Doctorate student:

Capt. Jetmund Runde

2022 - 2024

European Business University of Luxembourg

Doctor of Business Administration

DOCTORAL DISSERTATION

Impact of Autonomous Shipping on The Business Model of Commercial Shipping Companies

Authors Note

Dear Reader.

As the Author of this thesis, which is a Doctorate Dissertation called *Impact of Autonomous Shipping on the Business model of commercial shipping companies*, the thesis is a quantitative Research paper that discuss the challanges that may occure in the business models by implementing Autonomous ships to the industry.

I hope you enjoy reading the thesis as much as I enjoyed writing it.

Acknowledgement

My heartfelt sincere to my excellent supervisor, Dr. Mihaela Jucan, for all support and kind supervision. As to the administration staff of EBU, and my fellow students at EBU Doctor of Business Administration for endless discussion, good environment in virtual classes, and friendship.

As this thesis is dedicated to my beloved family, that have given me the opportunity to fulfil this study and given me the patience towards this thesis.

Abstract

With the rapid technological growth digital transformation has become one of the main aspects of business development. Digitalisation in business helps in ensuring that all business domains would be obligated to ensure that they are being able to engage in effective planning and overall operations which would allow them to improvise the operations well so as to achieve overall efficiency. The aim of the study is to analyse the impact of the autonomous shipping methods on the different aspect of commercial shipping companies' business model. In order to discuss the influence of commercial shipping on business the company has mainly tried to identify the relationship between commercial shipping with the value proposition, revenue generation, and competitive advantage and target customers. The literature review done in this paper also suggests that an autonomous ship is an entirely unmanned cargo transporter that operates independently using a fleet of sensors and AI algorithms.

In this study a survey questionnaire based primary research has been conducted, where participants were asked about what types of autonomous shipping system is being used, changes in value proposition, revenue generation, competitive advantage and target customers. Total 150 responses were randomly selected using sampling and the hypotheses are tested using the data analysis method. Through the statistical results the effects of autonomous shipping on value proposition, revenue generation, and competitive advantage and target customers have been found. The different impact of different methods of autonomous shipping system have been also explored and tested. It has been rightly identified that autonomous sipping impacts value proposition and competitive advantage to a greater extent.

Table of Contents

List of tables

List of figures

1 CHAPTER 1: INTRODUCTION

1.1 Overview

Digital transformations have now become a common part of the business and for this reason, it becomes effectively important to ensure that all business domains would be obligated to ensure that they are being able to engage in effective planning and overall operations which would allow them to improvise the operations well so as to achieve overall efficiency. Concerning this, the research work has taken the case of the shipping industry where new technologies are developed every day to enable flawless transactions, minimise delay time and alongside gain complete support through the navigation facilitations. One such technology may be identified to be the autonomous shipping technology which is driven by the Artificial intelligence. The artificial intelligence allows autonomous shipping facilitations with the help of which a complete unmanned cargo transporter would allow the cargo to function on its own by making use of a fleet of sensors and the usage of an Artificial Intelligence technology which would guide the cargo effectively towards its destination. The current business model of a shipping enterprise within the industry functions differently whereby the focus is placed on the different costing considerations which are faced in association with the enterprise. However, with the autonomous shopping in action, it is expected the model changes to a greater extent. Considering this, it is active to comprehend and identify the fact that, the in this respect, it is vital to take a note of the fact that it is through this research the focus lies on classifying the way in which the autonomous shipping has the overall capability to have a strong influence on the business model of the different shipping industries and how they will be able to bring about better success and related efficiency in the different engagements.

1.2 Introduction of subsequent content

This chapter will mainly provide a brief introduction to the whole research. The following section of the introduction chapter will discuss about the different logistics companies along with a background to the research. Also, this chapter will introduce the reader with the aims, research objectives, research questions and problem statement related to the automation in business industry. Also, this paper shares the overall significance of this study in the large research scale.

1.3 About the enterprises

COSCO shipping firm

The China Ocean Shipping Company Limited was known as the China Ocean Shipping enterprise also known as the COSCO group. It is a major holding enterprise for the COSCO shipping which formulates one of the greatest shipping companies globally. Back in 2016, the COSCO shipping was a result of the merger of COSCO and China Shipping group. Cosco has its headquarters in Ocean Plaza back in Beijing and owns around 1114 ships which also comprises of 365 dry bulk vessels with a fleet of 1580000 vessels and tankers. The fleet can be identified to have several ports worldwide. It can be identified as one of the best container ships and collective container volumes in the world. It is also known as China's largest dry bulk carrier and operators.

Zhonggu Logistics Corporation

Another enterprise which has been taken as a case for this study is the Zhonggu Logistics Corporation. The Shanghai Zhonggu Logistics Co. Ltd tends to offer suitable logistics services in regard to providing a container shipping, cold chain transportation and land warehousing as well. The enterprise has an expertise in providing business information consultancy as well.

Antong Holdings (QASC).

The Antong Holdings Co., Ltd is also known as the Heilongjiang Heihua Co. Ltd which is a China based enterprise which is into the freight transportation business and engages in the provision of freight forwarding agent, logistics management, warehousing as well as ship management services. In this regard, the business operates within the domestic market as well.

1.4 Background

The shipping industry is a critical part of the logistics and supply chain management across the world that enables flawless transportation of goods through naval transport in a large scale while contributing to economic benefit of the various industries (Hunaid, Bhurgri & Shaikh 2022). Autonomous ship is a watercraft that is piloted by Artificial Intelligence with the negligible guidance from human resource. An autonomous ship in a Cargo transporter that functions automatically by using different sensors and AI. The provision of remote assessment and analysis operations on board and ashore will be made possible by next-generation flexible control schemes and communication technologies (Ceyhun, 2020). This will include enhanced decision-making tools that enable remote control of partially or completely autonomous ships.

According to Zhang et al. (2020), autonomous cargo ships are also known as Maritime Autonomous Surface Ships (MASS) or Autonomous container ships, refers to crewless vessels which carriage either bulk cargo or vessels over navigable waters with little or no interaction of human being. It is possible to accomplish various techniques and degrees of autonomy by using surveillance and remote control from a neighbouring manned ship, an onshore control facility, or artificial intelligence and machine learning, allowing the vessel itself to determine the course of action (Akbar et al. 2021). It offers a secure framework for autonomous ship communication and storage of all pertinent ship data, resulting in a sort of "digital twin" of the ship. This virtual representation may be kept up for the duration of the ship, acting as a tested for prediction and autonomy. The digital platform offers a simple method for managing the amount of data needed for reporting. As per Bratić et al. (2019), autonomous shipping can be defined as the safe passage as well as navigation of an autonomous vessel, in addition to the monitoring and operation of its on-boar system. It provides a platform for communicating as well as storing all relevant data about autonomous ship.

There are four major automated methods of operating autonomous ships. The very common method is to use a conventional ship with an installed facility independent recommendation system, such as a structure for specific operations such as rout finding, collision avoidance and others (Feng et al., 2019). Another type is an intermittently independent ship, where automated functionalities are primarily used during the night and moderate visibility condition on high seas, and in good weather. The third type of autonomous ships are remote controlled automated ships, where autonomous functions are activated for all major operations, whereas the operations are controlled by the workforce remotely. The most type of autonomous ship is the fully autonomous ships that do not need any workforce ant it capable to make decision and determine its action by itself.

The existing business model of the different shipping companies were essentially based on several endeavours and steps such as the costing considerations, maximum safety and other related engagements with the help of which the transactions can be carried out easily. It is identifiable that several companies such as the Maersk and Hapag Lloyd have been undertaking a new customer to customer strategy which is focused on abandoning the current outdate strategy which is generally executed by multiple members of the industry thereby concentrating on the ports. It is essential to note that previously, the shipping industry has always reacted to demand and supplied a systematic service accordingly. However, currently it has to be adjusted to more efficient industries which have economic interdependencies. The speeds at which the

current changes are being made have a significantly strong influence on the overall modifications brought about within the industry. At present the industry has been following the passive operational behaviour and this can negatively influence the overall performance of the industry in the long term. It is essential to identify and assess the fact that the current business models adoption and overall implementation towards the change can be identified to be slow and any further change may critically influence the way in which the organisation tends to perform. Hence, it is essential to study the current state of the shipping industry which can thereby enable identification of the challenges within it. The companies within the industry have planned to acquire close competitors which will enable driving growth and increase the overall market share in a significant manner (Abaei et al., 2021).

There are a large number of players such as Maersk acquiring Hamburg Sued, Cosco acquitting Orient overseas which can be taken to be examples of the current consolidation which has been taking place within the shopping market. In such a concern, it is crucial that the market can be identified to be oligopoly in nature as 60% of the shipping business as present globally is being managed by seven liner enterprises only. The idea which exists behind these developments may be assessed to be to gain a better position in the future negotiations and improved profitability. This has then led to the use of mammoth ships which are now becoming increasingly popular to carry more cargo on a single journey (Ahn et al., 2019). When considering the overall developments within the digitalisation of the business domain, it is effective to see to it that the maritime industry remains rather traditional and the procedures within the industry are carried out manually which not only increase costs but reduce the overall efficiency as well. Moreover, there always remains a concern regarding the immediate position and overall cargo’s progress when not fully supported. In this regard, it is essential to assess the fact that the digitalisation in the maritime industry is being affected by each company searching for own solutions. The new concepts need to be adopted with adequate urgency which can increase in an increased gap to the other enterprises which share shipping interdependencies.

In the opinion of Muhammad et al. (2018), the market for autonomous ships will be worth $85.84 billion in 2020 and $165.61 billion in 2030, increasing at a 6.8% CAGR during that period. The skill and package are connected aboard autonomous ships, also referred to as crewless ships, without human intervention. The ship's sensors, autonomous navigation, propulsion and auxiliary systems, GPS tracker, and other features aid in helping the crew make decisions that are appropriate for the situation. Additionally, partially autonomous ships are

monitored and controlled by people through off-board control centres. Additionally, autonomous ships may make decisions and act independently because their whole functioning is under the supervision of powerful operating systems.

1.5 Problem Statement

In this era of globalisation and expanding demand, the shipping firms to are struggling to succeed in a highly dynamic and constantly shifting economic environment. The companies are searching for options to run their operations efficiently while incurring little costs and maintaining high standards of quality. Recent demand growth for freight transport has been restrained by the slow expansion of the worldwide economy and a profusion of available shipping capacity.

Sirimanne et al., (2019) opines that the freight rates reached historic lows in 2016, and shipping firms have had difficulty turning a profit. Large shipping businesses are therefore looking into novel tactics to deal with market volatility (Yang et al., 2019). In order to increase shipping demand, it might be necessary to move freight from the road to the sea. The strategy to increase the transport capacity through naval cargo transport can help achieve environmental sustainability objectives while also growing the container transportation industry. In order to maintain profit margins by lowering operating costs, shippers may also look into other trade routes. However, because of the dangers and expenses involved in implementing the aforementioned measures, traditional vessels might not be able to use those (Bogusławski et al., 2022).

Due to recent advancements in autonomous transport system related global projects, the concept of autonomous ships has seen major potentiality that can significantly overcome the disadvantages of conventional ships while ensuring an economically sustainable future. Even as autonomous shipping develops and tries to raise awareness, many commercial shipping businesses are unsure about how to use or integrate this "new" technology into established business structures. Over time, automation in shipping has altered how shipping companies' function. They witness to the necessity and value of this technology for improving the productivity of their operations and task completion. However, the prioritisation that should be ensured for initiating the Autonomous Shipping system is not adequate to make a revolutionary change as per its potential.

1.6 Impact of the pandemic on the choice of the topic

The Covid-19 pandemic has had a significantly strong influence on the topic. With the lockdown on all movements and related activities, it has been strongly identified that shipping safely became a huge concern as any contact with the shipments could lead to a significant issue and spread the contagious disease. Furthermore, it could also be a risky endeavour for the navy merchants and sailors on the vessels. Given the unprecedented disruptions caused by the pandemic in the shipping industry, acknowledging its potential is significant. In order to limit the spread of COVID-19 pandemic the international shipping has been restricted which caused negative impact on the overall shipping industry. The main logistics challenges imposed by the recent pandemic on the logistics operations are 4educing capacity of global shipping, fluctuating demands in the market, issues in inventory management and limited business growth. Before the pandemic it has been recorded that ocean freight services covered almost 90% of the global trade volume. However, due to the pandemic and on-going lockdown implemented by the local governments has reduced the volume of global trades.

1.7 Rationale of the Study

As per the existing issues in shipping industry and the scope of utilizing the autonomous shipping method it can be said that the major players of shipping industry require being more aware of the advantage of using autonomous shipping and the method of making the change. This study is focused on the determination of the how autonomous shipping affects on the commercial shipping companies' business strategies as well as business models. The found relationships within the different business aspects and autonomous shipping system can help to highlight the essentiality of the autonomous shipping in modernized logistics system. The study would help in contributing towards the domain of literature and identify how the autonomous shipping system functions. Furthermore the business model application alongside other benefits would be identified suitably. This would then be followed by the assessment of the way in which security concerns, costs and revenue generation aspects due to improved efficacy can impact the success of the firm and the economy.

The regulatory agencies and policymakers will benefit from this research. It has become a major issue because shipping businesses are unable to build specialised automated shipping methods and dynamics into their business models. This study will thus focus on the drawbacks firms must deal with as a result of this evolution, how it affects their effectiveness, and how it affects the success of their industry as a whole. Therefore, the result of this study can help the shipping companies to overcome their limitations that can help to optimize their operational

structure for the better adaptation of the Autonomous Shipping. Additionally, further evaluation of the autonomous shipping can be done considering their relationships with the business aspects so that adaptation strategies of shipping technologies can be customized in most beneficial ways.

1.8 Implications of the study

The study is being carried out due to the fact that it is bound to have several implications which will make the study rather structured and useful. Within the rationale of the study, it has been well established that the study would be useful in finding the current rate of development and alongside also be helpful in classifying and evaluating the way in which the shipping industry can benefit well. In this regard, it is useful to gain a comprehension of the fact that, the study is bound to have both practical and academicals implications.

1.8.1 Practical implications

Within the practical domain, from the context of the research and the overall research rationale, it has been well identified that the industry has been undergoing a state of lapse whereby several enterprises have been carrying out certain changes which seek to improve the overall business efficiency; however, the clarity has not been identified yet. Considering the fact that the business would be obligated to engage in better digitalisation and related innovations, it becomes significantly important to ensure that through the study, the way in which the autonomous shipping would bring about better business model for the purpose of the business can be identified. The autonomous shipping would ensure that the organisation is being able to reduce the manpower as involved in the overall operations and bring about better navigation facilitations. When better navigation facilities would be provided, the time to navigate and overall delivery would reduce considerably, and this would accelerate the rate of revenue earning capability with respect to the enterprise. This has become rather engaging for the purpose of all enterprises who have formulated an oligopoly in the domain but at the same time appears to be rather critical for the small firms within the industry and therefore, with consideration to this, it becomes vital to keep a note of the fact that, through the findings the companies would be able to gain a competitive edge.

1.8.2 Academic implications

In the domain of the academics, it becomes essential to identify the fact that within the domain of academics, the research would be able to identify the concepts associated with shipping, autonomous shopping alongside the business model. Considering this, this would help the

learners and other researchers to identify how the autonomy in this industry can engage in better facilitations.

1.9 Research Question

Based on the background of this research and the problem statement it can be seen that in order to positively instrument the concept of autonomous shipping, the effect of the autonomous shipping-based business model should be evaluated. The following research questions have been developed accordingly.

How will Autonomous shipping affect the business model of commercial shipping companies?

1.10 Aims and Objectives

The aim of the study is to find the impact of the autonomous shipping methods on the different aspect of commercial shipping companies' business model while finding the relationship with the value proposition, revenue generation, and competitive advantage and target customers.

The objectives of this paper have been presented below:

- To determine how autonomous shipping affects commercial shipping companies' business value propositions.
- To investigate the financial impact of autonomous shipping on commercial shipping companies.
- To impact of autonomous shipping on determine the competitive advantage of commercial shipping corporations.
- To determine the impact of autonomous shipping on target clients of commercial shipping companies.

1.11 Variables and Hypothesis

This study has five major variables whereas one independent variable and 4 dependent variables. The independent variable is the Use of Autonomous Shipping, and the dependent variables are Value Proposition, Finance, Competitive Advantage, and Target Customers. Therefore, the four hypotheses are:

H1: Use of Autonomous Shipping has significant impact on the Value Proposition of the company

H0: Use of Autonomous Shipping has no significant impact on the Value Proposition of the company

H2: Use of Autonomous Shipping has significant impact on the Finance of the company

H0: Use of Autonomous Shipping has no significant impact on the Finance of the company

H3: Use of Autonomous Shipping has significant impact on the Competitive Advantage of the company

H0: Use of Autonomous Shipping has no significant impact on the Competitive Advantage of the company

H4: Use of Autonomous Shipping has significant impact on the Target Customers of the company

H0: Use of Autonomous Shipping has no significant impact on the Target Customers of the company

Each of the above hypotheses is connected to the individual objective of this study. The Hypothesis 1 helps to meet the objective 1, Hypothesis 2 helps to meet the objective 2, Hypothesis 3 helps to meet the objective 3 and Hypothesis 1 helps to meet the objective 4 respectively.

1.12 Scope of the Research

The scope of this research is limited within the four aspects of the business model of the commercial shipping companies. The areas under the scope are value proposition, competitive advantage, and revenue generation and target customer. The emphasis of this study is to assess the impact of autonomous shipping through collecting information for the companies. However, the scope of this study is limited within the reflective opinion of the employees within the commercial shipping companies. This research does not have scope to examine the internal business forecasts and reports in order to assess the impact of autonomous shipping on different aspects of business model. The scope of the study is inadequate within the understanding of the current situation as per the observations and experiences of the employees of the shipping companies that are using autonomous shipping. The project implementation strategy is out of this research's scope. In other words, this study is not aimed at providing a planning for the shipping companies to adapt the autonomous shipping, whereas the findings can only help to develop strategic conceptual recommendations that can be considered in future while developing the technological adaptation procedures.

1.13 Overview of the Study

This study is an empirical study where the quantitative and measurable information has been collected from the shipping industry to response the research questions. Through recruiting the employees of the multiple shipping companies in a survey the study collecting data regarding different business aspects and adaptation of autonomous shipping. This study testified the identified hypotheses using the statistical analysis and empirical interpretation that helped to find the answer to the research question. A literature review has been also conducted in this study to develop the fundamental and advanced understanding about the context based on the finding of the existing literatures. It helped this study find the scope of further research and to develop proper tool for the data collection that can close the existing gaps in the literatures in the context of impact of autonomous shipping of different business aspects. The study is also aimed at exploring the current boundaries that can help to find the most optimum solution for the development of optimized adaptation strategies for the Autonomous shipping.

1.14 Structure of the Research

The structure of the research is based on 5 major chapters.

Chapter 1- The first chapter is introduction, the intention of this introduction chapter is to introduce the topic while presenting the rationale, purpose and overview of the research. The aims and objectives of this paper have been obtainable in this section along with the overview.

Chapter 2- The second chapter is literature review where the already existing literatures are reviewed. The literatures include the already published articles, journals, reports, books and others. The thematic presentation of literature review has been used in this section.

Chapter 3- The third chapter is methodology where the data collection and data analysis process of this study have been discussed considering both the practical aspects and conceptual rationale of the selection. The data collection process, source of data, data analysis process and other relevant methodology related factors have been addressed in the methodology chapter.

Chapter 4- The fourth chapters are the chapter of results and findings, where the findings after the analysis have been presented along with the detailed interpretation. In this chapter, tabular data, graphical charts and interpretative discussion have been presented.

Chapter 5- The fifth chapter is discussion and conclusion chapter where the findings of this study have been evaluated with the already existing knowledge developed in the literature review. In this chapter the implication and the limitation of the findings has been also evaluated.

Another important aspect of this chapter is that here the research has been concluded with final implication of the findings and conclusive statement. Besides, the future scopes of the study have been also evaluated along with linking the objectives with the findings of this paper.

1.15 Summary

Therefore, the chapter has focused on a refined format which is essentially absorbed on identifying and assessing the way in which the study has been designed. In the first section, a detailed backdrop of the enterprise's overall performance has been given which has enabled the overall understanding of the way in which the organisation tends to perform. In this context, it is crucially noteworthy to assess and identify the fact that, the detailed backdrop has been given which is then followed by the valuation of the problem statement and the justification of the study. In addition to this, the overall way in which the research would contribute towards the study and practical domain would be critically assessed and identified critically. In this setting, it is significant to measure and notify the fact that within the next chapter the key concepts of the literature review would be outlined significantly. The autonomous shipping alongside the way in which business model can be designed effectively has been identified. The research objectives alongside the research questions have been identified significantly.

2 CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

The focus of this section is to review the already existing literatures in the context of autonomous shipping and its different aspects in commercial shipping companies. In this section the existing literatures about all the shipping related variables of this research including value proposition, revenue generation, competitive advantage and target customer have been reviewed. The literature review has been conducted after selecting the secondary sources using the selection criteria. The first selection criteria of the paper are that the sources should be available in authentic, reliable as well as credible platforms, online journals and databases. The second criteria set are that the papers being reviewed should be within the last 10 years. The last criteria states that the sources are printed in English language. After, sorting the sources the duplicate sources were removed before final review process.

The literature review has been conducted using the thematic structure. The literatures respective to each theme have been evaluated under the respective theme. The different themes have been formed by the major answers from the literature review while considering the objectives of this research. In this literature review eight to ten major themes have been recognised that have been obtainable in the next section.

