviation in Europe (EUROCONTROL, n.d.-a).

´Flagship carrier´ is used to describe an airline that is owned or subsidized by a country's government and enjoy additional privileges and support from country´s government. They are often the primary airline of the respective country of origin representing country´s image and identity. They are expected to have high level of safety, quality of service and professionalism while connecting their country to the rest of the world (Li & She, 2021).

´Low-cost carrier´ also called LCC is the terms used when referring to airlines that have focused on minimizing their operational costs in order to offer lower fares to passengers compared to traditional full-service airlines. Efficiency and cost savings do not affect the safety of the airline but are visible to passengers throughout the travel journey. LCCs

increase the competitiveness and flexibility of ticket prices throughout the airline industry (Gross & Lück, 2016).

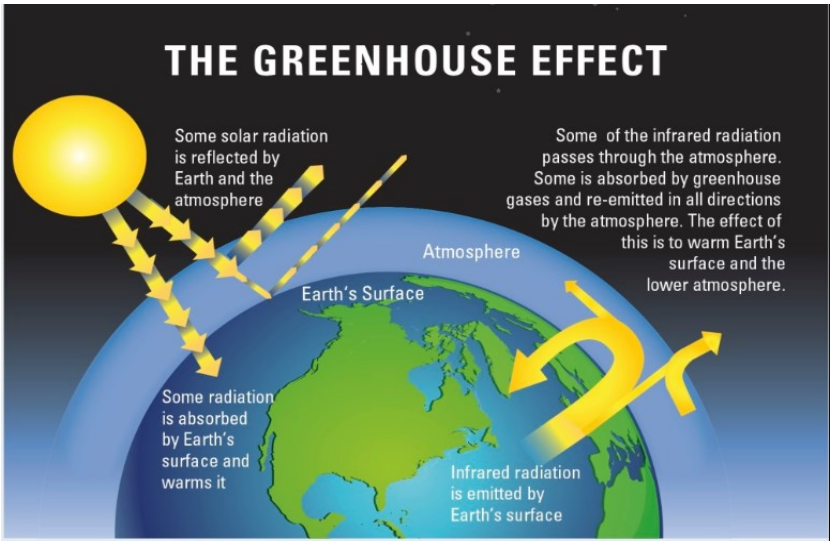
´Passenger´ or ´pax´ refers to airline customer even though it is not defined in any dictionary but it is a term commonly used in the airline industry and related literature (Aviation Stack Exchange, n.d.).

1.3 Climate change theory

In this thesis climate change is referred as a theory and identified as a cause for sustainable transformation needs. It is important to notice that climate change term is produced by collective scientific research efforts and does not have a single author for the theory. Therefore, the below publication is referred when climate change is mentioned in this thesis.

To further explore the meaning of climate change, a recent publication from Oxford University Press (Romm, 2022) can be studied to explain the phenomena. According to Romm (2022), the greenhouse effect has made life on Earth possible. The sun pours ultraviolet and infrared radiation across the electromagnetic spectrum and when solar energy hits the atmosphere, one third is reflected back to space and rest is absorbed by Earth. This is the process that heats up the Earth. Naturally occurring atmospheric gases let visible light into space while trapping certain types of radiation called greenhouse gases. These include water, carbon dioxide (CO2), methane (CH4) and they keep the planet around 16ºC warmer than it would otherwise be, and this enables human life on Earth. (Romm, 2022, p. 1).

Figure 2. The greenhouse effect (Royal Society, n.d.).



Since 1970, the Earth has warmed over 1.1ºC as humankind has been pouring billions of tons of additional greenhouse gases into the atmosphere, mainly CO2 in accelerating speed. Scientists and climate experts have agreed that global warming is unequivocal based on observations of increasing global average temperatures of air and ocean, melting of snow and ice and rising sea levels (Romm, 2022, p. 2).

Due to ocean being warmer, there´s more humidity in the air and this affects the plants and animal life. Animal species are moving towards the poles or higher altitudes, spring is coming sooner and plants bloom earlier. As the average temperature of Earth is rising, the duration, severity and frequency of heat waves is increasing around the globe (Romm, 2022, p. 3).

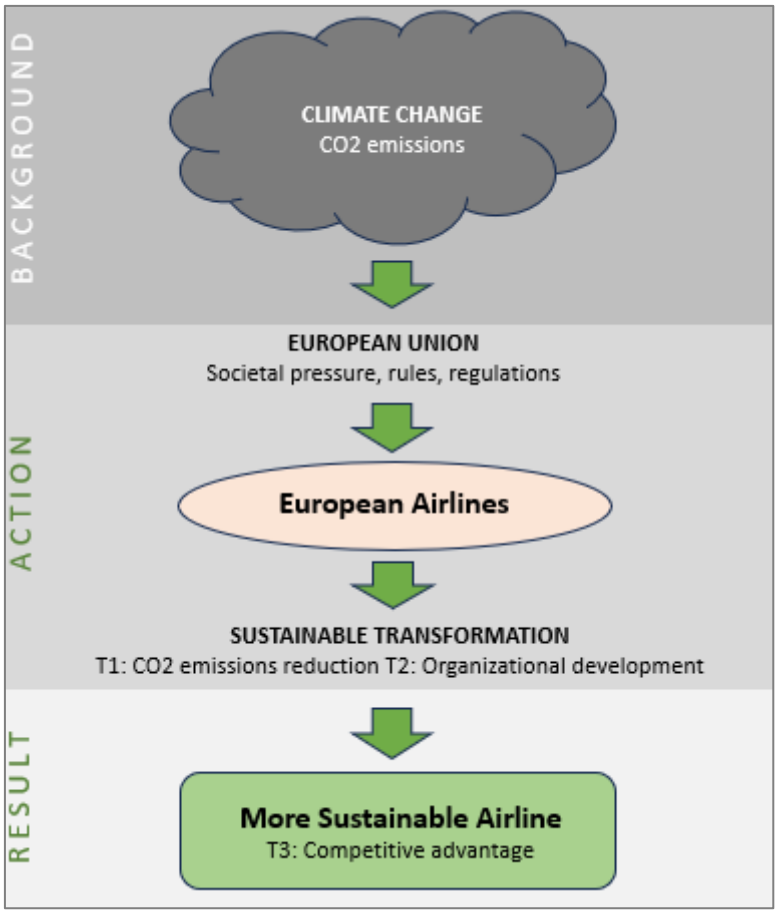
The Antarctic ice contains 90% of Earths ice and it would rise the sea levels by 61 meters in case it completely melts. The Antarctica is losing ice equivalent to size of Mount Everest every 2 years since year 2000 (Romm, 2022, pp. 5-6). According to recent study ‘Ice-Shelf Retreat Drives Recent Pine Island Glacier Speedup’ the speed of Antarctic glarier melting rose to 12% between just 2017 and 2020 (Barham et al., 2021).

Scientists and governments in the world agree that climate change is mainly caused by human activity. This can be seen when observing CO2 levels that have increased by 50% since the beginning of industrial age in mid 1800s from 280 parts per million (ppm) to more than 415 ppm as measured now. During 1970s CO2 levels were around 325 ppm which means that most rapid rise has happened during the five last decades. Also, the type of carbon (carbon isotopes) is matching to combustion of fossil fuels that is known to be caused by human activity (Romm, 2022, p. 10).

2 Theoretical framework

Theoretical framework and the structure of the thesis is based on cause-relationship effect that starts from defining the background factors: climate change theory (Romm, 2022) and CO2 emissions as causes, initiating action in forms of external pressure, regulations, organizational development and adaptation, contingency theory (Luthans & Stewart, 1977; Donaldson, 2001) and sustainable business models (SBMC-EA) leading to an outcome of a more sustainable airline that can create competitive advantage (Porter, 1985; 1990) as a results of sustainable transformation process. These elements and the overarching thesis process is shown in the figure below.

Figure 3. Thesis structure: Cause-relationship effect (Author´s compilation).



In the above Figure 3, climate change and the need to reduce CO2 emissions presented in this thesis as Theme 1 (T1: CO2 emissions reduction) that forms the background of this research. The background has influenced on social and regulatory trends and forced European Union to issue sustainability regulations affecting European airlines. As a consequence, European airlines have to act and adjust or develop their organizations in more sustainable ways as described in Theme 2 (T2: Organizational development) and operations to comply with the European Union regulations. Required organizational development is necessary for airline´s ongoing sustainable transformation process that is described and supported by theories and the research findings. As a result, a more sustainable airline can be developed that can create competitive advantage as presented in Theme 3 (T3: Competitive advantage) through its sustainability initiatives. The objective of this research is to discover and provide insights, best practises and recommendations that could be applied to sustainable transformation process of European airlines.

2.1 Literature review

This study is seeking answers on how European airlines can transform their operations and organizations in sustainable ways and to become more sustainable entities. There is limited research available that would directly answer the research question of this thesis but existing literature can be found from airline eco-friendliness, sustainability reporting, customer´s choice and organizational development that will be reviewed and analysed in this section.

In a recent article by Baumeister and colleagues (2022) is noted how climate change has initiated the need for airlines to improve their eco-friendliness. The research mentioned in the article was conducted as a customer survey to 5000 randomly chosen Finnair customers and 1170 valid responses were obtained and used as data for analysis. In this article, the conclusion was that being environmentally responsible airline can generate more customer satisfaction, re-purchase, positive WOM (word of mouth), value for money, positive brand image and customer loyalty (Baumeister et al., 2022).

Author´s research also identifies and reviews climate change as the initiator for airline´s sustainability development needs. The article (Baumeister et al., 2022) highlights the reason why the airlines should become more sustainable and environmentally friendly in the eyes of the consumer. Therefore, this article recognizes the importance of becoming a more sustainable airline. In author´s research it is studied how European airlines can become more sustainable from organizational development perspective that complements the findings of the consumer survey presented in the article by Baumeister and colleagues (2021).

In a study by Johansson and Zieba (2022) sustainability reporting in the airline industry is reviewed from global perspective. This research is concentrating on how the existing scholarly research has approached airline sustainability reporting and what distinguishable concerns have emerged from this research.

In this study (Johansson & Zieba, 2022), organizational responsibility of global airline industry is reviewed from environmental, economic and social point of views. This research is conducted as a standalone literature review and its findings include global sustainability reporting such as: corporate responsibility report (CR), corporate social responsibility report (CSR), corporate sustainability, environmental report, global reporting initiative (GRI), sustainability indicators and triple bottom line report. The study from Johansson and Zieba

(2022) points out that the purpose of the study was to analyse what has already been studied regarding sustainability reporting within global airline industry.

The research by Johanssen and Zieba (2022) is reviewing sustainability reporting globally in the airline industry, whereas author´s research is limited to airlines operating in European geographical area. Research conducted by Johanssen and Zieba (2022) supports the sustainability reporting findings that the author of this study has made for European Airlines according to sustainability trends and regulations identified in the European Union. Similarities can be found and many of the sustainability reporting initiatives are globally similar to Europe.

In author´s study, European Union sustainability reporting trends and regulations are introduced in overall level and recommendations limited to European airlines. The research highlights (Johanssen & Zieba, 2022) the importance of sustainability reporting and author of this study develops the idea into direction where the need of sustainability reporting, rules and regulations are forcing the airlines to develop their organizations towards a more sustainable airline to comply with sustainability reporting requirements. Author´s study continues from the need of airline sustainability reporting and explores the impact of constantly increasing sustainability requirements to European airline organizations.

In Master dissertation from Elkjaer (2021) is studied the adaptations the airline industry should do to comply with the sustainability goals of the Danish government, where carbon neutrality target is already set ahead of the rest of the Europe to 2030. A survey for 121 Danish and European consumers was conducted and analysed in this research.

According to this study, changes needed within the airlines' operations due to government regulation are reviewed through consumer choice and competitive position. As a conclusion this research highlights that if the Danish Government does not support the airlines financially, the whole airline business in Denmark will be compromised to higher ticket prices that affect their competitive position negatively. Assumption was made that those airlines with their own bio fuel (SAF) production will gain competitive advantage (Elkjaer, 2021) in the Danish market.

In Master dissertation by Elkjaer (2021) the initiator of this research is the carbon neutrality target set by Danish Government to airlines operating in Danish airspace. In author´s research, climate change is the original initiator which is then followed by rules and regulations from European Union affecting the airlines operating in Europe´s airspace.

Similarities in research logic can be detected here, although the research by Elkjaer (2021) is concentrating on the Danish Government regulations and Danish market.

Author´s research is concentrating on the airline expert side of sustainability, whereas the research from Elkjaer (2021) is reviewing the consumer point of view to airline sustainability and how higher ticket prices will affect the future of the airline business in Denmark. In author´s research sustainability affecting ticket prices and airline customers is briefly introduced but not reviewed as a main topic of this research.

Another article by Abdi and colleagues (2020) reviews how sustainability can impact firm´s value and performance specifically in the airline industry. This article is concentrating on the ESG (environmental, social and governance) perspective and how it impacts the attractiveness of the airline as a sustainable company for investors. This research was based on panel data analysis where data was collected from a known database including sample of 27 airlines globally, between years 2013 and 2019. In this research it was found out that environmental and governmental factors did increase positive company image and attractiveness towards investors. Social aspect of sustainability was seen as a negative factor increasing company´s costs and making it look less attractive for the investors (Abdi et al., 2020).

This article (Abdi et al., 2020) highlights the opportunity for airline companies to improve their value and attractiveness towards the investors. This re-enforces the assumption made in author´s research regarding sustainable organizational development, that regardless of the initial sustainability investments, the improved company image and attractiveness towards the investors could be a source of motivation for organizational sustainability transformation besides the sustainability regulations and reporting that the airlines have to comply with. The research conducted by Abdi and colleagues (2020) included airlines globally and the sample was quite small but it still gives a good overview on how sustainability can improve airline company´s value which can be applied to European airlines as a benchmark. Therefore, it provides solid foundation to author´s research to explore sustainable transformation process and its benefits to airline organization including long-term financial benefits to be gained affecting airline company´s value and increasing attractiveness towards investors.

To summarize the literature review findings, there was no previous research found that directly answers the research question of this study. In the light of the literature review findings and the absence of prior research directly addressing the research question, the three main themes were identified within existing literature, such as airline eco-friendliness,

airline sustainability reporting and organizational development in the airline industry. Based on the literature review, following findings support the relevance and importance of this research.

Airline eco-friendliness was found out to be a desirable outcome for the airlines but was only studied by (Baumeister et al., 2022) from consumer perspective and therefore organizational and airline industry expert perspectives could add an additional dimension to findings made in this research forming a more comprehensive understanding of the importance of airline eco-friendliness and its impact to customer preference.

Sustainability reporting in airlines was reviewed by Johanssen and Zieba (2022) in their research with conclusions highlighting the importance of sustainability reporting in global airline industry. In author´s study, sustainability reporting is limited to European Union economical area and its regulations. The importance of the EU regulations is recognized as one of the most powerful external factors that create pressure towards European airlines. This is forcing European airlines to further develop their organizations in order to comply with the evolving sustainability regulations and reporting standards.

Consumer point of view was examined in the research from Elkjaer (2021) from the airlines operating in the Danish market. This research points out the importance of financial support and availability of bio fuels (SAF) for airlines that affects their competitive position. Findings of this research can be reflected to European airlines as the challenges they will face are similar by 2050, whereas Denmark is already affected by these regulations in 2030. This research provides foundation on answering author´s research question regarding on how European airlines can lower their CO2 emissions? Competitive position was examined from competitive advantage perspective that will also be applied in author´s study and can provide additional aspects on the research question. Therefore, this research (Elkjaer, 2021) can be used as a benchmark to author´s research reflecting on challenges that the European airlines will face in year 2050.

The research conducted by Abdi and colleagues (2020) was exploring how sustainability impacts airline company value and attractiveness for investors. It was found out that from ESG perspective, environmental and governance actions created positive value but social actions mainly negative. This research gives a narrow but informative view on how airline sustainability can improve company value. This re-enforces the assumption in author´s research that the airlines should transform their organizations sustainably as it can also increase the airline company´s value and attractiveness for investors.

2.2 Societal and regulatory trends affecting European airlines

While the airline industry is a highly regulated industry with sustainability targets set by EU, IATA, UN and individual countries, considerable efforts are needed in order to navigate successfully through constantly evolving sustainability trends, regulations, initiatives and targets. Commitments to net zero flying and carbon neutrality are long-term targets that require additional steps in order to reach these targets by year 2050. European airlines are committed in reaching carbon neutrality target set by European Union (European Commission, n.d.) as part of the European Green Deal (EGD). There is also external pressure from stakeholders and investors that is forcing European airlines to enhance their sustainability practises and report on them in trustful, recognized ways.

Currently prominent phenomena around us are described through trends, such as SITRA megatrends (SITRA, n.d.) describing the big picture of change through nature, people, technology, power and economic factors that are also affecting the airline industry in Europe. These megatrends are defining the external pressure forming from environmental, social and governmental aspects affecting European airlines.

The most influential megatrend affecting European airlines currently is global warming as addressed in The Paris Agreement (The Paris Agreement, 2015), European Green Deal (The Council of the EU and the European Council, 2023) and Fly Net Zero by 2050 (IATA, n.d.-b). Megatrends introduced in the following chapters, such as CSR, waste management, consumer´s choice, pandemics and epidemics, United Nations sustainable development goals, followed by European Union regulations and initiatives from global environmental agreements and airline industry organizations provide an overview of the diversity of external requirements that European airlines are experiencing during their sustainable transformation journey.

Corporate social responsibility (CSR) and its importance has been recognized in the airline industry (CSR Europe, n.d.). CSR is part of the airline industry values and reporting, also affecting supplier selection and RFP (request for purchase) processes to ensure sustainability of the whole airline eco-system.

Waste management is an important topic to the airline industry as it is estimated that passenger flights globally produce about six million tonnes of waste per year according to IATA (IATA, n.d.) and improvements in managing and preventing waste can have a substantial sustainability impact, while also saving cost to the airlines.

Consumer´s choice should be considered as consumers are starting to be aware of the travel choices they make and their impact on the carbon footprint produced. Since flying has been ear-marked as one of the most polluting industries in the world, consumers can take note and start choosing other modes of transport in order to significantly decrease their carbon footprint. Movements like ´flight shaming´ can multiple and become more powerful, negatively affecting the whole airline industry (Flaherty & Holmes, 2020).

Pandemics and epidemics as seen during the COVID-19 pandemic, another global pandemic would be fatal to the whole airline industry and it is difficult to forecast or adapt to. Other more general risks are related to extreme weather conditions when flying to affected areas will not be possible, geopolitical uncertainty and restriction prohibit flying to certain countries or even to use of their airspace. Digital world has changed airline booking systems to be online, therefore cyber-attacks and electricity power cuts also affect airlines (SITRA, n.d.).

United Nations Sustainable Development Goals (SDGs) are defined and explained on United Nations website (United Nations, n.d.) and they have bypassed other sustainability reporting methods including the airline industry since their introduction in 2015. As mentioned in the article ´ The impact of the United Nations Sustainable Development Goals on corporate sustainability reporting´ the SDGs have gained popularity because they are non-binding, broad and flexible and defined by a globally trusted external organization (Argiolas et al., 2023). United Nations SDGs can be seen below.

Figure 4. United Nations SDGs (United Nations, n.d.).

Goal 5, gender equality. IATA (International Air Transport Association) has recently added this goal to its development agenda in order to attract more female experts to the airline industry. Advancing gender balance by 2025 means increasing the number of women in senior positions by 25 per cent, other under-represented areas by 25 per cent and up to a minimum of 25 per cent of the whole airline organization employees. This applies to all IATA member airline organizations. (IATA, n.d.-a).

Goal 9, industry Innovation and infrastructure. Technical innovations to improve sustainability of the airline operations. By 2030 sustainable aviation fuels are more widely available at the airports and should be the main aircraft fuel by this time. Aircraft technology is developing rapidly, and electric and hydrogen aircraft will be introduced by 2050. (IATA, n.d.-c).

Goal 12, responsible consumption and production. Waste management and responsible consumption. Passenger flights globally produce about six million tonnes of waste per year according to IATA website (IATA, n.d.) To control and reduce this amount of waste the airlines need to recycle and invest in renewable materials while getting rid of single-use-plastic items on the flights.

Goal 13, climate change. The most important United Nations sustainable development goal currently impacting the airline industry is Goal number 13: Climate change. This goal is already addressed by European Union Green Deal (European Commission, n.d.-f), IATA Fly Net Zero by 2050 (IATA, n.d.-b), The Paris Agreement (The Paris Agreement, 2015) and CORSIA scheme (CORSIA, 2022).

Goal 17, partnerships for the goals. Carbon offsetting partners are used to compensate CO2 emissions of the flight. Carbon credits can be sold to the customers and offsetting is done through a partnership in emerging markets e.g., in bio-fuel power plant investments or planting trees to rain forests etc. The products differ but the main purpose is to compensate produced CO2 emissions to the world. Other potential partnerships include organizations like UNICEF, WWF and Rainforest charities to directly address climate change (IATA, n.d.).

The European Green Deal (European Commission, n.d.-f) and The Paris Agreement (The Paris Agreement, 2015) as explained on The Council of the EU and the European Council website (2023) are affecting the airlines as it does to all economic activity in the European Union. EGD was reiterated from previous environmental targets to strive climate neutrality in the European Union by 2050. EGD is based on United Nations 17 SDGs that have been mainstreamed into politics. (Bongardt & Torres, 2022, p. 180).

Many airlines have committed to ´The Paris Agreement´ made in 2015 which overall goal is defined as following: “The increase in the global average temperature to well below 2°C comparing to pre-industrial levels” and pursue efforts “to limit the temperature increase to 1.5°C above pre-industrial levels.” (The Paris Agreement, 2015).

EU sustainability reporting: GRI, GSRD, GDPR, EMAS, EU taxonomy: Global Reporting Initiative (GRI) as explained on GRI website (GRI, n.d.) Companies are applying the GRI standards to communicate and give a holistic picture of the company´s sustainability efforts to its stakeholders including corporate sustainability and their contribution to sustainable development. (Koulouriotis et al., 2020).

