



Achieving Corporate Sustainability Despite the Presence of VUCA Conditions

A case study on Maersk's transition towards carbon neutrality

Andreas Philip Ringheim (S142358)
Master's Thesis (CFSMO1006E)

Supervisor: Michael Mol
Date of Submission: January 16, 2023

Number of Characters: 112,299
Number of Active Pages: 63
Number of Characters per Page: ~1,782.5

Abstract

Since 1850, the average surface temperature has risen 1.2 degrees Celsius. With our current trajectory, greenhouse gas emissions will lead to an increase of up to 3 degrees Celsius, which may have irreversible effects on the environment.

Therefore, during the December 2015 COP21, the Paris Agreement was adopted by 196 nations. This legally binding agreement was a landmark in the multilateral climate change process, and became the first international treaty committed to the pursuit of lowering greenhouse gas (GHG) emissions. However, since then, abatement initiatives in maritime shipping industry have been too slow to react.

In order to meet the targets set forth by the Paris Agreement, important players in the maritime shipping industry have publicly committed to carbon neutrality by 2050. Nonetheless, the transition to decarbonize this hard-to-abate sector, which accounts for roughly 4 percent of global greenhouse gas emissions, is plagued with uncertainty, and VUCA conditions. VUCA stands for volatility, uncertainty, complexity, and ambiguity.

Through a case study on Maersk's pathway to decarbonization, this paper dissects the VUCA conditions – namely the first three – standing in the way of carbon neutrality. Moreover, this paper discusses coercive pressure faced by Maersk, which adds urgency to decarbonizing.

Furthermore, this paper proposes a repertoire of elements found in strategic agility as the most effective way in maneuvering the VUCA-caused stormy waters, while also gaining tangible and intangible resources, which can have a significant impact on strategy realization.

This argument is backed up by the application of theories and knowledge gained via analyzing past academic papers and further adds to the dialogue surrounding strategy, strategic agility, and maritime carbon-neutrality efforts. Furthermore, quotes from Maersk executives and senior management add substance behind the applied knowledge.

Table of Contents

1.	INTRODUCTION.....	5
1.1	MOTIVATION	5
1.1.1	SETTING THE SCENE.....	5
1.1.2	A BRIEF INTRODUCTION TO VUCA	7
1.2	THESIS STRUCTURE	7
2.	RESEARCH QUESTION AND OBJECTIVES	9
3.	METHODOLOGY	10
3.1	TARGET GROUP AND RELEVANCE	10
3.2	RESEARCH METHODOLOGY	11
3.2.1	CASE STUDY AS RESEARCH DESIGN	12
3.3	DATA COLLECTION.....	13
3.4	DELIMITATIONS.....	14
4.	DECARBONIZATION IN THE SHIPPING INDUSTRY	16
4.1	THE SHIPPING INDUSTRY’S CURRENT STATE	16
4.1.1	PARIS AGREEMENT.....	16
4.1.2	CURRENT INDUSTRY	16
4.1.3	INDUSTRY EFFORTS FOR CARBON NEUTRALITY	19
4.2	INTRO TO THE COMPLEXITY OF CARBON NEUTRAL FUEL SOURCES	20
4.2.1	COST AND COST GAP.....	21
4.2.2	GREEN FUEL SOURCES	23
5.	LITERATURE REVIEW	26
5.1	STRATEGY PROCESS	26
5.1.1	STRATEGY.....	26
5.1.2	WHY DO FIRMS NEED STRATEGY.....	28
5.2	STRATEGY PROCESS IN LITERATURE	29
5.2.1	STRATEGY PROCESS AND PRACTICES.....	30
5.3	AGILE STRATEGY	32
5.3.1	META-CAPABILITIES	33
5.3.2	DYNAMIC CAPABILITIES.....	34
5.4	VUCA AND UNCERTAINTY	36

5.4.1	VOLATILITY	36
5.4.2	UNCERTAINTY	37
5.4.3	COMPLEXITY	38
5.5	SUSTAINABLE DEVELOPMENT AND CORPORATE SUSTAINABILITY	38
5.5.1	ENVIRONMENTAL INTEGRITY.....	39
5.5.2	ARGUMENTS FOR CORPORATE SUSTAINABILITY	39
6.	<u>THE CASE OF MAERSK: DECARBONIZATION EFFORTS AND PATHWAY</u>	<u>44</u>
6.1	INTRODUCING MAERSK	44
6.1.1	MAERSK’S PATHWAY TOWARDS CARBON NEUTRALITY	45
6.2	GREEN VESSELS AND METHANOL.....	46
6.2.1	GREEN METHANOL	47
6.2.2	UNCERTAINTY AND LIMITATIONS WITH GREEN METHANOL.....	48
6.3	PESTEL ANALYSIS	50
6.3.1	POLITICAL AND LEGAL.....	51
6.3.2	ECONOMIC	52
6.3.3	SOCIAL	53
6.3.4	TECHNOLOGY	54
6.4	MAERSK, THEIR BIG DREAM, AND HOW TO ACHIEVE IT	55
6.4.1	THE BIRTH OF A DREAM.....	56
6.4.2	MAERSK AND STRATEGIC AGILITY	57
6.4.3	COMBATting VUCA.....	60
7.	<u>CONCLUSIONS.....</u>	<u>65</u>
7.1	LIMITATIONS	66
8.	<u>BIBLIOGRAPHY.....</u>	<u>67</u>

List of Acronyms and Abbreviations

GHG – Greenhouse Gasses

GDP – Gross Domestic Product

MSC – Mediterranean Shipping Company

CMA CGM – Maritime Freighting Company – General Maritime Company

CO₂ – Carbon Dioxide

COSCO – China Ocean Shipping Company

LNG – Liquefied Natural Gas

VUCA – Volatility, Uncertainty, Complexity, Ambiguity

TCO – Total Cost Ownership

TEU – Twenty-Foot Equivalent Unit

IRENA – International Renewable Energy Agency

UNFCCC – The United Nations Framework Convention on Climate Change

RBV – Resource Based View

COP – Conference of Parties

WCED – World Commission on Economic Development

MMMCZC – Maersk Mc-Kinney Moller Center for Zero Carbon Shipping

CEO – Chief Executive Officer

PESTEL – Political, Economic, Sociological, Technological, Legal and Environmental

CAGR – Compounded Annual Growth Rate

CAPEX – Capital Expenditure

GFF – Green Finance Framework

1. Introduction

This chapter introduces the motivation behind the topic of the Master's Thesis and subsequently presents the research question that will guide the rest of the paper.

1.1 Motivation

Global temperatures are undoubtedly rising, which has led to the prominence of decarbonization as a global imperative. Since 1850, the average surface temperature has risen 1.2 degrees Celsius, while irreversible damage will be experienced at an increase of 2 to 3 degrees (Chen, 2021).

Governments and companies alike have made efforts and commitments to reduce, or fully eliminate, their greenhouse gas (GHG) emissions in order to combat the rising temperatures, and the adverse effects that come with. Progress has been made, but industries need to take bigger leaps in their strategies to see any tangible impact.

However, with the amount of uncertainty and complexity along the path to carbon neutrality, companies may opt for the "safer" solution, rather than the most effective – especially in harder-to-abate industries, which equate for 30 percent of the of global carbon dioxide (CO₂) emissions (Deloitte, 2020). Harder-to-abate industries refer to industries that have long asset lifespans, high energy dependency, and complexity of electrification (Ibid.).

1.1.1 Setting the Scene

Within the harder-to-abate sector lies the maritime shipping industry. Considered the backbone of the global economy, maritime shipping is one of the most effective modes of transportation and plays a crucial role in today's society. Nevertheless, maritime shipping does not come without its externalities and drawbacks.

According to a recent report from the International Maritime Organization (IMO), GHG emissions from maritime shipping equated to 1.076 million tons in 2018, which was a 9.3 percent increase from 2012 levels (IMO, 2020). This means that if the maritime shipping industry was a country, it would be the sixth largest polluter, sitting above Germany (Josephs, 2021).

Although abatement efforts are underway, this industry has been slow to react. Only in 2018 has there been any formal published guideline for maritime carbon neutrality. This came in the form of The Initial Strategy, created by the IMO.

Within The Initial Strategy are targets of a 40 percent reduction of GHG emissions by 2030, and 60 percent by 2040¹ (Joung et al., 2020). Although the ambitions for these reductions are constructive, heavy uncertainty still looms large when strategizing on how to meet those targets. With such drastic measures needed to decarbonize a historical polluter, companies will have to take sizeable leaps and potentially forego a traditional, profit-focused, mindset.

One of the aforementioned leaps, which will be expanded upon in later chapters, is Maersk's decision to leapfrog transitional fuels by investing in fully carbon neutral fuels, such as green methanol. Green methanol will be the primary source of fuel for their 13 incoming carbon-neutral vessels, and for their foreseeable future (A.P. Møller – Mærsk A/S, 2021b).

As Maersk puts it, the maritime shipping industry today faces a “chicken or the egg” dilemma, in which fuel producers want to ensure demand is high enough to start producing green fuel at a large scale, but shipping companies want to ensure availability of cost-competitive fuel at scale before ordering new green vessels (Ibid.).

By ordering the build and delivery of 13 new green vessels that are capable of running on green methanol, Maersk has broken this deadlock and has taken a significant leap of faith in order to accelerate the slow pace of abatement efforts in the maritime shipping industry (Ibid).

Be that as it may, Maersk's decision is clouded with volatility, uncertainty, and complexities. As it stands, the global supply chain of green fuels – specifically green methanol – is not sufficient enough to power the majority of Maersk's new fleet.

Uncertainty regarding the viability, and production capacity, of the fuel still remains. Furthermore, the complexity of decarbonizing a hard-to-abate industry is apparent, while volatility in the future economy plays a role in financing an expensive transition.

¹ The percentage reductions are compared to GHG's levels from 1990.

1.1.2 A Brief Introduction to VUCA

More than 30 years ago, social scientists at the U.S. Army War College first introduced the acronym “VUCA” in order to characterize the environment their students would later find themselves operating in (Baran & Woznyj, 2021).

Since then, VUCA – which stands for volatility, uncertainty, complexity, and ambiguity – has been speedily embraced in a multitude of other fields, such as strategic decision making, risk management, and situational problem solving, to name a few (Chermack, 2011; Costanzo & MacKay, 2009; Schick et al., 2017; Tovstiga, 2013; Tsoukas & Shepherd, 2004).

Moreover, after the financial crisis of 2008-2009, business and management science also adopted the concept when organizations around the globe found themselves operating in environments with VUCA-like symptoms (Bennett & Lemoine, 2014; Doheny et al., 2012).

Alongside the discussions revolving around VUCA were various ideas on how management and executives could guide their organizations through the turbulence. Of course, there are many theories, but a prevailing idea is that of strategic agility (Baran & Woznyj, 2021).

In later sections of this paper, I will attempt to further analyze VUCA by breaking down the individual components of the acronym. For the scope of this thesis, however, only volatility, uncertainty, and complexity will be touched upon as they are closely related to Maersk’s path towards decarbonization. Furthermore, and tangentially, I will discuss agility as a way for Maersk to tackle VUCA conditions.

1.2 Thesis Structure

The structure of this thesis is as follows:

Chapter 1 describes the motivation behind the chosen topic of this thesis, as well as a brief introduction to the maritime shipping industry, and Maersk, in relation to decarbonization.

Chapter 2 presents the research question, and sub-questions, this thesis aims to answer, as well as the objectives and aim of this paper.

Chapter 3 outlines the methodologies used in writing this thesis, including research design and this paper's stance on philosophy of science. This will lead to a further explanation as to why a case study was chosen for this thesis. Moreover, delimitations are discussed.

Chapter 4 more thoroughly discusses decarbonization in the shipping industry in order to provide the reader with context on the VUCA conditions – especially complexities and uncertainties – the industry faces to decarbonize. This will set the reader up with background knowledge before the Literature Review.

Chapter 5 presents a Literature Review on past academic research papers, most of which have been peer reviewed. More specifically, various literature on Strategy, Strategy Process, Agile Strategy, VUCA, and Sustainable Development and Corporate Sustainability are outlined, which will be used in the next section.

Chapter 6 analyzes the case of Maersk and their path towards carbon neutrality and the VUCA conditions the company faces, which is accompanied by a PESTEL analysis. Moreover, this chapter ties in discussions from the Literature Review and uses real-life examples of strategic agility implemented by Maersk used to combat VUCA conditions.

Chapter 7 is the conclusion to this thesis, which aims to concisely wrap up the discussions and ultimately answer the research question. Furthermore, limitations of this paper will be touched upon.

2. Research Question and Objectives

The purpose of this thesis is to explore theoretical concepts through the method of a case study, and apply these concepts to real-life examples. More specifically, the aim is to analyze Maersk's decision to decarbonize through the use of green methanol powered vessels – a decision plagued by VUCA conditions.

This thesis aims to further add to the dialogue within the ever-pressing issues of carbon neutrality, and the importance of steadfast decision-making under the guise of uncertainty – thus, giving value to this thesis. Additionally, this thesis indirectly argues that strategic agility is useful for organizations facing VUCA conditions in the transition towards carbon neutrality.

Given the paragraphs above, the following research question has been established, which will guide the direction of the paper:

Can strategic leaps under conditions of high uncertainty, or VUCA conditions, be successful? If so, why and how?

– Based on a case study into Maersk's decision to go carbon neutral.

Furthermore, few sub-questions will also be indirectly answered throughout the paper, which lends assistance in answering the research question:

- 1. What is uncertainty, or VUCA, and how does it affect strategic decision making?*
- 2. How has Maersk created and executed its strategy so far?*
- 3. What are the different approaches used in making strategy, and what factors determine the success of these approaches?*

3. Methodology

An integral part of a thesis, methodology is a research strategy with the aims of delineating the “how” in which the research will be undertaken (Melnikovas, 2018). As such, methodology should include a system of beliefs and assumptions, which can shape the research question, and influence the choice of research methods – such as a case study (Ibid.).

Expanding on the point above, this paper will loosely follow the research onion framework, which was proposed by Saunders et al. (2021). The onion framework essentially entails starting from the outward and moving inward.

In practice, this means starting with the chosen research philosophy, moving on to the approach and strategy before moving on to data collection. Lastly, this section finishes with describing the delimitations of this thesis.

3.1 Target Group and Relevance

As stated previously, this thesis aims to further add to the dialogue within the ever-pressing issues of carbon neutrality and strategic agility, and the importance of steadfast decision-making under the guise of VUCA conditions.

It does this by first outlining already existing literature on various topics related to Maersk’s case of carbon neutrality. In addition, carbon neutrality as a theory, rather than an obligation, is also discussed.

Thereafter, this thesis applies some of the knowledge and theories gained from the Literature Review section towards Maersk’s decision and path towards decarbonizing by weaving in real-life examples.

Decarbonization of hard-to-abate industries, maritime shipping, is still in its infancy. Thus, analysis surrounding specific companies and their decisions towards carbon neutrality is limited. Additionally, the context of VUCA conditions, and high uncertainty, at the forefront of carbon neutrality is also limited.

The target group of this paper is quite broad as there is no prior knowledge needed in order to digest the information presented. As such, anyone with an interest in decarbonization, business strategy,

Maersk, or any theoretical discussions presented in the Literature Review are welcome. However, professionals and academics within a harder-to-abate industry may find this thesis of extra relevance.

3.2 Research Methodology

Philosophy

A paper's research philosophy shapes the foundation of research by portraying the *ontology* – nature of reality, *epistemology* – sources of knowledge and facts, and *axiology* – values, beliefs and ethics of a paper (Melnikovas, 2018). The philosophy behind this thesis takes influence from both interpretivism and critical realism.

As explained by Saunders et al. (2021, p. 147), “critical realism focuses on explaining what we see and experience, in terms of the underlying structures of reality that shape the observable events”. As the name suggests, a critical realist approach considers reality to be the most important philosophical consideration (Saunders et al., 2021).

However, unobservable structures can cause observable events. To tie this distinction in to this thesis, observed realities in the case of Maersk's decarbonization efforts may be caused by unobservable events, regulations, or market forces.

That said, the observed realities hold substantially more weight. Furthermore, as most of the secondary data in this research paper is via observed reality, we can safely say that part of the philosophy of this paper is critical realism.

Interpretivism, on the other hand, “emphasizes that humans are different from physical phenomena because they create meanings” (Saunders et al., 2021, p. 148). Interpretive approaches encompass social theories and perspectives that embrace a view of reality as socially constructed, or made meaningful through actors' understanding of events (Putnam & Banghart, 2017). The purpose behind interpretivism is to create a richer understanding, and interpretations, of social worlds and the context behind them (Ibid.).

Moreover, Saunders et al. (2021, p. 148) suggests that interpretivism is useful for business and management research because it can aid in “looking at organizations from perspectives of different groups”, and in the context of this thesis, different theories. Therefore, through theories used within

this research paper attempting to analyze Maersk from different perspectives, we can safely say that the philosophy of interpretivism is also applied.

Theory Development

In exploring the idea of theory development, this thesis mainly uses a deductive approach. A deductive approach to theory development is applicable for existing theory testing (Melnikovas, 2018).

Additionally, deductive theory development starts with existing theories and/or examples, which gives rise to a question (Ibid.). Through data collection and analysis, this question will attempt to be answered.

Moreover, a deductive research approach is signified by progress from general to particular (Ketokivi & Matere, 2010), which can be seen in this paper by the application of existing theories and discussions towards a specific case. In this case, Maersk's pathway towards decarbonization. This case is then used to give rise to a conclusion.

It can be argued that inductive reasoning as theory development is also applicable in this thesis. The starting point for inductive reasoning are observations, which are then used in the creation of new theory (Saunders et al., 2021).

Inverse from deductive, an inductive research approach is signified by progress from the particular to the general (Ibid.). An inductive approach can be seen through the use of a case study within this research paper.