2.2 Autonomous shipping

In the opinion of Ahn et al. (2019), the autonomous shipping can be identified to be the upcoming of the maritime industry and the given industry is as troublesome as the smartphone, smart ship and related revolutionization. This is because the scenery of the ship design and operations has been changing and there exists a strong need to develop a set of electronic senses which tend to inform the brain of the computer and allows the vessels to navigate softly and safely in order to avoid the collisions. Akbar et al. (2021) also mentions the fact that the three main aspects can be identified as the sensor fusion, control algorithm and the communication mediums. Arnsdorf (2014) mentions the fact that the sensor fusion technology is found in several autonomous vehicle operations such as the cars where the competing developers have been prioritised in the context of differing technologies. The projects within the domain of autonomous shipping have been able to explore the contribution of varying sectors which have improvised the navigation of the vessels and at the same time focused on presenting an accurate perspective of the vessels and their surroundings at all times and related conditions. Balcombe et al. (2019) believes that there exist dissimilar types of locators, high-definition visual

cameras, thermal imaging and related LIDAR which the product has concluded fusing several sensors to give way to best results. Here the main concern is how the combination of the technologies can be well utilised in a cost-efficient way to consider the tests of the maritime setting. Bolbot et al. (2020) mentions that the concern is to find the most useful technique so as to combine the sensor technologies and to perform well in its best capacity.

Bolbot et al. (2022) mentions that another effective tool which can be well applied may be described as the control algorithms. The control algorithms contribute towards effective navigation and collision avoidance which will help in ensuring that remote and autonomous ships will be able to identify the associated actions which are crucial for their success and their overall identification of the objects. All decision algorithms generally require perfection as it has to involve the maritime rules as well as the regulations which often act as a challenge for the programmers at large. The development of the control algorithms alongside the generic interpretation challenges may act as a barrier and hence, such algorithms need to be well developed as an interactive and gradual service engagement.

The third priority of the step is communication and connectivity. Çetin, Akgül and Koçak (2018) states that the autonomous vessels would be requiring extensive level of input from the land which would make the connectivity between ships rather crucial. In this domain, the communication is obligated to be precise, ascendable, supported by several systems and be bidirectional which will guide the shipping vessel and minimise risk as well. When a sufficient communication link would be created, then in such a regard, it is essential that effective communication with the existing technology is also created which will thus ensure better shipping mechanisms. In this domain, creating a simulated autonomous ship control system thereby connecting it to a satellite communications link is crucial which allows the systems to explore the behaviour of the entire system well.

2.3 Key characteristics of autonomous shipping

The autonomous shipping system comprises of several characteristics which give way to better performance and guarantee a seamless shipping facilitation thus ensuring effective outcomes. Concerning this, it is integral to see to it that the key characteristics can be rightly identified to be the safety and security, legalities and economics.

2.3.1 Safety and Security

Chen et al. (2020) mentions states that the overall operations of the autonomous and remote ships need to be such that the existing vehicles are obligated to be safe and that they are being able to secure controlling support, the provision of the ship owners, operatives, mariners alongside the wider public reception as well. The remote and independent ships generally have the overall capability to minimise the related time taken for the shipment. Considering this, it becomes essential to identify the fact that when the business deals are being carried out suitably and shipping hours are reduced, this contributes towards better end results.

de Vos, Hekkenberg and Banda (2021) mentions that the process of the remote and autonomous ships needs to be very safe and would be obligated to be very safe in regard to the existing vehicles if they are obligated to pass the protected controlling endorsement alongside the support of the operators, owners, seafarers with wider public acceptance. Vos, Hekkenberg & Koelman (2020) states that the remote and independent ships generally have the potential to review and reduce the human based errors and alongside may require a certain level of modifications as well alongside related risks. The circumstances alongside the possible remedies would be obligated to be well explored. The marine industry has a certain level of experience on the systematic as well as the comprehensive risk assessments and for this reason, when emerging technology is largely involved, then in this regard, new knowledge and a wider understanding of the new and well identified risk is obligated which will make the overall issues rather simple. It is critical to identify that the cybersecurity needs to be applied with the help of which the operations can be made rather successful in nature. In consideration with this, the results need to be well applied to provide recommendations to regulators and other associated partners so as to create a suitable framework for creating a certain set of standards which would be useful for the remote and unmanned vessel operations.

2.3.2 Legalities

The legalities in the busy world can be identified as the laws and regulations where the autonomous vessel has been operating and has a significance influence on the overall rules and related regulations. Generally, a vessel’s journey is largely enclosed by a range of national, international as well as secluded legal outlines so ad to ensure that it's bound by safety concerns. It is crucial here that, adequate engagements are ensured to minimise the complications as involved (De Vos, Hekkenberg & Koelman , 2020) In this scenario, the matters become more complicated in scenarios such that the maritime law does not essentially anticipate the

expansion of the remote or related autonomous ships. It is integral here to identify the fact that for remote controlled and other associated self-directed shipping to become a reality, it is essential that all regulatory efforts are suitably applied which can thereby assure better organisational performance (Höyhtyä & Martio, 2020). There often exists questions of accountability for the varying autonomous ships which thereby influences the performance. It is vital here to note that the question of liability arises for the autonomous ships as they are meant to varying variations and may seem to be giving way to less of regulatory changes in the field. In this context, there do exist other liability rules such as product liability and in this concern, it is vital to follow the fact that for the firm to be fruitful, they need to continue researching on the elements of the law and to suggest effective solutions through the program as this would assure better performance management (Hunaid, Bhurgri & Shaikh, 2022).

There are several legal engagements of building and working a protest vessel at a national level which can be taken to be the changing rules related to the IMO. There are various questions arising in regard to the autonomous shipping as well and other related variations.

2.3.3 Economics

The remote and independent ships have the overall possibility to redefine the industry and the roles of the players within the industry (Hansen et al., 2016). The attractive benefits remote and autonomous shipping has gained increased popularity and hence, the use of autonomous shipping has several advantages in terms of economics as well. It ensures better usage of space, better crew management and better use of fuel. Hence, the costs are saved in such an engagement

2.3.4 Regulations for autonomous shipping

There are a large number of rules, regulations and related benefits driven and associated with the advanced technologies involving autonomous shipping and related facilitations. The IMO has developed a controlling scoping exercise based on the Maritime autonomous surface ships which have been designed to assess the existing instruments and see to it that they are applied to varying automation degrees (Issa et al., 2022). The Regulatory scoping exercise for safety treaties have also been recently exercised to ensure better review and automation of related performance. Due to the growth of the MASS technology and operations, it becomes engagingly critical that there are several high priority issues, cutting engagements and application of policies to determine the future work.

In this regard, it is essential to note that a suitable IMO strategic plan has been designed to "Integrate new and advancing technologies in the regulatory framework" (Kim et al., 2020). This involves derivation of suitable benefits and assuring better performance. Several committees have also been set for improvised performance.

2.4 Functionalities of Autonomous Shipping

Wright (2019) critiques that the key functionality of autonomous shipping includes reducing the cost of employee recruitment for shipping purpose. An autonomous ship refers to a watercraft that is piloted by artificial intelligence. These vessels possess the potential to function autonomously and unmanned as a type of seafaring drone.

The same technology used in automated automobiles and autopilots are also used by autonomous ships to attain their autonomy. Radar, GPS, loder, sonar as well as AIS are other sensors that can offer data for directional usage in addition to infrared along with visible spectrum sensors. Autonomous ships' artificial intelligence (AI) get an accurate composite view of the world through a fleet of sensors and sensor fusion. Wang et al. (2019) have also agreed to the fact highlighting Radar, high-definition cameras, thermal imaging, as well as sonar are some of the sensors employed. From completely human operated manned ships to partially controlled, remotely controlled, partially autonomous, and fully autonomous unmanned ships, ships can develop through various stages of autonomy. Due to a decrease in human error, autonomous ships make sailing of ships safer. There is also less expense because of decreased crew costs. Coastal ferries as well as commercial ships are examples of autonomous ships that have been put into use early (Munim, 2019). In spite of the advancements made in autonomous ships, some experts contend that onboard human supervision is always valuable and that there exists no current economic advantage to the quest of a completely autonomous ship.

The shipping vehicle is generally outfitted with a variety of mechanical as well as control devices to support the intricate Ship Outfitting elements. This demonstrates that robotics and automated machines must be used to different mechanical as well as control systems in the vessel to meet the vessel's goal in an autonomous ship. The unloading machinery that lifts the anchor whenever the ship is anchored as well as raises the anchor at the start, for instance, or the regular activities relating to the cargo are functions that are ordered by the centralized controller in an autonomous ship and should be carried out autonomously.

The Unmanned Ship is susceptible to a variety of threats when at sea, both inside and outside. Currently, the ship should be remotely or autonomously managed in order to safeguard it from danger and make decisions on its own when it is in the field. This implies that unless advanced automation techniques are integrated to the motorised or control systems installed and controlled on board, an autonomous ship is not feasible.

Furthermore, it is evident that the autonomous vessels can be considered as a major solution to the war crisis. Future naval forces are read to exploit a mix of traditional crew vessels along with unmanned autonomous systems which operates over, on as well as under the waves. These unmanned vessels are expected to generate lethal effect on the future battlefield along with minimizing the rate of fatalities. However, Ringbom et al. (2019) has argued that unmanned vessel is more dangerous compared to traditional vessels for war are and can result in far more casualties. The researcher has also highlighted that usage of unmanned vessels will increase the investment cost of warfare to a great extent (Abaei et al., 2021).

Moreover, the Baltic and International Maritime Council (BIMCO) as well as the Global Shipping Federation (ISF) announced in 2010 to the International Maritime Organization (IMO) that the delivery industry is likely to experience tightening labour markets along with ongoing scarcities of cruise officers because of dangerous working conditions and prolonged periods of staying away from shore (Issa et al., 2022). There has been decline on freight rates along with surplus capacities in the shipping sector as a result of the severe competition in the economies of scale. With the development of relatively low or zero-carbon alternative energy sources, it is more crucial than ever for reducing shipping pollution and emissions along with enhancing ship safety.

Utilizing the most recent information and communication (ICT) technologies, technological progress will enhance ships' control, transmission, as well as interface abilities. They will consequently soon be run by distant land-based or overseas services (Issa et al. 2022). Autonomous boats have previously been used for research, aviation, and military operations. Underwater unmanned vehicles, like autonomous unmanned vehicles (AUV) as well as remotely controlled vehicles (ROV) that are still in development are also used for thorough exploration. Nevertheless, the technology that substitutes staffing must beat the humans in terms of safety, effectiveness, as well as environmental conservation.

One of the key barriers that are being faced by the manufactures of autonomous shipping which is limiting the growth of the product is cyber threats. The researcher stated that automation in

vessels across the world enhances the risk of threats since these ships chiefly follows satellite route at the time of their voyages. In the upcoming years, the key operator off the marine vessels needs to connect the ships to the onshore networks. Installing the mechanisation system can be considered to be the first step towards competing mechanisation of the vessels since it enables the integration of critical subsystem of the marine vessels with the help of local network (Abaei et al., 2021). The usage of big data analytics for the growth of smart ships are being expected for enhancing the operation efficiency as well as the safety of the independent ships. However, de Vos et al. (2021) have contended that the automation is expected to make the ships more vulnerable to hackers and treats. given the fact that the number of online threads along with potential attacks are increasing globally the Maritime Safety Committee (MSC) of the international Maritime Organization (IMO) have been found to have introduced guidelines obligated for preventing cyber-attacks on the systems of the ships.

Some items worth billions of dollars are stimulated across watercourses and there are several containers which are essentially transported throughout. As commercial activities are largely involved, it becomes effective to note the fact that, there is a deadline for delivery and in this context it is vital that time allowances are managed well. Hence, using suitable containers is vital as it would thereby ensure that the goods can be transferred easily from one place to another. When such mechanised machines are used, the efficiency tends to improve considerably (Komianos, 2018).

In the context of this study, it has been identified that with the increased development in technology along with globalisation, the usage of autonomous vehicles has also got increased. Currently there exists more than thousand autonomous surface ship globally and is operated by approximately 53 organizations (Munim 2019). It has been found that the investment costs for manufacturing an autonomous vessel is much higher than a non-autonomous vessel. However, considering its long term benefits a significant number of organizations are opting for the same.

One remarkable nation here is Norway whereby it already possesses highly automated vessels in general use. In the year 2018, ferry operator Fjord1 had introduced 2 new boats, Eidsfjord and Gloppefjord for crossing the mile wide stretch of water between Lote and Anda which join the E39 highway in western Norway. The unmanned container ship, Yara Birkeland, will transport goods from a factory in Porsgrunn, southwest of Oslo, to the harbours of Brevik and Larvik, some few kilometres further west. Kongsberg is collaborating with the Norwegian fertiliser business Yara on the project. The NOK250m (£22m) ship, whose debut has been

postponed from 2018 to 2020, will begin with a crew of humans before becoming fully autonomous by 2022. 2 years later, the food wholesaler Asko intends to begin operating two autonomous boats over the Oslo fjord, which is located south of the city. One selling feature that unites the three programmes is ecological effectiveness, not autonomy. The Yara Birkeland is anticipated to substitute 40,000 lorry journeys annually. All of the watercrafts are driven by electricity instead of fossil fuels, and the commercial boats will lessen the demand for road transportation. The Norwegian government provides money, with the Yara Birkeland project getting NOK113.6 and the Asko scheme getting NOK119m from Enova, a government entity that finances projects aimed at reducing carbon emissions (Munim, 2019). Additionally, rather than replacing current ships in either endeavour, electric driverless ships will be a component of brand-new, integrated transportation networks. Vojković and Milenković (2020) have highlighted that *"due to the vessels' inability to access specific ports, COVID-19 has made it extremely difficult for the disagreement to be resolved during this time period, compelling the parties to participate in the payment of extra expenses that are in dispute. These costs are not being paid as a result of force majeure, which results in losses for the stakeholders."*

Lastly, Kim et al. (2022) have highlighted that one of the major issues ace by the shipping organizations at the time of the pandemic includes inability of changing crews that is obligated for ensuring safety, crew health as well as welfare. In such instances, autonomous vehicles were considered to be a major solution to the problem. Since the vehicles are unmanned, the risk of transmission of virus and the requirement of changing crew was comparatively lower compared to manned vessels. However, Di et al. (2019) have argued that with regard to the cruise industry as a whole, researchers have discovered that the implementation of automated vehicles has the ability to address a number of humanitarian problems the sector currently faces, including crew adjustments, marooned mariners in pandemic situations, and the long-standing welfare problems of seaborne staff. By transferring bridge officers from their current remote and dangerous workplace environment to a shore-based office setting, the implementation of remotely operated and autonomous operational concepts with coastline ship control and monitoring has extra possible to enhance societal values along with boosting the desirability of seagoing occupations.

Hence, in spite of the act that remotely controlled or autonomous vessels have been projected to be the upcoming eras of maritime operations, risk control, reliability, qualification as well as watch keeping requirements for seafarers as well as remote control operators along with a wide range of other challenges. Along with new capabilities and solutions and disruptive

technologies, comes new risk profiles and safety management challenges. The unpredictability and uncertainty would increase with increased levels of autonomy, posing additional issues for MASS operations in terms of safety as well as reliability assurance. In addition to this, the strict restrictions for foreign vehicles from the end of China can be considered to be another major barrier to autonomous vehicles. As per the law issued by the maritime Safety Administration (MSA) there exist stiff penalties and fie for non-compliant ships. Bolbot et al. (2021) have highlighted another major issue associated with autonomous vehicles. The massive size of autonomous ship may result in restriction to enter the Suez cannel. The researcher highlighted how “Ever Given” a 1,300-foot Japanese container ship while exporting goods from China to Europe got stuck in the Suez Canon for days and was finally freed after around the clock scramble for unblocking the shipping thoroughfare.

2.5 Implementation of Autonomous Shipping in Shipping Industry

Chaal et al. (2020) have highlighted a wide range of opportunities related with application of Autonomous shipping in the shipping industry. Based on the end usage, the autonomous mechanised ships market has been found to be segmented into retrofit as well as line fit. The growth associated with line fit segment possess the potential to attribute to the increment investment in the naval defence by a wide range of nations along with the rise in trade activities across the sea. Nations like ABB, Siemens, Kongsberg as well as Warsila are offering line fit autonomous vessels.

According to Sharma and Kim (2022), currently, the shipping sector is experiencing a surge of greater automation and digitization, and demand in autonomous as well as remotely controlled ships is rising quickly on a worldwide scale. The adoption of autonomous ships is justified for a variety of factors, including economic ones, improved efficiency, and safety concerns. Kim et al. (2020) outlines four key justifications for implementing autonomous ships: a better working environment, lower costs, lower pollution, and higher safety. Additionally, the advent of autonomous ships may lead to new forms of maritime transportation in addition to those that now exist. The usage of the new technology does, however, necessitate training for mariners. As a result, there is a natural delay between the new competency criteria and their incorporation into the shipping industry's current laws. Zhou et al. (2020) have emphasised that autonomous ships are becoming more significant and are anticipated to influence the direction of the international maritime sector in the future. Serious questions regarding following the 1972 International Regulations for Preventing Collisions at Sea are raised by this evolutionary

change (COLREGs). To remove ambiguity of interpretation, COLREGs require additional clarification and modifications.

Furthermore, Vojković and Milenković (2020) believe that the emergence of autonomous ships which are unmanned or low manned came to being in order to deduce the amount of risk faced by people in sea. While it has been seen that the number of coincidences has not been reduced by autonomous ships, the safety of human beings in the sea has got increased to a great extent. The international Maritime Organization (IMO) has defined 4 major degree autonomy that includes care ship with mechanical process and decision provision, remotely controlled vessel with mariners on board, remotely skilful vessels without mariners and fully controlled autonomous ships. Reduced operational, crew and voyage costs, enhanced level of safety of operations along with earning capacity from the new vessel projects.

Fonseca, et al. (2021), have highlighted that for implementation of MASS, an application of Technology Adaptation (TechAdo) model is obligated. The TechAdo model proposed by the researcher presents a range of factors that are normally present in technology diffusion model.

The 1st pillar is technical viability or innovation. The marketing of innovations, or innovation, has long been acknowledged by scholars as extending far past the stage of idea production that results in invention. This commercialisation can signify the completion of a new technological path and the opening of brand-new markets. Although a technical creation's ability to be commercialised is crucial to its success, the creation itself should not be disheartened because it is an essential component of that invention's marketing. That technical innovation comes about as a consequence of a very ambiguous process of combining, recombining, and integrating different technologies (Sahin and Yip 2017). Only after an invention has been shown to be commercially viable and has passed the business verification test is it deemed to be a breakthrough (i.e., considered to be marketable).

Intellectual capital is the 2nd pillar. Besides formal education and training, human capital includes collected expertise and is crucial to a company's strategy. Although it may be viewed as a manufacturing element, human capital serves as a catalyst for the adoption of new technologies (Balcombe et al. 2019). Innovation and technology consist of finding heavily on human capital since firms' capacity to innovate as well as embrace technology is intimately tied to the makeup of human capital. The third principle is concerned with the financial advantages of technology. For high levels of autonomy to succeed in MASS, the anticipated

higher capital costs must be offset by lower operating costs, whether from a vessel or a distribution network standpoint.

As per Babicz (2018), the technological advancements gained in significance as a result of shipping corporations' increasing vertical integration of other supply chain components. The coastal regions of Europe are home to almost 40 percent of its inhabitants. When taking into account great lake counties, the percentage is comparable in the U. S. at roughly 37 percent of the overall population. Three billion individuals live around two hundred kilometres of a coastline globally. In spite of this, the inter-city network system of today mainly relies on road travel. Road network contributes for 72.8 percent of greenhouse gas (GHG) emissions from the transportation sector across Europe (European Commission n.d.). However, although having far lower Gas (ghg) emissions than commercial vehicles, aquatic transportation is largely underutilised.

Additionally, the increased traffic and noise pollutants emitted by urban freight compromise road safety. Sahin and Yip (2017), highlighted that moving loads from highways to ocean via SSS may significantly contribute to the greening of the transportation sector and increase road safety. Recently, the media has centred its emphasis on highly developed, technologically sophisticated ships, sometimes known as smart ships or driverless in their most severe versions. The expanding use of technology aids ship crews in their efforts to manage the ships by supporting operations on board, providing connection to onshore assistance, and increasing independence in the navigational as well as engine departments.

The world’s largest first completely electric as well as self-driving cargo vessel, Yara Birkeland, which is currently under development in Norway, and other similar initiatives have raised enough awareness of and worry over the potential use of autonomous vessels on long-distance trips. The most major obstacles that autonomous systems must solve before they may operate in global seas are currently believed to be technological regulations as well as standards as well as likelihood of success. In the framework of the adoption of this technical breakthrough, a few other elements, including economic and social considerations, human resources, along with legal and governance aspects, must be taken into account. Markets & Markets predicted in 2019 that the market for unmanned vessels will be valued roughly 13.8 billion U.S. dollars by the year 2030.

Even while instances like the Yara Birkeland may strongly suggest that shipping practises need to alter, these vessels are not built with long-distance travel in mind. Even though others claim

that driverless sailing is also a viable alternative for longer voyages, shipping companies have so far shown little interest in this new kind of marine transportation, with a significant amount of predicting that automation won't soon lead to unpiloted container vessels.

2.6 Benefits and Limitations of Autonomous Shipping

There are significant advantages to autonomous ships. They tend to remove the mistake of the individuals alongside low down the expenses of the crew and thereby enable better effective space. As per the 3 years old research done in 2019, MUNIN (Maritime Unmanned Navigation via Intelligence in Networks) projected that each unmanned container will save more than 7 million dollars in fuel usage, crew consumables, and pay over a 25-year period. In the viewpoint of Silverajan et al. (2018), autonomous ships provide important safety advantages because human mistake is to blame for 75 percentage points of marine mishaps, with weariness and obsessive-compulsive disorder being the main culprits.

The major time mechanized ships would be essentially managed is generally when they are present within the port. This is because there do not exist spinning elements or associated batteries of gas fuel issues. This generally indicates that there are little or no pollutions all along. In line with this, there are some generations which consider the overall occupations as undesirable (Ziajka-Poznańska & Montewka, 2021). As per the ICS and BIMCO Manpower Report (2015), Mariners may maintain their social lives and manage and monitor unmanned vessels from ashore.

