Gordon Institute of Business Science
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Sustainable Business Model Innovation in Incumbent Airline Companies

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A research project submitted to the Gordon Institute of Business Science, University of Pretoria, in partial fulfilment of the requirements for the degree of Master of Business Administration.

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Abstract

There is a growing need for airline companies to address the impact they have on the environment. Airline companies play an essential role as enabler of global trade, and drive growth in the transportation industry. There is however public and political pressure on airline companies to reduce their overall carbon emissions, while at the same time continuing to meet the demands and expectations of international travel.

This creates the theoretical relevance for this research, where an exploratory approach is taken in order to gain a better understanding of how incumbent airline companies can implement a sustainable business model innovation process. The study aims to understand the challenges airline companies would face, tools that could help them achieve SBMI, the outcomes that would result from SBMI, and finally the potential implementation tools to utilise in the process.

This research was qualitative and followed an exploratory method to address the research questions proposed. The research design was in the form of a case study, and data was gathered from eight participants as primary data in combination with four industry reports as secondary data. The data was then analysed thematically.

The research concludes with a conceptual framework that aims to provide airline companies with a better understanding of how to implement the SBMI process. The outcomes of the research also added new insights as a potential refinement to literature.

Key Words

Sustainable Business Model Innovation, Environment, Sustainability, Challenges, Tools, Outcomes, Implementation, Aviation, Airline Companies, Innovation

I declare that this research project is my own work. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration at the Gordon Institute of Business Science, University of Pretoria. It has not been submitted before for any degree or examination in any other University. I further declare that I have obtained the necessary authorisation and consent to carry out this research.

Tristan Leigh Keeley

1st November 2022

Abbreviations

ACI	Airports Council International
BMI	Business Model Innovation
CEO	Chief Executive Officer
CO_2	Carbon Dioxide
CORSIA	Cardon Offsetting and Reduction Scheme for International Aviation
ESG	Environmental, Social and Governance
FAA	Federal Aviation Administration
IATA	International Association of Travel Agents
ICAO	International Civil Aviation Organisation
LTAG	Long Term Global Aspiration Goal for International Aviation
SAF	Sustainable Aviation Fuels
SBM	Sustainable Business Model
SBMI	Sustainable Business Model Innovation
SDG	Sustainable Development Goals
UNGC	United Nations Global Compact

Contents

Chapter 1: Introduction to the research problem

1.1 Background to the problem

Airlines play a key role in transporting people across the globe to various destinations for many different reasons. Airlines carried approximately 4.5 billion people to global destinations in 2019 (Amankwah-Amoah, 2020). Airlines are a major contributor to greenhouse emissions and account for approximately 2% of the world's total emissions. They are one of the fastest growing sources of greenhouse gases in the world (Ryley et al., 2020). The main processes that generate these emissions from aircraft are through the unburnt fuel in the combustion process that occurs in an aircraft engine, which leads to carbon in the fuel mixing with oxygen in the air to produce carbon dioxide or CO_2, (Yılmaz, 2017). In 2020 greenhouse gases from aviation activities was estimated as being 70% higher than what they were in 2005. Global forecasts estimate an increase of 300-700% above current levels if no measures are put in place to address this rapid expansion, (Amankwah-Amoah, 2020). Airlines and the aviation industry are projected to account for one-quarter of all global greenhouse gases by 2025 (Whitmarsh et al., 2020).

1.2 Why the research problem was selected?

In 2016 there were 196 parties that entered into the Paris Agreement, which aimed to limit global warming below 2 degrees Celsius compared to pre-industrial levels. Greenhouse gas emissions per sector would be targeted with the ultimate goal of becoming carbon neutral or net zero by 2050 (Delbeke et al., 2019). Notwithstanding the presence of many political leaders, company executives and environmental specialist at the Paris Accord there appeared to be a disconnect between what organizations and businesses knew would be required to achieve the targets set, and the actions that would be needed to achieve the required outcome. Research has shown that 99% of organisation leaders believe that sustainability is key to business success, however only 48% of them are actively implementing and supporting sustainability initiatives within their organisations (UNGC, 2019).

1.3 Business relevance

The airline industry contributes roughly $2.7 trillion dollars to global economic activity, and provides approximately 65 million jobs for its stakeholders around the world (Ryley et al., 2020). Airline transportation is essential to the survival and growth of the global transportation industry while simultaneously it is important to meet the goal set out by the

Paris Agreement in terms of reaching net zero by 2050. Public and political pressure are both increasing with the expectation that the airline industry will reduce its overall carbon emissions and will continue to meet the expectations and demands of international travel while simultaneously playing a vital role as an enabler of global trade, and as such the global economy (Sgouridis et al., 2011).

Airlines and organisations need to address the impact that they have on the environment in order to ensure that they continue to remain competitive in business (UNGC, 2019). To reach these goals airlines will need to innovate and start adapting their current business models to include the impact of their operations on the environment. This process is known as Sustainable Business Model Innovation (SBMI) (Young & Reeves, 2020).

For this reason it is considered by the researcher that there is a challenge for these organisations to move from their current business models to more sustainable business models, and research suggests that many of these sustainable business model innovations will fail (Geissdoerfer et al., 2018). This hinders competitive advantage, while at the same time impacts the environment negatively. This then led to the research gap in literature by Geissdoerfer et al. (2018) which states “How do organisations move from one business models to a more sustainable business model in practice?” (p.410). From this research gap in the literature, and there being a business need for the airline industry to reduce its carbon impact as a polluter of the environment. The main reason the research problem was thus selected.

1.4 Theoretical need for the study and contribution

There is a theoretical need to gain a greater understanding of the sustainable business model innovation process and to establish what the implementation gap steps are that incumbent airline companies would have to go through to move their current business models from their existing state to a Sustainable Business Model Innovation process (SBMI). To do so required a thorough understanding of the challenges being faced, the tools that could be used to overcome these challenges when transitioning to a SBMI process (Geissdoerfer et al., 2018). As well as the outcomes and advantages that have been identified in literature on how sustainable business models could help companies create value (Porter & Kramer, 2011). The implementation gap might be overcome using the conceptual framework that is provided in Chapter 7 of this report as result of the findings and key literature. It could potentially guide airline companies through the process

of SBMI by highlighting the key activities, challenges, tools, outcomes and implementation enablers that are available for them to use. There would also be a potential contribution to add to existing literature, through the finding of fuel enablers that is highlighted in Chapter 7.

1.5 Research questions

From the gap in literature described by Geissdoerfer et al. (2018) this research study based its main overarching research question and the sub research questions, which are:

1.5.1 Main Research Question

How can incumbent airline companies implement a sustainable business model innovation process?

1.5.1.1 Sub Research Question 1

What are the challenges airline companies face that are associated with a sustainable business model innovation process?

1.5.1.2 Sub Research Question 2

How can airline companies use additional tools to address challenges that they face in their transition to a sustainable business model innovation process?

1.5.1.3 Sub Research Question 3

Who will benefit from the transition to a more sustainable business model process?

1.6 Brief outline of the research proposal

The research report consists of seven chapters:

Chapter 1 of the research report provides the context as well as an overview of the business need for research. It also begins to give the reader a high-level overview of the research questions and overall research problem that is being asked.

In Chapter 2 the relevant literature and theory relating to the research problem is reviewed. It is separated into eight parts where an understanding of the different components that make up sustainable business model innovation are discussed. It is then followed by the drivers, challenges, tools, and outcomes of a sustainable business model innovation process.

Chapter 3 presents the main research question and follows with the sub research questions that were defined for the research.

Chapter 4 provides the detailed methodology which the research followed and includes justification why each section was chosen by the researcher.

Chapter 5 analysed the findings from the research.

Chapter 6 discusses the findings against key literature that was found in Chapter 2 and allows for similarities or differences to be noted.

Chapter 7 contains the conclusions from the study and includes a final version of the researcher's conceptual framework. This is then followed by recommendations and implications for managers. The research concludes overall with limitations of the study and any future research suggestions.

Chapter 2: Literature review

2.1 Introduction

Due to increasing pressures from the public, political and transportation sectors to reduce their carbon footprint and their impact on the environment, there is a need for the current business models of airlines to transition to more sustainable models (Sgouridis et al., 2011). Many organisations face significant challenges in transitioning their business models through the use of technology alone, and sustainable business model innovation could be a better alternative for leveraging sustainable solutions (Geissdoerfer et al., 2018).

The literature review was aimed at addressing the research questions that are found in chapter 3 of this report. The analysis of the literature review focused on business model innovation, sustainable business models, and sustainable business model innovation. The key constructs that were focused on were structured around the ideas found within Geissdoerfer et al. (2018). The literature review also focused on the key constructs that are challenges, tools, and outcomes of sustainable business model innovation.

Below is an outline of the literature review roadmap:

2.1 Introduction
2.2 Business Models
2.3 Sustainable business models
2.4 Business model innovation
2.5 Sustainable business model innovation
2.6 Drivers of sustainable business model innovation
2.7 Challenges of sustainable business model innovation
2.8 Tools or enablers of sustainable business model innovation
2.9 Outcomes of sustainable business model innovation
2.10 Conclusion and summary of literature review

Table 1: Author's own, Literature Review Roadmap

2.2 Business Models

Table 2 that is presented below was used to summarise the key scholars that were used when considering BMs. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of four scholars was due to their recent papers which were published in credible journals.

Author	**Bolton and Hannon (2016)**	**Geissdoerfer et al. (2018)**	**Bocken et al. (2014)**	**Teece (2018)**
Journal	Research Policy	Journal of Cleaner Production	Journal of Cleaner Production	Long range planning
Topics covered	There are three systems approaches with regard to innovative business models.	Covers the importance of being able to move into new business models to remain competitive.	Three important features are value creation, delivery, and value capture.	There are three main categories that are covered, value proposition, revenue model, and cost model.
Further research	The link between business models and sustainable innovations that can provide important insights on revenue generation.	How are businesses able to move from their current business model to a more sustainable business model.	The need to further explore social business model archetypes.	The areas for further research are organisational transformation, implementation, and change.

Table 2: Authors own, based on Bolton and Hannon (2016), Geissdoerfer et al. (2018), Bocken et al. (2014), and Teece (2018)

When conducting a literature review and trying to conceptualise transitioning to a sustainable business model, there is a need to first understand what a common business model framework looks like. According to Geissdoerfer et al. (2018), the working definition of a business model is a “simplified representation of the value proposition, value creation and delivery, and value capture elements and the interactions between these elements within an organisational unit” (p. 402). In industry and literature it is suggested that business model innovation is vital to the success of a business, (Bocken et al., 2014).

The four articles that are highlighted and summarised above are relevant to the understanding of business models. The reason that these articles were chosen is because they form the bases of alignment to the research questions. The journals that they are

published in are also top-rated journals. The articles also go into more detail regarding the sustainable business model which will be covered later in this chapter.

All the articles mentioned from Bolton & Hannon (2016) through to Teece (2018) have an underlying theme of value creation, and the various ways that business models can produce value in some form or another. There were only slight differences between some of the authors with perhaps Bocken et al. (2014) varying slightly from the others. Geissdoerfer et al. (2018) and Teece (2018) were very similar in their understanding of business models where both mentioned value proposition, delivery, and creation.

It appears after reviewing all the articles that Teece (2018) set the foundation on which the author describes the fundamentals of business models. The other scholars and authors then adopted this foundation on which to build their own views on value creation through business models. Geissdoerfer et al. (2018) then goes onto review this through the lens of SBMI.

There are differences noted between Bocken et al. (2014) and the other authors in terms of the application of business models. Where Bocken et al. (2014) talks about how a firm may use business models to improve its competitive strategy and design of its products or services. This then ties back into the value created by the firm's core products or services. This shares a close likeness with the view of Bolton and Hannon (2016) where the only slight difference is how Bolton and Hannon (2016) uses the activity approach to describe the interaction between stakeholders. This means that there is an interdependence on business related activities and system components which make up the business model.

2.3 Sustainable business models

Table 3 that is presented below was used to summarise the key scholars that were used when considering SBM. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of four scholars was due to their recent papers which were published in credible journals.

Author	Geissdoerfer et al. (2018)	Bocken et al. (2014)	Biloslavo et al. (2018)	Freudenreich et al. (2020)
Journal	Journal of Cleaner Production	Journal of Cleaner Production	Journal of Cleaner Production	Journal of Business Ethics
Topics covered	The design implementation gap: • There is a lack of follow-through for ideas • There is a lack of execution around concepts • Business failure	Looks at sustainable business model archetypes: • Technological • Social • Organisational SBM archetypes are the starting point for the SBM agenda.	Proposes a new sustainable business model framework called the Value Triangle" • Public • Partner • Customer These three angles add co-created value	Considers value creation through the use of a stakeholder value creation framework. • Different stakeholders • Resulting value • Value creation
Further research	How are businesses able to move from their current business model to a more sustainable business model.	Exploration of the role of social business model innovation in sustainability		There are new avenues for sustainability-oriented business model research.

Table 3: Author's own, based on Geissdoerfer et al. (2018), Bocken et al. (2014), Biloslavo et al. (2018), and Freudenreich et al. (2020)

Following on from business models we can then understand how the business model compares and differs from a sustainable business model. Geissdoerfer et al. (2018) provides us with a sustainable business model working definition, which is "business models that incorporate pro-active multi-stakeholder management, the creation of monetary and non-monetary value for a broad range of stakeholders and hold a long-term perspective" (p.403). According to Bocken et al. (2014), a sustainable business model may create competitive advantage by providing superior customer value and contribute to the sustainable development of an organisation and society.

When compared to business models, sustainable business models focus on value creation, value delivery and value capture (Figure 1). There is an additional requirement in focusing on social and environmental impacts and the role that these play in supporting and expanding an organization's reputation and brand in the global market.

Value propositions focus on the social capital that is generated and incorporates a sustainable reduction in environmental destruction in relation to the value that is created (Biloslavo et al., 2018).

For value creation to be successfully implemented there is a requirement for the engagement of multiple stakeholders in the process as opposed to the traditional process of satisfying the needs of customers and shareholders at the expense of the broader community and the environment. (Freudenreich et al., 2020; Biloslavo et al., 2018).

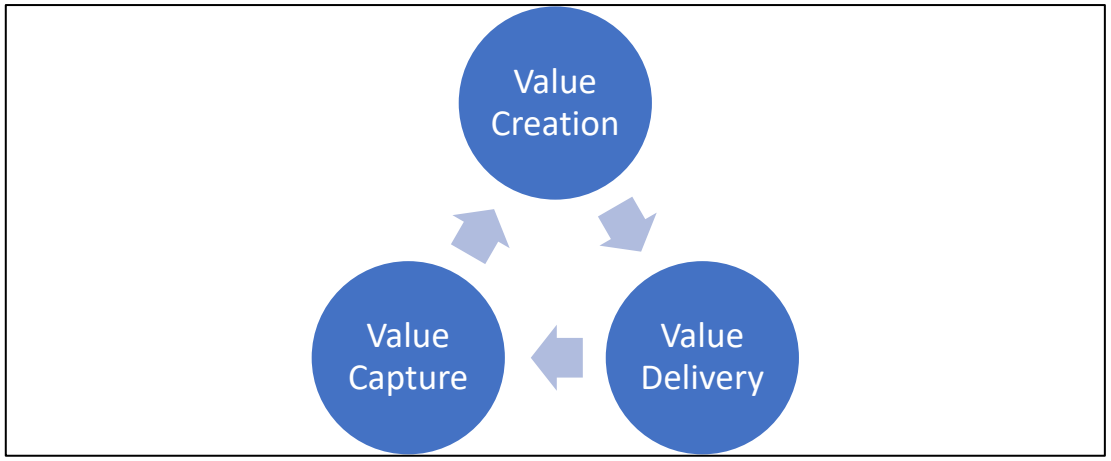

Figure 1: Key Value drivers within Sustainable Business Models based on Biloslavo et al. (2018) and Bocken et al. (2014)

2.4 Business model innovation

Table 4 that is presented below was used to summarise the key scholars that were used when considering BMI. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of four scholars was due to their recent papers which were published in credible journals.

Author	**Foss & Saebi (2017)**	**Geissdoerfer et al. (2018)**	**Karlsson et al. (2018)**	**Bolton and Hannon (2016)**
Journal	Journal of Management	Journal of Cleaner Production	Journal of Cleaner Production	Research Policy
Topics covered	Extensive research is done to understand BMI, and is broken into streams:	The design implementation gap: • There is a lack of follow-	Looks at business canvas with the examination of early phases of BMI for sustainability through: • Process	Looks at the role of innovative business models in transformation of socio-technical systems. The

	• Conceptualizing BMI • BMI as organisational change • BMI as an outcome • Consequences of BMI	through for ideas • There is a lack of execution around concepts • Business failure	• Value • People • Outcomes	paper proposes the use of a systems-based approach to BMI.
Further research	Conceptual clarification, simplification, and theoretical models are needed.	How are businesses able to move from their current business model to a more sustainable business model.	The future research may consider the later phases of the BMI process.	Since the study looked at the emergent business models and not established ones, there is potential to analyse more in-depth activity systems.

Table 4: Author's own, based on Foss & Saebi (2017), Geissdoerfer et al. (2018), Karlsson et al. (2018), and Bolton and Hannon (2016)

After reviewing the literature on the difference between business models and sustainable business models, there is a need to define the concept of business model innovation and understand how it is used to facilitate the planning and transformation from one business model to another (Geissdoerfer et al., 2018). Business model innovation is an extension of an existing business model, and could be utilised for many different reasons which may include accessing new markets, reducing cost, introducing new products and optimizing performance (Foss & Saebi, 2017). The use of business model innovation could be to change the entire business model of an organisation, or merely parts of it in response to opportunities or challenges that may be faced in the environment within which the organisation operates, (Geissdoerfer et al., 2018). According to Lindgardt et al. (2012), an aspect that would need to be met in order to qualify as business model innovation, is that at least two business model elements have to change, however, this claim is not clear from most reviewed articles and is relatively unexplored.

The literature from Karlsson et al. (2018) says that BMI is meant to create value for customers in two ways. The first relates to the activates and actions, and the other way is

through development and change, also known as the events-driven approach (Karlsson et al., 2018). The process for BMI encompasses a wide variety of factors that could be very random and disordered in the early stages and more cyclical in the later stages (Karlsson et al., 2018). In the literature by Bolton and Hannon (2016) there discussion around the use various types of system-based approaches to BMI, where they define the linking of activates around business model innovation as “consisting of adding new activities, linking activities in novel ways or changing which party performs an activity” (p.1733). Where it is understood that the activity refers to the business model being a system of interdependent activates (Bolton and Hannon, 2016).

2.5 Sustainable business model innovation

Table 5 that is presented below was used to summarise the key scholars that were used when considering SBMI. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of four scholars was due to their recent papers which were published in credible journals.

Author	**Bocken et al. (2014)**	**Geissdoerfer et al. (2018)**	**Bocken & Geradts (2020)**	**Baldassarre et al. (2017)**
Journal	Journal of Cleaner Production	Journal of Cleaner Production	Long Range Planning	Journal of Cleaner Production
Topics covered	SBM archetypes are used to describe mechanisms and solutions to build up SBMI. The archetypes are: • Material and energy efficiency • Value from waste • Renewables and natural processes • Deliver functionality	The design implementation gap: • There is a lack of follow-through for ideas • There is a lack of execution around concepts • Business failure	The key points that are covered are: • Institutional barriers and drivers • Strategic barriers and drivers • Operational barriers and drivers This is summarized as dynamic capabilities.	The paper considers of SBMI through value proposition design: • Stakeholders network • Sustainability problem • Product and service

Further research	Look at a wider political, social and economic variation in order to make the archetypes more mainstream.	How are businesses able to move from their current business model to a more sustainable business model.	Highlighting the importance of each barrier and driver.	The design would need to be tested in relation to multiple different sustainability problems to then adapt the design over time.

Table 5: Authors own, based on Bocken et al. (2014), Geissdoerfer et al. (2018), Bocken & Geradts (2020), and Baldassarre et al. (2017)

The literature on sustainable business model innovation is largely felt to lack the extensiveness and depth of normal business model literature (Bocken et al., 2014). It is also felt that due to the field of sustainable business model innovation being relatively new, there is no wide-ranging review of the literature as yet (Geissdoerfer et al., 2018). The definition of sustainable business model innovation by Schaltegger et al. (2016) gives a good understanding and description of the process, “modified and completely new business models can help develop integrative and competitive solutions by either radically reducing negative and/or creating positive external effects for the natural environment and society” (p. 3). There is also a definition of SBMI given by Bocken et al. (2014) which states “Innovations that create significant positive and/or significantly reduced negative impacts for the environment and/or society, through changes in the way the organisation and its value-network create, deliver value and capture value (i.e., create economic value) or change their value propositions” (p.44).

It can be argued that there are two processes that constitute sustainable business model innovation. The first is to develop or positively reduce the negative impacts on the environment, society and the overall organisation and its stakeholders (Geissdoerfer et al., 2018). The second is to adopt characteristics that cultivate sustainability in the organisations value proposition, value network and or creation (Geissdoerfer et al., 2018). It is also felt that sustainable practices in SBMI should be tackled at the source of the issue, which in this case is the business model itself, and not used to counteract the negative outcomes or by-products that a business may create as a result of its current business model (Bocken et al., 2014).

The use of sustainable business model innovation can also lead to improving organizational resilience and improve reputation, while at the same time benefiting the organisation by reducing expenditure and creating new income streams (Bocken &

Geradts, 2020). While there is mention of SBMI creating value and reducing negative impacts on the environment (Bocken et al., 2014). Literature by Baldassarre et al. (2017) suggests that there is also benefit for businesses through the economic value it provides. Being able to conceptualize a sustainable value proposition which is at the core of SBMI according to Baldassarre et al. (2017), is also key. It will require the understanding and managing of requirements from multiple different stakeholders across a network and developing of a product or service that addresses the problem with stakeholders in mind (Baldassarre et al., 2017).

2.5.1 Drivers of SBMI

Table 6 that is presented below was used to summarise the key scholars that were used when considering the drivers around SBMI. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of four scholars was due to their recent papers which were published in credible journals.

Author	**Lüdeke-Freund (2020)**	**Grekova et al. (2014)**	**Foss and Saebi (2017)**	**Evans et al. (2017)**
Journal	Business Strategy and the Environment	International Journal of Production Economics	Journal of Management	Business Strategy and the Environment
Topics covered	Looks at two major perspectives for BMfSI: • Agency perspective • Systems perspective These are perspectives are then integrated into the business mediation space.	Looks at externally oriented environmental management	Extensive research is done to understand BMI, and is broken into streams: • Conceptualizing BMI • BMI as organisational change • BMI as an outcome • Consequences of BMI	The article looks at challenges around value creation: • Mind-set • Resources • Technology innovation • External relationships • Triple bottom line Business modelling methods and tools

Further research	The future research could refine the analytical variables that are implied by the BMSI framework.	Performance factors can be linked to E-EM	Conceptual clarification, simplification, and theoretical models are needed.	The areas of future research are around development of variables from five theoretical propositions.

Table 6: Authors own, based on Lüdeke-Freund (2020), Grekova et al. (2014), Foss and Saebi (2017), and Evans et al. (2017)

When considering the literature around the factors that drive sustainable business model innovation there are two main categories. These can be broadly defined as internal and external drivers (Engert et al., 2016). These internal and external drivers help to explain why management may integrate sustainability into an organisation and also what some of the advantages are as a result (Engert et al., 2016).

Internal factors have been defined as cost reduction, reputational integrity, economic benefits, social and environmental compliance, and responsibility (Schaltegger et al., 2012). An additional driving factor identified was the preservation of an organizations brand integrity (Kiron et al., 2012).

External factors include increasing stakeholder pressure, media and non-governmental agencies requiring organizations to include sustainability as a core component of their business and governmental policies and regulations (Lüdeke-Freund, 2020). Increasingly strict environmental regulations and pressure from stakeholders would necessitate the engagement and focus from an entire organization for it to reduce its environmental and societal impact (Grekova et al., 2014).

The drivers described above are focused on sustainability in terms of the organizations impact on the environment. When there is an eco-system failure such as global warming, which is experienced through climate change. This plays a role in market demand encouraging organizations to move to more sustainable business models in order to protect their impact and share of the market (Long et al., 2018).