3.2.1 Case Study as Research Design

According to Yin (2009), a case study is an empirical study with the goal of thoroughly researching and analyzing current situations, or events, operating within real-world situations. Acting as the pillar of this thesis, a case study is deemed optimal as it enables analysis and discussion of single, or multiple, events (Yin, 2009). In this case, the event is Maersk's commitment to green methanol to fuel its incoming carbon neutral vessels in an attempt to decarbonize.

Furthermore, a case study is deemed appropriate due to the “how” nature of the research question, along with the focus on contemporary events in strategy (Ibid.). Case studies also evoke comprehension through the application of theoretical insights with observed knowledge (Ibid.). As further explain by Yin, (2009, p. 17):

“The essence of a case study, the central tendency among all types of case study, is that it tries to illuminate a decision or set of decisions: why they were taken, how they were implemented, and with what result.”

However, case studies can often be seen as a limited research strategy, and the viability of the findings may be questioned. The question of whether or not the findings from a specific event can be translated to multiple scenarios or cases has been debated throughout its conception in the academic world.

Nevertheless, the main purpose of a case study is to add to the existing theories and generalizations through analysis (Ibid.). This thesis acknowledges the limitations inherent to case studies, but believes there is a net-positive in applicability.

3.3 Data Collection

The data within this thesis is mainly qualitative. The qualitative data within the thesis, which acts as the “jumping-off point” for our own discussions and conclusions, has been collected via Copenhagen Business School’s internal database. This third-party database allows users to connect to, and access, established databases such as JSTOR and Business Source Complete – to name a few.

Through these databases, we are able to access secondary data in the form published research reports and journals written by recognized scholars and academics. These writings have been cited and peer reviewed, confirming the legitimacy and reliability of said writings.

Moreover the data primarily used throughout the Shipping Industry and Maersk Case Study sections, although numerical, is not deemed as quantitative as the interpretations of the numbers are qualitative in nature. Statistical or formal modeling tools are not used.

The secondary data used comes from external sources, which include, but are not limited to, annual and sustainability reports from Maersk, International Maritime Organization, Deloitte, United Nations Conference on Trade and Development, and Maersk Mc-Kinney Møller Center for Zero Carbon Shipping (MMMCZCS). Lastly, quotes from senior officers and executives were taken from publicly available press releases and interviews to add substance to the data.

A lot of pertinent information used in this thesis comes from the MMMCZCS, and as it is relatively new and unknown, these following paragraphs will shed some light on its importance. Founded in 2020, the MMMCZCS is a Copenhagen-based non-profit research and development center, which focuses on finding optimal solutions for carbon neutrality in the maritime industry.

Specifically, the MMMCZCS is focused on accelerating a net-zero future by working with organizations, as well as academics and authorities. These organizations are not just limited to the maritime shipping industry, but also include those within the transportation, energy, and chemicals industries. The MMMCZCS was made possible due to a DKK 400 million donation from the A.P. Møller Foundation.

3.4 Delimitations

Delimitations are the conscious choices made to set boundaries on a research paper. This is not to be confused with limitations, which are the general shortcomings affecting the quality of the paper itself. Limitations will be discussed in Chapter 7, as it does not pertain to the methodology of the thesis.

In this paper, there were few necessary delimitations made so that the paper's aim did not lose focus, and the goals did not become impossibly large. The first of which was to purposely forego any financial calculations in relation to the case of Maersk decarbonizing.

Although financials are touched upon, this thesis chose not to expand further via a financial analysis on green fuel sources, such as methanol. While a financial analysis and valuation of Maersk's primary green fuel source could provide substance to their decision, or attempt to eliminate uncertainties faced by Maersk, this was not a financial paper. This paper was focused on strategy.

Furthermore, the emergence of current geopolitical situations, which may have added to the volatility, uncertainty, and complexity towards Maersk's decarbonization path were not discussed in

length. Specifically, the Russia-Ukraine war and COVID-19². Moreover, it is impossible at this time to determine any significant impacts on uncertainty, or VUCA, on Maersk's green transition strategy, including their new fleet.

Another delimitation to this paper is the sole focus on Maersk's Ocean business. The reason for this is due to the fact that Maersk's Ocean business is viewed as the area with the largest room for decarbonization, ultimately making the biggest impact.

Therefore, when talking about decarbonization, this paper only focuses on their fleet of ships and decarbonizing their Ocean sector. Although Maersk owns and operates land transportation vehicles, the strategy surrounding how the company will decarbonize this sector is out of the paper's scope.

In regards to fuel sources, Maersk has recognized that, in the future, a mix of several different sources will be used to operate a carbon neutral fleet in the future. However, for the scope of this thesis, only green methanol will be expanded upon when discussing green fuel sources, as this will be the primary alternative fuel source used in the foreseeable future. Moreover, it will be the only alternative fuel source used in Maersk's 13 new vessels.

Lastly, during the process of writing this thesis, Maersk's Chief Executive Officer (CEO), Soren Skou, has retired. In his place will be Vincent Clerc – ex-CEO of the company's Ocean and Logistics department. Although this may not have any significant impact on Maersk's strategy to decarbonize, this will not be touched upon as a new CEO can shake things up and potentially add to the VUCA conditions faced.

² Although COVID-19 was briefly touched upon when discussing freight rates, it was not expanded upon further.

4. Decarbonization in the Shipping Industry

This chapter will outline the current state of the shipping industry in relation to decarbonization, and certain VUCA conditions faced. Furthermore, fundamental challenges and pathways will be explored. This will provide the reader a general context and foundation for the Literature Review, and Maersk's case study.

First, this chapter will chronicle the current state of the industry, followed by decarbonization efforts within the industry. Second, various carbon neutral fuel sources will be briefly touched upon to give further context.

4.1 The Shipping Industry's Current State

4.1.1 Paris Agreement

On December 2015, agreed to during the 21st Conference of Parties (COP 21)³, the Paris Agreement was adopted by 196 nations. This legally binding agreement signaled a “landmark in the multilateral climate change process” by becoming the first international treaty committed to the pursuit of lowering greenhouse gas (GHG) emissions (United Nations Climate Change, n.d.).

More specifically, the goal is to “limit [this century's] global warming [temperatures] to well below 2, preferably to 1.5 degrees Celsius, compared to pre-industrial levels” (Ibid.). Although maritime transport was not explicitly addressed in the Paris Agreement, it is expected that this industry will be included in future versions of the Paris Agreement (Mærsk Mc-Kinney Møller Center, 2021a).

4.1.2 Current Industry

Described as the backbone of the global economy, maritime shipping is not only one of the most efficient⁴ modes of freight transport, but also accounts for approximately 80 percent of global trade volumes (Deloitte, 2020). This equates to roughly 11 billion tons of goods transported across the earth's oceans (Ibid.).

Historically, the industry has grown hand-in-hand with the economy. As an example, from 2000 to 2018, global gross domestic product (GDP) increased by roughly 65 percent, while the volume of

³ The United Nations Framework Convention on Climate Change's (UNFCCC) 21st Conference of the Parties (COP 21)

⁴ Using the CO₂/ton-km measure, used to measure efficiency by mode of transportation (Deloitte, 2020)

global shipping increased by 93 percent in the same period (Ibid.). Given time, global GDP will continue to rise, which in turn, leads to the increase of global shipping volumes and GHG emissions in lockstep.

By effectively transporting cargo across the world, the maritime shipping industry plays a crucial role in the global improvement of lives and standards of living. Moreover, the maritime shipping industry continuously improves in efficiency; while shipping volumes have increased 101 percent over the last two decades, GHG emissions grew only 40 percent comparatively over the same period (Ibid.).

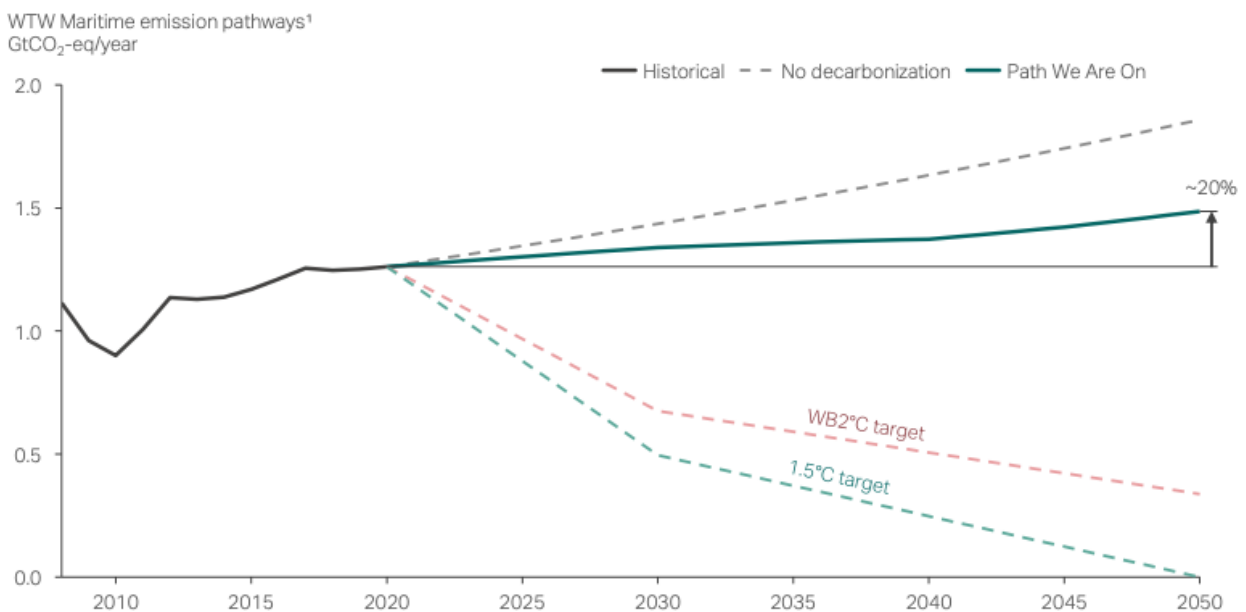
Nonetheless, the reality is that the usage of fossil fuels aboard the ship emits a substantial amount of GHG's and will continue to rise due to the maritime shipping industry's 1.3 percent compounded annual growth rate (CAGR) (Ibid.).

Although technological developments and abatement initiatives are present, this will not create enough traction necessary in meeting the Paris Agreement (Mærsk Mc-Kinney Møller Center, 2021a). Ultimately, at its current rate, the GHG emissions will lead to a 20 percent projected increase in GHG emissions by 2050 (see Figure 1 below).

To expand on Figure 1, a target of well below 2 degrees Celsius (WB2°C) will require an emissions reduction of roughly 25 percent by 2030 (Ibid.). The ideal target of 1.5 degrees Celsius (1.5°C) would require an emissions reduction of roughly 45 percent by 2030, which would translate to reaching net-zero by 2050 (Ibid.).

This percentage increase can lead to irreversible effects in the global climate. Moreover, this increase is largely due to current decarbonization efforts being outpaced by growing trade demands, and significant differences in traditional and green fuel costs (Mærsk Mc-Kinney Møller Center, 2021a).

Figure 1: Projection of greenhouse gas emissions by 2050



Source: Screenshot from MMMCZCS (2021a, p. 8)

As GHG emissions continue to rise, the consequences will be significant. According to the United Nations Environmental Program, the world is currently on pace for a temperature rise of 3.2 degrees Celsius⁵, in part due to the maritime shipping industry.

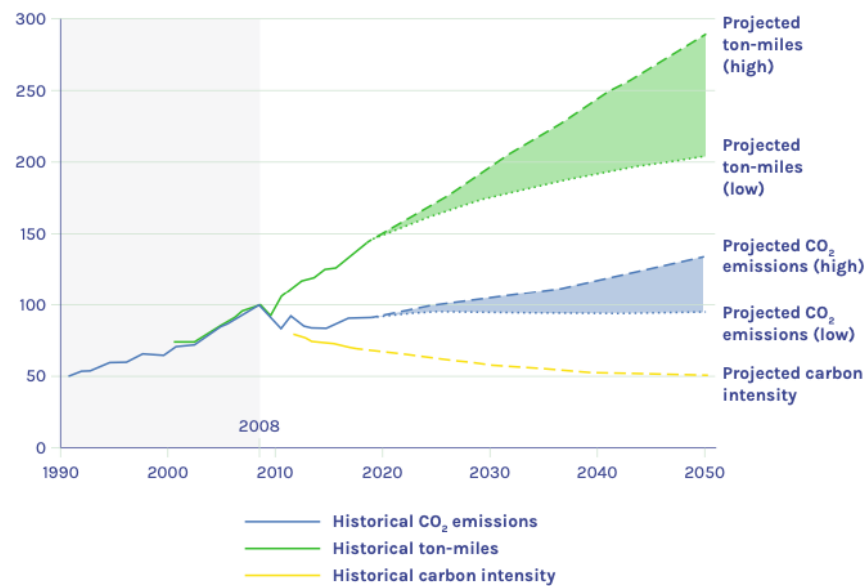
With more than 70,000 vessels consuming over 300 million tons of fossil fuel annually (Stone & Li, 2021), the maritime shipping industry accounts for roughly 3 percent of global CO₂ emissions, which could rise up to 8 percent by 2050⁶ (Deloitte, 2020; Mærsk Mc-Kinney Møller Center, 2021a).

Furthermore, if no abatement measures are implemented, GHG emissions in 2050 have been projected to increase by between 90 and 130 percent when compared to 2008 levels (IMO, 2020) (Figure 2). This expected trend in CO₂ emissions are “in spite of current reductions in carbon intensity within the shipping industry over the last decade and expectations of further improvements going forward” (Smith et al., 2021).

⁵ IMO (2018), Initial IMO Strategy on reduction of GHG emissions from ships

⁶ Largely due to the hard-to-abate nature of the maritime shipping sector. Other sectors of transport, such as road, are easier to abate and already have commercialized decarbonization solutions.

Figure 2: Trends in CO₂ emissions, transport demand, and carbon intensity under current policies (%)



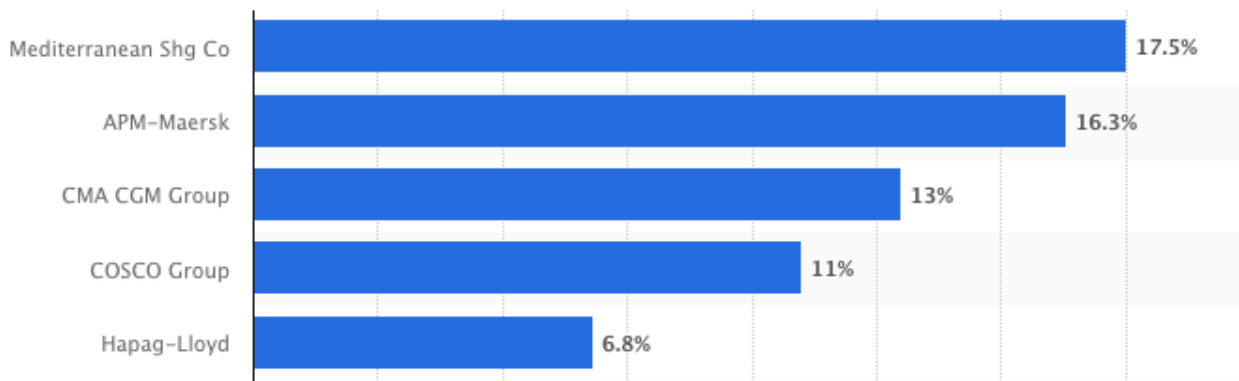
Source: Screenshot from Osterkamp et al. (2021, p. 3)

4.1.3 Industry Efforts for Carbon Neutrality

Despite being a hard-to-abate industry, four of the top thirty maritime shipping companies have publicly committed to carbon neutrality by 2050. MSC, the largest company by shipping volume, has pledged to “hit net-zero carbon emissions by 2050”, while third-largest, CMA CGM, has followed suit (Rivero, 2022a). Additionally, fifth-largest Hapag-Lloyd, pledged to be “climate neutral” by 2045 (Ibid.).

Contrary to the industry leaders’ initiatives, Chinese-run company, COSCO, which is the fourth largest, has not yet announced any ambitions of zero emissions. While four out of thirty may not seem like much, due to the consolidated nature of the industry, these companies operate roughly 50 percent of the world liner fleet (Placek, 2022) (Figure 3).

Figure 3: Top five container ship operators based on market share (%)



Source: Screenshot from (Placek, 2022), retrieved from:

<https://www.statista.com/statistics/198206/share-of-leading-container-ship-operators-on-the-world-liner-fleet/>

Maersk, the world's second-largest shipping line, and focus of this paper, can be seen as a first mover and leader in the path to carbon neutrality. On January 12th of this year, Maersk announced that their whole business will be carbon neutral by 2040, instead of its previously stated goal of 2050 (Ibid.).

Not only does this pledge account for its ocean freight sector, but it also encompasses their energy consumption and supply chains – more than any commitment of its industry peers. Maersk's decarbonization efforts will be further expanded upon in a later section.

4.2 Intro to the Complexity of Carbon Neutral Fuel Sources

Although big players within the industry are setting their sights on carbon neutrality, there does not seem to be a clear consensus on how to get there. The maritime industry faces a multi-faceted array of challenges, which can create complexity in decision making processes.