The attractive advantages of autonomous or unmanned vessels are being recognised and addressed by maritime industry more and more. As per the studies done by Liu et al. (2021), automation could reduce labour expenses by 90% whereas cheaper labour only reduced costs by 60%. Rolls-Royce reports that "A lot of the equipment and systems on board are merely there to keep the crew nourished, secure, and comfortable. Vessels might be greatly simpler if people were eliminated or reduced. Studies show that the elimination of the lodging building may save fuel consumption by 6% and construction costs by 5%, while creating more room for goods and boosting freight revenue.

Porathe et al. (2018), showed that over a 25-year period, the MUNIN project estimated fuel usage and crew costs, the two most important expenses in vessel operating costs, would be reduced by more than EUR6 million per ship. There is little question that these types of ships will enable more effective use of space in ship design, remove the possibility of human tragedy, and provide opportunities for manpower reductions. Additionally, autonomous ships would maximise fuel efficiency and optimise maintenance tasks, which would reduce their carbon

impact. The benefits of autonomous ships are numerous, and autonomous shipping is no longer simply a sci-fi concept that could come to pass in the future. It is currently being developed by several projects launched globally.

In spite the operative efficiencies, the investment within the technology of such ships needs high end investments and involves on shoring activities as well which thereby contribute to better performance and related management. Here, it is vital to secure that the absence of such financial investments make the execution difficult.

Liu et al. (2021) have added that in spite the potential advantages, particularly the administrative savings, engaging in the innovation will initially need a large capital outlay, particularly in the initial stages of its advancement. As per statistics, initiatives from Sea Machines Robotics, EU's MUNIN, SINTEF's Seatonomy, and Rolls-Advanced Royce's Autonomous Waterborne Applications Initiative have received at least EUR23 million in funding. Additionally, funds will be invested in establishing onshore services to keep track of fleet activities, particularly when an unmanned vessel conflicts with the existing marine infrastructures. The first remotely controlled, autonomous coastal vessel will be deployed in 2025, and if predictions are accurate, by 2035 we might witness completely autonomous, autonomous ocean - going ships (Porathe et al.,2018). As autonomous vessels must use higher-grade fuel, such Marine Diesel Oil (MDO) or Marine Gas Oil (MGO), to maintain smooth engine running, fuel costs may rise in addition to building costs. As per the estimates, MDO/MGO prices would need to drop by roughly 12 percent in the present market in order to make an autonomous bulk investment worthwhile. Secondly, there are unresolved legal issues. Since the use of unmanned ships is prohibited under the minimum crew requirements rule, firms are unsure of how international law will apply to these ships (Mallam et al. 2020).

2.7 Factors affecting the use of autonomous shipping

The autonomous shipping offers varying solutions so as to secure better ocean sustainability. In addition to sustainability, aspects like safety and automatization are also targeted. It is suitable to ensure that the factors affecting the success of the autonomous shipping may be identified as the factors such as the technological readiness, environmental fit, organizational resources such as stakeholder readiness (Kretschmann, Burmeister & Jahn, 2017). In this domain, the technological readiness may be identified as the overall availability of digital tools which influences long term success. Furthermore, there needs to be an overall fit between the

variables and lastly, the existence of stakeholder readiness and resource existence is also significant. When such aspects are offered, better autonomy can be assured.

2.8 Value Propositions in Commercial Shipping Industry

In the opinion of Felski and Zwolak (2020), the term value proposition can be defined as the short statement that communicate why buyers should select the product of a company or firm. It can be defined as the statement which clearly identifies the benefits an organization's services or products can deliver to its consumers. A well-developed value proposition possesses the potential to differentiate the company and its specific products or services in the marketplace and amongst the target audience and the target market. D'agostini (2022) believes that the shipping industry has been found to be facing a prolonged period of change. As a result of the long-lasting conditions of the over capacity as well as low demand, the shipping lines have been found to be struggling for making profit in the past 2 years. The pandemic ha d further weakened the position of the market of the shopping organizations, which in turn had accelerated drastic changes in their operational, strategic as well as marketing behaviour along with financial implications.

As a result, in the digital age, the switch from offline to online advertising is seen as a major component determining how clients are communicated a company's value offer. Digital advertising helps businesses to effectively convey quick, current information, which may direct to inform, enhance corporate procedures, and develop customer relationships (Lam et al., 2016). For the shipment industry to improve factors like brand awareness (new vessels, online platforms, quality of services, as well as prominence), information dissemination (bigger or relatively new ships, online platforms), media affairs (environmental proposals to cut pollution), collaborative effort, as well as sales service, it is crucial that these factors are communicated effectively (Kaplan & Haenlein, 2010). Social media utilisation is regarded as a crucial component of business marketing communications and has to be included into management procedures for strategic, tactical, as well as functional advancements (Plowman & Wilson, 2018).

Munim (2019) has highlighted that Maersk and MSC are two major shipping organization, and they use social media platforms for demonstrating value proposition. Social media offers benefits that go well beyond productivity and to include interaction. In essence, it offers two-way connection to the communal body of information, experience, and awareness, enabling people to act as sources of accuracy, cooperation, and originality. Both Maersk as well as MSC

communicate value proposition messaging on social media to boost their product awareness and sharing of information, in spite of significant variations in the substance of their Facebook posts. Despite the significant differences in their major areas, both companies attempt to increase the value of their brands in their core industries in accordance with their separate marketing techniques.

Thombre et al. (2020) have highlighted a wide range of distinct service qualities that are gained by the brands using a commercial shipping providers that are considered as a key part of its value proposition. First of all, when an organization works with a shipping company for exporting or importing its products or services, it is dependable, efficient and cost-effective options for them. In spite of the fact that a wide range of organizations believe that their company is too large or busy to consider collaborating with commercial shipping organizations, choosing commercial shipping over other transports can improve their sales and growth in the long run this concept is widely used by the firms established in global commercial shipping industry as value proposition. The commercial shipping organizations handle the order delivery from the origin to the destination. Considering the proficiencies provided by the advanced commercial shipping in this era. More and more business-to-business organizations have been found to be relying on these services for handling their logistics as well as shipping. a wide range of advantages are gained by these brands as a result of this these brands gains a wide range of advantages that include consolidating all the shipping costs into a predictable ingle monthly bill and negotiating lower number of expenses with a 3rd party logistics provider. Chen et al. (2020) have highlighted that these advantages given by the commercial shipping organizations to the firms are considered as a part of value proposition. Provision scalable capacity for high volume periods like the business expansion and holidays. Along with this, commercial shipping firms allow the company for focusing on more skill dependent duties like innovation and marketing. They assure that the things are safe in transit along with arriving in perfect condition.

As per de Vos, Hekkenberg and Banda (2021), offering free shipping is another major way to create value proposition. Consumers always tends to look for free shipping since it results in cost savings. However, it is highly crucial to make it less expensive for the organization. Incorporation of expanses of shipping into the pricing structure along with establishing a minimum amount of purchase threshold for free delivering makes it a win-win situation for both the shipping company as well as for the brand.

Mallam, Nazir and Sharma (2020) have highlighted that value proposition can be defined as a statement which explain why the logistics service is attractive or the consumers as well as the value that will be delivered to the consumers. As per the physical scope of the logistic services, there exists 3 major types of value proposition for the shipping lines that includes port to port, door to door as well as transporting up to the inland terminals.

In the study by Tsvetkova and Hellström (2022), the value proposition is needed for delivering the promise system value of autonomous solution in case of Maritime autonomous ships. The value created by the autonomous ships in the business ecosystem needs the input from a wide range actor. For an ecosystem actor for delivering value of their products as well as services, it is highly necessary to develop a specific arrangement with a wide range of other ecosystem factors, whose value proposals are balancing. In general, the operational efficiency has been found to be directly associated with the cost leadership value proposition, whereas the service effectiveness is associated with differentiation value proposition.

The following explanations can be used to describe the value that each component of the marine logistics chain adds. A standard marine logistics network that includes companies like shippers, freight forwarders, shipping lines, inland transporters, as well as port operators. The ultimate client to please is the shipper. Freight forwarders provide value by providing logistical services such creating customs papers, setting up insurance, designing shipment routes, and setting up freight rate payments. By offering maritime transportation services, such as empty bottles, booking cargo space on ships, and keeping a normal schedule of shipping routes, shipping lines bring value to their customers' transactions. When moving freight among seaports as well as shippers' facilities or interior ports, inland transporters bring value.

As per Utne et al. (2020), ensuring excellent operational efficiency can be considered as one of the key value propositions by the manufacturers of the commercial ships. In this era of high completion, consumers not only expect excellent innovation but also expect top notch services along with a justified amount of price. Therefore, in order to remain competitive, the commercial shipping organizations keeps their price lower than its competitors. It has been found that in order to provide the consumers with higher quality of services than its competitors the manufacturers of the shipping industry are highly focusing on its research and development (R&D) department. Approximately 37 percent of its total investment cost of Schenker Inc is spend on its research and development. The autonomous shipping can be considered as one of the most effective innovations of the commercial shipping organization. Commercial shipping

organisations that are developing autonomous shipping are currently experiencing higher value proposition compared to organizations that are not opting for autonomous shipping.

This anticipated shortfall can be avoided by having the option of sailing with a smaller crew. Economic efficiency is regarded as a second advantage. Wages paid to the crew make up a significant portion of a ship's expenditures, particularly for smaller ships. Moreover, accommodations and related ship systems are no longer obligated for autonomous ships. This reduces construction costs, enhances freight carrying capacity, as well as streamlines the design. These elements taken as a whole can result in considerable cost savings. This increases the competitiveness of the vessel operators as far as the additional expenses of turning the ship independent do not exceed this cost decrease. The idea that autonomous systems will make cargo safer is the third anticipated advantage.

All most 60 percent of the fatalities were the result of mistakes made by people. As per the statement made by an analysis by EMSA, human error accounted for the primary significant contributor in 65 percent of the documented incidents. Numerous research has been done on the topic of autonomous vessels due to the impact that human mistake has on maritime safety. It is anticipated that the introduction of autonomous ships would minimise the number of mishaps because of the significant effect of human mistake. The proportion of incidents that autonomous systems can avert has not yet been calculated, though.

As per the writings of Kavallieratos et al. (2019), digitalization applies in shipping for boosting the operational efficiency of the commercial shipping organizations. As per the entrepreneur responders who focused on crew issues as a result of the COVID-19 epidemic, training crews as well as administration appear to be the most crucial digital technologies for fleet-wide implementation. It has tremendously benefitted areas including vessel efficiency, meteorological routing, equipment tracking, etcetera., leading in more effective and safer vessel activities. Due to the increasing digitization and automation of operations, safety reporting is benefiting from these changes as well. The practises of ship operators are increasingly including technologies for crew shift as well as resting hour administration, inspection as well as accidents monitoring along with e-health services, improving education for safety and crew welfare.

The most frequently employed risk and protection digital apps throughout shipping companies' as well as management' ships likely to be cybersecurity with hazard control reporting. Additionally, the linked ships have greatly boosted the flow of ship operating data between

both the vessel and the land, making ships healthier and their activities more effective. Today, digital options for ship crew decision-making include remote audits, trip planning, and engine performance monitoring. Ships are becoming safer because to a mix of technologies and also the professional skills of the personnel. Information will be a critical element of the data integration as well as driverless ships in the upcoming years. Big data, AI, and IoT devices are already seen as providing the greatest benefits of digitization.

Kavallieratos et al. (2019) mentions that the shipping organizations are training their crew members to enhance their skills in autonomous vehicles.

New human factors problems arise when operations are switched from the on-board ship technique to remote control (D'agostini 2022). These encompass the knowledge, expertise, training, and schooling of RCC operators. Important knowledge about the Employee, Professional Experience, as well as Job Characteristics may be obtained by job analysis. It will be crucial to create competence criteria for onshore operators of these vessels and offer the necessary training in light of the dwindling seafarer population. The primary procedure for many human resource activities, including hiring and performance evaluation, according to human resource experts and specialists is job analysis. Any firm must have a job description and analysis to make sure the correct individuals are hired. Additionally, they aid various businesses in evaluating the organisational skills of prospective seekers.

Therefore, it is important to properly analyse and describe jobs since accuracy also has an impact on the calibre of human resources. Kavallieratos et al. (2019) investigated how using automated vehicles affected work and system processes. In relation to the human components and independence in complicated safety systems, they highlighted four key issues: trust, awareness as well as comprehension, control and training, as well as work organisation. As per their argument, future marine operators (in the SCC) would gradually shift toward supervisory positions that are physically apart from sharp-end activities as a result of automation. Traditional marine skills are no longer essential or relevant because of how technology has transformed many maritime skills.

2.9 Competitiveness in Commercial Shipping Industry

In the opinion of Hansen et al. (2016),Shipping services do not possess any alternative applications. As a result, competition arises amongst the ship owners for cornering the existing traffic. Španja, Krajnović and Bosna (2017) have highlighted that one of the key reasons

behind high competition in the shipping industry includes freedom to use of a certain highways. The ocean's eternal path is a gratuitous gift from nature. Without gaining any rights to sail the ships or steamers, it is accessible to all people and nations in the globe. Ships are free to go wherever on the sea, with the exception of various limitations in the nations' coastline waters, which encourages international competition.

Hansen et al. (2016) have highlighted limited number of investments obligated for establishing business in the shipping industry can be considered as one of the major reasons. The initial expenditure for shipping is little. Buying a steamboat or a ship does not need the financial expenditure obligated to build continuous routes, signals, crossings, excavations, culverts, stations, etc. The shipping companies manage the infrastructure for loading, unloading, as well as sheltering; as a result, the ship owner need not make any investments. The use of these amenities is contingent upon paying of port fees (Shin et al. 2017). Due to the low original investment, it draws several contestants from all over the world.

Kuo, Lu and Le (2020) claim that an effective mobility of the ships can be considered to be one of the key reasons behind higher level of competition in the shipping industry. First, there are several maritime roads that provide access to the whole world's pathways for travel. In contrast to inland canals and railroads, they are not constrained to a certain set of routes. Secondly, unlike railroads, vessels are not restricted to a certain path. They may be launched on other routes if one stops being profitable without incurring any financial or time losses. Therefore, shipping is more competitive due to ships increased along with frequent mobility, Mallouppas and Yfantis (2021) have debated. The majority of operating costs are spent on maintenance, administration, as well as insurance that are fixed costs unrelated to traffic levels, whereas the majority of capital expenditures go toward the purchase of ships.

Every shipping firm makes every effort to increase trade in order to lower its investment cost per unit of operation because the majority of costs remain constant and has been found to be not recoverable in the event of lower volume of traffic (Papathanasiou, Cole and Murray 2020). They engage in fierce rivalry in an effort to win over new clients, and occasionally they lower their prices to the point where they only make back their variable costs plus a little extra. Since these shipping enterprises are particularly severely affected during a slump and must compete fiercely for customers, they often resort to suicidal behaviour.

Kyusya (2015) stated that the freedom to determine the rates is a major factor that has enhanced the competitiveness of the shipping industry. The nation's government regulates rates as well

as charges for car and rail travel to a large extent, while shipping rates and costs are established freely in the lack of any regulatory requirements. Therefore, there are no restrictions on how much the rates can change. Because of this, rate-cutting and monopolistic pricing are common in shipping.

Lee et al. (2014) have highlighted that, the competitiveness of a nation's shipping sector is influenced by both its prospective shipping benefit and its current shipping strengths. From the views of marine time as well as cost, road cost as well as time, and port cost and time, the viability of the shipping industry might be examined. The future of the shipping business as a suitable alternative to road haulage heavily rests on its competitiveness versus road haulage. Sambracos and Maniati (2012) provided a summary of the degree to which Shipping infection and road freight transportation are competitive in continental port links. They believed that the most significant aspect affecting the shipping industry's viability was the administrative cost.

The recognised annual operational costs for maritime transportation included diesel, lubricating oils, port membership fees, repair, port fees, transportation fee as well as privileges of the Corinth Canal, health coverage, crew cost, employee cost as well as others (Çetin, Akgül and Koçak 2018). The recognised annual operational costs for commercial vehicles particularly included motorist cost, cost of insurance, vehicular fees, technological inspection, gasoline, petroleum products, tyres, maintenance, driver mileage along with toll fees. Managers may get some information about specific Shipping Industry policies throughout the EU in Douet and Cappuccilli (2011).

Lin and Chang (2017) however have stated that Industries related to shipping are crucial pillars in Indonesia's development as a major maritime hub. Nevertheless, the government's present tax regulations for the shipbuilding industry demonstrate a lack of assistance for the domestic shipping firms. International shipping businesses typically gain more from the developed regulations than domestic delivery companies do. Among many other things, some of these policies include a) no VAT charges for foreign shipping businesses using boxes; b) unequal VAT classification for port services; as well as c) presumed scheduler rates of taxation on the basis of previous revenue tax regime, which had reasonably high-income tax rates. The Indonesian government supports the growth of the domestic maritime industry. As a result, national shipping corporations receive benefits in terms of taxation (Papathanasiou, Cole and Murray 2020).

The rule succeeds in lowering port anchoring costs that ultimately will increase the capacity of domestic maritime businesses to participate on the international market. Tax incentives might make Indonesian export goods more attractive. Ahn et al. (2019) have emphasised how crucial it is for the business to carefully choose new hires. A company's high calibre workforce may be a major competitive advantage. The issue facing shipping firms is the variety of their workforce, which makes the process of collective homogeneity more challenging (Zelenika & Zanne, 2008). The majority of employees often originate from several continents rather than just one nation, and they all have unique work cultures.

Lin and Chang (2017) opine that the shipping can be identified to be a competitive industry, and, in this regard, there are demands for the shipping services and do not have any other alternative applications. Hence, amongst the ship owners, the competition arises so as to corner the existing traffic. The cause of competition may be the freedom to use certain highways. As there is large scale freedom to use certain highways, in such a regard, it is considerate to identify and establish the fact that the competition increases. Other than this, the freedom of determination of rates also affects the competition. There exists freedom of determination of the rates with respect to the fact that the railways and motor transports are largely regulated by the government of the nation. It is essential that since the freedom to set the rate exists, there are no limits to such operations. The competition within the tramp services have been increasing and due to greater mobility and flexibility, the tramps provide quick and promote services to the shippers which accommodates the needs accordingly. Due to this flexibility offered, the demand is considerately very high.

Kyusya (2015) also mentions that the competition in the line services has also been increasing. Although the industry requires high level capital investment, however, they tend to provide sound services and suitable performance management which assures better engagements and end results. Hence, it is important that the competition in the industry is captured well.

2.10 Financial Scope in Commercial Shipping Industry due to Autonomous Shipping

Ventikos, Chmurski and Louzis (2020) state that the Norwegian shipping organizations, a total turnover of 229 billion NOK in the year 2018, an increment of 11 percent compared to the year 2017. International deep sea shipping organizations, specifically, demonstrated strong development in 2018 that is driven by increment in freight rates within the 2nd half of the year. Approximately, 60 percent of the owners of ship is expected to enhance the freight rates in the 2022, while 20 percent is expected diminished revenue along with 20 percent remain

unchanged. Chen et al. (2020) have highlighted that for shortage of ships, Germany is still considered one of the largest markets that is followed by UK. For deep sea ship owners, both China and USA are highly crucial markets. Both UK and Norway are considered to be highly crucial for the offshore as well as rig organizations.

Ventikos, Chmurski and Louzis (2020) have highlighted that offshore segment has anticipated continued challenging industry with a significantly higher number of ships in prolonged low rates, layup as well as short horizons associated with contracts. Profitability on the Norwegian shelf has dramatically grown over the past few years as a result of considerable cost cuts, efficiency upgrades, and supplier industry-wide merger. The oil corporations have extremely solid margins as a result of significant cost reductions as well as more steady oil price that is significantly higher compared to its lowest levels. Zhao, Roh and Lee (2019) have highlighted that ship owners anticipate hiring 137 vessels as well as 5 rigs in total throughout that time. Deep sea as well as short sea transportation are likely to account for the majority of orders. The majority of short sea ship - owners, who make up approximately 40 percent of shipping businesses, view Norwegian shipbuilding as important for the building of new ships.

Kalgora and Christian (2016) have highlighted that during the boom of the shipping industry, ship owners, bankers as well as investors had developed financial stability. However, this financial growth of the shipping industry has got ceased in the previous 10 years. Specifically with the advent of Covid 19, the shipping industry is undergoing severe crisis. Ziajka-Poznańska and Montewka (2021) have highlighted that Autonomous shipping poses the potential to enhance the profit margin and thereby result in financial growth of the shipping industry. The author has highlighted that autonomous merchant ships have been found to more beneficial than other kind of ships. However, it has also been highlighted that without real time data, the degree to which autonomous shipping will be beneficial financially for a specific industry, cannot be understood without proper real time execution. Therefore, it is highly crucial for shipping organizations to opt for autonomous shipping.

However, Akbar et al. (2020) took into account the possibility of operating the autonomous mother vessel in LSND-A. Compared to a completely traditional approach, the ship's running costs are reduced by 20 percent. The price of petrol is reduced by 10 percent. The authors make the assumption that the deployment of autonomous daughter ships is likely to save overall operational expenses by around 11percent with in situation with the usage of a conventional mother vessel and autonomous daughter boats calling 22 ports. Low duration charter expenses

(the personnel cost is eliminated) and fuel prices (6 percent), which make up the vast majority of the savings (94 percent) are to blame.

Ventikos, Chmurski and Louzis (2020) have highlighted that autonomous vessel results in reduced fuel consumption which in turn enhances the profit margin of the owners. Industry experts examine a number of factors that might improve the fuel economy of automated vehicles (Jokioinen, 2016). Lower air resistance, lighter ship mass, as well as the onboard lodging system are all taken into account in this research. When all impacts are considered, the driverless ship's fuel usage is decreased by around 6 percent. This projection is quite cautious when contrasted to other predictions of possible fuel savings for autonomous vessels, such as 12 to 15percent (Arnsdorf, 2014). It should be emphasised once more that only impacts directly connected to an autonomous ship are taken into account in this study; potential impacts of ship cognition are not. However, estimated fuel savings somewhere may take into account such ship intelligence benefits.

