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Comprehensive Strategic Analysis for Sustainability: An Aviation Industry Case Study

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Abstract: This paper presents a framework for strategic innovation, the Comprehensive Strategic Analysis for Sustainability, aimed at identifying climate risks faced by organisations and developing appropriate responses to enhance their resilience. The framework integrates the analytical tools of comprehensive strategic analysis with a range of sustainability methodologies to offer a holistic approach to sustainable innovation. The framework was tested through a case study on a large multinational airport retailer, which helped identify the drivers and barriers to sustainably oriented innovation. The application of the framework informed criteria for assessing the suitability for different sustainable business model archetypes to be implemented but did not identify specific sustainable business model innovations that were appropriate for the case firm, highlighting the complexities of managing scope 3 emissions without taking systems-level and multi-stakeholder approaches. The Comprehensive Strategic Analysis for Sustainability framework presents a valuable contribution to approaches for strategic sustainable innovation by acting as a useful lens through which sustainable business model innovation in large industries can be viewed. This study suggests that such holistic frameworks have significant value for the business community in transitioning to low-carbon business models to mitigate the challenges of the climate emergency, whilst the CSAfS framework demonstrates potential as an effective tool for organisations seeking to enhance their sustainability and resilience.



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Keywords: business model innovation; comprehensive strategic analysis; framework; strategic sustainable development; sustainable development

1. Introduction

This paper presents an approach to fostering sustainable innovation within organisations named ‘Comprehensive Strategic Analysis for Sustainability’ (CSAfS). Through a sequence of steps, CSAfS seeks to develop an awareness and understanding of sustainability challenges for businesses, resulting in the formulation of innovative solutions that can aid their transition to a low-carbon society.

The rationale for the research is provided in the literature review in Section 2. It describes the importance of sustainability as a strategic imperative for businesses to manage their environmental impact and highlights various tools, such as environmental management systems and sustainable business models, that have been developed to help firms innovate and implement sustainable practices, noting that there are some gaps that may hinder effective practices by organisations and practitioners looking to aid in the transition to a low-carbon economy, namely a paucity of strategic approaches to such a challenge, and a lack of holistic approaches to innovation that an organisation may need to go through to innovate effectively, i.e., from understanding their climate impacts and climate risks; creating a call to action for innovation to take place; and the ideation, prioritisation, and selection of suitable pathways for innovation.

Accordingly, this paper looks to extend an existing strategic framework (comprehensive strategic analysis) [1] to the specific challenges of innovation and, in doing so, answers the research question: *How can the CSA framework be adapted and extended to help firms understand and adapt to environmental sustainability challenges?*

More specifically, the paper looks to ascertain the ability of the framework to: (a) understand existing business practices, (b) quantify climate-associated impacts resulting from the model, and (c) identify appropriate innovation pathways for the business to reduce its climate risks and enhance its resilience to the global transition to sustainable business practices. Note that throughout this paper we use the term ‘sustainability’ specifically to describe ‘environmental sustainability’ rather than economic or social sustainability.

We believe that this work provides a new lens through which the exploration of sustainable business model innovation can be explored, in that it takes an approach previously developed for practitioners in the strategic management fields and applies it in the context of environmental management. In doing so, the framework’s method of bringing in tools from the environmental management field represents a unique and original approach to exploring opportunities for strategic management innovation in sustainability contexts. As the literature shows, there is a paucity of frameworks that embed tools from different aspects of environmental and strategic management into one holistic approach, which is something that we feel would be a powerful addition to an organisation’s ability to innovate for sustainability. Hence, we hope that this paper will offer unique value.

The adaptation and method underpinning the use of the CSAfS framework is discussed in Section 3, where we describe the framework’s application in a case study setting for a duty- and tax-free retail sector of the air transport industry. The results of its application are summarised in Section 4, where the framework is shown to adequately identify and quantify environmental impacts associated with the business and develop an appropriate call to action for innovation, as well as provide a series of innovation opportunities—none of which were deemed by the case firm to be something that they wanted to pursue.

Section 5 discusses the implications of this, notably how the case study has proven to be a valuable illustration of the complexities of managing system-level carbon emissions in which there are a number of acting stakeholders without using systems-level and multi-stakeholder approaches. We summarise in Section 6 by stating our belief that the CSAfS framework holds significant potential as a tool for strategic sustainable innovation and that its application should be further studied and extended in other case settings, and we call for multi-stakeholder cooperation when addressing systemic climate impacts rather than actors acting in silos.

2. Literature Review

If patterns of production and consumption define the character and scale of sustainability and climate challenges, then businesses embody the critical interface between the two [2]. Consequently, and in compliance with national and international carbon targets, sustainability is now considered a strategic imperative for firms [3], with organisations increasingly taking steps to better manage their environmental impact. This has been accomplished by the use of a range of tools, such as design for sustainable manufacturing [4,5], resource efficiency [6], tools designed to help instigate a circular economy [7–10], environmental management systems (EMS) supported by a range of guidelines, standards [11], impact assessments [12], life-cycle assessment [13,14], collaborative environmental management [15], and total quality management [16].

At the same time, other concepts rooted in sustainability have been developed based on ideas such as ‘eco-design’ [17–20], closed-loop systems [21–23], product-service systems [24,25], and sustainable product design [26–30]. A similar story can be told in the emerging field of sustainable business model innovation [31–36], in which a number of tools have emerged to categorise and develop sustainable business models [33,34,36–39]. Although these have great value in terms of helping businesses to innovate, the authors of [40,41] found that the majority lack a focus on the actual implementation of such innovations, concentrating

merely on their ideation, with Geissdoerfer, Bocken, and Hultink [42] stating that “(1) many business model innovation meetings and workshops are conducted, but the ideas are not followed up, (2) promising sustainable business model concepts are not implemented, and (3) most implemented business models, especially in the start-up context, fail in the market” (ibid., p. 407). Moreover, these frameworks tend to exist as separate entities to wider business and strategic management and are not embedded in wider decision-making processes. This is echoed by Boardman, Shapiro, and Vining [1] who stated that although the business literature is good at providing specific concepts and tools of analysis, it is weak in integrating the elements in a useful, systematic way (ibid; p. 1). This can lead to them being misused by firms and practitioners or their findings not being fully understood, thus having minimal impact on organisational behaviour.