Foss and Saebi (2017) in conjunction with Evans et al. (2017) propose that a gap in literature exists in relation to the drivers within a successful implementation of SBMI. They propose the first phase of the process is to identify the drivers of value creation and that is followed by the identification of the challenges associated with the implementation of

the identified drivers. The challenges are explored further in section 2.5.2 and that is followed by a review of the tools and enablers that support successful SBMI implementation in section 2.5.3.

2.5.2 The challenges of SBMI

Table 7 that is presented below was used to summarise the key scholars that were used when considering the challenges around SBMI. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of five scholars was due to their recent papers which were published in credible journals.

Author	**Bocken and Geradts (2020)**	**Lüdeke-Freud et al. (2016)**	**Laukkanen and Patala (2014)**	**Evans et al. (2017)**
Journal	Long Range Planning	Journal of Autoimmunity	International Journal of Innovation Management	Business Strategy and the Environment
Topics covered	The key points that are covered are: • Institutional barriers and drivers • Strategic barriers and drivers • Operational barriers and drivers This is summarized as dynamic capabilities.	General thinking is around business sustainability and shared value. Key points on barriers are: • Pressures for short-term results • Aversion to the risk of jeopardizing existing business • Inertia and resistance to change	Article looks at the three main barrier archetypes which are: • Technological • Organisational • Social This is then structured in three categories • Regulatory • Market and financial Behavioural and social	The article looks at challenges around value creation: • Mind-set • Resources • Technology innovation • External relationships • Triple bottom line • Business modelling methods and tools
Further research	Highlighting the importance of each barrier and driver.		The areas for further research would focus on specific mid-level archetypes.	The areas of future research are around development of variables from five theoretical propositions.

Table 7: Authors own, based on Bocken and Geradts (2020), Lüdeke-Freud et al. (2016), Laukkanen and Patala (2014), and Evans et al. (2017)

During the literature review a number of challenges were identified in the implementation of sustainable business model innovation. It is important that these challenges around business transformation toward sustainability be address before a SBM can be successfully implemented (Evans et al., 2017).

Some of the challenges according to Geissdoerfer et al. (2018), were the challenges are split into three parts. The first part being ideas that are not followed up after innovation meetings, the second part is that concepts are not implemented even if they are favourable, and the third part is that some of the business models may fail once in the market. These challenges can then be broken down further into the activities or processes that make up the three parts. Some of these activities or processes are generally defined as triple bottom line, organisation resources, external stakeholder relationships, persons mindsets and tools, and technological innovation (Evans et al., 2017).

Organisations lack dynamic capabilities, which would allow them to reconfigure internal and external operations quickly in order to meet the ever-changing environments in which they operate (Bocken & Geradts, 2020). As these dynamic capabilities are able to create and align the organisations resources, such as a business model, it is imperative that an organisation has strong dynamic capabilities relative to its competitors (Teece, 2018).

There are a number of challenges that are listed by Lüdeke-Freund et al. (2016), one of which are the pressures for short term results and as a result the business models for sustainability do not involve enough experimentation resulting in failure to plan for the long term. The other challenge with SBMI and the use of technologies which may aid in the process of becoming more sustainable, is the cost associated with these sustainable practices (Laukkanen & Patala, 2014).

Many other challenges are confirmed by other authors in the literature. This can be referred to as the design-implementation gap. It is felt by Geissdoerfer et al. (2018) that not much research has been done in order to understand sustainable business model innovation, the implementation of these new business models, and the challenges that may be faced when trying to do so.

2.5.3 Tools / enablers of SBMI

Table 8 that is presented below was used to summarise the key scholars that were used when considering SBMI. There were other scholars that were mentioned literature; however, they were not listed in the table provided. The main reason for the selection of five scholars was due to their recent papers which were published in credible journals.

Author	**Bocken and Geradts (2020)**	**Lüdeke-Freud et al. (2016)**	**Morioka et al. (2017)**	**Caldera et al. (2019)**
Journal	Long Range Planning	Journal of Autoimmunity	Journal of Cleaner Production	Journal of Cleaner Production
Topics covered	The key points that are covered are: • Institutional barriers and drivers • Strategic barriers and drivers • Operational barriers and drivers This is summarized as dynamic capabilities.	General thinking is around business sustainability and shared value. Key points on barriers are: • Pressures for short-term results • Aversion to the risk of jeopardizing existing business • Inertia and resistance to change	Article looks at value proposition, value creation, value capture. Four contributions to SBM's: • Framework to support implementation • Cascaded sustainable value • SDG's as a framework • Use of competitive advantage.	Articles considers four enablers and six barriers to implementation of SBMI in SMEs. Enablers are: • Integrated strategy • Continuous improvement • Stakeholder involvement • Streamlined processes
Further research	Highlighting the importance of each barrier and driver.		The studies can be validated with future research and investigating SBM	The future research can look into the lean and green tools to optimise SBM practice.

Table 8: Authors own, based on Bocken and Geradts (2020), Lüdeke-Freud et al. (2016), Morioka et al. (2017), and Caldera et al. (2019)

The literature has identified several tools or enablers which could help support the implementation of SBMI. According to Caldera et al. (2019), to achieve strategic sustainable business model innovation there are three key enablers, which are aligning the company's strategic objectives, reinforcing continues improvement in green methods, involving internal and external stakeholders, and streamlining processes. These tools or enablers can also be to be characterised as internal and external according to Bocken

and Geradts (2020) and Morioka et al. (2017), and consist of aspects such as communication, education, stakeholder engagement, and collaboration within and external to the organisation.

When considering the external viewpoints that might have an impact on SBMI and its enablement. Morioka et al. (2017) considers these external aspects to be legislation, social general context, industry-specific competitive dynamics, natural environment, and public opinion. The other key tools that could aid in external SBMI implementation according to Bocken and Geradts (2020) is educating people around sustainability inside and outside the organisation. Laukkanen and Patala (2014) mention in literature that awareness is seen as a barrier to SBMI, and that if people are educated about sustainability this might lead to the barrier being overcome. The other tool that can be viewed as an external consideration is the collective effort and action that is needed for businesses to maximise its protentional for SBMI (Lüdeke-Freud et al., 2016). Technology is seen to be another external enabler of SBMI, as Morioka et al. (2017) mentions that technology will be critical for enabling low carbon applications in organisations. The other key aspect in the external enablement of SBMI for companies is on policy and regulations. Government is seen to be an important enabler of sustainability practices for organisations (Dentchev et al., 2018), and government also plays an important role in motivating other organisations to participate in SBMI.

It is argued that focusing on these enablers will impact positively on the ability of the organization in its implementation journey from SBM to SBMI (Lüdeke-Freund et al., 2016). It is clear from the research that in many cases the challenges faced during the move from SBM to SBMI are often identified as enablers. The challenges stem from the organizations existing implementation maturity levels regarding key processes such as strategy, leadership, communication, collaboration, vison and values, stakeholder engagement and the tools to resolve these shortcomings lie in addressing the status quo and moving to greater levels of successful implementation and performance.

The move takes place within the context of global market forces, and this provides the stimulus required to motivate and galvanise organisations to embark on the journey from SBM to that of SBMI implementation.

2.5.4 Outcomes derived from SBMI

Table 9 that is presented below was used to summarise the key scholars that were used when considering SBMI. There were other scholars that were mentioned in literature; however, they were not listed in the table provided. The main reason for the selection of four scholars was due to their recent papers which were published in credible journals.

Author	Bocken & Geradts, (2020)	Biloslavo et al., (2020)	Comin et al. (2020)	Gregori and Holzmann (2020)
Journal	Long Range Planning	Management Decision	Benchmarking	Journal of Cleaner Production
Topics covered	The key points that are covered are: • Institutional barriers and drivers • Strategic barriers and drivers • Operational barriers and drivers This is summarized as dynamic capabilities.	Transformation toward sustainability through legitimation theory and business model innovation theory.	Analysis of sustainable business models and the applied practices. • Sustainable business models • Practices of sustainable models	Institutional logics perspective on SBM. • Blended Value • Integrative creation • Multidimension value capture
Further research	Highlighting the importance of each barrier and driver.	Focus on the final product instead of the raw material, and see how the choices may differ	Look at more organisational theories and regulations that are put on companies. This will collect more relevant information on SBM	Research needs to be done on specific challenges from social, environmental, and digital logics.

Table 9: Authors own, based on Bocken & Geradts, (2020); Biloslavo et al., (2020); Comin et al. (2020); and Gregori and Holzmann (2020)

Business model innovation forms a key foundation and activity for organisations to remain competitive in business, and revolves around creating value through customer value proposition, creation, delivery and capturing mechanisms (Bocken & Geradts, 2020). This is in comparison to SBMI which incorporates a wider notion of value (Bocken & Geradts,

2020). The value that SBMI includes is social and environmental, as well as customer, shareholder, multi-stakeholder, and societal stakeholders (Bocken & Geradts, 2020).

Sustainable business model innovation takes the core foundations of business model innovation and adds three main components that can also be defined as the triple bottom line of business, these being economy, social equity and the environment (Biloslavo et al., 2020). Based on these three additional components it could be argued that sustainable business model innovation encompasses more than just the financial aspects of a company's value, and also embodies the non-financial value such as social and environmental aspects beyond the organisation and its customers. (Comin et al., 2020). According to Comin et al. (2020) the benefits of SBMI would also include employees, suppliers, society and other stakeholders. While Biloslavo et al., (2020) argues that there is a benefit to the financial components of an organisation through SBMI, Biloslavo et al., (2020) also states that meaningful livelihoods, career development and long-term employment are also part of the outcomes to SBMI.

There is also value creation as an outcome that can be considered with the shift to a SBMI process. It considers the higher value that is added through environmental stewardship, and the use of clean energy by being more energy efficient (Comin et al., 2020). Gregori & Holzmann (2020) also states the socioenvironmental aspect and benefit thereof in the value you created through sustainable business models. Organisational reputation is also seen as a direct benefit of the value created through SBMI (Bocken & Geradts, 2020).

The outcomes as a result of SBMI can be seen to be many, from the value created at a organisational level to a multistakeholder level and finally an environmental level. It would appear from literature that value is created on multiple levels (Comin et al., 2020).

2.6 Conclusion and summary of literature review

The literature review conducted, aimed at identifying the transition from a sustainable business model concept to that of sustainable business model innovation. Organizations have historically focused on profit, the impact of their operations on shareholders, stakeholders and more recently on the lasting impact of environmental degradation. These initiatives yielded improved results but challenging business cycles, economic downturns, and other factors may have brought sustainability into the spotlight. While there is not

much literature at the moment in the field of SBMI, the studies concerning SBMI have been receiving increasing attention. A complimentary approach was proposed which incorporated the above-mentioned focus areas, with the concept of sustainability, in the development of SBMI. The SBMI process is based on four key drivers these being:

I. The factors guiding the movement of companies from SBM to SBMI.
II. Challenges that organizations face in the transition process.
III. Implementation enablers that assist organizations during the transition process.
IV. Value created in the transition from SBM to SBMI, either for the organization, shareholders, and stakeholders.

For organizations to survive in the global economy, many challenges are encountered, and the traditional business models and strategies are no longer sufficient to satisfy economic, social, and environmental pressures (Geissdoerfer et al., 2018). Sustainability needs to be derived from innovative practices and competitive advantage requires organizations to leapfrog their competitors on a continuous basis.

Concluded studies have focused on SBM and the role that SBM's have played in organizational development and improvement. Innovation as a concept was not a focus point of these studies and Geissdoerfer et al. (2018); Foss and Saebi (2017); Roome & Louche (2016), have identified the lack of research regarding innovation in the SBM process. Their research has identified several key challenges and enablers.

Equally the driving forces that encourage the movement from traditional SBM to SBMI within organizations has shown significant gaps (Evans et al., 2017), and the challenges faced during these processes shows additional research gaps (Long et al., 2018). This presents a significant opportunity, both from a researcher perspective as well as an implementation opportunity.

The research study has identified gaps in the literature regarding the movement from SBM to SBMI with specific reference to airline companies. The gaps identified have been translated into key research questions. The main research question and its subordinate questions, relating to the implementation of SBMI in airline companies, are defined and described in Chapter 3.

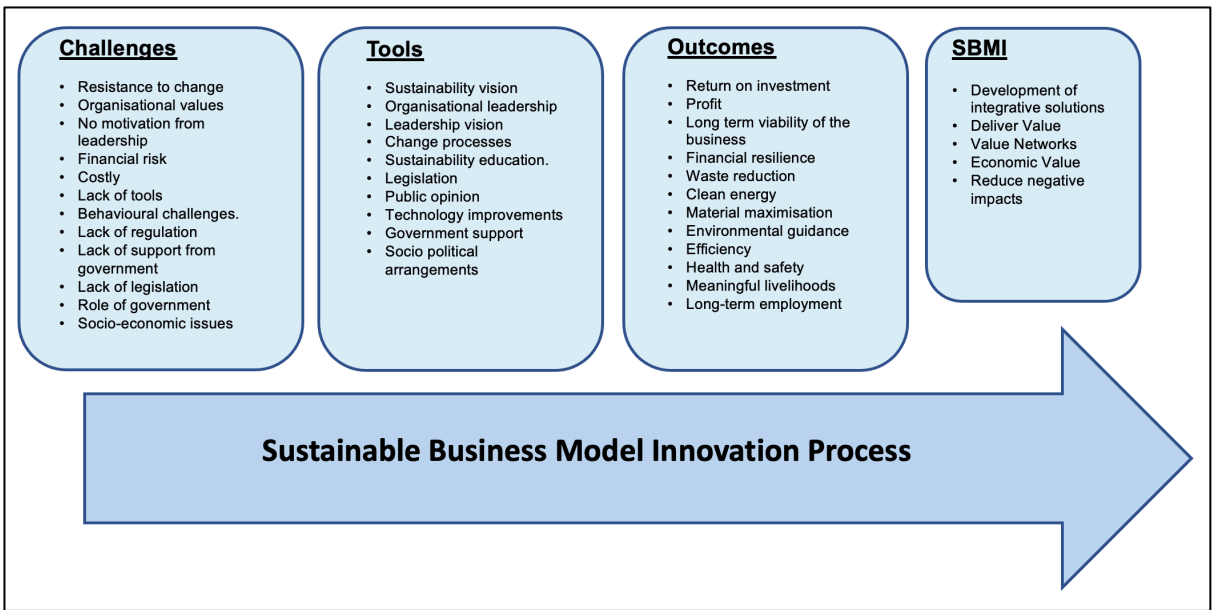

Figure 2: Authors own, initial Conceptual Framework created by researchers understanding from Biloslavo et al. (2020); Bocken and Geradts (2020); Comin et al. (2020); Evans et al. (2017); Geissdoerfer et al. (2018); Laukkanen and Patala (2014); Lüdeke-Freund (2020); Lüdeke-Freud et al. (2016); and Morioka et al. (2017)

Chapter 3: Research Questions

3.1 Definition of the Research Question and research opportunity

Before formulating the research questions there was a need to find a research gap in the literature. After a review of the article published by Geissdoerfer et al. (2018), the research opportunity and main research question was identified. According to Geissdoerfer et al. (2018) the following research gap exists “three areas of sustainable business model innovation that undermine bridging its design-implementation gap: 1) the implementation of the business model innovation process; 2) its tools; and 3) its challenges” (p.408). This led to the formulation of the main research question followed by three sub-questions that were explored in this study. Below are the questions based on the research gap by Geissdoerfer et al. (2018).

3.1.1 Main Research Question

How can incumbent airline companies implement a sustainable business model innovation process?

3.1.1.1 Sub Research Question 1

What are the challenges airline companies face that are associated with a sustainable business model innovation process?

The research question around challenges was formulated by Geissdoerfer et al. (2018) and has been asked by the researcher to try and gain a better understanding from airline companies what some of the challenges they face are when transitioning to more sustainable business practices.

3.1.1.2 Sub Research Question 2

How can airline companies use additional tools to address challenges that they face in their transition to a sustainable business model innovation process?

The research question on tools that address the challenges, and aids in supporting the transition of organisations to a more SBMI process is mentioned by Geissdoerfer et al. (2018). The researcher considered that this question of tools could assist the airline companies in better implementing SBMI. Geissdoerfer et al. (2018) also mentions that the

use of tools could also help managers by providing them with guidance in expectation of the challenges relating to SBMI.

3.1.1.3 Sub Research Question 3

Who will benefit from the transition to a more sustainable business model process?

The research question around outcomes of SBMI are identified and based on a gap in literature by Bocken and Geradts (2020). This is considered by the researcher as a need to understand more about the value and overall benefit that is generated through the transition of airline companies to a SBMI process.

Chapter 4: Proposed research methodology

In this chapter the research methodology is outlined for the purpose of this study. The research is attempting to understand how airline companies can implement a sustainable business model innovation process. The research design is defined in the following chapter, and how the research aims to undertake the process of answering the relevant research questions. The chapter will look at the following key headings:

4.1 Choice of methodology
4.2 Population / Setting
4.3 Level and Unit of analysis
4.4 Sampling method and size
4.5 Research instrument
4.6 The process utilized for the gathering of data
4.7 The approach adopted for the analysis of data
4.8 Control process utilized to manage the quality of the research
4.9 Ethical considerations for data collection
4.10 Limitations of the Research

4.1 Choice of methodology

The philosophy of this research, which is explained as the postulations and beliefs of the character and development of knowledge, (Saunders & Lewis, 2018) lends itself to being an interpretivist philosophy and qualitative in nature.

The research seeks to be explorative in nature as it looks to gain new insights into how airline companies can transition from their current business models to implement a sustainable business model innovation process, and what the best practices would be to overcome the challenges and implementation gap identified.

The research design was in the form of a case study as the main question leads with a “how” type of question in order to gain insights into the research problem (Myres, 2022). There were two considerations when doing a case study, and those were to define the case and bound the case study (Yin, 2017). The reason for defining the case is according to Yin (2017), each different case will have its own research design and data collection strategy depending on the research questions that are selected. The definition of the case study through the setting will be outlined in the setting section 4.2 of this report. Outlining

the boundaries of the case are key to defining the case, aspects such as clarifying the relevant organisation, or geographical area of the case and the type of evidence collected create the boundaries of a case (Yin, 2017). According to Yin (2017), the strength of a case study is the opportunity to utilise many sources of data in a triangulation strategy. By also converging the data from different sources of evidence though triangulation, the validity of the case is strengthened (Yin, 2017).

The research design followed was in the form of semi-structured interviews in combination with secondary data. This allowed for deeper insights into the main research questions and sub questions that were proposed, (Saunders & Lewis, 2018). The research approach was inductive for the primary data due to the process of observing patterns and then formulating some general conclusions around these patterns and theories (Saunders & Lewis, 2018). While the approach for the secondary data followed a deductive process.

The timeline of the research was cross-sectional due to the time constraints of completing the research project. Using a cross-sectional study where a particular subject is studied at a particular time (Saunders & Lewis, 2018), was also relevant due to the main research question not having a change orientation, as it is considering the development of the change and not the character of the change itself.

4.2 Population / Setting

As per the requirements of a case study, the setting and boundary of the research needs to specify the parameters in which the participants operate and the particular location of the industry (Yin, 2017). The setting when exploring the research questions for this study is therefore defined as the aviation companies, and the scope of the research is globally. The selection of the research setting will identify individuals from the airlines companies that can provide relevant and insightful information into the research questions posed, (Gupta & Awasthy, 2015). Due to the time frame and scope of work, the main setting focus will be on the airline companies in the aviation industry.

4.3 Level and Unit of analysis

The level of analysis for this study would be aviation companies at sustainably level. The primary unit of analysis will be the individuals within the airline companies who are responsible for the implementation of the business models and sustainability, and who possess the relevant expertise and knowledge of sustainability within the organisation.

The other primary unit of analysis will be individual energy experts from organisations that form part of the value chain related to sustainability in airline companies. The final primary unit of analysis would be individuals from outside airline companies that are consultants in the industry. This would enable the researcher to gain deeper insight into the research questions being asked.

The second unit of analysis which will be used to triangulate the data gathered would be secondary data in the form of published industry reports relating to airline companies sustainability. This also includes secondary data published by governing bodies that specify the operational guidelines to airline companies around sustainability. These industry reports can also be compared to the literature that has already been published. The primary data will be analysed in the form of a thematic analysis, and the secondary data will follow a content analysis approach.

4.4 Sampling method and size

The sampling method that will be used for the study is purposive. This method will select a sample based on a range of different criteria, which met the research objective as they had the knowledge and experience for the relevant topic (Saunders & Lewis, 2018). Using this recruitment process the criteria that was used is the following:

4.4.1 Primary Data Sample

The primary data sample consisted of participants from airline companies, external energy organisations, and consultants from within the industry that form part of the value chain of sustainability. All the primary data met the following criteria:

(i) incumbent airline companies; and or organisations that are involved in airline sustainability

(ii) the participant should have knowledge and experience in sustainability within the airline industry

(iii) each organisation should be pursuing various degrees of sustainability as per the company sustainability reports.

The goal was to select three individuals from each selected airline company, as well as three individuals from each selected external energy organisation, and lastly 2 consultants that form part of the airline value chain and are part of the overall sustainability value chain. These individuals were selected purposively due to their involvement in the

sustainability practices within the organisation and have knowledge and experience in aviation sustainability. The researcher utilised their professional network and referrals to identify these participants.

4.4.2 Secondary Data Sample

To triangulate the data and provide more depth and strengthen the legitimacy of the case study, and increase the confidence in the findings (Yin, 2013). Secondary data was also used in the sample. This secondary data was purposive in the form of four industry sustainability reports that are publicly available and relate to the airline companies. The sample was based on criteria that met the research objective to achieve sustainability in airline companies. According to (Suri, 2011), deciding on the minimum or maximum amount of secondary data to be used should be guided by the amount of sufficient data collected in order to answer the research question, and not a specific number of documents.

4.5 Research instrument

The proposed research study is qualitative in nature and used semi-structured interviews to gather information. The primary measurement instrument was an interview guide that the interviewer utilised. The interviewer used their senses to interpret the information from the interviews conducted (Maxwell, 2012). The interview guide was also used to provide direction and consistency during the interview process. This also allowed for deep and meaningful data to be collected during the interview process.

Appendix D is an example of the interview guide that was followed for the semi-structured interviews. The planning and structure that was followed invited the interviewees to talk in-depth about the research problem and the sustainability practices within their organisations (Josselson, 2013). To guarantee that there was validity of the research instrument the researcher did a pilot interview to test and refine the questions that were used for the process of data gathering. This pilot interview was not utilised in the final data collection.

4.6 Data gathering process

Data gathering was through the use of semi-structured interviews with individuals and management that are involved with the sustainability practices in the airline companies and other organisations, such as energy companies that also form part of the value chain

of sustainability in airline companies. These interviews were aligned with the research questions and interview guide highlighted in Appendix D. Interviews were conducted in person where possible or due to convenience for the respondents, the interviews were also done over a digital/virtual platform such as Microsoft Teams or Zoom.

Short-list questions were asked and the due to the interviews being semi-structured in nature, the respondents were also able to answer any additional questions that would arise from the interview. There was a certain process that was also followed during the data gathering process, whereby the participant was required to sign a consent form before the interview could take place. Once the interview started the researcher would give the participant details around the scope of the research before asking the participant if they had any questions and were happy to proceed with the interview. All of the interviews were recorded with two separate recording devices to ensure the backup of data for analysis at a later stage.

To ensure the validity and reliability of the case study according to Bell et al. (2019) the data was triangulated to include other data sources. As mentioned in the method, the use of secondary data in the form of an airline industry sustainability reports were also used to further gain insight into the research problem and give a different perspective. This also added value, validity, and reliability to the semi-structured interviews. To ensure that the study could minimize errors and biases and be replicated in the future by another researcher (Yin, 2017).