Montewka et al. (2018) have highlighted that One of the key factors contributing to the increased level of profit from autonomous vessels is the cheap cost of personnel upkeep. A boarding crew is in charge of caring for the engine plant, ancillary plants, supply systems, electric as well as automation systems and others on the autonomous vessel. The job is anticipated to be done by a staff of nine engineers and technicians while the ship is berthed or awaiting (Tusher et al., 2022) Kretschmann et al., state that the related expenses amount to roughly USD 135,000 per ship per year (including 15 percent for profit and other expenditures) (2015).

The necessity for a crew to live on board is no longer necessary, and unmanned ships are not constrained by minimal sight distance requirements from the bridge. As a result, it is now feasible to construct modern ships without the deckhouse structure that is present on traditional boats today. The decks house’s removal lowers air friction, which boosts fuel economy. In calm weather, the ship's velocity as well as the surface area accessible to the wind above the horizon generally determine air resistance. It normally amounts to 2 percent of a ship's overall resistance, but in high winds, it may be substantially higher (Montewka et al., 2018). The amount of surface area exposed to the air is less without the need for a deckhouse construction. Fuel usage and propelling power are thereby reduced.

2.11 Customers and Markets of Commercial Shipping Industry

The autonomous shipping industry is still growing and currently is unsaturated. It is estimated to be 39 billion USD in the year 2022 and is projected at reaching 8.2 billion USD in the year 2030 (Karetnikov et al., 2019). A wide range of factors are driving the market that includes development of new as well as advanced systems for autonomous ships, enhancing trade in Asia Pacific along with increasing the usage of cruise ship passengers. Currently 4 of the companies that are manufacturing the autonomous ships includes Kongsberg Maritime (Norway), Hyundai Heavy Industries (South Korea), Fugro (Netherlands), BAE Systems (UK) and Rolls-Royce PLC (UK).

2.12 Other crucial findings in the literature

2.12.1 Education and training in shipping

The maritime scene has been changing considerably. It is essential to note the fact that, the continuing epidemic has thrown light on the role which the maritime industry plays within the global economy. Considering this, it is essentially significant to identify the fact that the maritime scene has been changing considerably and the seafarers are at the heart of shipping.

The safety of the navigation services has become rather digital in nature and pertains that new skills and capabilities which need to be well assured for better engagements. Digital transformation is the need of the industry and hence, it is essential to assess and consider the fact that full interactions are needed here.

In this concern, maritime education has been evolving considerably and therefore, augmented reality, artificial intelligence, autonomous operations alongside the big data which becomes a significant part of the maritime operations. Hence, the changing technology and customer expectations generally requires the MET course correction which would assure better understanding of activities to build a better future. Here, it is essential to consider the fact that, with emerging immersive technologies, learning about these are essential.

2.12.2 Liability of maritime

The maritime industry has several advantages as it supports overall shipping and related engagements. Lin & Chang (2017) also identifies the fact that the ships are the most energy efficient method which enables movement across seas. In this context, it is suitable to understand the fact that the shipping has several disadvantages as well. These can be stated to

be within the context of ballast water. A cargo ship discharges ballast water into the sea, and this has a negative influence on the environment. The cruise ships, large tankers as well as other unload cargo and ballast waters into the sea which brings about negative health effects. Mallouppas and Yfantis (2021) state that another impact of the shipping industry may be stated to be the sound pollution. In this regard, the sound pollution has increased in the recent years, and this can travel long distances which brings about certain limitations. It is essential that adapting to aquatic ecosystems and economic damage as well as health issues as well.

Montewka et al. (2018) identifies the fact that the wildlife collision is another critical consideration of the marine travel. Here, it is suitable to note the fact that there have been several serious injuries and negative cases which bring about issues and give way to poor engagements. The atmospheric pollution may be identified to be another ill effect of the maritime strategies.

2.12.3 Artificial intelligence usage in maritime

As per Munim (2019), artificial intelligence can be identified as a simulation of the human intelligences which are largely processing within the computer systems. These procedures essentially comprise of learning and reasoning and the usage of self-correction. It is critically important to highlight that the artificial intelligence is largely implemented by using techniques such as the machine learning, natural processing and the robotics (Kuo, Lu & Le, 2020). The goal of the artificial intelligence research is to engage in the creation of systems which can perform all tasks well which would require basic human intelligence, visual perception, speech recognition as well as decision making. In this regard, the artificial intelligence can be taken to be useful for the purpose of automation whereby they can automate the repetitive tasks and improve efficiency in varying industries such as finance, healthcare and manufacturing.

Lee et al. (2014) mentions that predictive analytics is another artificial intelligence-based tool which can analyse the tasks, carryout data management and make predictions in a way such that the customer behaviour can be well captured. Robotics can also be identified as a system using which the robots can be well captured. It is essential to understand the fact that the robotics automates several various physical tasks in the context of agriculture and space exploration which would give way to better organisational performance and give way to better shipping facilities. Here it is essential to consider the fact that, the artificial intelligence provides provision for the computerised vision and enables the utilisation of information in a

way such that, the application of security, surveillance and self-driving ships can be well understood and applied.

Papathanasiou, Cole and Murray (2020) mention that the artificial intelligence in the shipping industry can be applied in the context of Fleet management. The artificial intelligence can be utilised to optimise the fleet operations and improve the efficiency of the routes. Sambracos and Maniati (2012) states that the predictive maintenance can be assessed to be another usage of the artificial intelligence which reduces downtime and saves the different business costs. The autonomous ships can be rightly identified to be the tool using which navigation, dock management and other decisions may be made suitably. Ringbom (2019) also mentions that cargo optimisation and other loading as well as unloading through analysis of the cargo weight and volume may be identified to be another application of the artificial intelligence systems. The risk management may be identified as another key usage of the artificial intelligence. When the businesses intend to engage in suitable acts and endeavours, it becomes significantly integral to understand the fact that the shipping companies are being able to utilise these for a better growth and future.

2.12.4 Maritime strategy

The maritime strategies have been functioning considerably. In line with this, there have been several wars within Iraq, Afghanistan, Kuwait in the Gulf as well as regional the Vietnam and Korean region. They have carried out various operations and have devoted a considerate amount of resource to different military actions which have imposed blockades against the enemy shipping. Sambracos and Maniati (2012) states that the maritime strategies of such wars have been different and therefore, each country has a predefined set of regulations in regard to which they are successfully able to engage in better planning and related engagements. It is essential to identify that allied maritime strategy has to be designed and characterised through the innovative struggle so as to oppose the successful strategy. It is significant to note that the maritime strategy changes considerably in regard to context, structure, national purposes, technologies as well as the equipment's available and therefore, it is significant that suitable planning is engaged in to assure better operations.

2.13 Conceptual Framework

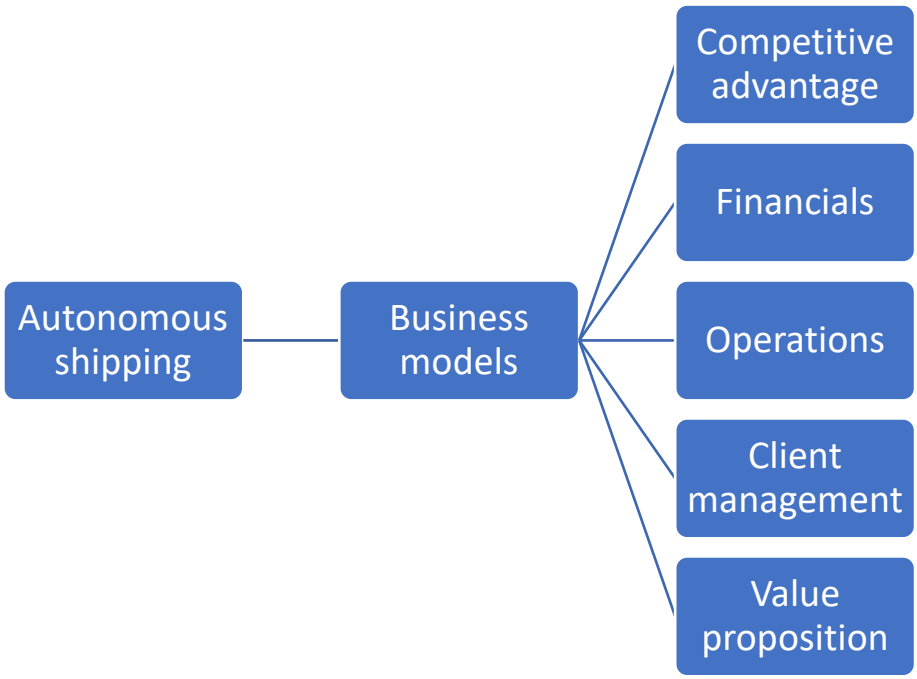

Figure 1 Conceptual framework

(Source: As created by the author)

2.14 Summary and Literature Gap

From the above discussion, it can be found that reduced labour costs for shipping purposes is one of the primary benefits of autonomous shipping. An artificially intelligently operated ship is referred to as an autonomous ship. A wide range of mechanical and control equipment are installed on the ship to support the complex Ship Outfitting components. This illustrates how, in an autonomous ship, robotics and automated machines must be utilised to various mechanical as well as control systems of the vessel. Compared to conventional warships, unmanned boats are riskier and may cause a lot more deaths. The use of autonomous vessels will significantly raise the investment cost of combat, according to the researchers. Over a billion containers transit between ports across the world every day, and billions of dollars' worth of goods are transported daily across waterways. Some of them are urgent problems that must be shifted to a different port by a certain deadline. It has been discovered that the production expenses of an autonomous vessel are significantly greater than those of a non-autonomous vessel. However, a sizable number of firms are choosing the same due to its long-term advantages. COVID-19 has made it exceedingly difficult for the dispute to be settled during this time period because to the boats' inability to reach specified ports, forcing the parties to take part in the payment of additional fees that are in dispute. There are several prospects

related to the use of autonomous shipping in the maritime sector. The autonomous hips market has been shown to be divided into retrofit and line fit according on the end use.

In order to lessen the risk that seafarers encounter, autonomous ships that are unmanned or lightly staffed have emerged. Although it has been seen that the frequency of incidents has not decreased as a result of autonomous ships, the safety of marine life has significantly improved. Application of the Technology Adaptation (TechAdo) paradigm is necessary for MASS deployment. The researcher's suggested TechAdo model includes a number of elements that are often included in models of technology dissemination. Human capital encompasses accumulated skills in addition to formal education and training and is essential to a company's strategy. The adoption of new technologies is accelerated by human capital, despite the fact that it is sometimes considered to be a manufacturing component.

Autonomous ships provide significant safety benefits because human error accounts for 75% of maritime accidents, with fatigue and obsessive-compulsive disorder being the primary contributors. Due to the lack of a workforce that must travel ashore for crew changes, fully autonomous vessels may more easily slow down and preserve energy and fuel. Additionally, autonomous ships would maximise fuel efficiency and optimise maintenance tasks, which would reduce their carbon impact. The benefits of autonomous ships are numerous, and autonomous shipping is no longer simply a sci-fi concept that could come to pass in the future. It is currently being developed by several projects launched globally. The shipping industry has been found to be facing a prolonged period of change. As a result of the long-lasting conditions of the over capacity as well as low demand, the shipping lines have been found to be struggling for making profit in the past 2 years. Social media utilisation is regarded as a crucial component of business marketing communications and has to be included into management procedures for strategic, tactical, as well as functional advancements.

These benefits provided to businesses by commercial shipping corporations are regarded as a component of value proposition. For times of high traffic, such as business expansion and holidays, plan scalable capacity. The demand for shipping services is increasing, and the shipping business may be seen of as being quite competitive. There aren't any alternatives to shipping services. As a result, there is competition among ship owners to control the current flow. Norwegian shipping companies reported a total revenue of 229 billion NOK in 2018, an increase of 11% from the previous year. International deep sea transport companies in

particular showed significant growth in 2018, which was fuelled by an increase in freight rates in the second half of the year.

3 CHAPTER 3: METHODOLOGY

3.1 Introduction

Autonomous shipping may be rightly identified as a technique using which the application of technologies is engaged in so as to find the best way in which the overall shipping becomes largely convenient. Furthermore, the business model of the commercial shipping has been changing considerably due to the increasing rules and related regulations in the recent times. However, such autonomous shipping engagements are also known to have a strong influence on the business model of the commercial shipping companies. However, very few studies have been undertaken in such a domain which is largely focused on identifying and establishing the best way in which the autonomous shipping strongly influences the business model of the commercial shipping enterprises. Through the research, it is intended that the following objectives are achieved successfully:

- To determine how autonomous shipping affects commercial shipping companies' business value propositions.
- To investigate the financial impact of autonomous shipping on commercial shipping companies.
- To impact of autonomous shipping on determine the competitive advantage of commercial shipping corporations.
- To determine the impact of autonomous shipping on target clients of commercial shipping companies.

The purpose of this methodology section is to discuss the methods that have been used to conduct the research including data collection and data analysis. In this section both conceptual and practical aspects of selecting the chosen methods have been discussed considering the details rationale of selection. The structure of the research methodology is based on the framework of research onion. As per the structure of the research onion, the conceptual aspects of the methodology should be selected to proceed through the practical aspects of the research

method.

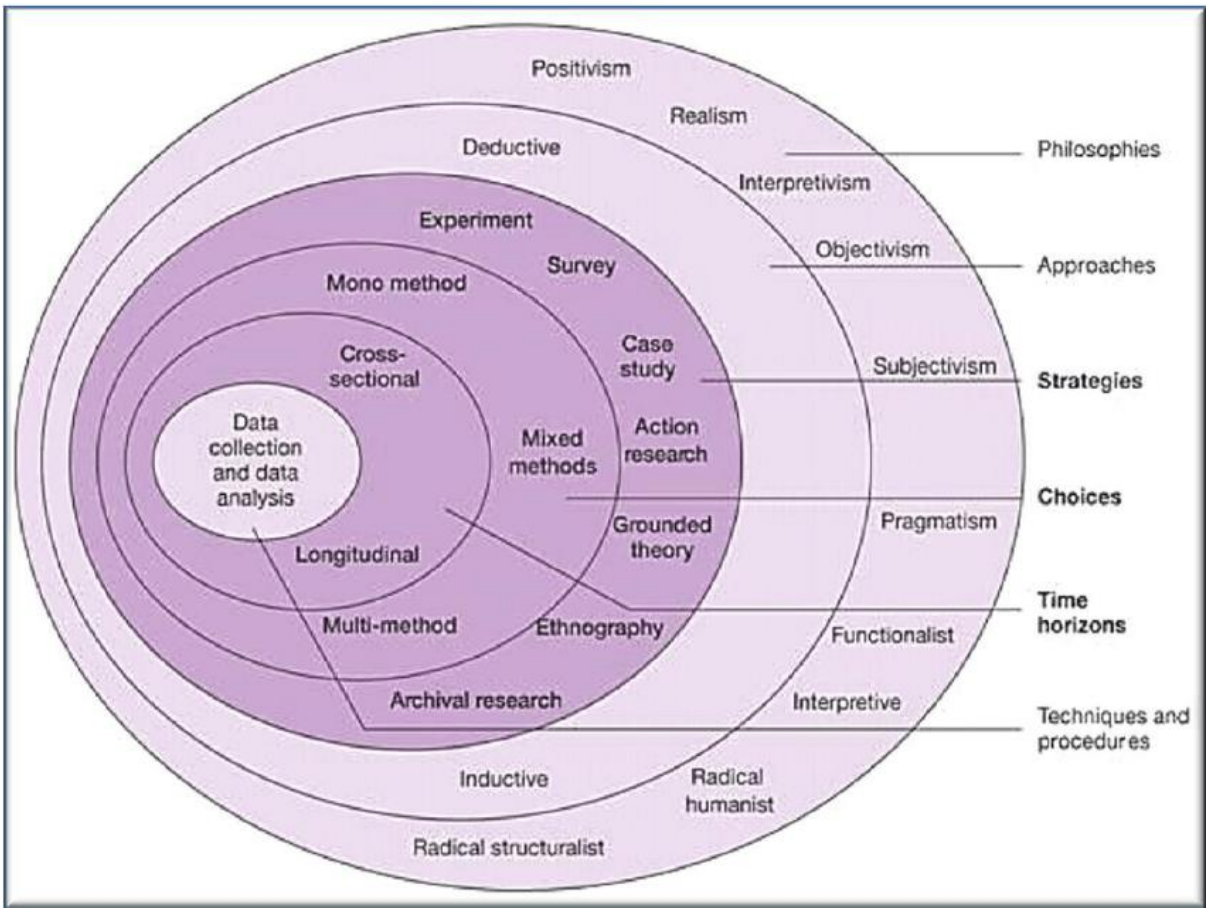

Figure 2: *Research Onion*

Source: (Sahay, 2016)

The conceptual aspects that are the outer layers of the onion are the research philosophy and research approach. The practical aspects are in the inner layers and core the research onion that include data collection, data analysis, and sampling. In the following section the external layers of the research onion have been explained with rationale followed by the internal or practical layers of the method.

The research onion is focused on detailing the choices which are made by the businesses in crafting the methodology section of the research. In this regard, it is suitable to gain an understanding of the fact that, the research philosophy can be identified as the set of beliefs on the basis of which the research is based. Considering this, the research approaches may be stated to the broader method which is generally used for the research analysis. These can be stated to be the deductive, inductive as well as qualitative and quantitative methods. In consideration with this, the research strategies may be stated to be the overall way in which the research is conducted. These may be identified to be action based, case study based and

experimental based. In this regard, it is essential to identify that the choices, time horizons as well as techniques and procedures have to be decided in ways such that, the overall research outcomes are largely successful.

3.2 Research Philosophy

The research philosophy refers the perception about the research problem and the potential truth that the researcher wants to find out. The philosophy of a research is based on the ontology and epistemology of the research. A research philosophy can be based on positivism, interpretivism and pragmatism based on the ontology and epistemology of the research (Tamminen & Poucher, 2020). As per the purpose of this study it can be said that the truth that this study aimed to find is a singular truth which is not dependent on the perception of different observer. Therefore, the ontology of this research is based on objectivism. This paper is aimed at finding the relation within multiple variables using measurable parameters, and therefore the epistemology of this research supports empirical measurability. Hence, positivism research philosophy has been chosen in this research. Using positivism philosophy, quantitative strategy has been used where the data collection is based on numerical approach and the relationships within different variables have been measured with empirical understanding.

The rationale behind selecting the positivism philosophy is that analysing the impact of autonomous shipping on different business aspects from non-measurable aspects would ensure less implications in practical field. On the other hand, measurable aspects can ensure the scope of further empirical evaluation for operational decision making and execution of recommended strategies. Through the positivism philosophy the survey method has been applied with empirical data collection process. As per Sahay (2016), the research philosophy associated with positivist philosophy is largely focused on the outcomes of the research and not the human reasoning and therefore, this makes it essential that the findings are fact based and authentic. Regarding this, it is essential to mention the fact that, when such a philosophy is well applied then in this regard, it enables better contribution towards the study outcomes.

3.3 Research Approach

The approach of a research suggests the approach of solving the problematic and answering the research questions of the research. The three major types of investigate approach are inductive approach, deductive approach and abductive approach (Benitez-Correa, Gonzalez-Torres & Vargas-Saritama, 2019). The determination of this study is to find the association between the dependent and independent variables. This study is not only inducing a new

concepts or recommendations based on the previous understanding. The study is also on aiming at explaining a concepts through abducting external concepts or phenomenon. The relationship within different variables have been assumed through evaluating the already existing knowledge and theories. In order to understand the association within multiple variables this study tries to testify the theory through inferential evaluation of the information. Hence, the deductive approach has been used in this research paper. The deductive research approach enabled this research to testify he assumed relationship in the shipping industry. The use of the deductive research approach assures the researcher's role is minimum and they are engaging in a simple deduction of the critical information which assures better understanding of critical information and gives way to better analysis of the key concepts. This assures improved assessment of the key concepts and assures openness of key concepts. This study has four hypotheses to testify that involves one independent variable and three dependent variables. The following hypothesis have been testified in this study.

H1: Use of Autonomous Shipping has significant impact on the Value Proposition of the company

H0: Use of Autonomous Shipping has no significant impact on the Value Proposition of the company

H2: Use of Autonomous Shipping has significant impact on the Finance of the company

H0: Use of Autonomous Shipping has no significant impact on the Finance of the company

H3: Use of Autonomous Shipping has significant impact on the Competitive Advantage of the company

H0: Use of Autonomous Shipping has no significant impact on the Competitive Advantage of the company

H4: Use of Autonomous Shipping has significant impact on the Target Customers of the company

H0: Use of Autonomous Shipping has no significant impact on the Target Customers of the company

The rationale behind selecting the deductive approach relies on the purpose of this study. This study has one dependent variable that is Autonomous Shipping whereas the study aimed at examining the impact of this method on the different aspects of the business. Therefore, the

relationship of the Autonomous Shipping with the different business aspects related variables can be only explained through testifying the assumptions. As per the literature review it can be found that it has been proven that the technological advancements have strong impact over the competitive advantages, performance, operations and clients of the organisations. Therefore, through assuming the similar relationship for the autonomous shipping the relationship can be formed to examine the impact of the Autonomous Shipping. The deductive approach enabled this study to develop the hypothesis and testifying the hypothesis according to the inferential findings.

3.4 Research Design

In this research cross sectional correlational study project has been used. In cross-sectional research design, a large number of populations can be involved in the data collection process at a single time where the data about all variables can be collected (Wang & Cheng, 2020). Cross-sectional studies are largely engaged in assessing the data from a large population at a particular point in time and at the same time sort of observational study, or descriptive research can be conducted by using the data. These studies are essentially applied to understand the prevalence of varying outcomes and critically discuss the characteristics of the population. The use of correlation design is a non biased method where the level of connotation between the variables is tested.