To bridge this gap, Boardman, Shapiro, and Vining proposed a holistic framework—‘Comprehensive Strategic Analysis’ (CSA)—to integrate elements of strategic decision making into one cohesive approach [1]. The literature in the field of strategic management, strategic development, and strategic innovation emphasizes the importance of organisations adapting to changes in their environment through the use of effective strategic management practices by developing and implementing strategies that enable organisations to achieve long-term goals and objectives. Strategic leadership can provide a clear direction and vision for the organisation, as well as foster innovation and creativity in problem solving. Organisations that have strong strategic visions that are deeply embedded in corporate culture and leadership tend to be more effective in adapting to changes in their environment and achieving their strategic objectives. Hence, strategic approaches to sustainability can be seen as important, since the challenges of the climate emergency entail a reconfiguration of economic activity from incumbent externalising business models to sustainable, circular, responsible, and regenerative ways of doing business [43,44]. Crucially, strategic innovation offers the potential for different tools to be embedded in an innovation process, and several strategic innovation frameworks exist [40,41,45–47]. Such processes are an essential aspect in innovation, providing a structured approach to generating and implementing new ideas via a repeatable, robust, evidencable, and manageable platform. Indeed, Garud et al. [48] go as far as defining innovation as the ‘entire process that takes an idea from inception to implementation’. It can be argued that the world changes too rapidly for strategic innovation to reliably rely on such processes [49]; however, processes do nonetheless enable businesses to improve their chances of success, reduce risks, and increase the efficiency of decision-making processes [50].

There is a paucity of research on frameworks for strategic sustainable innovation, perhaps the most well-known being Broman and Robert’s [51] Framework for Strategic Sustainable Development, which takes an iterative approach for businesses to strategically innovate to sustainability in line with the demands of a sustainable society, doing so through phases that look to understand an organisation, identify an appropriate future vision, and develop appropriate solutions to take the organisation towards that future vision. Although the FSSD has found value, it does not include any specific guidance through which wider environmental assessment can be integrated, whilst the lack of alternative approaches suggests that there is space for other approaches to emerge. That the CSA framework emerged from the strategic management rather than the sustainability literature suggests that its structure and nomenclature may synergise with the expectations of the business community. Moreover, its potential ability to analyse an operational scenario and to identify innovation solutions in relation to external factors fits well with the requirements of sustainable development. We specifically discuss our adaptation, which we call Comprehensive Strategic Analysis for Sustainability (CSAfS), in Section 3.

3. Materials and Methods

In this section, we describe the adaptation and application of the CSA Framework to the case study.

3.1. The Comprehensive Strategic Analysis Framework

Boardman et al.'s [1] Comprehensive Strategic Analysis Framework describes the major components of strategic analysis and an order in which they can be executed. Using common concepts from the field of strategic decision making, CSA enables researchers and practitioners to work with an organisation to determine the current situation of a firm and the appropriateness of that situation (considering predicted changing externalities) and identify solutions that will enable the firm to adapt to the predicted future environment. The CSA framework looks to address strategic challenges through three sequential stages. First, it identifies future problems likely to face an organisation (*Situation Analysis*). Next, these data are assessed, and a call to action on the scale and urgency for such challenges is established (*Fulcrum Analysis*). Finally, strategic interventions to solve that challenge, informed by the internal and external characteristics of an organisation and existing strategic priorities, are developed (*Solution Analysis*).

The CSA framework as developed by Boardman, Shapiro, and Vining [1] is structured through three analytical phases: Situation Analysis, Fulcrum Analysis, and Solution Analysis. The application of each phase, including modifications made from the original CSA framework are described through Sections 3.1.1–3.1.4.

3.1.1. Adaptation and Application of the Comprehensive Strategic Analysis Framework

The methodology of this study involves adapting the CSA (Corporate Sustainability Assessment) framework to an environmental sustainability context. The CSA framework is a methodology that has been used to assess a company's performance, to assess internal and external risks posed to that performance, and to put forward innovations that can reduce that risk, enhance resilience, and find opportunities that the firm might be able to exploit. In our study, we modified and applied the CSA framework to specifically evaluate a focal firm's contributions to environmental challenges and the potential threat to the firm posed by those challenges.

To achieve this goal, we first defined sustainability in the context of our study as referring to the negative environmental externalities associated with the firm, such as carbon emissions, waste, and water usage. We then integrated a range of changes to the framework to integrate methods or environmental assessment and sustainable innovation. Modifications made to each stage of the framework are illustrated in Figure 1 and described in Sections 3.1.2–3.1.4. These modifications allowed us to evaluate the focal firm's environmental performance and identify potential areas for sustainable innovation. The sustainable business model archetypes were used as a stimulus for sustainable innovation thinking with a lay audience of senior managers.

3.1.2. Situation Analysis

In *Situation Analysis*, the current situation facing a firm is described and analysed. First, the firm and the problem it faces (i.e., climate change) are introduced. Second, an internal analysis describes the internal characteristics of the firm (i.e., its business model). Third, an external analysis describes the wider setting a firm is placed in and how this is predicted to change over time. Fourth, the current strategy is reviewed. Finally, there is a review of the financial performance of a firm. These steps provide an in-depth background into the current scenario in which the firm operates, providing practitioners with a robust understanding of the company that will form the context of the research phases that follow.

Table 1 describes how the researcher carried out this Situation Analysis for the case study presented in this paper. We modified the Situation Analysis stage of the CSA framework to incorporate the Business Model Canvas tool [52] as a method through which we could understand a firm's incumbent business model, associated activities, and likely sources of environmental impacts that result and, later, quantify those impacts through environmental performance data using standard carbon accounting practices as defined by the Greenhouse Gas Protocol [40]. These modifications allowed us to assess the focal

firm’s environmental performance, identify areas of risk, and prioritise opportunities for sustainability-orientated innovation to take place.