Corporate Sustainability Reporting Directive (GSRD) which covers large companies and listed companies making sustainability reporting as a requirement may apply to airlines meeting the criteria and operating in the European economic area (European Commission, n.d.-b).

General Data Protection Regulation (GDPR) affecting all organizations which are collecting and storing data of the people in the European Union (GDPR, n.d.). This applies to most of the airlines as they hold data of millions of passengers and payment details required for making a flight booking.

Eco-Management and Audit Scheme (EMAS) is mentioned in European Commission´s website as an advanced tool that can help organizations to track and enhance their performance in environmental matters, energy and resource optimization according to EMAS regulation (European Commission, n.d.-c).

EU taxonomy as part of the ´Green Deal´ to achieve EU wide carbon neutrality by 2050 which European airlines are also committed to achieve. This is explained on European Commission website as following: "The EU taxonomy is a classification system, establishing a list of environmentally sustainable economic activities. It could play an important role help the EU scale up sustainable investment and implement the European green deal” (European Commission, n.d.).

Single European Sky (SES) initiative is addressing air traffic management (ATM) in Europe that is needed to manage air traffic growth, variations and disruption like seen during COVID-19 pandemic. Harmonising air traffic management systems across Europe can have

considerable impact in lowering air traffic carbon emissions by optimizing airspace capacity and reducing flight delays (European Commission, n.d.-e).

IATA and ICAO sustainability initiatives. All member airlines of IATA have committed to Net Zero Flying by 2050 according to IATA website (IATA, n.d.-b). There are also other sustainability initiatives from UN body ICAO (International Civil Aviation Organization) ongoing like CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) that can be found at ICAO website (ICAO, n.d.).

Fly Net Zero is the commitment that all IATA member airlines have agreed to aim achieving by 2050. According to IATA website (IATA, n.d.-b) it was defined in 77th IATA Annual General Meeting in Boston, USA, on 4 October 2021. Achieving net-zero carbon emissions from airline operations is also in line with The Paris Agreement limiting the global warming to 1.5°C. In order for this ambitious goal to succeed it will require coordination of the whole airline industry as well as the governments. Fly Net Zero is also contributing to The European Green Deal following the same climate targets.

Mid-term carbon emission reduction by 55 per cent by 2030 as part of EGD and Fly Net Zero with the help of the SAF fuels does not seem to be achievable due to the availability and limitations of the sustainable aviation fuels. The real impact of the SAF fuels will be seen from 2030s onwards when SAF fuels can be competitive with fossil kerosene contributing 65 per cent of the target reduction. Therefore, this target has been shifted to 2050 as shown on the IATA website (IATA, n.d.-c).

CORSIA is an offsetting and reduction scheme provided by ICAO (ICAO, n.d.), a United Nations specialised agency for uniting global aviation. CORSIA scheme aims to move away from national and regional regulatory initiatives by offering ways to harmonize different emission reduction activities internationally within the aviation industry. CORSIA offers ways to calculate CO2 emissions and offsetting them in reliable ways as very little can be achieved at the moment from technological, operational or sustainable aviation fuels perspective. (CORSIA, 2022).

2.3 Organizational development theories

There are many organizational development theories that can be applied to organizational sustainability transformation. Climate change related organizational strategies can be a source of competitive advantage and strong market performance (Kolk & Pinkse, 2004). In

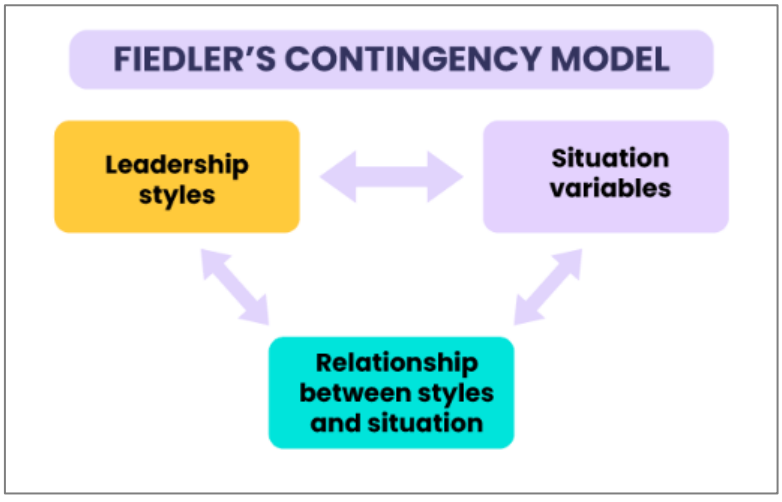
this research, the main theories being explored and reflected against research findings are: Fiedler´s contingency theory (Luthans & Stewart, 1977; Donaldson, 2001) concentrating in leadership and organizational development and second, Porter´s competitive advantage theories (Porter, 1985; 1990) explaining how competitive advantage and early adoption strategies could be applied. In highly competitive market such as airline industry, these strategies were utilized to better understand the opportunities when aiming to create competitive advantage through sustainability initiatives.

2.3.1 Contingency theory

Through applied contingency theory, the relation of the organization and its' environment (Luthans & Stewart, 1977) was studied. Airlines have many internal and external dependencies that can be studied and improved from sustainability point of view, such as management commitment, low-carbon operations, sustainable supply chains, sustainable partnerships, customer contribution and waste resource management.

Contingency theory contributed to the understanding of the importance of the leadership support and organizational development needs during sustainable transformation process. The key contributors to the original contingency theory are scholars such as Fred Fiedler and Joan Woodward. In Friedler´s contingency model it is suggested that the effectiveness of a leader depends on how leader´s leadership style (task or relationship oriented) matches to the favourable leadership situation (Luthans & Stewart, 1977). Fiedler´s contingency model can be seen below in Figure 5.

Figure 5. Fiedler´s Contingency Model (Vantage Circle, n.d.).



Woodward´s research identified different technology types such as: unit production, mass production and process production where each type requires different organizational structure (Luthans & Stewart, 1977).

These contingent relationships between management and environmental variables helped in identifying the requirements for sustainable business transformation. Contingency theory emphasizes that the organizations have to be able to respond in changing circumstances, be flexible and adaptable while remaining effective. According to contingency theory there is not a solution that fits all organizations, and it rather focuses on how the organization and its leadership adapts to a changing situational or environmental factor it encounters (Luthans & Stewart, 1977).

Donaldson´s (2001) publication about contingency theory of organizations focused on effectiveness of organizations and how it can be used to explain success or a failure of organization. Organizational efficiency has variety of meanings that include efficiency, profitability, employee satisfaction and innovation rate. Organizational efficiency can be seen as its ability to function and perform meeting the goals it has set to itself and goals set by the external parties and stakeholders.

According to Donaldson (2001), contingency can be any variable that moderates or has an effect on organizational characteristic or organizational performance. Because of the broad definition of contingency theory, it has also been criticised of being open-ended, not singular theory of organizations without unifying paradigm leading to non-structural theory of organizations. However, there is fit-performance relationship that can be seen in the essence of contingency theory paradigm providing theoretical explanation to the association between structure and contingency as well as contingency that is causing structural change in the organization (Donaldson, 2001).

There are internal contingencies like organizational structure as well as external contingencies like environmental uncertainty that affects the organization and causes adaptation of the organization and its structure. There is a need to fit the intraorganizational contingencies and the environmental contingencies and as a result, the organization is shaped because of the need to fit its environment. Therefore, environmental contingencies intervene with variables from the intraorganizational contingencies shaping the organization (Donaldson, 2001).

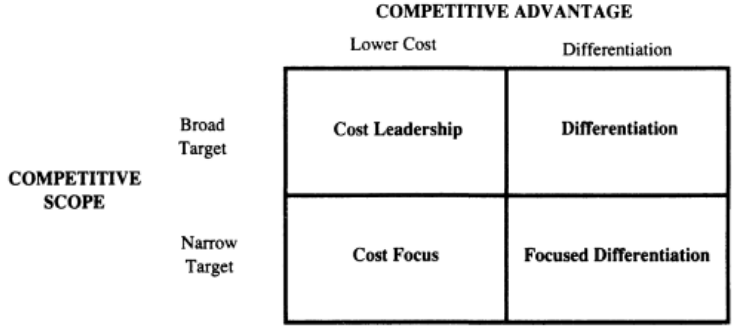
Despite of the broad definition and wide range of variables mentioned in criticism towards contingency theory, the author found the contingency theory useful in studying the impacts of external sustainability requirements that affect European airline organizations face. The main contingency theory aspects that contributed to this research were, the contingency leadership theory (Luthans & Stewart, 1977) highlighting the importance of leadership commitment and the contingency theory of organizations (Donaldson, 2001), found useful in examining how European airline organizations react to constantly evolving sustainability requirements and pressure coming from regulatory bodies, aviation industry organizations, stakeholders and customers, while still maintaining profitable operations.

2.3.2 Competitive advantage theory

Competitive advantage theory is defined as above the average performance in the long-term and the company´s competitive position is defined by its competitive strength (Porter, 1985). In global competitive landscape, moving early to exploit a change can create competitive advantage to companies who detect the importance of the change and move strongly towards them as early adaptors (Porter, 1990).

According to Porter, a competitive advantage can either be achieved by lower or higher cost whereas competitive scope can have narrow or broad target. Overall cost leadership can be achieved by lower product or service prices to consumers that can be used in marketing. Differentiation strategy means making product or service different or unique comparing to competitors in the industry. Cost focus strategy concentrates on minimizing the cost in a focused market and differentiation strategy aims to differentiation from competitor´s products or services in a focused market (Porter, 1985). The four ways to achieve a competitive advantage are shown below in Figure 6: cost leadership, differentiation and focus on cost or focused differentiation.

Figure 6. Porter´s Competitive Advantage (Porter, 1985).



According to Porter (1990), the early movers have the opportunity to gain advantages for being first ones to scale their operations, reduce cost through learning and re-enforce their brand names and relationships with customers without direct competition. Moving early can also help companies to translate innovation into an advantage (Porter, 1990).

As seen in Porter´s (1985) competitive advantage model, the same principals for creating competitive advantage still apply in today´s competitive environment, where sustainability adds an additional layer on competitive strategies described by Porter. The author has chosen competitive advantage model (Porter, 1985) when analysing the research findings related to how airlines have created competitive advantage or are going to do so through their sustainability efforts and initiatives. This research aimed to shed light on whether the airlines could create competitive advantage through their sustainability initiatives and if there are examples available in showcasing this.

Airline industry in Europe is highly competitive and competitive landscape is global as European airlines compete against global players even in the European territory. Therefore, the author felt that it was important to explore sustainability initiatives that European airlines are taking in order to create competitive advantage and improve their competitive position in the global environment.

Competitive advantage created through sustainability initiatives could help the airlines to convince the consumers to choose an airline that has a better environmentally friendly brand image and is known for its sustainability efforts. It is important to notice that the airlines moving early and improving their sustainability have an opportunity to create additional competitive advantage through innovation and learnings taken from early adopted sustainability practises.

2.4 Sustainable transformation

The applied research part is based on defining the elements of the ongoing sustainable transformation process in European airline organizations in order to become more sustainable entities. In this section, a brief history of sustainability in Europe is explored, sustainable business models are introduced and ´The Sustainable Business Model Canvas´ (Threebility, n.d.) is introduced as a customized tool (SBMC-EA) to support European airlines in their ongoing sustainable transformation journey.

First, Europe's enduring sustainability legacy is introduced, which finds its roots in the Middle Ages, aiming to discover the reasons behind Europe's profound and longstanding commitment to sustainability. This brief overview of the historical evolution of sustainability in Europe helps to understand the factors that have shaped Europe's sustainability heritage and formed a base for strong sustainability commitments in place today.

Environmental scientific research in Europe has taken place since the Middle Ages when the researchers were trying to find out the biodiversity impact on agriculture as well as social and economic factors that may have contributed to the spread of Black Death in Europe (Hoffmann, 2014). Since then, there has been various movements and initiatives in Europe including sustainability over time. Sustainable business practises can be tracked to 19th and early 20th centuries. Some businesses were including social responsibility and ethical conduct like the Cadbury chocolate company in the United Kingdom did in 1878 (Cadbury, n.d.).

During the recent decade, the environmental awareness gained momentum in the 1960s and 1970s across the Europe. Growing concern about increasing pollution and resource overuse lead to implementation of the modern environmental law which dates back to 1972 in Europe (Gunningham, 2009).

In 1987 the Brundtland Report defined sustainability as ´Our Common Future´ proposing long-term environmental strategies in order to achieve sustainable development for year 2000 and beyond (Hajian & Jangchi, 2021). Sustainability was defined as following: “Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs” (United Nations, n.d.-a). This report initiated for companies to start implementing sustainability as part of their business practises.

In the 1990s and early 2000s, Corporate Social Responsibility (CSR) gained ground in Europe. Businesses started to realize the importance of social and environmental matters, integrating them as part of their business operations. Sustainability reporting started within the arrival of CSR, a new model based on economic, social and environmental considerations that had consistency with sustainable development paradigm that businesses could apply in their sustainability management (Perrini, 2006).

In 1997, The Kyoto Protocol aimed to fight the global climate change by setting emission reduction targets mainly to developed countries. European businesses started to take action

in reducing their carbon footprint and investing in renewable energy. Although there weren´t significant emission improvements in the commitment period, The Kyoto Protocol has established the international starting point for the future climate policies. (Böhringer, 2003).

The European Union (EU) has been promoting sustainable practises since 1993 when EU introduced the Environmental Management and Audit Scheme (EMAS) for businesses to assess, manage and improve their environmental performance (European Commission, n.d.-c). More recently EU has developed taxonomy for sustainable activities, embraced circular economy concept and adopted UN Sustainable Development Goals (SDGs) in 2015 (United Nations, n.d.). These milestones demonstrate the long history and effort that has been made in Europe throughout its history to improve sustainability and implement sustainability as part of the European business culture.

2.4.1 Sustainable business models

Drivers for sustainability management can come from external stakeholders like investors, shareholders, consumers, changes in regulation, markets, competitors and overall, from globalization (Haigh, et al., 2006). Sustainable business models help companies to transform their business models into more sustainable ones like The Sustainable Business Model Canvas (Threebility, n.d.). Sustainable business models can be applied as applicable to the company´s business or just elements of different sustainable business models.

The transformation of the airline business into a sustainable entity presents a substantial challenge, primarily due to technical constraints due to reliance on aircraft powered by fossil jet fuel. Therefore, the author suggests choosing elements from different sustainable business models that airlines could integrate into their existing business models and cover the whole airline eco-system. Suggested business models and applicable elements are introduced in this chapter.

Circular business model can be applied throughout the organization to make sure resources are used wisely and less waste is produced, and recycling takes place. This is important to airlines that provide catering and need to manage waste and recycling of returned food from flight-, and lounge networks.

According to circular economy principles where resources do not get wasted but will be return to the consumption circle, 4R framework (Hofmann & Jaeger-Erben, 2020) could be applied to airline organizations: Reducing the use of raw materials for catering, office

supplies and flight operations. Reusing the returned non-expired food to charity and reuse packaging. Recycling biodegradable items and other recyclable materials from office and flights. Returning expired food and other suitable materials back to raw materials by composting or incarceration.

Biomimicry as sustainable business model is applying nature´s principles to designing, producing, transporting and distribution and it also provides solutions to complex environmental and economic problems (Ivanić et al., 2015). Learnings from the nature have improved aircraft wing design, aerodynamics and flight performance (Slosar, 2021). Aircraft designers are looking into the nature and mimicking animal flight to the aircraft design that can make the aircrafts faster, efficient and more ecofriendly (FAA, 2016). As an example, the invention of winglets improving the aircraft fuel efficiency and cruising range was inspired by flying eagles having their feathers upturned at their wingtips. Airline industry and manufacturers are exploring solutions for achieving carbon-neutral aviation by 2050, perhaps biomimicry with its inspiration originating in nature, will provide solutions for addressing this challenge also in the future.

Performance economy is focusing on doing the right things the right way instead of just doing things right. (Stahel, 2010). This could be included in airline´s human resources policy being a labour-intensive industry. Aspiration to create more wealth and jobs locally in Europe instead of cutting cost by laying off the personnel and transferring many jobs to low-cost labour countries outside of Europe. This is vital and necessary step in transformation towards a sustainable airline and responsible employer in the society.

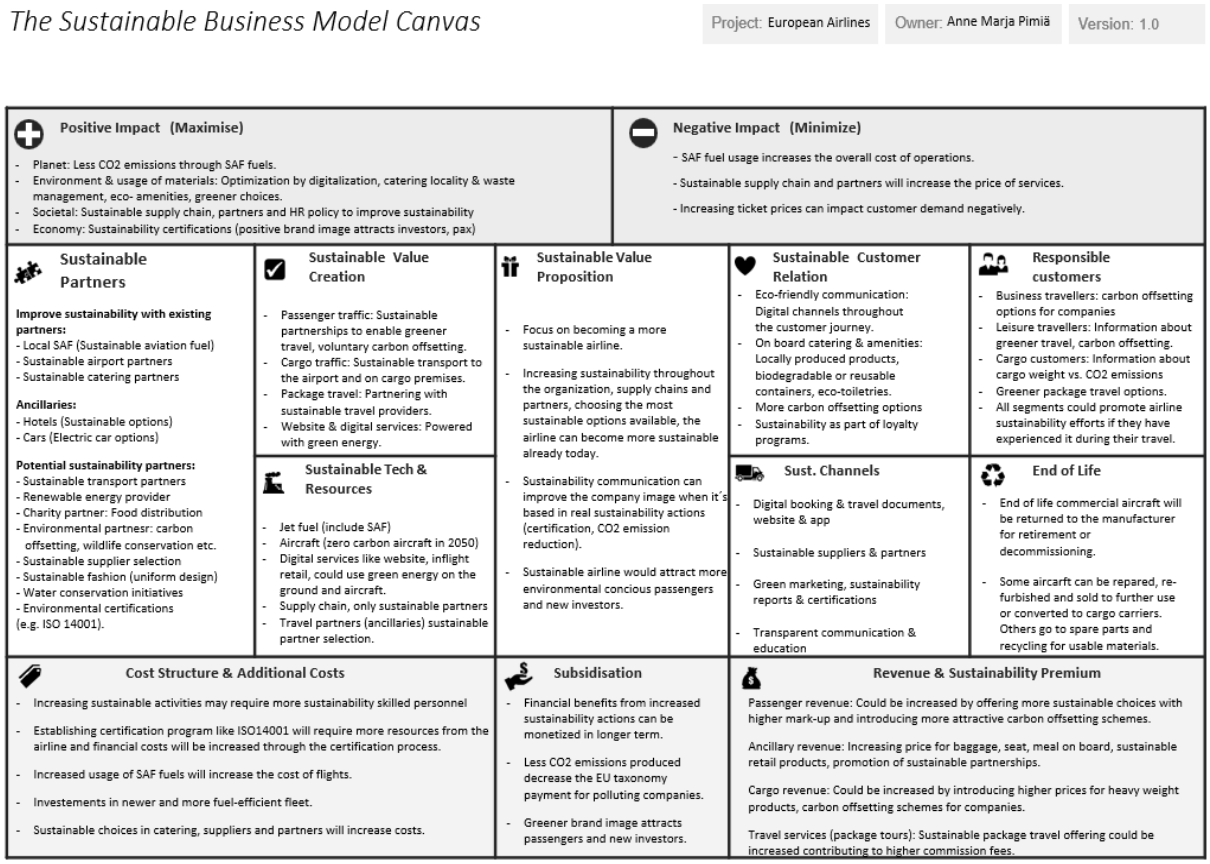
Standardization and certification are important to consider in a polluting industry such as the airline industry and its seen as one of the trusted ways to show commitment and action in sustainability matters. Some of the most used standards are ISO standards (ISO, n.d.) and particularly ISO 14001 Environmental Management System. Airlines could gain more sustainability trust by applying external certifications such as ISO.

2.4.2 Sustainable business model canvas: SBMC-EA

The Sustainable Business Model Canvas is a tool created to enable the businesses to map their most relevant business areas within TBL (Triple Bottom Line) context and maximise the sustainability impact of their business whilst minimising negative externalities (Threebility, n.d.). In this thesis, suggestions on how to explore and identify sustainability initiatives, challenges and opportunities can be reflected in the Sustainable Business Model Canvas.

The sustainable business model canvas helps to form a holistic understanding of airline organization´s sustainability initiatives and can be used as a tool to support sustainable transformation process. SBMC-EA as an example customised for European airlines can be seen below.

Figure 7. The Sustainable Business Model Canvas, SBMC-EA (Author´s compilation).



The above example of Sustainable Business Model Canvas as Figure 7 is modified according to airline organizations (author´s compilation) including suggested sustainability initiatives to consider if not already implemented. This tool and its elements are later on referred as SBMC-EA in this thesis. SBMC template without any industry specific modifications can be also used (Threebility, n.d.).

Sustainable business model elements (author´s compilation) starting with sustainable partners: Many of airline´s existing partners offer sustainable services like fuel suppliers, airport operators, catering services and 3rd party ancillary partners. There are also potential new partners to consider that could help airlines in their sustainable transformation process like green ground transport, trains, electric cars, bio-fuel busses to-and-from the airport.

Choosing a renewable or green energy provider. Finding a charity partner or food rescue organization to partner with in-flight and lounge non-expired food waste.

Cooperating with environmental partners for carbon offsetting, wildlife conservation and nature protection to increase the attractiveness of the carbon offset schemes. Choosing sustainable fashion brands to design and deliver staff uniforms. This would re-enforce a positive brand image of an airline. Considering water conservation initiatives: communicate to passengers how the airline is conserving water on the flight and on the ground. Applying environmental certifications like ISO 14001 Environmental Management System (ISO, n.d.) to be compliant and recognised for sustainability actions.