This study focused on quantitative strategy of designing this research so that the impact of the autonomous shipping system on the organisational settings can be evaluated measurably. The objective of quantitative research design is to engage in the identification of only fact based data which is generally free of any related emotions and reflect the opinions relating to the study itself. The quantitative design enabled the study to highlight the different business aspects and the measurable relationships in the change of the dissimilar features of the business as a result of autonomous shipping. The quantitative design appears to be the most appropriate for the purpose of the study as it assures understanding of the relationships between the different variables and further assures better assessment of the key details. In this regard, it is essential to note that as the research intends to identify the relationship between the autonomous shipping and the success of the business, then in such a regard, the choice of the quantitative design enables a suitable analysis technique thereby assuring better outcomes.

3.5 Population Selection

The identified population of data collection helps in creation of the foundation of the research and assuring that the pertinent participants can be involved. It is out of the population that the target sample may be selected (Davis, 2020). Selection of the population of a study holds the validity of the collected datasets. The determination of this study is to identify the effectiveness of the autonomous shipping implementations. Therefore, the valuable data can be collected from the population who are currently working in the shipping industry.

The All COSCO shipping alongside the Zhonggu Logistics Corporation, and Antong Holdings are the key firms whose employees have been chosen as the participants are the research. The enterprises comprise of several employees coming up to a total of above 100000 employees. The COSCO enterprise is a conglomerate in Shanghai and is currently the world number 1 shipping company. Shanghai Zhonggu Logistics Co., Ltd. focuses on container logistics services. The company provides international shipping, international shipping auxiliary business, domestic waterway transportation, domestic ship management business etc. The company was founded in 2010 and headquartered in Shanghai City, China.

Lastly, the Antong Holdings Co., Ltd., is a freight and transportation business which assures better provisions in terms of organizational management and vessel administration.

3.6 Sample Size and Sampling method

The probability sample method has been used in this study. The simple random sampling-based probability sampling method enables a study to ensure that each of the potential sample has equal likeliness to be selected that reduced the risk of having bias (Berndt, 2020). Employees from these companies will be chosen as respondents using the simple random sampling strategy. Each participant within the population has an equal opportunity of being taken for the study and generalizations can be made without being bias. This helps in gaining an all-round opinion.

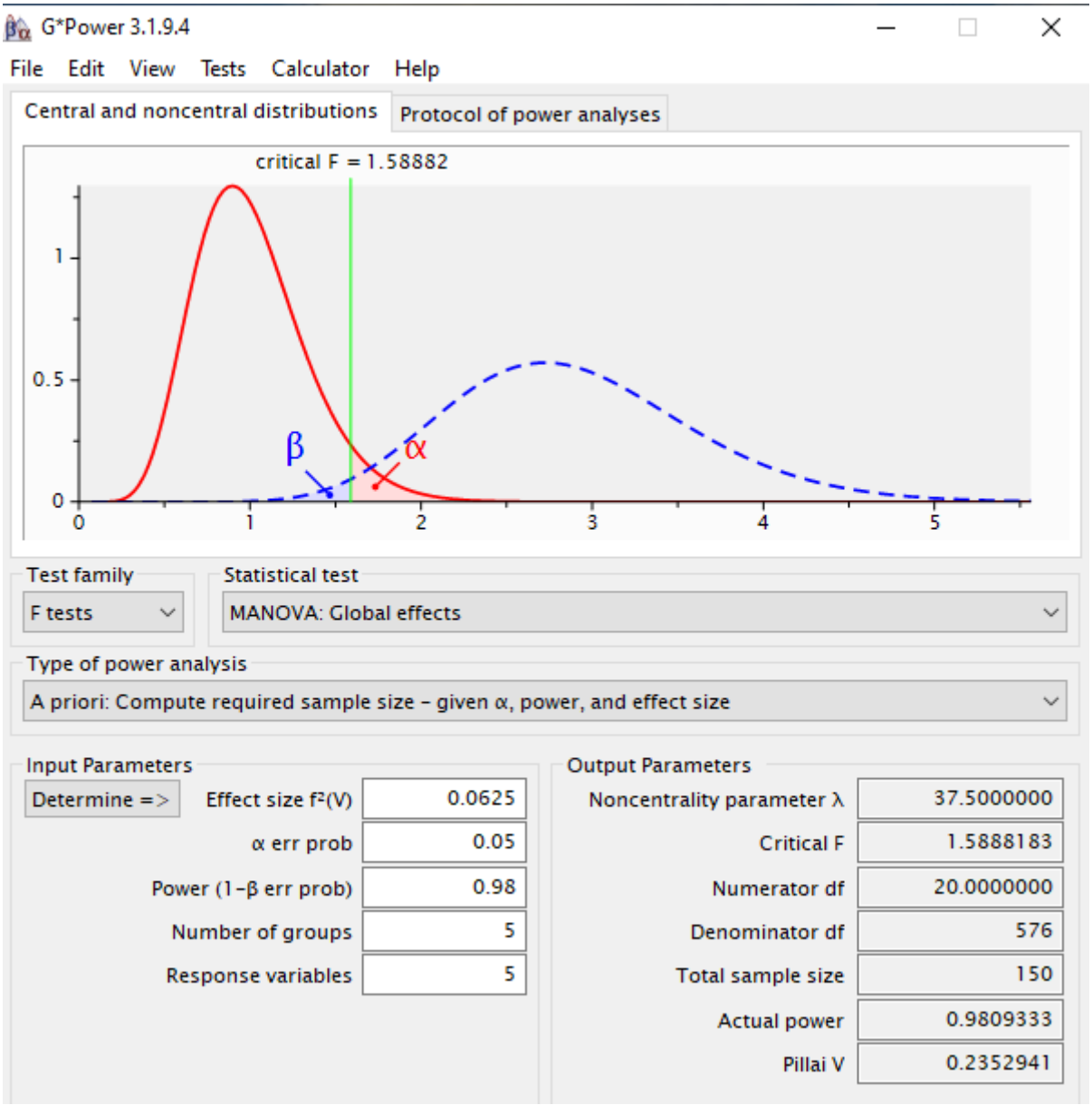

Figure 3: Sample Size Calculation using G-power Software

So as to identify the sample size, the correlation model has been estimated using g-power software with effect size, alpha error and 1-beta error probability. Two tails model has been selected for calculating sample size. The alpha error has been found as 0.05 considering the 95% confidence level as the threshold of the significance level. It has been found that effect size to determine the operational changes in the shipping industry is 0.06215. As per the report the final sample size is 150 participants. Randomly 50 participants have been recruited from COSCO shipping firm, 50 participants from Zhonggu Logistics Corporation and 50 participants from Antong Holdings (QASC). Total 150 questionnaire responses have been received from 150 participants

To summarize, it was targeted that the employees from these three companies would be rightly targeted. This would enable better understanding of the way in which random population is selected. Here, it is essential to identify that, the human resource department was approached and an email to the employees were sent out. The employees who responded were selected and no particular selection criteria was set in place.

The choice of 150 research participants appears to be justified due to the fact that it takes the opinions of 50 employees each from the three chosen enterprises thus giving equal importance to each of the members of the enterprise. Furthermore, the choice of 150 as a sample size is also suitable due to the fact that it adequately reflects the percentage of the target audience. As the target audience is the employees of the three different enterprises, choosing 50 respondents each appears to be a suitable choice and this way equal attention can be given to all three enterprises.

In line with this, the chosen sample size also reflects a confidence level of 95%. Reflection of a 95% confidence level assures validity of the research outcomes and also reflects the reliability of the overall research results. Furthermore, the chosen sample size has also passed the reliability and validity test in regard to which, it can be well verified that, the sampling size is adequate for the research and supports the findings well. Furthermore, within the domain of a research study, achieving a total of 150 sample size can be believed to be adequate to express the outcomes of the research.

3.7 Data Collection Process

Online survey questionnaire has been used to collect the data from the chosen respondents. One of the most suitable ways to collect data are a survey whereby quantitative information using a scale can be collected. (Zhou et al., 2018). The survey research has its set of advantages such as the large access to a huge population, statistical improvement in power as well as the availability of fact based models to assess the details. The survey questionnaire has been presented to the participants using online survey questionnaire platforms. The link of the questionnaire has been shared with each of the participants where the participants can use the survey questionnaire form through clicking on the survey link. The survey consists of 9 major questions that includes both single questions and multiple sub-parts. The participants obligated 5 to 10 minutes to answer all the research questions. While presenting the survey questions the survey questionnaire also included the purpose of the survey and the thankful note at the end of the questionnaire.

The questions have been developed in a way so that the participants did not have to share any personal information that can violate the data privacy and security policy. Besides the questions have been formed in a way in which it can be ensured that the chance of giving biased responses is minimum. The survey responses have been initially stored in a .csv dataset file using MS-Excel. The file has been stored in a secured digital storage system where only the researcher can have the access. The survey has been developed along with the pre-survey information sheet and post-survey thank you page. The pre-survey page guides the participants to answer the questions while participating in the procedure appropriately.

3.8 Tools and Measures

The survey questionnaire of this study is based on the close ended questions where multiple options are used. The close ended structured questionnaire enabled the respondents to share their responses in a structured way that can be easily measurable. The close ended questionnaire also enables the participants to respond very specifically without deviating from the context of the question (Krosnick, 2018). The structured question enabled all respondents to answer the exact same textual representation of the questions. Different set of multiple choice of options were developed for the questions. Nominal, Ordinal and Scale based options were used for the questionnaire. The scale-based options were used to collect information regarding the independent variable autonomous shipping and dependent variables Financial Factors, Value Proposition, Competitive Advantages and Target Clients.

Table 1: Participant information

Purpose	Variable	Question	Measures
Participants Background Related Data Collection	Gender	Your Gender	Nominal Male, Female, Others
	Age	Your Age	Ordinal (20 to 30 years, 31 to 40 years, 41 to 50 years, 51 to 60 years, 60+ years
	Experience	Your Experience in shipping industry	Ordinal (Less than 1 years, 1 to 5 years, 5 to 10 years, 10 to 20 years, 20 + years)

The data collection has been done by segregating the survey tool in three major components namely participants background related details, independent variable measures and dependent variables. In background related measures the age of the participants, gender, experience in shipping industry and similar questions have been asked. The Independent Variable of this study is Autonomous shipping. The Dependent variables of this study are Value proposition, Revenue generation, competitive strategy, target customer.

Table 2: Autonomous shipping

Purpose	Variable	Question	Measures
Autonomous Shipping Usage Related Data Collection	Adaptation since	From how many years the Autonomous shipping technology have been used in your organisation	Ordinal (Less than 1 years, 1 to 2 years, 2 to 4 years, 4 to 6 years, 6 + years)
	Partially Automated	Partially autonomous with on-board Seafarer	Likert Scale (1, 2, 3, 4, 5)
	Remote Controlled	Remotely controlled ship	Likert Scale (1, 2, 3, 4, 5)
	Full Autonomous	Fully automated ship with advanced AI	Likert Scale (1, 2, 3, 4, 5)

In order to collect data regarding the depend on variables each dependent variable has been segregated into three components. Through using average of the responses of three components the score for each dependent variable has been developed for the data analysis. Therefore, for dependent variables 4 customised variables have been developed by using the average function with the underlying components of 4 independent variables.

Table 3: Questions

Purpose	Variable	Question	Measures
Perceived level of value proposition factors with Autonomous Shipping	Distinct value	Distinct value including safety and others	Likert Scale (1, 2, 3, 4, 5)
	Fulfilling needs and expectations	Fulfilling the needs and expectations from service	Likert Scale (1, 2, 3, 4, 5)
	Operational Efficiency	Fulfilling organisational operational efficiency	Likert Scale (1, 2, 3, 4, 5)
	Revenue	Revenue generation	Likert Scale

Perceived level of financial factors with Autonomous Shipping			(1, 2, 3, 4, 5)
	Profitability	Profitability	Likert Scale (1, 2, 3, 4, 5)
	equity	Net worth or equity	Likert Scale (1, 2, 3, 4, 5)
Perceived level of Competitive Advantage factors with Autonomous Shipping	Brand recognition	Brand recognition	Likert Scale (1, 2, 3, 4, 5)
	Market Share	Market Share	Likert Scale (1, 2, 3, 4, 5)
	Irreplaceable and Inimitable	Irreplaceable and Inimitable	Likert Scale (1, 2, 3, 4, 5)
Perceived level of Target Client factors with Autonomous Shipping	Client Change	Change in target client	Likert Scale (1, 2, 3, 4, 5)
	Client Satisfaction and Loyalty	Client Satisfaction and Loyalty	Likert Scale (1, 2, 3, 4, 5)
	Changes client operations	Changes within client's operations	Likert Scale (1, 2, 3, 4, 5)

To receive responses in continuous variable-based questions, the Likert's scale has been used (Jebb, Ng & Tay, 2021). In Likert's scale questions 5 option Likert's scales have been presented, whereas 1 represents the least support to the factor and 5 represents most supportive notion to the respective factor. In order to determine the central tendency of the continuous responses, the descriptive methods of statistics have been used.

3.9 Data Analysis Methods

The data analysis procedure of this learning is based on statistical analysis method where both inferential and descriptive statistics have been conducted. While descriptive statistics is the use and analysis of such statistics in descriptive manner to develop the overall understanding about the data and data distribution. A descriptive statistic tends to summarise the distribution of the information (Siedlecki, 2020). In this study the used descriptive statistical methods are mean, median, standard deviation, maximum, and minimum. In this study the descriptive statistics enabled to understand the overall condition of the use of autonomous shipping and the outcome of autonomous shipping process within the chosen organisation. The measure of mean and median are called as the measure of central tendency, that can help to measure centre

placement of data set. The deviation tends to measure the way in which the responses are largely dispersed in a group of values. In this study the standard deviation and maximum minimum measures have been used to measure the deviation and distribution of the data from the central tendency.

To compare alongside contrast the variations between the conduct groups, inferential analysis is frequently used. Inferential analysis use data from the study's sample of members to compare the different treatments and draw deductions about the subject populace as a whole.

Y = Autonomous shipping

X_1 = Value proposition

X_2 = Revenue generation

X_3 = competitive strategy

X_4 = Target customer

"Functional relationships between variables"

$Y = f(X_1, X_2, X_3, X_4)$

The multiple regression models for this study are presented below:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \varepsilon$$

Here, the dependent variable's value can be taken to be Y is a linear function of the value of the independent variable X_{1-4} in the observations. The coefficients acts as the slope and intercept alongside the slope and the error term. The use of SPSS tool has been made to evaluate the information using descriptive and inferential statistics such as regression and correlation analysis.

3.10 Reliability and Validity

The reliability and validity of a research are two major aspect of a study that holds the credibility and the viability of the findings of the study. In quantitative study, the validity of a research refers to the capability of the findings to address the true nature of the general population (Sürücü & MASLAKÇI, 2020). It ensures the appropriateness of the study techniques to answer the target research questions. KMO and Bartlett's test of sphericity have been used in this study to test the suitability of data collected for the interpretation for ensuring the validity of the data collection method and selected population. The Kaiser-Meyer-Olkin

Measure of Sampling Adequacy indicates the adequacy and appropriateness of the data source considering the variables for that the data has been collected.

The dependability of the quantitative study refers the accuracy of the method of conducting the study so that it can be ensured that the method can reproduce the same results in multiple executions. Reliability is a measure of accuracy or the data collection process to ensure a consistent result (Quintão, Andrade & Almeida, 2020). In this research Cronbach's Alpha reliability analysis has been used. The Cronbach alpha values can be ranged from 0 to 1, where a when the value is more than 0.7 it is considered satisfactory. If a Cronbach's alpha value is more than 0.8, it is considered as a good reliability and of a Cronbach's alpha value is more than 0.85, it is considered as extremely reliable. In this study, if the alpha value is more than 0.7, it has been accepted for further data analysis.

3.11 Ethical Consideration

The ethical consideration of this research is based on three major concerns. The first ethical concern is the impact of the study on the participant's health. The study has been conducted using the online survey questionnaire, where the risk of having any health impact is almost zero in this pandemic situation. Besides, the questionnaire has been designed in a way so that it cannot have any impact over the psychological and emotional health of the participants. The questionnaire has been also designed in a way so that it cannot hart the dignity of the study. The second concern is the confidentiality of the personal data.

The data collection, data handling and data analysis process of this study is adhered to data privacy and protection regulation (Solangi et al., 2018). The personal information of the participants such as name, e-mail id, contacts, address and others have been demolished after collecting the data. In the research non personal information about the participants has been exposed. The personal information of the participants has not been used for statistical analysis and the data is not exposed in this research..

Another concern is the opinion of the participants. In order to safeguard the willingness of the participants a consent form has been shared to the participants. The consent form comprises the details about the research purpose, process of participations, privacy protocol and others. It has been also ensured that the participants can leave the survey process anytime they want. After receiving the acknowledgement from the participants through the consent form the final data collection process has been executed.

3.12 Summary

Positivism research philosophy has been chosen in this research. The deductive research approach enabled this research to testify he assumed relationship in the shipping industry. In this research cross sectional correlational study design has been used. This study focused on quantitative strategy of designing this research so that the impact of the autonomous shipping system on the organisational settings can be evaluated measurably. All COSCO Shipping, Zhonggu Logistics Corporation, and Antong Holdings (QASC) employees in China are included. Online survey questionnaire has been used to collect information from the respondents. Online survey questionnaire has been used to collect information from the respondents in the sample, where the final sample size is 150. The survey consists of 9 major questions that includes both single questions and multiple sub-parts. The participants obligated 5 to 10 minutes to answer all the research questions. After receiving the responses, the SPSS software has been used for the data analysis procedures. The data analysis process of this study is based on quantitative statistical analysis method where both inferential and descriptive statistics have been conducted. In inferential statistical analysis MANOVA analysis have been used where the process is aimed at testing model with one independent variable and 4 dependent variables.

4 CHAPTER 4: ANALYSIS AND FINDINGS

4.1 Introduction

The study focuses on the way in which the research would successfully be able to establish and identify the best way in which the autonomous shipping brings about a considerate influence on the business model of the shipping companies. The understanding would bring about an identification of how the different business engagements would undergo a considerable change and the overall way in which the performance of the shipping companies can be improvised to a greater extent. In this concern, it is essential to establish the fact that, the chapter is the results section and is largely based on the SPSS outputs of the statistical of statistical analysis methods where survey responses of 150 participants have been considered. After receiving the responses, the response data was extracted in an excel worksheet. After initial coding the data was imported in SPSS software for final data analysis. After final coding in SPSS, the descriptive and inferential statistical methods were used to develop the results. From the survey, for each variable three component-based responses have been received. The dependent and independent variables have been developed by calculating average of the three components of each variable. In this chapter the findings from the data analysis have been presented considering the reliability and validity analysis, descriptive analysis and inferential analysis. Both tabular and graphical presentation of the data have been used in this findings section and the interpretation have been done accordingly. The hypotheses of this study are also tested in this analysis. The hypotheses of this research are:

H1: Use of Autonomous Shipping has significant impact on the Value Proposition of the company

H0: Use of Autonomous Shipping has no significant impact on the Value Proposition of the company

H2: Use of Autonomous Shipping has significant impact on the Finance of the company

H0: Use of Autonomous Shipping has no significant impact on the Finance of the company

H3: Use of Autonomous Shipping has significant impact on the Competitive Advantage of the company

H0: Use of Autonomous Shipping has no significant impact on the Competitive Advantage of the company

H4: Use of Autonomous Shipping has significant impact on the Target Customers of the company

H0: Use of Autonomous Shipping has no significant impact on the Target Customers of the company

Hence, the chapter follows a structured layout which is largely focused on identifying and discussing the best way in which the overall understanding of the techniques in which the findings can be well verified. This would be followed by the descriptive analysis and thereby, the inferential analysis would be engaged in.

4.2 Validity and Reliability

The validity and reliability analysis can be rightly identified as a technique using which the data quality and the sampling adequacy can be well measured. In this context, it is crucial to state and establish the fact that the reliability analysis can be assessed with the help of Cronbach alpha analysis. The standard accepted value of Cronbach alpha value is taken to be the standard value of 0.7. When the value 0.7 is achieved, the data set is taken to be largely reliable in nature.

Table 4: Case processing

Case Processing Summary			
		N	%
Cases	Valid	150	100.0
	Excluded[a]	0	.0
	Total	150	100.0
a. Listwise deletion based on all variables in the procedure.			

Table 5: KMO and Bartlett's test

KMO and Bartlett's Test		
Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.201
Bartlett's Test of Sphericity	Approx. Chi-Square	768.481
	df	105
	Sig.	.000

Communalities		
	Initial	Extraction
Partial_automatic	1.000	.810
Remote_controlled	1.000	.845

Full_Autonomous	1.000	.661
Distinct_value	1.000	.614
Fulfilling_needs_expectations	1.000	.873
Operational_efficiency	1.000	.833
Revenue_generation	1.000	.614
Profitability	1.000	.667
Equity	1.000	.692
Brand_recognition	1.000	.624
Market_share	1.000	.731
Irreplaceable_Inimitable	1.000	.685
Client_change	1.000	.804
Client_Satisfaction_loyalty	1.000	.627
Change_Client_operations	1.000	.775
Extraction Method: Principal Component Analysis.		

According to the p-value in KMO bartlett's test it can be found that the validity of the collected data is significant. It has been found that the sampling adequacy coefficient is 0.201 and the p-value is less than 0.05, which signifies that the collected data valid. However, the Extraction values of the responses under each factor it can be said that the collected data is moderately valid. The value of communalities has to be above 0.6 and therefore, it has been identified that all values are above 0.6.