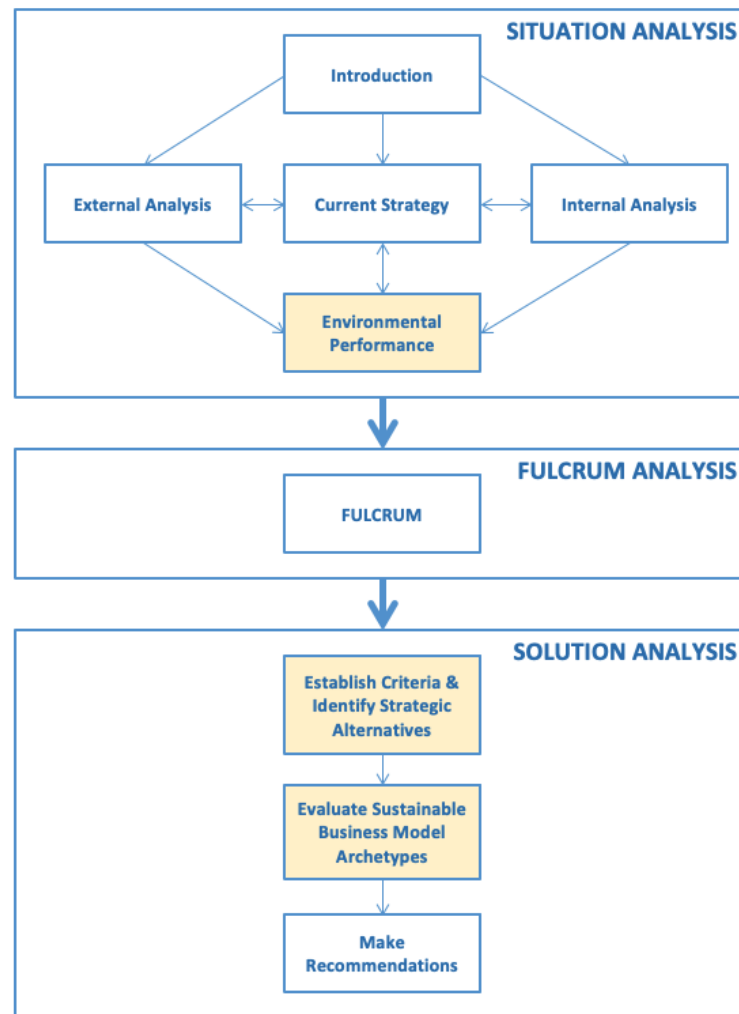


Figure 1. The adaptation of comprehensive strategic analysis, as applied with the case organisation (Authors own).

Table 1. How Boardman et al.’s [1] situational analysis was applied in this research (Authors Own).

Analysis Phase	Objective	In This Study
Introduction	Provide a brief historical overview of the firm and explain the purpose of the analysis. Provide contextual information about the focal firm, including ownership and control, its financial performance, and corporate scope.	Interviews with three senior company executives and analysis of company reporting documentation.
Current Strategy	Describe the current strategy of the business unit and the firm. This may include corporate strategy, its competitive stance, functional strategy, and an assessment of how these strategies fit together.	Interviews with three senior company executives and analysis of company reporting documentation.
Internal Analysis	What is the company’s business model. What are its activity and value chains?	The existing company business model assessed by completing the Business Model Canvas (BMC) in a workshop with eight senior company management employees. The BMC acted as a facilitation tool and a data capture device.

Table 1. *Cont.*

Analysis Phase	Objective	In This Study
External Analysis	Define the broad industry in which the business sits. What are its state and characteristics? Is the industry attractive or not? How is the competition performing? What is the market structure?	Interviews with senior company executives and analysis of company reporting documentation. Thorough literature review of documentation surrounding the aviation industry from the academic and grey literature.
Environmental Sustainability Analysis	Understand the company's position in terms of environmental sustainability. How does the business positively and negatively contribute to environmental sustainability? What signs of sustainability are present in the existing business model? What sort of initiatives and activities are the company doing to improve its sustainability performance?	Interviews with senior company executives and a review of environmental documents. Carbon accounting was also conducted both for the firm's direct emissions (i.e., vehicle fleet emissions), upstream indirect emissions (i.e., energy use), and downstream emissions (i.e., additional aircraft fuel burn).

The phases carried out were a combination of interviews with a range of participants from senior management, including Business Relations and External Affairs Directors, Operations Managers, Head of Trading, Airport Relations and Development Manager, Marketing and Digital Managers, Group Brand Managers, Supply Chain Management, Safety and Environmental Managers, and on-site Operational Managers. Interviews were semi-structured in nature, following the objectives of each research phase.

3.1.3. Fulcrum Analysis

In Fulcrum Analysis, Situation Analysis is summarised, and a prediction is made as to what may happen to the firm should current practice continue unchanged, thus providing a rationale for action. In this way, Fulcrum Analysis narrows the range of strategic alternatives for the firm, by providing broad strategic direction. This commitment can help to focus and drive strategic and business model innovation and decision making across the firm. This phase is split into two sub-phases as described in Table 2 below. No modifications to the CSA framework were made in this phase.

Table 2. The components of Fulcrum Analysis used in this research (Authors own).

Analysis Phase	Objective	In This Study
A summary of the current and expected future performance of the firm.	Draw on the Situation Analysis and consider questions such as: Is the industry attractive? Does current strategy fit the external environment? Are the firm's activities and attributes appropriate for this environment?	Review and analyse Situation Analysis phase. Document provided and presented to the organisation by the researcher for internal review and validation.
A statement of strategic direction.	Based on the previous stages of Fulcrum Analysis, the researcher identifies the strategic direction and intent that the firm may need to take to remain profitable in the predicted future scenario they are likely to be placed in. This may point towards a limited or potentially large number of potential alternative strategies.	Meeting held with senior management to review findings of the analysis, review implications, and ideate impacts on the organisation without change, as well as identify necessary changes to reduce risk.