Sustainable value creation & proposition: sustainable value for passengers can be created through sustainable partnerships that enable greener travel and voluntary carbon offsetting schemes. In cargo segment, sustainability applies to transport to-and-from the airport and on the cargo premises. Focus on high-value items instead of heavy cargo decreases the weight of the aircraft and therefore reduces carbon emissions of the flight. Package travel providers can offer a wider selection of more sustainable travel packages. Digitalized services throughout the consumer journey could be powered by green energy.

Airlines should have sustainability included in their mission and vision as this would help in sustainability integration throughout the organization with the support of the airline management team. If the airline succeeds in its sustainability efforts, it can attract new environmental conscious investors and create additional value to the existing shareholders.

Sustainable technologies, resources and channels: sustainable technologies in the airline industry currently rely in the usage of SAF fuels to cut the CO2 emissions of the flights. As mentioned earlier the aircraft technology from current manufactures does not include any zero-carbon aircraft and the first concept aircraft are planned to be released in 2050 for commercial airline use (IATA, n.d.).

Sustainable channels benefit from digitalization that enable booking the flight tickets and obtaining travel documentation online. Sustainable channels also include green marketing, sustainability reporting and certifications. Many airline partner companies have made sustainability as part of their businesses and are reporting and following sustainable values voluntarily like the United Nations SDGs (United Nations, n.d.). It is recommended for airlines to cooperate with these partners and leverage from their sustainability efforts, allowing them to contribute to airline´s transformation towards a more sustainable entity.

Sustainable customer relation and responsible customers: eco-friendly customer communication through digital channels is a key in gaining the trust of the customers. On board catering could be locally produced, organic food, using biodegradable of reusable containers and avoid usage of single-use plastic items. On-flight toiletries and give away business class flight amenities could include eco-friendly packaging and products.

A wider variety of carbon offsetting options could be available. Airlines could demonstrate by examples on how the offset schemes have been applied in practise and gain the trust from customers that their offset payment is used in purposeful way.

Customers could also be encouraged through the loyalty programs to choose more sustainable travel options or pay for carbon offsetting and gain extra loyalty points by doing so. This would demonstrate airline´s sustainability commitments, encouraging the customers to participate sustainability efforts by offering rewards and extra loyalty points for choosing sustainable products within the flight ticket.

For business travellers there could be carbon offsetting options available for companies and governments that could be purchased within the business travel ticket. This way the individual traveller would not have to compensate the flight but rather the companies and organizations who are responsible of initiating the business travel.

Leasure travellers could be educated about green travel choices and encouraged to purchase these options when available. This could be supported by granting extra loyalty program points that the traveller earns when making more sustainable travel choices.

Airline customers have a great potential to promote airline´s sustainability efforts and green choices if they have experienced this during their travel with the airline. Therefore, it is important to consider changes according to performance economy literature to do the right things instead of just doing them right (Stahel, 2010). It would also contribute to rectifying the negative media attention many airlines have received due to misleading advertising such as ´zero carbon flights´ when, in reality, such claims are not currently technologically feasible.

Subsidisation: immediate financial benefits from sustainability actions are limited but the accumulated financial benefits can be realized in the future when customers could choose a more sustainable airline as a preferred travel partner over the non-sustainable ones. One of the current financial benefits include reduction in EU taxonomy payment (European Commission, n.d.), in case the company is profitable. Successful sustainability actions could

create greener brand image to airlines, attract more environmentally aware customers and investors and increase company profits in the long run.

End of life commercial aircraft is returned to the manufacturer for retirement and decommissioning. Some aircraft can be repaired, refurbished, painted and returned to commercial or cargo traffic. Otherwise, the aircraft ends up as spare parts and recycling for usable materials that are then sold to different industries (Airbus, n.d.). Airlines rarely are responsible of recycling the aircraft by themselves.

Cost structure and additional costs: increasing sustainable activities will require more personnel. Establishing certification programs like ISO 14001 (ISO, n.d.) will require additional financial and personnel resources to comply with the standard. Increasing the use of SAF fuels will add the cost of the flight reflecting to ticket prices. Also, investments in new greener fleet will add costs. Sustainable choices in catering, supplier selection and partnerships will also increase the costs.

Revenue and sustainability premium: passenger revenue could be increased if more sustainable choices are offered with higher mark-up introducing more attractive carbon offsetting schemes. Ancillary revenue can be increased by raising the price of baggage, seat, meal on board (require pre-order), sustainable retail products and promotion of sustainable partners like green transport and eco-friendly accommodation. Revenue can only be increased by these means assuming that demand will not experience a significant decline, even as ticket prices increase.

Positive and negative impact: sustainable actions have positive impact on the planet when SAF fuels are used and less CO2 emissions are produced. Environment and material usage can be optimized through digitalization, local materials in catering, waste management, eco-amenities on flight and educating and encouraging customers to make greener choices. Positive societal impact comes through sustainable supply chain and partners as well as sustainable HR policy. Economy could be impacted positively by gaining more trust through external sustainability certifications contributing to more sustainable brand image that can attract new environmentally aware customers.

Negative impacts from sustainability actions include increasing SAF fuel usage that will significantly increase the flight ticket prices potentially leading to a lower customer demand. By choosing more sustainable suppliers and partners may result in not getting the lowest prices for products and services purchased and therefore the increase from sustainable

supply chain will also eventually reflect in flight ticket prices. Airlines will have to carefully estimate and measure the impact of each sustainability action taken and find the perfect balance between increasing sustainability initiatives and staying profitable.

3 Philosophical considerations and methodology

This research was conducted as a mixed method research that included qualitative and quantitative research methods. Several data sources were also utilized such as qualitative interviews conducted for airline sustainability experts and content analysis performed on airline sustainability reports. It was essential to incorporate philosophical considerations and methodological approaches in order to ensure the validity of the research as well as reliability and meaningfulness of the research findings.

3.1 Philosophical considerations

The author applied the pragmatic paradigm, meaning that reality cannot be understood or researched by using one theory or methodology (Kivunja & Kuyini, 2017) and instead applying a combination of methods and theories in order to obtain new knowledge and answer the research question.

This scientific approach was chosen to assess sustainability changes and adaptation needs of European airline organizations through Fiedler´s contingency theory (Luthans & Steward, 1977) and to explore how the airlines can create competitive advantage with sustainability initiatives through Porter´s competitive advantage model (Porter, 1985; 1990) leading to finding innovative ideas and suggestions to European airlines and support their sustainable transformation process. Therefore, multiple theories and methods were used in order to understand holistically what sustainability means for European airlines today and in the future.

Ontological assumptions about the nature of reality and the epistemological stance regarding on how knowledge is acquired were made. Semantic approach used by qualitative researchers work hard in identifying intrinsic necessary and defining concept attributes (Goertz & Mahoney, 2012). Therefore, the author has chosen qualitative approach in this research.

The author believes in an objective reality (Kivunja & Kuyini, 2017) that can be discovered through in-depth interviews conducted to airline industry experts in order to uncover insights that may not be discovered through other methods of research and therefore complement the findings made during thematic content analysis. The author intended to stay bias and not impact the outcome of the interviews by own perceptions of airline sustainability or knowledge acquired while working in the airline industry.

The author was applying phenomenological approach that aimed to discover meanings related to phenomena studied (Heinlahti & Kakkuri-Knuuttila, 2006, p. 47) and find the essence of the experiences, thoughts and feelings of the participants related to sustainability and future of air travel. This approach supported the qualitative in-depth interviews conducted to participants from different backgrounds such as airline sustainability experts and airline industry experts while giving importance to the observations from the interviewer during the interviews.

In Interpreting and understanding the meanings of the interviewees´ narratives, hermeneutic principles (Heinlahti & Kakkuri-Knuuttila, 2006, p. 33) were utilized. This approach helped the author to better understand and interpret the reasons behind conflicting opinions from different participants that may be impacted by subjective experiences, culture, traditions, habits and every day practises.

3.2 Methodology

In this research, mixed method research was applied mainly relying in qualitative research approaches, while utilizing elements of quantitative research during the analysis phase. Qualitative research provides insight into real-world problems and instead of numerical data collection, qualitative research is used to explore the collected data in order to form a deeper understanding of the topic. Participant´s own experiences, behaviour and perceptions are gathered during qualitative research (Brannan et al., 2017).

Qualitative research is often used to analyse meanings and relationships of the material in images, speech or written text and data that can be produced from interviews, autobiographies and observations in order to collect detailed and high-quality insights on research topic (Lindblom-Ylänne et al., 2014). Qualitative research asks open-ended questions rather ´how´ and ´why´ that changes the nature of the research from linear to be more flexible in explaining processes and patterns that could be otherwise difficult to

quantify. Qualitative research also allows the participants to express themselves, their thinking, feelings, experiences during a certain time or an event (Brannan et al., 2017).

Qualitative research starts with defining the objective and target population including the methods of obtaining information from target population (Brannan et al., 2017). This research was targeting airline sustainability experts as population and the information was obtained through qualitative interviews conducted, allowing diverse data collection within the research topic including unexpected avenues.

This research was applying phenomenological approach in studying the phenomena of climate change and its impacts to European airlines. According to an article (Brannan et al., 2017), phenomenology is studying the meaning of phenomena and seeking to explore experiences from individual perspectives looking into participant´s ´lived experiences´.

Quantitative and qualitative approaches are different, but not mutually exclusive (Brannan et al., 2017). Besides qualitative method that has been chosen as main research method, this research has also utilized quantitative approaches in presenting findings from sustainability reports that were detected during content analysis performed on airline sustainability reports. These findings were based on frequencies of information occurring in sustainability reports and it was found out that quantitative method best worked in presenting this information as part of the research results. Therefore, the author feels justified to call this research as mixed method research including approaches from qualitative and quantitative research methods.

Quantitative information in this research included sustainability report names, certifications and commitments made by European airlines, which is anticipated to be interesting for the research audience (European airlines) to find out which metrics are most commonly applied across airlines in Europe. This type of dual-focus scenario is based on correlation and can be applied in qualitative research showcasing quantitative research methods integrated within the research in order to produce more comprehensive or in-depth insights related to the research topic (Brannan et al., 2017).

Thematic content analysis (TCA) can be applied to interview transcripts and other texts used in data collection where common themes in the textual data are identified and provided for analysis. When applied to interview transcripts, TCA can display thematic content by identifying common themes and categories in the texts prepared for analysis. While identifying themes and categories, researcher interpretation is kept to minimum (Anderson,

2007). In this research, the author identifies common themes found in airline sustainability reports and selects the information suitable to this research purpose.

In qualitative research, predetermined number of questions are used in structured interviews and same questions are asked from all participants. Researcher can be observer non-participant, detached observer or participant-observer in the interview situation (Brannan et al., 2017). In this research, total of 12 Interview questions were asked during the interviews and the interview questionnaire was shared with the participants before hands. Interview questions were asked and discussed while presented in the meeting as a presentation and discussed together during the interview meeting where interviewer was also participating in the discussion, while trying not to influence the outcomes of the interview.

Qualitative research design often prescribes a controlled environment where data has been collected and this can vary depending on research objectives and design. Large amount of data can be produced within qualitative research that is then transcribed and coded manually or with the help of software analysis tools for further analysis (Brannan et al., 2017). In this research, the key findings from interview transcripts were collected to an Excel spreadsheet, where the findings were coded according to research themes (T1 to T3) and interview question topics (Q1 to 12). Key findings were then manually collected under the main themes resulting to identification of key insights that answered research question presented in this thesis.

Research design applied in this thesis, can be seen in Appendix 1. Research design. Data collection describes data collection methods and sources (content analysis performed on airline sustainability reports and qualitative interviews conducted to airline sustainability experts). Based on the datasets produced (Appendix 4 and Appendix 5), thematic content analysis was performed and categories were collected under the themes (T1 to T3) and organized according to interview question topics (Q1 to Q12). Key insights from categories were identified and collected under the themes (T1 to T3) connecting the insights to the thesis research question. Finally, answers were detected and distributed according to previously introduced theme perspective to produce answers by uncovering sustainability initiatives, identifying challenges and detecting opportunities that European airlines have experienced during their sustainability transformation journey.

Mixed method research offers an alternative to qualitative and quantitative research methods choosing from diverse sources, systems or styles what appears to be most appropriate in order to meet the research objectives. Researcher knowledgeably or intuitively chooses the

techniques believed to best deliver answers to research question. Using mixed method research promises to reduce weaknesses of each method supporting the use of quantitative and qualitative methods in conjunction (Tashakkori & Teddlie, 2011).

This research was based on mixed method research, combining qualitative interviews conducted to airline experts with thematic content analysis performed on publicly available sustainability reports from author selected European airlines and airline groups. Besides qualitative analysis, quantitative research methods were applied in some of the research findings in order to present them in more vivid manner, such as metrics, certifications and sustainability commitments made by European airlines based on frequency data obtained from airline sustainability reports. Frequencies are shown in column ´Frequency´ found in Appendix 5. Content analysis data (Author´s compilation). Detecting frequencies is a common method as identified being the simplest method within content analysis to count elements in material and counting their frequency of occurrence (Mayring, 2014).

Combining data from qualitative interview transcripts with textual data obtained from sustainability reports, thematic content analysis is applied to both datasets produced, which offered a possibility to intertwine data findings and form a more comprehensive understanding of the research topic. Content analysis included both qualitative and quantitative elements, while only qualitative analysis was applied on interview transcripts.

Thematic content analysis for interview transcripts and content analysis data was identified as following: CO2 emissions reduction (Theme 1), organizational development (Theme 2) and competitive advantage (Theme 3) combining qualitative airline expert interview findings to content analysis performed on airline sustainability reports formed a solid foundation to this research. Research design can be seen in Appendix 1. Research design (Author´s compilation).

Qualitative expert interviews involved open-ended conversations with individuals who possess expertise in airline sustainability field. Airline experts were interviewed to gain in-depth insights into their perspectives, experiences, and recommendations regarding research themes. Qualitative interviews allowed for a deeper exploration of individual insights, experiences, and opinions, which is valuable in understanding the nuances of the industry and the thought processes of experts interviewed from European airlines (Interviews A to D). Airline experts provided context, anecdotes, and real-world examples that not have been available in any other data sources. Interviews helped to capture the "human factor" in

decision-making and strategy development, shed light on the motivations and constraints faced by airlines in their sustainability efforts.

Thematic content analysis (TCA) involved systematically analysing the content of publicly available airline sustainability reports and sustainability sections of annual reports from 2022. These documents were used to identify recurring themes and patterns related to the research question and then analysed to identify and categorize the strategies and initiatives that the airlines are taking in order to reduce their CO2 emissions, develop their organization in sustainable way and create competitive advantage through sustainability initiatives (Reports A to F).

Airline sustainability reports provided plenty of structured and organized textual data related to an airline's sustainability efforts. These reports often contained information on targets, initiatives, and progress made in reducing emissions. Thematic content analysis enabled the identification of commonalities and trends across multiple reports, helped to identify overarching strategies and industry-wide priorities as well as detected usage of specific sustainability reports, certifications and sustainability commitments (Reports A to F).

Comprehensive understanding of the research topic was achieved by combining qualitative interviews and thematic content analysis related to the research themes, complemented by interview questions for more in-depth knowledge of the topic and strategies used by individual airlines as well as the wider airline industry. Qualitative interviews offered rich, context-specific insights, while sustainability report content analysis allowed identification of detailed practises such as sustainability reporting applied and common industry-wide trends (Interviews A to D and Reports A to F).

With the use of multiple data sources (airline expert interviews and airline sustainability reports), the research method employed data triangulation, which enhanced the validity and reliability of the findings. Validity is used to describe the quality of the research: the data is produced in a valid, scientifically accepted way and the research is valid in describing the research phenomena, whereas reliability means uniformity of the measurements and consistency in interpreting the findings (Lindblom-Ylänne et al., 2014, p. 131). Data triangulation helped to verify and cross-validate the results obtained from different sources forming a solid foundation to this research as can be seen in Appendix 4. Interview data and Appendix 5. Content analysis data.

Qualitative interviews can be structured or un-structured with open-ended questions (Brannan et al., 2017). In this research, semi-structured interviews were conducted in order to provide a personal perspective, individual experiences and opinions of airline experts, while still following the research structure in order to produce answers to research question.

Content analysis performed on airline sustainability reports offered a wider airline and airline industry perspective to the research topic. The chosen mixed method research combination allowed the author to intertwine information collected from individual perspectives and industry wide sustainability initiatives (Interviews A to D and Reports A to F) into more comprehensive understanding of the state of sustainability in European airlines. Qualitative interviews captured the subjective viewpoints of experts (Interviews A to D), while thematic content analysis introduced objectivity by systematically categorizing and identifying themes in airline sustainability reports (Reports A to F) obtained from airline websites. This balance ensured a more well-rounded and comprehensive data collection for this research.

In conclusion, utilization of mixed research methods that combined qualitative interviews to mixed method content analysis intertwining thematic analysis to datasets produced, ensured more comprehensive, holistic approach to research topic than solely relying in single research method considering the complexity of the topic. Mixed method research is argued to be a fruitful way of exploration when different viewpoints, data collection and analysis are utilized in discovering broader purpose, breadth and depth of understanding and affirmation (Tashakkori & Teddlie, 2011).

The author believes that mixed research method used in this research contributed to a more comprehensive study and insightful research findings. Findings of this research could benefit the European airline industry by providing invaluable insights and practical recommendations regarding sustainability strategies and initiatives the airline organizations could take during their ongoing sustainable transformation journey.

3.2.1 Qualitative interviews: Airline experts

In this research, qualitative interviews to airline sustainability experts were conducted as semi-structured interviews. There are different types of qualitative interviews available, such as deep interviews, focus interviews, narrative interviews, biographical interviews and semi-structured interviews that can be applied in order to produce transcripts (Mayring, 2014).

Structured interviews have predetermined number of questions that are asked from the participants and the researcher can be non-participant, participant-observer or detached observer (Brannan et al., 2017). Material produced from qualitative interviews sometimes wander away from interview topic, which is tolerated as it is part of a natural discussion and other relevant content related to research question can be found outside the predetermined interview questions (Mayring, 2014). In this research, semi-structured interviews with 12 predetermined questions were asked from the participants including an open-ended question number 12 that enabled any other issue to be discussed. In this research, the author participated in the discussion as well as made observations during the interviews.

The objective of the qualitative interviews conducted to airline experts was to complement the findings made from thematic content analysis based on sustainability reports of European airlines offering invaluable insights, personal experiences and every day practises according to research themes on how to reduce CO2 emissions, develop organization and create competitive advantage through sustainability initiatives. The analysis considered insights from airline expert interviews (Interviews from A to D). Details of interview design and questionnaire can be seen as Appendix 3. Interview design and questionnaire (Author's compilation).

Ethical considerations were upheld during the interview data collection process from participants by requesting consent and permission for recording the interviews for transcription purposes. The privacy and confidentiality of the interviews was guaranteed and no participant identities, titles or company names were published without participants´ consent. The data was handled responsibly and securely according to HAMK data management plan that can be seen as Appendix 10. Thesis data management plan. According to HAMK data management plan, the interview data will be deleted after a period of one year from the date of publishing this master´s thesis.

Predetermined interview candidate sampling was performed by the author in order to identify suitable candidates for this research interview. The final airline expert sampling included experts in airline sustainability (2 participants), airline technology sustainability (1 participant) and airline industry sustainability (1 participant). Triangulation was also considered as part of candidate sampling as the chosen participants represented different airline companies and airline industry organizations across different European countries to ensure the variety, credibility and reliability of the interview findings.

The selection of interview participants was conducted by the interviewer, who assessed candidates' suitability based on their LinkedIn profiles. Candidates with job titles or job descriptions highlighting sustainability responsibilities were chosen. This selection criteria was essential to ensure that interviewees possessed the requisite sustainability knowledge, as the interview questions primarily focused on sustainability-related topics. Chosen candidates were then invited to participate to the research interview at their preferred time and date. In total of 36 interview invitations were sent to potential interview candidates and 4 interviews were confirmed and conducted successfully.

Interviews often contain introduction, research question and motivation of the participant in order to create a good climate and compliance of the interviewee (Mayring, 2014). Participation to research interviews conducted within this research were voluntary and based on personal invitations sent by the author. Introductions were made in the beginning of the interview where the author shared her background in the airline industry and introduced the research topic where the interview contributed to. Research questionnaire was shown as part of the research presentation shared during the virtual video meeting to support and guide the interview conversation.

The interview consisted of three parts: airlines contributing to CO2 emissions reduction, sustainable organizational development and sustainable initiatives creating competitive advantage. Interview topics were sent to the participants prior to the interview in order to allow time to prepare the answers before hands contributing to a more fluent and in-depth interview conversation. The interview was a forum to discuss these topics further and allowed flexibility in exploring any other unexpected avenues or inquiries. This approach enabled participants to cover the relevant themes as well as share their perspectives or narratives in any other sustainability related topics. Interview invitation for airline experts can be seen in Appendix 2. Interview invitation, airline expert.

In-depth qualitative interviews were conducted through virtual video meetings supported by research presentation prepared for the interviews ´Airline Sustainability in Europe´ including the research background, interview themes and questions. Follow-up questions were used to encourage participants to reveal more about their experiences, narratives and opinions as well as observations were made by the interviewer. Each interview transcript was recorded and littered for this research purpose only and the transcripts remained available for the interviewees to review afterwards. This enabled member checking already in transcription phase that increased the accuracy and authenticity of the research findings.

Reflexivity was considered as the author attended to remain bias and objective throughout the research process regardless of the airline industry background and sustainability knowledge the author possesses. The author´s believes that positive sustainable outcomes are within the reach for European airlines and this positive attitude towards sustainability actions may have influenced the research process and its findings.