4.7 Data analysis process

After all the interviews had been concluded the analysis started from early on during the process when initial insights were gained, and patterns started to form in the researcher's mind (Saunders & Lewis, 2018). Thereafter a thematic analysis of the qualitative data was followed according to Anderson et al. (2014). The analysis of the primary data followed an inductive approach for coding and analysis of the data. Following on from this a deductive approach was then aimed at identifying themes and highlighting similarities and differences in the data. The following process was carried out:

(i) The researcher got familiarized with the data through transcribing and noting down initial ideas;
(ii) Followed by creating initial codes and noting interesting features of the data through the use of those codes in a systemic fashion;

(iii) Assembling the codes into 1st order categories;

(iv) Identifying themes from the 1st order categories, and then reviewing the themes and creating a thematic map of the analysis;

(v) Refining the specifics of each theme in an ongoing analysis until an overall story started to emerge;

(vi) Producing a report of findings through the final analysis

The secondary data analysis was initially inductive in nature, as according to Hyde (2000) the researcher gains an in-depth understanding of the data by first reading the secondary data, in this case the industry reports, in detail to generate themes. Once the themes from the secondary data started to form and were identified. A deductive research process would aid in the analysis as different patterns and insights started to emerge. Figure 4 below outlines the process that was followed for the secondary data versus the primary data analysis in the analysis steps that were taken.

The steps for the primary and secondary data analysis detailed above were done using a platform called ATLAS.ti. For each interview to be analysed using the ATLAS.ti platform the audio recording of each interview first needed to be transcribed. After each interview the researcher would utilise a transcription tool called Otter.ai to transcribe the interview in order to input the data into ATLAS.ti and carry out the analysis steps detailed in figure 3 below. The number of codes, categories and themes are highlighted in figure 3, and the list of descriptive codes is included in the study as Appendix C.

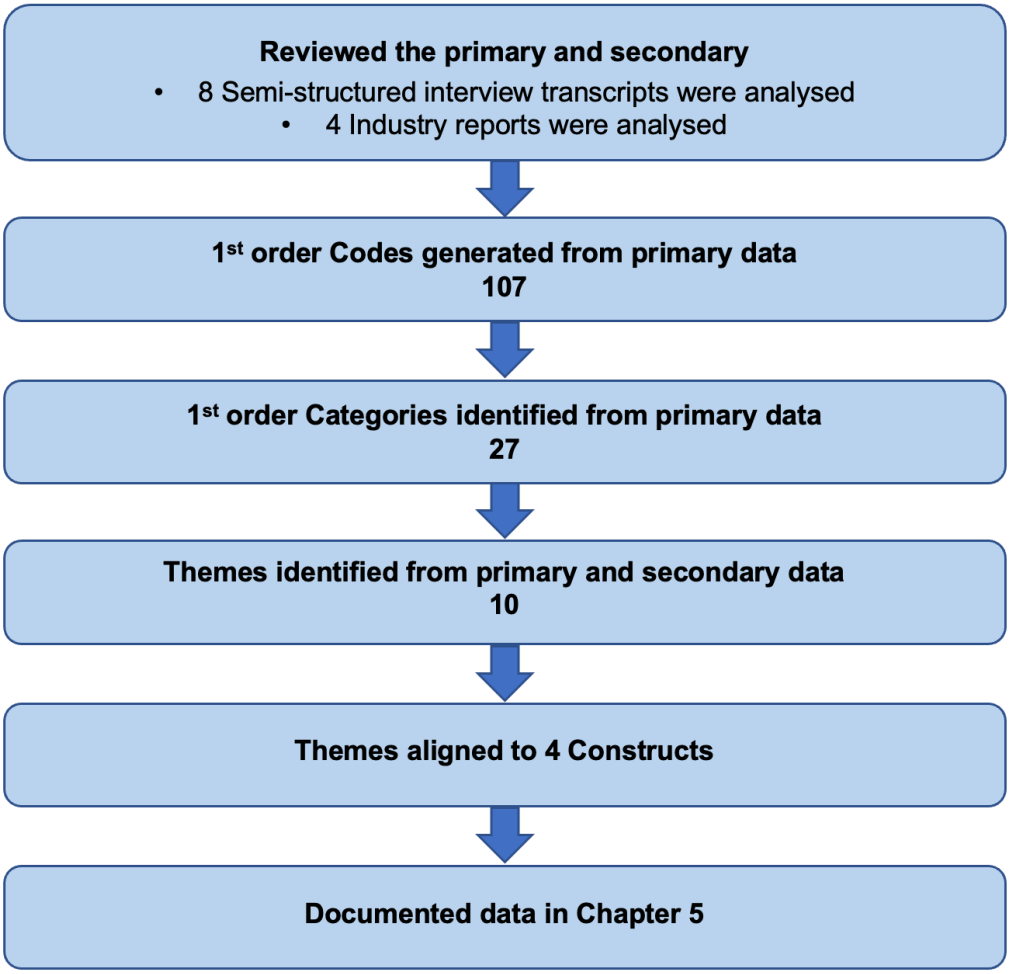

Figure 3: Author's own, Phases of the thematic data analysis

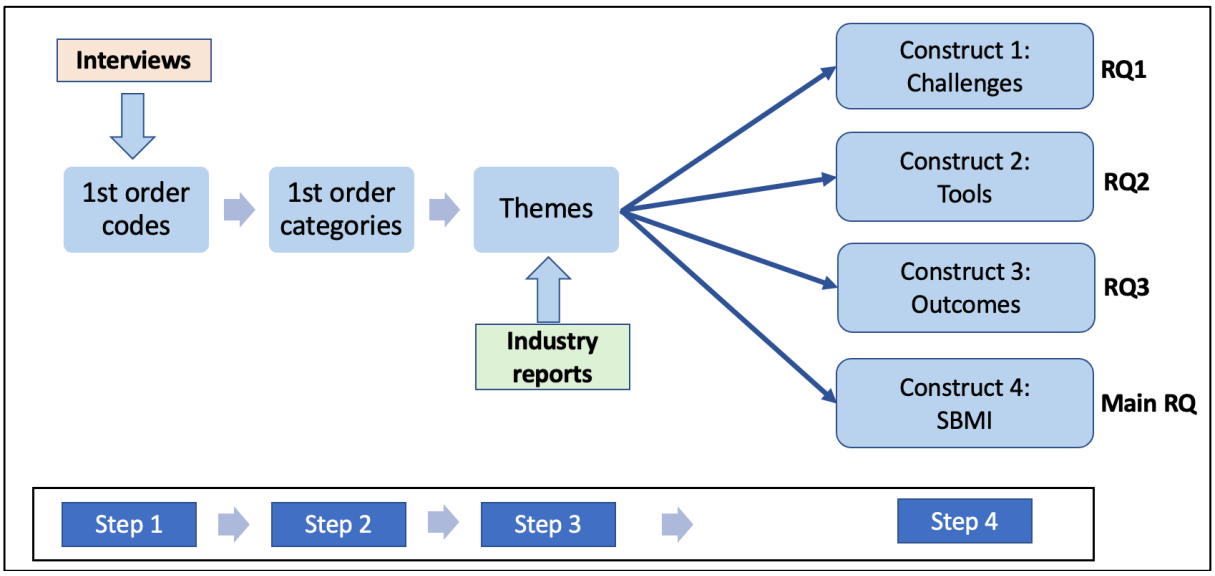

Figure 4: Author's own, depiction of primary and secondary data in the thematic data analysis process

4.8 Quality and rigour control process

Sometimes qualitative research is criticised for not having the scientific rigour and justification that is associated with quantitative research. (Noble & Smith, 2015). It was therefore key that the validity and reliability of the methodology utilized to conduct the research was followed accurately to ensure the trustworthiness and reliability of the findings (Noble & Smith, 2015). As also mentioned in section 4.1 of this study per, the data in the case is defined and bound to ensure its validity (Yin, 2017).

A triangulation strategy was also used to ensure the quality of the research by assessing the different data sets and gaining an understanding of the data by using different perspectives (Morse, 2015), in this case using primary and secondary data. An effort to guarantee the validity made sure that data triangulation and in-case and cross-case analysis was applied, which also allowed for greater insights.

Ensuring reliability meant that the data collected would be consistent and that the study could be replicated in the future (Saunders & Lewis, 2018). An audit trial of the data was also maintained, which assisted in confirming the dependable utilisation of the interview guideline, thus allowing for the provision of a backup of the data, which was collected through ATLAS.ti and then also stored on a cloud data storage medium.

4.9 Ethical considerations for data collection

To maintain the confidentiality of the interviewees during the primary data gathering process the researcher did not report any names of the organisations or names of the interviewees. The reporting and storing of data will also be done without identifiers, and the recordings of interviews and transcriptions was stored on a password protected computer.

The research and interviews conducted were not aimed at any particular company or individual, and rather looked at the sustainability practices that each airline company was conducting. This meant that organisational or company consent was not needed for the propose of the study. Only companies and individuals that meet the above-mentioned criteria in section 4.4.1 would have been suitable.

The secondary data that was included in the research was in the form of publicly available published industry sustainability reports. The sampling method that was used for the non-

primary data will be purposive. This method selected a sample based on the criteria that met the research objective to achieve sustainability in airline companies.

4.10 Limitations of the Research

The research limitations that were experienced in conducting the research study were mainly due to the lack of experience of the researcher in undertaking qualitative research. This may therefore make the process challenging and also create a lower quality in the data collected. (Noble & Smith, 2015).

The data was obtained from a small sample and more interviews could have provided more depth. This could make the extrapolation of findings and conclusions to the broader airline companies management and leader population more difficult to justify. (Creswell & Creswell, 2017).

The research is also based on one sub-set of the airline industry, specifically focused on airline companies, which is the specialisation of passenger transport. It does not take into consideration other sub-sets within the industry such as cargo transportation, private aircraft ownership, or small scale charter operations.

Chapter 5: Findings

5.1 Introduction

In this chapter are the key findings from the data gathering process as outlined in chapter 4 are analysed. The findings were viewed from the theoretical lens of the constructs that were mentioned in chapter 2. These are the challenges, tools, and outcomes, and sustainable business model innovation. Following on from the interviews, and analysis thereof 10 themes emerged that were then categorised and aligned to the constructs. Figure 4 in chapter 4 details the process that was followed.

5.2 Summary of participants and the setting of context

A total of 8 interviews were conducted with various participants that made up the unit of analysis. The interviewees were made up of people from the energy sector, airline sector, and aviation consultants. All participants were involved in sustainability within the airline industry and had knowledge of the current sustainability practices that are being carried out within the industry that related to airline companies. Participants were also from different parts of the world, which offered a different perspective regarding the sustainability practices found in those countries.

The groups and how they are constructed can be found in Table 10. A basic role description has been added to Table 11 in order to provide a better understanding of each group and its contribution within the level of analysis, which is airline companies.

All of the interviews were conducted online via the Zoom meeting platform due to the convenience it provided the participants. The interviews were recorded using Zoom, and thereafter uploaded into a transcription program to allow for a more detailed understanding to be gained by the researcher.

Category	Group 1: Airline Sector	Group 2: Energy Sector	Group 3: Consultants	Group 4: Industry Reports
Number of participants	3	3	2	4

Role Description	Working directly within an airline, and is involved in sustainability practices	Individuals that form part of the value chain of sustainability, such as fuel or alternate energies	Advisors to the airline industry, and in the field of sustainability	Aviation governing body reports, and external consultants

Table 10: Authors own, breakdown of Participating groups

As part of the interview guide the researcher asked each of the participants about their involvement in aviation and sustainability. Table 11 shows the responses to the question regarding their involvement in sustainability.

Participant	Involvement	Group
P3	"Former CEO of company A, so I joined them with the sole purpose of transitioning them into a what we call a sustainable business model that they can take forward"	1
P2	"I've been involved on advising clients in the air transport and aerospace sector…We've worked all around the world, including working with organisations like company B… From a public affairs and Corporate Communications and Media Relations perspective."	1
P6	"I am currently responsible for aircraft fleet and fuel management… we were very involved in environmental stability, environmental improvements"	1
P5	"First project I worked on in 1990 was annual environmental report card for Airport A… particularly with noise, air quality and ground transportation…it's morphed into the organisation to a full-blown sustainability programme"	2
P7	"My current role is as vice president of sustainability and ESG. So environmental, social and governance issues"	2
P8	"…my role is, is I'm a product engineer…the strategy of Company C is concerning hydrogen and other sustainable gas"	2
P1	"I've been what is called a chair one aviation journalist for the past five or 10 years or so in South Africa, which has given me pretty good access to all the key players around the world"	3

P4	"My involvement with the environmental stuff started in 1984. When we added noise as the big driver, noise abatement at airports, a number of actions were taken, and in 1984, the FAA decided to implement the so-called stage to noise abatement regulations"	3
Report	**Applicability**	**Group**
R1	ICAO – "to research new air transport policy and standardization innovations as directed and endorsed by governments through the ICAO Assembly" (ICAO, 2022b)	4
R2	IATA – "is the trade association for the world's airlines, representing some 290 airlines or 83% of total air traffic. We support many areas of aviation activity and help formulate industry policy on critical aviation issues." (IATA, 2022)	4
R3	Mckinsey & Co – "McKinsey is committed to achieving net-zero climate impact by 2030, and we have set science-based targets validated by the Science Based Targets initiative in line with a 1.5-degree pathway." (Company, 2022)	4
R4	ACI – "Airports Council International World contributes to the safety, security, and sustainability of the global aviation industry by advancing the collective interests of airports and the communities". (ACI, 2022)	4

Table 11: Authors own, Involvement with sustainability (primary and secondary data)

5.3 Summary and conclusion of the participants

All the interviews that were held were very informative and offered insightful information into the future sustainability practices of aviation and the airline company sector. The number of interviews that were conducted stopped once the researcher considered that saturation had been reached, and there were no further new insights gained. The participants that were identified for interviews formed part of the researchers own professional network and following the interviews all data was analysed using the below coding process.

5.4 The process for coding

Once all the interviews had been transcribed the transcriptions were added to Atlas.ti, which is a qualitative analysis software. Using Atlas.ti, 1st order codes could be allocated

to the various transcripts. This was the first step in the process that allowed the researcher to see the different themes start to emerge from the frequency count of the codes. Once the 1st order coding had been concluded, the 1st order categories could be grouped together (grouping of the 1st order codes). These first two steps followed an inductive process. The frequency of the codes and categories do not represent their importance or significance.

The third and fourth step in the data analysis process was deductive in nature. The 3rd step was identifying the themes that started to emerge from the 1st order categories. These themes were then aligned in the 4th step to the three key research constructs and research questions, as can be found in the conceptual framework from Chapter 2 of this report. Figure 4 highlights the thematic data analysis process that was followed by the researcher when analysing the interview data. A list of the 1st order codes can be found in Appendix C.

The secondary data that was used was in the form of four industry reports chosen by the researcher for analysis and was selected based on the relevance that they had in terms of contributing to the final themes and constructs. The coding process that was followed by the researcher for the industry reports was step 3 and step 4 as per the above process for the primary data. Industry reports were analysed using Atlas.ti and themes were chosen based on their relevance to the final constructs that had emerged from the primary data. The industry reports were mainly compiled by aviation governing bodies such as ICAO and IATA, as well as third party consultants such as McKinsey & Company and ACI.

The mapping of categories and themes to constructs can be found in figure 5 below:

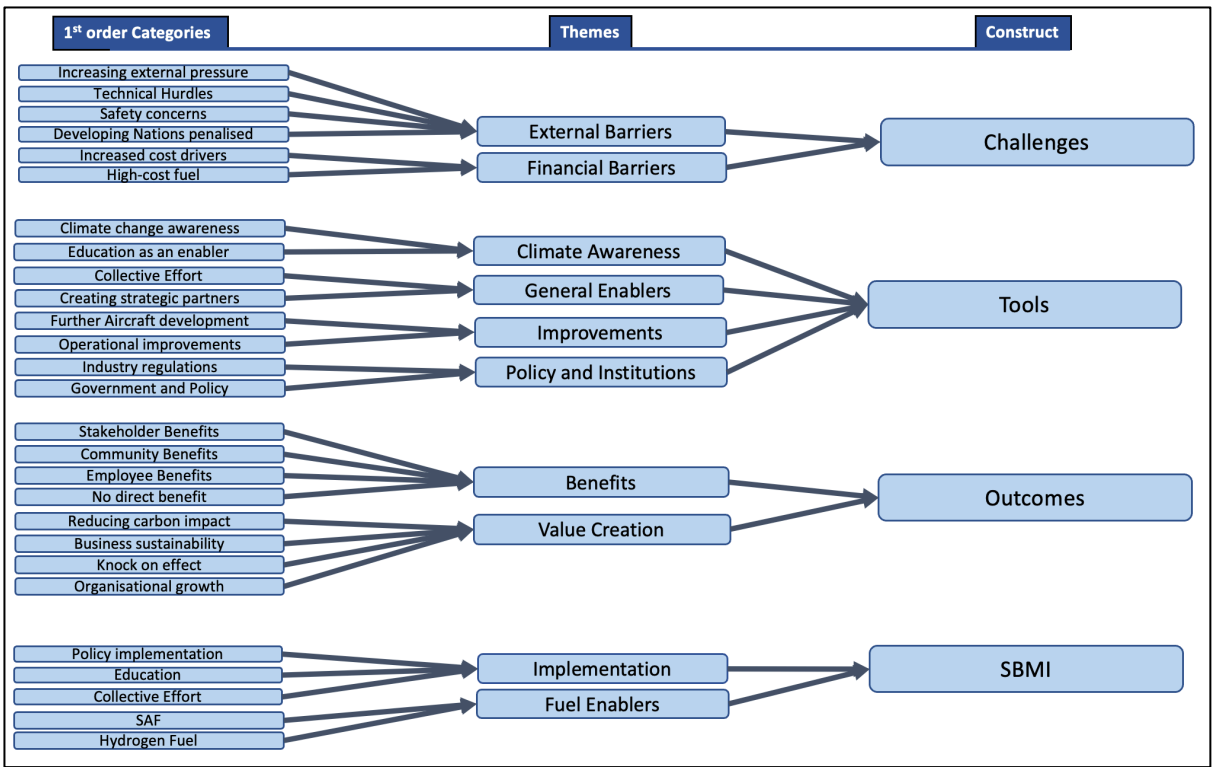

Figure 5: Authors own, Cross-tabulation of 1st order categories, themes, and constructs

5.5 Presentation of the results

When presenting the results of the data the researcher used the research questions presented in Chapter 3 of this report to align the themes that emerged from the interviews. The data that emerged was used based on their frequency count from the coding process whether or not they had a positive or negative effect on the results. The constructs were assigned codes in line with the research questions as can be seen in figure 5. The findings and results that are presented are believed by the researcher to be of significance to addressing the 4 research questions.

5.6 Findings:

The main overarching research question that was considered is:

How can incumbent airline companies implement a sustainable business model innovation process?

Below are the chosen themes that provide more insight and understanding into the research questions and are considered by the researcher to provide more of an understanding when implementing a sustainable business model process. Starting with challenges and the themes that contribute to the challenges. The research then moves

onto the tools required for the successful completion of a sustainable business model, followed by outcomes, and ending with SBMI.

5.7 Challenges Construct

This research question is aimed at understanding some of the challenges that airlines may face when moving towards sustainable strategies in their business model transition. The predominate themes that emerged under this research question relate mainly to external pressures and financial aspects. These were considered by the researcher to be predominate due to the number and frequency of codes allocated to them. While there were other codes that made up these themes, they did not feature as much. Figure 6 highlights the make-up of the construct in more detail.

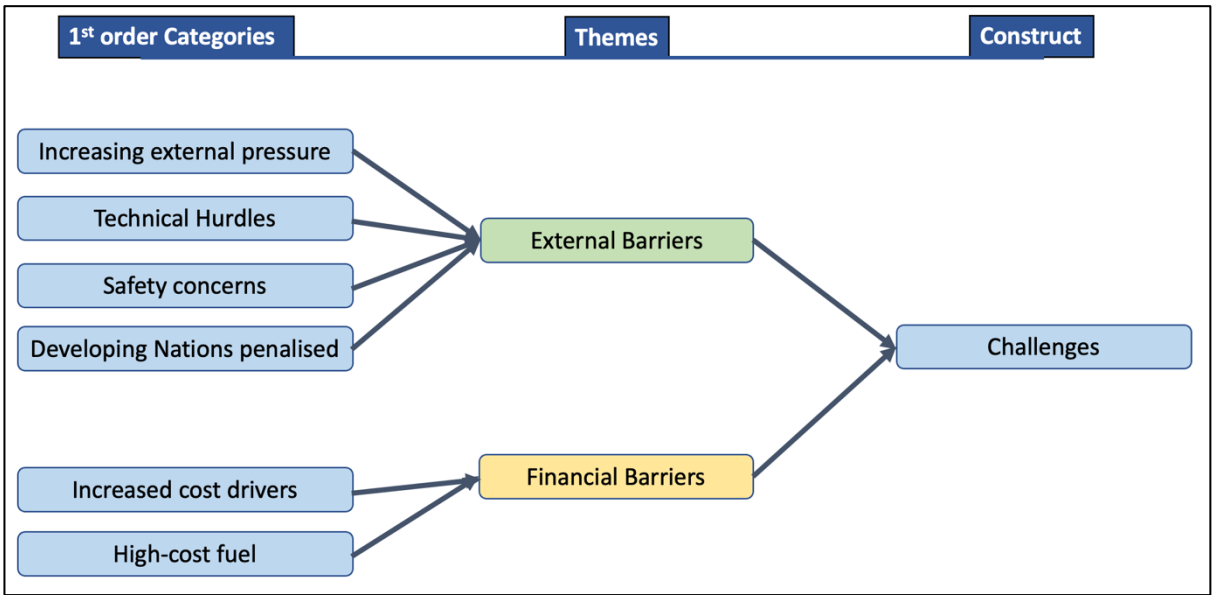

Figure 6: Authors own, Themes aligned to the challenges construct

5.7.1 Primary Data

Group	Participant	Description of quote
External Barriers		
3	P1	"There's been an increasing pressure on the airline industry in terms of it being a very high visibility industry"
1	P2	"…you start running into some technical hurdles knowing they'll get overcome, but it's not something that's going to be overcome immediately, and in the short term…"
3	P4	"The European fines for emissions and that type of stuff"
Financial Barriers		

1	P3	"So you have to think about it and create that awareness to say, look, sustainability from an environmental impact point of view is that the cost will be much more harsher"
3	P4	"So the economies of scale has changed dramatically as a result of technology. However, there's a cost to it, you know, these things are so bloody expensive"
2	P5	"…so a financial, some of them do. So what we're encouraging folks to do is more of a lifecycle cost assessment, rather than a first cost…"
2	P7	"I think one of the major challenges for airlines is they do not like the fact that flying will become more expensive"
2	P5	"…so airlines want to save money. They don't care that much about noise and air quality. To be frank, they want to save money on their fuel. So that's their primary motivation"
1	P6	"The biggest challenge for us, is that the new fuels are very expensive…it's just exorbitant, it's not something that we can sustain"
3	P4	"…all of them really depend on the issue of crops. So, the irony is where you can actually grow crops to create sustainable aviation fuel…"
2	P8	"…hydrogen technology is yet too expensive… so production cost, just producing the molecules is relatively expensive."

Table 12: Primary Data Evidence (Challenges construct)

5.7.2 Secondary Data

Group	Report	Description of quote
External Barriers		
4	R1	"…high expectations for consensus amongst ICAO Member States on an LTAG, and to facilitate implementation of the various innovations available – aircraft technologies, operations, and fuels…" (ICAO, 2022, p.2)
4	R2	"Our industry recognizes that our operations contribute to climate change and we are taking the responsibility to lessen this impact extremely seriously" (IATA, 2019, p.1)
4	R3	"Even before the coronavirus pandemic began, the industry was facing the challenge of reducing its carbon emissions in line with international goals in order to reach net-zero emissions by 2050" (Dichter et al., 2020, p.2)

4	R3	"Liquified hydrogen would require four times the volume of kerosene, so its use would reduce space for customers or cargo" (Dichter et al., 2020, p.6)
Financial Barriers		
4	R1	"…access to finance is a critical factor in enabling the aviation sector to decarbonise, the market conditions driven by the COVID-19 outbreak, coupled with growing levels of sustainability ambition…" (ICAO, 2022, p.38)
4	R2	"…potential for further emissions reductions is limited or the abatement costs are unduly high." (IATA, 2019, p.2)
4	R3	"While SAF has drawbacks, including high prices and supply concerns, airline CEOs should view it as a promising tool in their decarbonization toolkits" (Dichter et al., 2020, p.2)

Table 13: Secondary Data Evidence (Challenges construct)

5.7.3 Analysis of evidence – In-case and cross-case analysis

5.7.3.1 External Barriers

During the interviews it became apparent that there is increasing pressure on the airlines to carry out more sustainable practices, such as participant 1 suggests *"There's been an increasing pressure on the airline industry".* This is due to the microscope with which people place the airline industry under, and as such they must be seen to be doing the right thing, as participant 7 says *"I think that what the airlines are trying to do is demonstrate corporate responsibility, but specifically climate responsibility"*. One of the external barriers that was mentioned by the participants was the challenge of technical hurdles. There was also the issue that emerged from the data which related to the use of SAF as an enabler to overcome carbon emission, and the challenge that there is around growing enough crops to produce the SAF. Participant 4 said, *"…all of them really depends on the issue of crops. So the ironies where you can actually grow crops to create sustainable aviation fuel…"*.