3.1.4. Solution Analysis

In the Solution Analysis phase, the focus is on developing and evaluating strategic alternatives to the current business strategy. To assist with the identification of strategic alternatives, the researchers used sustainable business model archetypes developed by Bocken et al. [38]. These archetypes provide eight classifications of sustainable business models that can be used as a tool to conceptualize potential sustainable innovations for a firm. Rather than using a matrix to evaluate alternatives, the researchers used evaluative

criteria based on the existing firm strategy and specific challenges as identified in the Situation Analysis phase. Here, we modified the Solution Analysis stage of the CSA framework to account for the different nature of visioning sustainability innovation and the requirement for transformative changes in business practice towards sustainable business models if the requirements are for a sustainable society in which the climate emergency are to be avoided. To do this, we integrated into the framework of Bocken et al. [36] sustainable archetypes in the context of the Fulcrum Analysis and company strategy to identify future courses of action. These sustainable business model archetypes were developed to create a common language that can be used to accelerate the development of sustainable business models in research and practice. Using them in this context would enable us not just to reflect on the incumbent business model but also to seek out pathways to the organisation reorganising towards sustainability, acting as a tool through which the validity of different pathways could be assessed. Table 3 describes how this phase was applied in the study.

Table 3. How Solution Analysis was modified for the case study (Authors own).

Analysis Phase	Objective	In This Study
Establish criteria	Identify criteria of the potential new strategic options that the company must adhere to in order to meet the call to action described in Fulcrum Analysis.	Informed by existing company strategy, and requirements outlined in Fulcrum Analysis.
Identify strategic alternatives	Here, a range of alternative business models are identified so that they may be assessed against the above criteria.	Each of Bocken et al.'s [38] sustainable business model archetypes used as potential new business models.
Evaluate the alternatives	Evaluation takes place by comparing the alternative models generated by the identified criteria.	Qualitative analysis of the sustainable business model archetypes in terms of their ability to overcome challenges faced by the focal firm.
Make recommendations and conclusions	Make recommendations to the focal firm by presenting the different alternatives, their appropriateness for the company objectives, and the predicted future operating environment.	Evaluation phases assessed and the most appropriate business model archetypes proposed to the business.

3.2. Case Study Background and Research Application

The researchers applied the modified CSA framework to a multinational duty- and tax-free retailer operating in the aviation sector. The research took place over 4 years between 2012 and 2016 and utilised workshops, interviews, and desk research. The company is a market leader with some 500 stores worldwide. The study was conducted across airports in the United Kingdom and at the company's UK offices, with the results of the study reflecting the entire UK operations of the company. There is well documented and growing pressure on the aviation industry to reduce emissions as a result of its contribution to climate change [53,54]. The specific challenge posed to duty-free retailers, however, had not previously been assessed. Our case study, then, represents a useful 'revelatory case' through which the ability of the CSA framework to identify an environmental challenge and to generate appropriate interventions to mitigate this threat can be assessed.

We believe that this sector represents an ideal lens through which the challenges of sustainable development can be investigated. Aviation can be considered an exemplar of the sustainable development challenge in that it is a sector that drives considerable local and global socioeconomic benefits but is a significant contributor to a range of environmental externalities [55–57]. Duty-free represents a particularly interesting lens in that it has become an essential revenue stream for airport operators, but one which makes its own unique contribution to aviation's carbon emissions associated with climate change. Moreover, as a sector embedded in a wider industry and operational environment, its future success is bound not only by direct business concerns but also by those associated with this wider industry. Notably, the air transport industry is a major contributor to

climate change, and there are major calls to constrain sector activity: for instance, through demand side management [58]. All actors within this sector (including retailers), therefore, have the opportunity to be impacted by, and to impact, the wider industry response to this challenge.

During the initial engagement phase, the background of the company was obtained through desk research and interviews with key stakeholders. The engagement phase also gave the researcher opportunity to engage with participants on issues of environmental sustainability and climate change, achieved through the provision of briefing document regular meetings on the subject with senior and operational managers within the organisation, the aim being to increase the capacity of participating stakeholders to understand the climate challenge faced by society.

The primary research participants were the Business Relations and External Affairs Director and the Group Brand Manager, although a number of senior executives and managers were involved throughout the research via interviews and workshops. After each phase was completed, results were fed back to the participants to ensure that they agreed with the outcomes, to validate the findings, and to obtain buy-in to the process by ensuring that their opinion was considered at all points in the research process.

4. Results: Applying the Modified CSA Framework to the Case Firm

This section presents the results of the application of CSA within the case organisation. The results have been summarised to detail the most pertinent research findings.

4.1. Situation Analysis

4.1.1. External (Sector) Analysis

External sector analysis was informed through the findings of an in-depth literature review and found that the firm is heavily dependent on the success of the wider aviation industry—namely by the passenger numbers at airports in which each store operates. The predicted growth of the aviation industry means that the airport retailing sector is expected to continue growing for the foreseeable future; however, there are a number of threats. These include an increase in low-cost carrier flights, which operate on tight margins and carry users with less propensity to spend in the airport, and major global interventions, such as COVID-19 mitigation actions.

Climate change and broader concepts of sustainability (such as peak oil) were also found to pose major risks to the aviation industry and to the focal firm, due to the fact that the majority of the products sold are taken onto aircraft by passengers, increasing aircraft weight and fuel burn, and thus aircraft carbon emissions and airline fuel costs, comparable with existing weight-saving initiatives conducted by airlines and aircraft manufacturers.

The symbiotic financial relationships between the airport, airlines, and the case firm suggest that, for its own long-term commercial security, the case organisation should play an active role in helping the sector overcome its carbon challenges. Failure to do so could see the company come under threat, should its own emissions be calculated as significant. Figure 2 summarises the interplay between carbon emissions and internal and external pressures requiring the focal firm to act on its direct and indirect carbon emissions.

The primary sources of pressure for retailers to reduce their emissions came from airlines (who have previously acted on the issue and who face an uncertain future of rising fuel costs and the threat of economic policy measures to address their emissions) and from airports. Airports generate significant revenue from duty-free retail, and the focal firm was found to be taking appropriate measures to reduce its scope 2 emissions from in-airport energy use.