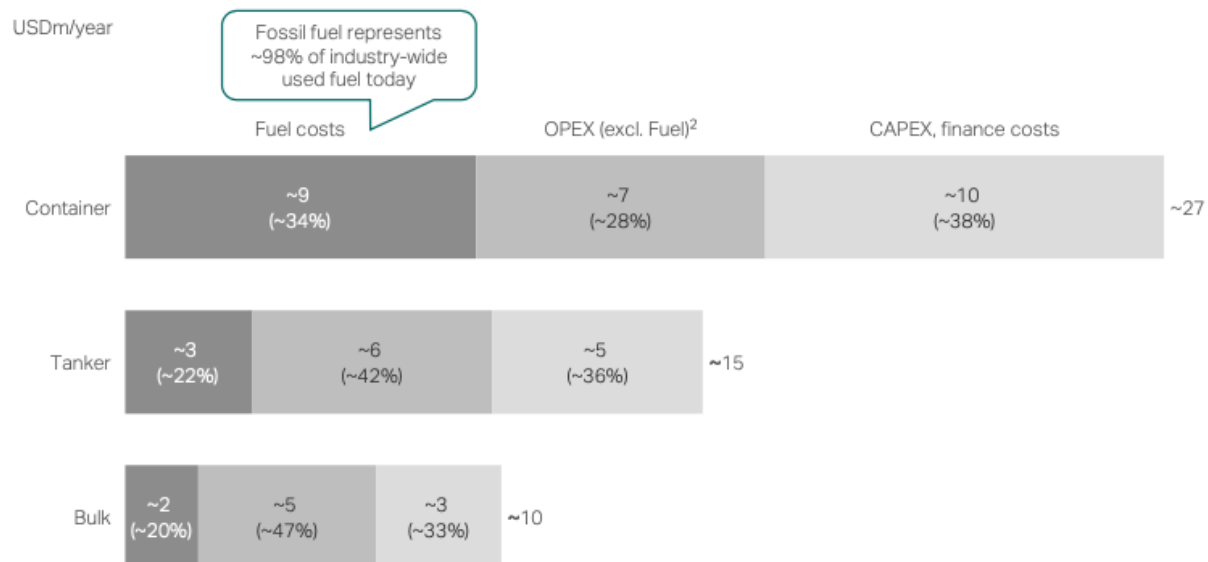
This section will focus on two factors: first, the cost gap between traditional fuels and green alternatives, and second, the potential viability of specific green fuel sources.

4.2.1 Cost and Cost Gap

In the maritime shipping industry, fuel represents a substantial proportion of the overall costs for the vessel. These costs primarily come from purchasing the fuel, but additional costs stemming from the quality of the fuel affecting vessel maintenance and performance are also captured (Mærsk Mc-Kinney Møller Center, 2021a).

Maritime fuel costs represent roughly 20 to 35 percent of annual total cost ownership⁷ (TCO), with container vessels realizing the highest proportion when compared to tankers and bulk carriers (Figure 4) (Ibid.).

Figure 4: Breakdown of TCO for container, tanker, and bulk vessels in 2020 (USDm/year)



Source: Screenshot from (Mærsk Mc-Kinney Møller Center, (2021a, p. 15)

With this in mind, fuel costs play a crucial role in the budgeting and planning of the company's fleet composition. Traditional fossil fuels already have the infrastructure and global logistics, which enable competitive pricing, whereas those supply chains for alternative fuels are still at their infancy (Ibid.).

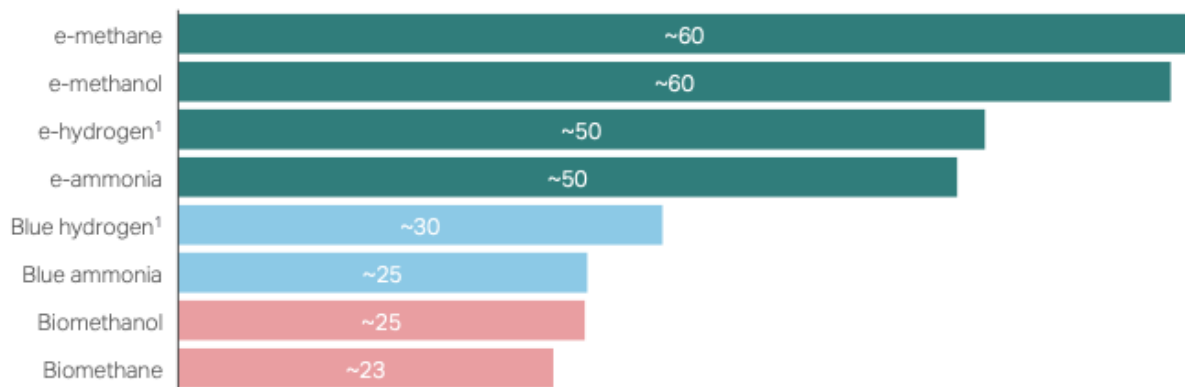
⁷ Total cost ownership (TCO) refers to the acquisition costs, operational costs, and personnel costs which go into running a vessel.

The production costs of these alternative fuel sources can range from double the cost to upwards of eight times the cost when compared to traditional fossil fuels (LSFO) (Figure 5) (Ibid.). With maritime fleets consuming an extensive amount of fuel, this can have a significant impact on the bottom line. And while the cost gap is projected to lessen, the reduction alone will not be enough to sway companies into committing significant resources towards carbon neutrality.

Figure 5: Estimated production price for different green fuel sources in 2025 (USD/GJ)

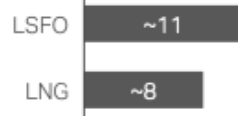
Estimated production price, 2025

USD/GJ



Estimated production price, 2025

USD/GJ



Source: Screenshot from MMMCZCS (2021a, p. 16)

With current supply chains and production pipelines, halving shipping emissions by 2050 will be a costly endeavor. In order to meet the targets of the Paris Agreement, it is estimated that the industry-wide average annual investment ranges between USD 40 and 60 billion through 2050 (UNCTAD, 2021).

Some of this cost comes from developing new land-based infrastructure for storage and bunkering, but the overwhelming majority comes from the production of alternate fuels such as methanol, hydrogen, and ammonia among others (Ibid.).

4.2.2 Green Fuel Sources

Since the transition from coal in the 1950s, the landscape of fuel sources in shipping has vastly evolved. However, only recently has there been a need to explore alternatives. As it stands, fossil fuels represent roughly 98 percent of the fuel used industry-wide (Mærsk Mc-Kinney Møller Center, 2021a). Although the need of an alternative source is recognized, the viability of carbon neutral fuel sources is still in development.

There are many potential options, but no clear “winner”. Due to the many interconnected parts in the decisions being made, decarbonization is a highly complex process. Because of this many companies have decided to invest in liquified natural gas (LNG) as a transitional fuel source until the market decides on an optimal solution.

Although a juxtaposition, LNG is the most green fossil fuel source; when compared to traditional fuel oil, LNG could reduce Sulphur emissions by 99 percent, nitrogen oxide by 80 percent, and CO₂ emissions by 20 percent (UNCTAD, 2021).

Moreover, LNG can be used in dual-fuel engines, which is already present aboard many ships (Ibid.). For these reasons, companies such as MSC, CMA CGM, COSCO and Hapag Lloyd are committed to phasing out traditional fuel sources in favor for LNG.

However, LNG is still a fossil fuel and consists primarily of methane⁸ – a far more potent GHG than CO₂ (Ibid.). A net increase in GHG emissions will result if even a small amount of LNG leaks during the production, usage, or storage of LNG. This has led to the World Bank to publish a report recommending countries avoid supporting LNG as a fuel source (Ibid.).

Simply put, LNG is not a viable long-term option for a green fuel source and will not make a significant impact on climate change. The use of LNG can be compared to putting a bandage on a gun-shot wound.

Several options of green fuels are being researched and developed such as hydrogen, ammonia, methanol, e-methane, and bio-oils (Mærsk Mc-Kinney Møller Center, 2021a). The challenge of

⁸ Not to be confused with e-methanol (green methanol).

commercial applicability of these alternative fuels not only relies on scalability, costs and technological maturity, but also on the factors shown below in Figure 6 (Ibid.).

Figure 6: Challenges towards the adoption of various alternate fuels

				Mature and proven	Solutions identified	Major challenges remain
Energy Carrier	Feedstock availability	Fuel production	Fuel storage, logistics, bunkering	Onboard fuel conversion ¹	Onboard safety and fuel management ²	Regulation ³
Alternative fuels for decarbonization	Fossil fuels					
	e-hydrogen					
	Blue hydrogen					
	e-ammonia					
	Blue ammonia					
	e-methanol					
	Bio-methanol					
	e-methane					
	Bio-methane					
	Bio-oils					

Source: Screenshot from MMMCZCS (2021a, p. 22)

Maersk has foregone investments into transitional fuels such as LNG, and decided to leapfrog directly into alternative fuels, such as green methanol, to power their fleet (A.P. Møller – Mærsk A/S, 2021b). Maersk's stance is further emphasized by a statement from their CEO of Fleet & Strategic Brands, Henriette Hallberg Thygesen, in a 2022 press release⁹:

"To transition towards decarbonisation, we need a significant and timely acceleration in the production of green fuels. Green methanol is the only market-ready and scalable available solution today for shipping. Production must be increased through collaboration across the ecosystem and around the world. That

⁹ A.P. Møller – Maersk. (2022). A.P. Møller - Maersk engages in strategic partnerships across the globe to scale green methanol production by 2025. [Press release]. <https://www.maersk.com/news/articles/2022/03/10/maersk-engages-in-strategic-partnerships-to-scale-green-methanol-production>

is why these partnerships mark an important milestone to get the transition to green energy underway.”

Green methanol will be further expanded upon in Chapter 6.

5. Literature Review

According to Bell et al. (2019), “existing literature represents an important element in all research”. Furthermore, it acts as a structured and evaluative inspection of already existing literature related to the subject in question (Bell et al., 2019). This thesis will use the literature review as a tool to further expound and evaluate existing topics and theories, which will be helpful in attempting to answer our research question.

This literature review will be divided into three main themes; first will be strategy and strategy process, second will be uncertainty and VUCA, and third will be carbon neutrality. These three sections will set the basis for our discussions, and will ultimately aid in answering the “how” within the research question, while also answering sub-questions 1 and 3.

5.1 Strategy Process

Over 30 years ago, two influential research papers regarding strategy process were published in the *Strategic Management Journal* (Chakravarthy & Doz, 1992; Pettigrew, 1992) – however, a lot has changed since then. Organizations, markets, and practices have all transformed, largely due to globalization and the emergence of new technologies (Burgelman et al., 2018).

5.1.1 Strategy

Before expanding on strategy process, we must first discuss strategy. The term *strategy* is derived from the Greek word *strategia*, which means “generalship”. However, strategy as a concept predates the Greeks, as seen through Sun Tzu’s, *The Art of War*, originating around 500 BC (Grant, 2018).

As implied via the title, however, this book centered around military strategy. And while there are parallels between military and business strategy, the formalized notion of business strategy came to the forefront much later.

The concept of strategy in business began to occupy an important role in literature during the 1980s and 1990s (M. E. Porter, 1991). Previously, strategy in business was hardly popular in literature (Ibid.), and, specifically in the 1970s, few key theoretical developments invoked strategy as a concept (van Tulder et al., 2021).

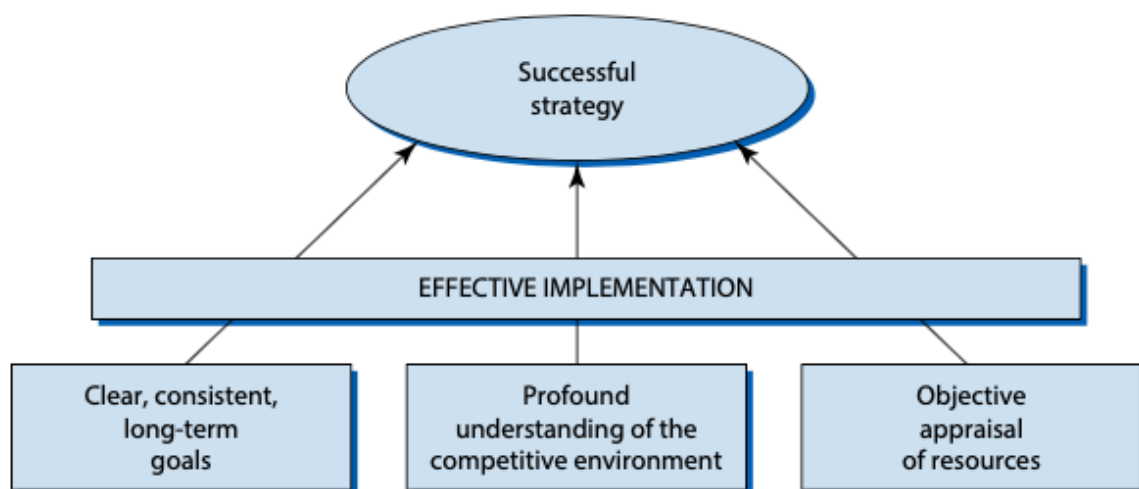
An interesting distinction to note is that previously, the concept of strategy was mostly used synonymously with a chosen course of action, or in other cases, as an indicator of particular chosen decisions of importance (Ibid.).

In the broadest sense, Grant (2018) elicits strategy as the means by which individuals or organizations achieve their objectives. Most commonly, strategy involves the setting of goals, allocation of resources, and establishing consistent and coherent decisions and actions (Ibid.).

Moreover, Grant (2018) suggests that organizational success is rarely purely random, nor does it come from an endowment of skills and resources. Organizations tend to thrive largely due to successful strategies, and a successful strategy – whether in warfare, chess, or business – should contain four elements that play an influential role (Figure 7) (Ibid.):

1. Goals that are consistent and long-term.
2. Profound understanding of the competitive environment.
3. Objective appraisal of resources.
4. Effective implementation.

Figure 7 – Common Elements in Successful Strategies



Source: Screenshot from Grant's Contemporary Strategy Analysis 10th edition (2018, p. 9)

Although Grant (2018) outlines common elements of successful strategies, the elements of a firm's successful strategy has greatly evolved throughout the last half-century (Ibid.).

One example can be seen through Buckley and Casson's (2001) rational action approach in defining strategy. This approach implies that some decisions hold more importance than others – aiding in strategy process. Moreover, they define the strategic decision, in rational action terms, as one with the following attributes:

1. "Long-term perspective creates a need for inter-temporal planning;
2. Uncertain environment;
3. Information needs to be collected in the most efficient and reliable manner'
4. Irreversible commitments of resources;
5. Determines the context in which future tactical (short-term) decisions are taken: the implications for tactical decisions need to be considered before strategic decisions are made; and
6. Inter-action with other strategists: whether competition, co-operation, or both (Buckley & Casson, 2001; van Tulder et al., 2021)

5.1.2 Why Do Firms Need Strategy

No matter what theory, or piece of literature, is used in defining strategy and its various components, the need for strategy to assist in effective organizational management is inarguable; first, strategy is used to enhance decision-making quality, second, it facilitates coordination, and, third, it increases organizational targets (Grant, 2018).

Strategy and Decision Making Quality

Decision making can be complex to navigate, especially when subject to human behavioral habits, such as bounded rationality¹⁰. Strategy "simplifies decision-making by constraining the range of decision alternatives considered and acts as a heuristic" (Ibid.).

¹⁰ Bounded rationality describes the way that humans make decisions that departs from perfect economic rationality.

Strategy further enhances the decision-making quality by pooling and integrating the knowledge of different individuals, which can unearth new perspectives (Ibid.). Lastly, strategy is used to facilitate the use of analytical tools and frameworks, adding to the discussed quality.

Strategy and Coordination

Coordination of organizational resources can prove to be a difficult challenge to management. However, strategy can act as a communication tool used in promoting coordination. Statements surrounding strategy clearly communicates the organizations goals, identity, and positioning to all members within (Ibid.). This organizational alignment is crucial in moving forward with a consistent direction (Ibid.)

Strategy and Targets

Strategy is used to drive companies forward by not only thinking how the firm will compete in the present day, but also how they will look in the future. Establishing direction and aspirations for the organization will lead to motivation and inspiration within the firm (Ibid.). This is a form of strategic intent.

Hamel & Prahalad (1989), use strategic intent to describe an organizations desired strategic position: “Strategic intent creates an extreme misfit between resources and ambitions. Top management then challenges the organization to close the gap by building new competitive advantages” (Hamel & Prahalad, 1989). This implies that strategy should embrace the “stretch” of forward-thinking ambitions, rather than be constrained by fitting in (Grant, 2018).

5.2 Strategy Process in Literature

As research surrounding strategy has seen a bloom in the last 30 years, so too has strategy process. It is argued that (Bower, 1970), (Mintzberg, 1978) and (Burgelman, 1983), are the prominent founders of strategy process research. Moreover, Pettigrew (1992) argued that understanding strategy processes could bring enlightenment to future strategic context and content.

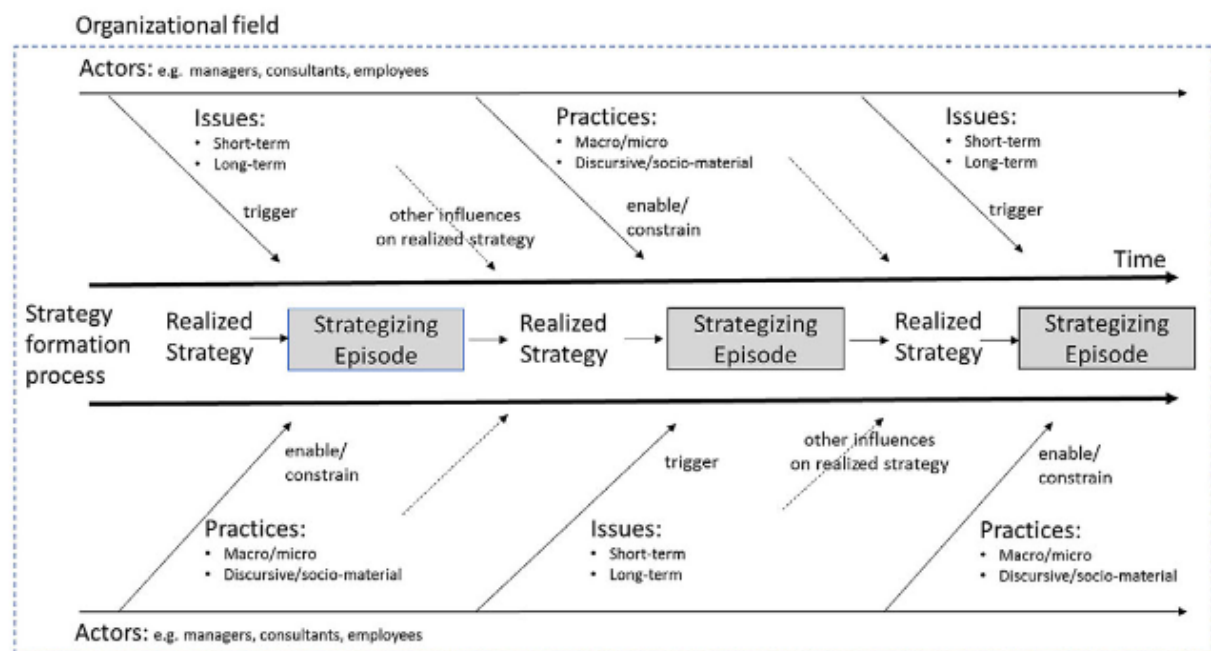
Pettigrew (1992, p. 6) also implored researchers to “extend the themes pursued by process scholars beyond the still-important but limiting areas of decision making and change”. This call led to an abundance of themes surrounding strategy process¹¹.