Data analysis consisted of thematic content analysis that was applied to interview transcripts in order to identify recurring themes, patterns, opposing opinions, conflicting views and meanings within the interview data. Interpretation of the interview transcripts can be seen as Appendix 4. Interview data. Interview transcripts included in-dept and detailed data regarding the phenomena studied and link between data and analysis was formed as well as the link between data and theories presented were taken into account (Gammelgaard, 2017) together with the conclusions drawn after analysing findings based on each theme.

Theoretical framework consisted of three main theory elements: first element included climate change theory (Romm, 2022) that was applied when exploring airline contribution to CO2 emissions and ways to reduce them. Second element addressed the organizational development and adjustment needs in light of contingency theory (Luthans & Stewart, 1977; Donaldson, 2001) that was utilized in analysing European airline organizations´ ability to adjust their organizations to meet the current and future sustainability requirements. Third element consisted of competitive advantage (Porter, 1985; 1990) that was applied when considering whether sustainability initiatives of the airlines were creating or having potential to create competitive advantage in the future. By incorporating these philosophical considerations and methodological approaches, the author intended to yield valuable insights regarding airline sustainability and contribute comprehensively to the understanding of the European airlines´ sustainability.

Based on the quality and amount of data collected in thematic content analysis and interviews, the saturation point was achieved during the fourth interview. Therefore, the author concluded after the fourth interview that the collected data is sufficient to perform the research analysis. The interview data was collected during undetermined period of September 2023 to October 2023, research period being flexible due to potential interview candidates´ availability. The interview process was set to end by October 23rd when the author concluded that the collected data is sufficient in order to perform a comprehensive interview analysis together with the data produced from content analysis.

Data obtained from airline expert interviews was coded and referred in this research as following: Interview A and D (airline experts), Interview B (airline technology expert) and Interview C (airline industry expert). Themes were classified as Theme 1: CO2 emissions reduction, Theme 2: organizational development and Theme 3: competitive advantage. The interview questions were referred as Q1 to Q12 as shown in Appendix 3. Interview design and questionnaire (Author´s compilation) and interview findings and categorization can be seen in Appendix 4. Interview data (Author´s compilation).

The research protocol, data-collection guidelines, informant selection and number of informants has to be traceable and open in order to ensure quality of the research, whereas reliability cannot be guaranteed as new insights are produced through qualitative research methods such as interviews. Therefore, openness about the research process is considered as the most important factor for quality assessment (Gammelgaard, 2017).

In this research, half of the qualitative data was produced from interviews and research process was shared openly with the participants in order to ensure good quality of the research. Participants were also informed about data-collection methods, privacy, participant selection process, interview process and possibility to be informed about the research findings. As a result, all interview participants expressed a strong interest in receiving the research findings.

Research resources in the interview process were limited to the author and therefore the number of conducted in-depth interviews is not as high as if there were more researchers involved. Limited number of interviews may affect the research results regardless, the conducted interviews were made in-depth with intention in revealing wider variety of aspects and opinions on the topics. As mentioned in an article (Gammelgaard, 2017), if the expected findings were valid for this research, and the paradigmatic that seeks to create new perspectives and understandings of this phenomena, the number of the interviews conducted is not as important as the quality of the information captured and analysed in this research.

3.2.2 Content analysis: Airline sustainability reports

Within this research, content analysis performed on airline sustainability reports included mixed research methods. Qualitative research methods were applied in identifying themes (T1 to T3) and question topics (Q1 to Q12) and quantitative research method based on frequency was applied in identifying which sustainability reports, certifications and sustainability commitments are most commonly applied by European Airlines. Mixed

methods research includes qualitative research approach applied in assignment of categories and quantitative step that can include analysing frequencies based on text topics (Mayring, 2014).

The author discovered that there is a wide range of airline sustainability information publicly available on airline websites. Therefore, the sustainability reports and sustainability sections of annual reports from 2022 were explored in this research in order to provide more holistic overview of current and future sustainability practises and strategies adopted by European airlines. Consequently, a thematic content analysis was performed to extract and categorize information related to sustainability initiatives according to research themes (T1 to T3). Content analysis data can be seen in Appendix 5. Content analysis data (Author´s compilation).

Data sample as base of empirical research, can include documents, web-pages, persons, situations and entities that has to follow a sampling strategy (Mayring, 2014). In this research, data sampling strategy was to collect sustainability information from majority of airlines operating in Europe and therefore, airlines and airline groups were carefully selected by the author based on her airline industry knowledge. Data samples were collected from publicly available airline sustainability reports and sustainability sections of annual reports from 2022. These reports were found on airline websites. Airline sampling in this research included national flagship carriers, individual airlines, airline groups and low-cost carriers from different European countries.

The objective of the content analysis was to complement findings made from the qualitative interviews and to identify innovative approaches adopted by the airlines on how to reduce CO2 emissions, develop organization and create competitive advantage through sustainability initiatives. Information from airline sustainability reports (Reports A to F) supported the findings made from qualitative interviews, revealed sustainability strategies, airline company visions, current and future sustainability initiatives as well as detailed information on exact sustainability reports in use, environmental certifications applied and sustainability commitments made by European airlines.

Content analysis data was obtained from airline websites, including airline sustainability reports and sustainability sections from annual reports 2022. Reports used as data sources in this research were coded as following: Report A (Air France -KLM Group), Report B (EasyJet), Report C (IAG Group), Report D (Lufthansa Group), Report E (Norwegian Air Shuttle) and Report F (Ryanair Group).

Reports (A to F) included most of the European airlines, many of them as part of airline group reporting. Report A: Air France – KLM Group annual report consists of Air France, KLM and Transavia (Airfrance-KLM, 2022), Report C: IAG Group annual report includes British Airways, Aer Lingus, Iberia, Vueling and Level (IAG, 2022) and Report D: Lufthansa Group´s annual report consists of Lufthansa German Airlines, Eurowings, SWISS, Austrian Airlines and Brussels Airlines (Lufthansa, 2022). Report F: Ryanair Group sustainability report includes Ryanair, Buzz, Lauda and Malta Air (Ryanair, 2022). Report E: Norwegian Air Shuttle annual report (NAS, 2022) and Report B: EasyJet annual report (Easyjet, 2022) are from individual airline companies. Content analysis data and report categories can be seen in Appendix 5. Content analysis data (Author´s compilation).

The units of the analysis were based on the themes of the research. Theme 1: CO2 emissions, Theme 2: organizational development and Theme 3: competitive advantage, also later on in this research referred as T1, T2 and T3. Inside of each unit, the content was split to sub-sections by interview question numbers (Q1 to Q12) where applicable and categories were identified related to each content finding in order to showcase more in-depth knowledge of the findings. Units were identified as sentences, paragraphs, charts and sections found in airline´s annual and sustainability reports.

Thematic content analysis from publicly available airline sustainability reports allowed the author to extract valuable insights into the strategies and initiatives airlines are undertaking in their sustainable transformation journey as described earlier in this thesis. This method helped to shed light on the industry best practices, trends, and efforts in addressing environmental concerns.

Limitations in performing thematic content analysis on airline sustainability reports included the author´s selection on information relevant to this research. Airline sustainability reports are wide, including broad spectrum of different metrics and indicators, therefore with the limited research resources, the author has chosen the information best suited to this research even though there is a wider range and more in-depth information available in the airline sustainability reports. The author preserved the right to choose the information that was found valid to this research purpose.

4 Research findings and analysis

The objective of the research analysis was to identify and evaluate innovative approaches adopted and planned by European airlines in order to reduce their CO2 emissions, develop their organizations in sustainable ways and create competitive advantage through sustainability initiatives. The analysis considered insights from airline expert interviews (Interviews A to D) and information from airline sustainability reports and sustainability sections from annual reports from 2022 (Reports A to F) and assessed how these strategies align with climate change theory (Romm, 2022), contingency theory (Luthans & Stewart, 1977; Donaldson, 2001) and competitive advantage theory (Porter 1985; 1990). Data collected from interviews can be seen in Appendix 4. Interview data (Author´s compilation) and data produced from content analysis can be found in Appendix 5. Content analysis data (Author´s compilation).

4.1 Theme 1: CO2 emissions reduction

Theme 1 was discovering initiatives related to CO2 emissions reduction. The objective of this analysis section was to evaluate innovative approaches adopted or planned by European airlines to reduce their CO2 emissions. The analysis considered insights from airline expert interviews (Interviews A to D) and information from airline sustainability reports and sustainability sections from annual reports from 2022 (Reports A to F) and assessed how these strategies align with EU regulations, climate change theory and global warming concerns addressed in the beginning of this thesis.

In the interview question 1, participants were asked to share insights on innovative approaches that airlines could adopt to effectively reduce their CO2 emissions. Findings were classified to categories that were identified during this analysis as SAF, hydrogen technology, recycling initiatives, weight reduction, biomimicry, SUP (Single-use-plastic) reduction and collaboration efforts.

SAF (Sustainable Aviation Fuels) as Report A mentioned that KLM and Air France signed multi-year contracts for sustainable aviation fuels (SAF) to cover a significant portion of their fuel needs, whereas sustainability Report F mentioned that Ryanair has founded a Sustainable Aviation Research centre (Trinity College Dublin) for further exploring the possibilities of using SAF. Report C announced first alcohol-to-jet (ATJ) commercial plant investment for SAF production with LanzaJet. These strategies focused on reducing CO2

emissions by increasing SAF usage and contribute to EU target to increase SAF usage by 2030 as introduced earlier in this thesis.

Hydrogen technology as Report B and Report C discussed the investments in hydrogen aircraft and partnerships with Rolls-Royce, Airbus and Zero Avia for hydrogen combustion engine technology. This highlighted the airline industry's efforts to explore hydrogen as a clean aviation fuel for reaching EU Net Zero by 2050 target as mentioned in Interview C.

Recycling initiatives were mentioned in Report F as an initiative to recycle aircraft tires together with partner Michelin, contributing to environmental sustainability. This approach aims to reduce waste and environmental impact. Reports B and C also mentioned in-flight recycling activities. All interviews (A to D) mentioned initiatives contributing to circular economy principles whether concerning waste management or food waste as discussed this thesis within sustainable business models.

Weight reduction was mentioned in Interview B as weight reduction initiatives in the cabin and network optimization. This strategy implied optimizing aircraft design for fuel efficiency and reducing weight. These strategies focused on reducing CO2 emissions by decreasing fuel burn and contributing to climate change actions taken by the airline.

Biomimicry was mentioned in Report D that introduced fuel-saving surface technology AeroSHARK (Aeroshark, n.d.), a shark skin-imitation of surface film that is applied to aircraft fuselage reducing drag and improving fuel efficiency of the aircraft as also mentioned in Interviews A and D. This technological innovation improves aerodynamics, reduces fuel consumption and follows the principles of biomimicry that is inspired by nature as introduced earlier in this thesis.

Plastic reduction was discovered in Report E as one of the airline's efforts to stop using non-recyclable plastic, cut single-use plastic by 30%, and implementing pre-order to reduce food waste. Interview C and D also pointed out the importance of plastic reduction. These initiatives focused on reducing environmental impact through reduced plastic usage and food waste contributing to circular economy principles mentioned in thesis.

Collaborations were mentioned in Report B as important partnerships with Rolls-Royce and Airbus for carbon removal technology development. This collaborative approach seeks to accelerate technological innovations to reduce emissions and meet EU Net Zero target by

2050. The importance of partnerships was discussed in this thesis as part of sustainable business model development.

Thematic analysis conducted from question 1 identifies that SAF adoption and hydrogen technology emerged as significant themes in the airline industry's efforts to reduce CO2 emissions. These strategies were seen in reports A, B, and C as well as mentioned in all interviews (A to D) indicating a consistent focus on sustainable fuel (SAF) increase in order to meet 2030 targets and technological development (hydrogen and electric aircraft) in order to achieve carbon neutrality by 2050.

Interview question 2 was asking participants perspectives on the most challenging barriers that airlines face when it comes to achieving significant reductions in CO2 emissions. Following categories were formed based on participant´s answers and sustainability report data: technological limitations, EU regulations and taxes as well as SAF limitations.

Technological limitation were mentioned in all Interviews from A to D and all Reports (A, B, C, D, E, F). The aviation industry faces technological limitations as all currently available aircraft types operate with fossil based jet fuel. Therefore, many airlines are in process of developing more fuel-efficient ways to fly and operate current aircraft in order to reduce CO2 emissions. According to Interviews A and D, from current aircraft types Airbus Neo series is highlighted as a significant advancement in aircraft technology, reducing CO2 emissions by 15%.

EU regulations and taxes were mentioned in all Reports (A, B, C, D, E, F). European Union regulations and taxes can create additional financial burdens and regulatory hurdles for airlines trying to reduce their CO2 emissions. As mentioned in interview A, European Union sanctions polluters instead of rewarding and encouraging airlines that have successfully managed to cut their CO2 emission and contributed to fighting climate change.

SAF limitations due to hight price and availability were seen as major issues as mentioned in all Interviews from A to C, and all Reports (A, B, C, D, E, F), currently being the major barrier in short term for airlines in increasing SAF usage by 2030 as directed by European Union. As stated in all Interviews (A to D), the increase of SAF usage that is many times more expensive than fossil jet fuel, will also reflect to air ticket prices and therefore can negatively impact the customer demand in the whole airline industry.

Key Insights from Q2 in thematic content analysis revealed that multiple sources and airline experts agree on the primary challenges in reducing CO2 emissions. These challenges included technological limitations, EU regulations and taxes and SAF limitations due to high price and availability. The need for advancements in aircraft technology and efficiency is also emphasized as a requirement to achieve carbon neutrality by 2050.

Interview question 3 was asking the participants to provide examples of specific initiatives or projects that their organization was currently undertaking or planning to take in order to lower CO2 emissions. Findings made based on the answers and data obtained, could be categorised to fleet renewal, operational efficiency, SAF, flight optimization, technological advancements, renewable energy and carbon offset programs.

Fleet renewal was mentioned in all Interviews from A and D and in all Reports from A to F. Renewing the aircraft fleet with more fuel-efficient and less carbon-intensive models is a common initiative among airline organizations to reduce their CO2 emissions.

Operational efficiency was also mentioned in all Interviews (A to D) and Report A, Report B, Report D. Improving operational efficiency by optimizing flight procedures, load factors, navigation technologies and air traffic control system harmonisation known as SES (Single European Sky) initiative were emphasized as initiatives that can considerably reduce fuel consumption and emissions by optimizing airspace capacity and reducing flight delays with estimated impact of 10% reduction in CO2 emissions.

SAF was mentioned in Interview A, Report A, Report B, Report E, Report F. Increasing the use of SAF, a more environmentally friendly alternative to traditional aviation fuel, is a key initiative to lower CO2 emissions and as pointed out in interview C, the airlines are eagerly acquiring SAF and every drop of SAF produced in the world is consumed by the airlines.

Flight optimization was mentioned in Interview B and Report D. Initiatives included optimizing flight routes, speeds, and procedures to minimize fuel consumption and emissions. According to interview B, the opportunity to reduce fuel burn in optimal flight conditions (horizontal and vertical flight profiles) was explored and up to 16% less fuel consumption was achieved.

Technological advancements were mentioned in Interview B, Report B and Report F. Airline organizations are investing in new technologies for traffic management (up to 10% emission reduction) and acquiring advanced navigation systems as referred in Interview A for

deployment of AI based navigation system. More fuel-efficient aircraft was seen as a solution to address reduction of CO2 emissions as mentioned in all Interviews (A to D) and all Reports (A to F).

Renewable energy and sustainability practices were found in Report C. Organizations are incorporating sustainability practices, such as using renewable energy, offering vegan menus, reducing food waste, and implementing recycling measures. Also, renewable energy and green transportation methods to office and back were mentioned in Interview A.

Carbon offset programs were introduced in Report C and Report F. Carbon offsetting programs were being offered to passengers, allowing them to offset their emissions through verified offset schemes although Interviews A, B and D point out that carbon reduction should be in focus rather than compensation programs.

Thematic content analysis from question 3 revealed that airline companies are committed to reducing CO2 emissions by implementing a combination of initiatives like fleet renewal, increasing operational efficiency, and use of SAF. These were commonly applied strategies in lowering CO2 emissions and contributing to climate change. Initiatives included optimizing flight routes and procedures, investments in advanced technology and integrating sustainability practices. Carbon offset programs were being employed to engage passengers in emissions reduction efforts to meet European Union regulations as well as in cases where emissions cannot be reduced in any other way than compensating them.

The interview question 4 was enquiring organizational approach in the evaluation of the environmental impact of its initiatives aimed at CO2 reduction and additionally asking for any particular metrics or indicators that the organization is prioritizing related to this. Based on the answers received and data obtained, following categorized were identified: emission reduction targets, environmental impact evaluation, metrics and indicators.

Emissions reduction targets were mentioned as approaches in Interview A and B. Airline organizations set specific emissions reduction targets and target dates as mentioned in all Reports (A to F), measure and report the progress by using reporting methods commonly applied in the airline industry.

Environmental impact evaluation was discussed in all Interviews from A and D and found in all Reports (A, B, C, D, E, F). It was discovered that airline organizations use various tools, standards and initiatives to evaluate the environmental impact of their CO2 reduction efforts.

The amount of different sustainability rating agencies, reporting frameworks and reporting methodologies used by the airlines indicated to lack of standardization and suitability of sustainability reporting to airline industry. According to Interviews C and D also the external demand for different sustainability reports contributed to the vast and various amount of sustainability reports that the airlines are currently producing.

Metrics and indicators could be seen in all Reports (A, B, C, D, E, F) and mentioned in Interviews A to D. Specific metrics and indicators, often associated with third-party organizations, were used to assess the impact of CO2 reduction initiatives like CDP (Carbon Disclosure Project), SBTi (Science Based Targets), ICAO Chapter 4 (noise reduction), UNFCCC (Climate Neutral Now), CHOOSE (UN & Gold Standard), Fit for 55 (EU target to reduce emissions 55% by 2030) etc. as listed in Reports A to F. All European airlines introduced in this research were applying CDP rating as a global sustainability evaluation of the airline or airline group. The actual CDP scores can be seen in Appendix 5. Content analysis data.

Question 4 thematic content analysis revealed several key insights such as: airline organizations have set emissions reduction targets to reduce their CO2 emissions by specific percentages by certain years and these targets vary by airline company although most are following regulations from EU and initiatives from UN and IATA as introduced earlier in this thesis. The most commonly referred target by all airlines is EU carbon neutrality by 2050.

4.2 Theme 2: Sustainable organizational development

Theme 2 was exploring sustainable organizational development. This section was examining how sustainability requirements affect European airline organizations creating the need for sustainable transformation. Organizational development and adaptation needs were reviewed from external pressure perspective forcing the airline companies to improve their organizational sustainability. The analysis consisted of insights gathered from airline expert interviews (Interviews A, B, C and D) and data obtained from airline sustainability reports (Reports A, B, C, D, E and F). Based on the findings, it was further assessed on how these strategies align with contingency theory (Luthans & Stward, 1977; Donaldson, 2001) and SBMC-EA tool introduced earlier in this thesis, contributing to sustainable transformation process of European airlines.

Interview question 5 was requesting the participants to elaborate on any collaborative efforts or partnerships that their organization has engaged with to improve sustainability. Findings

were categorized to partnerships in SAF, waste reduction, collaboration with start-ups, NGOs (Non-Profit Organizations) and technology collaborations.

Partnerships for SAF were mentioned in Report A, Report B, Report C, Report D, Report E and Report F and Interviews A, B, C and D. Partnerships with various organizations, including SAF producers and suppliers, to enable the use of sustainable aviation fuels now and in the future. Partnerships for waste reduction were mentioned in Interview A and D. Reports A and Report D also mentioned collaboration with airports, waste management, and ground operation partners as significant in reducing emissions and promoting sustainable practises.

Collaboration with start-ups has been discussed in Interviews B and D and mentioned in all Reports from A to F. All of the European airlines are collaboration with innovative start-ups to explore sustainability solutions mainly in fields of new technology and SAF production. Partnerships with NGOs are mentioned in Interview D, Report C, Report E and Report F. Partnerships with organizations like UNICEF, Save the Children, and offsetting initiatives to address environmental and social aspects of sustainability. Technology collaborations are mentioned in Report B, Report C. Collaboration with technology providers, including aircraft manufacturers and software companies were seen to enhance airlines´ sustainability efforts.

Based on thematic content analysis performed on question 5 findings, following insights could be highlighted. Collaboration within the aviation industry plays a vital role in improving sustainability in airline organizations. Collaborative efforts involve variety of partners, including technology providers, start-ups, NGOs (Non-Profit Organizations), suppliers and SAF providers. These collaborations can be seen in areas such as aircraft efficiency, waste reduction, sustainability practices and technological advancements. These findings support the application of contingency theory (Donaldson, 2001) supporting the airline organizations´ ability to develop their organizations with the help of partnerships to comply with the new environment shaped by constantly changing and increasing sustainability requirements. Importance of partnerships in increasing airline eco-system´s sustainability as also introduced earlier in this thesis within the SBMC-EA model.

Interview question 6 was asking the participants to identify ways that sustainability manifests in their organization and its operations, both internally and externally. It was noted that this question only produced valid data from Interviews A and D as internal practises are rarely described in airline sustainability reports. Categories based on the data collected, can be

identified as following: energy efficiency and green energy, electric vehicle adoption, sustainable transport and internal sustainability.

Energy efficiency and green energy were pointed out and according to Interview A, the airline is using green energy sources and ensuring the energy efficiency of the office within the airport. Electric vehicle adoption was mentioned in Interview A, among initiatives such as increasing charging stations at the office parking and electrifying the company's car fleet that contributes to organizations overall CO2 emissions reductions. The airline is promoting sustainable transport options as mentioned in Interview A, using green transport for commuting to and from the airport by train or bus powered with clean energy. These initiatives promote the use of green transport for commuting company employees as well as transport to and from the airport.

Airline organizations´ internal sustainability efforts were discussed in Interview D, highlighting the importance of increasing sustainability awareness of the company´s employees by educating and training the airline organization personnel. The responsibility for these falls on the sustainability team that is also overseeing sustainability strategy from the airline group´s perspective and harmonizing sustainability initiatives within the airlines in the group.