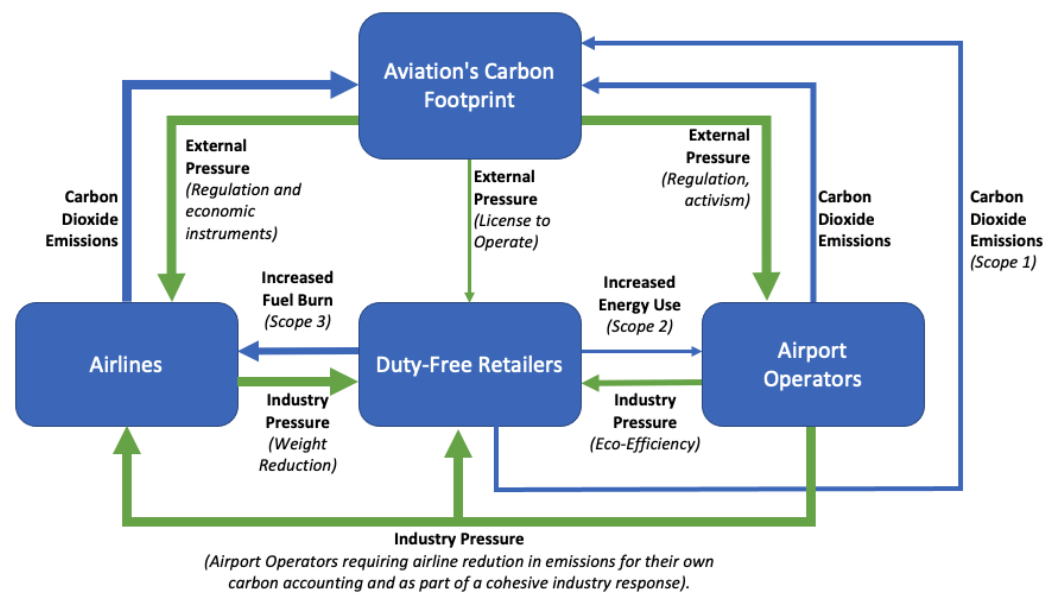


Figure 2. Carbon emissions that arise from the focal firm’s activity and associated internal and external pressures facing the retailer (Authors own).

Key findings include:

- Duty-Free is an integral part of the aviation industry and has a symbiotic relationship with airports (the physical interface between retailers and their customers contributing to airport energy emissions, water use, and the production of wastes) and airlines (which transport duty-free products on aircraft at the cost of increased fuel burn and carbon emissions).
- The aviation industry faces significant and mounting pressure as a result of its contributions to climate change—both politically (via NGOs and the public) and economically (via rising fuel costs and calls for an aviation fuel tax). This pressure is likely to increase as other sectors more easily move towards low- or zero-carbon operations and the public becomes more aware of the environmental impacts of flying. Every actor in the industry will have to demonstrate actions to minimise their carbon impact. This threat has been recognised by the case firm.
- Airlines have already responded to rising fuel costs and environmental pressure by seeking to reduce as much weight on aircraft as possible. Previously, some of these attempts have had negative implications for duty-free retailers and have even seen an airline remove their own on-board duty-free offering to reduce fuel costs.

4.1.2. Internal (Company) Analysis and Current Strategy

This analysis was conducted through the use of Osterwalder and Pigneur’s [52] Business Model Canvas (BMC). Figure 3 illustrates the BMC analysis produced via a workshop with eight company executives. Desk research on company corporate documents, such as annual reports, and semi-structured interviews with six senior managers and retail managers and staff also took place to ratify the findings of the BMC and to provide further insight as to how the focal firm operates. These interviews were recorded for transcription, with the BMC completed by participants, acting as a record in its own right and capturing participant thoughts on what the business model looks like.

Key partners	Key activities	Value propositions	Customer relationships	Customer segments
Airports	Buying and selling products	Discounted prices	Direct - Transactional	Airport Passengers
Suppliers (Brands)	Winning tenders for new stores	Brand range, quality and availability	Personal Assistance	Airport Staff
Other Retailers (co-operation)	Robust and efficient logistics	Speed and convenience		Brands
3rd Parties (designers, marketers, travel brokers)	Designing and building new stores	Location		
Airlines (co-operation)	Key resources	Value Added Services	Channels	
	Highly-skilled employees	Luxury, exclusive and specialist brands	Retail Outlets	
	Partners (supplier brands and airports)		Online communications; Social media and website	
	Location (large footfall)		Non-online communications; traditional advertising	
	Stock (Range and brands)			
	Capital			
	Logistics and infrastructure			
	eCRM database			
Cost structure		Revenue streams		
Stock acquisition	Building costs	Asset Sale (list price)	Advertising fees from brands	
Rental Agreements with airports	Distribution of goods (fuel)	Sale of recycling waste	Business to business sales to airports	
Utility costs				

Figure 3. The Business Model Canvas co-created by the researcher and research participants (Authors own).

Through this phase, the retailer was found to be operating under the ‘master concessionaire’ model of the airport retailer, in which it is hired by the airport operator to provide the service of retailing based on the quality of its services and its expertise in this field of providing high volumes of sales. Under this model, the airport faces the strategic and operational challenge of not just winning the custom or airport passengers against other retailers in the same airport but also against other retailers who may bid for the right to operate in the airport in their place. As a result, the airport has developed a business model in which strong partnerships with airport operators are a key activity and partnership that must be maintained. The company acknowledged that good environmental performance is an increasingly important success factor in this respect.

Importantly, the BMC workshop, interviews, and document analysis helped to identify a number of barriers to innovation, as listed in Table 4, that constrain the case firm’s ability to implement potentially innovative new business models. These barriers can be categorised as being either physical (i.e., limited space for sales and product storage), economic (i.e., the company has to generate substantial profits for airport operators or they will lose contracts), and regulatory (i.e., legalities surrounding the sale of duty-free products) in nature. The identification of such barriers to company activity and innovation at this phase proved essential in assessing the feasibility of alternative business models generated in the Solution Analysis (Section 4.3).