5.2.1 Strategy Process and Practices

In order to demonstrate and summarize themes referenced in the footnote, Burgelman et al., (2018), has put forward a combinatory framework which integrates key themes surrounding strategy process.

The framework in Figure 8 is selective, but comprehensive enough to understand the coming-together of processes and practices used in the strategy process. Key themes are *actors*, *strategy formation*, *strategic issues* and *strategizing episodes* (Ibid.)

Figure 8: Combinatory framework for strategy process and practice



¹¹ These themes includes: strategic decision making and decision processes; actors including CEO's, boards, middle managers, etc.; cognition, including attention and behavioral dynamics and emotion; evolution of competences and capabilities; formal processes; and organizations as ecologies of strategic initiatives subject to forces of evolution (Burgelman et al., 2018)

Source: Screenshot from Burgelman et al. (2018, p. 541)

Strategy formation process is at the heart of the figure above, which results in what is called *realized strategy* – ultimately enabling emergent and deliberate strategy through strategizing episodes (Burgelman et al., 2018; H. Mintzberg & McHugh, 1985).

Strategizing episodes acknowledge that realized strategy is accentuated through intentional strategy creation. This can be done either formally, via meetings and seminars, or informally via sporadic encounters between actors (Burgelman et al., 2018; Hendry & Seidl, 2003; Johnson et al., 2010). It is acknowledged throughout literature that while these strategizing episodes may not always be fruitful, they are of significant importance for a firm's evolution (Ibid.).

Furthermore, all of these actions take place within the *organizational field*. The concept of an organizational field considers actors, as well as extra-organizational influences such as regulators and government agencies (Burgelman et al., 2018; Whittington, 2003).

Actors help “identify and promote” specific issues to the strategy formation process, which can act as a catalyst for strategy formation (Ansoff, 1980; Dutton & Jackson, 1987; Lechner et al., 2010). Burgelman et al. (2018) elaborates by stating that “actors’ cognitive schemes, sensemaking processes, and emotions influence the selection and interpretation of issues that come to trigger strategizing episodes” (Balogun & Johnson, 2004; Liu & Maitlis, 2014; Vuori & Huy, 2016). Of course, this process can have huge variations between organization.

The end product of the strategy process can have multiple outcomes, but it is clear that a high-level view of this process includes:

- Issues, coming from actors and the organizational field, that trigger the need for a strategy formation process;
- Macro or micro practices, which also come from actors and the organization field, enable or constrain the process.

From issues and practices comes the product of a realized strategy, which calls for multiple strategizing episodes over time, leading to a clear vision – or strategy.

5.3 Agile Strategy

Literature suggests that over time, and through established strategic processes, efficient organizations naturally evolve their business models and strategies towards increasing stability (Y. L. Doz & Kosonen, 2010).

Stability is further amplified, and almost required, by an organizations need for efficiency and predictability in their processes – particularly in periods of growth, in which reliability and efficient scaling is critical (Y. Doz & Kosonen, 2008b).

Paradoxically, however, in a dynamic operating environment, this can lead to rigidity. Thus, the organizational gains from running efficiently, with rigid processes and procedures, are easily negated when differing scenarios come into existence in dynamic operating environments (D. Teece & Leih, 2016).

In order to stay ahead of the game, so to speak, new literature calls for organization to adopt what is called an agile strategy – or strategic agility. Strategic agility can be described as a firms ability to form strong commitments, while also remaining adequately fleet of foot in order to manage and adapt to continuous change (Y. Doz & Kosonen, 2008b; Ivory & Brooks, 2018). Moreover, As Weber & Tarba, (2014, p. 7) explain:

“Strategic agility is the ability of management [or an organization] to constantly and rapidly sense and response to a changing environment by intentionally making strategic moves and consequently adapting the necessary organizational configuration for successful implementation.”

Although strategic agility has been in literary discussion for almost 20 years (Weber & Tarba, 2014), the idea only gained notability after its criticisms of established concepts such as strategic planning (Ansoff, 1965), the resource-based view (RBV) (Wernerfelt, 1984), and sustainable competitive advantage (N. P. Hoffman, 2000). These concepts were deemed “too vague, tautological, or linear given the rate and complexity of change” (Henry Mintzberg, 1994; Weber & Tarba, 2014).

Literature suggests that becoming strategically agile will require three foundational shifts in the way the organization is managed. First, moving away from a constant forward-looking mindset in the

strategy planning process in order to capitalize on current situations – making sense of such situations to set their strategic course in action (Y. Doz & Kosonen, 2008a).

Second, is the shift from stagnant resources, or resources that only serve one specific need; allowing resources to “switch gears” can enable an organizations ability to capitalize on current opportunities (Ibid.). Lastly, organization-wide unity is required (Ibid.).

5.3.1 Meta-Capabilities

Adding to the paragraph above, Y. L. Doz & Kosonen (2010) distinguish three “meta-capabilities” necessary in achieving strategic agility. These meta capabilities are: strategic sensitivity, leadership unity, and resource fluidity.

Strategic Sensitivity

Strategic sensitivity is the ability to gather and integrate knowledge, which acts as a catalyst towards an organization’s pursuit of continuous strategic development and innovation, allowing the identification of new business models and opportunities (Junni et al., 2015; Wilson & Doz, 2011).

Central to this meta-capability, strategic sensitivity is about “sense-making” (Ivory & Brooks, 2018). Moreover, Ivory & Brooks (2018, p. 354) allude to the usefulness of this meta-capability by claiming that “strategic sensitivity increases the depth and breadth of the organization’s ability to understand and interpret the wider [...] environment”.

Furthermore, Y. L. Doz & Kosonen, (2008b) explain that organizations depicting strategic sensitivity are those with a “sharpness of perception and intensity of awareness and attention [...to...] incipient trends and converging forces with intense real-time sense making” (p. 96).

In other words, it is not enough to simply have knowledge. Being able to make correct decisions with that knowledge is key, which is arguably achieved through a “deep involvement” with the ecosystem the firm operates within, and through potential providers of relevant knowledge (Brueller et al., 2014).

Collective Commitment

Originally labeled as “leadership unity” by Y. L. Doz & Kosonen (2010), collective commitment focused on a top-down approach in which leaders heavily influenced decisions, strategy, and culture (Ivory &

Brooks, 2018). However, since then, it has been argued that this approach disregards the distributed approach of modern leadership (Junni et al., 2015; Lewis et al., 2014).

Junni et al. (2015) expressed that leadership unity is only one aspect of a “top team’s ability to reach collective commitments” (Y. L. Doz & Kosonen, 2010, p. 381). As such, Junni et al. (2015, p. 602) provide the term – *collective commitment* – to describe the existence of “common ground, common interest, empathy and trust in order to increase the engagement of organizational members”.

Collective commitment enables organizations to respond to potential opportunities unaccompanied by hindrance from internal disagreements (Y. L. Doz & Kosonen, 2010; Junni et al., 2015). In practice, this leads to minimal organizational resistance towards potential transformative decisions.

Resource Fluidity

Lastly, resource fluidity refers to the “swift mobilization and deployment” of resources (Ivory & Brooks, 2018). Critical to an organizations strategy, Y. Doz & Kosonen (2008b, p. 96) explain that “even when wholehearted, commitments are still only as good as the resources put behind them”.

In a later paper, Y. L. Doz & Kosonen (2011, p. 156) tie resource fluidity to collective commitments by stating that “indecisiveness at the top and rivalries at the bottom conspired to make resource fluidity more difficult”.

Moreover, this meta-capability can also refer to the reconfiguration of business systems (Y. Doz & Kosonen, 2008b) in the hopes of capitalizing potential opportunities (Brueller et al., 2014). In other words, resource fluidity refers to a firm’s ability to find multiple uses in one asset (Y. Doz & Kosonen, 2008b). This is seen as an operational capability, of which the importance has been acknowledged in a complex and dynamic environment.

5.3.2 Dynamic Capabilities

The concept of meta-capabilities can easily be linked to Teece et al's. (1997) concept of dynamic capabilities. In fact, Ivory & Brooks (2018) assert that strategic agility has actually emerged from dynamic capabilities literature.

Just like Y. L. Doz & Kosonen's (2010) meta-capabilities concept within strategic agility, dynamic capabilities are a tool in enabling companies to respond to changes in their business environment, and to change their operational capabilities accordingly (Figure 9) (D. J. Teece et al., 1997).

Teece et al. (1997, p. 516) define dynamic capabilities as “the firm’s ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments”, thus encapsulating a firms evolutionary nature.

Figure 9: Simplified schema of dynamic capabilities, business models and strategy

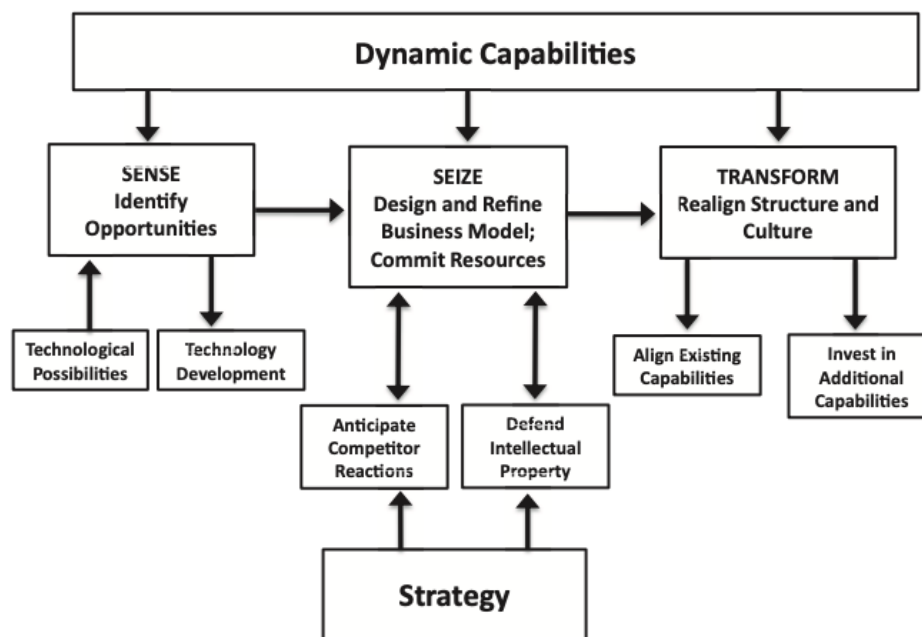


Fig. 1. Simplified schema of dynamic capabilities, business models, and strategy.

Source: Screenshot from D. J. Teece, (2018, p. 44)

Moreover, dynamic capabilities can reflect an organizations ability in achieving innovative forms of competitive advantage, given path dependencies and market positions (Leonard-Barton, 1998). This, in turn, can help organizations avoid competence traps and irrelevancies in an ever-changing business environment (Zahra et al., 2006). Ultimately, dynamic capabilities are highly beneficial for an organization in highly turbulent, complex, and uncertain settings (Ibid.).

5.4 VUCA and Uncertainty

“Across many industries, a rising tide of volatility, uncertainty, and business complexity is roiling markets and changing the nature of competition” (Doheny et al., 2012).

The VUCA concept was first introduced by the U.S. military after the end of the Cold war, but has eventually found its way into the international business lexicon (van Tulder et al., 2021). The components in the abbreviation – volatility, uncertainty, complexity, and ambiguity – are terms used to describe an environment in which certain businesses operate (Bennett & Lemoine, 2014). As such, it is the reality that the modern global economy includes all features of VUCA (van Tulder et al., 2021).

Many pundits and executives believe that in a “VUCA world”, core activities which drive organizational performance – such as strategy planning – are deemed futile (Ibid.). Understanding the future, and planning appropriate responses, is incredibly difficult and can lead to stagnation.

However, in order to understand the implications on strategy, we must first define the individual components of VUCA. For the scope of the thesis, we will be focusing on volatility, uncertainty and complexity as these are the most present in Maersk’s transition towards carbon neutrality.

5.4.1 Volatility

Volatility refers to a situation that is “unstable or unpredictable”, rather than a situation clouded by a lack of knowledge or doubt of potential outcomes (Ibid.). Volatility can also be looked at as relatively unstable change, which can affect future strategic planning.

Bennet and Lemoine (2014) argue that when unstable change is expected, devoting resources towards an agile strategy may be the best course of action to combat instability. Tying back to the above section, need for agility is reemphasized when dealing with environmental volatility.

Effective leaders and strategists build slack resource availability – enabling agility – when change is ever-present, but the magnitude and length of the change is unknown. However, this can be an expensive endeavor and frequently unnecessary (Ibid.).

5.4.2 Uncertainty

Perhaps the most relevant to the thesis, the majority of uncertainty-related research in business has focused on issues such as environmental uncertainty (Hoque, 2004; Matanda & Freeman, 2009; Werner et al., 1996), or specifics such as policy uncertainty (Nguyen et al., 2018) technology uncertainty (Celly et al., 1999), and market uncertainties (Song, 2013).

Uncertainty refers to a situations characterized by a lack of knowledge pertaining to the significance of a certain event, or viability of alternatives (van Tulder et al., 2021). Cause and effect are understood, but the meaningful ramifications are unknown (Bennett & Lemoine, 2014). In today's complex and interdependent business world, uncertainty is ubiquitous (D. Teece & Leih, 2016).

In strategic management literature, uncertainty often gets used synonymously with risk, however, this is not the case (Liesch et al., 2011). As Alvarez & Barney, (2005, p. 778) stated, "risk and uncertainty are treated as if they were synonyms".

Miller, (2007, p. 66) clarifies that "risk is a multidimensional construct and the meanings and sources of risk can differ across individuals and situations" (van Tulder et al., 2021). To summarize that statement, uncertainty can be a cause of risk, but risk is not a cause of uncertainty.

Moreover, most classical approaches to strategy and strategic management (e.g., Porter's Five Forces) implicitly assume "relatively predictable environments" (D. Teece & Leih, 2016). As such, and due to the ignorance of uncertainty, most classical approaches are of little help to organizations in how to navigate environments filled with disruption due to uncertainty – and other VUCA symptoms (Ibid.)

Uncertainty can often lead to organizations not knowing the best response or strategy moving forward due to the ubiquitous risk. However, what some may see as risk may be an act of God to someone else, or even an opportunity (Tversky & Kahneman, 1985).

Researchers believe uncertainty is a chance to differentiate and potentially stray away from competition in a favorable manner (Hemingway & Marquart, 2013). Although uncertainty exists due to lack of adequate information, this can be solved by obtaining said information.

Obtaining adequate information can come in the form of structurally devoting resources to “boundary-spanning activities: moving beyond existing networks, data sources, and analysis processes to gather information from new partners” with differing perspectives and competencies (Bennett & Lemoine, 2014).

Even if uncertainty cannot fully be dispelled by information collection, the impact can be significantly lessened by narrowing the margin of error (van Tulder et al., 2021).

5.4.3 Complexity

In strategic management literature, complexity refers to the “many interconnected parts forming an elaborate network of information and procedures; often multiform and convoluted” (Bennett & Lemoine, 2014).

Due to the many interconnected parts, huge amounts of effort is needed to collect and digest, in order to understand relevant information in its entirety (Ibid.). Otherwise, research suggests organizations may succumb to stagnation (Bennett & Lemoine, 2014).

Heugens & Lander, (2009) explain that research around complexity has constantly proven that organizations who adapt themselves to match environmental change consistently perform at a higher level. Furthermore, firms that maintain past processes and structures amidst changing environments underperform (Heugens & Lander, 2009).

5.5 Sustainable Development and Corporate Sustainability

In 1987, the term “sustainable development” was made popular by the World Commission on Economic Development (WCED) in their well-cited report, *Our Common Future* (Bansal, 2005; Diamond, 1996). As described by the WCED, sustainable development entails the ability to meet one’s present needs without compromising on the ability of future generations (Bansal, 2005).

Moreover, the WCED maintained that the simultaneous presence of three principles were needed to enable sustainable development: environmental integrity, economic prosperity, and social equity (Ibid.). Initially, this was met with skepticism as this was a provocation to the general assumption that, at that time, environmental integrity and economic success could not mix (Ibid.).

More than a decade later, however, research showed that many large multinationals agreed with, and adopted, the simultaneous presence of these three principles (Rondinelli & Berry, 2000).

5.5.1 Environmental Integrity

For the scope of this paper, we will only touch upon environmental integrity. Environmental integrity refers to the assurance that human activity does not lead to the destruction of the planet's resources, whether on land, sea or air (Bansal, 2005).

Environmental integrity comes in the form of corporate environmental management, in which organizations must actively seek to reduce the size of their carbon footprint. Most related to the themes of this paper, is through pollution prevention, which aims to reduce emissions through innovative processes or technologies (Klassen & Whybark, 1999).

As such, a resource-based view would suggest that, through a firm's desire for process improvement, pollution prevention initiatives will lead to the development of "superior resources and capabilities", more so than just pollution control (Russo & Fouts, 1997).

5.5.2 Arguments for Corporate Sustainability

In this section, corporate sustainability will be dissected through a resource-based view, and through an institutional theory. Through that, this section will also shed light on the different forms of pressure organizations face to decarbonize. Lastly, corporate sustainability through strategic agility is discussed.