When analysing the findings there was a challenge which was the pressure and accountability that is being put on the industry to transition to more sustainable business practices. As participant 6 says *"…the benefits are really for the environment, not necessarily for the airlines as yet"*. The reason for the feeling was mainly because the participant may have felt that the airlines are not benefiting yet due to the higher cost and implication that this has on the airlines financial bottom line. There was a difference that was mentioned of technical hurdles in the primary data by participant 2, "…you start running into some technical hurdles…they'll get overcome, but it's not something that's

going to be overcome immediately", and this was considered to be a potential new theme or sub theme that could possibly contribute to the challenges of SBMI.

Evidence from the secondary data shows that the challenges faced by the airline industry are in alignment with the participants responses. The governing bodies are aware that there is an increasing need for the transformation of the industry to become more sustainable, as is shown by R3 *"the industry was facing the challenge of reducing its carbon emissions in line with international goals"* (Dichter et al., 2020, p.2).

5.7.3.2 Financial Barriers

There is also evidence that suggests that this transition to more sustainable business practices bring with it a high cost to company. In the interviews that were conducted almost all the participants alluded to costs being high, and also being the biggest challenge that airlines face. As participant 6 says *"The biggest challenge for us, the new fuels are very expensive"* and the costing model and margins for airlines is already small according to participant 7 *"they are a low margin business"*. This extra cost will then most likely then have to be passed down to the consumer according to participant 6 "I'm sure that the consumer won't be able to absorb that cost".

Participant 3 said that *"…we were on a survival mode and sustainability was not on a top priority list…"* which echoes the sentiment that sustainability is a high-cost transition and will be a challenge for some of airlines. This was not only the feeling of group 1, but also of the other groups in the sample such a participant in group 2 who says that *"…to be frank, they want to save money on their fuel. So that's their primary motivation".* This shows the sentiment is aligned with regards to costs involved with sustainability.

The participants that were in group 1 were more vocal about the high costs of sustainability practices and this being the major challenge they face. Perhaps this may be because they are directly involved with the costs involved in implementing sustainability into their business models. The other groups were still supporting this thinking but did not always go into as much detail. As participant 4 from group 3 put it, *"there's a cost to it, you know, these things are so bloody expensive"*, but did not go into the extent of exactly how expensive. Participant 3 from the group 1 said, *"What keeps us awake is the cost and the revenue"*, which again shows how important costs are to airlines.

When looking at secondary data the challenges around awareness and costs. There were 3 out of 4 industry reports that agreed with the themes on awareness and cost, such as R1, which states *"…access to finance is a critical factor in enabling the aviation sector to decarbonise…"* (ICAO, 2022, p.38), R2 also stated that *"…emissions reductions is limited or the abatement costs are unduly high…"* (IATA, 2019, p.2). The increased cost associated with becoming more sustainable is also acknowledged by R1, *"access to finance is a critical factor in enabling the aviation sector to decarbonise"* (ICAO, 2022, p.38). The other industry reports eco these sentiments and more information can be seen in the table above (Table 7).

5.7.4 Conclusions reached regarding the construct

The challenges that exist consist of very difficult hurdles to overcome. The external pressure and cost drivers that was mentioned in the interviews are not very easy to mitigate in the view of the researcher. The external pressure to change is seen to be a challenge because if there was no pressure from outside regulators and other industries to change then airlines would be able to continue as normal without the worry of increased costs and protentional risk to its way of operations. The pressure for airlines to transition into more sustainable business practices has a knock-on effect that drives higher costs in the airline industry. The new sustainability innovations also come at a higher cost to company than the traditional way of operating that airlines have become accustomed to. The fact that the airlines are also dependant on the aircraft manufactures for the technology to develop new innovations such as sustainable aviation fuel means that manufactures could also be a potential bottle neck in the transition process.

There was a potential new sub-theme that emerged and was identified from the findings which was technical hurdles. This was considered to be a new sub-theme under external barriers because of the fact that airline companies are dependent on other stakeholders in the value chain for the development of components that would help them transition to becoming more sustainable.

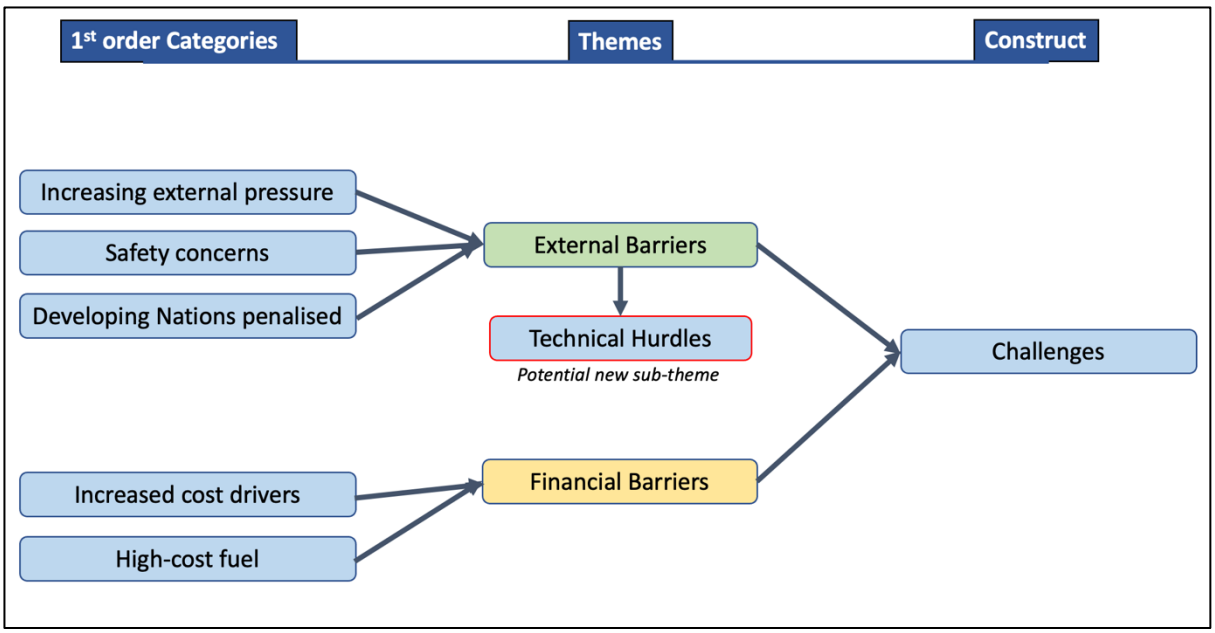

Figure 7: Authors own, Potential new sub-theme relating to challenges construct

5.8 Tools Construct

This research question is aimed at trying to understand some of the tools or enablers that airlines may be able to utilise when transitioning towards more sustainable strategies in their business models. The predominate themes that emerged under this research question relate to climate change awareness, general enablers, improvements, and policies. These were considered by the researcher to be predominate themes due to the number and frequency of codes allocated to them. While there were other codes that made up these themes, they did not feature as much. Below is a figure 8 that highlights the themes that make-up the construct in more detail.

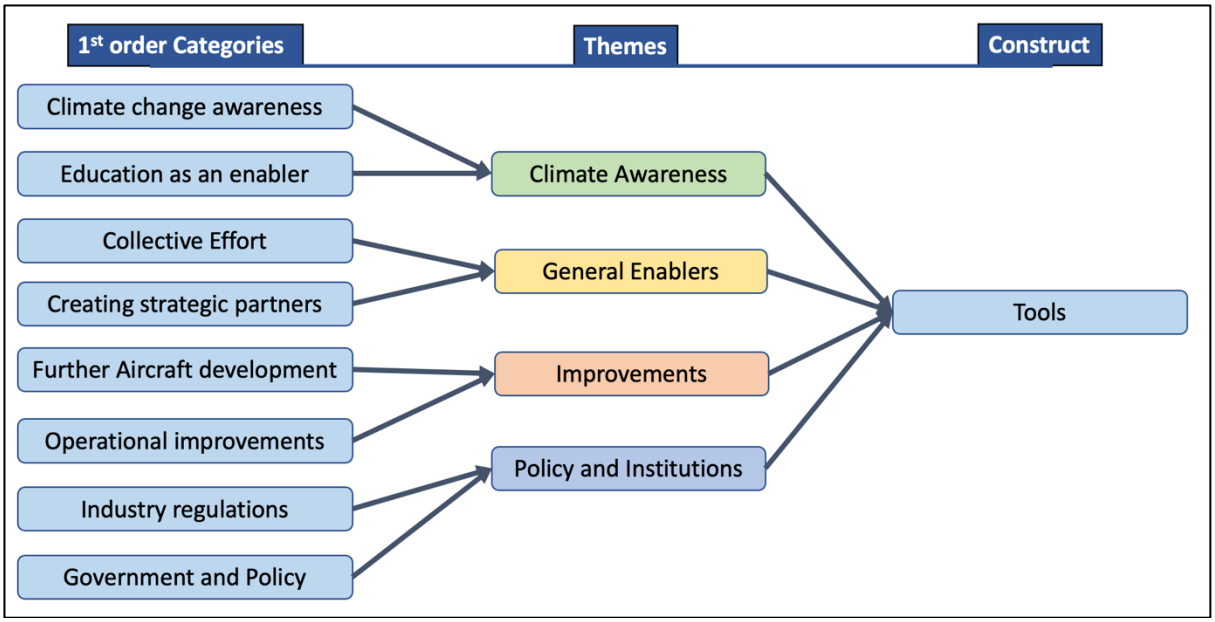

Figure 8: Authors own, Themes that align to the tools construct

5.8.1 Primary Data

Group	Participant	Description of quote
Climate Awareness		
3	P1	"…the objective is then to by 2050, to have the airline industry producing no more carbon than it is getting credits on offsets…"
1	P3	"… at a leadership level, we acknowledged that there is climate change that we need to be concerned about. We also are aware that affiliation plays a significant role in that space…"
2	P5	"…I see a massive focus on climate adaptation. So how to protect your assets…"
1	P3	"…So the biggest thing we perhaps want to say is then creating awareness by bringing the world together and making employees and managers understand the impact basically, then the disadvantage of not being proactive in making sure that we save the environment…"
2	P5	"…And then it's education, the biggest part is helping people in one's organisation understand how they can contribute to be more sustainable…"
General Enablers		

2	P5	"…going to get to net zero. So, you know, every part of the industry is trying to get there…"
1	P3	"…I think, once we get the strategic equity partner coming on board, it will then rationalise the business model and the strategy…"
Improvements		
2	P5	"…one of the most effective ways of being sustainable is making your operations more efficient"
1	P2	"… all about making aircraft lighter, more efficient"
3	P4	"…You found a lot of improvements with regard to engine performance, which resulted into fuel savings"
3	P4	"The second one is operations and infrastructural improvements"
2	P5	"… aircraft are being designed, they are much lighter, which means they don't need as much fuel because they don't, they're not as heavy"
Policy and Institutions		
3	P1	"…IATA has done a lot of work on CORSIA"
1	P2	"…should become a bigger imperative for governments when it comes to how they formulate their air transport policies"
2	P5	"…getting support from the federal and local governments, whoever is doing that and having a whole bunch of programmes"
1	P6	"…all of the airline industries are tracking the CORSIA CO^2 usage"

Table 14: Primary Data Evidence (Tools construct)

5.8.2 Secondary Data

Group	Report	Description of quote
Climate awareness | General enablers | Improvements | Policy		
4	R1	"…innovative in-sector measures in technology, fuels and operations, and their enablers, including information on probable cost" (ICAO, 2022, p.7)
4	R2	"…one of the elements that will enable the industry to meet the mid-term goal of carbon-neutral growth 2020, by

		complementing technology, sustainable aviation fuels, operational and infrastructure measures" (IATA, 2019, p.1)
4	R2	"…development of new, more efficient aircraft and engines can substantially decrease CO2 emissions. New technology aircraft are, on average, around 15- 20% more fuel-efficient than the models they replace. Sustainable aviation fuels, which are already being used on certain commercial flights, will have the potential to cut emissions by up to 80%" (IATA, 2019, p.1)
4	R3	"…executives should consider not just fuel-price predictions but also the future cost of carbon. Applying carbon emissions as a fuel-cost premium could lead to an accelerated fleet rollover and faster adaption of future aircraft technology, including some electrification" (Dichter et al., 2020, p.6)
4	R3	"Every kilogram of kerosene produces 3.15 kilograms of CO2.3 Airlines therefore have an intrinsic motivation for adopting more fuel-efficient flying, taxiing, and airport operations" (Dichter et al., 2020, p.5)
4	R4	"Sustainability is an accepted concept that enhances an airport's economic vitality, operational efficiency, natural resource conservation and social impact" (Committee, 2016, p.1)

Table 15: Secondary Data Evidence (Tools construct)

5.8.3 Analysis of the evidence - In-case and cross-case analysis

5.8.3.1 Climate Awareness

Group 1 that was interviewed said that they were aware that there is a need to transition into a more sustainable business model, and that it plays a vital role moving into the future. As said by P3 *"…at a leadership level, we acknowledged that there is climate change that we need to be concerned about."* Another participant in the group 1 also echoed this thinking *"…the world is pushing the airlines whether you want to or not, to comply and reduce your carbon footprint".* This would suggest that within group 1, which is the airline sector there is already mindsets that a change needs to be made in order to become more sustainable.

Group 2 was also aligned with group 1, where P5 said *"…I see a massive focus on climate adaptation".* The other participant in group 2 also said *"airlines are trying to do is demonstrate corporate responsibility, but specifically climate responsibility"* and therefore were also aware that a change was needed in the airline industry was the energy sector. This thinking between the first two groups might be since they work closely with one another in the value chain to get the industry as a whole to become more sustainable.
Group 3 was also aware that the airline industry needed to produce less carbon emissions in an effort to becoming more sustainable. As P1 said *"…the objective is then to by 2050, to have the airline industry producing no more carbon*". Then P4 also said *"the greenhouse effect, you know, the contrails, is actually supporting the greenhouse effect".* In group 3 all the thinking on climate change awareness was supported by the participants.

While the secondary data did not explicitly mention awareness in their reports, the fact that the reports exist would suggest that industry bodies are aware of how important it is to transition to a SBMI process and that they are aware of the issues aviation is creating in a climate sense.

Across all the groups the thinking around climate awareness was generally the same and they shared the same thoughts on the need to move to a more sustainable model for the industry.

5.8.3.2 General Enablers

The theme of enablers was made up of two main categories. Those were collective effort and the formation of strategic partners. Participant 5 from group 2 said that *"…to get to net zero. So, you know, every part of the industry is trying to get there…".* This thinking was also said from a participant in Group, *"once we get the strategic equity partner coming on board, it will then rationalise the business model"*.

This thinking of collectiveness was not shared across all the groups, and the secondary data was also not aligned to this thinking. Or at least in the reports that were chosen there was no mention of collective effort.

5.8.3.3 Improvements

The improvements that were mentioned by the respondents existed in the form of aircraft technical improvements, and operational improvements. These operational improvements related to ground, air and airport improvements. Group 1 mentioned that it was, *"all about making aircraft lighter, more efficient."* Another participant from group 1 also said that *"…they need to remove some of the technology and put in new technology".* This was in light of the improvements that would need to take place if airlines are to run on SAF in the future.

In group 2 the ideas around improvements were also around aircraft design and other operational improvements. Participant 5 felts that *"…one of the most effective ways of being sustainable is making your operations more efficient"* and *"…aircraft are being designed, they are much lighter, which means they don't need as much fuel because they don't, they're not as heavy."* When talking to participant 7 about the future innovations around airlines it was felt by the participant that *"current technologies that we're using that are viable commercially"*, in order to move to different forms of aircraft such as electrical or hydrogen.

Group 3 also stated that improvements need to be in the form of operational and technical advances. Participant 4 spoke about how the improvement in engine technology has already saved fuel *"…with regard to engine performance, which resulted into fuel savings."* In Group 4, which was the secondary data, R1 stated that *"…innovative in-sector measures in technology, fuels and operations, and their enablers"* (ICAO, 2022, p.7), were going to aid the industry to move forward and become more sustainable. In another industry report R2 stated that *"elements that will enable the industry to meet the mid-term goal of carbon-neutral growth 2020, by complementing technology, sustainable aviation fuels, operational and infrastructure measures"* (IATA, 2019, p.1). These reports in group 4 are aligned to the participants thinking, and it is considered by the researcher that the reason for the alignment between the participants and industry reports is because participants use the industry reports to guide them in moving to SBMI.

5.8.3.4 Policy and Institutions

A theme that emerged when conducting the primary interviews was around policy and government institutions. This was not considered to be a major factor by the researcher when conducting the interviews. The major policy that emerged from participants was called CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation). The

only group in the primary interviews that did not mention CORSIA was group 2. The remainder of the groups all mentioned CORSIA several times in interviews. Participant 6 from group 1 mentioned *"…all of the airline industries are tracking the CORSIA CO^2 usage"* and from the same group participant 3 also said *"…IATA has done a lot of work on CORSIA".* There was a potential difference that was noted by the researcher, and it was considered that policy and institutions in the form of regulations could be a potential new theme or sub theme toward tools and aiding in the implementation of SBMI.

5.8.4 Conclusions reached regarding the construct

The insights gained through the primary and secondary data gathering have offered various ways in which airlines might be able to transition to a more sustainable business model. It is evident that the groups align in their thinking around the various tools and innovation that can be utilised. The predominate theme that emerged from the interviews and secondary data was operational improvements as a tool towards SBMI. The other themes mentioned would also provide additional aid in this transition to SBMI for the airline companies.

There was a potential difference and new sub-theme that emerged from the findings as a tool was under policy and institutions. This sub-them was the identified as regulations that could be implemented to aid in the SBMI process and aid airline companies to becoming more sustainable.

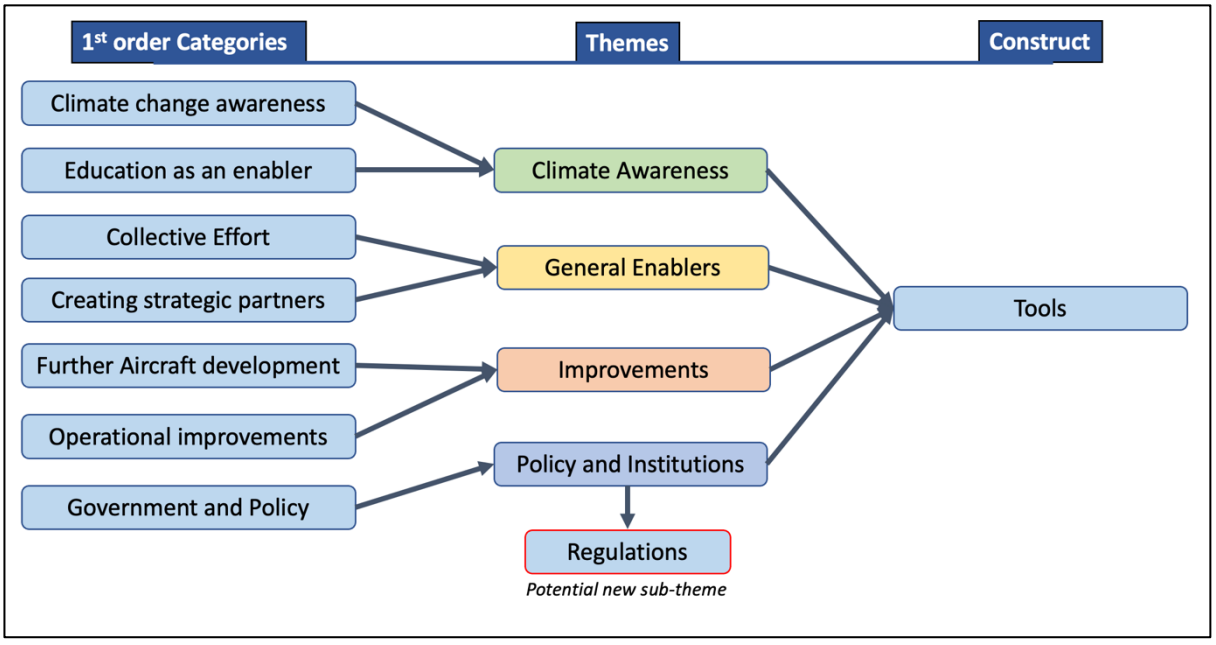

Figure 9: Authors own, Potential new sub-theme relating to Tools

5.9 Outcomes Construct

This research question is to understand what the outcomes are for airlines when implementing a sustainable business model. The themes that emerged under this research question were benefits and value creation. These themes are then analysed in greater detail in terms of the categories that identified each theme. The contributors to each theme were as follows:

Figure 10 details the categories that contribute to each theme and the outcomes construct.

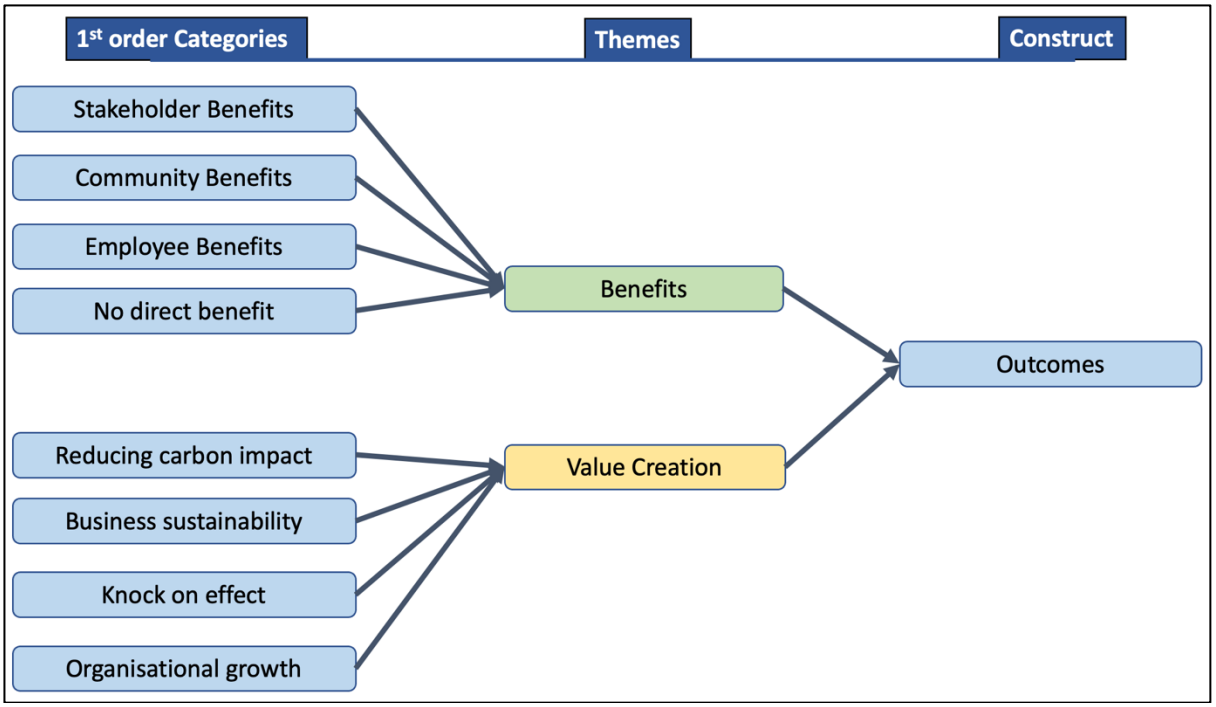

Figure 10: Authors own: The themes that align to the outcomes construct

5.9.1 Primary data

Group	Participant	Description of quote
Benefits		
2	P5	"…Well, I mean, it's a win, win, win, win wherever you go."
2	P7	"…everyone who's involved in the aviation sector will benefit from a more climate aligned industry…"
1	P6	"the benefits are really for the environment, not necessarily for the airlines as yet"
3	P1	"…you know that there's no direct benefit to the airline industry"
Value Creation		

1	P2	"reducing the amount of carbon emissions that are being pumped out and reducing aviation's carbon footprint, and its impact on the environment"
3	P1	"…long term strategy here is to ensure that ultimate survival and short term everything that they do around reducing their bad reputation as polluters"
1	P3	"…one of the key things, one of the key benefits are definitely that the aviation industry will be modelled as a responsible corporate citizen"
2	P7	"…we can have an outside effect on local employment, truly green jobs, meaningful jobs, that pay and are better for the environment, and reducing air pollution for our communities…"
2	P5	"…helps the organisation grow, while limiting the impacts."