Key findings include:

- The focal firm is wholly reliant on the sale of duty-free products as a revenue stream.
- Innovation away from the existing business model may be difficult due to a number of barriers that govern the physical, economic, and political operating scenario in which the firm can be found.
- Any potential business model innovations will have to consider these barriers, as well as seeking opportunities via innovation. This may limit the capacity of the organisation to innovate.
- The Business Model Canvas workshop was well received by attendees who gained a new insight into how their business operates and the potential impacts that each aspect of the business model may have on others. This proved useful in developing a plan for assessing the environmental performance of the organisation.

Table 4. Barriers to new business models identified through Situation Analysis, listed in alphabetical order (Authors own).

Barriers to Innovation	Implications
Airport location	Limited available space for the storage of items on site. The company must store items at a secure bonded warehouse and receive daily deliveries to replenish stock, requiring a robust logistics and supply chain management system.
Airport revenues	The retailer helps to support aviation by making a significant contribution to airport revenues. Revenues must be maintained to retain operating contracts in their airports and to ensure that such revenues are not sought from aeronautical charges (which could potentially increase the cost of flying if passed onto the consumer by airlines).
Airport security	Requires that all products must be stored securely. Company bonded warehouses require same level of security as airport sites.
Duty and tax-free classification	For duty- and tax-free retailers, legislation requires that products are sold and taken ownership of by the passenger on the airside of the airport only.
Establish criteria	The discounts offered are one of the key value propositions offered by the company.

4.1.3. Environmental Performance

In this component of the Situation Analysis, the sustainability of the firm was assessed from an environmental perspective, rather than the traditional CSA perspective of financial sustainability, and renamed environmental performance to reflect that change.

Carbon emissions arising from company operations, including contributions to the emissions of aircraft, were calculated. The single greatest source of emissions, representing 37% of company emissions across all three scopes, was found to be from products sold to passengers being taken onto aircraft (i.e., scope 3 emissions from increased aircraft fuel burn). Further analysis of the company's approach to sustainability identified that whilst they were engaging in sustainability initiatives comparable to an award-winning carbon management programme of a high-street retailer, they were doing relatively little to reduce the largest source of their emissions—those arising from the aircraft fuel burn. Considering the potential threats to the air transport industry as a result of climate change, it is clear that such emissions can be considered a threat to the company's incumbent business model—although airlines claim the ultimate responsibility for these emissions, they would not exist without the retailer, and carbon accounting guidance states that they should in theory be incorporated into organisational accounting.

Key findings include:

- The airport had a robust and award-winning environmental management programme for its direct environmental impacts (e.g., in-store energy use, waste, water).
- Energy use of the on-site facilities operated by the retailer make a notable contribution to overall airport carbon emissions.
- Down stream (scope 3) carbon emissions from products taken onto aircraft by passengers were found to be the highest source of emissions linked to the organisation and of a comparable scale to existing airline weight reduction initiatives.
- The firm had no existing plan to address such emissions, and carbon accounting best practice suggests that the company should be including these emissions in its carbon inventory.
- The environmental performance carried out at this stage of CSAfS proved useful in underlining the scale of the risk posed to the case organisation, providing an essential input to the Fulcrum Analysis regarding the need for innovation away from the incumbent business model.

4.2. Fulcrum Analysis

In the Fulcrum Analysis stage of the CSA Framework, the situation analysis is considered, and a targeted vision for the future of the case firm is developed. This vision acts as a call to action to motivate a commitment to change.

Assessment of the Situation Analysis phase found that the pressures faced by the wider aviation sector in terms of its contribution to climate change pose a significant threat to the long term economic, political, and environmental sustainability of the case organisation. Although the organisation had an award-winning carbon management plan in place for its scope 1 and 2 emissions and had been working to help its airport competitors to also enhance their practice, there was no comprehensive plan as to how to deal with its largest source of emissions—the scope 3 emissions from increased fuel burn of products taken onto aircraft. Hence, these emissions were prioritised as a focus of the Solution Analysis phase.

Key findings include:

- In the context of externalities (i.e., rising fuel costs, the threat of an aviation carbon tax, the introduction of an aviation fuel tax, increasing societal pressure), it is a reasonable assumption that duty-free retailers will be called on to reduce the emissions that arise from products being taken onto aircraft.
- As part of effective management, the focal firm should investigate the potential for future low-carbon business models that are both profitable and feasible.
- The Fulcrum Analysis proved a valuable phase in breaking away from data collection and towards defining the problem faced by the organisation, defining the need and scale for change, and understanding what the future of the firm may look like in a low-carbon and zero-waste society. Doing so helped to inform on the Solution Analysis by framing what sort of innovations might be appropriate, which barriers existed, and what innovation pathways might be suitable.

4.3. Solution Analysis

In Solution Analysis, options are considered using evaluation criteria, and recommendations are made. In our modified CSAfS framework, we incorporated the use of Bocken et al.'s [38] archetypes to assist in thinking about potential future low-carbon business models.

4.3.1. Establishing Evaluation Criteria

The criteria that would guide the assessment of alternative sustainable business models and business approaches by the company were informed by the findings of Situation Analysis and the call to action articulated in Fulcrum Analysis. These criteria are presented as the following requirements for any strategic of business model innovation:

- Be legislatively compliant. Legislation requires that products must be sold airside in the airport for the duty- and tax-free exemptions to be applied. This means that passengers are required to take physical ownership of products at the point of sale (i.e., within retailer stores) or pay for them and collect items upon return to the airport. The company could lobby for this rule to change, but discussions highlighted that this poses a significant threat to the company, as it would enable other retailers (such as high street or on-line) to argue that they should be allowed to sell duty-free products also.
- Reduce carbon emissions for the firm, airports, and airlines. As the organisation was seeking to reduce the carbon intensity of its operating model, it was imperative that any new business model deliver absolute or relative carbon reductions compared to its incumbent model. Although the priority for such reductions would be for emissions that are under the direct control and ownership of the retailer, as a systems-level and complex sector, such emission reductions should also be sought for the wider aviation network (for instance, the retailer's airport landlords) and for airlines. This is particularly the case for airlines, for whom product weight represents a potential

carbon gain of a similar magnitude to that already being achieved through their own initiatives.