Resource-based View

A resource-based view declares that, through effective corporate strategies, organizations can build resources and capabilities that are rent-earning (Bansal, 2005). These resources are both tangible – such as physical plant and equipment, and intangible – such as culture and intellectual capital (Grant, 1991). Capabilities refer to the skills developed by firms to reproduce and manage said resources (Barney, 1995).

The potential for rent-earning through the deployment of a firm's resources and capabilities, are heavily linked to the scarcity, uniqueness, durability, inimitability, and non-substitutability –

ultimately determining a firm's competitive advantage (Barney, 1995; Dierickx & Cool, 1989; Peteraf, 1993).

Literature suggests a resource-based view is applicable in corporate sustainability for various reasons:

1. Implementing corporate sustainability has shown to positively influence firm performances (Hart & Ahuja, 1996; Waddock & Graves, 1997);
2. Investments of financial and human resources are required in the pursuit of corporate sustainability (Sharma & Vredenburg, 1998);
3. An evolution in technology, legislation, and market forces, create new resource-based opportunities due to a firm's corporate sustainability developments (M. Porter & van der Linde, 1995).

Lastly, Bansal (2005) suggests that organizational slack, or resource fluidity, can be a significant variable in regards to a firm's ability in adopting corporate sustainability. Bourgeois (1981, p. 30) describes organizational slack as "that cushion of actual or potential resources which allows an organization to adapt successfully to internal pressures for adjustment or to external pressures for change".

Organizational slack, which can be linked to as one of the pillars of strategic agility, also allows organizations to invest in resources and capabilities which may not have immediate pay-off, but can set the firm up in an advantageous future position (Levinthal & March, 1981).

Moreover, this fluidity of resources created by organizational slack can lead to the development of resources and capabilities used for increasing the speed and efficiency in which firms can adapt to external environment demands (Cheng & Kesner, 1997).

An Institutional Theory

As an explanation for corporate sustainability, an institutional theory, coined by DiMaggio & Powell (1983) highlights the social context in which a firm operates (Bansal, 2005). Most firms have the ability to operate within institutional constraints, which may not include an aspect of sustainability. However, intentional disregard of critical societal initiatives can have a significant impact on a firm's legitimacy, resources, and profitability (DiMaggio & Powell, 1983; Oliver, 1991; Scott, 1987).

Institutional norms, which can come from governments, regulators, and even public opinion, can heavily shape the way in which a firm chooses to operate (Bansal, 2005). In fact, by strategically responding and conforming to these norms, firms may realize improved opportunities to capture rent-building resources and capabilities (Oliver, 1991; Suchman, 1995).

Literature suggests that an institutional view is applicable to corporate sustainability for various reasons:

1. A firm's commitment, or lack thereof, towards sustainability is judged through an individual's value and beliefs, which can affect a firm's acceptability and legitimacy (Bansal & Roth, 2000);
2. Actors with differing opinions on corporate sustainability will establish norms through dialogue and discussion (A. J. Hoffman, 1999; Wade-Benzoni et al., 2002);
3. Regulations and international agreements have led to the institutionalization of corporate sustainability (Frank et al., 2000).

Moreover, an institutional theory is useful in explaining how institutional pressures, which are brought into play by different stakeholders¹², influence a firm's behavior – especially towards that of corporate sustainability (DiMaggio & Powell, 1983). Literature has referred to these institutional pressures as coercive, mimetic, or normative, and has found said pressures to positively influence carbon abatement measures (Chitambo et al., 2020; Haque & Ntim, 2020).

Coercive Pressure

Coercive pressure gets exerted on an organization by external stakeholders, such as government authorities and influential customers, by forcing compliance with various environmental rules and principles (Roxas & Coetzer, 2012). An example of coercive pressure is the aforementioned Paris Agreement. As Dhanda et al. (2022) suggest, coercive pressure is more effective than other institutional pressures when it comes to corporate sustainability and emission reduction.

Additionally, governmental and regulatory pressure have been proven to positively contribute towards a firm's emission reduction initiatives (Lewandowski, 2017). Moreover, organizations who

¹² Primary stakeholders include organizations, employees, customers/consumers, suppliers, competitors, governments, communities, activist groups and trade associations (DiMaggio & Powell, 1983).

proactively deal with coercive pressures tend to develop competitive advantages compared to those who don't (Ibid.).

These competitive advantages arise when proactive firms accommodate to the pressures from internal (employees) and external (governments, clients) stakeholders to explore new business opportunities with the ambition to reach a common objective in sustainability (Buysse & Verbeke, 2003).

Mimetic Pressure

As the name suggests, mimetic pressure refers to a firm imitating the sustainability practices of early adopters within their industry, which can help reduce various uncertainties (DiMaggio & Powell, 1983). Studies have shown that mimetic pressure, which is a form of peer pressure, is influential in shaping attitudes and adoption rates of sustainability practices within the same industry (Okhmatovskiy & David, 2012).

The more peers that embrace carbon neutrality, the more mimetic pressure the industry faces. However, organizations succumbing to a mimetic pressure face initial disadvantages than those with coercive pressures.

Normative Pressure

DiMaggio & Powell (1983) suggest that normative pressure arises from shared beliefs in business and social norms. These "norms" can come from entities who justify what activities and practices are "normal" for certain organizations and industries (Zhang et al., 2022).

Normative pressures from an array of stakeholders could urgently provoke organizations to evolve from intent to action, which can shape their strategies towards more aggressive emission reduction (Sprengel & Busch, 2011). However, literature suggests that normative pressures prove to be less effective than coercive pressures (Dhanda et al., 2022).

Corporate Sustainability and Strategic Agility

As Ivory & Brooks (2018, p. 352) explain, "corporate sustainability is an inherently strategic notion [...] which is concerned with the purpose and positioning of the organization over the long term and

in relation to its context”. Corporate sustainability, which is complex and multifaceted in nature, requires a holistic approach for such goals to be reached (Hahn et al., 2014).

Historically, strategy has also taken a long-term view and holistic approach, but the inherent rigidity caused by a “traditional” approach has given way to the emergence of strategic agility – especially for firm’s existing within a complex ecosystem.

Neugebauer et al. (2016) further emphasizes this by arguing that, while traditional strategies are appropriate for “straightforward and controllable contexts”, the complexity of corporate sustainability does not allow for such a uniform approach.

6. The Case of Maersk: Decarbonization Efforts and Pathway

The aim of this case study is to give answers as to how Maersk aims to achieve their big dream of carbon neutrality by 2040, which was recently accelerated from 2050. First, this section briefly introduces Maersk's background and reach before outlining their self-proclaimed pathway to decarbonize.

Afterwards, this section touches on Maersk's green fleet and the main green fuel source – green methanol – used to power these vessels, and any new vessels in the foreseeable future. Additionally, uncertainties and limitations regarding green methanol will be introduced before moving on to a PESTEL analysis.

The PESTEL analysis has a primary focus on what Maersk deems to be the most important factor, and biggest challenge, towards carbon neutrality – green fuel. This PESTEL analysis also sheds light on the uncertainty, and VUCA conditions, present regarding green methanol's present and future.

Thereafter, elements from the Literature Review section will be brought in to discuss Maersk's strategy in achieving their big dream – therefore, answering the “how” in sub-question 2. This will also act as a foundation for the Conclusion section.

6.1 Introducing Maersk

Founded in 1904, A.P. Møller – Maersk A/S, commonly referred to simply as Maersk, is an international shipping company primarily operating in ocean and land freight transportation. Headquartered in Copenhagen, Denmark, Maersk's reach spans across all continents. With a presence in 130 countries and over 475 ports, a Maersk container ship calls port every 6 minutes (A.P. Møller – Mærsk A/S, 2021a).

Maersk boasts a fleet of over 730 container vessels, which transports roughly 17 percent of all containers worldwide – ultimately servicing upwards of 100,000 customers (Ibid.). Since its inception, Maersk has climbed the ranks of the maritime shipping industry, eventually becoming the world's

largest shipping company – a title they held for 25 years. However, in early 2022, MSC dethroned Maersk to claim the title of world’s largest shipping company¹³ (Rivero, 2022b).

It is clear to see that Maersk’s global presence and scale of operations is vast. However, so too are the company’s dreams. In 2018, the management team of Maersk made a commitment to make the company carbon neutral by 2050, with few smaller goals in between now and then. To most, 2050 is a distant future. However, due to asset lifespans, to be carbon neutral by 2050 would require zero-carbon container vessels by 2030.

Inherent to operating a large maritime fleet is the substantial consumption of fuel. In 2021, Maersk used over 11 million tons of fuel, with the overwhelming majority coming from traditional heavy fuel (A.P. Møller – Mærsk A/S, 2021c).

Due the company’s fuel consumption – and alongside their daily operations – Maersk’s current emissions account for 1 percent of the total emissions from the transport and logistics industry (Ibid.). This translates to almost 0.1 percent of all global emissions (Ibid.).

To put that into perspective, Maersk emits the same amount of GHG’s annually as Denmark (Ibid.). However, Maersk has realized a drastic change is needed if both their dream, and the Paris Agreement targets, are to be met.

6.1.1 Maersk’s Pathway Towards Carbon Neutrality

Throughout 2021, several events contributed to the additional urgency in the company’s path to decarbonization. First, the United Nations Panel on Climate Change re-emphasized the need for eliminating GHG emissions, citing potential irreversible effects of climate change (A.P. Møller – Mærsk A/S, 2021b). Second, supply chain congestions led to increased emissions in the company’s ocean sector (Ibid.). Third, customer demand for carbon neutrality continued to grow.

As a result, Maersk reframed their sustainability initiatives, creating an Environment, Social, and Governance (ESG) framework with ambitions to be a leader in decarbonizing their business, amongst

¹³ When using the metric of total TEU capacity.

other social and governance initiatives. In regards to the scope of this thesis, only the environmental aspect will be touched upon.

On top of their ESG framework, Maersk has also expedited its goal of reaching carbon neutrality from 2050 to 2040, largely due to events touched upon previously. Therefore, Maersk has created a roadmap to carbon neutrality by 2040 shown in Figure 10. Thus, aligning with the Paris Agreement's 1.5 degree ambitions.

Maersk has also provided goals for their near future. By 2030, the company plans on using green alternative fuels to cover 25 percent of its total fleet fuel consumption (Ibid.). As it stands, Maersk will reach this target through the use of green methanol, rather than following the industry-wide route of transitional fuels.

Figure 10: Overview of Maersk's targets and efforts towards decarbonization



Source: Screenshot from A.P. Møller – Mærsk A/S (2021b, p. 19)

6.2 Green Vessels and Methanol

2021 also proved to be a pivotal year in the development of Maersk's green fleet. With favorable market conditions leading to higher freight rates, Maersk experienced record-high profits of USD 14.8 billion during the pandemic (Rivero, 2022a). This enabled the company to ramp up their green strategy and set high decarbonization ambitions.

The company did so by investing over USD 2 billion towards 13 container vessels, which are to be built by Hyundai Heavy Industries (Ibid.). These 13 vessels are set to be delivered in 2024 and 2025, aiding their goal of at least a quarter of their fleet to be carbon neutral (A.P. Møller – Mærsk A/S, 2021a). The vessels were bought for roughly USD 175 million each, which comes at a 10 to 15 percent premium when compared to conventional vessels (Rivero, 2022a).

Furthermore, these 13 vessels boast an innovative dual-fuel engine capable of running on green methanol as well as conventional low Sulphur fuel if necessary (A.P. Møller – Mærsk A/S, 2021b). When fully phased in, these vessels can replace GHG emissions of 1.5 million tons, correlating to 4.5 percent of Maersk’s fleet emissions in 2020 (Ibid.).

However, the total twenty-foot equivalent (TEU)¹⁴ units of the 13 new vessels only translate to less than 5 percent of Maersk’s current cargo capacity, far from the commitment of transporting 25 percent of its TEU capacity will be transported by green vessels by 2030 (Rivero, 2022a).

Moreover, sourcing an adequate amount of green methanol to fuel these vessels will be a critical challenge, requiring substantial changes in their supply chain and a “significant ramp-up of global production capacity” (A.P. Møller – Mærsk A/S, 2021b).

6.2.1 Green Methanol

“Green methanol is the best scalable green fuel solution for this decade”

– Palle Laursen, Chief Fleet & Technical Officer at Maersk¹⁵

Backed up by the quote above, Maersk is fully “bought-in” to the efficacy of green methanol. Green methanol is a low carbon fuel, which can be produced via two different sources.

Bio-methanol is produced from feedstocks of biowaste – typically from forestry and agricultural waste as well as biomass gasification from landfills (Sinclair & Bucchioni, 2021). E-methanol is produced through capturing CO₂ from renewable sources (Ibid.).

As seen in Figure 8, green methanol is relatively mature in the immature landscape of alternative fuel sources. Therefore, Maersk has decided to power their incoming carbon neutral fleet with this green fuel source.

¹⁴ Twenty-foot equivalent unit is unit of measurement used in maritime shipping to determine the cargo capacity of a vessel.

¹⁵ A.P. Møller – Maersk. (2022) *Maersk continues green transformation* [Press Release]
<https://www.maersk.com/news/articles/2022/10/05/maersk-continues-green-transformation>

However, in spite of Maersk's bet on green methanol, the current production only creates roughly 30,000 tons annually. This will need to increase to 500,000 tons in 2024 just to operate the 13 ordered vessels (Mærsk Mc-Kinney Møller Center, 2022).

6.2.2 Uncertainty and Limitations with Green Methanol

Although attractive for early-movers due to commercial availability, green methanol faces some serious limitations, which places further uncertainty in the future viability of this as a primary alternative fuel source. This uncertainty can also have a significant impact on Maersk's decision to power their 13 incoming vessels primarily with green methanol.

First, as a majority of green methanol comes from biomass, producers must use sustainable biomass to avoid the creation of new ESG problems in the name of emission reduction (Ibid.). Determining the sustainability of the biomass is another complex issue in and of itself, never mind production being decentralized, uncertificated, and not coupled with liquefaction (Ibid.).

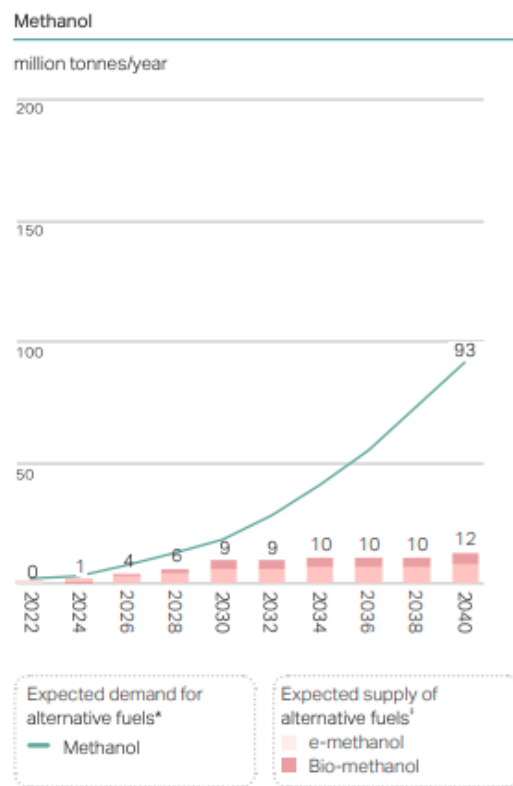
Nevertheless, the demand for dual-fueled vessels capable of running on green methanol is increasing. As stated above, production of green methanol needs to substantially increase in order to meet the fast-paced growth of dual-fueled vessels in the market – and in Maersk's fleet.

Research suggests that, by 2030, green methanol supplies will be sufficient to meet the demand. Thereafter, projected demand in the following decade will far outpace the effective supply, with a yearly shortfall of up to 20 million tons (Mærsk Mc-Kinney Møller Center, 2022) (Figure 11).

However, Jim Hagemann Snabe, Chairman of Maersk, claims that this imbalance is “wonderful” as “higher demand than supply normally means great business opportunities for everyone who choose to participate”¹⁶. This further emphasizes his stance on togetherness towards a carbon neutral future.

¹⁶ Quote from Jim Hagemann Snabe's TED Talk: *Dreams and details for a decarbonized future*. Taken from: https://www.youtube.com/watch?v=uDt1MhAQcLs&ab_channel=TED

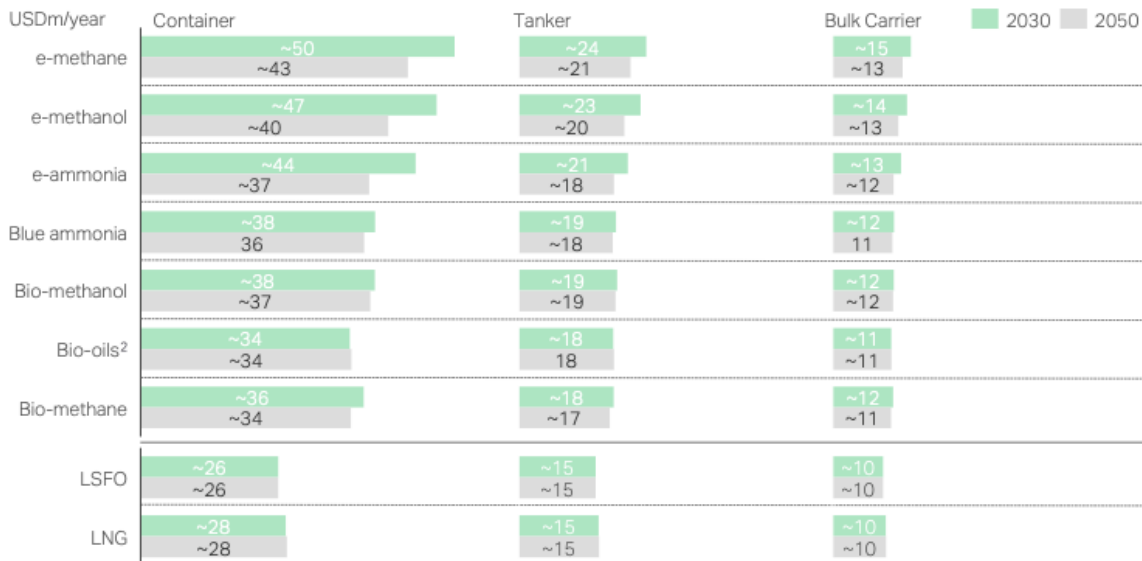
Figure 11 – Expected methanol demand versus expected supply



Source: Screenshot from Mærsk Mc-Kinney Møller Center (2022, p. 42)

Lastly, the shipowners' TCO will continue to be higher when compared to using traditional fuel sources (Figure 12). Based on recent analysis, the TCO gap between alternative fuel sources and traditional is double, even through 2050.