According to thematic analysis, following insights could be identified: the airline organization demonstrates a strong commitment to sustainability by implementing various practices related to energy efficiency, electric vehicle adoption, sustainable commuting and internal sustainability. These efforts contribute to reducing the organization's environmental impact both internally and externally and these initiatives highlight specific ways in which sustainability is manifested in the airline organization's daily operations, both internally and externally covering energy usage, transportation, green initiatives and internal sustainability awareness. These initiatives are result of airline organization´s efforts to be seen and to act sustainable way by developing its ways of working accordingly as mentioned in contingency theory (Donaldson, 2001) as one of the strategies on how organization can adapt to changes in its environment. Many of these initiatives are also included in sustainable business model canvas (SBMC-EA) presented earlier in this thesis.

Question 7 was asking participants to elaborate on any ongoing or planned sustainability actions that their organization is involved in, also enquiring how these actions align with their organization's broader mission and vision. Findings made, could be categorised to operational efficiency, sustainability vision and zero carbon flying.

Operational efficiency was pointed out in Interview A, there is an ongoing project to investigate Google AI software for aircraft route optimization, with the aim of improving operational efficiency, reducing fuel consumption, and increasing sustainable aviation fuel (SAF) usage. Improving aircraft navigation system could also be found in Report E.

Sustainability vision´s importance was highlighted in Report A, Report B, Report C and Report D. Airline organizations express their sustainability vision and ambition to become sustainability leaders in the aviation industry. Interview D highlights that sustainability is one of the strategic pillars of the airline group demonstrating high commitment to sustainable values. The emphasis of these commitments is in long-term value, sustainability and societal contributions.

Zero carbon flying was mentioned in all Reports (A to F) and Interviews (A to D) emphasizing airline industry´s ambition to achieve zero carbon flying by 2050. This ambition was also mentioned in reference to addressing climate change, including operational efficiency improvements, increase of SAF usage, technology advancements and supporting EU climate targets by following closely the evolving rules and regulations.

Based on the key Insights found through thematic content analysis, it could be noted that airline organizations are actively engaged in sustainability initiatives that align with their mission and vision as introduced within SBMC-EA sustainable value proposition. Majority of the efforts are focusing on operational improvements, flight route optimization and the increased use of SAF. The ambition to become a leader in sustainable aviation is evident in most of the reports, although it can be noted that most of the low-cost carriers have not included sustainability as part of the company vision.

Question 8 was inquiring about sustainability regulations that from participants´ point of view are most critically affecting their organization and the broader airline industry like regulations and initiatives coming from EU, IATA and ICAO. Based on the interview and content analysis data, following categories could be identified: EU regulations, global environmental agreements, regulatory bodies and frameworks, UN Sustainable Development Goals (SDGs) and organizational commitments.

EU regulations were mentioned in Interviews A to D and Reports A to F and identified as the strictest for European airlines to follow. This refers to rules, regulations and initiatives introduced by the European Union (EU), such as EU carbon neutrality by 2050 (EGD), EU Taxonomy, ETS (Emission Trading System), upcoming CSRD, EU Fit for 55 (55% emission

reduction by 2030), SAF increase 10% by 2030. Global environmental agreements include commitments like the Paris Agreement and CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) from UN body ICAO. EU Regulations are described in Interview A: "EU makes strictest regulations concerning airlines in Europe like EU taxonomy. Financial punishment doesn't support decarbonizing and ETS (Emission Trading System) compliance.”. As mentioned in Interview B: "EU regulations are becoming stricter and include sanctions." While, Interview C states that: "Currently EU have the strictest sustainability rules and regulations although the other regions tend to follow the example of Europe.".

Regulatory bodies and frameworks included various regulatory bodies, frameworks, and reporting standards, such as CSRD (Corporate Sustainability Reporting Directive), IENVA (IATA Environmental Assessment), GRI (Global Reporting Initiative), and many others that could be found from Reports A to F. Regulatory bodies and frameworks were mentioned in all Interviews (A to D) and Reports (A to F), with various specific regulatory bodies, reporting standards and frameworks listed.

UN Sustainable Development Goals (SDGs) were included by majority of the European airlines and specific goals and commitments were highlighted in Reports B, C, D, E and F. UN SDGs were introduced earlier in this thesis. Organizational commitments related to sustainability were mentioned in Interviews A and D as well as Reports B, C and D. Specific SDG goals are mentioned in Report D: UN SDGS (3, 4, 7, 8, 9, 10, 12, 13, 16, 17). Report E: UN SDGs (1, 8, 13, 17) and Report F stating commitment to all UN SDGS.

Organizational commitments and initiatives were mentioned in Interview D and Report C, according to which these initiatives were identified as IENVA, GRI, CoC (Code of Conduct), SCoC (Supplier Code of Conduct), CSR, and others. Report D indicated organizational commitments like CoC, SCoC and involvement in various sustainability development collaborations and organizations.

Thematic analysis performed on question 8 key insights highlighted that EU regulations are strict and central followed by all European airlines, whereas global agreements are crucial for airline industry´s environmental responsibility. Compliance with regulatory standards is pivotal and UN Sustainable Development Goals (SDGs) commitments are mentioned either selectively or mentioned as overall commitment by most of the European airlines. Airlines´ active engagement in sustainability initiatives was emphasizing the significance of compliance, global commitments, regulatory frameworks, and organizational engagement in the evolving landscape of sustainability regulations which were seen as restrictive but also

creating opportunity to demonstrate airline company´s commitment to more sustainable future.

Interview question 9 was asking how participant´s organization comply to sustainability certifications and to which ones. Findings based on interviews and content analysis data indicated that only one category could be identified for sustainability certifications and differences can be noted through different certifications applied by airlines, such as ISO, IENVA and ESG.

As noted from Reports (A to F), ESG rating concerns all European airlines, most apply ISO standards and some have already adopted IENVA as mentioned in Reports B and C. Interview C explains the meaning of IENVA (IATA Environmental Management System) certification and its impact on the aviation industry's sustainability rating. Specifically Reports A, B, C, D, E, and F contribute to the theme of "Sustainability certifications" by mentioning various certifications, including ISO 14001, ISO 45001, ISO 9001, IATA IENVA and ESG ratings.

According to thematic analysis, sustainability certifications category reveals the sustainability certifications that the airline organizations comply with, including ISO standards, IATA Environmental Assessment (IENVA), and ESG (Environmental, Social and Governance) ratings. Airline organizations actively comply with a range of sustainability certifications and ratings, reinforcing their commitment to sustainable organizational development and showing transparency in their sustainability practises by implementing external certifications.

4.3 Theme 3: Competitive advantage

Theme 3 was investigating if sustainability initiatives could create competitive advantage to airlines? This section of the analysis aimed to find out whether European airlines can create competitive advantage with their sustainability initiatives and if there were existing examples available. The analysis considered insights from airline expert interviews (Interviews A to D) and data obtained through content analysis performed on airline sustainability reports and sustainability sections from 2022 annual reports (Reports A to F). Findings were assessed and investigated on how the chosen strategies and initiatives align with competitive advantage theory and suggestions made in SBMC-EA earlier in this thesis.

Question 10 was asking participant´s point of view on how their organization is leveraging sustainability initiatives in order to create competitive advantage and if there are any

examples available where sustainable practices have positively impacted their organization's brand image or reputation. Based on the interviews and content analysis, following initiatives could be seen as creating competitive advantage to an airline: green fares and emission offset, sustainable flight planning applications, air travel, sustainability, low fares and sustainability leadership.

Green fares and emission offset were mentioned in Interviews A and D. The organization offers green fares, allowing passengers to offset 100% of emissions within six months of purchase through third-party program. This initiative aligns with chosen sustainability strategy and creates competitive advantage comparing to airlines not offering green fares or possibilities for customers to offset their carbon footprint.

Sustainable flight planning applications were mentioned in Interviews A and B and Report E. The airline organization utilizes a flight planning application to find the most sustainable flight routes optimizing fuel usage while creating competitive advantage. Also, interview C highlights the importance of fuel saving efforts as they consequently save costs for the airline in terms of less jet fuel consumed and contribute to emissions reduction.

Air travel as transport method was pointed out as competitive advantage within different transport industries according to Interview C. Air travel itself is considered to have a competitive advantage over other transport modes due to its safety, speed, and affordability. Airline industry is actively working on improving its sustainability while maintaining this competitive edge.

Sustainability was mentioned in Report B and Interview D. The airline organization prioritizes sustainability and communicates its sustainability commitments and ambition to become a leader in this area, recognizing the significance of sustainability as a key purchase driver in the future. Interview D points out that if airline does not consider sustainability right now, it will not be profitable in the future.

Low fares and sustainability leadership were mentioned in Report F. Airline organization's competitive advantage is reflected in its lowest fares, non-substitutable routes and high sustainability ratings, positioning it as a leader in Europe and globally.

The thematic content analysis revealed several key insights related to question 10. Airline organizations leverage sustainability initiatives to create competitive advantages, with a focus on green fares, sustainable flight planning, and the advantages of air travel as

transport method. It´s been recognized that sustainability actions can positively impact airline´s brand image and reputation when communicated truthful and transparent ways. Sustainability is also acknowledged as a significant factor as a future purchase driver for airlines´ customers, while also decreasing flight shaming impacts.

Question 11 was asking the participants to evaluate the efficiency of marketing and communication regarding the organization's commitment to sustainability and the resonance with stakeholders. Based on interview and content analysis findings, following categories could be identified: efficiency and transparency, external pressure, lack of best practises and alternative communication methods.

Efficiency of sustainability marketing and communication was mentioned in Interviews A, B and D. The challenges and risks associated with communicating sustainability efforts, emphasizing the importance of transparency and avoiding greenwashing stamp. According to Interview D there are opportunities in communicating airline´s sustainability efforts to customers and stakeholders in transparent and truthful way.

External pressure was discussed in Interview B. The external pressures comes from airline´s stakeholders, government, and customers and there is a clear need to communicate about sustainability actions of the airline. Interview D is highlighting the fact that also no external communication can be harmful for airlines and therefore the potential damages of communicating or not communicating should be considered carefully.

Lack of best practises was highlighted in Interview C. The lack of best practises and good examples of successful airline sustainability communication and marketing are not seen currently. The airline industry in Europe and all over the world is suffering from greenwashing accusations concerning their sustainability communication and marketing, leading to caution in all sustainability related communication.

Alternative communication methods like announcing airline´s own ´Climate Action Plan´ were discovered from Report A. This demonstrates airline organization's commitment to sustainability and its efforts to be more transparent about climate actions with the help of publishing the ´Climate Action Plan´. Another example is mentioned in Report B:´ Net Zero Roadmap´ and the launch of a ´Net Zero Roadmap´ is considered as an important step towards more open communication about airline´s sustainability efforts. Investor days were held as a forum to communicate about airline´s sustainability efforts as mentioned in Report C, where the airline is hosting an ´Environmental, Social, and Governance (ESG) Day´ for

investors in 2022. Report D highlights ´Make Change Fly´ marketing campaign, with the goal of showcasing airlines´ sustainability commitments and initiatives around the world.

The thematic content analysis performed on question 11 findings, revealed several key insights. Sustainability communication is viewed as challenging due to the risk of greenwashing, emphasizing the need for transparency and truthful communication based on real sustainability actions by the airline. External pressure, especially from stakeholders, government, and customers, plays a crucial role in driving effective sustainability communication. Although there are limited examples currently available of successful sustainability marketing and communication activities in the airline industry, some examples could be provided.

Question 12 was an open question to interview participants inquiring any additional comments or ideas that they´d like to share within this research topic. In content analysis, findings were made based on additional information that was found to complement the data found within the actual interview question topics. Any additional topics observed from the interviews and discovered from sustainability reports were categorized as: non-CO2 emissions, collaboration and stakeholder involvement, safety and environmental sustainability, and disadvantages of EU regulations.

Non-CO2 emissions and the way they are calculated was pointed out in Interviews A and D. The growing importance of non-CO2 emissions was mentioned in Interview A, as non-CO2 emissions like contrails, are a hot topic in the airline industry currently as their impact on global warming is emphasized. It is noted that these emissions should be included in the calculations of total emissions produced and there is an ongoing EU investigation to clarify this matter within the European Union (European Commission, 2020).

Collaboration and stakeholder involvement in order to achieve carbon neutral flying was mentioned in Interview B and D. In order for the airline industry to achieve carbon neutral flying, there should be a collaboration between investors, governments, and the European Union. This collaborative effort is seen as essential to reaching sustainability targets. Also, customer contribution to airlines´ sustainability in terms of carbon offsetting and SAF purchase possibilities work as enablers of future greener flying as mentioned in Interview D.

Safety and environmental sustainability were mentioned as priorities according to Interview C. Safety is highlighted as the most important aspect of the aviation industry and it is emphasized that safety underpins operations for the future and guides the path to

environmental sustainability. Governments are encouraged to support airlines in reducing CO2 emissions, particularly by enabling the increased use of SAF with sufficient production quantities and even distribution within the European Union.

EU regulations were seen as negatively impacting competitiveness of European airlines. Decarbonization efforts such as EU mandates for increasing SAF usage were mentioned in Report A. European Union mandates blending of SAF in all airlines departing from European Union airports, with a specific timeline for increasing the percentage of SAF use. These mandates are seen as an important step in decarbonizing the aviation industry and heavily affecting European airlines. Additionally, carbon pricing is mentioned in Report F as aviation taxes are seen as factors that make air travel more expensive for customers, creating potential disadvantage to European airlines who compete against global players with less strict and non-sanctioning sustainability regulations.

The thematic content analysis revealed several key insights such as: non-CO2 emissions, including those from contrails, are gaining attention in the airline industry, with calls for their inclusion in total emissions calculations. Collaboration between investors, governments, and the EU is considered essential for achieving NetZero emissions in the airline industry. Safety is a top priority in the aviation industry, and it is seen as a foundational element for achieving environmental sustainability goals. EU regulations, particularly mandates for SAF blending and carbon pricing, play a significant role in the industry's decarbonization efforts but can also impact customer demand and favour non-European airlines in this competitive landscape.

4.4 Key insights and results

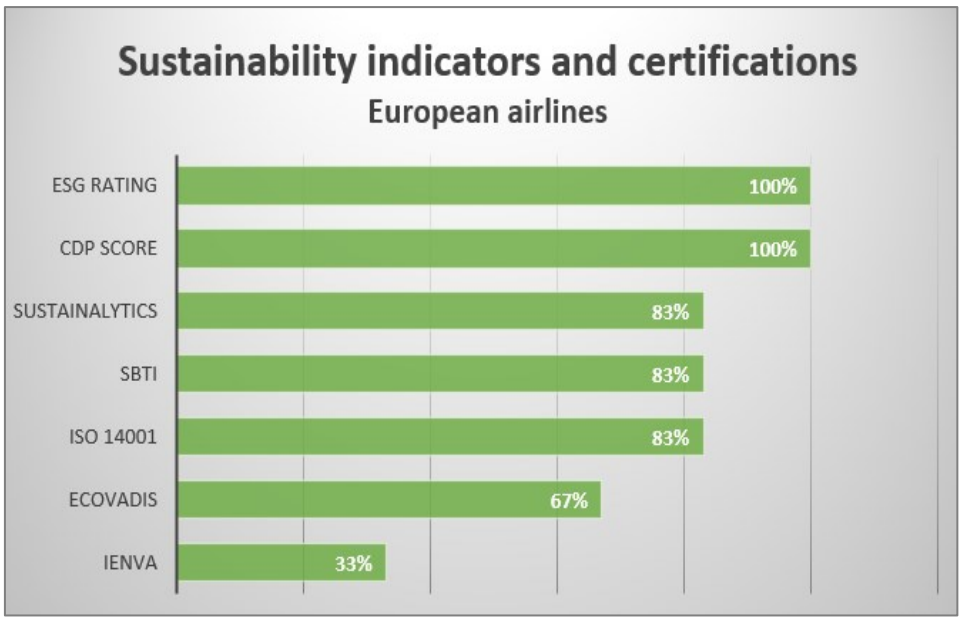
Theme 1 was concentrating in CO2 emissions reduction including topics from innovative approaches, challenges and barriers, project and initiatives, sustainability metrics and indicators. Based on the answers obtained from qualitative expert interviews (Interviews A to D) and content analysis performed on airline sustainability reports (Reports A to F), following emerging categories and key insights could be identified.

Innovative approaches and initiatives included investments and partnering with SAF producers, investing in hydrogen technology, increasing recycling initiatives, weight reduction (flights), biomimicry innovations, Single-Use Plastic (SUP) reduction and collaboration efforts to increase sustainability.

Challenges and barriers were caused by technological limitations (fossil fuel aircraft), EU regulations and taxes (sanctions), SAF limitations (availability and price). Current sustainability initiatives were identified as fleet renewal, improving airline´s operational efficiency, increasing SAF usage, flight optimization, technological advancements, choosing renewable energy, following sustainability practices and leveraging carbon offset programs.

Evaluating environmental impact through external sustainability indicators and certifications to demonstrate airline´s commitment to sustainability were widely applied across European airlines. Most commonly used sustainability indicators and certifications applied by European airlines are based on findings and frequencies detected from airline sustainability reports (A to F) as shown below in Figure 8.

Figure 8. Sustainability indicators and certifications, European airlines (Author´s compilation).



Given the broad range of sustainability metrics, indicators, and certifications in current use, Figure 8 helps to identify the most commonly used indicators and certifications by European airlines based on 2022 sustainability reporting (Reports A, B, C, D, E, F). Content analysis revealed following findings: all (100%) of European airlines included in this research were applying ESG rating and CDP (Carbon Disclosure Project) score to their operations (CDP, n.d.). Second most commonly used indicators (83%) were ISO 14001 certification (ISO, n.d.), SBTi (Science Based Targets for corporate climate action) that defines best practice in science-based target setting (SBTI, n.d.) and Sustainalytics providing sustainability ratings (Sustainalytics, n.d.). 67% of European airlines include EcoVadis rating for supply chain

sustainability (Ecovadis, n.d.) and 33% IENVA (IATA Environmental Assessment for airlines) certification (IENVA, n.d.).

EU Emission Trading System (ETS) could have been included in this chart as it was mentioned in all Reports (A to F) but it was excluded as it clearly concerns all European airlines, making polluters to purchase ETS allowances for compensation and therefore, it is not seen as sustainability initiative or indicator (European Commission, n.d.-g).

Insights from Theme 1 demonstrated initiatives, challenges, opportunities and strategies related to reducing CO2 emissions in the airline industry as introduced in the research question. Based on the findings made related to CO emissions reduction in European airlines, it can be stated that in all mentioned strategies, initiatives and reporting practises identified in questions Q1 to Q4, align with climate change theory and mitigate global warming. The adoption of sustainable aviation fuels, weight reduction, recycling, and technology innovations were in line with the industry's ambition to fight climate change and achieve EU regulatory CO2 emission targets.

Theme 2 was focused on sustainable organizational development including topics such as partnerships, sustainability practises, sustainability in company values, sustainability regulations and initiatives and sustainability certifications. Based on the answers obtained from qualitative expert interviews (Interviews A to D) and content analysis from sustainability reports (Reports A to F), following categories represented the main themes and strategies identified from the data produced within this research.

Collaborative efforts and partnerships were identified as partnerships for SAF, partnerships for waste reduction, collaboration with start-ups and partnering with NGOs (Non-profit organizations) and technology collaborations. Manifestation of sustainability: improving energy efficiency and choosing green energy, electric vehicle adoption, sustainable transport options made available and internal sustainability improvements (sustainability team, education, awareness). Ongoing and planned sustainability initiatives such as increasing airline´s operational and organizational efficiency, including sustainability in company vision and commitments to zero carbon flying by 2050.

Sustainability regulations such as the EU regulations, global environmental agreements, regulatory bodies and frameworks, organizational commitments and application of sustainability certifications were detected. Sustainability certifications were seen as providing clarity within the complex and diverse landscape of sustainability rules, regulations and

initiatives that European airlines must navigate to identify the most suitable options for their needs. Sustainability commitments made by European airlines are based on findings and frequencies detected from airline sustainability reports (A to F) as seen in Figure 9 below.

Figure 9. Sustainability commitments, European airlines (Author´s compilation).

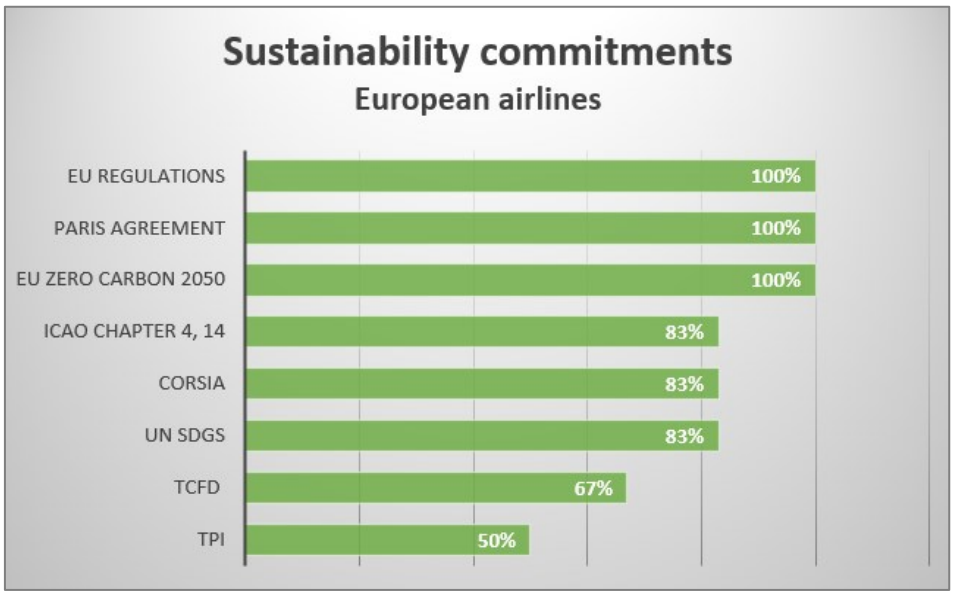


Figure 9 shows sustainability commitments made by European airlines based on 2022 sustainability reporting (Reports A to F). It can be seen that all European airlines (100%) have committed to the Paris Agreement, EU zero carbon emissions target by 2050 and EU regulations such as GDPR, GRI, EU taxonomy and CSRD. Secondly, 83% of airlines have committed to Unites Nations SDG´s, ICAO Chapters 4 and 14 (noise reduction) and whole CORSIA scheme as introduced earlier in this thesis. TCFD (Task Force on Climate-Related Financial Disclosures) framework that helps organizations to disclose climate-related risks (TCFD, n.d.) have been adopted by 67% of European airlines and TPI (Transformation Pathway initiative) by 50% of the airlines included in this study.