Table 16: Primary Data Evidence (Outcomes construct)

5.9.2 Secondary data

Group	Report	Description of quote
Benefits		
4	R1	"These solutions are aimed at the aviation industry in general and are intended to be disseminated for the benefit of the entire industry" (ICAO, 2022, p.36)
4	R1	"States would also benefit from the use of already developed emissions methodologies to quantify aviation-related emissions" (ICAO, 2022, p.79)
Value Creation		
4	R2	"…environmental and economic benefits, such as the preservation of biodiversity, support to local communities and the protection of the forests' vital ecosystem functions" (IATA, 2019, p.3)
4	R3	"While this is costly today, the process benefits from cheaper renewable-electricity generation in the future" (Dichter et al., 2020, p.8)
4	R4	"…they realize significant benefits for their communities, passengers, tenants, employees and other stakeholders" (Committee, 2016, p.1)

Table 17: Secondary Data Evidence (Outcomes construct)

5.9.3 Analysis of the evidence - In-case and cross-case analysis

5.9.3.1 Benefits

When it came to the benefits that emerged from the primary data, there was no consensus as to whether everyone would benefit from the transition to a SBMI process. It seems that group 1 felt *"the benefits are really for the environment, not necessarily for the airlines as yet*", which could be because of the higher cost involved with sustainability identified in section 5.5.1.1. so, there would not be a direct benefit to them in the short term.

Group 2 felt that it was going to benefit the entire value chain, and everyone involved. As participant 7 said *"…everyone who's involved in the aviation sector will benefit from a more climate aligned industry…"*, and this was also the same felling that participant 5 had *"…I mean, it's a win, win, win, win wherever you go…"*. Participant 5 then proceeded to elaborate on some of the benefits, "*So the passengers, the community around the airport would benefit that obviously, because of greenhouse gases, air quality is going to improve*". This group was particularly excited with the future possibility of moving to a more sustainable business model and offered some good insights and views.

Group 3 was aligned with group 1 on the thinking that this transition will not benefit the airline industry. Participant 1 said *"…you know that there's no direct benefit to the airline industry*". The feelings that were expressed by the participant was that it was going to be more expensive for the airline industry to transition, and it would be cheaper if things remained as they are. Participant 1 said *"…it's more profitable to be a bad citizen*." Bad in the sense of using more harmful carbon emitting products.

In group 4, which was the secondary data. The views on benefits were that R1 stated *"…solutions are aimed at the aviation industry in general and are intended to be disseminated for the benefit of the entire industry"* (ICAO, 2022, p.36). This outcome was shared across many of the reports, and while R3 also mentioned the initial cost implication saying, *"this is costly today, the process benefits from cheaper renewable-electricity generation in the future*" (Dichter et al., 2020, p.8), in the long term there are benefits for the industry. Across all the groups the majority of participants and industry reports do think that there is a long-term benefit to moving to a SBMI process within the aviation industry.

5.9.3.2 Value creation

The value creation theme was made up of how the transition to more sustainable practices would benefit and meet the needs of others in the value chain, such as the customers, business, and employees. The general feeling around value creation was positive and insights were gained by the researcher which aid the overall outcomes.

Group 1 mentioned that it would aid the airline in being viewed as a model corporate citizen and doing the right thing, as participant 3 said *"…one of the key things, one of the key benefits are definitely being modelled as a corporate citizen"*. Participant 6 was not sure about the value that would be added by the transition to more sustainable practices, saying *"at this specific moment, we are still in the infant stages, so we can't really say".*

Group 2 felt that the value add to the total industry would be impacted in a positive way, with participant 7 mentioning *"…we can have an outside effect on local employment, truly green jobs, meaningful jobs, that pay more than better for the environment, and in reduced air pollution for our communities…"*. The feedback given by participant 5 was also that sustainability *"…helps the organisation grow, while limiting the impacts."*

Group 3 said that *"…long term strategy here is to ensure that ultimate survival and short term everything that they do around reducing their bad reputation as polluters*". This was the same thinking that was shared under the thoughts around the benefits theme, where the participant felt the value was more for the environment and not for the airline industry in the short term. The value that would be created for the airlines was more around their view in the light of public impression.

In group 4 all the reports mentioned that in some form there would be value creation for the industry and create a better business environment going into the future by reducing the carbon impact of the aviation industry. Such as R4 suggests *"…they realize significant benefits for their communities, passengers, tenants, employees and other stakeholders"* (Committee, 2016, p.1).

The cross-case analysis shows that amongst all the groups there is an overall benefit to many of the stakeholders in the industry. Notability though the airlines themselves would not see the benefit in the short term until they have made the transition to a SBM in the long term.

5.9.4 Conclusions reached regarding the construct

After considering the themes that would add a deeper insight into the outcomes of transitioning to an SBMI process. The findings from primary and secondary data gave a good understanding to the researcher of the main benefits that would be achieved through SBMI. The main take away was that in the long term there is a benefit to transitioning to a SBM, and that many stakeholders in the value chain would benefit, albeit at a higher cost to the airlines. The main conclusion drawn from the findings of primary and secondary data was that there should be a long-term benefit to the passengers, employees, and other stakeholders that make up the airline industry.

5.10 Sustainable Business Model Innovation Construct

This research question was aimed at understanding how the challenges faced by airlines would be overcome when implementing a sustainable business model. The predominate theme that emerged under this research question was around implementation and fuel enablers. The themes were investigated in more detail around the categories that made up the themes. These themes were considered by the researcher to be important because it provided an understanding of the implementation processes that could be utilised by airlines to move to a SBMI process. Figure 11 highlights the make-up of the themes in more detail, and how they aligns to the construct.

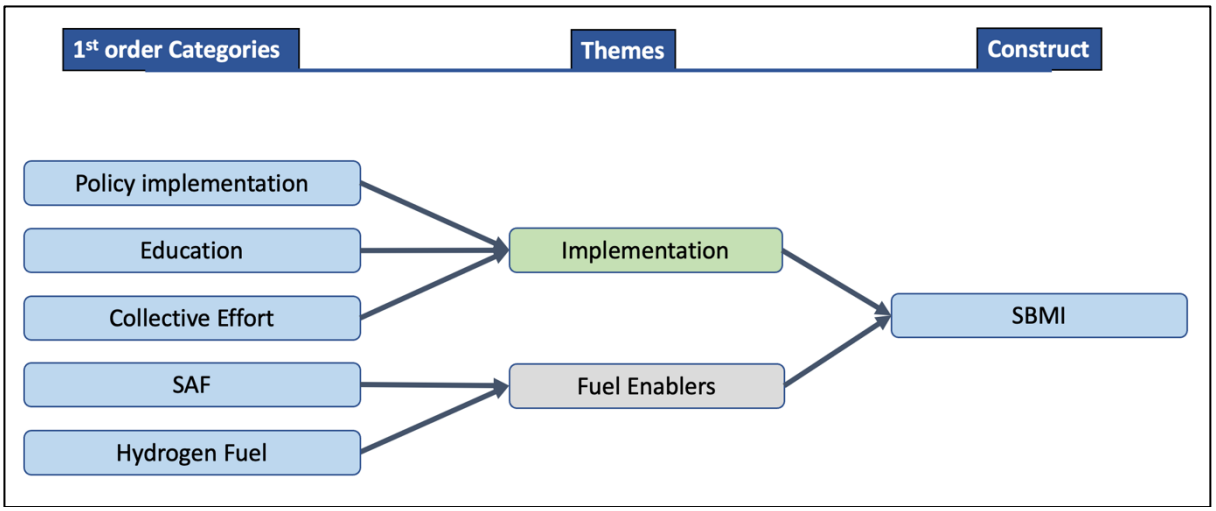

Figure 11: Authors own: The themes aligned to the SBMI construct

5.10.1 Primary data

Group	Participant	Description of quote
Implementation		
1	P2	"…your Director General's and Deputy Director Generals are the people who've got to actually work, making these things happen."
1	P3	"…the biggest thing we perhaps want to say is then creating awareness by bringing the world together and making employees and managers understand the impact basically, then the disadvantage of not being proactive…"
2	P5	"…education is the biggest thing I would say. I would say getting support from the federal and local governments, whoever is doing that and having a whole bunch of programmes."
1	P6	"…I think that's what the regulatory authorities are trying to do, but by putting in specific requirements."
1	P6	"we need to get the world to stand together"
2	P7	"…would be early adopters who are willing to make these changes, and a more ambitious roadmap to get to net zero"
Fuel Enablers		
3	P1	"…the big one that's happening right now is the shift towards SAF…"
2	P5	"…They're talking about green hydrogen, blue hydrogen for maritime and sustainable aviation fuel is, you know, the hot topic of the moment…"
2	P5	"…Sustainable aviation fuel is by far the biggest bang for the buck that everybody's doing…"
2	P7	"…we're seeing a lot more attention on to liquid as one of the conversion technologies that takes waste co2, and combines it with green hydrogen…"
1	P6	"…they call it a blended fuel where we have fossil fuel and biofuel mixed…"
2	P8	"…have to just step away from oil and go and find something else. Now whether it's going to be natural gas… I can't predict this but hopefully hydrogen…"

Table 18: Primary Data Evidence (SBMI construct)

5.10.2 Secondary Data

Group	Report	Description of quote
Fuel Enablers		
4	R1	"The price gap with conventional fuels, coupled with policy incentives, also represent key drivers for the full deployment of SAF, taking also into consideration that that the recent fossil fuel prices have risen the economic case for diversification of aviation energy sources" (ICAO, 2022, p.34)
4	R2	"…development of new, more efficient aircraft and engines can substantially decrease CO2 emissions. New technology aircraft are, on average, around 15- 20% more fuel-efficient than the models they replace. Sustainable aviation fuels, which are already being used on certain commercial flights, will have the potential to cut emissions by up to 80%" (IATA, 2019, p.1)
4	R1	"…many innovations are looking into game-changing technologies including electric, hybrid and hydrogen-powered aircraft" (ICAO, 2022, p.33)
4	R1	"renewable hydrogen is one of the future solutions for mid-range flights and, at least for long haul flights" (ICAO, 2022, p.39)
4	R3	"Aircraft could also be powered by hydrogen, either from direct combustion (hydrogen turbine) or via a fuel cell." (Dichter et al., 2020, p.6)

Table 19: Secondary Data Evidence (SBMI construct)

5.10.3 Analysis of the evidence - In-case and cross-case analysis

The two groups that featured predominantly in how airlines would overcome challenges and implement an SBMI process were groups 1 and 2. The aspects that made up the theme were policy, education, and collective effort. There is also the theme of fuel enablement which is a key theme and discusses the use of SAF and hydrogen in SBMI process.

5.10.3.1 Implementation

In group 1 there were a number of key items that were expressed, such as participant 2 who mentioned that it would be government and its members that make things happen,

"…your Director General's and deputy Director Generals are the people who've got to actually work, making these things happen." Participant 6 also echoed this thinking by saying that, *"…I think that's what the regulatory authorities are trying to do, but by putting in specific requirements."* when talking about the leadership of a country and what they need to do in order to assist the airline industry. Group 2 was also aligned with group 1's thinking around policy and governments support. Participant 5 went on to say *"…getting support from the federal and local governments, whoever is doing that and having a whole bunch of programmes."*

In group 2 one of the insights was that education was important when trying to overcome the challenges and aid in the implementation of SBMI, as participant 5 said *"…education is the biggest thing I would say…".*

An additional insight gained from group 1 was working together to implement sustainability practices. Participant 3 and participant 6 both said the following respectively, *"…bringing the world together and making employees and managers understand the impact basically, then the disadvantage of not being proactive…"* and *"we need to get the world to stand together".*

5.10.3.2 Fuel Enablers

Fuel and alternate fuel sources were mentioned in all the interviews that were conducted by the researcher. It emerged as a major theme in gaining insights towards what innovations are going to drive the airline industry towards a SBMI. Two of the categories that were prominent were SAF and Hydrogen. Group 1 mentioned SAF and fossil fuels that are mixed, *"…they call it a blended fuel where we have fossil fuel and biofuel mixed…"* but there will be a shift to using only SAF in the next few years, *"target is by 2030, we need to be operating 100% sustainable aviation fuel, either biofuel or hydro gas".*

Group 2 also spoke about both SAF in an effort to move into a more sustainable future. Participant 5 felt that *"Sustainable aviation fuel is by far the biggest bang for the buck that everybody's doing"* and that following on from SAF will be the transition to hydrogen.
Group 3 also said that *"…the big one that's happening right now is the shift towards SAF"* and was in line with the thinking of the other participants in the group.

Group 4 which was the secondary data also stated that SAF and alternate fuels were going to be the major driving force for the shift towards becoming more sustainable. R1

spoke about SAF at great length and how it has many advantages for aviation and is a vital component *"represent key drivers for the full deployment of SAF"* (ICAO, 2022, p.34). All the other reports repeated similar thoughts around SAF and how it can reduce CO_2 emissions.

Across all the groups the thinking around fuels was aligned and that it may be the single biggest contributor to reducing carbon emissions going forward, due the large volumes of fuel that are used by jet aircraft and it being an essential part of the entire process.

The mention of hydrogen in the findings was very insightful to the researcher as a potential difference in the findings and would seem to be a promising fuel alternative to implement going into the future. Group 2 was the most vocal about the use of hydrogen as a future fuel for airlines. Participant 8 said when asked about the future of fuel, "…I can't predict this but hopefully hydrogen…". Participant 7 also stated that, *"…more attention onto liquid as one of the conversion technologies that takes waste CO_2 and combine it with green hydrogen."*

Group 4 which was the secondary data provided valuable insights about hydrogen and its future use. R1 said *"renewable hydrogen is one of the future solutions for mid-range flights and, at least for long haul flights"* (ICAO, 2022, p.39), and R3 *"Aircraft could also be powered by hydrogen…"* (Dichter et al., 2020, p.6).

It was considered that the use of hydrogen toward SBMI was a potential difference could therefore be a potential new theme or sub theme in the research.

5.10.4 Conclusions reached regarding the construct of SBMI

The contributions from the primary and secondary data provided the researcher with a different perspective on how to best overcome the challenges faced when carrying out a SBMI process. The primary and secondary data provided the most interesting insight and key difference to the researcher. The main conclusions that can be drawn from these two themes presented is that policy and support from government plays a vital role in the SBMI process. There are also very promising uses for fuel as a key component in overcoming the challenges presented with trying to achieve a SBMI process within airline companies. There is a need to provide the global population, airlines companies, management and employees with the relevant education and training on the impact of global warming on

the environment and how to utilise the various tools and implementation findings presented to overcome the challenges associated with SBMI.

The potential difference and new sub-theme that came from the findings was under the fuel enablers. The sub-theme that was identified was hydrogen and its future use as an enabler to help transition the airline companies to becoming more sustainable.

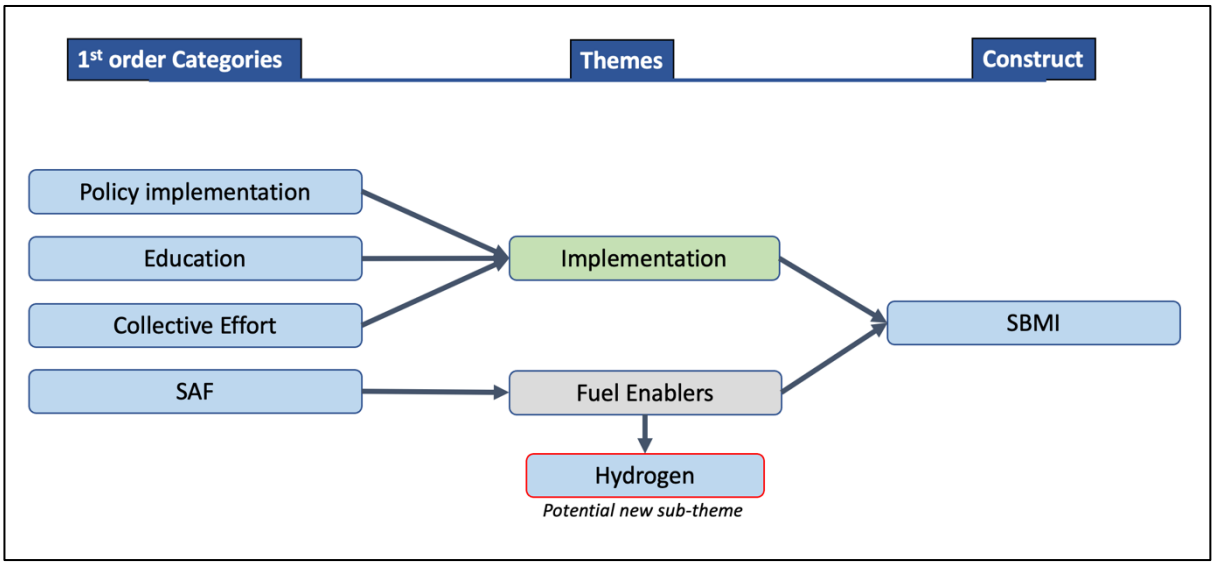

Figure 12: Author's own, Potential new sub-theme relating to SBMI

5.11 Conclusion in relation to the findings of the research

In this Chapter the key research findings are presented from the data gatherings and analysis. A thematic analysis was conducted for the findings around the 4 constructs, which related to each research question posed in Chapter 3. These constructs were challenges, tools, outcomes, and SBMI. Using coding and analysis software helped to identify and categorise the codes into themes that ultimately aligned to the constructs, as well as identify similarities and differences. These differences are highlighted and indicated in table 20, which shows the potential sub-themes identified from the participants and secondary data.

Research question		Themes	Construct	Most mentioned code group	Potential new sub-themes
What are the challenges airline companies face that are associated with SBMI?	1	External Barriers	**Challenges**	External Pressue	Technical Hurdles
	2	Finacial Barriers	**Challenges**	Increased costs	
How can airline companies use additional tools to address challenges transitioning to SBMI?	3	Climate Awareness	**Tools**	Climate Change	
	4	External Enablers	**Tools**	Collective Effort	
	5	Improvements	**Tools**	Aircraft developments	
	6	Policy and Institutions	**Tools**	Governing Institutions	Regulations
Whom will benefit from the transition to SBMI?	7	Internal and external benefits	**Outcomes**	Stakeholder Benefits	
	8	Value Creation	**Outcomes**	Reducing Carbon impact	
How can incumbent airline companies implement SBMI?	9	Implementation	**SBMI**	Government policy	
	10	Fuel Enablers	**SBMI**	SAF	Hydrogen

Table 20: Author's own, summary of the themes and potential differences

5.11.1 Conclusion on challenges

5.11.1.1 Similarities

From the analysis of the findings on challenges of the SBMI process the key challenges were external barriers, and financial barriers. The key insights from the external barriers were external pressure to transition becoming more sustainable and the challenges that it brought about with it. The key insights from the financial barriers were the increased costs associated with airline companies becoming more sustainable. These were the main insights due the frequency that they were mentioned across all the participant groups and in the secondary data.

5.11.1.2 Differences

Furthermore, the potential new sub-theme that emerged, and was identified from the findings was technical hurdles. This was considered to be a new sub-theme under external barriers because of the fact that airline companies are dependent on other stakeholders in the value chain for the development of components that would help them transition to becoming more sustainable.

5.11.2 Conclusion on tools

5.11.2.1 Similarities

Based on the analysis of the findings was the various tools that can potentially be utilised in the SBMI process. The key insights based on the frequency that they were mentioned by participants and found in the secondary data was climate awareness, external enablers, improvements, and policy and institutions. The key insights that were gained from climate awareness were the those of climate change and the impact of airline companies on the environment, which should cause concern for leadership. The next insight was found though external enablers, which was the need for there to be collective effort to change and drive airline companies towards being more sustainable. Additionally, there were key insights given into the improvements and in particular the mention of aircraft developments and improvements. Finally, the insights from the findings make mention of the policy and institutions that would play a role in driving sustainability in airline companies.

5.11.2.2 Differences

The potential difference and new sub-theme that emerged from the findings as a tool was under policy and institutions. This sub-them was the identified as regulations that could be implemented to aid in the SBMI process and aid airline companies to becoming more sustainable.

5.11.3 Conclusion regarding the outcomes

5.11.3.1 Similarities

The analysis on the findings of the outcomes was what benefits would come about as a result of the implementation of SBMI. The two main insights gained through the primary and secondary data analysis were defined as internal and external benefits and value creation. This was due to the frequency they were mentioned and the contribution they offered to the SBMI process. The key insights on internal and external benefits was those of stakeholder benefits where it was mentioned that all stakeholders that form part of the value chain in airline companies will benefit from SBMI. The key insight from value creation is reducing carbon impact, which is a benefit to the environment through the transition to a SBMI process.

5.11.3.2 Differences

There were no potential themes or sub-themes that emerged under the outcomes construct.

5.11.4 Conclusion regarding SBMI

5.11.4.1 Similarities

Concluding the analysis on the findings of the SBMI construct and was how to overcome the challenges in the overall transition to a SBMI process. What was identified from the primary and secondary data was the themes implementation and fuel enablers. The insights gained under implementation were mainly around the policy implementation by governing bodies such as local governments to aid in the SBMI process. The second key insight was under fuel enablers and the use of SAF as a major component to assist airline companies to becoming more sustainable.

5.11.4.2 Differences

The protentional difference and new sub-theme that came from the findings was under the fuel enablers. The sub-theme that was identified was hydrogen and its future use as an enabler to help transition the airline companies to becoming more sustainable.

The summary of findings from Chapter 5 were used to update the conceptual framework that was presented in Chapter 2. The updated conceptual framework seen in figure 10 will form the bases on which the findings will be discussed in relation to literature in Chapter 6.

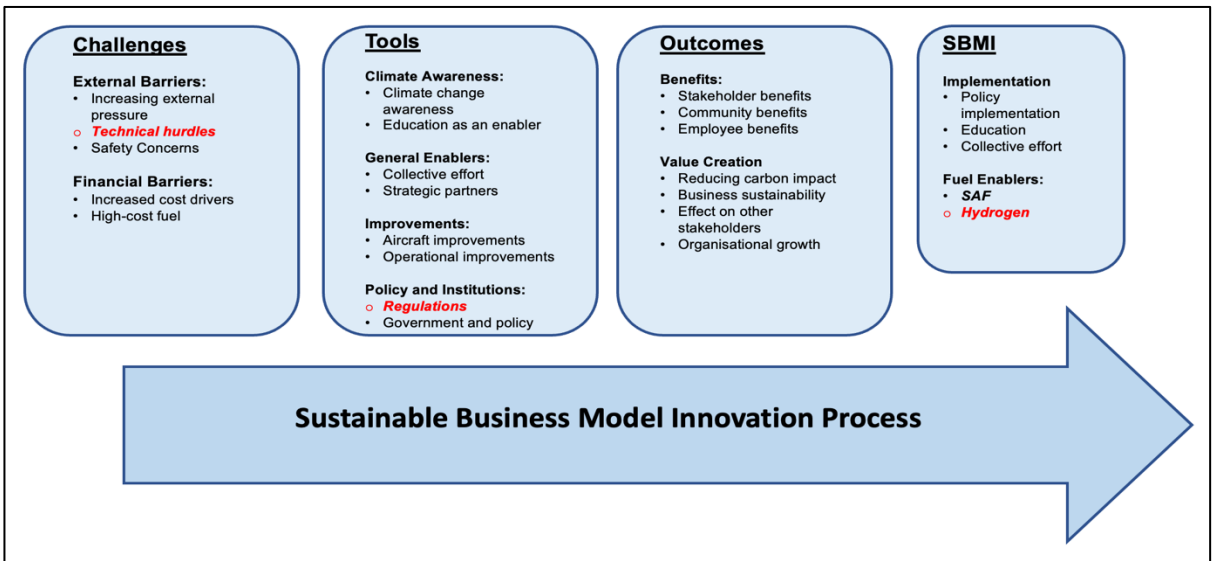

Figure 13: Author's own, updated conceptual framework from Chapter 2 after conclusions on findings

Chapter 6: Discussion of Results.