Figure 12 – Estimated TCO of different fuel sources across various vessel types



Source: Screenshot from Mærsk Mc-Kinney Møller Center (2021a, p. 19)

6.3 PESTEL Analysis

After discussing Maersk's upcoming carbon neutral fleet, and green methanol, this section aims to provide a deeper understanding on various factors surrounding the eventual adoption of this alternative fuel source.

As most of Maersk's uncertainty in a carbon neutral future revolves around their biggest challenge¹⁷ – green fuel and its efficacy – this analysis will primarily be focusing on factors which have an effect on said challenge. More specifically, a PESTEL analysis will be used to shed light on the future uncertainties and complexities faced in the transition towards carbon neutrality.

This will be done by analyzing the political, economic, social, technological and legal factors that can have a significant influence in the uncertainty Maersk operates within. For the scope of this thesis,

¹⁷ A.P. Møller – Maersk. (2022). *2021 Sustainability Report*(A.P. Møller – Mærsk A/S, 2021b)

the environmental factors will not be discussed as it adds little uncertainty in Maersk's decision to go green.

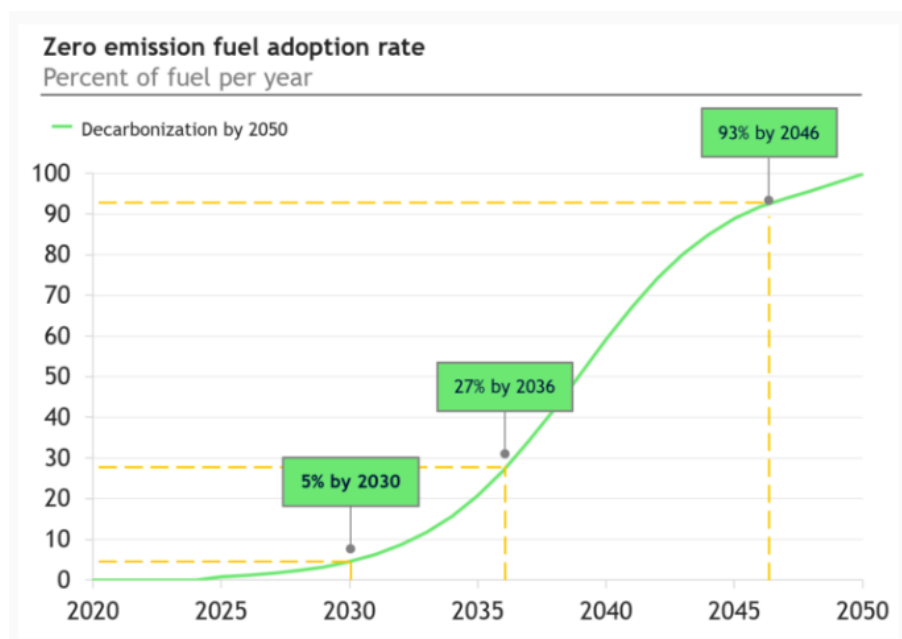
6.3.1 Political and Legal

As it stands, current market conditions are not sufficient enough to adequately accelerate decarbonization efforts needed to meet the targets set forth during the Paris Agreement (UNCTAD, 2021). New regulation and policies will be needed to alleviate uncertainty in decarbonization, and fuel the transition towards alternative energy sources (Smith et al., 2021).

These new regulations and policies can aid in reducing the gap between the cost of fossil fuels and green fuel sources, which can give incentive to both early adopters and hesitant followers. Furthermore, a reduction in the cost gap – and ultimately the TCO – allows the channeling of resources (resource flexibility) towards research and development ventures, which can effectively ease uncertainty (UNCTAD, 2021)

However, uncertainty and complexity implicit to green fuel sources is crippling the necessary adoption rate in maritime shipping. Osterkamp et al., (2021) argue that, as with all historical innovations, adoption rates will follow an S-curve (Figure 13).

Figure 13 – Zero emission fuel adoption rate required for decarbonization by 2050 (%)



Source: Screenshot from Osterkamp et al. (2021, p. 3)

An S-curve consists of three phases:

- First, “a slow emergence phase when there is rapid learning and costs start to come down”(Osterkamp et al., 2021).
- Second, “the diffusion phase starts with rapid adoption of the new technology, with positive feedback loops between different actors raising confidence, increasing demand and investment throughout the value chain.” (Ibid.)
- Third, the “reconfiguration phase as the new technology is adopted and a new normal is established.” (Ibid.).

Figure 13 shows that by 2030¹⁸, 5 percent of the total percentage of fuel used per year needs to be carbon neutral in order to meet the targets set forth during Paris Agreement. However, an estimation from the International Energy Agency (IEA) reports that, at current pace, carbon neutral fuels will only make up roughly 2 percent in 2030. It is clear that regulatory action is needed for acceleration.

This can come in the form of subsidies, exemptions, and carbon taxes, however, the introduction of these instruments is intrinsically complex due to the global nature and stakeholders involved (Mærsk Mc-Kinney Møller Center, 2021a).

In the spirit of egalitarianism, Maersk has acknowledged the slow pace of decarbonization and has called for a carbon tax of USD 150 per ton of CO₂ (Ibid.). Nonetheless, there is still a presence of high uncertainty around the carbon taxes regarding structure, which is an externality caused by the numerous stakeholders involved.

6.3.2 Economic

Cyclical by nature, the maritime shipping industry is generally one that is risk-averse (Mærsk Mc-Kinney Møller Center, 2022). Asset management, which involves buying and selling ships at a profit, plays an important role in the industry (Ibid.).

¹⁸ Prediction from the University Maritime Advisory Services (UMAS) and COP26 Climate Champions (Osterkamp et al., 2021)

However, the current volatility of the macroeconomic environment may have a substantial impact on the costs required of decarbonization. As such, during volatile and uncertain times in the economy, ship owners and ship builders may be unwilling to invest – especially a period of economic downturn.

One interesting point regarding economies, and the complex nature of many stakeholders involved in the decarbonization process, is that the shipping industry must consider how the impact on transport costs may disproportionately affect the economies of developing countries that have less tolerance for a subsequent price increase (Ibid.).

This brings up the question of whether customers in nations with less developed economies can afford to actively participate in the premium-nature of green shipping, leading to a negative effect on adoption.

6.3.3 Social

Sustainability and environmental conservation has emerged as a global imperative and has solidified itself into the global consciousness. Globally, 67 percent of people consider climate change and biodiversity loss as the premier challenge over the next decade (Mærsk Mc-Kinney Møller Center, 2021b). This seems to imply customer's willingness to pay the immanent "green premium" in carbon neutral shipping. However, this issue is more complex.

An analysis on customers with positive attitudes towards sustainability revealed that only around 10 percent of maritime consumers acted on their willingness to pay a low premium (Ibid.). This gap on intention versus action may further add to companies and their unwillingness to invest in green fuels. Is demand for green shipping truly high, or is it "lip service"?

Based on the average shipping customer's consumer preferences, and weighted industry averages, there is an expectation that 20 percent of customers will be willing to pay an additional premium of 5 percent for green shipping (Table 1) (Mærsk Mc-Kinney Møller Center, 2021a). By 2050, it is expected that 35 percent of customers will be willing to pay a premium of 8 percent (Ibid.).

Table 1: Current industry expectations and willingness to pay green premiums (%)

Weighted Industry Averages	2020	2030	2040	2050
Path We Are On				
Customers paying a premium on the global ton-miles transported	10%	20%	25%	35%
Premium paid	2%	5%	7%	8%

Source: Own creation based on Mærsk Mc-Kinney Møller Center (2021a, p. 58)

An additional survey conducted by Boston Consulting Group (BCG) corroborates the average customers' current willingness to pay of a 2 percent premium (Jameson et al., 2021). However, "findings also estimate that a premium of 10 to 15 percent over current rates would be needed to fund the industry's transition to net-zero emissions by 2050" (Ibid.). The uncertainty in customers' willingness to pay can have a significant impact on pricing structures implemented by maritime shipping companies.

6.3.4 Technology

With the risk-averse nature of the maritime shipping industry comes their hesitancy around new technologies. Typically, energy efficiency investments are only implemented if payback periods are less than five years (Mærsk Mc-Kinney Møller Center, 2022).

Of course, the end-goal of carbon neutrality may make that rule an exception unless governments and regulatory agencies step in to advance technological development. However, pressure towards shipping companies to swiftly decarbonize still continues to build.

Generally speaking, ship owners demand full-scale demonstrations before new technologies are widely adopted, which slows uptake rates (Mærsk Mc-Kinney Møller Center, 2022). Moreover, building carbon neutral ships adds complexity to ship builders and ship owners due to the various "push and pull" demands of a multitude of stakeholders (Ibid.). On top of complexity, uncertainty surrounding costs and ship design can hinder the rate of adoption to a company's current fleet.

As the technology regarding green fuel sources is still immature, companies are opting for a dual fuel engine setup, capable of running on conventional low Sulphur fuel and, in Maersk's case, methanol

(A.P. Møller – Mærsk A/S, 2021b). Vessels fitted with dual fuel engines are currently 10 to 15 percent more expensive than conventional vessels¹⁹.

However, as it stands, the inclusion of new technologies will lead to increases in costs and adds uncertainty towards payback periods. On top of that, green fuel costs are volatile due to the uncertainties in sufficient sources, which further exacerbates the uncertain payback period (Ibid.). In terms of green fuel sources – while there are many in consideration, large amounts of R&D is still required in order to increase viability²⁰.

On top of that, a significant ramp up in production and an acceleration of the maturity of supply chains for green fuel sources must be experienced (A.P. Møller – Mærsk A/S, 2021b). However, scalability of supply chains depend on proven and mature technologies, and the uncertainty on the viability of green fuels increases risk moving forward (Mærsk Mc-Kinney Møller Center, 2022).

Specifically for green methanol, cost of production is expected to decrease over time. However, this is simply an assumption from the International Renewable Energy Agency (IRENA), which has projected methanol cost reductions based on the reductions of solar and wind power (IRENA, 2016).

Current production costs of green methanol are estimated to range from USD 800 to 2400 per ton. IRENA foresees the range to drop to between USD 250 to 630 per ton by 2050 (Ibid.). Presently, the technology is too immature to predict cost reductions without large amounts of certainty.

6.4 Maersk, Their Big Dream, and How to Achieve it

Explained by the Chairman of Maersk, Jim Hagemann Snabe, in his TED talk about Maersk's dream of a decarbonized future, a big and almost incomprehensible dream is necessary in transforming an industry.

In fact, that is what true leadership is all about; dreams that can inspire the pursuit of the seemingly impossible. However, just as important to a dream are the details. Without this, a dream will remain a dream.

¹⁹ A.P. Møller – Maersk. (2022). A.P. Møller - Maersk accelerates fleet decarbonisation with 8 large ocean-going vessels to operate on carbon neutral methanol [Press release]. <https://www.maersk.com/news/articles/2021/08/24/maersk-accelerates-fleet-decarbonisation>

²⁰ International Chamber of Shipping. (2020). ICS report reveals scale of challenge to decarbonise shipping [Press release]. <https://www.ics-shipping.org/press-release/icsreport-reveals-scale-of-challenge-to-decarbonise-shipping/>

In this section, the details that have gone behind Maersk's dream will be discussed. First, the birth of this dream is presented, discussing Maersk's previous initiatives and the pressures faced to decarbonize through an institutional theory. Second, Maersk's agile strategy is looked at, which will enable the company to act swiftly. Last, measures Maersk has taken in order to eliminate VUCA conditions clouding their pathway are discussed.

6.4.1 The Birth of a Dream

Even before the introduction of a green fleet, corporate sustainability has always been one of Maersk's priorities. In fact, from 2008 to 2018, Maersk had achieved more than a 40 percent reduction in GHG emissions per container moved (A.P. Møller – Mærsk A/S, 2021b). This was done by building bigger vessels, capable of carrying more TEU's per trip, and by slow-steaming, which means burning less fuel by sailing at slower speeds.

However, due to the ambitious targets set forth by the Paris Agreement, these abatement measures simply would not cut it. A much more drastic form of abatement was needed. Looking at the Paris Agreement from an institutional theory standpoint, it can be said that Maersk's big dream was accelerated through coercive pressure.

As mentioned in Chapter 5.5.2, coercive pressure is exerted on an organization by external stakeholders, such as government authorities and regulatory bodies (Roxas & Coetzer, 2012). This has been proven to have a positive impact on a firm's emission reduction initiatives (Lewandowski, 2017), and is arguably well-suited for a first-mover, such as Maersk, as they are already positioned to swiftly respond to this pressure.

Maersk had a constructive reaction towards this coercive pressure, ultimately re-shaping their strategy to match the dynamism of the environment, and combat the uncertainties and complexities, of reaching carbon neutrality.

This reshaped strategy can be seen, and justified, through Buckley & Casson's (2001) rational action approach as it contains elements of long-term perspectives and operates within uncertain environments.

Additionally, information needed to be collected in the most efficient and reliable manner (MMMCZCS), and irreversible commitments of resources (CAPEX), has determined which short-term decisions were taken. Lastly, this strategy involved cooperation with internal and external actors.

6.4.2 Maersk and Strategic Agility

Although a sound strategy, In order to meet the targets set forth by the Paris Agreement, and their self-imposed goals, a new and more agile approach was necessary. Mentioned earlier, this quote from Weber & Tarba (2014, p. 7) reiterates the logic behind a more agile strategy:

“Strategic agility is the ability of management [or an organization] to constantly and rapidly sense and response to a changing environment by intentionally making strategic moves and consequently adapting the necessary organizational configuration for successful implementation.”

Seen in the quote, an agile strategy would be beneficial in a dynamic environment. Although not made explicit, Maersk’s adoption of this ethos can be seen through various strategic moves explained throughout this section. Furthermore, it is argued that an agile strategy is highly beneficial when VUCA conditions are present (Bennett & Lemoine, 2014).

Put simply, strategic agility can be described as a firm’s ability to form strong commitments, but also remaining nimble enough to adapt (Ivory & Brooks, 2018). By proclaiming a clear and concise commitment to carbon neutrality by 2040, and other milestones along there pathway (see Figure 10), the company established a direction and aspiration for the organization, which will lead to motivation behind a collective cause.

Additionally, through a collective cause, Junni et al. (2015) would argue that Maersk established the existence of a common ground, common interest, and empathy and trust in order to increase engagement throughout.

In other words, Maersk has utilized Y. L. Doz & Kosonen's (2010) meta-capability of collective commitment. This collective commitment is the first step in combatting any inter-company uncertainty regarding Maersk’s future. This lack of inter-company uncertainty will lead to minimal

organizational resistance towards transformative decisions along the strategy planning process, which is necessary in the face of fast-approaching targets.

Another meta-capability necessary to achieve strategic agility is strategic sensitivity. Strategic sensitivity is the ability to gather and integrate knowledge, acting as a catalyst towards an organization's pursuit of continuous strategic development and innovation (Junni et al., 2015; Wilson & Doz, 2011). This allows for the identification of new business models and opportunities (Ibid.).

In order to gather the necessary knowledge in decarbonization, and to ultimately find a solution beneficial to Maersk, the company's main shareholder – the A.P. Møller Foundation – donated DKK 400 million to create a global center for zero carbon shipping.

This center, referred to in this paper as MMMCZCS, brings together companies and specialists from all over the world, across multiple industries, in order to research and develop solutions towards carbon neutrality.

This enables Maersk to stamp out uncertainties, complexities, and other VUCA symptoms that riddle the path towards carbon neutrality. This is done so by increasing the depth and breadth of the organization's knowledge through the research and development initiatives of the MMMCZCS. This can be seen as a form of "sense-making" (Ivory & Brooks, 2018).

Moreover, the knowledge-sharing aspect of the MMMCZCS allows Maersk to have a deep involvement with the maritime shipping industry ecosystem. As experts across many fields contribute to the MMMCZCS, Maersk is provided with external sources of relevant knowledge that allow for new perspectives and competencies, ultimately cutting down on VUCA conditions (Brueller et al., 2014). Even if uncertainty cannot fully be dispelled by information collection, the impact can be significantly lessened by narrowing the margin of error (van Tulder et al., 2021).

Gathering external competencies can be directly tied to D. J. Teece et al.'s (1997) concept of dynamic capabilities, which is a tool that enables companies in responding to changes within their business environment. As D. J. Teece et al. (1997, p. 516) describes, this concept is "the firm's ability to integrate, build and reconfigure internal and external competences to address rapidly changing environments".

The MMCZCS purpose is to help accelerate the transition through collaboration. Through partners (external competences), and their own knowledge (internal competences), the MMCZCS facilitates the development of feasible transition pathways (address rapid change), and to help materialize these pathways (integrate) (Mærsk Mc-Kinney Møller Center, 2021a).

Less than 3 years after the creation of the MMCZCS, Maersk has found their solution for their big dream coming in the form of green fuel. This leads to another implemented meta-capability – resource fluidity.

Resource fluidity is dual-faced in meaning. First, Ivory & Brooks (2018) argue that resource fluidity is seen through a swift mobilization and deployment of resources. This is necessary because even a wholehearted commitment will not become a reality without necessary resources (Y. Doz & Kosonen, 2008b). This swift mobilization of resources can be seen through the huge investment to fund the not-for-profit MMCZCS, and to erect the center in the same geographic location.