Table 6: Total variance

Total Variance Explained						
	Initial Eigenvalues			Extraction Sums of Squared Loadings		
Component	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1	2.803	18.685	18.685	2.803	18.685	18.685
2	2.201	14.676	33.361	2.201	14.676	33.361
3	1.931	12.871	46.233	1.931	12.871	46.233
4	1.500	10.002	56.235	1.500	10.002	56.235
5	1.419	9.457	65.692	1.419	9.457	65.692
6	1.003	6.686	72.379	1.003	6.686	72.379

7	.916	6.105	78.483			
8	.812	5.414	83.897			
9	.707	4.713	88.611			
10	.639	4.263	92.874			
11	.440	2.932	95.806			
12	.343	2.284	98.089			
13	.159	1.060	99.150			
14	.099	.659	99.808			
15	.029	.192	100.000			
Extraction Method: Principal Component Analysis.						

The total variance in the data can be well explained by the first 6 variables. In this regard, it is essential to consider the fact that, the overall extraction of the squared loadings is well explained.

Table 7: Scale

Scale Statistics			
Mean	Variance	Std. Deviation	N of Items
66.1818	11.129	2.59660	15

Table 8: *Reliability Analysis Results*

Cronbach's Alpha	N of Items
.724	15

As per the findings in figure 4.2.2, it can be seen that Cronbach's alpha value is 0.724, which more than 0.07. A Cronbach's alpha value that is more than 0.7, should be acceptable as a reliable dataset. Therefore, the collected responses and their datasets have adequate level of reliability.

According to the above reliability and validity analysis it can be said that the collected data is adequately dependable and moderately valid. Therefore, the collected dataset has adequate credibility to be accepted for the final data analysis and interpretation process.

4.3 Background of Participants

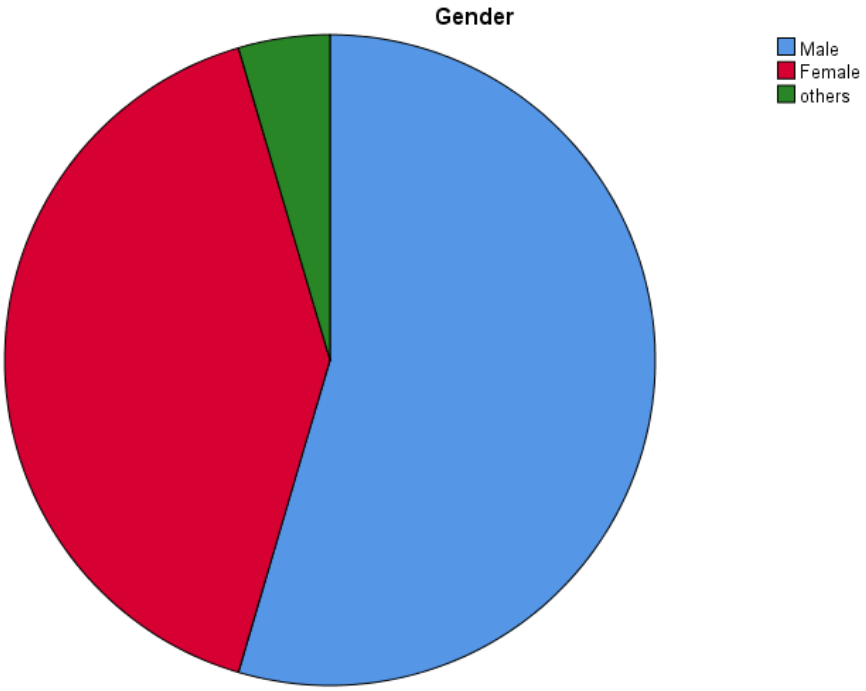

Figure 4: Frequency distribution of gender within participants

Table 9: Gender

Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Male	82	54.7	54.7	54.7
	Female	61	40.7	40.7	95.3
	others	7	4.7	4.7	100.0
	Total	150	100.0	100.0	

As per the findings of figure 4.3.1, it can be seen that 54.7% of the participants are male and 40.9% participants are Female. Therefore, the male and female population is almost equally distributed within the respondents whereas the proportion of male is slightly higher than the male population. Considering the fact that there is no correlation between the gender of the participants and their perception about autonomous shipping, it does not have any impact over the accuracy of the result. Gaining and gathering data from a larger population simply represents that the perspectives of all suitable participants have been gained successfully.

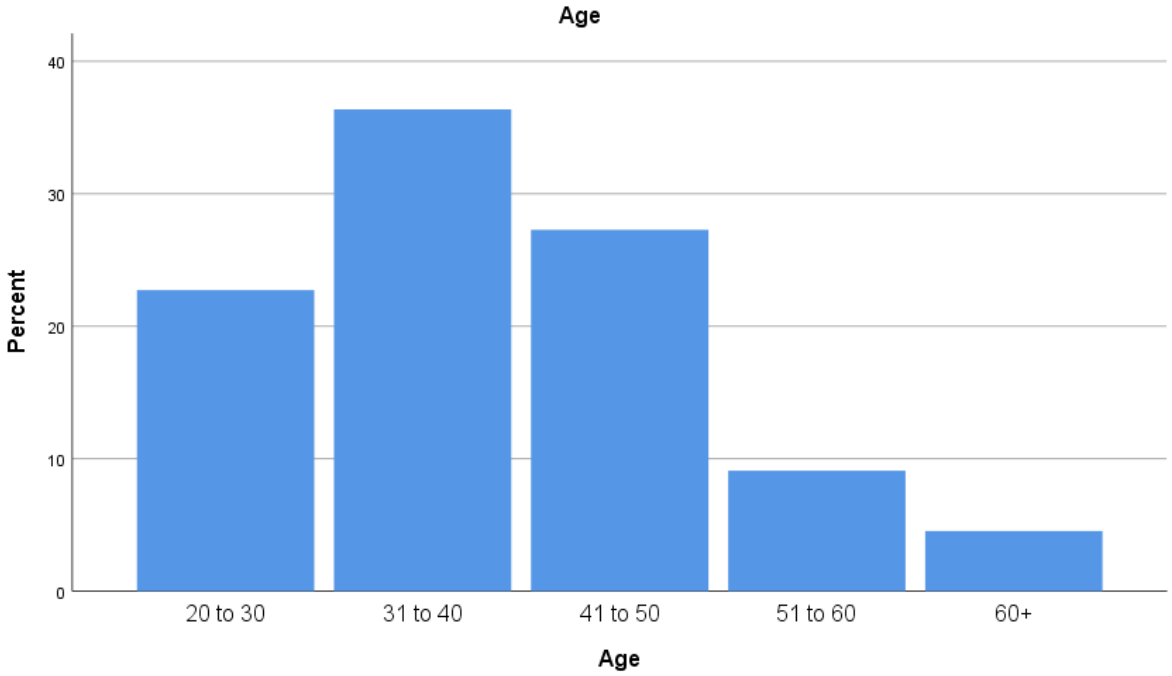

Figure 5: ***Frequency distribution of Age Group within participants***

Table 10: ***Frequency distribution of Age Group within participants***

Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	20 to 30	33	22.0	22.0	22.0
	31 to 40	56	37.3	37.3	59.3
	41 to 50	41	27.3	27.3	86.7
	51 to 60	14	9.3	9.3	96.0
	60+	6	4.0	4.0	100.0
	Total	150	100.0	100.0	

As per the result in figure 4.3.2, it can be seen that most of the participants that is 37.3% participants are from 31 to 40 years age group, whereas 27.3% of them are from 41 to 50 years of age group. 22% of the participants are from 20 to 30 years of age group. Therefore, 86.7% participants are from the age group of 20 to 50. The participants are from young and middle age and since, in this age group the Technology related awareness is high they can share better perspective regarding the application of Autonomous Shipping and its impact. Gaining and

gathering data from a larger population simply represents that the perspectives of all suitable participants have been gained successfully.

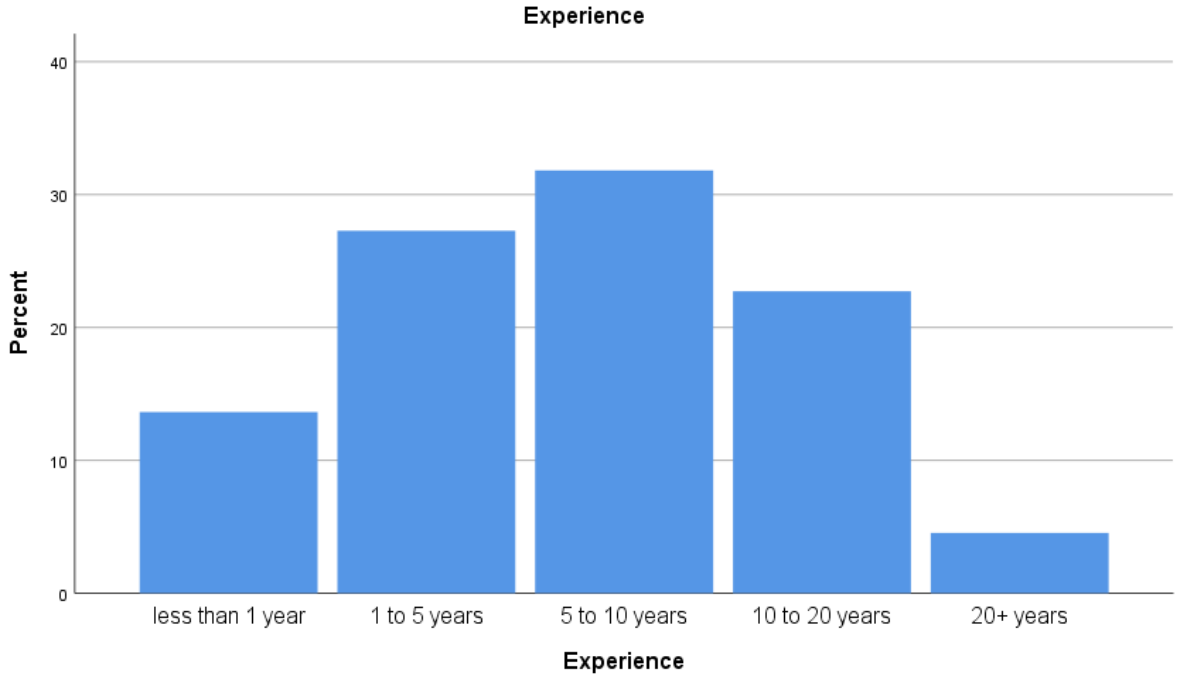

Figure 6: Frequency distribution of gender within participants

Table 11: Frequency distribution of gender within participants

Experience					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	less than 1 year	20	13.3	13.3	13.3
	1 to 5 years	41	27.3	27.3	40.7
	5 to 10 years	48	32.0	32.0	72.7
	10 to 20 years	34	22.7	22.7	95.3
	20+ years	7	4.7	4.7	100.0
	Total	150	100.0	100.0	

As per the findings in figure 4.3.3, it can be said that maximum proportion of participants or 31.8% of them have 5 to 10 years of experience, whereas 27.3% of participants have 1 to 5 years of experience in shipping industry. Around 23% of employees have 10 to 20 years of experience in shipping industry. It has been found that 82% of the participants have 1 to 20 years of experience in this field and therefore, they have adequate level of understanding regarding the organisational procedures. Gaining and gathering data from a larger population

simply represents that the perspectives of all suitable participants have been gained successfully. It is essential to consider the fact that varying shareholders within the industry are bound to have varying experiences, however, it is suitable to consider the fact that the opinion of all participants is suitably included within the context of the study.

4.4 Descriptive Findings

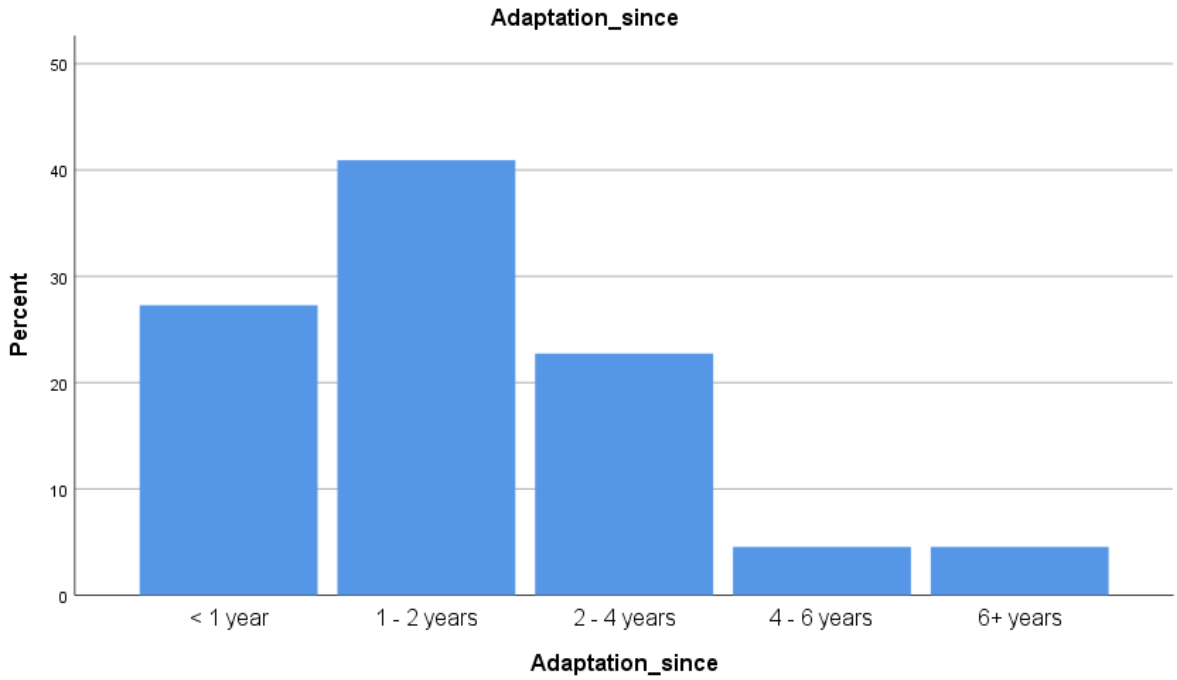

Figure 7: Adaptation of Autonomous shipping

Table 12: Adaptation of Autonomous shipping

Adaptation since					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	< 1 year	42	28.0	28.0	28.0
	1 - 2 years	63	42.0	42.0	70.0
	2 - 4 years	32	21.3	21.3	91.3
	4 - 6 years	7	4.7	4.7	96.0
	6+ years	6	4.0	4.0	100.0
	Total	150	100.0	100.0	

As per the findings in figure 4.4.2 it can be seen that 42% of the participants have found that the Autonomous shipping has been adapted within past 1 to 2 years. Other 28% said that

Autonomous shipping technology has been adopted within past 1 year. 22.3% of them said that the Autonomous shipping technology has been adopted from past 2 to 4 years. Rest of the participants are negligible in proportion. Around 91% of the participants said that the new technologies have been adopted from less than 1 year to 4 years of time period. Therefore, the adaptation of Autonomous shipping technology is very recent trend in the shipping and ship manufacturing industry. Gaining and gathering data from a larger population simply represents that the perspectives of all suitable participants have been gained successfully.

Descriptive statistics

The descriptive statistics can be identified as the findings which are largely focused on ensuring and assessing that the distribution of the data is well understood. The average responses received alongside the way in which the responses are distributed may be identified. In the following descriptive findings, the results can be ranged from 1 to 5, where 1 implies extremely negative response or disagree response and 5 implies extremely positive response or supportive response in any terms.

Autonomous shipping

Table 13 Descriptive of first variable

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Partial_automatic	150	1	5	2.82	.837
Remote_controlled	150	1	5	3.64	1.029
Full_Autonomous	150	1	5	3.36	.885
Autonomous_shipping_use	150	2.33	4.33	3.2727	.53077
Valid N (listwise)	150				

From the overall score of Autonomous shipping (mean 3.27) it has been found that currently the autonomous shipping is moderately adopted in shipping industry which is ranged from low to high level of adaptation. Remote controlled ship has the high mean value that is 3.64, which implies that remote controlled shipping methods are the most utilized autonomous shipping method. The full autonomous shipping (mean 3.36) is secondly used method in this industry.

Currently the partial automatic shipping method is used at low level and comparatively rarely (mean 2.82). Therefore, it can be said that in the descending order the adaptation of the autonomous shipping system is mostly based on Remote controlled ship, Full Autonomous ship and Partial automatic ship.

Value proposition

Table 14: Descriptive Output about Value Proposition Related Factors

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Distinct_value	150	2	5	3.82	.890
Fulfilling_needs_expectations	150	1	5	3.32	.877
Operational_efficiency	150	2	5	3.64	.832
Value_proposition	150	2.33	4.33	3.5909	.59673
Valid N (listwise)	150				

As per the results in figure 4.4.3, it can be seen that overall value proposition score is 3.6, which implies that currently the companies have moderately to high level value proposition. It can be found that the companies have highly distinct level value proposition (3.82). The operational efficiency of the companies is also at moderate to high level (3.64). The services are also capable to fulfilling the needs and expectations of the services (3.32). In descending order, the essential value proposition factors after adaptation of autonomous shipping are Distinct Service Value, Operational Efficiency and Fulling Needs and Expectations.

Financial performance

Table 15: Descriptive Output of Financial Factors

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Revenue_generation	150	1	5	3.00	.958
Profitability	150	2	5	3.41	.838
Equity	150	2	5	3.32	.703
Financial_Factors	150	2.33	4.00	3.2424	.54541
Valid N (listwise)	150				

From the overall score of Financial Factor (mean 3.24) it has been found that currently the financial performance is moderately affected in the shipping industry which is ranged from low to high level of performance. It has been found that profitability has the highest mean value (3.41), which implies that profitability is the most essential or important financial factors for these companies. The equity (mean 3.36) of this companies are secondly essential financial factor in this industry, which is currently as moderate level. Revenue generation (mean 3.00) is the comparatively lower in the financial performance parameters in shipping industry. After implementing Autonomous shipping, the highest to lowest level financial factors are Profitability, Equity and Revenue.

Competitive advantage

Table 16: Descriptive Output of Competitive Advantages

Descriptive Statistics					
	N	Minimum	Maximum	Mean	Std. Deviation
Brand_recognition	150	1	5	3.41	.989
Market_share	150	1	5	2.95	.882
Irreplaceable_Inimitable	150	2	5	3.73	.753
Competitive_Advantage	150	2.67	4.67	3.3636	.57919
Valid N (listwise)	150				

As per the results in figure 4.4.5, it can be seen that overall Competitive Advantage score is 3.36, which implies that currently the companies have moderately to high level of Completive Advantages. It can be found that the companies have highly irreplaceable and inimitable (3.73) service providing capability which is the most important factor of the competitive advantages of the companies. The Brand Recognition of the companies is also at moderate to high level (3.41). The market share is the lowest factors in the competitive advantage of these companies (2.95). Therefore, in terms of competitive advantages the most to least essential factors are Irreplicable and inimitable, brand recognition and market share.

Target client

Table 17: Descriptive Output of Client Related Factors

Descriptive Statistics

	N	Minimum	Maximum	Mean	Std. Deviation
Client_change	150	1	4	2.41	.782
Client_Satisfaction_loyalty	150	2	5	3.14	.818
Change_Client_operations	150	2	5	3.68	.765
Target_Clients	150	2.33	4.00	3.0758	.49392
Valid N (listwise)	150				

From the overall score of Target Client (mean 3.07) it has been found that currently the target client level is moderately affected in the shipping industry which is ranged from low to high level of performance. It has been found that changing client operations has the highest mean value (3.68), which implies that clients need to change their operations as a result of automation shipping. The client satisfaction and loyalty (mean 3.14) of this companies are secondly strong target client related factor in this industry, which is currently as moderate level. Changing client (mean 2.41) is a negligible factor in Autonomous shipping industry. In terms of target client related factors, after implementing Autonomous shipping the essential factors are Change in client operations followed by client satisfaction and loyalty and change in target clients.

Overall data descriptive analysis

In the given table, the descriptives of all variables associated with the research have been critically identified and crucially discussed. In this context, it is essential to identify that the mean statistics for the linear variables could be assessed to be close to 4 which reflected a positive response of the participants towards the statement related to the autonomous shipping and other crucial aspects of the business. In consideration with this, the skewness and kurtosis value has been considered. The value of the kurtosis and skewness is obligated to lie between -3 to 3 and pertaining to this, it can be well identified that the data is distributed normally. The value of the standard deviation may be identified to be close to 1 which reflects a close dispersal of information.