6.1 Introduction

This chapter discusses the key research findings from Chapter 5 against the literature found in Chapter 2. The structure that is followed in the chapter will be similar to that found in Chapter 5, whereby the analysis will be discussed around the key research questions. The chapter will be broken down in the following format and there will be four parts that are carried out during the comparative approach to literature process. The process will be as follows:

Part 1: Evidence of themes from the findings in Chapter 5

Part 2: Evidence of themes from the literature found in Chapter 2

Part 3: Analysis to see if there are similarities or differences between findings and literature. If there are differences found, then systematic steps will be taken to actively check if literature covers the apparent differences. These steps are as follows,

> *Step 1* – There is no difference, and the finding is similar to literature. Do not continue with step 2. However, if a difference is found in the findings whether distinct or nuance, proceed to step 2.
> *Step 2* – Check the literature already discussed in Chapter 2 for key words relating to the difference found in Chapter 5. If there are no results found in Chapter 2 for the key word searches, then move onto step 3.
> *Step 3* – Conduct a targeted word search on the finding key word in top journals related to SBMI or do a search using Google Scholar on the top journals.

Part 4: Conclusions on the theme

This approach will be carried out for each research question that was formulated in Chapter 3.

Table 21 which is a summary of the findings at the end of Chapter 5 and can be found below. The research questions have been added to the table, as well as the key scholars that provided the theory around each construct. This will be compared to the conceptual framework that was found in Chapter 2 and at the end of Chapter 5, in order to compare any differences or similarities that occurred. Below is the modified table of key themes, along with the contribution of key scholars.

Research question		Themes	Construct	Most mentioned code group	Potential new sub-themes
What are the challenges airline companies face that are associated with SBMI?	1	External Barriers	**Challenges**	External Pressue	Technical Hurdles
	2	Finacial Barriers	**Challenges**	Increased costs	
How can airline companies use additional tools to address challenges transitioning to SBMI?	3	Climate Awareness	**Tools**	Climate Change	
	4	External Enablers	**Tools**	Collective Effort	
	5	Improvements	**Tools**	Aircraft developments	
	6	Policy and Institutions	**Tools**	Governing Institutions	Regulations
Whom will benefit from the transition to SBMI?	7	Internal and external benefits	**Outcomes**	Stakeholder Benefits	
	8	Value Creation	**Outcomes**	Reducing Carbon impact	
How can incumbent airline companies implement SBMI?	9	Implementation	**SBMI**	Government policy	
	10	Fuel Enablers	**SBMI**	SAF	Hydrogen

Table 21: Authors own, summary of RQ's in relation to themes and differences

After a thorough assessment of this chapter's findings of similarities and differences in relation to the literature, the development of research outcomes can be formulated. This will then culminate in Chapter 7, and an updated conceptual framework will be created detailing all the insights that were gained from the study.

6.2 Discussion of the themes for research question 1: Challenges

Research question 1: What are the challenges airline companies face that are associated with sustainable business model innovation processes?

Research question 1 was formulated to provide further insights as to what the challenges are that incumbent airline companies would face when trying to implement SBMI. Below is a table that to show the challenges that were identified from Chapter 5. The comparison of these findings and the literature in Chapter 2 will be discussed in more detail below.

Research question	Themes		Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct
What are the challenges airline companies face that are associated with SBMI?	1	External Barriers	**Challenges**	External Pressue	Technical Hurdles	Bocken and Geradts (2020), Laukkanen and Patala (2014), Long et al. (2018), Schaltegger et al. (2016)
	2	Finacial Barriers	**Challenges**	Increased costs		

Table 22: Authors own, The key findings on challenges

6.2.1 Evidence

6.2.1.1 Findings – Evidence of themes

The results and key findings from the majority of the groups and secondary data in Chapter 5 can be summarized as the external barriers of transitioning to more sustainable business practices, and the financial barriers that were involved in transitioning to SBMI.

The key findings on external barriers specified that external pressure, technical hurdles and safety concerns were seen as a challenge. In addition to this was the key finding of financial barriers, which was made up of higher fuel costs, and other external costs. The mention of external pressures for airlines to transition into more sustainable business practices has a knock-on effect that drives the higher costs in the airline industry. The new SBMI processes also come at a higher cost to company then the traditional way of operating that airlines have become accustomed to. The potential sub theme that emerged was technical hurdles, and the fact that airlines are also dependant on aircraft manufactures for the technology that will be used with innovations such as sustainable aviation fuel, hydrogen, and further aircraft development. This would make manufactures a potential bottle neck and a barrier in the transition process required for SBMI.

6.2.1.2 Evidence from key Literature and conclusions from challenges

As mentioned from the findings there are two key themes to be discussed in terms of the literature, these being external and financial barriers. The literature will be reviewed in relation to each theme and the key scholars that provide insight into these themes.

External barriers are discussed in literature by Bocken and Geradts (2020), Lüdeke-Freud et al. (2016), Laukkanen and Patala (2014), Kennedy & Bocken (2020), and Long et al. (2018). The main reason for selecting these scholars was because of their current published papers in highly ranked journals.

Challenges that prevent SBMI				
Authors	Bocken and Geradts (2020)	Lüdeke-Freud et al. (2016)	Laukkanen and Patala (2014)	Kennedy and Bocken (2020)
Authors Key topics covered	The key points that are covered are: • Institutional barriers • Strategic barriers • Operational barriers This is summarized as dynamic capabilities.	General thinking is around business sustainability and shared value. Key points on barriers are: • Pressures for short-term results • Aversion to the risk of jeopardizing existing business • Inertia and resistance to change	Article looks at the three main barrier archetypes which are: • Technological • Organisational • Social This is then structured in three categories • Regulatory • Market and financial • Behavioural and social	Offers insights to barriers of SBMI through the lens of managers who are responsible for SBMI. Managers may innovate a BM through four ways: • Creation • Extension • Revision and termination

Table 23: Authors own, Challenges based on Bocken and Geradts (2020); Laukkanen and Patala (2014); Lüdeke-Freud et al. (2016); and Kennedy and Bocken (2020)

6.2.2 Analysis

6.2.2.1 External Barriers

All of the findings across the groups, and industry reports mentioned the external barriers such as external pressure. This also refers to the pressure that is put on airline companies to adopt new sustainability practices and technology. According to Lüdeke-Freud et al. (2016) there is often pressure that is put on organisations for short-term results these being at odds with developing new sustainable business models. Lüdeke-Freud et al. (2016) go on to say that business models do not come into place in the short term and will involve significant trial and error before implementation. Clearly the themes that contribute to the construct of challenges are considered to be important in both literature as well as the feedback obtained from the interviews with the three groups interviewed.

There was another challenge regarding technical hurdles mentioned by the airline group in the findings, which was considered by the researcher to be a potential new sub-theme. When considering the literature by Laukkanen and Patala (2014) the sentiment that sustainable technologies hold the promise of being able to reduce harmful emissions was

echoed by the findings in Chapter 5. However, Laukkanen and Patala (2014) states that new technologies often have a difficult time competing with existing technology, and to overcome the barrier to utilizing new technologies in a SBMI initiative should focus on R&D and channel resources focusing on specific innovations. The research findings pointed out in Chapter 5 that there is a barrier to the number of new innovations that exist for airlines to transition too.

Concluding the discussion of the findings and literature for external barriers. There is alignment between the literature and the findings with the thinking that if there are technological hurdles and limitations, organisational effectiveness in becoming more sustainable would be hindered.

6.2.2.2 Financial Barriers

There was a high number of groups in the findings that mentioned cost as a major barrier to the implementation of an SBMI initiative. This is clear in the evidence presented in Chapter 5, in both the primary and secondary data. The move to becoming more sustainable comes at a higher cost to company according to many of the groups. When considering the literature by Bocken and Geradts (2020) it is evident that SBMI is hard to achieve, and this also makes it more complex in staying substantially profitable. Bocken and Geradts (2020) also go on to compare financial performance in the light of shareholder value and concludes that due to the higher cost that organisations would face would make them reluctant to drive SBMI, because it can negatively impact the financial performance of airlines companies.

In the finds from Chapter 5 there was consensus regarding the higher cost of sustainability practices such as the use of biofuels to replace fossil fuels or aircraft improvements. The findings revealed that the cost associated with biofuel is much higher than that of the current fossil fuel being used. That would result in the airline organisation being reluctant to change to SBMI. Literature by Laukkanen and Patala (2014) identified that many organisations are successful in maintaining profitability in their current form of operations, making them unwilling to change to SBMI and would be happy maintaining the status quo.

Concluding the discussion of financial barriers and the insights towards the challenges construct. The findings of the study support the current literature regarding financial barriers and challenges for aviation companies to the migrate to a SBMI process.

6.2.3 Conclusion

After establishing a comparison between the findings in Chapter 5 and the existing literature on the challenges regarding SBMI the findings of the study were similar in respect to the themes identified and the potential new sub-theme identified by the researcher. The summary of the comparison between the finding and literature can be found in the table 24 below:

	Themes	Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct	Comparison to key findings and key literature	Comparison to potential new sub-themes and key literature	Difference
1	External Barriers	**Challenges**	External Pressue		Bocken and Geradts (2020), Laukkanen and Patala (2014), Long et al. (2018), Schaltegger et al. (2016)	Consistant with Ludeke-Freud et al. (2016) and Laukkanen and Patala (2014) on the external pressure and technical hurdles	Consistant with Laukkanen and Patala (2014) on the technical hurdles	No new difference
2	Finacial Barriers	**Challenges**	Increased costs			Consistant with Bocken and Geradts (2020) and Laukkanen and Patala (2014) on the finacial related barriers		

Table 24: Author's own, Challenges comparison to literature

The potential new sub-theme called technical hurdles found in the external barriers was not confirmed as a new sub-theme. This is because it is currently consistent with the literature conducted by Laukkanen and Patala (2014). The study thus provides no new insights in terms of the challenges in relation to the implementation of SBMI. In conclusion the analysis shows that of the findings explored within the groups of themes are similar to the literature found in Chapter 2, and the challenges construct for research question 1. Therefore, the findings will remain unchanged.

6.3 Discussion of the themes for research question 2: Tools

Research question 2: How can airline companies use additional tools to address challenges that they face in their transition to a sustainable business model innovation process?

Research question 2 was formulated to provide further insights into what tools may be utilised by incumbent airline companies to implement SBMI. The table below is an extract from the table of findings in Chapter 5. The key scholars have been added to the table

and a comparison of these findings and the literature will be discussed below in more detail. The findings will be compared to the literature found in Chapter 2 for any similarities or areas of difference.

Research question	Themes		Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct
How can airline companies use additional tools to address challenges transitioning to SBMI?	3	Climate Awareness	**Tools**	Climate Change		Bocken and Geradts (2020), Biloslavo et al. (2020), Dentchev et al. (2018), Morioka et al. (2017),
	4	External Enablers	**Tools**	Collective Effort		
	5	Improvements	**Tools**	Aircraft developments		
	6	Policy and Institutions	**Tools**	Governing Institutions	Regulations	

Table 25: Author's own, key findings on Tools

6.3.1 Evidence

6.3.1.1 Findings – Evidence of themes

The findings from Chapter 5 regarding the tools that could be used to assist incumbent airline companies in transitioning to a SBMI process were identified from findings of the primary and secondary data and emerged in five key themes. The key themes that were in the findings were climate awareness, external enablers, improvements, policy and institutions. The most predominant code within the tools construct based on the number of times it was mentioned by each participant, and found in secondary data was operational improvements, which also included aircraft improvements. The potential new sub-theme to policy and institutions was referred to as regulations. This was understood from the findings as what regulations could be implemented to better assist airline companies with their transitions to SBMI. While there were many other codes that provided valuable insights into the protentional tools or enablers to SBMI, these themes were to be a key focus, and as such also the potential new sub-theme in the research.

6.3.1.2 Evidence from key literature and conclusions of tools

As mentioned from the findings there are five key themes to be discussed in terms of the literature, these being climate awareness, external enablers, improvements, and policy and institutions. The literature will be reviewed in relation to each theme and the key scholars that provided insight into these themes.

The tools are discussed in literature by Bocken and Geradts (2020), Lüdeke-Freud et al. (2016), Laukkanen and Patala (2014), Morioka et al. (2017), and Caldera et al. (2019).

The main reason for selecting these scholars was because of their current published papers in highly ranked journals.

Tools used in the implementation of SBMI				
Authors	Bocken and Geradts (2020)	Lüdeke-Freud et al. (2016)	Morioka et al. (2017)	Caldera et al. (2019)
Authors Key topics covered	The key points that are covered are: • Institutional barriers and drivers • Strategic barriers and drivers • Operational barriers and drivers This is summarized as dynamic capabilities.	General thinking is around business sustainability and shared value. Key points on barriers are: • Pressures for short-term results • Aversion to the risk of jeopardizing existing business • Inertia and resistance to change	Article looks at value proposition, value creation, value capture. Four contributions to SBM's: • Framework to support implementation • Cascaded sustainable value • SDG's as a framework • Use of competitive advantage.	Articles considers four enablers and six barriers to implementation of SBMI in SMEs. Enablers are: • Integrated strategy • Continuous improvement • Stakeholder involvement • Streamlined processes

Table 26: Author's own, based on Bocken and Geradts (2020); Caldera et al. (2019); Lüdeke-Freud et al. (2016); and Morioka et al. (2017)

6.3.2 Analysis

6.3.2.1 Climate awareness

The findings from groups largely mentioned that the need for awareness by leadership and education were needed in order to counter and overcome the challenge of implementing SBMI. This was similar to the literature provided by Bocken and Geradts (2020), whereby it was also mentioned that a lack of awareness and understanding of SMBI could inhibit the capacity of SBMI. Therefore Bocken and Geradts (2020) mention that there is a need for people development and training, and it was important to enable the dynamic capabilities for SBMI.

There was also mention in the findings by groups of internal awareness at an organisational level and external awareness being the public who utilise airlines for travel. This was similar to the thinking of Laukkanen and Patala (2014) who mention that a barrier

to sustainable business is a lack of awareness, and to overcome this barrier providing education in a company and outside a company could aid in SBMI implementation.

In concluding the discussion of climate awareness, the key insights revealed that the findings of this theme around climate awareness are consistent with existing literature.

6.3.2.2 External enablers

The enablers that were identified in the findings can be broken into two parts, the first being internal enablers that is the collective effort of the organisation and airline companies to enable more sustainable business practices. The other is more external collaboration and collective effort from different people and businesses in the value chain. There were similarities in this thinking from Lüdeke-Freud et al. (2016) that mentioned co-operative mutual collectives as an innovation enabler of SBMI. As well as Bocken and Geradts (2020) who said that in order to address the complex sustainability challenges there is the need for cross collaboration to inspire and create innovative solutions.

In concluding the discussion of external enablers the findings, the insights gained on the theme of external enablers are consistent with existing literature.

6.3.2.3 Improvements

The findings on improvements from groups of primary and secondary data were about making the organisational operations more efficient. These operations that were talked about were around the everyday business operations of airline companies. Things like quicker turn arounds of flights and less time wasted on the ground thereby burning more fuel and as a result producing excess carbon emissions. This also includes the air traffic navigation services which route aircraft from beacon to beacon until they reach their destination. Caldera et al. (2019) makes mention of evidence that involves the sharing of responsibilities across all the business functions, and that successful adoption of sustainable business operations would include internal and external stakeholders. This could be from the organisational employees being internal, and the air traffic navigation being external and playing a critical role in the adoption of SBMI.

Another category from the findings on the theme of improvement related to aircraft design and technological developments. This was mentioned by a number of groups in the findings and secondary data. Morioka et al. (2017) refers to technology as an enabler of

SBMI, and that technological innovation will be critical for enabling low carbon applications. Technology will make sustainable business possible according to Laukkanen and Patala (2014), and expects relay the importance of regulatory mechanisms to aid in the development of technological innovations to tackle challenges in a sustainable manner.

In concluding the discussion on the findings associated with the improvements. There are key insights gained that are consistent with the findings in literature.

6.3.2.4 Policy and Institutions

The findings on industry regulations and policy by government were seen to be of great importance by the groups and in the secondary data. Groups discussed the importance of the polices around sustainability and the drive by industry to become more sustainable going forward. While there are many policies which appear in the secondary data on different ways to mitigate the effect of carbon emissions. Some of the groups said that the regulations by local governments were lacking and needed to be improved if sustainability practices were to be effectively implemented. It was for this reason that the researcher add the potential new sub-theme of regulations under policy and institutions to add to the tools that airline companies can utilise to implement a SBMI process.

If government can support and show involvement to enforce sustainable practices, then it is mentioned by Dentchev et al. (2018) that government can be an important enabler of SBMI. Dentchev et al. (2018) goes on to say that government play an important role in motivating different stakeholders to participate in SBMI. The groups also highlighted the importance of regulation and policy in the findings and how it should drive the future direction of aviation sustainability. Morioka et al. (2017) mentions that through the guidelines of the SDG's government can implement policy oriented actions towards addressing root-causes of unsustainability.

In concluding the discussion on the findings in literature associated with policy and institution. The literature indicated that the regulations have already been mentioned and therefore these findings are consistent with existing literature.

6.3.3 Conclusion

The preceding paragraphs show a number of similarities between the findings and the literature with regard to various different tools that exist. Table 27 below highlights the detail of this and the similarities that were found.

	Themes	Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct	Comparison to key findings and key literature	Comparison to potential new sub-themes and key literature	Difference
3	Climate Awareness	**Tools**	Climate Change		Bocken and Geradts (2020), Biloslavo et al. (2020), Dentchev et al. (2018), Morioka et al. (2017),	Consistant with Bocken and Geradts (2020) and Laukkanen and Patala (2014) on climate awareness		
4	External Enablers	**Tools**	Collective Effort			Consistant with Bocken and Geradts (2020) and Ludeke-Freud et al. (2016) regarding the external enablers		
5	Improvements	**Tools**	Aircraft developments			Consistant with Laukkanen and Patala (2014), Morioka et al. (2017), and Caldera et al. (2019) on aircraft improvements		
6	Policy and Institutions	**Tools**	Governing Institutions			Consistant with Dentchev et al. (2018) and Morioka et al. (2017) on regulation and governing institutions.	Consistant with Morioka et al. (2017) on regulations	No new difference

Table 27:Author's own, Tools comparison to literature

The potential difference of regulations as a sub-theme is consistent with the literature by Morioka et al. (2017). Thus, study provides no new insights in terms of tools in relation to the implementation of SBMI. In conclusion the analysis shows that of the findings explored within the groups, the themes are similar to the literature found in Chapter 2 and aligned with the tools construct for research question 2. There were no new insights identified, and consequently the findings will remain unchanged.

6.4 Discussion of the themes for research question 3: Outcomes

Research question 3: Who will benefit from the transition to a more sustainable business model process?

Research question 3 was formulated to provide further insights as to what the benefits and outcomes are that incumbent airline companies would have by implementing SBMI. Table 28 below is to show the outcomes that were identified from the findings in Chapter 5. The comparison of these findings and the literature in Chapter 2 will be discussed in more detail below.

Research question		Themes	Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct	Comparison to key findings and key literature
Whom will benefit from the transition to SBMI?	7	Internal and external benefits	**Outcomes**	Stakeholder Benefits		Bocken and Geradts (2020), Biloslavo et al. (2020), Comin et al. (2020), Gregori and Holzmann (2020)	Consistant with Comin et al. (2020) and Bocken and Geradts (2020) on stakeholder benefits
	8	Value Creation	**Outcomes**	Reducing Carbon impact			Consistant with Evans et al. (2017), Gregori and Holzmann (2020) and Biloslavo et al. (2020)

Table 28: Author's own, The key findings on Outcomes

6.4.1 Evidence

6.4.1.1 Findings – Conclusions of themes

The findings from the groups of primary and secondary data that provided insights into the outcomes of transitioning to an SBMI process gave a good understanding to the researcher of the main benefits that would be achieved through SBMI. The findings produced two main themes, which were internal and external benefits and value creation. The main take away was that in the long term there is benefit for airline companies to transition to a SBM, and that many stakeholders in the value chain, including the environment, would benefit. The main conclusion drawn from the findings of primary and secondary data was that there should be a long-term benefit to the passengers, employees, and other stakeholders that make up the airline companies.

6.4.1.2 Key Literature and conclusions from outcomes

The two main themes from the findings in Chapter 5 will be discussed in terms of the literature. The themes were internal and external benefits, and value creation. The main scholars that were chose for the comparison of findings and literature were Bocken and Geradts (2020), Biloslavo et al. (2020), Comin et al. (2020), and Gregori and Holzmann (2020). The reason for selecting these scholars was because of their relevant literature on the topic of outcomes, which was published in highly ranked journals.

Benefits and outcomes through SBMI				
Authors	Bocken and Geradts (2020)	Biloslavo et al. (2020)	Comin et al. (2020)	Gregori and Holzmann (2020)
Authors Key topics covered	The key points that are covered are: • Institutional barriers and drivers	Transformation toward sustainability through legitimation theory and business model innovation theory.	Analysis of sustainable business models and the applied practices. • Sustainable business models	Institutional logics perspective on SBM. • Blended Value • Integrative creation • Multidimension value capture

	• Strategic barriers and drivers • Operational barriers and drivers This is summarized as dynamic capabilities.		• Practices of sustainable models	

Table 29: Author's own, Outcomes based on Biloslavo et al. (2020); Bocken and Geradts (2020); Comin et al. (2020); and Gregori and Holzmann (2020)

6.4.2 Analysis

6.4.2.1 Internal and external benefits

The internal benefits that were mentioned in the findings across all the groups were relating to stakeholder and employee benefits. It was believed that everyone in the airline sector would benefit from the transition to a SBMI process. According to Comin et al. (2020), the benefits would be created for all stakeholders should an organisation move to a more sustainable business model. Comin et al. (2020) continues to also say that the benefits of SBMI would also be for the employees, suppliers, society, and various partners. There is also shared thinking from Bocken and Geradts (2020) around value that would be generated from SBMI for multiple stakeholders and the social and environmental value it would provide.

The findings in Chapter 5 also mentioned that the environment would benefit from the transition, and the secondary data said that there would be economic benefits to the airline companies. Biloslavo et al. (2020) indicates that SBMI would create value that includes economic value, and the long-term viability of the organisation. Evans et al. (2017) mentioned that sustainable value would incorporate economic, social and environmental forms.

Concluding the discussion on internal and external benefits, the key insights revealed that the findings of this theme around benefits are consistent with existing literature and remain unchanged based on the comparative analysis with literature.

6.4.3 Value creation

The theme of value creation that was mentioned in the findings related to reducing carbon impact, business sustainability, and organisational growth. The insights into value creation came from all the groups including the secondary data and were all mainly aligned in the thinking around value creation for airline organisations. The main aspect of this would be the reduction of carbon produced and the positive impact it would have on the environment.

Comin et al. (2020) considers SBM's to offer a high value around the use of clean energy and energy efficiency, as well as environmental stewardship. The mention of more meaningful jobs was also evident in the findings as a contribution towards value creation. Biloslavo et al. (2020) indicated in the literature that long-term employment and secure meaningful livelihoods, labour and career development was part of the value created in SBM's. The socioenvironmental aspect of value creation through sustainable business models is also mentioned by Gregori and Holzmann (2020). Bocken and Geradts (2020) include the value of SBMI and improving overall organizational reputation as a direct benefit.