Moreover, resources fluidity can also refer to the reconfiguring of assets to match new business systems in order to capitalize on potential opportunities (Brueller et al., 2014; Y. Doz & Kosonen, 2008b). But how could Maersk reconfigure their existing 750 vessels running on traditional bunker fuel, with an average asset lifespan of 20 to 25 years, to match the present needs of carbon neutrality?

Rather than slowly replacing all 750 vessels, and creating a massive pile of waste, Maersk has decided to retrofit these existing vessels²¹ by adding a new dual-fuel combustion engine designed for green fuel (A.P. Møller – Mærsk A/S, 2021b).

This green fuel, namely green methanol, also shows agility and flexibility through its multiple uses, which has reach outside the maritime industry. If there is an excess of green fuel, Maersk states that this excess can be used across many different industries. So, rather than having the fuel sit in storage, Maersk would then have the opportunity to sell this green fuel. This combats one of the biggest and complex problems in renewable energy systems, which is storage.

²¹ On top of ordering new green vessels, which will slowly make their way into the fleet.

6.4.3 Combatting VUCA

By its nature, corporate sustainability is inherently complex and multifaceted (Hahn et al., 2014). Furthermore, the path to carbon neutrality is riddled with characteristics of VUCA, most notably uncertainty and complexity.

These characteristics can not only affect a firm's strategy, but it could influence organizations to unintentionally lag behind their peers in sustainability initiatives. However, as part of their strategy, Maersk has tried to combat the presence of VUCA through a few strategic actions.

First, by gaining new knowledge, the development of the MMMCZCS played a pivotal role in bringing to light to the "best" pathways for decarbonization. This has eliminated much uncertainty regarding the efficacy of potential green fuels, and has led Maersk to confidently rely on green methanol as their main alternative fuel source for the foreseeable future.

However, uncertainty still remains about the supply. As previously mentioned, the current production of methanol only creates roughly 30,000 tons annually. This will need to increase to 500,000 tons in 2024 just to operate the 13 ordered vessels. However, the complex nature of production is beyond Maersk's scope.

Strategic Partnerships

Therefore, in March 2022, Maersk had announced six strategic partnerships in the production of green methanol for their fleet. These six partnerships will be able to produce at least 730,000 tons of green methanol by 2025, split between e-methanol and bio-methanol. This can be seen below in Table 2.

Table 2: Overview of strategic partnerships and production capacity

Strategic Partner	Type of fuel	Production capacity in 2024 (tons/year)	Production capacity in 2025 (tons/year)	Production capacity added after 2025 (tons/year)	Geography
CIMC ENRIC	bio-methanol	50,000		200,000	China
European Energy	e-methanol		2-300,000		North America, South America
GTB	bio-methanol	50,000		300,000	China
Ørsted	e-methanol		300,000		North America
Proman	bio-methanol, e-methanol		100,000		North America
WasteFuel	bio-methanol	30,000			South America
Total		130,000	6-700,000	500,000	

Source: Own creation based on Maersk Press Release²²

Moreover, Maersk is continuously looking for new partnerships that can add to the supply of green methanol. An example of such partnership can be seen through fellow Danish company, Ørsted, and their “Green Fuels for Denmark” project.

This project “brings together leading Danish companies representing the demand and supply side of sustainable e-fuels behind a vision to establish an ambitious sustainable fuels production facility” (Korsgaard, 2022). The project will be locally based, and is led by a consortium consisting of Ørsted, Maersk, and Copenhagen Airports, to name a few (Ibid.).

Maersk and their strategic partnerships, in the pursuit of a common and compatible goal. These organizations rely on sharing and exchanging resources, which is a form of cooperation (Albers et al., 2016). More specifically, it is a form of strategic alliance, as seen through the voluntary and symbiotic

²² A.P. Møller – Maersk. (2022). *A.P. Møller - Maersk engages in strategic partnerships across the globe to scale green methanol production by 2025*. [Press release]. <https://www.maersk.com/news/articles/2022/03/10/maersk-engages-in-strategic-partnerships-to-scale-green-methanol-production>

nature in developing green methanol, which may have positive implications for capturing rent-building resources – whether tangible or intangible (Grant, 2018).

Furthermore, by having a diversified range of partners, Maersk's reduces reliance on a single company, which therefore reduces risks and uncertainties in fuel production, while also adding complementary strengths to the firm (Hoang & Rothaermel, 2016).

Green Finance Framework

In the coming years, the volatile global economic situation will have a huge effect on Maersk and their ability to finance the transition towards zero-carbon shipping. This naturally increases the potential VUCA conditions faced, which can have a significant impact on financing their big dream.

Currently, the production of alternate fuels is roughly 2 to 8 times costlier than the price of fossil fuels (Mærsk Mc-Kinney Møller Center, 2021a). Although this can eventually be brought down through economies of scale, decarbonizing Maersk could require a USD 2 trillion investment in green fuel production facilities between now and 2050 (Lin, 2022). This number was estimated by Morten Bo Christiansen, a senior executive at Maersk, during the company's 2022 ESG day.

This figure was derived from the required investment to decarbonize Maersk's fuel supply usage; to eliminate GHG emissions from their fleet, Christiansen stated an investment of USD 100 billion would be needed to construct production facilities capable of an output of 20 million metric tons per year of green fuels, which is Maersk's annual consumption (Ibid.).

Additionally, there is a 10 to 15 percent premium on producing Maersk's new dual-fuel ships. Maersk has therefore estimated an additional USD 1.5 billion in capital expenditure (CAPEX) for green vessel investments are needed between 2022 and 2025 (Ibid.).

Furthermore, an extra USD 5 billion in CAPEX is necessary in order to reach their 2030 target of a 60 percent reduction in GHG emissions compared to 2008 levels (Ibid). By 2025, Maersk's CAPEX will already have increased by 10 percent.

To combat VUCA – most notably volatility and uncertainties – surrounding the financing their green transition, Maersk has launched their Green Finance Framework (GFF) in November 2021. The GFF's

purpose is to align their decarbonization strategy and finances, as seen in the quote by Maersk Chief Financial Officer, Patrick Jany, in a 2021 press release²³:

Issuing Green Financing Instruments is a further step to integrating sustainability into our financing operations as it is an effective tool for channeling investments to projects with positive environmental impact and thereby contributing to the achievement of the UN Sustainable Development Goals (SDGs) and the Paris Agreement.

The first instrument in the GFF is a 10-year, EUR 500 million Green bond, which will support the funding of Maersk's incoming green vessels. With additional hopes of diversifying their investor base, and increase transparency, the bond was a huge success.

The bond's positive reception led to a final booking value of EUR 3.7 billion, priced at a coupon rate of 0.75 percent, which is the lowest cost of debt realized by the company²⁴. Ultimately, the GFF will give financial stability even in the economy's potential choppy waters.

ECO-Delivery

Maersk also faces uncertainties in their customer's willingness to pay for decarbonized shipping (see Chapter 6.3.3). It is a simple fact that carbon neutral shipping is, at this stage, more expensive than normal shipping. However, Maersk is adamant that customer demand is one of the driving forces behind the acceleration of their decarbonization targets (A.P. Møller – Mærsk A/S, 2021b).

To test their hypothesis and eliminate uncertainties, Maersk launched a shipping product named ECO Delivery in 2019. Maersk ECO Delivery is an offering for ocean transport customers that uses green fuels (e.g., biodiesel), rather than conventional fossil fuels (Ibid.).

Since its launch, customer demand has grown more than 170 percent year-on-year (Ibid). Moreover, Maersk expects the growth in ECO Delivery sales to continue to grow at equally significant levels (Ibid.).

²³ A.P. Møller – Maersk. (2021). Maersk issues first green bond to fund first green methanol vessels. [Press release]. <https://www.maersk.com/news/articles/2021/11/19/maerskissues-first-green-bond-to-fund-first-green-methanol-vessels>

²⁴ Ibid.

This form of product-testing acted as a soft-launch for the eventual release of a full-scale carbon neutral offering. Furthermore, ECO Delivery saw an uptake in larger clients, such as H&M Group and Visy, which has shown willingness to pay amongst larger players in the industry. With its success, uncertainties regarding carbon neutrality offerings are surely diminished.

Lastly, ECO Delivery has potentially eliminated a customer's uncertainty towards willingness to pay. Even though green fuel is 2 to 3 times more expensive than conventional fossil fuels, the bottom line barely gets affected. For example, a pair of sneakers transported from Asia to the US or Europe would only cost the customer USD 5 cents more than traditional transportation methods.

7. Conclusions

The main purpose of this thesis has been to explore theoretical concepts through the method of a case study, and apply these concepts to real-life examples. More specifically, this thesis set out to analyze Maersk's decision to decarbonize by dissecting the firm's strategic moves, and applying theoretical knowledge gained from the Literature Review.

Additionally, this paper aimed to give shine to certain theories regarding strategy process, strategic agility, VUCA conditions, and corporate sustainability, all through a maritime shipping lens.

By reviewing past works of academics, and applying their theories and stances, this paper hoped to contribute to the existing literature. Ultimately, this would enable an answer to the research question, and sub-questions.

Therefore, this paper finds that strategic leaps under high-VUCA conditions can potentially be successful, and are also a necessary catalyst in accelerating hard-to-abate transformations. To achieve carbon neutrality, VUCA conditions will always be present.

However, through the help of coercive pressures imposed by governments and regulatory bodies, companies need to aggressively reconfigure their strategy to match the environment in which they operate within. This aggressive reconfiguration comes in the form of strategic agility, which literature argues is the most successful approach to corporate sustainability.

This is backed up by Heugens & Lander's (2009) stance that organizations who adapt themselves to match environmental change will consistently perform at a higher level. Additionally, firms that maintain past processes and structures amidst changing environments underperform.

In order to adapt to environmental change, and to reduce VUCA conditions, companies need to obtain adequate information that can illuminate their path to carbon neutrality through elements found within strategic agility.

Obtaining adequate information can come in the form of structurally devoting resources to "boundary-spanning activities: moving beyond existing networks, data sources, and analysis

processes to gather information from new partners” with differing perspectives and competencies (Bennett & Lemoine, 2014).

Maersk has shown this by committing resources towards the conception of the MMMCZCS. The MMMCZCS will aid not only Maersk, but the industry as a whole, when it comes to obtaining the knowledge needed for such strategic leaps. Furthermore, Maersk has shown agility and flexibility in their resources, as current ships will now be retrofitted to adapt to environmental needs.

Moreover, researchers believe uncertainty is a chance to differentiate and potentially stray away from competition in a favorable manner (Hemingway & Marquart, 2013). This is seen through Maersk’s commitment to green methanol as opposed to the widely adopted, LNG. Maersk can be seen as a first-mover in green methanol, which will further solidify their industry leadership. This paper showcases Maersk’s leadership in the path towards carbon neutrality.

7.1 Limitations

This paper acknowledges a few limitations effecting the quality of this paper. First and foremost, is the lack of interviews. With no interviews, this paper’s primary-source information get negatively affected. Interviews are a great way in backing up points made throughout, but thankfully, public quotes from key executives or managers within Maersk were obtained and used.

Furthermore, many assumptions regarding Maersk’s future success are made. Of course, it is impossible to predict the future success of the company. However, due to Maersk’s recent performance, historical reputation, and sound management, this paper assume future success through analyzing the organization’s strategy towards decarbonization.

Lastly, assumptions were also made on whether or not Maersk truly is following an agile strategy. With no public records stating so, interviews would be beneficial in corroborating my assumptions. However, the application of knowledge and theories gained from the Literature Review was necessary in attempting to answer the research question, plus sub-questions, and in moving the paper forward.

8. Bibliography

- A.P. Møller – Mærsk A/S. (2021a). *2021 Annual Report*.
https://doi.org/10.1163/9789004502796_037
- A.P. Møller – Mærsk A/S. (2021b). *2021 Sustainability Report*.
- A.P. Møller – Mærsk A/S. (2021c). *Maersk ESG data overview 2021*.
- Albers, S., Wohlgezogen, F., & Zajac, E. J. (2016). Strategic Alliance Structures: An Organization Design perspective. *Journal of Management*, 42(3).
- Alvarez, S. A., & Barney, J. B. (2005). How do entrepreneurs organize firms under conditions of uncertainty? *Journal of Management*, 31(5), 776–793.
<https://doi.org/10.1177/0149206305279486>
- Ansoff, H. I. (1965). *Corporate strategy: An analytical approach to business policy for growth and expansion*. New York: McGraw Hill.
- Ansoff, H. I. (1980). Strategic Issue Management. *Strategic Issue Management*, 1(2), 131–148.
<https://www.jstor.org/stable/2486096>
- Balogun, J., & Johnson, G. (2004). Organizational restructuring and middle manager sensemaking. *Academy of Management Journal*, 47(4), 523–549.
<https://doi.org/10.2307/20159600>
- Bansal, P. (2005). Evolving sustainably: A longitudinal study of corporate sustainable development. *Strategic Management Journal*, 26(3), 197–218.
<https://doi.org/10.1002/smj.441>
- Bansal, P., & Roth, K. (2000). Why Companies Go Green: A Model of Ecological Responsiveness. *Academy of Management Journal*, 43(4), 717–736.
- Baran, B. E., & Woznyj, H. M. (2021). Managing VUCA: The human dynamics of agility. *Organizational Dynamics*, 50(2), 100787. <https://doi.org/10.1016/j.orgdyn.2020.100787>
- Barney, J. B. (1995). Looking inside for competitive advantage. *Academy of Management Perspectives*, 9(4), 49–61.
- Bell, E., Bryman, A., & Harley, B. (2019). *Business research methods* (Fifth).
- Bennett, N., & Lemoine, G. J. (2014). What a difference a word makes: Understanding threats to performance in a VUCA world. *Business Horizons*, 57(3), 311–317.
<https://doi.org/10.1016/j.bushor.2014.01.001>

- Bourgeois, L. J. (1981). On the Measurement of Organizational Slack. *The Academy of Management Review*, 6(1), 29–39.
- Bower, J. L. (1970). *Managing the resource allocation process a study of corporate planning and investment*.
- Brueller, N. N., Carmeli, A., & Drori, I. (2014). How do different types of mergers and acquisitions facilitate strategic agility? *California Management Review*, 56(3), 39–57.
- Buckley, P., & Casson, M. (2001). Strategic Complexity in International Business. *Oxford Handbook of International Business*, 88–126.
- Burgelman, R. A. (1983). A Model of the Interaction of Strategic Behavior, Corporate Context, and the Concept of Strategy. *Academy of Management Review*, 8(1), 61–70.
<https://doi.org/10.5465/amr.1983.4287661>
- Burgelman, R. A., Floyd, S. W., Laamanen, T., Mantere, S., Vaara, E., & Whittington, R. (2018). Strategy processes and practices: Dialogues and intersections. *Strategic Management Journal*, 39(3), 531–558. <https://doi.org/10.1002/smj.2741>
- Buyse, K., & Verbeke, A. (2003). Proactive environmental strategies: a stakeholder management perspective. *Strategic Management Journal*, 24(5), 453–470.
- Celly, K., Spekman, R., & Kamauff, J. (1999). Technological Uncertainty, Buyer Preferences and Supplier Assurances: An Examination of Pacific Rim Purchasing Arrangements. *Journal of International Business Studies*, 30(2), 297–316.
- Chakravarthy, B., & Doz, Y. (1992). Strategy Process Research: Focusing on Corporate Self-Renewal. *Strategic Management Journal*, 13, 5–14.
- Chen, J. M. (2021). Carbon neutrality: Toward a sustainable future. *The Innovation*, 2(3), 100127. <https://doi.org/10.1016/j.xinn.2021.100127>
- Cheng, J. L. C., & Kesner, I. F. (1997). Organizational Slack and Response to Environmental Shifts: The Impact of Resource Allocation Patterns. *Journal of Management*, 23(1), 1–18.
- Chermack, T. J. (2011). *Scenario planning in organizations: How to create, use and assess scenarios*. Berrett-Koehler.
- Chitambo, L., Tingbani, I., Agyapong, G. A., Gyapong, E., & Damoah, I. S. (2020). Corporate voluntary greenhouse gas reporting: Stakeholder pressure and the mediating role of the chief executive officer. *Business Strategy and the Environment*, 29(4), 1666–1683.

- Costanzo, L. A., & MacKay, R. B. (2009). *Handbook of research on strategy and foresight*.
- Deloitte. (2020). *Decarbonising Shipping: All Hands on Deck*.
https://www.shell.com/promos/energy-and-innovation/decarbonising-shipping-setting-shells-course/_jcr_content.stream/1601385103966/709d83f692075a4f1880104fc5cc466168e8a26a/decarbonising-shipping-setting-shells-course.pdf
- Dhanda, K. K., Sarkis, J., & Dhavale, D. (2022). Institutional and stakeholder effects on carbon mitigation strategies. *Business Strategy and the Environment*, 31(3), 782–795.
- Diamond, C. (1996). *Environmental Management System Demonstration Project Final Report*. December.
- Dierickx, I., & Cool, K. (1989). Asset stock accumulation and sustainability of competitive advantage. *Management Science*, 35(12), 1504–1514.
- DiMaggio, P. J., & Powell, W. W. (1983). The Iron Cage Revisted: Institutional Isomorphism and Collective Rationality in Organizational Fields. *American Sociological Review*, 48(2), 147–160.
- Doheny, M., Nagali, V., & Weig, F. (2012). *Agile operations for volatile times*. McKinsey Quarterly.
- Doz, Y., & Kosonen, M. (2008a). *How Strategic Agility Will Help You Stay Ahead of the Game*. Wharton School Publishing.
- Doz, Y., & Kosonen, M. (2008b). The Dynamics of Strategic Agility: Nokia’s Rollercoaster Experience. *California Management Review*, 50(3), 95–118.
- Doz, Y. L., & Kosonen, M. (2010). Embedding strategic agility: A leadership agenda for accelerating business model renewal. *Long Range Planning*, 43(2–3), 370–382.
<https://doi.org/10.1016/j.lrp.2009.07.006>
- Doz, Y. L., & Kosonen, M. (2011). Nokia and strategic agility: A postscript. *California Management Review*, 53(4), 154–156.
- Dutton, J. E., & Jackson, S. E. (1987). Categorizing Strategic Issues: Links to Organizational Action. *Academy of Management Review*, 12(1), 76–90.
<https://doi.org/10.5465/amr.1987.4306483>
- Frank, D. J., Hironaka, A., & Schofer, E. (2000). The nation-state and the natural environment over the twentieth century. *American Sociological Review*, 56, 96–116.