Table 18: Overall descriptives

Descriptive Statistics							
	N	Minimum	Maximum	Mean	Std. Deviation	Skewness	Kurtosis

	Statistic	Statistic	Statistic	Statistic	Statistic	Statistic	Std. Error	Statistic	Std. Error
Gender	150	1	3	1.50	.588	.703	.198	-.466	.394
Partial_automatic	150	1	5	2.81	.841	.380	.198	.861	.394
Remote_controlled	150	1	5	3.63	1.033	-.752	.198	.210	.394
Full_Autonomous	150	1	5	3.35	.891	-.760	.198	.550	.394
Distinct_value	150	2	5	3.81	.893	-.425	.198	-.491	.394
Fulfilling_needs_expectations	150	1	5	3.31	.882	-.644	.198	.530	.394
Operational_efficiency	150	2	5	3.67	.816	-.214	.198	-.403	.394
Revenue_generation	150	1	5	3.02	.945	.008	.198	-.528	.394
Profitability	150	2	5	3.40	.835	.042	.198	-.558	.394
Equity	150	2	5	3.34	.693	.286	.198	.027	.394
Brand_recognition	150	1	5	3.43	.979	-.292	.198	.001	.394
Market_share	150	1	5	2.95	.885	.092	.198	.189	.394
Irreplaceable_Inimitable	150	2	5	3.74	.746	-.127	.198	-.290	.394
Client_change	150	1	4	2.40	.777	.296	.198	-.244	.394
Client_Satisfaction_loyalty	150	2	5	3.13	.825	.256	.198	-.555	.394

Change_Client_operations	150	2	5	3.68	.763	-.029	.198	-.401	.394
Autonomous_shipping_use	110	2.33	4.33	3.2727	.53077	.235	.230	-.191	.457
Value_proposition	110	2.33	4.33	3.5909	.59673	-.384	.230	-.845	.457
Financial_Factors	110	2.33	4.00	3.2424	.54541	-.190	.230	-1.039	.457
Competitive_Advantage	110	2.67	4.67	3.3636	.57919	.499	.230	-.690	.457
Target_Clients	110	2.33	4.00	3.0758	.49392	.203	.230	-.819	.457
Valid N (listwise)	110								

4.5 Impact of Autonomous Shipping Use on Different Business Aspects

Table 19: Multivariate MANOVA Analysis for impact of Autonomous Shipping on Different Aspects

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Value proposition	6.300[a]	6	1.050	3.326	.005
	Financial Factors	11.657[b]	6	1.943	9.636	.000
	Competitive Advantage	17.312[c]	6	2.885	15.435	.000
	Target Clients	6.639[d]	6	1.106	5.712	.000
Intercept	Value proposition	1015.365	1	1015.365	3216.618	.000
	Financial Factors	862.912	1	862.912	4279.823	.000
	Competitive Advantage	940.885	1	940.885	5033.309	.000
	Target Clients	762.579	1	762.579	3936.654	.000
	Value proposition	6.300	6	1.050	3.326	.005

Autonomous shipping use	Financial Factors	11.657	6	1.943	9.636	.000
	Competitive Advantage	17.312	6	2.885	15.435	.000
	Target Clients	6.639	6	1.106	5.712	.000
Error	Value proposition	32.513	103	.316		
	Financial Factors	20.767	103	.202		
	Competitive Advantage	19.254	103	.187		
	Target Clients	19.952	103	.194		
Total	Value proposition	1457.222	150			
	Financial Factors	1188.889	150			
	Competitive Advantage	1281.111	150			
	Target Clients	1067.222	150			
Corrected Total	Value proposition	38.813	149			
	Financial Factors	32.424	149			
	Competitive Advantage	36.566	149			
	Target Clients	26.591	149			
a. R Squared = .162 (Adjusted R Squared = .114)						
b. R Squared = .360 (Adjusted R Squared = .322)						
c. R Squared = .473 (Adjusted R Squared = .443)						
d. R Squared = .250 (Adjusted R Squared = .206)						

It has been found that the R-squire value is highest for Competitive Advantage (0.443), therefore, the Use of Autonomous Shipping most strongly predicts variability on Competitive Advantage with 44.3% accuracy. The predictable variability of Financial Factor (0.322) is that the second position by Use of Autonomous Shipping which is 32.2%. It has been found from the p-values (<0.05) that all four business related factors such as Value Proposition, Financial Factors, Competitive Advantage and Target Clients can be significantly affected by Use of Autonomous Shipping. Therefore, all hypotheses of this study are accepted since for all dependent variables the p-values are lower than 0.05. As per the F-value the lowest impact of overall Use of Autonomous Shipping has been found on Value Proposition (F= 3.326). The

maximum impact of Autonomous Shipping can be found on Competitive Advantages (F=15.435). Therefore, in order of most affected to least affected factors, the impact of Autonomous Shipping can be found on Autonomous Shipping, Financial Factors, Target Clients, and Value Proposition.

H1: Use of Autonomous Shipping has significant impact on the Value Proposition of the company **ACCEPTED**

H2: Use of Autonomous Shipping has significant impact on the Finance of the company **ACCEPTED**

H3: Use of Autonomous Shipping has significant impact on the Competitive Advantage of the company **ACCEPTED**

H4: Use of Autonomous Shipping has significant impact on the Target Customers of the company **ACCEPTED**

Table 20: Multivariate MANOVA Analysis for impact of Autonomous Shipping on Value Proposition Factors

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Distinct_value	30.221[a]	6	5.037	9.241	.000
	Fulfilling_needs_expectations	10.292[b]	6	1.715	2.402	.033
	Operational_efficiency	24.550[c]	6	4.092	8.279	.000
Intercept	Distinct_value	1140.326	1	1140.326	2092.049	.000
	Fulfilling_needs_expectations	874.652	1	874.652	1224.513	.000
	Operational_efficiency	1040.137	1	1040.137	2104.599	.000

Autonomous_shipping_use	Distinct_value	30.221	6	5.037	9.241	.000
	Fulfilling_needs_expectations	10.292	6	1.715	2.402	.033
	Operational_efficiency	24.550	6	4.092	8.279	.000
Error	Distinct_value	56.143	103	.545		
	Fulfilling_needs_expectations	73.571	103	.714		
	Operational_efficiency	50.905	103	.494		
Total	Distinct_value	1690.000	150			
	Fulfilling_needs_expectations	1295.000	150			
	Operational_efficiency	1530.000	150			
Corrected Total	Distinct_value	86.364	149			
	Fulfilling_needs_expectations	83.864	149			
	Operational_efficiency	75.455	149			
a. R Squared = .350 (Adjusted R Squared = .312)						
b. R Squared = .123 (Adjusted R Squared = .072)						
c. R Squared = .325 (Adjusted R Squared = .286)						

As per the results in Figure 4.5.2, it can be seen that R-squire value of Distinct Value is 0.312, which implies that Use of Autonomous Shipping can predict only 31.2% of Distinct Value of service. The predictability of Use of Autonomous Shipping of Fulfilling needs and expectation (R-squire = 0.072) is very low. Compared to other value proposition related factors Distinct Value is the most essential factor that can be influenced by Use of Autonomous Shipping,

where impact on fulfilling needs is lowest. Use of Autonomous Shipping has also a significant impact on the operational efficiency (F=8.279) of the shipping companies. Therefore, it can be said that in terms of Value Proposition, Use of Autonomous Shipping can have major impacts on Distinct value and Operational Efficiency of the company. Impact on the ability to fulfil the needs and expectation from the services is comparatively low.

Table 21: ***Multivariate MANOVA Analysis for impact of Autonomous Shipping on Financial Factors***

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Revenue generation	39.595[a]	6	6.599	11.253	.000
	Profitability	16.758[b]	6	2.793	4.808	.000
	Equity	17.245[c]	6	2.874	8.084	.000
Intercept	Revenue generation	707.196	1	707.196	1205.886	.000
	Profitability	1012.955	1	1012.955	1743.750	.000
	Equity	882.444	1	882.444	2482.089	.000
Autonomous shipping use	Revenue generation	39.595	6	6.599	11.253	.000
	Profitability	16.758	6	2.793	4.808	.000
	Equity	17.245	6	2.874	8.084	.000
Error	Revenue generation	60.405	103	.586		
	Profitability	59.833	103	.581		
	Equity	36.619	103	.356		
Total	Revenue generation	1490.000	150			

	Profitability	1355.000	150			
	Equity	1265.000	150			
Corrected Total	Revenue generation	100.000	149			
	Profitability	76.591	149			
	Equity	53.864	149			
a. R Squared = .396 (Adjusted R Squared = .361)						
b. R Squared = .219 (Adjusted R Squared = .173)						
c. R Squared = .320 (Adjusted R Squared = .281)						

It has been found in figure 4.5.3 that the R-squire value is highest for Revenue Generation (0.396), therefore, the Use of Autonomous Shipping most strongly predicts variability on Revenue Generation with 36.1% accuracy. The predictable variability of Equity (0.322) is at the second position by Use of Autonomous Shipping which is 32.2%. It implies that Use of Autonomous Shipping has second strong impact on Equity within the Financial Factor (F= 8.084). It has been found from the p-values (<0.05) that all financial factors such as Revenue Generation, Profitability and Equity can be significantly affected by Use of Autonomous Shipping. As per the F-value the lowest impact of Use of Autonomous Shipping has been found on value Profitability (F= 4.808). Therefore, Use of Autonomous Shipping has significantly influenced the revenue generation ability of the company followed by the Equity, whereas the impact on profitability is comparatively low.

Table 22: ***Multivariate MANOVA Analysis for impact of Autonomous Shipping on Competitive Advantages***

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.

Corrected Model	Brand_recognition	35.591[a]	6	5.932	8.605	.000
	Market_share	22.868[b]	6	3.811	6.341	.000
	Irreplaceable_Inimitable	20.342[c]	6	3.390	8.419	.000
Intercept	Brand_recognition	952.651	1	952.651	1382.014	.000
	Market_share	745.517	1	745.517	1240.425	.000
	Irreplaceable_Inimitable	1145.983	1	1145.983	2845.879	.000
Autonomous_shipping_use	Brand_recognition	35.591	6	5.932	8.605	.000
	Market_share	22.868	6	3.811	6.341	.000
	Irreplaceable_Inimitable	20.342	6	3.390	8.419	.000
Error	Brand_recognition	71.000	103	.689		
	Market_share	61.905	103	.601		
	Irreplaceable_Inimitable	41.476	103	.403		
Total	Brand_recognition	1385.000	150			
	Market_share	1045.000	150			
	Irreplaceable_Inimitable	1590.000	150			
Corrected Total	Brand_recognition	106.591	149			

	Market_share	84.773	149			
	Irreplaceable_Inimitable	61.818	149			
a. R Squared = .334 (Adjusted R Squared = .295)						
b. R Squared = .270 (Adjusted R Squared = .227)						
c. R Squared = .329 (Adjusted R Squared = .290)						

As per the results in Figure 4.5.4, it can be seen that R-squire value of all three Competitive Advantage related components is within 0.2 to 0.3 and they are very close to each other. It has been found that Use of Autonomous Shipping can predict Brand recognition by 29.5%, Market Share by 22.7% and Irreplicable Inimitable quality by 29%. The impact of Use of Autonomous Shipping is highest on Brand Recognition (F = 5.932) within the all-competitive advantage related factors. Compared to other competitive advantages related factors Irreplicable and Inimitable is the least essential factor that can be influenced by Use of Autonomous Shipping, where impact on fulfilling needs is lowest. Therefore, in terms of the competitive advantages, Use of Autonomous Shipping can influence the Brand Recognition as well as Irreplicable and Inimitable brand value to some extent. The impact of Autonomous Shipping on the increment of the market share is comparatively low.

Table 23: ***Multivariate MANOVA Analysis for impact of Autonomous Shipping on Target Client***

Tests of Between-Subjects Effects						
Source	Dependent Variable	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	Client_change	2.615[a]	6	.436	.702	.649
	Client_Satisfaction_loyalty	25.883[b]	6	4.314	9.439	.000
	Change_Client_operations	10.959[c]	6	1.826	3.556	.003

Intercept	Client_change	483.153	1	483.153	777.863	.000
	Client_Satisfaction_loyalty	809.135	1	809.135	1770.521	.000
	Change_Client_operations	1050.956	1	1050.956	2046.100	.000
Autonomous_shipping_use	Client_change	2.615	6	.436	.702	.649
	Client_Satisfaction_loyalty	25.883	6	4.314	9.439	.000
	Change_Client_operations	10.959	6	1.826	3.556	.003
Error	Client_change	63.976	103	.621		
	Client_Satisfaction_loyalty	47.071	103	.457		
	Change_Client_operations	52.905	103	.514		
Total	Client_change	705.000	150			
	Client_Satisfaction_loyalty	1155.000	150			
	Change_Client_operations	1555.000	150			
Corrected Total	Client_change	66.591	149			
	Client_Satisfaction_loyalty	72.955	149			
	Change_Client_operations	63.864	149			
a. R Squared = .039 (Adjusted R Squared = -.017)						
b. R Squared = .355 (Adjusted R Squared = .317)						
c. R Squared = .172 (Adjusted R Squared = .123)						

It has been found in figure 4.5.5 that the R-squire value is highest for Client Satisfaction and Loyalty (0.317), therefore, the Use of Autonomous Shipping most strongly predicts variability on Client Satisfaction and Loyalty with 31.7% accuracy. It has been found that p-value of changing client is higher than 0.05, which implies that the Use of Autonomous Shipping do not have any impact on changing clint, or it is not requiring any change in target client. It has been found that Use of Autonomous Shipping has minor impact on operational changes in clients (F= 3.556). It has been found from the p-values (<0.05) that operational changes in client and client satisfaction loyalty are significantly affected by Use of Autonomous Shipping. Therefore, as a result of Autonomous Shipping no significant impact has been found in changed target clients whereas it increased the client satisfaction and loyalty significantly. The use of Autonomous Shipping also changed the client's operational structure to some extent.

4.6 Correlation of Different Autonomous Ship Adaptation and Business Aspects

The correlation analysis may be rightly identified as the use of statistical tool with the help of which a comprehensive understanding of the association between the different variables can be well established and identified. Here, it is suitable to note that the different autonomous shipping phases alongside the business aspects as a part of the business model have been critically assessed and considerably established. Here it is essential to understand that in the given sections, the correlation between the different variables have been given.

Table 24: Correlation between different Autonomous Shipping and Value Proposition

Correlations				
		Distinct value	Fulfilling needs expectations	Operational efficiency
Partial automatic	Pearson Correlation	.325**	.080	-.293**
	Sig. (2-tailed)	.001	.409	.002
	N	150	150	150
Remote Controlled	Pearson Correlation	-.090	.086	-.130
	Sig. (2-tailed)	.350	.372	.175
	N	150	150	150

Full Autonomous	Pearson Correlation	.378**	.226*	.370**
	Sig. (2-tailed)	.000	.017	.000
	N	150	150	150
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

As per the results in figure 4.6.1, it can be found that Partial Automation has a significant correlation with the Distinct Value creation by the company, whereas the correlation with Full Automation (0.378) is higher. It implies that full autonomous shipping method helps to increase the distinct value of the company most significantly. However, partial automatic shipping has negative correlation operational efficiency. It implies that partial autonomous shipping significantly reduces the operational efficiency. The correlation with operational efficiency with full automation (0.370) implies that full autonomous shipping can significantly increase operational efficiency. The correlation of Remote Controlled with the value proposition related factors is insignificant. Therefore, it implies that Remote Controlled shipping adaptation has no relationship with the Value Preposition related factors of the company. On the other hand, Full Autonomous shipping process has strong impact on the positive change in the Value Proposition related components.

Table 25: Correlation between different Autonomous Shipping and Financial Factors

Correlations				
		Revenue generation	Profitability	Equity
Partial automatic	Pearson Correlation	-.114	.172	-.135
	Sig. (2-tailed)	.234	.072	.161
	N	150	150	150
Remote Controlled	Pearson Correlation	-.093	.121	-.092
	Sig. (2-tailed)	.334	.209	.338
	N	150	150	150
Full Autonomous	Pearson Correlation	.054	-.079	.335**
	Sig. (2-tailed)	.575	.414	.000
	N	150	150	150
*. Correlation is significant at the 0.05 level (2-tailed).				

**. Correlation is significant at the 0.01 level (2-tailed).

In the context of the correlational output of figure 4.6.2, it can be found that Partial Automation and Remote-controlled Shipping do not have any significant correlation with the any components of financial factor. Only Full Autonomous shipping has significant correlation with Equity of the company, whereas the correlation with Full Automation (0.335). It implies that full autonomous shipping method helps to increase the equity of the company that influences the financial performance of the company. However, partial automatic shipping and remote-control shipping method has no impact on the financial efficiency of the shipping companies. It can be also found that Full Autonomous Shipping usage has no influence on the Revenue generation and Profitability.

Table 26: Correlation between different Autonomous Shipping and Competitive Advantages

Correlations				
		Brand recognition	Market share	Irreplaceable Inimitable
Partial automatic	Pearson Correlation	-.131	-.260**	-.007
	Sig. (2-tailed)	.173	.006	.945
	N	150	150	150
Remote Controlled	Pearson Correlation	-.171	.080	-.056
	Sig. (2-tailed)	.073	.405	.559
	N	150	150	150
Full Autonomous	Pearson Correlation	.303**	.119	.247**
	Sig. (2-tailed)	.001	.214	.009
	N	150	150	150
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

As per the results in figure 4.6.3, it can be found that Partial Automation has a significant correlation with market share of the company the company, whereas the correlation with the market share is negative (-0.260). It implies that partial autonomous shipping method causes

reduction in the market share of the company most significantly. However, Full Autonomous shipping has significant correlation with Brand Recognition (0.303) and Irreplaceability and Inimitability (0.247). It implies that full autonomous shipping most significantly increases the Brand Recognition and less significantly increases the Irreplaceability and Inimitability of the company. There is no significant correlation of Remote-Control shipping with all Competitive advantage related factors. It implies that remote control shipping is not contributing the competitiveness of the companies, whereas the partial automatic shipping method reduces the market share of the companies. Full Autonomous shipping adaptation has the strongest positive impact over the Competitive Advantages where the significant impacts can be found in increment of brand recognition and making the brand irreplaceable and inimitable.

Table 27: Correlation between different Autonomous Shipping and Target Client

Correlations				
		Client change	Client Satisfaction loyalty	Change Client operations
Partial automatic	Pearson Correlation	-.166	-.164	-.163
	Sig. (2-tailed)	.084	.086	.089
	N	150	150	150
Remote controlled	Pearson Correlation	.301**	.158	.498**
	Sig. (2-tailed)	.001	.098	.000
	N	150	150	150
Full Autonomous	Pearson Correlation	.151	.322**	.240*
	Sig. (2-tailed)	.116	.001	.012
	N	150	150	150
*. Correlation is significant at the 0.05 level (2-tailed).				
**. Correlation is significant at the 0.01 level (2-tailed).				

According to the correlational output of figure 4.6.4, it can be found that Remote-controlled Shipping has significant correlation with Client Change (0.301) and Changing Client

Operations (0.489). It implies that remote control shipping method causes most significant changes in the operational structure of clients as less significant changes in the selection of target clients. It has been found that Partial Autonomous shipping does not have any relationship with any of the client related factors. Full Autonomous shipping has significant correlation with Client Satisfaction and Loyalty (0.322), whereas the correlation Client's operational changes (0.240) is also significant. It implies that full autonomous shipping method helps to increase the Client Satisfaction and Loyalty of the company. At the same time, it also requires changes in client's operational structure. However, remote-control shipping method has stronger impact on the change in client's operation compared to Fully Autonomous shipping method. The Full Automation ship usage has strongest impact on client satisfaction and loyalty whereas the impact on changing the client's operations is lower than the impact of remote-control shipping method on changing clint's operations.

Correlations

In the given table, the correlation analysis of the partial autonomous shipping with each business aspect has been examined. Considering this, it can be strongly identified that the partial autonomy shares the strongest association with value proposition and fulfilment of the expectations.

Table 28 Correlation of autonomous shipping with various aspects

Correlations											
		Partial_automatic	Distinct_value	Fulfilling_needs_expectations	Operational_efficiency	Revenue_generation	Profitability	Equity	Brand_recognition	Financial_Factors	Competitive_Advantage
Partial_automatic	Pearson Correlation	1	.327**	.071	-.280**	-.122	.159	-.117	-.136	-.037	-.209*

	Sig. (2-tailed)		.000	.385	.001	.138	.053	.155	.098	.705	.028
	N	150	150	150	150	150	150	150	150	110	110
Distinct_value	Pearson Correlation	.327**	1	.303**	.172*	-.266**	-.025	-.135	-.070	-.223*	-.256**
	Sig. (2-tailed)	.000		.000	.035	.001	.760	.099	.398	.019	.007
	N	150	150	150	150	150	150	150	150	110	110
Fulfilling_needs_expectations	Pearson Correlation	.071	.303**	1	.190*	-.386**	-.131	-.161*	.073	-.354**	-.140

	Sig. (2-tailed)	.385	.000		.020	.000	.110	.050	.375	.000	.146
	N	150	150	150	150	150	150	150	150	110	110
Operational_efficiency	Pearson Correlation	-.280**	.172*	.190*	1	-.017	.049	.332**	.280**	.162	.150
	Sig. (2-tailed)	.001	.035	.020		.833	.550	.000	.001	.090	.118
	N	150	150	150	150	150	150	150	150	110	110
Revenue_generation	Pearson Correlation	-.122	-.266**	-.386**	-.017	1	.160	.205*	.376**	.761**	.331**

	Sig. (2-tailed)	.138	.001	.000	.833		.051	.012	.000	.000	.000
	N	150	150	150	150	150	150	150	150	110	110
Profitability	Pearson Correlation	.159	-.025	-.131	.049	.160	1	.030	-.210**	.617**	-.215*
	Sig. (2-tailed)	.053	.760	.110	.550	.051		.714	.010	.000	.024
	N	150	150	150	150	150	150	150	150	110	110
Equity	Pearson Correlation	-.117	-.135	-.161*	.332**	.205*	.030	1	.210**	.555**	.201*

	Sig. (2-tailed)	.155	.099	.050	.000	.012	.714		.010	.000	.035
	N	150	150	150	150	150	150	150	150	110	110
Brand_recognition	Pearson Correlation	-.136	-.070	.073	.280**	.376**	-.210**	.210**	1	.211*	.752**
	Sig. (2-tailed)	.098	.398	.375	.001	.000	.010	.010		.027	.000
	N	150	150	150	150	150	150	150	150	110	110
Market_share	Pearson Correlation	-.265**	-.351**	-.515**	-.217**	.387**	.153	-.040	.294**	.277**	.691**

	Sig. (2-tailed)	.001	.000	.000	.008	.000	.062	.631	.000	.003	.000
	N	150	150	150	150	150	150	150	150	110	110
Irreplaceable_Inimitable	Pearson Correlation	.016	-.083	.214**	.187*	-.183*	-.392**	.224**	.107	-.210*	.510**
	Sig. (2-tailed)	.849	.310	.009	.022	.025	.000	.006	.192	.028	.000
	N	150	150	150	150	150	150	150	150	110	110
Client_change	Pearson Correlation	-.189*	.099	.202*	-.106	.117	.072	-.055	.312**	.088	.310**

	Sig. (2-tailed)	.021	.230	.013	.198	.154	.379	.505	.000	.360	.001
	N	150	150	150	150	150	150	150	150	110	110
Client_Satisfaction_loyalty	Pearson Correlation	-.166*	.025	-.130	-.133	.195*	-.010	.167*	.337**	.165	.411**
	Sig. (2-tailed)	.043	.762	.112	.105	.017	.906	.042	.000	.085	.000
	N	150	150	150	150	150	150	150	150	110	110
Change_Client_operations	Pearson Correlation	-.170*	-.157	.217**	-.022	.316**	.192*	.106	.202*	.333**	.160