- Acknowledge operational constraints and limitations. The unique characteristics of the airport environment mean that any new business models, processes, products, or services that may result in carbon savings must be compatible with operational parameters, such as limitations of physical space, limited contact time with consumers, and rules surrounding airport security.
- Sustain current revenues and, if possible, support growth. As an actor within a larger system of actors with their own business objectives, it is important that any proposed innovations deliver financial return to company shareholders and their airport landlords. This is particularly important in this specific case due to the fact that winning and maintaining operating contracts is critical for the company.

4.3.2. Identifying and Evaluating Alternatives

The evaluation criteria were applied to each of Bocken et al.'s [38] sustainable business model archetypes to determine the appropriateness of each in terms of the retailer adapting to the call to action expressed in Fulcrum Analysis. In the context of the barriers listed in Table 4, the application of the CSA framework suggested that in the short term, innovation away from the focal firm's incumbent business model is difficult, as profitable innovations with the potential to reduce the total weight of products taken onto the aircraft were found to be lacking in magnitude or viability.

Key findings include:

- The barriers to innovation in the duty-free sector make innovation away from the current business model difficult.
- None of the sustainable business model archetypes were found to be able to move the company away from the current business model's contribution to aircraft fuel burn emissions significantly. Indeed, the lease of products rather than asset sale could potentially see even more products taken onto aircraft.
- In the context of these aircraft emission contributions, it may be that the airport duty-free retail sector is inherently unsustainable whilst the idea of carbon-free flight remains many decades away.
- The ideation of business model alternatives conducted in solution analysis was useful in identifying new potential business model approaches for the organisation; however, the specific situation faced by the firm and the identified barriers to innovations made the development of specific innovations away from the incumbent business model difficult.

5. Discussion

This paper looked to ascertain the potential for a strategic analysis framework to facilitate sustainable innovation through the adaptation and extension of the comprehensive strategic analysis framework into an environmental sustainability context, doing so via a case study application with a multi-national retailer.

The research showed that the CSAfS framework was broadly successful in helping the case firm to understand its business model and to identify and latterly quantify its environmental impacts. It was also effective in creating a call to action for innovation to take place, identifying a priority area in which such innovation should take place. Although CSAfS was able to identify a wide range of innovation opportunities to reduce those emissions, it ultimately was unsuccessful at identifying innovation opportunities that the businesses wanted to pursue. These findings suggest that there is much potential for an integrated and holistic framework in which sustainable innovation can take place, with the approach particularly useful for bringing together different tools of analysis under one framework; however, we advocate for further study of such an approach to take place to better embed aspects of systems-level analysis and empathy building into the process.

5.1. Understand Existing Business Practice and Associated Climate Risks

The Situation Analysis proved effective at understanding the firm in detail and informing an effective Fulcrum Analysis and its call to action. In particular, we found that breaking this phase into sub-phases of inquiry helped to organise researcher thoughts and resources, whilst also making the process clear to engaged participants in the organisation. These phases (internal, external, and environmental analysis) provided a series of spaces in which different types of activities and types of thinking could take place and proved useful in focusing and managing the researcher process. For instance, qualitative research took place to understand the firm in detail, from which likely sources of environmental impacts were established, on which quantitative analysis could take place to assess the scale of environmental consequences, that could then be put into the context of a wider external analysis. This qualitative analysis proved particularly useful in helping the business to quantify the carbon impacts that accrue from its operations. This was perhaps the most useful element of this phase of the work in terms of the development of the call to action in Fulcrum Analysis; however, the phases before this played an important role in identifying where the carbon analysis needed to take place, in identifying boundaries for that analysis, and in providing valuable additional context for the Fulcrum and Solution Analysis phases.

The Framework for Strategic Sustainable Development [51] takes a similar approach through phase B of its ABCD approach, in which the current situation of a firm is understood. Unlike CSAfS, FSSD does not, however, provide any additional structure on how to complete this analysis. We believe that the broadly defined yet flexible phases of CSAfS benefit the research process and would prove useful to non-experts and practitioners in understanding case organisations in detail.

We believe that this phase could be enhanced further through the use of tools that embed systems-level perspectives of business practice. For instance, since the work was carried out, a number of sustainable business model tools have been put forward that may have been more appropriate than the Business Model Canvas [33,34], as well as mapping tools that enable the value created, destroyed, or missed to be identified [19] and systems-mapping tools that can encourage businesses to think beyond the confines of their current practice—something that may have benefited the Solution Analysis phase and subsequently ideated innovation opportunities.

Overall, we believe that CSAfS was effective at implementing different tools of analysis and that a flexible approach to its application would be essential to its application in different organisational contexts. For instance, a business that produces products may integrate life-cycle assessment tools rather than carbon accounting to ascertain the environmental impacts of the case firm. Further research on what tools might be appropriate and how and where they may be implemented into the framework would be welcomed.

The authors also felt the benefit from adding phases of sustainability competence raising into the introduction sub-phase. Again, this process shares some similarities with the ABCD approach of FSSD (Phase A), in which participants learn about the sustainability challenge. In the present case, this phase was completed through the provision of a range of materials and presentations to inform the organisation of the risks of climate change and wider environmental sustainability with the aim of motivating action. The organisation found these materials useful, and they were disseminated across the organisation. We believe that such phases should be an embedded key early stage in the engagement process.