Concluding the discussion on value creation, the key insights revealed that the findings of this theme around outcomes for the airline companies are consistent with existing literature and remain unchanged based on the comparative analysis with literature.

6.4.4 Conclusion

The preceding paragraphs show a number of similarities between the findings and the literature with regard to various different outcomes that exist. Table 30 below highlights the detail of this and the similarities that were found.

	Themes	Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct	Comparison to key findings and key literature	Comparison to potential new sub-themes and key literature	Difference
7	Internal and external benefits	**Outcomes**	Stakeholder Benefits		Bocken and Geradts (2020), Biloslavo et al. (2020), Comin et al. (2020), Gregori and Holzmann (2020)	Consistant with Comin et al. (2020) and Bocken and Geradts (2020) on stakeholder benefits		
8	Value Creation	**Outcomes**	Reducing Carbon impact			Consistant with Evans et al. (2017), Gregori and Holzmann (2020) and Biloslavo et al. (2020)		

Table 30: Author's own, Outcomes comparison to literature

After establishing a comparison between the findings in Chapter 5 and the existing literature on the outcomes regarding SBMI. The study provides no new insights in terms

of the outcomes in relation to the implementation of SBMI. In conclusion the analysis shows that of the findings explored within the groups of themes are similar to the literature found in Chapter 2, and the outcomes construct for research question 3. There were no new insights identified, and consequently the findings will remain unchanged.

6.5 Discussion of the theme for the study's main question: SBMI

> **Main Question:** How can incumbent airline companies implement a sustainable business model innovation process?

The main underlying question was to understand more about the implementation and enablement of a SBMI process. The approach and thinking when asked in the interviews is around overcoming the challenges. Some of the findings on this question in Chapter 5 overlap with the tools section of the study, with some responses from the findings being similar to those found in research question 2. The key scholars have been added to the table below, and a comparison of these findings and literature will be discussed in more detail for any similarities or areas of difference.

Research question	Themes		Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct
How can incumbent airline companies implement SBMI?	9	Implementation	**SBMI**	Government policy		Dentchev et al. (2018), Ludeke-Freund et al. (2016), Laukkanen and Patala (2014), Bocken et al. (2014)
	10	Fuel Enablers	**SBMI**	SAF	Hydrogen	

Table 31: Author's own, The key findings on SBMI

6.5.1 Evidence

6.5.1.1 Findings – Evidence of themes

The contributions and key findings from the primary and secondary data in Chapter 5 provided the researcher with a different perspective on how to best overcome the challenges faced when carrying out a SBMI process. The primary and secondary data provided key insights consisting of implementation and fuel enablers.

There was a difference noted to the researcher of hydrogen as a sub-theme to fuel enablers. The main conclusions that can be drawn from these two themes presented is

that policy and support from government plays a vital role in the SBMI process. The fuel enablers are also a key component in overcoming the challenges as per the findings in Chapter 5 when trying to achieve a SBMI process within airline companies.

6.5.1.2 Evidence from key literature and conclusions regarding SBMI

As mentioned in the findings there are two main themes that emerged and will be discussed in terms of the literature. These were implementational factors and fuel enablers. The key scholars that provided insight into these themes are Dentchev et al. (2018), Lüdeke-Freund et al. (2016), Laukkanen and Patala (2014), and Bocken et al. (2014). The scholars were selected because of their relatively current published articles in highly ranked journals.

SBMI implementation				
Authors	Dentchev et al. (2018)	Lüdeke-Freund et al. (2016)	Laukkanen and Patala (2014)	Bocken et al. (2014)
Authors Key topics covered	Explores the various sustainable models, and looks at mechanisms, solutions, challenges, theoretical lenses, and empirical evidence.	General thinking is around business sustainability and shared value. Key points on barriers are: • Pressures for short-term results • Aversion to the risk of jeopardizing existing business Inertia and resistance to change	Article looks at the three main barrier archetypes which are: • Technological • Organisational • Social This is then structured in three categories • Regulatory • Market and financial Behavioural and social	Looks at SBM archetypes to describe groups of mechanisms and solutions. Archetypes are: • Maximise material • Value from waste • Substitute with renewables • Deliver functionality

Table 32: Author's own, SBMI based on Bocken et al. (2014); Dentchev et al. (2018); Laukkanen and Patala (2014); and Lüdeke-Freund et al. (2016)

6.5.2 Analysis

6.5.2.1 Implementation

The theme of implementation factors and the findings thereof, relates to the various categories that emerged from Chapter 5 and how they would assist in SBMI process. The findings from the primary and secondary data showed that policy, education, and collective effort were the major insights gained to try and implement a SBMI process.

Looking at the key findings around policy that was mentioned as an implementation technique. Laukkanen and Patala (2014) states that policymakers and governments play a big role in creating a regulatory environment towards creating innovation for SBMI. Laukkanen and Patala (2014) goes onto also say that policymakers should support new entrepreneurs with regulations that allow for the experimentation of new projects. These projects could be applied to aviation in many ways such as technology improvements, or alternate fuel improvements in an industry that is already regulated heavily in terms of technology improvements.

The finding on education was seen as another implementation technique to aid in SBMI. As per the literature education is another way to implement more sustainable practices, as Bocken et al. (2014) states, and education should be used to encourage more use of sustainable products. Bocken et al. (2014) goes onto say that the need for education and awareness would facilitate the adoption of sustainable business models.

The final key insight towards implementation was collective effort. This being the collective effort of the airline industry as a whole when trying to carry out sustainability practices. According to Lüdeke-Freund et al. (2016) collective action is going to be key to addressing the most critical challenges in order to maximize the value creation of sustainability.

Concluding the discussion on the factors that are key towards implementation of SBMI, the key insights revealed that the findings of this theme around SBMI are consistent with existing literature and remain unchanged based on the comparative analysis with literature.

6.5.2.2 Fuel enablers

The theme of fuel enablers from the findings provided many insights into how the aviation could overcome the challenges faced when implementing a SBMI process. One of the major categories that was mentioned under the theme of fuel enablers across all the groups and secondary data in the findings was the use of SAF to overcome sustainability

challenges in airline companies and help to implement more a SBMI process. SAF is also referred to as biofuel for the purpose of understanding when looking at the literature.

When considering the literature that was found in Chapter 2 it was found that Laukkanen and Patala (2014) mentions the use of biofuels as new innovation under the heading of resource mobilization and it is seen as an innovation to overcome the barrier to SBMI. Bocken et al. (2014) also mentions the use of biofuel under a concept called Blue Economy, which are systems considered to address the global challenges of sustainability. Laukkanen and Patala (2014) consider the use of new technological innovations such as fuel cells for transportation an enabler.

While there is mention of biofuels in literature, it is not in depth and does not provide the same level of insight into the use of SAF as an innovation. The findings from the groups in Chapter 5 have provided more detailed and depth into the detail and overall the use of SAF or biofuel as an enabler towards SBMI.

Concluding the discussion of SAF in relation to the theme of fuel enablers the findings on SAF provide a nuance of difference when compared to literature.

Continuing within the theme of fuel enablers was the mention of hydrogen in the findings by groups and secondary data. This was mentioned as another alternative fuel to SAF and a potential replacement for the current fossil fuel that is being used in aircraft. This was considered at the time of data gathering by the researcher to potentially be a new sub-theme and nuance of difference in the research. Thus a search was conducted in the existing literature to see if there could be any more insights provided by scholars.

The potential new sub-theme of hydrogen was found to be a difference when compared to literature, as the second step conducted by the researcher was to do a key word search in Chapter 2 of this report to see if there was any mention of hydrogen. Within the secondary literature used in Chapter 2 of this report there was no mention of hydrogen in any of the articles. This meant that as per the process outlined in the beginning of the chapter, the researcher then proceeded to step three of the analysis and see if a targeted word search of hydrogen could be found in top rated journals in Google Scholar. Once a targeted word search had been conducted the use of hydrogen in the SBMI process was mentioned by two scholars in two recently published articles.

Kennedy and Bocken (2020) mention hydrogen in the value capture process, and how managers need to be able to replace a unstainable product or service with something that produces more net good, in this case using hydrogen instead of fossil fuels. The example that is used is by Wells (2018) is in the automotive sector and how technological innovations within cars can be utilised by replacing the current vehicle architecture, such as changing the fuel used in cars to a hydrogen fuel cell. This is through the lens of business model innovation according to Wells (2018).

While a few examples of hydrogen are mentioned in literature, none of these examples explored the challenges or implementation issues of using hydrogen that have been provided in the findings section of this research. To add to this the literature does not make mention directly to the aviation industry, which would have its own unique challenges to overcome in order to implement the hydrogen as a fuel enabler. In concluding the discussion of hydrogen within the theme of fuel enablers. Based on the analysis above and the search for literature the use of hydrogen will remain as a sub-theme and nuance of difference.

6.5.3 Conclusion

There were a number of similarities identified in the key literature when compared with the findings around themes of implementation and fuel enablers. Table 33 below highlights the detail of this and the similarities that were found. There was also differences noted under the theme of fuel enablers, which are shown in the table below.

	Themes	Construct	Most mentioned code group	Potential new sub-themes	Literature and key authors relating to construct	Comparison to key findings and key literature	Comparison to potential new sub-themes and key literature	Difference
9	Implementation	SBMI	Government policy		Dentchev et al. (2018), Ludeke-Freund et al. (2016), Laukkanen and Patala (2014), Bocken et al. (2014)	Consistant with Laukkanen and Patala (2014), Bocken et al. (2014), and Ludeke-Freund et al. (2016)		
10	Fuel Enablers	SBMI	SAF	1. SAF 2. Hydrogen		Consistent with Laukkanen and Patala (2014), Bocken et al. (2014)	Mentioned by Kennedy and Bocken (2020) and Wells (2018)	Nuance of difference

Table 33: Author's own, SBMI comparison to literature

The potential nuance difference of SAF and hydrogen as a sub-theme is mentioned as an example in the literature by Laukkanen and Patala (2014) and Kennedy and Bocken (2020) respectively but was not discussed in detail in relation to literature relating to SBMI. Thus, the study provides new insights in terms of fuel enablers in relation to the SBMI process for airline companies. In conclusion the discussion of findings and the analysis shows that of the findings explored within across the groups. There are themes that are similar to the literature found in Chapter 2 for implementation techniques in regarded to

policy and aligned with the implementation construct for the main research question stated above. There are also nuance differences that are noted for the fuel enabler's theme in relation to the third construct of SBMI.

6.6 Conclusion on discussion of findings compared to literature

This chapter discussed the key research findings that were presented in Chapter 5 and compared them to literature that was presented in Chapter 2. There were many similarities that were presented as well as a few protentional differences in the form of sub-themes that emerged from the findings, and these were systematically compared with Chapter 2 in a three step process that was stated at the beginning of the chapter.

The table 34 below highlights the similarities and removes the potential new sub-themes as a result of the systematic comparison to literature and the findings being consistent with the literature. The table also highlights the new sub-themes and the difference that the findings had in comparison to literature.

The conclusions from the discussion of the research findings and the key literature presented 3 sets of outcomes. There were similarities for the two sub-themes in table 34 that were similar to literature and therefore not considered to be a difference:

6.6.1 External Barriers

The study discovered a new sub-theme of technical hurdles under the theme of external barriers. However, this was removed as a sub-theme after conducting a comparison to literature, as it was consistent with Laukkanen and Patala (2014) and it was left as a similarity under the theme of external pressure.

6.6.2 Policy and Institutions

The study revealed a new sub-theme under Policy and Institutions called regulations. Due to the consistency with Morioka et al. (2017) on regulations it was removed as a sub-theme and left under the theme of policy and institutions.

There were two sub-themes that were confirmed after the discussion of the findings against the literature. These are highlighted in table 34 with the mention of the scholars who touch on a few examples, but not enough to consider the findings similar to literature:

6.6.3 Fuel Enablers

The study revealed a new sub-theme of SAF and hydrogen under the theme of Fuel enablers. While there was mention of SAF and hydrogen in the literature by Kennedy and Bocken (2020) and Wells (2018), it was considered to be mentioned as an example and the literature did not go into much detail around its use toward SBMI. This therefore appears to have nuance of difference between the findings and the literature.

The outcomes of the similarities and differences concluded in this chapter will be discussed in the conclusion of Chapter 7.

	Themes	Construct	Most mentioned code group	Potential new sub-themes	Similar	Nuance of difference	Comparison to key findings and key literature
1	External Barriers	**Challenges**	External Pressue	Technical Hurdles	✓		Consistant with Ludeke-Freud et al. (2016) and Laukkanen and Patala (2014) on the external pressure and technical hurdles
2	Finacial Barriers	**Challenges**	Increased costs				Consistant with Bocken and Geradts (2020) and Laukkanen and Patala (2014) on the finacial related barriers
3	Climate Awareness	**Tools**	Climate Change				Consistant with Bocken and Geradts (2020) and Laukkanen and Patala (2014) on climate awareness
4	External Enablers	**Tools**	Collective Effort				Consistant with Bocken and Geradts (2020) and Ludeke-Freud et al. (2016) regarding the external enablers
5	Improvements	**Tools**	Aircraft developments				Consistant with Laukkanen and Patala (2014), Morioka et al. (2017), and Caldera et al. (2019) on aircraft improvements
6	Policy and Institutions	**Tools**	Governing Institutions	Regulations	✓		Consistant with Dentchev et al. (2018) and Morioka et al. (2017) on regulation and governing institutions.
7	Internal and external benefits	**Outcomes**	Stakeholder Benefits				Consistant with Comin et al. (2020) and Bocken and Geradts (2020) on stakeholder benefits
8	Value Creation	**Outcomes**	Reducing Carbon impact				Consistant with Evans et al. (2017), Gregori and Holzmann (2020) and Biloslavo et al. (2020)
9	Implementation	**SBMI**	Government policy				Consistant with Laukkanen and Patala (2014), Bocken et al. (2014), and Ludeke-Freund et al. (2016)
10	Fuel Enablers	**SBMI**	SAF	1. SAF 2. Hydrogen		✓	Mentioned by Laukkanen and Patala (2014), Bocken et al. (2014)

Table 34:Authors own, summary table of differences and similarities

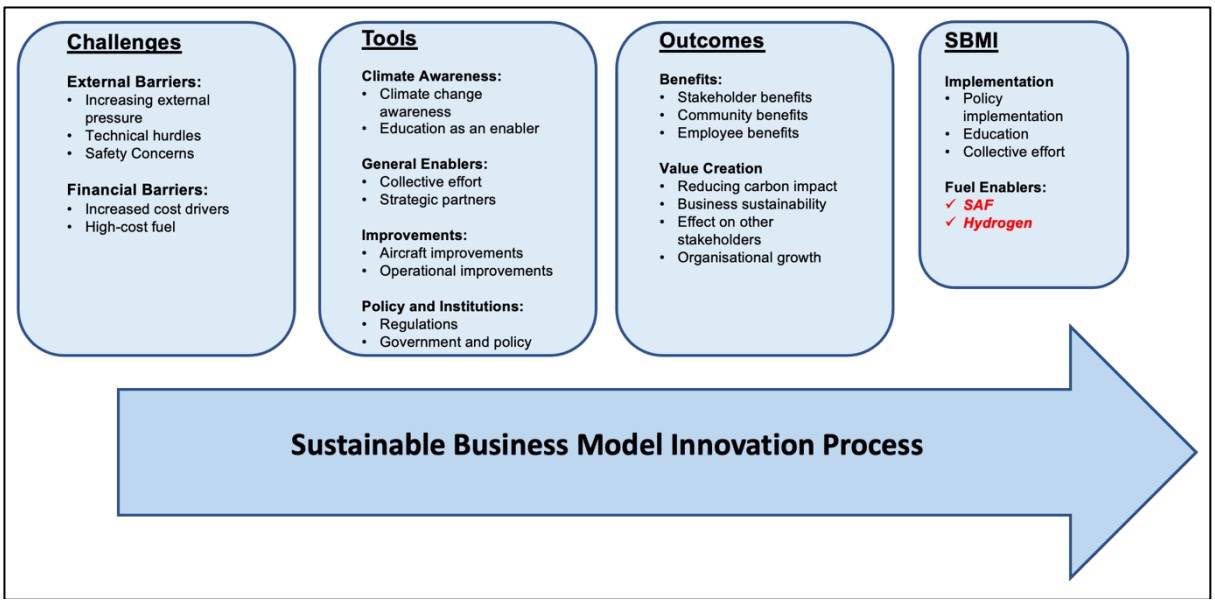

Figure 14: Authors own, Updated Conceptual framework after the conclusions drawn from Chapter 6

Chapter 7: Conclusions and Recommendations

In this chapter the main outcomes of the research will be highlighted, and the various conclusions regarding the research questions are drawn. There will also be a final updated conceptual framework provided based on the analysis presented in Chapter 6 of this report. A theoretical research contribution will be provided for each research question, and what the implications are of this study for business professionals in airline companies and stakeholders. In addition, the chapter will also provide limitations for the study and suggestions for potential future research. The research was an exploratory study on how airline companies can implement a sustainable business model innovation process, which explored four different constructs on the challenges, tools, outcomes and SBMI. The setting of the research was the airline companies that form part of the airline industry.

The aim of the research was to develop a conceptual framework with which airline companies could utilise to assist them in implementing a SBMI process. The main research question was accompanied by three sub research questions, which were identified by the researcher through the article by Geissdoerfer et al. (2018).

7.1 Principal Conclusions of the Research

7.1.1 Research Question 1: Principal Conclusion on the Challenges for SBMI

Research question 1: What are the challenges airline companies face that are associated with sustainable business model innovation processes?

Research question 1 looked at the research conclusions on the construct of challenges towards SBMI and were made up of two themes. Those themes were external barriers and financial barriers, and the conclusion of how they contributed as a challenge to the overall construct will be highlighted below.

The external barriers were consistent with literature and identified by Lüdeke-Freud et al. (2016) who said there is often pressure put on organisations for short-term results these being at odds with developing new sustainable business models. Then business models do not come into place in the short term and will involve significant trial and error before implementation (Lüdeke-Freud et al., 2016). Laukkanen and Patala (2014) then shared

the sentiment that sustainable technologies hold the promise of being able to reduce harmful emissions, however there is a challenge to utilizing new technologies in a SBMI initiative, and that the new technologies will often have a hard time competing with existing technology.

The financial barriers identified in this study are consistent with literature and can be identified by Bocken and Geradts (2020) who mentioned that the higher cost that organisations would face would make them reluctant to drive SBMI. The other aspect of the financial barrier was that many organisations are successful in maintaining profitability in their current form of operations, making them unwilling to change to SBMI (Laukkanen and Patala, 2014).

The challenges identified in this study around external barriers and financial barriers are relevant when compared to literature and as such provide insights into the research question. The literature is similar to the conclusions of the study and consistent with the challenges presented.

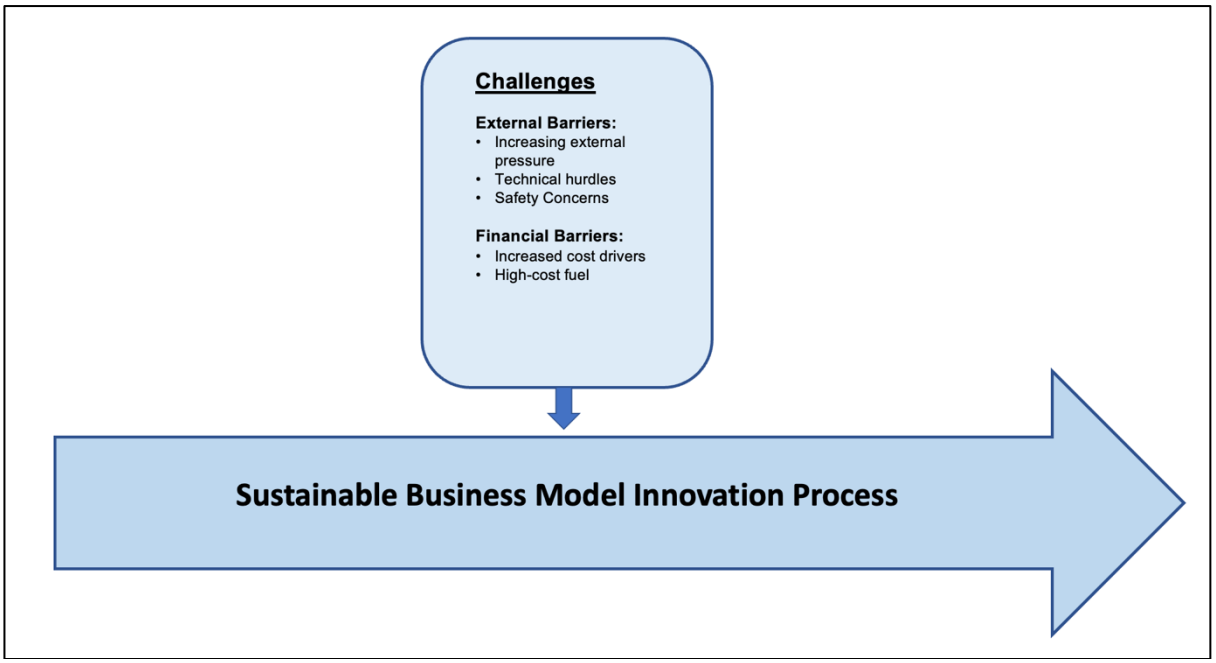

Figure 15: Author's own, Challenges in the conceptual framework

7.1.2 Research Question 2: Principal Conclusion on the Tools for SBMI

Research question 2: How can airline companies use additional tools to address challenges that they face in their transition to a sustainable business model innovation process?

Research question 2 looked at the research conclusions on the construct of tools towards SBMI and were made up of four themes. Those themes were climate awareness, external enablers, improvements, policy and institutions. Looking at the conclusion of how they contributed as a tool to the overall construct will be highlighted below.

The key conclusion around climate awareness were consistent with the literature from Bocken and Geradts (2020), whereby it was mentioned that a lack of awareness and understanding of SMBI could inhibit the capacity of SBMI. Bocken and Geradts (2020) also mention that there is a need for people development and training, which is important to enable SBMI. There is also Laukkanen and Patala (2014) that said a barrier to sustainable business is a lack of awareness, and to overcome this there is a need to provide education in a company and outside a company, which could aid in SBMI implementation.

The key conclusion of external enablers and a collective effort as a tool towards SBMI was consistent with literature. This was mentioned by Lüdeke-Freud et al. (2016) who said co-operative mutual collectives is an innovation enabler of SBMI, and Bocken and Geradts (2020) who said that in order to address the complex sustainability challenges there is the need for cross collaboration to inspire and create innovative solutions.

The key conclusion around improvements in this study as also a tool is consistent with literature. One of the improvements being in the day to day operations of airline companies, and Caldera et al. (2019) mentions that this would involve the sharing of responsibilities across all the business functions, and that successful adoption of sustainable business operations would include internal and external stakeholders. The other improvement insight was around aircraft improvements and technology as a tool to aid in SBMI. Morioka et al. (2017) refers to technology as an enabler of SBMI, and that technological innovation will be critical for enabling low carbon applications. There was

also Laukkanen and Patala (2014) who expects the importance of regulatory mechanisms to aid in the development of technological innovations towards tackling challenges in order to implement SBMI.

The final key conclusion from the study was policy and institutions as a tool towards SBMI and was consistent with literature. Dentchev et al. (2018) makes mention that government can be an important enabler of SBMI, and that government can support and show involvement to enforce sustainable practices. Dentchev et al. (2018) also says that government play an important role in motivating different stakeholders to participate in SBMI. There is also Morioka et al. (2017) who mentions that through the guidelines of the SDG's governments can implement policy oriented actions towards addressing root-causes of unsustainability.

The tools identified in this study around climate awareness, external enablers, improvements, policy and institutions are relevant when compared to literature. As such they provide insights into the research question posed. The literature is similar to the conclusions of the study and consistent with the tools presented.