Key insights from Theme 2 contributed to the organizational development part of the research question. Findings were related to sustainable internal and external organizational development practises, adjustments and highlighting the importance of sustainability considerations in airline organization resulting in various commitments to EU regulations, airline industry organization initiatives and compliance with sustainability certifications. These findings can be interpreted in the light of contingency theory and reflected in the SBDM-EA model.

Theme 3 was exploring whether competitive advantage can be created with sustainability initiatives. Topics in this section included competitive advantage examples related to sustainability initiatives, sustainability marketing and communication. The interview question number 12 was used to record observations made during the interviews and additional remarks made from sustainability reports during content analysis. Based on the interview data retrieved from qualitative expert interviews (Interviews A to D) and content analysis from sustainability reports (Reports A to F), following categories and key insights were identified.

Sustainability initiatives that created competitive advantage were identified as following: introducing green fares and carbon offset schemes to customers, implementing sustainable flight planning applications, focusing in airline organization´s sustainability, becoming an industry leader both in low fares and sustainability. Air travel as a transport method was also seen creating competitive advantage due to its safety, speed, affordable price and increasing sustainability compared to other modes of transport.

Sustainability marketing and communication was found important but noted that it must be truthful and transparent reflecting the real sustainability actions taken by the airline. External pressure forces the airlines to communicate about their sustainability efforts regardless of the lacking best practices (no good examples, many greenwashing accusations) and alternative communication methods that could be considered in reaching different stakeholders such as partners, investors and customers (websites, newsletters, conferences, events, media).

Additional sustainability comments and ideas were observed during the interviews and content analysis. These observations included increasing attention to non-CO2 emissions, collaboration and stakeholder Involvement in emissions reduction initiatives, ensuring flight safety, increasing environmental sustainability and strict EU regulations creating competitive disadvantage to European airlines. The escalating scenario is leading to a need for more intense collaboration between the regulatory bodies and the airline industry in Europe to fortify the competitiveness of European airlines within the global business environment.

Theme 3 key insights represented the main themes and observations related to creating competitive advantage by providing insights into sustainability initiatives, marketing, and communication, as well as additional comments and ideas discovered within the research topic. These findings were reflected in the competitive advantage theory (Porter, 1985; 1990) and suggestions made in the SBDM-EA model.

In addressing the central research question of this master's thesis:” What are the initiatives, challenges, and opportunities in the sustainable transformation of European airlines, with emphasis on CO2 emissions reduction, organizational development, and competitive advantage?”. A comprehensive analysis was conducted and responses were derived from pre-identified themes (Themes 1 to 3) inherent in the research question. The emphasis was placed on distilling the most crucial findings related to initiatives, challenges, and opportunities that emerge during the ongoing sustainable transformation process within European airlines.

Majority of the current sustainability initiatives were primarily focused on reducing CO2 emissions, given it is the most significant issue requiring resolution. These initiatives included improving flight efficiency, developing navigation technologies for route optimization, investments in new more fuel efficient fleet, increasing SAF fuel usage and partnering with SAF producers and providers. There were also flight related sustainability initiatives ongoing like getting rid of SUP (single-use-plastic), improving waste management and recycling. From airline organization´s perspective partnerships were leveraged in technological development, research, collaboration with start-ups and NGOs, carbon offsetting, waste management, packaging and recycling, green ground transport and in green energy usage which were seen as vital parts in airlines´ ongoing sustainable transformation process. Initiatives from competitive advantage perspective included introduction of green fare ticket classes, carbon offset schemes and SAF purchase options for customers.

The main challenge lies in current aircraft technology which still relies on the use of fossil jet fuels, thereby contributing to CO2 emissions and climate change. Fossil jet fuel cannot be fully replaced but even proportional increase in SAF usage reduces CO2 emissions of a flight. Availability of SAF fuel was seen as current obstacle but also its high price that is considerably higher than fossil jet fuel reflecting to flight ticket prices. Airlines are struggling in finding the balance between increasing sustainability actions such as SAF usage without negatively affecting the customer demand. Additionally, European airlines found the strict CO2 reduction targets set by European Union to have a negative impact on their operations.

Challenges from organizational perspective arise when navigating the ever-evolving and expanding landscape of sustainability rules and regulations, including various sustainability indicators provided by external rating agencies and sustainability requirements from different external stakeholders and investors. There appeared to be lack of standardization in sustainability metrics within the airline industry, and therefore the airlines are producing various sustainability reports, ratings and scores.

The airline industry faces challenges due to external pressures, given its widely recognized status as one of the largest individual contributors to global pollution. Technology necessary for achieving fully carbon-neutral flying by 2050 is not yet available, and therefore there is no significant competitive advantage to be pursued through carbon-neutral flying targets. European airlines have also faced challenges related to misleading sustainability communication and marketing practices contributing to mistrust among airline customers regarding the genuine commitment of airlines to sustainability, further raising doubts about the authenticity of their sustainability efforts.

Opportunities within airline sustainability were found during the interviews and content analysis. Key opportunities and sustainability initiatives were identified as following: implementation of Single European Sky (SES) air traffic control system (ATM) that has potential of reducing CO2 emissions by 10%. Investments made in SAF production and development of hydrogen or electric aircraft technology may create competitive advantage in longer term and bring early adaptor benefits to airlines involved.

Several sustainability initiatives by European airlines were seen creating competitive advantage already today, such as pursuing sustainability leadership, including sustainability as part of company vision, increasing transparent and truthful sustainability communication and marketing, and engaging in sustainable transformation process in order to become more sustainable entity. Cooperative efforts with stakeholders and customers, pursuing sustainability leadership and making strategic investments in sustainability today, were seen as strategies having considerable potential in establishing long-term competitive advantage in sustainability.

Airlines found the collaboration between different parties, such as governments, regulatory bodies, stakeholders, investors and customers crucial, in supporting the airline industry to meet the sustainability targets set by European Union for years 2030 and 2050. Many airlines considered sustainability as an opportunity and competitive advantage that will impact the future customer´s buying behaviour. Therefore, many European airlines believe that sustainability investments made today will have a positive impact on customers' choices in the future when they choose an airline to travel with.

Research findings were also examined within the context of theoretical framework, incorporating theories related to climate change (Romm, 2022), organizational contingency (Luthans & Stward, 1977; Donaldson, 2001), competitive advantage (Porter 1985; 1990) and sustainable business models (SBMC-EA).

Climate change theory, particularly CO2 emissions where the airline industry stands out as a major individual contributor, resonates strongly with airline stakeholders and customers, creates flight shaming campaigns and generally portrays air travel as a significant threat to the future of this planet. There are currently technical limitations for airlines to become fully carbon-neutral today but regardless, there are numerous ongoing innovative projects, initiatives and investments made in new technology and SAF production in order for the airline industry to meet its 2050 carbon-neutrality targets. This demonstrates the airline industry's dedication and desire to evolve into a more sustainable, ultimately carbon-free travel option for its customers.

In terms of organizational development, the key concepts to be reflected against the research results are, the contingency leadership theory (Luthans & Stewart, 1977) that highlights the importance of leadership commitment and how it drives the organizational change. As seen in interviews (A to D) and reports (A to F), many airlines have defined sustainability as part of their company vision. This also means that sustainability commitments are part of the airline company´s future targets and in order to reach them, management support is needed. Sustainability is not a change project but it is a continuous organizational development process where today´s targets will be reached in 2050, meaning that there will be several airline management teams from today to year 2050 managing the sustainable transformation process. Therefore, it is extremely important to include sustainability as part of airline company´s vision to ensure the future management´s commitment to continue on the sustainable transformation path established today.

Secondly, contingency theory of organizations (Donaldson, 2001) appears to align with current sustainability rules, regulations and requirements that pressure the airline organizations to adopt to changes as well as develop their organizations and operations according to constantly evolving sustainability rules and regulations. External pressure emanates from regulatory bodies, aviation industry organizations, stakeholders, investors and customers. The airline has to find a balance between increasing its sustainability efforts without sacrificing its operational efficiency and profitability. The importance of organizational development while staying profitable is also highlighted in the theory of organizations (Donaldson, 2001).

The competitive advantage theory helps in analysing the sustainability initiatives already implemented by airlines and identifying areas where they perceive a competitive advantage has already been created. According to competitive advantage model (Porter, 1985) it can be identified that sustainability advantages would fall to the differentiation section in Porter´s

competitive advantage model rather than in cost leadership section due to investments and higher price of current means to increase airline sustainability.

When considering Porter´s (1990) competitive advantage creation strategies, it was stated that the early movers have the opportunity to gain advantages as first ones in the market. This could be reflected to sustainability efforts of airline industry where many airlines pursue sustainability leadership in order to be customer´s choice also in the future. This approach has significant potential in creating competitive advantage, even in cost leadership as early sustainability investments can often yield long-term monetization. Additionally, early mistakes made within sustainability initiatives have already been rectified, contributing to sustainability lessons learned.

Sustainable business models and tools, such as SBMC-EA provide suggestions and ideas on how to comprehensively examine sustainability of the whole airline eco-system and identify the areas requiring immediate development. Many of the sustainability elements introduced in this thesis, discussed during airline expert interviews (Interviews A to D) and discovered from content analysis performed on airline sustainability reports (Reports A to F), the findings indicate that utilizing tools such as SBMC-EA can provide additional benefits while establishing a solid foundation for the ongoing sustainable transformation of the airline organization.

5 Discussion and recommendations

In this chapter, key findings are summarized and the importance and relevance of this research for the airline industry is discussed. Contribution to existing literature is identified acknowledging the inherent limitations of this research while outlining the prospects for future research and finally proposing concrete recommendations based on the empirical findings of this research.

Based on the research findings it can be detected that majority of the current sustainability initiatives by the airlines are focusing on reducing CO2 emissions which notably is the most significant challenge to solve with current technology. Neither would any of the currently available sustainability practises fully solve the issue, only moderately reduce CO2 emissions by improving flight efficiency, renewing existing fleet and increasing SAF usage. Based on the research findings, there are many initiatives currently ongoing in this area. However, it is noteworthy that the impact of airlines on CO2 emissions reduction remains limited.

The other significant area for sustainability initiatives based on the research findings, were flight related actions like SUP (single-use-plastic) removal, waste management improvements and increase of recycling efforts. This is an area where there may be more opportunities to enhance airline sustainability since these goals are achievable and do not require advanced technology that is currently not available. These sustainability initiatives are also apparent to airline customers and may enhance the positive brand image of an airline when customers experience the airline´s sustainability efforts during their travel.

It has been noticed during this research that European airlines are leveraging various partnerships in technological development, research, start-ups, NGOs, carbon offsetting, waste management, packaging, recycling, green ground transport and in green energy usage. These partnerships support the airlines in implementation of their sustainability strategies as they complement airlines´ sustainability efforts, provide additional expertise and knowledge from the areas that airlines do not have sufficient expertise in. It has become evident during this research, that partnerships are crucial part of the ongoing sustainable transformation process of European airlines.

Findings related to challenges were declaring the current aircraft technology as the most significant obstacle for airline sustainability. Because of this barrier, airlines cannot become fully sustainable until the carbon-neutral aircraft technology is available. Airlines are directing their efforts towards reducing jet fuel consumption while increasing SAF usage but achieving the 2050 carbon neutrality target requires introducing new aircraft technologies like hydrogen or electric aircraft as the target will not be reachable with current sustainability initiatives.

Despite SAF usage increase that has been considered a pathway to achieve 2030 reduction targets, numerous challenges are detected concerning SAF availability and usage. Current aircraft is not able to fully utilize SAF and increasing SAF portion in the fuel mix directly affects the flight ticket prices due to considerably higher SAF price comparing to fossil jet fuel. Airlines need to find a balance between increasing SAF while still remaining profitable.

Findings related to sustainability opportunities include Single European Sky implementation, SAF investment in production and delivery, and investments in hydrogen aircraft technology. These opportunities are recognized for their potential to establish a long-term competitive advantage. Competitive advantage has been seen in initiatives such as in introduction of green fare classes, establishing carbon offsetting programs and making SAF purchase options available to airline customers.

The airlines have also become aware of the importance of sustainability communication and marketing, which have been identified as potential ways to create competitive advantage and improve airline´s sustainable brand image when communication is carried out in truthful and transparent ways. This is an area where airlines can make significant improvements in response to the recent surge of misleading sustainability marketing, that has often been perceived as greenwashing efforts by the airlines.

There are collaboration opportunities for airlines to improve their sustainability when working closer together with governments, regulatory bodies, stakeholders, investors and customers in order to reach sustainability targets set for 2030 and 2050. Many airlines see that sustainability investments made today are necessary in order to be profitable in the future. Including sustainability as part of airline company´s vision showcases the management commitment and enables continuation of organizational sustainability transformation also in the future. The future customers may prefer a more sustainable airline over a lower ticket price.

Previous research conducted by Johanssen and Zieba (2022) on global airline sustainability reporting created a foundation to reflect the research finding made from European Airlines related to sustainability rules and regulations applied in the European Union economical area. Similarities can be found and many of the sustainability reporting initiatives are globally similar to Europe. Sustainability reporting is discussed earlier in this thesis and within the research findings. An overview to European airline´s sustainability reporting is provided but no in-depth reporting initiatives are introduced. This research recognizes sustainability reporting, rules and regulations as driving forces compelling European airlines to act and develop their operations and organizations toward a more sustainable model that aligns with established sustainability reporting rules and requirements. This study build on the imperative need for airline sustainability reporting and explores the impact of constantly evolving and escalating sustainability requirements confronting European airlines. In doing so, this study contributes a European perspective to the existing literature.

In the research article by Baumeister and colleagues (2022) it was concluded that being environmentally responsible airline can generate more customer satisfaction, re-purchase, positive WOM (word of mouth), value for money, positive brand image and customer loyalty (Baumeister et al., 2022). These conclusions emerged from the research, revealing an ambition towards environmentally friendly airline brand image. Initiatives such as incorporating sustainability into the company´s vision, integrating it into the overall strategy, communicating it to customers and stakeholders, and setting targets to establish

sustainability leadership within the industry were discovered during this research aligning with the conclusions drawn in existing literature.

Consumer´s choice was examined in the research from Elkjaer (2021) from the airlines operating in the Danish market highlighting the importance of financial support and availability of bio fuels (SAF) usage for airlines affecting their competitive position. It was also noted that Denmark with the most aggressive emissions reduction target for airlines can be used as a benchmark when reflecting the challenges that the rest of the European countries will face in the near future. In this research similar findings were made in relation to SAF availability and its price affecting flight ticket prices and customer demand. By examining competitive advantage from the airline expert perspective through the interviews conducted, this research complemented the findings made in existing literature and contributed to more comprehensive understanding of the state of airline sustainability in Europe.

Previous research (Abdi et. al, 2020) was studying sustainability from ESG perspective and how it affects airline company value and attractiveness for investors. Research findings highlighted that sustainability actions created positive value but societal sustainability actions resonated negatively among the investors. This research did not concentrate on airline company value directly but it was observed during the research process. When examining the research findings through competitive advantage theoretical lens, it was discovered that European airlines believed that their sustainability efforts improve the airline company brand image and increase attractiveness towards investors and customers. This research aligns with the findings made in the existing literature regarding environmental and governance factors, while noting that societal aspect was not explored in-depth in this study.

The objective of this research was to form a comprehensive understanding of airline sustainability in Europe, exploring the initiatives airlines are taking in their ongoing sustainable transformation process including challenges and opportunities. After exploring the current initiatives, challenges and opportunities identified based on this research, recommendations were made based on sustainability strategies, initiatives, theories and tools introduced earlier in this thesis.

Throughout this study, the three themes (T1: CO2 emissions reductions, T2: organizational development and T3: competitive advantage) have been followed from the theoretical framework to research findings and analysis in order to present the obtained information in organized and structured manner. Themes can be seen as introduced within the thesis structure shown in Figure 3. Thesis structure: Cause-relationship effect.

This research combined data obtained through qualitative expert interviews and content analysis performed on airline sustainability reports in order to form a comprehensive overview with findings made from different data sources complementing each other. The author was satisfied with the quality and quantity of the data produced during this mixed method research. This data was of great worth in exploring such a wide and complex topic as airline sustainability in Europe. It was concluded in the research results section that initiatives, challenges and opportunities including the three themes of CO2 emissions reduction, organizational development and competitive advantage were successfully analysed and interpreted in this research.

Based on the research findings, it was concluded that this research can support individual European airlines as well as the whole airline industry in Europe in their ongoing sustainable transformation process and support the path towards a more sustainable airline. Current examples of airline sustainability strategies, initiatives and best practises are summarized and recommendations are given for airlines to utilize them in their sustainable transformation processes.

The key findings and the research results are summarized below in Figure 10. They encompass the initiatives, challenges, and opportunities encountered in the ongoing sustainable transformation of European airlines (left column) divided by the three themes (top row) in reducing CO2 emissions (Theme 1), developing airline organization´s sustainability (Theme 2) and creating competitive advantage (Theme 3).

Figure 10. Summary of the research results (Author´s compilation).

RESEARCH RESULTS	THEME 1 CO2 emissions	THEME 2 Organizational development	THEME 3 Competitive advantage
Initiatives	• Increase SAF usage • Flight efficiency & fleet renewal • New navigation technology	• Partnerships • Waste and recycling improvements, SUP removal, utilizing green energy • Carbon reduction vs. compensation	• Green fares and green ticket classes • Diverse carbon offset schemes • SAF purchase options for airline customers
Challenges	• Aircraft technology (fossil fuel) • SAF availability and high price • Strict CO2 reduction EU regulations (affecting competitiveness of European airlines)	• Evolving and escalating sustainability regulations (EU) • Diversity in sustainability reports (lack of standardization) • External Sustainability requirements from stakeholder and investors	• Polluter stigma of air travel (flight shaming) • Sustainability communication challenges (greenwashing) • Technology preventing substantial competitive advantage benefits from sustainability actions
Opportunities	• Single European Sky (SES) improvements in ATM systems • SAF investments in production and distribution • Investments in hydrogen aircraft development (ac manufacturers)	• Sustainability as part of airline company vision • Transparent sustainability communication & marketing • Sustainable transformation as part of organization´s strategy	• Cooperation with regulatory bodies, airline industry, stakeholders, investors and customers • Pursue sustainability leadership • Sustainability investments today, airline customers tomorrow

During the research process, it was found out that airline sustainability is such a wide issue that it rarely can be covered by a single sustainability expert from an airline, and therefore it is useful to include airline sustainability reporting in order to obtain more detailed information about sustainability practises of the airlines. Airline sustainability reports or sustainability sections in annual reports often consists of contributions from different departments in the airline organization and it is a collaboration effort rather than an individual contribution. The interviews provided valuable insights and sustainability practises inside the organizations that could not have been found from airline sustainability reports. The combination of mixed-method research combining different approaches that complement each other, was proven to be effective in this research.

During the research process, any significant or considerably contradicting point of views were not discovered. A slight difference was observed between airlines and airline industry interviewee´s perceptions regarding the prioritization of sustainability efforts of the airlines. It was noted that the airlines focus most of their sustainability efforts in reducing CO2 emissions where they have very little impact over due to technical limitations instead of concentrating on other sustainability initiatives that they could significantly improve already today. These initiatives include improvements in waste management, reducing SUP use, increasing recycling, mitigating environmental impact and decreasing aircraft noise during take-off and landing.

As a limitation related to the purpose of this thesis, it was highlighted that the intention was not to compare sustainability of European airlines. Comparisons were not made according to scores obtained through different sustainability rating agencies or number of certifications obtained by the airlines. The intent of this research was to objectively observe the findings without favouring any airline or airline group.

Regarding limitations related to research interviews, it was noted that the research resources were restricted to one researcher, and therefore the number of conducted in-depth interviews was not as high as if there had been multiple researchers involved. Limited number of interviews may have affected the validity and reliability of the research results, while the author acknowledges the conducted interviews sufficient and effective in serving the objectives of this this research.

Limitations related to content analysis were identified based on performing thematic content analysis on airline sustainability reports from 2022 relying heavily in interpretation of the author and how the author has decided to use the information available to serve the purpose

of this research. Data found from sustainability reports did not cover developments from 2023 since the reporting period ends in 2022. As an observation, airline sustainability reports are wide, including broad spectrum of different metrics and indicators, therefore the author has chosen the information relevant to this research regardless of the wider range of information provided in the airline sustainability reports.

In this thesis, ESG (environmental, social and governance) approach was introduced within societal and regulatory trends and sustainable business models. However, the societal aspect did not emerge prominently from the interviews, and consequently, was not further examined during the content analysis phase. Since the focus of this thesis was in environmental and governance aspects of sustainability, there would be an opportunity to conduct similar research uncovering the social sustainability aspect of European airlines. It is also recognized that social aspect of sustainability is a vast and complex topic itself and requires expertise from different sustainability areas and other types of airline experts than interviewed in this research.