5.2. Motivating a Call to Action for Innovation to Take Place

We found the Fulcrum Analysis to be highly effective at providing the researchers with the opportunity to feed the results of Situation Analysis back to the organisation and in empowering the organisation to query the research, asking questions to understand what had taken place and how the results had been arrived at. In the case of the present research, participants queried some of the calculations undertaken by the research team, helping to refine the figures more accurately, and thus providing a beneficial opportunity for some additional learning and knowledge exchange. Ultimately, the case for innovation towards

more sustainable business models was accepted by the organisation; however, thoughts around innovation opportunities were already constrained by the identification of barriers and the experience of participants. This suggests some limitations in Fulcrum Analysis in terms of its aim of producing an idealised vision for the organisation to strive towards. In FSSD, this sort of thinking takes place at the start of the framework (Phase A of the ABCD approach) so that such thinking can take place without constraint. We acknowledge the value of this approach and believe that such visioning activity may be better suited at the start of the framework, with the Fulcrum Analysis instead providing an opportunity for reflection from the initial vision compared to the identified business model and associated environmental impacts.

5.3. Identify Appropriate Innovation Pathways

Whilst we believe that the Situation and Fulcrum phases of analysis were successful, the Solution Analysis phase of the work proved more challenging. Although it was able to identify a number of pertinent innovation opportunities for the case firm by analysing Bocken et al.'s [38] sustainable business model archetypes and putting forward a series of recommendations as to what such innovations might look like for the case firm, the organisation was unwilling to embrace radical notions of innovation away from its incumbent business, in large part due to a number of sector-specific barriers, which, when coupled with existing and well-documented barriers to sustainable business model innovation [36], proved difficult for the company to overcome. Nonetheless, it suggests that the focal firm may be stuck in an unsustainable business model when the entirety of its operations and environmental impacts are taken into account [35].

Ultimately, the business was of the opinion that the climate threat was not significant enough to warrant this sort of change or investment, whilst their competitors were not taking action, and whilst the risks of climate inaction compared to the costs and risks of innovation were ultimately not seen to tip in the favour of moving away from current practices. Rather, the business wanted to focus on its existing approaches to sustainable innovation revolving around management of its direct scope 1 and 2 emissions. This approach should not be critiqued—their efforts in this space were arguably market leading, and the company had even set up a charity to account for the carbon emissions it is not able to avoid. However, when put into the context of the scale and urgency for change of the climate emergency, this sort of incremental innovation in which business as usual is maintained could be viewed as inadequate. Again, this is not to critique the organisation at hand, which may well call on capitalistic approaches to climate change as justifying their approach. Instead, it points to a failing of the application of this framework and to solving scope 3 sustainability challenges in a broader sense. Scope 3 emissions are notoriously complicated to manage owing to contested opinions as to whom such emissions ultimately belong. In the present case, the emissions arising from duty free products increasing fuel burn could be claimed by many actors: the passengers who buy the products, without whom the products would not be on an aircraft; the retailer who sells the products to the customer, without which the passengers would not have the opportunity to buy the product; the airport, without which neither the retailer nor the passenger would exist; and the airline, which ultimately is the actor that is most directly responsible for the carbon emissions being emitted by their aircraft. The present study was applied in the context of the focal firm, meaning that the outcome of the study was always likely to arrive at solutions that would be put to the interests of that company at its core. Moreover, although the carbon analysis of the company was able to identify scope 3 emissions as its biggest climate risk, the analysis ultimately lacked the type of systems-level analysis increasingly advocated for today [9,20]. If the same framework was applied but at a systemic level and completed as a co-creative piece of work in which all of the above stakeholders were involved, the solutions ideated may have been different. This, however, in practice, is rather difficult, owing to the competing interests of different stakeholders, and this study should serve as an illustrative example of the difficulties managing scope 3 emissions and

the need for solutions that go beyond organisational boundaries and instead approach challenges holistically.

5.4. Limitations, Implications, and Future Research

We identified a number of limitations of the work, many of which have been introduced throughout this discussion. Additionally, it should be noted that as a single case study, this research represents only an initial exploration into the capacity for CSAfS to act as a driver for sustainable innovation in organisations. We would encourage its further adaptation and exploration by other academics and practitioners and welcome any critical feedback. Although we believe that the CSAfS was broadly successful in its aim to help, the framework could be further enhanced by bringing in elements from FSSD—backcasting and the development of implementation pathways—and by better integrating the types of systems-level analysis.

A further limitation of the Solution Analysis was that the barriers identified were organisation-specific. This was to be expected, as the framework was developed to guide individual organisations. That said, a systems approach, perhaps looking at the entire aviation industry rather than a specific duty-free retailer, may have identified different results that would have been able to help the aviation industry as a whole to enhance its environmental performance.

Further, whilst using Bocken's sustainable business model archetypes proved useful in helping the case firm to understand different types of innovation and provided structure to ideation, the archetypes proved to be less applicable to the service sector than we would have hoped.

In terms of implications for practice, we believe that the work has demonstrated that it is possible to create and use processes for sustainable and strategic innovation when supporting businesses in their efforts to transition to a low-carbon economy; however, we would advocate that such practitioners take a flexible approach to the framework's application and, importantly, implement some of the recommendations highlighted elsewhere in this discussion, not least the use of sustainability-oriented methods of analysis, whether sustainability-focused business model tools [33,34] or systems-mapping methods. We would also advocate for a better integration of backcasting methodologies, as found in Broman and Robert's FSSD framework, to better drive buy in to more radical innovations. The CSAfS approach attempted to do this; however, by implementing visioning exercises only at the end of Situation Analysis, the potential for innovative ideation was already constrained.

6. Conclusions

This paper applied an adapted version of the CSA framework—CSAfS—to assess the environmental sustainability challenges of an airport retailer by integrating elements of sustainability into strategic analysis. It did this by bringing sustainability tools (carbon accounting) and business model theory (via the Business Model Canvas and business model archetypes) into a strategic management context.

The application of the framework proved successful, in that it was able to determine the threat posed to a case organisation by sustainability issues and to inform on the ability of the organisation to adapt in response. Although the research was not able to find clear solutions for the case firm, the researchers believe that this is due to the specific setting of the aviation industry and the complexities of scope 3 carbon management rather than being a limitation of the framework, *per se*. With further testing and modification, notably through the addition of systems-level tools, we believe that the CSAfS framework could have great value in contributing to a shift towards a low-carbon and zero-waste economy and, with continued development, would support its application by practitioners in the strategic management and sustainability space.

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