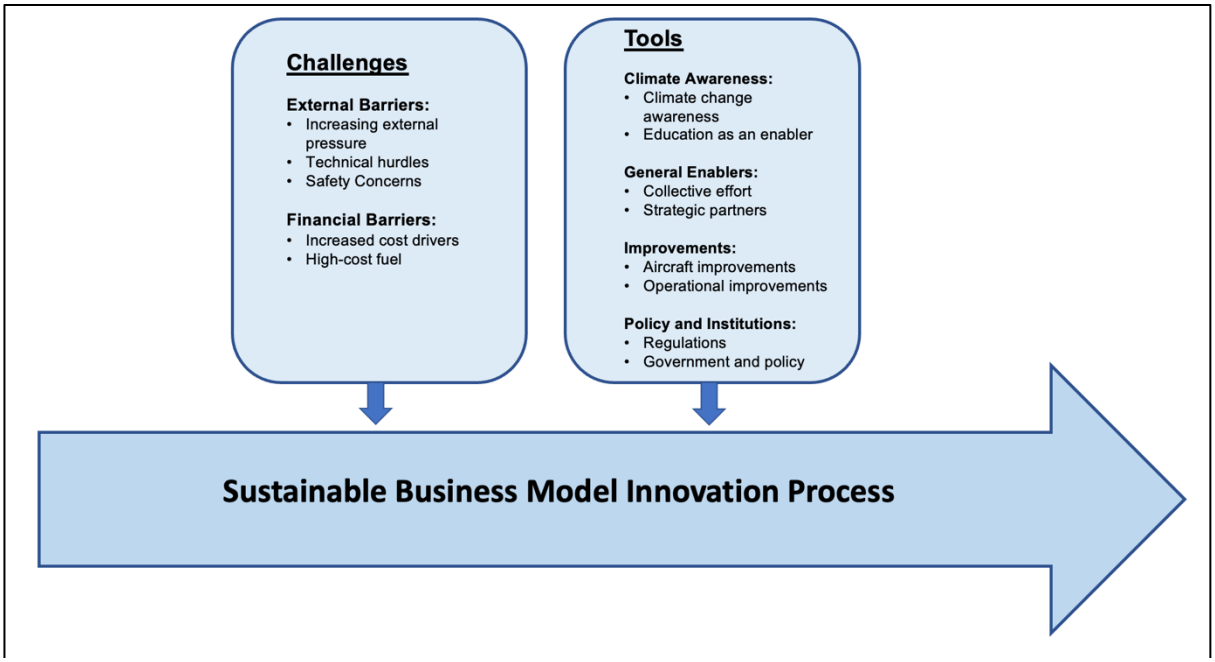

Figure 16: Author's own, Challenges and Tools in the Conceptual Framework

7.1.3 Research Question 3: Principal Conclusion on the Outcomes for SBMI

Research question 3: Who will benefit from the transition to a more sustainable business model process?

Research question 3 looked at the research conclusions on the construct of outcomes and who will benefit transitioning towards SBMI and were made up of two themes. Those themes were internal and external benefits, and value creation. Looking at the conclusion of how they contributed as a tool to the overall construct will be highlighted below.

The key conclusion of internal and external benefits. When considering the internal benefits Comin et al. (2020) mentioned that benefits would be created for all stakeholders if an organisation moved to a more sustainable business model. This benefit would be for the employees, suppliers, society, and various partners (Comin et al., 2020).

The conclusion of value creation when considering the benefits of SBMI would incorporate economic, social and environmental forms when looking at the sustainable value according to Evans et al. (2017). Biloslavo et al. (2020) also says SBMI would create value that includes economic value, and the long-term viability of the organisation.

The outcomes that are identified in this study around internal and external benefits, and value creation are relevant when compared to literature. This concludes that they provide insights into the research question posed and the literature is similar to the conclusions of this study. It is consistent with the benefits that have been presented.

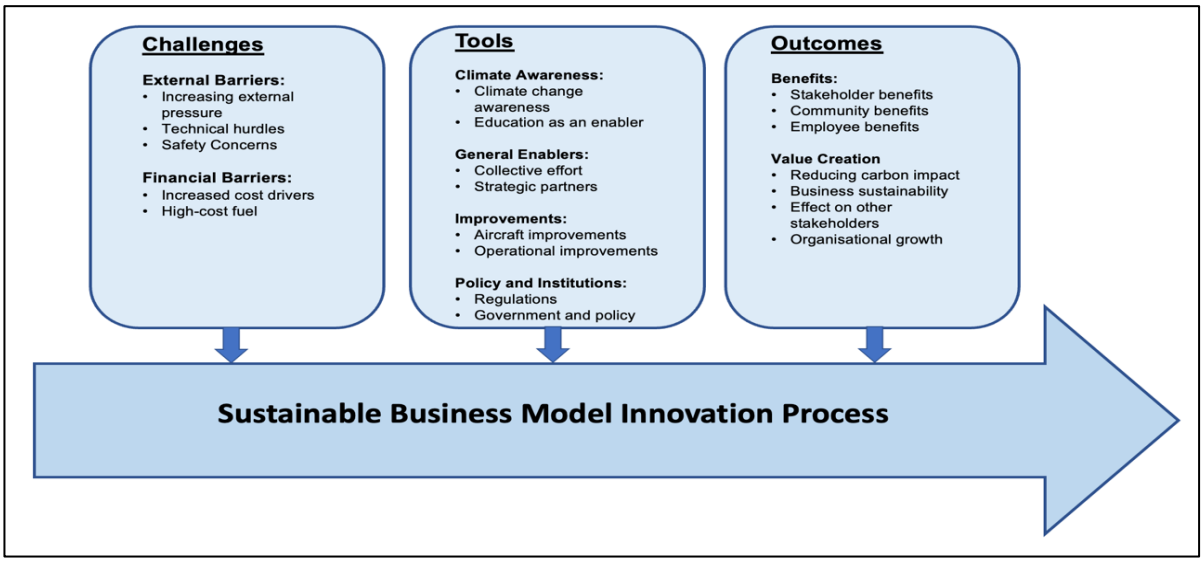

Figure 17 : Author's own, Challenges, Tools, and Outcomes in the Conceptual Framework

7.1.4 Main Research Question: Principal Conclusion on the Implementation of SBMI

Main Question: How can incumbent airline companies implement a sustainable business model innovation process?

The main research question of SBMI looked at how to overcome the challenges when transitioning towards a SBMI process and the insights that were gain from the literature when carrying out this implementation. There were two main themes that made up this construct. Those themes were identified as implementation and fuel enablers. Looking at the conclusion of how they contributed as a implementation technique to the overall construct will be highlighted below.

Regarding the implementation theme as a key insight to the SBMI process, the role that policy and governments play in overcoming the challenges associated with implementation were consistent with literature. Laukkanen and Patala (2014) stated that policymakers and governments play a significant role in creating a regulatory environment towards creating innovation for SBMI. There was also the mention by Laukkanen and Patala (2014) to say that the policymakers should support new entrepreneurs with regulations that allow for the experimentation within projects. The other implementation technique involved education. It is said by Bocken et al. (2014) that there is the need for education and awareness that would facilitate the adoption of sustainable business models, and that education should be utilised more to encourage the use of sustainable products. This implementation should also be done as a collective according to Lüdeke-Freund et al. (2016), who said collective action is going to be key to addressing the most critical challenges associated with sustainability.

The key conclusion of fuel as an enabler towards the construct of SBMI emerged as a nuance difference when compared to literature. While the literature made mention of the fuels as an innovation, such as Laukkanen and Patala (2014) who mentioned the use of biofuels as new innovation to overcome barriers towards SBMI. There was Bocken et al. (2014) who also mentions the use of biofuel to address the global challenges of

sustainability. While also considering the use of hydrogen as a fuel enabler, Kennedy and Bocken (2020) briefly mention hydrogen in literature. However, these were not very detailed in there explanation and were examples of hydrogen as an innovation that can be used. Literature did not cover the challenges that may be faced, or how to implement these fuels as enablers.

The conclusions identified in this study regarding the implementation to a SBMI process prove to be similar when compared to literature. Thus, under the theme of implementation they provide insights into the research question posed and the literature is similar to the conclusions of this study. The research presented for fuel enablers did show there was nuance of difference between the literature and the conclusions of this research.

7.1.5 Final conclusions and conceptual framework

The final conceptual framework below highlights the similarities and differences when comparing this study to existing literature. The framework highlights the challenges, tools, outcomes and SBMI as constructs that all contribute to helping airline companies start the SBMI process. The nuance of difference under fuel enablers is also highlighted on the final conceptual framework.

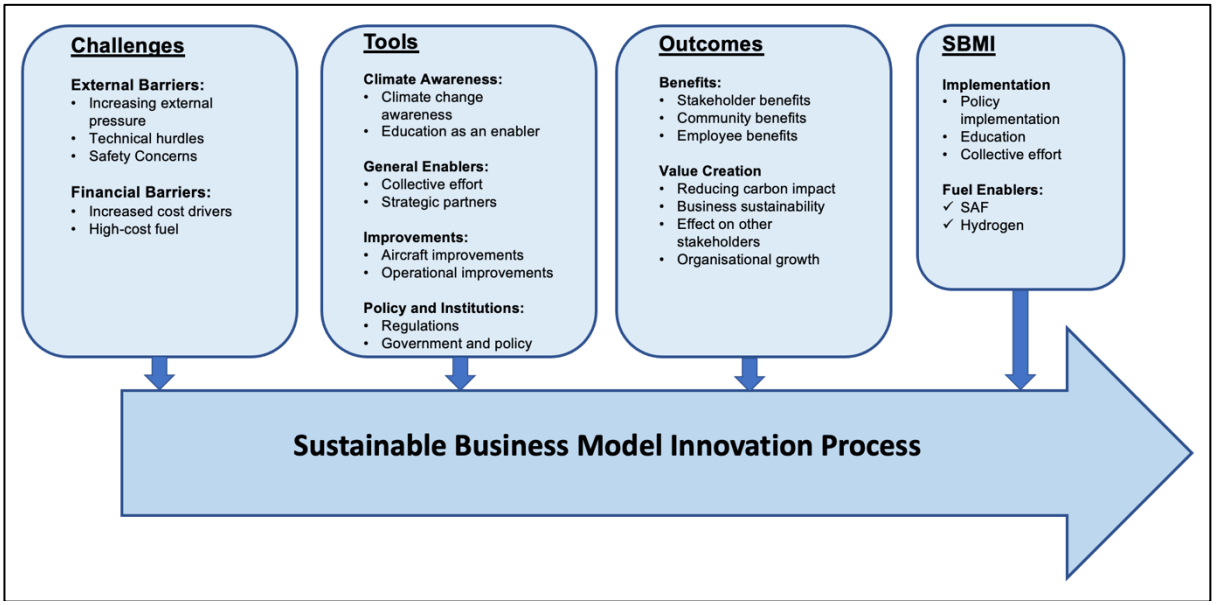

Figure 18: Author's own, final Conceptual Framework adapted from Chapter 6

7.2 Theoretical Research Contribution

This research was an exploratory study that aimed to explore the theory by Geissdoerfer et al. (2018). The purpose of the research is to make a theoretical contribution in a few areas that might refine or extend existing literature on how airline companies can implement a sustainable business model innovation process. Based on the scope of the research analysis and conclusions, the following potential contributions are claimed:

7.2.1 Similarities to SBMI literature: A Small contribution to the body of knowledge on SBMI literature

7.2.1.1 Research Question 1:

The challenges construct is similar to the existing body of knowledge and is therefore adding to the amount of knowledge.

7.2.1.2 Research Question 2:

The tools construct is similar to the existing body of knowledge and is therefore adding to the amount of knowledge.

7.2.1.3 Research Question 3:

The outcomes construct is similar to the existing body of knowledge and is therefore adding to the amount of knowledge.

7.2.2 Nuances of difference with SBMI literature: Refinements to the existing body of knowledge on SBMI literature

7.2.1.4 Main Research Question*:*

The potential refinement to the current body of knowledge is under the theoretical construct of SBMI. It is identified in the final conceptual framework in figure 15 under fuel enablers.

SAF

The research outcome of SAF relates to biofuel as an enabler of SBMI in incumbent airline companies. The implementation covered the use of SAF instead of fossil fuel in order to reduce carbon impact.

Hydrogen

The research outcome of hydrogen relates to fuel enablers and its use toward achieving a SBMI process in airline companies. The use of hydrogen was covered as a fuel replacement for traditional fossil fuels.

These differences that were noted both relate to fuel as an enabler of sustainability, which could be used in airline companies. It could also be noted that both of these fuel enablers could have the potential to aid substantially in the transition of airline companies toward a SBMI process.

7.3 Implications for management

The implications for managers and other stakeholders were that by providing the various constructs presented in this study, business leaders and managers might be able to implement a SBMI process in their particular airline companies. At present there is no clear path for airline companies to achieve a SBMI process, and all the challenges, tools, and outcomes that may result thereof. This study aims to therefore provide a better understanding to management and stakeholders about navigating their way to achieving a more sustainable future for their customers and businesses. The conceptual framework that has been provided is intended to give managers and stakeholders guidance in the SBMI process.

7.3.1 Recommendations: Challenges

i. Managers and leaders of airlines companies should be aware of the challenges and barriers that exist when trying to consider implementing a SBMI process. By being aware of these challenges before setting out to implement more sustainable practices managers and leaders will be aware of what will hinder them in the process.

7.3.2 Recommendations: Tools

i. Mangers and leaders need to be aware of what tools are going to assist them in ensuring an easy transition to more sustainable innovations and practices. Managers will know before setting out on the journey to sustainability what the best tools are to aid in the SBMI process by utilising the framework and pro-actively identifying best practices.

7.3.3 Recommendations: Outcomes

i. Managers and stakeholders involved in airline companies need to understand the value and benefit that is gained through the use of SBMI, as the impacts thereof effect multiple different levels of people and the environment.
ii. Managers who are aware of the many benefits associated with SBMI will be in a better position to motivate others and make them aware in order to implement the change needed to adopt sustainable practices.

7.3.4 Recommendations: SBMI

i. Managers and stakeholders need to ensure that policies and regulations are followed in order to better implement a SBMI process.
ii. Managers and leaders of airline companies need to ensure that the correct policies are in place by the countries governments and that they are followed correctly to better address the concerns around sustainability.
iii. Managers of airlines companies need to use enablers such as new fuel innovations to drive their sustainability strategies.

7.4 Limitations of the research

Limitations for in respect of the research that have been identified are:

i. The study focused specifically on airline companies, as it was not possible in this research to explore in detail the entire aviation industry.
ii. The study was only able to interview a limited number of participants from airline companies and industry experts.
iii. There were also limitations highlighted in Chapter 4 regarding the research design and methodology.
iv. The study broadly explored the challenges, tools, outcomes, and implementation of SBMI, thus might not have explored each construct in sufficient detail.

7.5 Suggestions for future research

While carrying out the research study the author identified a few possible areas for future research:

i. The study would benefit from a greater number of airline companies being interviewed as well as other industry experts in the aviation industry.

ii. While the research looked broadly at the challenges, tools, outcomes, and implementation of SBMI, future research could be conducted at a micro level to analyse the different aspects and factors that make up the constructs.

iii. There is a need for more in-depth research regarding the implementation of SBMI and the value creation derived from SBMI

iv. Future research could also be conducted on the fuel enablers that were mentioned as a nuanced difference in the study. While there is some information provided in the study, the author did not have sufficient time to conduct an in-depth study of the nuanced differences that relate to the use of SAF and hydrogen within airline companies.

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Appendices

Appendix A: Participant consent form

Gordon Institute of Business Science
University of Pretoria

Subject line: Informed Consent for interviews

Dear _____

I am conducting research as part of the fulfilment of a Masters in Business Administration degree with the Gordon Institute of Business Science (University of Pretoria).

My research topic relates to sustainability, and how airline organisations are moving towards a sustainable business model to reach net zero carbon emissions by 2050. The interview is expected to last approximately 45 minutes to one hour (60 minutes) and will help me understand your experience in sustainability within the airline sector. ***Your participation is entirely voluntary, and you may withdraw at any point, without any consequence.***

- The interview to be recorded;
- The recording to be transcribed by a third-party transcriber, who will be subject to a standard non-disclosure agreement;
- Verbatim quotations from the interview may be used in the report, provided they are not identified with your name or that of your organisation;
- The data to be used as part of a report that will be publicly available once the examination process has been completed; and
- All data to be reported and stored without identifiers.

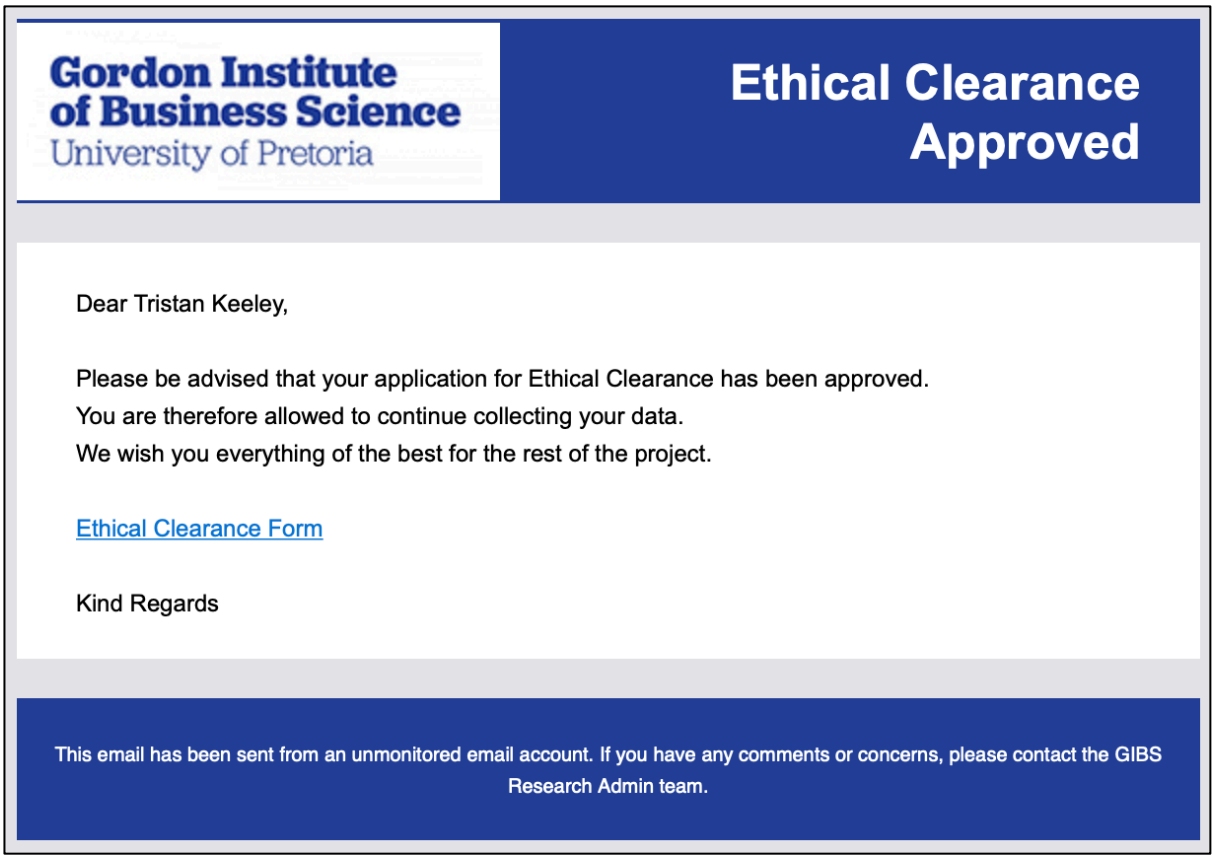
Researcher: Tristan Keeley
Email: 21819132@mygibs.co.za
Phone: (+27) 82 576 8362

Research Supervisor: Dr Jill Bogie
Email: bogiej@gibs.co.za

Signature of participant: _____
Date: _____

Signature of researcher: _____
Date: _____

Appendix B: Ethical clearance approval



Gordon Institute of Business Science
University of Pretoria

Ethical Clearance Approved

Dear Tristan Keeley,

Please be advised that your application for Ethical Clearance has been approved.
You are therefore allowed to continue collecting your data.
We wish you everything of the best for the rest of the project.

Ethical Clearance Form

Kind Regards

This email has been sent from an unmonitored email account. If you have any comments or concerns, please contact the GIBS Research Admin team.

Appendix C: List of codes used

1	Airline push back	55	High growth in the industry
2	Airline representative	56	Human's future security
3	Airlines are on a back foot	57	Humans don't contribute much to greenhouse gas
4	Airlines saving money	58	Hydrogen fuel
5	Airport emissions	59	Impact to industry
6	Bad leadership	60	Increasing external pressure
7	benefits	61	Industry Driven
8	benefits to airlines	62	Industry governing bodies
9	Better air traffic routing	63	Infrastructure improvements
10	Better for the community	64	Innovation
11	Blended bio fuel	65	Knock on effect to other businesses
12	Blended biofuel	66	Larger scale will reduce costs
13	building relationships	67	Leadership drivers
14	Business sustainability	68	Monitoring and tracking
15	Cannot abandon current technologies	69	More efficient routing
16	carbon credits	70	More meaningful work
17	Climate change awareness	71	No direct benefit
18	collective effort	72	Noise pollution
19	Company Policy	73	Not enough power supply
20	Consumer benefits	74	Operational improvements
21	Consumer will have to pay the price	75	Organisational growth
22	Corporate governance	76	Penalised for emissions
23	CORSIA	77	People no longer travelling
24	Cost Drivers	78	Phased approach to adoption
25	Cost savings through sustainability	79	Policy incentives
26	COVID	80	Positive impact
27	Creating strategic partners	81	Predictable weather patterns
28	Customers covering the cost	82	Public awareness
29	Developing nations	83	Recognition of the issue
30	Developing nations being penalised	84	Recycling
31	Different factors	85	Reducing Carbon impact
32	Dynamic industry	86	Reduction in big aircraft
33	Early Adopters	87	Reduction in demand
34	Economic growth through aviation	88	regulation requirement
35	Economic model has changed	89	Responsibility
36	Education and awareness as an enabler	90	SAF
37	Electric Aircraft	91	Safety concerns
38	Electric engine challenges	92	SBMI
39	Electric engines	93	Seen to be doing the right thing
40	Electric ground service equipment	94	Sensors to understand usage
41	Embodied Carbon	95	Small scale start
42	Employees benefits	96	Smaller economies of scale
43	Environmental benefits instead of airlines	97	social impact
44	Environmental Sustainability	98	Solutions sooner
45	EONS framework	99	Stakeholder benefits
46	ESG	100	Strategic choices
47	Farming for SAF	101	Subsidise
48	Flight shaming	102	Sustainability cannot be put on a balance sheet
49	Fossil Fuel	103	Sustainability not prioritised
50	Further aircraft developments and improvements	104	Technical hurdles
51	Government support	105	Technology as an enabler
52	Governments and policy	106	Unpredictable weather
53	High Cost	107	Working together
54	High cost involved with not implementing sustainability		

Appendix D: Interview guide

Interview Guide/ Protocol

Good morning / afternoon / evening.

As mentioned in my introductory email/letter to you, my research topic relates to sustainability in airline organisations, and how those airline organisations that are moving towards a sustainable business model to reach net zero carbon emissions by 2050 set out in the Paris Climate Agreement.

Q1 – Introduction	1. Please can you tell me about your role at this airline/organisation, and your involvement in sustainability in the airline industry?
Q2 – Sustainability	1. Please could you explain to me what the organisation is aiming to achieve through sustainability? 2. Could you also tell me what drivers are moving the organisation towards becoming more sustainable?
Q3 – Implementation and Innovations	1. Please could you tell me what some of the innovations are around sustainability that are being introduced in the organisation? 2. If you could also, please tell me how the organisation is implementing these innovations for sustainability?
Q4 – Challenges	1. In your experience, what would some of the challenges be when implementing sustainability into the airline organisation?
Q5 – Enablers	1. Please tell me in your experience what would be needed to overcome the challenges?
Q6 – Outcomes	1. In moving to a sustainable business model in the airline, what are the benefits that the business has created, and for whom has this been achieved?
Q7 – Closing	1. Looking into the future, how do you see this moving forward?

General probing questions to assist conversation:

- Please could you tell me more about that?
- Please could you give me an example to illustrate?
- Could you elaborate on that or give me an example?

Clarifying question:

- Please could you clarify 'xyz'? - where 'xyz' is an acronym, word or phrase that is unclear.

Interviewer's personal notes to remember:

- Explain to the interviewee if the question has two parts before asking it