Other prospects for future research would be to conduct this research for airlines operating in other regions following their region-specific sustainability rules and regulations such as US, Asia, Middle-East, Africa and Latin America comparing the findings to the results of this research. It would be also interesting to conduct follow-up research in Europe in mid-term future after 2030 to validate whether the commitments made today have been met and if the 2050 carbon neutrality target is still reachable.

Recommendations and best practises are presented in the following chapters and divided according to previously presented themes in this thesis. Theme 1 was focusing on CO2 emissions reduction, Theme 2 exploring sustainable organizational development and Theme 3 identifying initiatives in creating competitive advantage.

Recommendations based on Theme 1: airlines should continue to explore and invest in sustainable aviation fuels, such as SAF and hydrogen, as these hold the potential for substantial CO2 emissions reductions. Weight reduction and surface technology should be further optimized for efficiency. Recycling initiatives and the reduction of single-use plastics should be scaled up industry-wide. Collaborations with technology and industry leaders are crucial to accelerate the development and implementation of emissions reduction strategies.

Continue to explore and invest in innovative technological approaches that align with airline´s sustainability targets. Investments in research and development are crucial, given the

technological limitations mentioned, therefore airlines should invest in research and development efforts to advance aircraft technology and design in the future. Collaborating with aircraft manufacturers and research institutions is important in order to develop more fuel-efficient and environmentally friendly aircraft already in mid-term future.

Focus on operational efficiency, including flight optimization, load factors and new flight procedures, to reduce fuel consumption and emissions. This may include route planning to minimize fuel consumption, reducing aircraft weight, and employing more efficient and green ground operations.

Invest in fleet renewal, consider the adoption of the latest generation aircraft models that are more fuel efficient. Although cost considerations may come into play, these newer aircraft are often designed to be more environmentally friendly and can contribute to emission reductions, while saving cost to airline with lower fuel consumption.

Airline organizations should continue to prioritize and enhance the use of specific metrics and indicators commonly used in the airline industry by established tools and standards (e.g., CDP, SBTi, Sustainalytics and EcoVadis) for more accurate and transparent reporting on the environmental impact. Comprehensive assessment could be considered distinguishing between different types of emissions, such as CO2 and non-CO2 emissions (e.g., contrails), to gain a more comprehensive understanding of the environmental impact of initiatives. It is also important to regularly monitor and assess the effectiveness of sustainability initiatives in relation to the set emissions reduction targets helping to make necessary adjustments and improvements.

Theme 2 related recommendations: continue to strengthen and expand partnerships with various stakeholders in the aviation industry, as these collaborations are instrumental in achieving sustainability goals. Extend partnerships with NGOs and offset initiatives to address not only environmental aspects but also social and community-related aspects of sustainability. Maintain transparent reporting and monitoring of collaborative efforts to demonstrate the positive impact of these partnerships.

Collaborate on airline industry initiatives. Airlines should consider joining industry-wide initiatives and partnerships aimed at sustainability improvements. These collaborations can lead to shared research and development costs and the pooling of resources to address common challenges. Airline industry best practices sharing by collaborating with industry

peers in order to collectively develop sustainability efforts and helping the whole airline industry in achieving its carbon neutrality targets by 2050.

Continue exploring carbon offsetting options. Airlines can explore carbon offsetting programs as a temporary solution while transitioning to more sustainable practices. These programs involve investing in projects and partnerships that remove or reduce CO2 emissions when they cannot be directly reduced by the airline. Customers can be encouraged to compensate their carbon footprint through carbon offsetting schemes.

Commit to global environmental agreements. The airline organization should continue to commit to global agreements like the Paris Agreement, Fly Net Zero and CORSIA, demonstrating its dedication to environmental responsibility. Maintaining compliance with these agreements and actively participating in associated initiatives is advised.

Airlines should actively engage with policymakers and regulatory bodies to advocate for regulatory frameworks that promote sustainable aviation practices. Regulatory bodies and frameworks are useful in enhancing transparency and credibility, the airline organization should consider adopting and reporting according to commonly used sustainability reporting standards and frameworks. Staying informed about these regulatory bodies and actively participating in related initiatives is crucial.

Continue committing to United Nations Sustainable Development Goals (SDGs) as already done by most of the European airlines. This is a great initiative that can align airline´s sustainability efforts with relevant SDGs, contributing to global development goals and demonstrating airlines´ commitment to generally recognized sustainability goals.

It is recommended to continue embracing external sustainability certifications to demonstrate airline organization's compliance with sustainability certifications such as ISO standards, IENVA, and ESG ratings. Applying recognized standards and ratings demonstrates a commitment to sustainable values and ambition to sustainable transformation.

Given the strictness of EU regulations, it is recommended that the airline organization closely monitors and adapts to these evolving regulations. Compliance and a proactive approach to sustainability initiatives are essential in order to navigate the regulatory landscape effectively.

Recommendations based on Theme 3: increase sustainability communication and marketing and communicate effectively organization's sustainability vision and goals both internally and

externally. Transparency and engagement with stakeholders is crucial. Since airlines are considered as significant polluters, they need to educate customers, stakeholders and investors of the real sustainability actions taken during their sustainable transformation journey. Airline organizations should focus on transparently communicating their sustainability efforts and avoiding greenwashing while utilizing marketing strategies that genuinely reflect their commitment to sustainability.

Advocate for continued collaboration between stakeholders, investors, governments, customers and international bodies like the EU, to drive sustainability goals in the aviation industry. Continue to engage with stakeholders and investors to ensure that sustainability communication resonates effectively with this audience. As mentioned earlier in this thesis within SBMC-EA, one of the best practises to engage customers to airline´s sustainability efforts, would be to offer rewards through the loyalty programs. Customers could earn additional rewards and loyalty points by choosing sustainable travel options within or besides the flight ticket purchase.

Continue innovations within the green product offerings such as introducing green fares and ticket classes that look attractive to customers and enhance the airline´s environmental brand image. Carbon offset schemes and SAF purchase options could include several plans serving the needs of environmentally conscious customers. Airline´s customers together with stakeholders and investors are the key to join forces with, when fighting against climate change and succeeding in the airline´s sustainable transformation.

6 Conclusions

In this concluding chapter, a reflection to the thesis process, research journey and invaluable insights gained along the way are summarized. The focus will be on key findings and remarks made during the process of conducting this study. A comprehensive, but high-level overview of the research findings and final conclusions are presented in this chapter.

Throughout the thesis process, the author gained practical understanding of state of sustainability within European airlines. This journey included learnings about sustainability strategies and initiatives, innovative biomimicry projects like shark skin, real life examples of improving flight efficiency, formation of contrails, diversity of sustainability metrics, indicators, certifications and commitments currently in use in European airline industry. A significant aspect of this journey was gaining insight into the daily tasks and roles of airline sustainability

experts, revealing a shared passion and optimism for the opportunities that sustainability can bring to the airline industry as a whole.

When reflecting on the research journey, it was surprising to discover the multitude and diversity of sustainability initiatives currently ongoing within European airlines. This clearly shows the utmost commitment to sustainability and demonstrates the willingness of airline organizations to sustainably transform their operations. This leads the author to ponder why so many airlines have fallen short in their sustainability communication and marketing efforts, even resorting to greenwashing, when there is a great deal of genuine sustainability actions to showcase.

While concluding this research journey, it is crucial to revisit the fundamental context upon which this research has been built. The phenomena of climate change where airline industry´s contribution is measured in the form of CO2 emissions, airlines bearing the responsibility of 3,5% of the world´s total emissions.

Since the airline industry stands out as a major individual contributor to climate change and global warming, it is facing movements like ´flight shaming´ and external societal and regulatory pressure that eventually forces the airlines to sustainably transform their operations and engage with ongoing organizational sustainability transformation process in order to become more sustainable entities. An airline with stronger sustainable brand image has an opportunity to create competitive advantage through its sustainability initiatives, attract environmentally aware consumers and investors as well as maintain their business viability also in the future.

The objective of this research was to identify and analyse the various strategies and initiatives adopted by the airlines in Europe to enhance their sustainability. This thesis aimed to comprehensively study initiatives, challenges and opportunities in sustainable transformation of European airlines, with emphasis on CO2 emissions reduction, organizational development and competitive advantage.

When assessing the research process and structure of the thesis, several crucial themes emerged that were identified and followed in each stage of this thesis, extending from organizational and theoretical framework to the research methodology and its findings. The emerging themes were identified as following: CO2 emissions reduction (Theme 1), organizational development (Theme 2) and competitive advantage (Theme 3).

The literature review confirms that this research introduces fresh insights and new perspectives, making valuable contribution to the existing knowledge as well as establishing a base for holistic airline sustainability research in other regions. Potential contributions could be seen as confirming the conclusions made by Baumeister and colleagues (2022) that environmentally friendly airline attracts more customers and maintaining their loyalty as was found to be the perception from the airline expert side as well. This research also provides a European high-level overview to airline sustainability reporting, where previous research was conducted on global level (Johanssen & Zieba (2022). Another study where this research can add European airline expert perspective is consumer´s choice and airline competitive position study conducted on the Danish market (Elkjaer, 2021), while reinforcing the research findings made on how ESG perspective affects airline company value and attractiveness for investors (Abdi et. al, 2020).

Theoretical framework was selected according to the needs of sustainable transformation process and to enhance the capacity to interpret the research findings: Fiedler´s contingency theory (Luthans & Stewart, 1977; Donaldson, 2001) to understand the importance of leadership commitment and organizations´ ability to adapt and develop according to changing external environment. The desired outcome of sustainable transformation process would be a more sustainable airline that can create competitive advantage (Porter, 1985) through its sustainability actions and gain first mover benefits (Porter, 1990) by adopting sustainability practises early and achieve sustainability leadership in the market.

Societal trends such as SITRA Megatrends (SITRA, n.d.) were introduced as an example of external pressure affecting European airlines, including corporate responsibility, consumer´s choice, pandemics and epidemics, United Nations SDGs (United Nations, n.d.), global environmental agreements such as The Paris Agreement (The Paris Agreement, 2015) and regulations from European Union such as The European Green Deal (European Commission, n.d.-f) with carbon neutrality target by 2050 being the umbrella to other rules, regulations and initiatives affecting airlines in Europe.

The ongoing sustainable transformation process was explored though sustainable business models (SBM). During the research process it was discovered that many of the introduced SBMs were included in European airline´s sustainability strategies, such as circular business model initiatives including waste management improvements, increasing recycling activities and removing single-use-plastic. Biomimicry innovations such as AeroSHARK (Aeroshark, n.d.) were applied to improve aircraft´s fuel efficiency. Application of external certifications such as Carbon Disclosure Project (CDP, n.d.), Science Based Targets (SBTI, n.d.), ISO

Environmental Management Systems (ISO, n.d.) and IATA Environmental Assessment certification (IENVA, n.d.) were actively applied. Sustainable business model canvas (SBMC-EA) was introduced as a tool to support European airlines in their ongoing sustainable transformation process.

This research was conducted as mixed method research including qualitative interviews conducted to airline sustainability experts and content analysis performed on airline sustainability reports. The most significant challenge during the research process was recruiting suitable candidates to participate in the research interviews. This recruitment process took longer than anticipated. However, the extra time invested in curating a diverse and high-quality pool of airline sustainability ambassadors greatly enhanced the quality and richness of the interview findings. During the content analysis phase, the vast amount of data present in airline sustainability reports posed a challenge. The time-consuming task of sifting through and prioritizing the most relevant data was imperative in identifying the information aligning with the research objectives.

Utilizing thematic analysis process, the research findings were collected from both sources and organized according to the predetermined themes. Based on the themes (T1 to T3), key insights were identified leading to answer the research question:" What are the initiatives, challenges, and opportunities in the sustainable transformation of European airlines, with emphasis on CO2 emissions reduction, organizational development, and competitive advantage?". Research results were summarized according to initiatives, challenges and opportunities following the previously introduced themes.

Key initiatives included increasing SAF (sustainable aviation fuel) usage, improving flight efficiency and navigation systems, investments in fleet renewal, utilizing sustainability partnerships, improving waste management, increasing recycling, getting rid of single-use-plastic, concentrating on carbon reduction instead of compensating, introducing green fares and ticket classes and offering carbon offsetting schemes and SAF purchase options to airline customers.

The most significant challenges were seen within the current aircraft technology being fossil fuel based, availability and high price of SAF, strict EU regulations, diverse sustainability reporting (lack of standardization), external sustainability reporting requirements (stakeholders, investors), airline industry's reputation as polluters (flight shaming), communication challenges (greenwashing) and current technology preventing the airlines to

become fully sustainable and creating substantial competitive advantage through their sustainability efforts.

Opportunities were found in reducing CO2 emissions like implementing SES (Single European Sky) air traffic management system, investments made in SAF production and distribution and investments in new aircraft technology together with aircraft manufacturers. Organizational development opportunities were detected in including sustainability as part of company visions, increasing transparency and trustworthiness of sustainability communication and including sustainable transformation as part of airline company´s strategy.

Competitive advantage creation could be seen through pursuing sustainability leadership, cooperation with regulatory bodies and the wider airline industry as well as inviting airline stakeholders, investors and customers to collectively contribute to greener flying. Sustainability investments made today were seen essential in ensuring long-term business viability and attracting future customers and environmentally conscious investors.

Majority of the current sustainability strategies and initiatives were focusing on reducing CO2 emissions, which apparently is the most significant challenge to overcome. However, airlines have little impact over reducing CO2 emissions due to current technological limitations. Therefore, it is worth considering other sustainability domains, such as improving waste management, increasing recycling, reducing aircraft noise, mitigating environmental impacts and minimizing single-use plastic. These sustainability initiatives present areas, where airlines can contribute and achieve the targets already in the near future.

It was noticed, that airline sustainability development has been rapid during the recent years and many innovative projects and investments are ongoing. There are examples, such as investments in SAF, investments in new aircraft technology and cooperation with research entities and start-up companies. It was stated during the research process that sustainability strategies and decisions made today will shape the future of the whole airline industry, guiding the pathway to carbon neutrality by 2050.

In our modern world, air travel is considered as essential part of the society being a catalyst for positive economic growth, cultural exchange, tourism and movement of goods (Flaherty & Holmes, 2020). Therefore, it is important that regulatory bodies, airline industry, stakeholders, investors and customers come together and collectively endorse the airline

industry in its sustainability efforts resulting in reducing CO2 emissions and fostering a positive impact on the ongoing fight against climate change.

This research affirmed that European airlines have the capacity to transform into more sustainable entities, positively influence consumer preferences, create competitive advantage over other transport industries and notably reduce their carbon footprint. More environmentally friendly airline industry image would appeal to airline customers, potentially encouraging them to choose air travel more frequently, if flying was seen more sustainable than it is today.

Perhaps the future customer conversations will shift away from seeking the lowest flight ticket price to emphasizing how they can minimize their carbon footprint by choosing a more sustainable airline as a preferred travel choice. A more sustainable airline industry would attract environmentally conscious investors, fostering trust and anticipating the industry´s greener future as an investment opportunity.

Culminating in these research findings and the comprehensive thesis, uncovering the essence of airline sustainability in Europe including innovative initiatives, invaluable insights and best practises, while offering practical recommendations and tools to support sustainable transformation journey, the author believes that this research can empower European airlines to enhance their sustainability initiatives towards a greener future.

Ultimately, the true measure of success for this research will be the realization of sustainable transformation progressing in European airlines. If, through this work, even a single airline is inspired to enhance its sustainability practices and successfully implements any of the suggested initiatives, the author could proudly affirm that the goals of this research have been exceeded, making flying a little greener already today.

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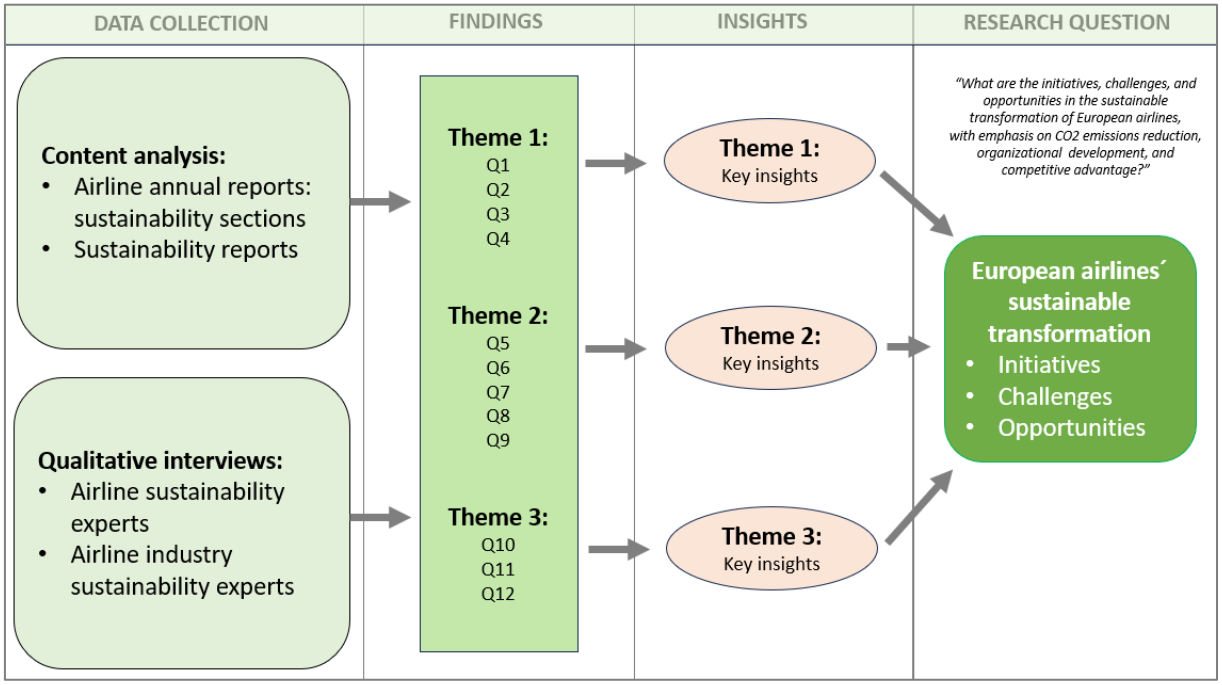
Appendix 1. Research design (Author´s compilation)



Appendix 2. Interview invitation, airline expert (Author´s compilation)

Dear [Expert's Name],

Subject: Invitation to participate research interview on ´Airline Sustainability in Europe´ (Master Thesis).

My name is Anne Marja Pimiä, and I am currently pursuing a Master's degree in Sustainable Business Management at HAMK University of Applied Sciences in Finland. As part of my academic requirements, I am conducting research on the crucial topic of "Airline Sustainability in Europe."

I am reaching out to you because of your extensive expertise and experience in the field of aviation and sustainability. Your insights and perspectives would greatly contribute to the depth and quality of my research and I am particularly interested in learning from your experiences.

The primary objective of this research is to analyse the various strategies and initiatives adopted by airlines in Europe to enhance their sustainability practices. The study aims to shed light on the successes, challenges, and opportunities encountered by airlines as they work towards more sustainable operations.

Your insights would be valuable in shaping a comprehensive understanding of:
- How your airline is reducing CO2 emissions?
- Current and future sustainability initiatives in your organization?
- Sustainability initiatives that have created competitive advantage?

I am seeking your participation in a research interview, which I anticipate will take approximately 15 to 20 minutes. The interview can be conducted through: Video conference/ phone call/ answer questions by email. Your perspectives will be treated with the utmost confidentiality and used for this research purpose only.

Should you be willing to participate, please communicate a suitable time and preferred method of contact (videoconference, phone call, email) for the interview.

I appreciate your consideration of this invitation and looking forward to learn from your experiences.
If you have any further questions regarding this interview, please don´t hesitate to contact me.

Sincerely,
Anne Marja Pimiä

Master´s Degree Student in Sustainable Business Management
HAMK University of Applied Sciences
Email: anne.pimia@student.hamk.fi

Appendix 3. Interview design and questionnaire (Author´s compilation)

Interview topic: Airline sustainability in Europe

Background information:
Interviewee: Airline expert
Name:
Title:
Airline/ organization name:
Location:
Date:

Reducing CO2 emissions:
Question 1: Could you share your insights on innovative approaches that airlines could adopt to effectively reduce their CO2 emissions?
Question 2: In your perspective, what are some of the most challenging barriers that airlines face when it comes to achieving significant reductions in CO2 emissions?
Question 3: Could you provide examples of specific initiatives or projects your organization is currently undertaking or planning to take in order to lower CO2 emissions?
Question 4: How does your organization approach the evaluation of the environmental impact of its initiatives aimed at CO2 reduction? Are there any particular metrics or indicators that you prioritize?

Sustainable organizational development:
Question 5: Considering the complex nature of the aviation industry, can you elaborate on any collaborative efforts or partnerships your organization has engaged with to improve sustainability?
Question 6: In what ways does sustainability manifest in your organization's operations? Internally and externally? Can you provide specific instances or practices?
Question 7: Could you elaborate on any ongoing or planned sustainability actions that your organization is involved in? How do these actions align with your organization's broader mission and vision?
Question 8: Given the evolving landscape of sustainability regulations, could you share your perspective on the most critical changes that could affect your organization (EU, IATA, ICAO etc.)? And the broader airline industry?
Question 9: According to your knowledge, does your organization comply to any sustainability certification? If yes, which ones?

Sustainability initiatives creating competitive advantage:
Question 10: From your viewpoint, is your organization leveraging sustainability initiatives to create competitive advantage? If so, can you provide examples where sustainable practices have positively impacted your organization's brand image or reputation?
Question 11: In your opinion, is marketing and communication used efficiently in showcasing your organization's commitment to sustainability? Are there any instances where sustainability communication has notably resonated with your stakeholders (investors, customers, partners)?
Question 12: Do you have any other comments or ideas you´d like to share within the research topic?