- Grant, R. M. (1991). The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation. *California Management Review*, 33(3), 114–135.
- Grant, R. M. (2018). *Contemporary Strategy Analysis* (10th ed.). Wiley.
- Hahn, T., Preuss, L., Pinkse, J., & Figge, F. (2014). Cognitive frames in corporate sustainability: Managerial sensemaking with paradoxical and business case frames. *Academy of Management Review*, 39(4), 463–487. <https://doi.org/10.5465/amr.2012.0341>
- Hamel, G., & Prahalad, C. K. (1989). Strategic intent. *Harvard Business Review*. <https://doi.org/10.4324/9780080561219-14>
- Haque, F., & Ntim, C. G. (2020). Executive Compensation, Sustainable Compensation Policy, Carbon Performance and Market Value. *British Journal of Management*, 31(3), 525–546. <https://doi.org/10.1111/1467-8551.12395>
- Hart, S. L., & Ahuja, G. (1996). Does it pay to be green? An empirical examination of the relationship between pollution prevention and firm performance. *Business Strategy and the Environment*, 5, 30–37.
- Hemingway, A., & Marquart, J. (2013). *Unvertainty is opportunity: Engage with purpose*. Edelman.
- Hendry, J., & Seidl, D. (2003). The structure and significance of strategic episodes: Social systems theory and the routine practices of strategic change. *Journal of Management Studies*, 40(1), 175–196. <https://doi.org/10.1111/1467-6486.00008>
- Heugens, P. P. M. A. R., & Lander, M. W. (2009). Structure! Agency! (And Other Quarrels) - a meta analysis of institutional theories of organizations.pdf. *Academy of Management Journal*, 52(1), 61–85.
- Hoang, H., & Rothaermel, F. T. (2016). How to Manage Alliances Strategically. Why do so many strategic alliances underperform - and what can companies do about it. *MIT Sloan Management Review*, 58(1).
- Hoffman, A. J. (1999). Institutional evolution and change: environmentalism and the U.S. chemical industry. *Academy of Management Journal*, 42(4), 351–371.
- Hoffman, N. P. (2000). An examination of the “sustainable competitive advantage” concept: Past, present and future. *Academy of Marketing Science Review*, 20(1–25).
- Hoque, Z. (2004). A contingency model of the association between strategy, environmental uncertainty and performance measurement: Impact on organizational performance.

- International Business Review*, 13(4), 485–502.
<https://doi.org/10.1016/j.ibusrev.2004.04.003>
- IMO. (2020). Fourth IMO GHG Study 2020 Full Report. In *Angewandte Chemie International Edition* (Vol. 6, Issue 11).
- IRENA. (2016). Innovation Outlook: Renewable Mini-Grids. In
 /publications/2016/Sep/Innovation-Outlook-Renewable-mini-grids.
 /publications/2016/Sep/Innovation-Outlook-Renewable-mini-grids%0Ahttp://www.irena.org/
- Ivory, S. B., & Brooks, S. B. (2018). Managing Corporate Sustainability with a Paradoxical Lens: Lessons from Strategic Agility. *Journal of Business Ethics*, 148(2), 347–361.
<https://doi.org/10.1007/s10551-017-3583-6>
- Jameson, P., Egloff, C., Sanders, U., Krogsgaard, M., Burke, D., Tan, M., Hegnsholt, E., & Nyheim, E. (2021). *Global Shipping's Net-Zero Transformation Challenge*. Boston Consulting Group.
<https://www.bcg.com/publications/2021/global-zero-carbon-shipping-transformation-challenge>
- Johnson, G., Prashantham, S., Floyd, S. W., & Bourque, N. (2010). The Ritualization of strategy workshops. *Organization Studies*, 31(12), 1589–1618.
<https://doi.org/10.1177/0170840610376146>
- Josephs, J. (2021). *Climate change: Shipping industry calls for new global carbon tax*. BBC.
<https://www.bbc.com/news/business-56835352>
- Joung, T. H., Kang, S. G., Lee, J. K., & Ahn, J. (2020). The IMO initial strategy for reducing Greenhouse Gas(GHG) emissions, and its follow-up actions towards 2050. *Journal of International Maritime Safety, Environmental Affairs, and Shipping*, 4(1), 1–7.
<https://doi.org/10.1080/25725084.2019.1707938>
- Junni, P., Sarala, R. M., Tarba, S. T., & Weber, Y. (2015). The role of strategic agility in acquisitions. *British Journal of Management*, 26, 596–616.
- Ketokivi, M., & Matere, S. (2010). Two Strategies for Inductive Reasoning in Organizational Research. *The Academy of Management Review*, 35(2), 315–333.
- Klassen, R. D., & Whybark, D. C. (1999). The impact of environmental technologies on manufacturing performance. *Academy of Management Journal*, 42(6), 599–615.
<https://doi.org/10.2307/256982>

- Korsgaard, M. (2022). *Green Fuels for Denmark receives Danish IPCEI funding*. Ørsted. <https://orsted.com/en/media/newsroom/news/2022/12/13666863#:~:text='Green Fuels for Denmark' is Denmark's leading Power-to,the decarbonisation of heavy transport.>
- Lechner, C., Frankenberger, K., & Floyd, S. (2010). Task contingencies in the curvilinear relationships between intergroup networks and initiative performance. *Academy of Management Journal*, 53(4), 865–889. <https://doi.org/10.5465/amj.2010.52814620>
- Leonard-Barton, D. (1998). *Wellsprings of knowledge: building and sustaining the sources of innovation*.
- Levinthal, D. A., & March, J. G. (1981). A model of adaptive organizational search. *Journal of Economic Behavior & Organization*, 2(4), 307–333.
- Lewandowski, S. (2017). Corporate Carbon and Financial Performance: The Role of Emission Reductions. *Business Strategy and the Environment*, 26(8), 1196–1211.
- Lewis, M. W., Andriopoulos, C., & Smith, W. K. (2014). Paradoxical leadership to enable strategic agility. *California Management Review*, 56(3), 58–77.
- Liesch, P. W., Welch, L. S., & Buckley, P. J. (2011). Risk and Uncertainty in Internationalisation and International Entrepreneurship Studies: Review and Conceptual Development. *Management International Review*, 51(6), 851–873. <https://doi.org/10.1007/s11575-011-0107-y>
- Lin, M. (2022). *Maritime decarbonization requires \$2 trillion spending on green fuels: Maersk*. S&P Global Commodity Insights. <https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/energy-transition/112222-maritime-decarbonization-requires-2-trillion-spending-on-green-fuels-maersk>
- Liu, F., & Maitlis, S. (2014). Emotional Dynamics and Strategizing Processes: A Study of Strategic Conversations in Top Team Meetings. *Journal of Management Studies*, 51(2), 202–234. <https://doi.org/10.1111/j.1467-6486.2012.01087.x>
- Mærsk Mc-Kinney Møller Center. (2021a). *We show the world it is possible: Industry Transition Strategy*. October.
- Mærsk Mc-Kinney Møller Center. (2021b). *What will it take to decarbonize global shipping?* November. <https://cms.zerocarbonshipping.com/media/uploads/documents/Five-Critical-Levers-that-make-a-Difference.pdf>

- Mærsk Mc-Kinney Møller Center. (2022). *Maritime Decarbonization Strategy 2022*.
- Matanda, M. J., & Freeman, S. (2009). Effect of perceived environmental uncertainty on exporter-importer inter-organisational relationships and export performance improvement. *International Business Review*, 18(1), 89–107. <https://doi.org/10.1016/j.ibusrev.2008.12.004>
- Melnikovas, A. (2018). Towards an explicit research methodology: Adapting research onion model for futures studies. *Journal of Futures Studies*, 23(2), 29–44. [https://doi.org/10.6531/JFS.201812_23\(2\).0003](https://doi.org/10.6531/JFS.201812_23(2).0003)
- Miller, K. D. (2007). Risk and rationality in entrepreneurial processes. *Strategic Entrepreneurship Journal*, 1–2, 57–74. <https://doi.org/10.1002/sej>
- Mintzberg, H., & McHugh, A. (1985). Strategy formation in an adhocracy. *Administrative Science Quarterly*, 30(2), 160–197. <https://doi.org/10.2307/2393104>
- Mintzberg, Henry. (1978). Patterns in Strategy Formation. *Management Science*, 24(9), 934–948.
- Mintzberg, Henry. (1994). *The rise and fall of strategic planning*.
- Neugebauer, F., Figge, F., & Hahn, T. (2016). Planned or Emergent Strategy Making? Exploring the Formation of Corporate Sustainability Strategies. *Business Strategy and the Environment*, 25(5), 323–336. <https://doi.org/10.1002/bse.1875>
- Nguyen, Q., Kim, T., & Papanastassiou, M. (2018). Policy uncertainty, derivatives use, and firm-level FDI. In *Journal of International Business Studies* (Vol. 49, Issue 1). Palgrave Macmillan UK. <https://doi.org/10.1057/s41267-017-0090-z>
- Okhmatovskiy, I., & David, R. J. (2012). Setting your own standards: Internal corporate governance codes as a response to institutional pressure. *Organization Science*, 23(1), 155–176. <https://doi.org/10.1287/orsc.1100.0642>
- Oliver, C. (1991). Strategic Responses to Institutional Processes. *The Academy of Management Review*, 16(1), 145–179.
- Osterkamp, P., Smith, T., & Søgaaard, K. (2021). *Five percent zero emission fuels by 2030 needed for Paris-aligned shipping decarbonization*. March, 6. <https://www.globalmaritimeforum.org/news/five-percent-zero-emission-fuels-by-2030-needed-for-paris-aligned-shipping-decarbonization>
- Peteraf, M. (1993). The cornerstones of competitive advantage: a resource-based view.

- Strategic Management Journal*, 14(3), 179–191.
- Pettigrew, A. M. (1992). The Character and Significance of Strategy Process Research. *Strategic Management Journal*, 13, 5–16.
- Placek, M. (2022). *Leading Container Ship Operators*. Statista.
- Porter, M. E. (1991). Towards a Dynamic Theory of Strategy. *Strategic Management Journal*, 12, 95–117. <http://www.jstor.org/stable/2486436>
- Porter, M., & van der Linde, C. (1995). Green and competitive: ending the stalemate. *Harvard Business Review*, 73(5), 120–134.
- Putnam, L. L., & Banghart, S. (2017). Interpretive Approaches. *The International Encyclopedia of Organizational Communication*, 1–17.
- Rivero, N. (2022a). *Maersk could push the entire shipping industry to move up its climate goals*. Quartz.
- Rivero, N. (2022b). *Maersk is no longer the world's largest shipping line*. Quartz.
- Rondinelli, D. A., & Berry, M. A. (2000). Environmental citizenship in multinational corporations: Social responsibility and sustainable development. *European Management Journal*, 18(1), 70–84. [https://doi.org/10.1016/S0263-2373\(99\)00070-5](https://doi.org/10.1016/S0263-2373(99)00070-5)
- Roxas, B., & Coetzer, A. (2012). Institutional environment, managerial attitudes and environmental sustainability orientation of small firms. *Journal of Business Ethics*, 111(4), 461–476.
- Russo, M., & Fouts, P. (1997). A Resource-Based Perspective on Corporate Environmental Performance and Profitability. *Academy of Management Journal*, 40(3), 534–559. <http://www.ghanaweb.com/GhanaHomePage/politics/STL-s-role-in-elections-EC-under-pressure-428089>
- Saunders, M. N. K., Lewis, P., & Thornhill, A. (2021). *Research methods for business students*. Pearson Education Limited.
- Schick, A., Hobson, P. R., & Ibsch, P. L. (2017). Conservation and sustainable development in a VUCA world: the need for a systemic and ecosystem-based approach. *Ecosystem Health and Sustainability*, 3(4). <https://doi.org/10.1002/ehs2.1267>
- Scott, W. R. (1987). The Adolescence of Institutional Theory. *Administrative Science Quarterly*, 32(4), 493–511.

- Sharma, S., & Vredenburg, H. (1998). Proactive corporate environmental strategy and the development of competitively valuable organizational capabilities. *Strategic Management Journal*, 19(8), 729–752.
- Sinclair, C., & Bucchioni, C. (2021). *FEATURE: Biomethanol offers renewable fuel alternative*. S&P Global Commodity Insights.
[https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/electric-power/042821-feature-biomethanol-offers-renewable-fuel-alternative#:~:text=Typically%2C biomethanol is produced from,CO2 captured from renewable sources.](https://www.spglobal.com/commodityinsights/en/market-insights/latest-news/electric-power/042821-feature-biomethanol-offers-renewable-fuel-alternative#:~:text=Typically%2C%20biomethanol%20is%20produced%20from,CO2%20captured%20from%20renewable%20sources.)
- Smith, T., Baresic, D., Fahnestock, J., Galbraith, C., Velandia Perico, C., Rojon, I., & Shaw, A. (2021). *A Strategy for the Transition to Zero-Emission Shipping*. <https://www.ummas.co.uk/wp-content/uploads/2021/10/Transition-Strategy-Report.pdf>
- Song, S. (2013). FDI Structure, Investment Specificity, and Multinationality Value under Host Market Uncertainty. *Management International Review*, 53(6), 795–817.
<https://doi.org/10.1007/s11575-013-0181-4>
- Sprenkel, D. C., & Busch, T. (2011). Stakeholder engagement and environmental strategy - the case of climate change. *Business Strategy and the Environment*, 20(6), 351–364.
- Stone, M., & Li, J. (2021). *Shipping and carbon zero: An interview with Bo Cerup-Simonsen*. McKinsey & Company.
- Suchman, M. C. (1995). Managing Legitimacy: Strategic and Institutional Approaches. *The Academy of Management Review*, 20(3), 571–610.
- Teece, D. J. (2018). Business models and dynamic capabilities. *Long Range Planning*, 51(1), 40–49.
- Teece, D. J., Pisano, G., & Shuen, A. (1997). Dynamic Capabilities and Strategic Management. *Strategic Management Journal*, 18(7), 509–533.
- Teece, D., & Leih, S. (2016). Uncertainty, innovation, and dynamic capabilities: An introduction. *California Management Review*, 58(4), 5–12. <https://doi.org/10.1525/cmr.2016.58.4.5>
- Tovstiga, G. (2013). *Strategy in Practice: A Practitioner's Guide to Strategic Thinking*.
- Tsoukas, H., & Shepherd, J. (2004). *Managing the Future: Foresight in the Knowledge Economy*.
- Tversky, A., & Kahneman, D. (1985). Judgement under uncertainty: heuristics and biases. *Science* 185.

- UNCTAD. (2021). Review of Maritime Report 2021. In *United Nations Publications*.
http://unctad.org/en/PublicationsLibrary/rmt2015_en.pdf
- United Nations Climate Change. (n.d.). *The Paris Agreement*. Retrieved December 13, 2022,
 from <https://unfccc.int/process-and-meetings/the-paris-agreement/the-paris-agreement>
- van Tulder, R., Verbeke, A., Jankowska, B., & Buckley, P. (2021). *International Business in a VUCA World: The Changing Role of States and Firms*. Emerald Publishing Limited.
- Vuori, T. O., & Huy, Q. N. (2016). Distributed Attention and Shared Emotions in the Innovation Process: How Nokia Lost the Smartphone Battle. *Administrative Science Quarterly*, 61(1), 9–51. <https://doi.org/10.1177/0001839215606951>
- Waddock, S. A., & Graves, S. B. (1997). The corporate social performance - financial performance link. *Strategic Management Journal*, 18(4), 303–319.
- Wade-Benzoni, K. A., Hoffman, A. J., Thompson, L. L., Moore, D. A., Gillespie, J. J., & Bazerman, M. H. (2002). Barriers to resolution in ideologically based negotiations: The role of values and institutions. *Academy of Management Review*, 27(1), 41–57.
<https://doi.org/10.5465/AMR.2002.5922336>
- Weber, Y., & Tarba, S. Y. (2014). Strategic agility: A state of the art introduction to the special section on strategic agility. *California Management Review*, 56(3), 5–12.
<https://doi.org/10.1525/cmr.2014.56.3.5>
- Werner, S., Brouthers, L. E., & Brouthers, K. (1996). International Risk and Perceived Environmental Uncertainty : The Dimensionality and Internal Consistency of Miller ' s Measure. *Journal of International Business Studies*, 27(3), 571–587.
- Wernerfelt, B. (1984). The resource based view of the firm. *Strategic Management Journal*, 5, 171–180.
- Whittington, R. (2003). The work of strategizing and organizing: for a practice perspective. *Strategic Organization*, 1, 117–125.
- Wilson, K., & Doz, Y. L. (2011). Agile innovation. *California Management Review*, 53, 6–26.
- Yin, R. K. (2009). *Case Study Research: Design and Methods*.
- Zahra, S. A., Sapienza, H. J., & Davidsson, P. (2006). Entrepreneurship and dynamic capabilities: A review, model and research agenda. *Journal of Management Studies*, 43(4), 917–955.
<https://doi.org/10.1111/j.1467-6486.2006.00616.x>

Zhang, A., Tay, H. L., Alvi, M. F., Wang, J. X., & Gong, Y. (2022). Carbon neutrality drivers and implications for firm performance and supply chain management. *Business Strategy and the Environment*, July, 1–15. <https://doi.org/10.1002/bse.3230>