Appendix 4. Interview data 1/2 (Author´s compilation)

Category	Question	Interview A	Interview B
Role		Airline expert	Airline technology expert
Theme 1			
Q1	Could you share your insights on innovative approaches that airlines could adopt to effectively reduce their CO2 emissions?	Carbon reduction development or strategy certified by an external party. Reduce carbon emissions instead of compensating.	Weight reduction in the cabin, new materials and new technologies. Replacing SUP, network optimization. Use of multiple apps for flight optimization.
Q2	In your perspective, what are some of the most challenging barriers that airlines face when it comes to achieving significant reductions in CO2 emissions?	Lack of viable technologies. Airbus Neo series is currently the most CO2 efficient aircraft for short haul (reduction 15%) which is a big leverage but not enough to meet target 30%.	Availability and price of new generation aircraft and SAF.
Q3	Could you provide examples of specific initiatives or projects your organization is currently undertaking or planning to take in	Fleet renewal, operational efficiency (single-engine taxiing, reducing fuel burn which is 98% of emissions), increasing SAF fuel usage. Not printing boarding passes or decreasing inflight products to lower the weight with a few kilos doesn´t make significant difference. Single engine taxiing, increasing direct routes, pilot training to fly more fuel efficiently. HR: Awarding fuel efficient pilots contributing to airline sustainability.	Pilot performance and training contributing to reducing fuel comsumption. Questioning need to speed up (in case of delay). Choosing most sustainable route (not necessarily shortest), weather conditions etc. New technology for traffic management. Test flight in perfect conditions (vertical and horizontal flight profile) showed 16% fuel saving that can be achieved with flight optimization and efficiency (opportunity).
Q4	How does your organization approach the evaluation of the environmental impact of its initiatives aimed at CO2 reduction?	Target is to reduce CO2 emissions 30% by 2030. This is not going to be achieved by hydrogen or electric planes.	Target is to reduce 50% CO2 emissions by 2030. Interesting will be the split to CO2 emissions and non-CO2 emissions (contrail).
Theme 2			
Q5	Considering the complex nature of the aviation industry, can you elaborate on any collaborative efforts or partnerships your organization has engaged with to improve sustainability?	Collaboration with AeroSHARK: Cutting emissions with sharkskin, technology (AeroSHARK), reduces aircraft dragh by 1%. Airports regarding waste management and ground operations reducing emissions. Sustainable supplier selection process.	Swiss company producing SAF from sunlight (Synhelion). Collaboration with many innovative start-ups for finding innovative sustainability solutions for the whole airline group.
Q6	In what ways does sustainability manifest in your organization's operations?	We´re using green energy, office is energy efficient within airport. Increasing charging stations at office parking, electrifying company car fleet. Green transport to and from airport by train or bus.	See sustainability report.
Q7	Could you elaborate on any ongoing or planned sustainability actions that your organization is involved in?	Project ongoing to investigate Google AI software to aircraft for route optimization. Improving operational efficiency, decreasing fuel burn and increasing SAF usage.	See sustainability report.
Q8	Given the evolving landscape of sustainability regulations, could you share your perspective on the most critical changes that could affect your organization (EU, IATA, ICAO etc.)?	EU makes strictest regulations concerning airlines in Europe like EU taxonomy (financial punishment doesn´t support decarbonizing), ETS (Emission Trading System) compliance. In the United states, reductions in emissions are incentivized.	EU regulations becoming stricter and with sanctions. Others will impact in the near future like EU Taxonomy and the upcoming CSRD.
Q9	According to your knowledge, does your organization comply to any sustainability certification?	Science Based Targets initiative (SBTi) and investor relations page: EU Taxonomy, GRI Index, SDG index.	See sustainability report.
Theme 3			
Q10	From your viewpoint, is your organization leveraging sustainability initiatives to create competitive advantage?	Yes with green fares that we´re offering both economy and business class where emissions can be 100% offset within 6 months of purchase (3rd party certification). By 2025 soft mandate from EU: Any aicraft departing the EU territory, needs to have at least 2% of SAF fuel. Creates disadvantage to EU long haul flights as others can make flight connection outside EU and continue with normal jet fuel.	Our application for flight planning to find the most sustainable flight route creates us competitive advantage. Then we are really looking for best ways to support our customers. This helps with evaluating and balancing the cost and emissions (not only cost or only emissions).
Q11	In your opinion, is marketing and communication used efficiently in showcasing your organization's commitment to sustainability?	Communicating about airline sustainability is always risky as it can be easily intepreted as greenwashing effort. Our marketing and communication highlights that we are aware that we pollute and we´re doing our utmost best to reduce the environmental impact.	There´s a lot of external pressure (stakeholders, government, customers) to communicate about sustainability actions that airline is taking. There shouldn´t be any marketing or communication if there is no real action behind (greenwashing).
Q12	Do you have any other comment or idea you´d like to share within the research topic?	Hot topic in the airline industry now is non-CO2 emissions and how they will be shown. Only 30% of flights emissions are CO2 and the rest is from contrail (similar effect than CO2, warming the planet) to be calculated in total emissions.	To achieve NetZero the airline industry, investors, governments and EU need to work together in order for aviation industry to achieve this target.

Appendix 4. Interview data 2/2

Category	Question	Interview C	Interview D
Role		Airline industry expert	Airline expert
Theme 1			
Q1	Could you share your insights on innovative approaches that airlines could adopt to effectively reduce their CO2 emissions?	Newest fleet can reduce CO2 emission 10-15%. It´s important to find a balance between reducing CO2 emissions and staying profitable.	Aero shark technology to reduce dragh, investements in SAF production. Reducing single-use-plastic (SUP).
Q2	In your perspective, what are some of the most challenging barriers that airlines face when it comes to achieving significant reductions in CO2 emissions?	Availability of SAF: All that is produced is purchased by airlines. Airlines have very little influence of reducing CO2 emissions through flight operations (they don´t drill the oil, they don´t produce SAF, don´t manufacture aircarft). Airlines should put pressure on other industries to become more sustainable or to provide more sustainable options for them to use and operate profitably.	Aicraft technology (hydrogen, electric) needed to reach 2050 target, finance for new technologies, availability of SAF, high price of SAF resulting increase in ticket prices effecting the customer demand negatively. Finding the balance between increased sustainability actions and remaining profitable.
Q3	Could you provide examples of specific initiatives or projects your organization is currently undertaking or planning to take in	Improving air traffic control system (Single European Sky), this approach is not up to airlines, it´s a political decision but biggest low hanging fruit at the moment. Improving flight efficiency decreases the fuel burn, decreases the cost to airline and reduces CO2 emissions (win-win situation). Airlines should concentrate on sustainability initiatives where they can make a difference: Waste management, reducing SUP, water supply (flights & buildings), noise and air quality, wastewater and noise, even biodiversity and wildlife aspects like wildlife trafficking..	Improving flight efficiency, investing in new and more fuel efficient fleet (A320 NEO), increasing SAF usage,improving air traffic control system (Single European Sky),
Q4	How does your organization approach the evaluation of the environmental impact of its initiatives aimed at CO2 reduction?	Fly Net Zero 2050 and IATA roadmap to measure the targets.	Zero carbon flying by 2050. Variety of metrics available to measure airline fuel usage and fuel usage per pax. Scope 1 (direct) and 2 -3 (indirect) emissions.
Theme 2			
Q5	Considering the complex nature of the aviation industry, can you elaborate on any collaborative efforts or partnerships your organization has engaged with to improve sustainability?	n/a	There are many partnerships from aicraft manufacturers (Airbus and Boeing) to small start-ups. Partnerships in SAF production (like Shell) and distribution like airports. NGOs, communication agencies, charity organizations. Partners for sustainable packaging and recycling of food waste.
Q6	In what ways does sustainability manifest in your organization's operations?	n/a	Airline organization has invested in sustainability team. Internal communication about sustainability targets and practises have been planned.
Q7	Could you elaborate on any ongoing or planned sustainability actions that your organization is involved in?	n/a	Increase sustainability awareness in the organization by educating the employees. Sustainability as part of the organizational development strategy (Sustainability is one of the pillars).
Q8	Given the evolving landscape of sustainability regulations, could you share your perspective on the most critical changes that could affect your organization (EU, IATA, ICAO etc.)?	Currently EU have the strictest sustainability rules and regulations although the other regions tend to follow the example of Europe. Rules and regulations will be applied to rest of the world eventually.	All regulations from EU (like Green Deal) to airline industry organizations and UN bodies apply.
Q9	According to your knowledge, does your organization comply to any sustainability certification?	IENVA (IATA Environmental Management System) certification that adds aviation industry specific requirements to ISO 14001. Airlines can get better sustainability rating when complying with IENVA.	There are ISO, CDP, Black Rock et. Certifications obrtained on airline group level. Different certificatios are required by different external parties that contributes to vast amounts of metrics the airline is producing and many certifications to apply.
Theme 3			
Q10	From your viewpoint, is your organization leveraging sustainability initiatives to create competitive advantage?	Air travel itself has competitive advantage over other transport modes as it is safest, fastest and cheapest way to travel. Currently airlines are doing their utmost best to what comes to sustainability efforts.	Telling customers truetfully about airlines´ sustainability initiatives (e.g. Green fares) can create competitive advantage. EU regulations can be seen as disadvantage to European airlines and creating comptitive advantages to non-European airlines who don´t need to follow these regulations (e.g. % in SAF usage) and can sell cheaper tickets to same routes.
Q11	In your opinion, is marketing and communication used efficiently in showcasing your organization's commitment to sustainability?	Currently there are no good examples of airline sustainability marketing and communication available.	Communication to customers is important based on facts and transparency. Customers believe that flying is not sustainable, airline can communicate about it´s sustainability initiatives to become more sustainable. For airline not communicating about it´s sustainability can be harmful too. Sustainability is visible in sales channels and marketing (TV, print media). newsletter and roadshows to stakeholders.
Q12	Do you have any other comment or idea you´d like to share within the research topic?	Most important thing for the aviation industry is safety. Safety underpins operations for the future and guides the way towards environmental sustainability. Governments should help the airlines in CO2 reductions like providing more SAF.	Customers should be willing to participate financially in making flying more sustainable (offsetting, higher ticket price, SAF contribution). Airline can´t be profitable in the future if sustainability is not considered now.

Appendix 5. Content analysis data 1/3 (Author´s compilation)

Airline / Group	Air France - KLM Group	Easyjet	IAG Group
Report	**A**	**B**	**C**
CDP score (Climate change)	C	B	A
Theme 1			
Q1	KLM and Air France signed multi-year SAF contracts with two reputable suppliers of SAF for a total of 1.6 million tons of fuel, which will cover a third of KLM's and Air France's need until 2030.	Partnering with Rolls-Royce, pioneering hydrogen combustion engine technology, and Airbus, to support the development of carbon removal technology.	First alcohol-to-jet (ATJ) commercial plant in the world (LanzaJet): SAF produced at the Freedom Pines Fuels facility from sustainably-sourced ethanol. Invests in hydrogen aircraft (ZeroAvia).
Q2	Technological limitations, EU regulations and tax, price and availability of SAF.	Technological limitations, EU regulations and tax, price and availability of SAF.	Technological limitations, EU regulations and tax, price and availability of SAF.
Q3	Committed to 30% CO2 reduction by 2030: inceasing SAF by 10% worldwide by 2030, investing in new fleet (-25% CO2). Fleet renewal with fuel burn and noise reduction, reducing the carbon and noise footprint.	Target: EU NetZero by 2050, Science-based target (SBTi) of a 35% carbon emissions intensity improvement by 2035. Future focus on zero carbon emission aircraft. Current: Fleet renewal, operational improvements and efficiencies, airspace modernization (flight path optimization, Single European Sky), SAF.	Target: -15% CO2 by 2030. Lounges: renewable energy, vegan menus. In-flight: Pre-order to reduce food waste, recycling. Ground: Trialling electric buses for passengers, electric Mototoks to pull aircraft, electric trucks, renewable electricity to power aircraft on the ground. PAX: Voluntary offsetting for customers using verified offsets, SAF for customers, use of IAG-procured SAF.
Q4	CDP, S&P: DJSA, Ecovadis, Climate Action 100+, Sustainalytics ratings, ETS (Emission Trading) CO2 allowances	CDP, SBTi, ETS, ICAO Carbon Emissions Calculator Methodology, ICAO Chapter 14 regulations, FTSE4Good and Transition Pathway Initiative	CDP, ATAG (Air Transport Action Group), WEF (World Economic Forum). Science-Based Targets initiative (SBTi) and EU ETS, Transition Pathway Initiative (TPI).
Theme 2			
Q5	Partnerships for SAF: Neste, DG Fuels, Total Energies, Dutch Red Cross	Rolls-Royce, Airbus for hydrogen narrowbody aircraft. SAF supply agreement with Q8	Partnerships for SAF: Phillips 66, Neste (more planned when production starts 2025->), UNICEF, Save the children (Spain), sustainability start-ups, CHOOSE & Avikor (offsetting), LanzaJet (SAF production), Heirloom (carbon capture start-up), ZeroAvia (hydrogen aircraft manufacturer) I6 (fuel management software) NAVflight services (flight planning services) Honeywell Forge (fuel efficiency software).
Q6	n/a	n/a	n/a
Q7	Pioneering to become a frontrunner in sustainable aviation'. At Air France-KLM, we are proud to bring people together, to help our customers discover new places and new cultures, and to secure the sustainability of our economic exchanges, thus fulfilling one of humankind's oldest dreams on a daily basis.	Ambition: Establish sustainability leadership. During the year, easyJet has set out plans for the next phase of our journey towards our ultimate ambition of zero carbon emission flying.	IAG's vision is to be the world's leading airline group on sustainability. Increased focus in sustainability, commitment to deliver long-term value: to our people, customers, shareholders, society.
Q8	Paris agreement, EU net zero by 2050, GDPR, CSRD, SBTi, CORSIA.	Paris agreement, EU net zero by 2050 GDPR, CSRD, CDP, MSCI, TCFD and Sustainalytics. Progress against the UN's Sustainable Development Goals (SDGs).	Paris agreement, EU net zero by 2050, GDPR EU Taxonomy, CSRD. IATA SEAL (Sustainability Environment Advisory Council) for Net Zero commitment. EcoVadis, TCFD, CORSIA, JZT (UK: Jet Zero Council), EU Transparency Register, A4E, GRI (noise & air quality, people, society), CoC, SCoC, CSR, IATA Environmental Management System (IEnvA), SASB (Sustainability Accounting Standards Board), ERM.
Q9	ISO 14001, ESG rating.	ISO 14001, IATA IEnvA, ESG.	ISO 14001, IATA IEnvA, ESG rating.

Appendix 5. Content analysis data 2/3

Airline / Group Report	Air France - KLM Group A	Easyjet B	IAG Group C
Theme 3			
Q10	n/a	Sustainability continues to be a priority for easyJet and its customers. The net zero roadmap demonstrates our commitment to leading in an area which is likely to be a key purchase driver in the future.	n/a
Q11	Despite of the criticism, we continue to believe in the quality of our plans. In order to be more transparent about our climate actions, we have published our Climate Action Plan.	Net zero roadmap launch	First ESG day for investors in 2022.
Q12	EU is mandating all airlines departing from EU airports to blend SAF, starting at two per cent in 2025, hitting five per cent in 2030 and ending at 63 per cent in 2050.	n/a	The aviation industry will decarbonise faster with stakeholder and policy support.

Airline / Group Report	Lufthansa Group D	Norwegian Air Shuttle E	Ryanair Group F	Frequency
CDP score (Climate change)	A-	B-	B	ALL
Theme 1				
Q1	Fuel-saving surface technology AeroSHARK. Replacing some short distance feeder flights with train or bus (greener transport).	Stop using non-recyclable plastic by eo 2023, cut SUP (single-use plastic) by 30%. Pre-order to cut food waste, discounts on last flights. Investements in hydrogen production.	Ryanair Sustainable Aviation Research centre (Trinity College Dublin) for SAF. Recycling aircarft tyres (Michelin), SESAR air traffic mgmt process: 10% CO2 reduction.	Various innovative approaches: New aviation technology, SAF (partnerships, production, research), In-flight improvements.
Q2	Technological limitations, EU regulations and tax, price and availability of SAF.	Technological limitations, EU regulations and tax, price and availability of SAF.	Technological limitations, EU regulations and tax, price and availability of SAF.	Technological limitations, EU regulations and tax, price and availability of SAF.
Q3	Target to reduce CO2 emissions 30.6% from 2019 to 2030. Fleet renewal, incresing SAF, flight optimization: load factors, introducing new flight procedures and navigation technologies. determining optimal routes and speeds, and developing many activities to save fuel.	CO2 reduction target 45% by 2030: Fleet renewal, increasing SAF, advanced navigation systems. KPI: Carbon efficiency, waste, accountability.	CO2 reduction target Net zero by 2050. SUP plastic free by 2025. SAF goal: 12,5% by 2030. SAF (34%), Single European Sky (10%), Carbon offsetting (24%), Tech & operational improvements (32%). New gamechanger fleet: 16% less fuel burn, 40% less noise.	EU Net zero by 2050. Other targets vary by airline.
Q4	CDP, SBTi, CORSIA, ICAO Chapter 4 (noise reduction), Sustainalytics, Ecovadis.	CDP, UNFCCC (Climate Neutral Now), CEMAsys (by PwC) carbon accounting report, CHOOSE (UN & Gold standard) climate offsetting.	CDP, ETS, SBTi, ICAO (noise reduction), Sustainalytics, Fit for 55 (EU net emissions reduction 55% by 2030), Pathway to Net Zero.	CDP, ETS, Sustainalytics, , SBTi (Worldfavor), EcoVadis (Supplier sustainability), EU fit for 55 apply to most airlines.

Appendix 5. Content analysis data 3/3

Airline / Group Report	Lufthansa Group D	Norwegian Air Shuttle E	Ryanair Group F	Frequency
Theme 2				
Q5	Miles & More WorldShop (upcycling old uniforms, blankets), German national railway, partnerships for producing SAF like Synhelion.	Partnership for SAF: Neste, Norske e-fuel (Hydrogen start-up), Terravera Foundation (offset 80% emissions, corporate pax), UNICEF, Power-to-X (PtX).	Partnership for SAF: Neste, Offset partners: First Climate (Uganda), Wind Power Plant (Turkey), Kitchen Regimes (Malawi).	Partnerships for: SAF, new aviation technology, carbon offsetting, charity.
Q6	n/a	n/a	n/a	n/a in sustainability reports.
Q7	Vision statement of Lufthansa group: Connecting people, cultures and economies in a sustainable way.	n/a	Climate goals (Pathway to NetZero): Efficiency, SAF, Technology, Regulation (support climate targets), Reduction (reduction over offsetting), Insights (airline industry).	Most of the airlines have sustainability as part of vision or sustainability goals.
Q8	Paris agreement, EU net zero by 2050, EU Taxonomy, GRI, GDPR. UN SDGS (3, 4, 7, 8, 9, 10, 12, 13, 16, 17), Code of Conduct, Supplier Code of Conduct, ISS ESG, FTSE4GOOD (FTSE Russel), MSCI, TCFD (by SASB), Ecovadis, VE, ECPI, SRD, IATA, A4E (Airlines for Europe).	Paris agreement, EU net zero by 2050 GDPR, UN SDGs (1, 8, 13, 17), Kyoto agreement, SAP Ariba Procurement (Supplier score for sustainability), EcoVadis, Transparency Act.	Paris agreement, EU net zero by 2050, GDPR, GRI, CSAT, EU taxonomy (n/a this report year), CORSIA, CSRD, SFRD, CoC, anti-corruption (ABAC). Destination 2050, UN SDGs (all 17), Global Compact, TCFD.	Most common within airlines are commitments to: Paris agreement, EU net zero by 2050, GDPR, GRI, EU taxonomy, CSRD (Corporate Sustainability Reporting Directive) .
Q9	ISO 14001, ISO 45001, ESG rating.	ESG rating.	ISO 14001, 45001, 9001, ESG rating.	Most airlines utilizing ESG rating and ISO 14001 (IENVA rising as tailored to airlines).
Theme 3				
Q10	n/a	n/a	Lowest fares, non-substitutable routes (from Ireland), according to Sustainalytics #1 rated airline in Europe and #2 globally.	Not mentioned in most sustainability reports.
Q11	"Make change fly" communications campaign 2022, goal; Showcase LH group sustainability activities worldwide & illustrate sust. Measures	n/a	Pathway to NetZero decarbonization strategy.	Only few mentions in sustainability reports.
Q12	n/a	n/a	EU loophole: Long-haul flights are excluded from any contribution to decarbonization (disadvantage to European airlines). EU regulations, carbon pricing and aviation taxes make travel by air too expensive to customers.	Mentioned in some sustainability reports.

Appendix 6. Thesis data management plan

HAMK
Häme University
of Applied Sciences

THESIS DATA MANAGEMENT PLAN

This data management plan concerns following thesis: "Airlines fighting climate change: a comprehensive study on sustainable transformation strategies and initiatives in European airlines." And this document is a description on how the data is collected, used and processed in this thesis.

1 Management and storage of research data

Research data in this thesis incudes interview videos and transcripts, content analysis data performed on publicly available airline sustainability reports.

During the research process, the data collected is saved in HAMK´s secure cloud and used for analyzing purposes within this thesis. The only external parties having access to research data are the thesis supervisor and HAMK evaluators in the thesis process. It has also been agreed with the interviewees that no interview videos or transcripts in their original format would be published. This thesis data doesn´t include any confidential or sensitive data that would require additional safety measures in storing the data.

2 Processing of personal data and sensitive data

No personal data may be published in a completed thesis and no interviews are published as an appendix to the thesis, only anonymous interview data file with key findings included.

Personal data such as role, company and location are included in the interview transcripts which are only available to the thesis supervisor and HAMK nominated evaluators in this thesis process.

3 Ownership of thesis data

The data and results of this thesis solely belong to the author, Anne Marja Pimiä.

4 Further use of thesis data after the work is completed

The author of the thesis stores the data in a secure manner for a period of one year from the date of approval of the thesis, so that the results of the thesis can be verified and destroyed after in a secure manner.