	Sig. (2-tailed)	.037	.055	.008	.793	.000	.019	.198	.013	.000	.095
	N	150	150	150	150	150	150	150	150	110	110
Autonomous_shipping_use	Pearson Correlation	.663**	.365**	-.057	-.466**	-.090	.125	-.317**	-.360**	-.125	-.375**
	Sig. (2-tailed)	.000	.000	.556	.000	.349	.193	.001	.000	.194	.000
	N	110	110	110	110	110	110	110	110	110	110
Value_proposition	Pearson Correlation	.064	.722**	.718**	.622**	-.321**	-.060	.022	.131	-.209*	-.126

	Sig. (2-tailed)	.506	.000	.000	.000	.001	.535	.823	.173	.028	.190
	N	110	110	110	110	110	110	110	110	110	110
Financial_Factors	Pearson Correlation	-.037	-.223*	-.354**	.162	.761**	.617**	.555**	.211*	1	.170
	Sig. (2-tailed)	.705	.019	.000	.090	.000	.000	.000	.027		.076
	N	110	110	110	110	110	110	110	110	110	110
Competitive_Advantage	Pearson Correlation	-.209*	-.256**	-.140	.150	.331**	-.215*	.201*	.752**	.170	1

	Sig. (2-tailed)	.028	.007	.146	.118	.000	.024	.035	.000	.076
	N	110	110	110	110	110	110	110	110	110
Target_Clients	Pearson Correlation	-.262**	-.003	.156	-.156	.323**	.146	.106	.437**	.310**	.473**
	Sig. (2-tailed)	.006	.974	.105	.105	.001	.128	.270	.000	.001	.000
	N	110	110	110	110	110	110	110	110	110	110

Table 29 Correlation analysis of partial autonomy with various aspects

Correlations

	Market_share	Irreplaceable_Inimitable	Client_change	Client_Satisfaction_loyalty	Change_Client_operations	Autonomous_shipping_use	Value_proposition	Target_Clients

Partial_automatic	Pearson Correlation	-.265**	.016	-.189*	-.166*	-.170*	.663**	.064	-.262**
	Sig. (2-tailed)	.001	.849	.021	.043	.037	.000	.506	.006
	N	150	150	150	150	150	110	110	110
Distinct_value	Pearson Correlation	-.351**	-.083	.099	.025	-.157	.365**	.722**	-.003
	Sig. (2-tailed)	.000	.310	.230	.762	.055	.000	.000	.974
	N	150	150	150	150	150	110	110	110
Fulfilling_needs_expectations	Pearson Correlation	-.515**	.214**	.202*	-.130	.217**	-.057	.718**	.156

	Sig. (2-tailed)	.000	.009	.013	.112	.008	.556	.000	.105
	N	150	150	150	150	150	110	110	110
Operational_efficiency	Pearson Correlation	-.217**	.187*	-.106	-.133	-.022	-.466**	.622**	-.156
	Sig. (2-tailed)	.008	.022	.198	.105	.793	.000	.000	.105
	N	150	150	150	150	150	110	110	110
Revenue_generation	Pearson Correlation	.387**	-.183*	.117	.195*	.316**	-.090	-.321**	.323**
	Sig. (2-tailed)	.000	.025	.154	.017	.000	.349	.001	.001
	N	150	150	150	150	150	110	110	110

Profitability	Pearson Correlation	.153	-.392**	.072	-.010	.192*	.125	-.060	.146
	Sig. (2-tailed)	.062	.000	.379	.906	.019	.193	.535	.128
	N	150	150	150	150	150	110	110	110
Equity	Pearson Correlation	-.040	.224**	-.055	.167*	.106	-.317**	.022	.106
	Sig. (2-tailed)	.631	.006	.505	.042	.198	.001	.823	.270
	N	150	150	150	150	150	110	110	110
Brand_recognition	Pearson Correlation	.294**	.107	.312**	.337**	.202*	-.360**	.131	.437**

	Sig. (2-tailed)	.000	.192	.000	.000	.013	.000	.173	.000
	N	150	150	150	150	150	110	110	110
Market_share	Pearson Correlation	1	.063	.174*	.340**	.187*	-.169	-.530**	.359**
	Sig. (2-tailed)		.445	.034	.000	.022	.077	.000	.000
	N	150	150	150	150	150	110	110	110
Irreplaceable_Inimitable	Pearson Correlation	.063	1	.146	.133	-.076	-.195*	.158	.097
	Sig. (2-tailed)	.445		.075	.104	.352	.041	.100	.313
	N	150	150	150	150	150	110	110	110

Client_change	Pearson Correlation	.174*	.146	1	.272**	-.009	.023	.100	.672**
	Sig. (2-tailed)	.034	.075		.001	.912	.808	.299	.000
	N	150	150	150	150	150	110	110	110
Client_Satisfaction_loyalty	Pearson Correlation	.340**	.133	.272**	1	.004	-.368**	-.104	.693**
	Sig. (2-tailed)	.000	.104	.001		.959	.000	.280	.000
	N	150	150	150	150	150	110	110	110
Change_Client_operations	Pearson Correlation	.187*	-.076	-.009	.004	1	-.274**	.014	.509**

	Sig. (2-tailed)	.022	.352	.912	.959		.004	.887	.000
	N	150	150	150	150	150	110	110	110
Autonomous_shipping_use	Pearson Correlation	-.169	-.195*	.023	-.368**	-.274**	1	-.063	-.332**
	Sig. (2-tailed)	.077	.041	.808	.000	.004		.514	.000
	N	110	110	110	110	110	110	110	110
Value_proposition	Pearson Correlation	-.530**	.158	.100	-.104	.014	-.063	1	.002
	Sig. (2-tailed)	.000	.100	.299	.280	.887	.514		.980
	N	110	110	110	110	110	110	110	110

Financial_Factors	Pearson Correlation	.277**	-.210*	.088	.165	.333**	-.125	-.209*	.310**
	Sig. (2-tailed)	.003	.028	.360	.085	.000	.194	.028	.001
	N	110	110	110	110	110	110	110	110
Competitive_Advantage	Pearson Correlation	.691**	.510**	.310**	.411**	.160	-.375**	-.126	.473**
	Sig. (2-tailed)	.000	.000	.001	.000	.095	.000	.190	.000
	N	110	110	110	110	110	110	110	110
Target_Clients	Pearson Correlation	.359**	.097	.672**	.693**	.509**	-.332**	.002	1

	Sig. (2-tailed)	.000	.313	.000	.000	.000	.000	.980	
	N	110	110	110	110	110	110	110	110

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

From the table given, it can be strongly reviewed that the partial autonomy is best suited with market share and distinct value. In the opinion of when the partial autonomy needs to be applied, then in such a regard, the associated values are also bound to change considerably. Therefore, enterprises must apply such partial autonomy, if their focus lies to engage in better value generation and sales.

Correlations

In the given table, the correlation analysis of the remote-controlled autonomous shipping with each business aspect has been examined. Considering this, it can be strongly identified that the remote-controlled autonomous shipping shares the strongest association with client change expectations and the overall profitability within the context of the enterprise.

Table 30 Correlation between benefits and remote controlled autonomy

Correlations										
	Distinct_value	Fulfilling_needs_expectations	Operational_efficiency	Revenue_generation	Profitability	Equity	Brand_recognition	Market_share	Competitive_Advantage	Target_Clients

Distinct_value	Pearson Correlation	1	.303**	.172*	-.266**	-.025	-.135	-.070	-.351**	-.256**	-.003
	Sig. (2-tailed)		.000	.035	.001	.760	.099	.398	.000	.007	.974
	N	150	150	150	150	150	150	150	150	110	110
Fulfilling_needs_expectations	Pearson Correlation	.303**	1	.190*	-.386**	-.131	-.161*	.073	-.515**	-.140	.156
	Sig. (2-tailed)	.000		.020	.000	.110	.050	.375	.000	.146	.105
	N	150	150	150	150	150	150	150	150	110	110

Operational_efficiency	Pearson Correlation	.172*	.190*	1	-.017	.049	.332**	.280**	-.217**	.150	-.156
	Sig. (2-tailed)	.035	.020		.833	.550	.000	.001	.008	.118	.105
	N	150	150	150	150	150	150	150	150	110	110
Revenue_generation	Pearson Correlation	-.266**	-.386**	-.017	1	.160	.205*	.376**	.387**	.331**	.323**
	Sig. (2-tailed)	.001	.000	.833		.051	.012	.000	.000	.000	.001
	N	150	150	150	150	150	150	150	150	110	110

Profitability	Pearson Correlation	-.025	-.131	.049	.160	1	.030	-.210**	.153	-.215*	.146
	Sig. (2-tailed)	.760	.110	.550	.051		.714	.010	.062	.024	.128
	N	150	150	150	150	150	150	150	150	110	110
Equity	Pearson Correlation	-.135	-.161*	.332**	.205*	.030	1	.210**	-.040	.201*	.106
	Sig. (2-tailed)	.099	.050	.000	.012	.714		.010	.631	.035	.270
	N	150	150	150	150	150	150	150	150	110	110

Brand_recognition	Pearson Correlation	-.070	.073	.280**	.376**	-.210**	.210**	1	.294**	.752**	.437**
	Sig. (2-tailed)	.398	.375	.001	.000	.010	.010		.000	.000	.000
	N	150	150	150	150	150	150	150	150	110	110
Market_share	Pearson Correlation	-.351**	-.515**	-.217**	.387**	.153	-.040	.294**	1	.691**	.359**
	Sig. (2-tailed)	.000	.000	.008	.000	.062	.631	.000		.000	.000
	N	150	150	150	150	150	150	150	150	110	110

Irreplaceable_Inimitable	Pearson Correlation	-.083	.214**	.187*	-.183*	-.392**	.224**	.107	.063	.510**	.097
	Sig. (2-tailed)	.310	.009	.022	.025	.000	.006	.192	.445	.000	.313
	N	150	150	150	150	150	150	150	150	110	110
Client_change	Pearson Correlation	.099	.202*	-.106	.117	.072	-.055	.312**	.174*	.310**	.672**
	Sig. (2-tailed)	.230	.013	.198	.154	.379	.505	.000	.034	.001	.000
	N	150	150	150	150	150	150	150	150	110	110

Client_Satisfaction_loyalty	Pearson Correlation	.025	-.130	-.133	.195*	-.010	.167*	.337**	.340**	.411**	.693**
	Sig. (2-tailed)	.762	.112	.105	.017	.906	.042	.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	110	110
Change_Client_operations	Pearson Correlation	-.157	.217**	-.022	.316**	.192*	.106	.202*	.187*	.160	.509**
	Sig. (2-tailed)	.055	.008	.793	.000	.019	.198	.013	.022	.095	.000
	N	150	150	150	150	150	150	150	150	110	110

Autonomous_shipping_use	Pearson Correlation	.365**	-.057	-.466**	-.090	.125	-.317**	-.360**	-.169	-.375**	-.332**
	Sig. (2-tailed)	.000	.556	.000	.349	.193	.001	.000	.077	.000	.000
	N	110	110	110	110	110	110	110	110	110	110
Value_proposition	Pearson Correlation	.722**	.718**	.622**	-.321**	-.060	.022	.131	-.530**	-.126	.002
	Sig. (2-tailed)	.000	.000	.000	.001	.535	.823	.173	.000	.190	.980
	N	110	110	110	110	110	110	110	110	110	110

Financial_ Factors	Pearson Correlation	-.223*	-.354**	.162	.761**	.617**	.555**	.211*	.277**	.170	.310**
	Sig. (2-tailed)	.019	.000	.090	.000	.000	.000	.027	.003	.076	.001
	N	110	110	110	110	110	110	110	110	110	110
Competitive_Advantage	Pearson Correlation	-.256**	-.140	.150	.331**	-.215*	.201*	.752**	.691**	1	.473**
	Sig. (2-tailed)	.007	.146	.118	.000	.024	.035	.000	.000		.000
	N	110	110	110	110	110	110	110	110	110	110

Target_Clients	Pearson Correlation	-.003	.156	-.156	.323**	.146	.106	.437**	.359**	.473**	1
	Sig. (2-tailed)	.974	.105	.105	.001	.128	.270	.000	.000	.000	
	N	110	110	110	110	110	110	110	110	110	110
Remote_controlled	Pearson Correlation	.375**	-.242**	-.363**	-.102	.104	-.084	-.313**	-.115	-.340**	-.186
	Sig. (2-tailed)	.000	.003	.000	.213	.205	.307	.000	.163	.000	.052
	N	150	150	150	150	150	150	150	150	110	110

Table 31 Correlation between benefits and remote controlled autonomy

Correlations

		Irreplaceable_Inimitable	Client_change	Client_Satisfaction_loyalty	Change_Client_operations	Autonomous_shipping_use	Value_proposition	Financial_Factors	Remote_controlled
Distinct_value	Pearson Correlation	-.083	.099	.025	-.157	.365**	.722**	-.223*	.375**
	Sig. (2-tailed)	.310	.230	.762	.055	.000	.000	.019	.000
	N	150	150	150	150	110	110	110	150
Fulfilling_needs_expectations	Pearson Correlation	.214**	.202*	-.130	.217**	-.057	.718**	-.354**	-.242**
	Sig. (2-tailed)	.009	.013	.112	.008	.556	.000	.000	.003
	N	150	150	150	150	110	110	110	150
Operational_efficiency	Pearson Correlation	.187*	-.106	-.133	-.022	-.466**	.622**	.162	-.363**
	Sig. (2-tailed)	.022	.198	.105	.793	.000	.000	.090	.000
	N	150	150	150	150	110	110	110	150
Revenue_generation	Pearson Correlation	-.183*	.117	.195*	.316**	-.090	-.321**	.761**	-.102

	Sig. (2-tailed)	.025	.154	.017	.000	.349	.001	.000	.213
	N	150	150	150	150	110	110	110	150
Profitability	Pearson Correlation	-.392**	.072	-.010	.192*	.125	-.060	.617**	.104
	Sig. (2-tailed)	.000	.379	.906	.019	.193	.535	.000	.205
	N	150	150	150	150	110	110	110	150
Equity	Pearson Correlation	.224**	-.055	.167*	.106	-.317**	.022	.555**	-.084
	Sig. (2-tailed)	.006	.505	.042	.198	.001	.823	.000	.307
	N	150	150	150	150	110	110	110	150
Brand_recognition	Pearson Correlation	.107	.312**	.337**	.202*	-.360**	.131	.211*	-.313**
	Sig. (2-tailed)	.192	.000	.000	.013	.000	.173	.027	.000
	N	150	150	150	150	110	110	110	150
Market_share	Pearson Correlation	.063	.174*	.340**	.187*	-.169	-.530**	.277**	-.115
	Sig. (2-tailed)	.445	.034	.000	.022	.077	.000	.003	.163
	N	150	150	150	150	110	110	110	150

Irreplaceable_Inimitable	Pearson Correlation	1	.146	.133	-.076	-.195*	.158	-.210*	-.240**
	Sig. (2-tailed)		.075	.104	.352	.041	.100	.028	.003
	N	150	150	150	150	110	110	110	150
Client_change	Pearson Correlation	.146	1	.272**	-.009	.023	.100	.088	.287**
	Sig. (2-tailed)	.075		.001	.912	.808	.299	.360	.000
	N	150	150	150	150	110	110	110	150
Client_Satisfaction_loyalty	Pearson Correlation	.133	.272**	1	.004	-.368**	-.104	.165	-.162*
	Sig. (2-tailed)	.104	.001		.959	.000	.280	.085	.048
	N	150	150	150	150	110	110	110	150
Change_Client_operations	Pearson Correlation	-.076	-.009	.004	1	-.274**	.014	.333**	-.519**
	Sig. (2-tailed)	.352	.912	.959		.004	.887	.000	.000
	N	150	150	150	150	110	110	110	150
Autonomous_shipping_use	Pearson Correlation	-.195*	.023	-.368**	-.274**	1	-.063	-.125	.659**

	Sig. (2-tailed)	.041	.808	.000	.004		.514	.194	.000
	N	110	110	110	110	110	110	110	110
Value_proposition	Pearson Correlation	.158	.100	-.104	.014	-.063	1	-.209*	-.095
	Sig. (2-tailed)	.100	.299	.280	.887	.514		.028	.323
	N	110	110	110	110	110	110	110	110
Financial_Factors	Pearson Correlation	-.210*	.088	.165	.333**	-.125	-.209*	1	-.032
	Sig. (2-tailed)	.028	.360	.085	.000	.194	.028		.738
	N	110	110	110	110	110	110	110	110
Competitive_Advantage	Pearson Correlation	.510**	.310**	.411**	.160	-.375**	-.126	.170	-.340**
	Sig. (2-tailed)	.000	.001	.000	.095	.000	.190	.076	.000
	N	110	110	110	110	110	110	110	110
Target_Clients	Pearson Correlation	.097	.672**	.693**	.509**	-.332**	.002	.310**	-.186
	Sig. (2-tailed)	.313	.000	.000	.000	.000	.980	.001	.052
	N	110	110	110	110	110	110	110	110

Remote_controlled	Pearson Correlation	-.240**	.287**	-.162*	-.519**	.659**	-.095	-.032	1
	Sig. (2-tailed)	.003	.000	.048	.000	.000	.323	.738	
	N	150	150	150	150	110	110	110	150

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

From the table given, it can be strongly reviewed that the remote controlled autonomy is best suited with distinct value. In the opinion of when this autonomy needs to be applied, then in such a regard, the associated values are also bound to change considerably. Therefore, enterprises must apply such partial autonomy, if their focus lies to engage in better value generation and sales.

Correlations

In the given table, the correlation analysis of the complete autonomous shipping with each business aspect has been examined. Considering this, it can be strongly identified that the complete autonomy shares the strongest association with operations, market share and fulfilment of client and organisational operations.

Table 32 Correlation of complete autonomous shipping with each business aspect

Correlations										
	Distinct_value	Fulfilling_needs_expectations	Operational_efficiency	Revenue_generation	Profitability	Equity	Brand_recognition	Market_share	Competitive_Advantage	Target_Clients

Distinct_value	Pearson Correlation	1	.303**	.172*	-.266**	-.025	-.135	-.070	-.351**	-.256**	-.003
	Sig. (2-tailed)		.000	.035	.001	.760	.099	.398	.000	.007	.974
	N	150	150	150	150	150	150	150	150	110	110
Fulfilling_needs_expectations	Pearson Correlation	.303**	1	.190*	-.386**	-.131	-.161*	.073	-.515**	-.140	.156
	Sig. (2-tailed)	.000		.020	.000	.110	.050	.375	.000	.146	.105
	N	150	150	150	150	150	150	150	150	110	110
Operational_efficiency	Pearson Correlation	.172*	.190*	1	-.017	.049	.332**	.280**	-.217**	.150	-.156
	Sig. (2-tailed)	.035	.020		.833	.550	.000	.001	.008	.118	.105
	N	150	150	150	150	150	150	150	150	110	110
Revenue_generation	Pearson Correlation	-.266**	-.386**	-.017	1	.160	.205*	.376**	.387**	.331**	.323**
	Sig. (2-tailed)	.001	.000	.833		.051	.012	.000	.000	.000	.001
	N	150	150	150	150	150	150	150	150	110	110
Profitability	Pearson Correlation	-.025	-.131	.049	.160	1	.030	-.210**	.153	-.215*	.146

	Sig. (2-tailed)	.760	.110	.550	.051		.714	.010	.062	.024	.128
	N	150	150	150	150	150	150	150	150	110	110
Equity	Pearson Correlation	-.135	-.161*	.332**	.205*	.030	1	.210**	-.040	.201*	.106
	Sig. (2-tailed)	.099	.050	.000	.012	.714		.010	.631	.035	.270
	N	150	150	150	150	150	150	150	150	110	110
Brand_recognition	Pearson Correlation	-.070	.073	.280**	.376**	-.210**	.210**	1	.294**	.752**	.437**
	Sig. (2-tailed)	.398	.375	.001	.000	.010	.010		.000	.000	.000
	N	150	150	150	150	150	150	150	150	110	110
Market_share	Pearson Correlation	-.351**	-.515**	-.217**	.387**	.153	-.040	.294**	1	.691**	.359**
	Sig. (2-tailed)	.000	.000	.008	.000	.062	.631	.000		.000	.000
	N	150	150	150	150	150	150	150	150	110	110
Irreplaceable_Inimitable	Pearson Correlation	-.083	.214**	.187*	-.183*	-.392**	.224**	.107	.063	.510**	.097
	Sig. (2-tailed)	.310	.009	.022	.025	.000	.006	.192	.445	.000	.313
	N	150	150	150	150	150	150	150	150	110	110

Client_change	Pearson Correlation	.099	.202*	-.106	.117	.072	-.055	.312**	.174*	.310**	.672**
	Sig. (2-tailed)	.230	.013	.198	.154	.379	.505	.000	.034	.001	.000
	N	150	150	150	150	150	150	150	150	110	110
Client_Satisfaction_loyalty	Pearson Correlation	.025	-.130	-.133	.195*	-.010	.167*	.337**	.340**	.411**	.693**
	Sig. (2-tailed)	.762	.112	.105	.017	.906	.042	.000	.000	.000	.000
	N	150	150	150	150	150	150	150	150	110	110
Change_Client_operations	Pearson Correlation	-.157	.217**	-.022	.316**	.192*	.106	.202*	.187*	.160	.509**
	Sig. (2-tailed)	.055	.008	.793	.000	.019	.198	.013	.022	.095	.000
	N	150	150	150	150	150	150	150	150	110	110
Autonomous_shipping_use	Pearson Correlation	.365**	-.057	-.466**	-.090	.125	-.317**	-.360**	-.169	-.375**	-.332**
	Sig. (2-tailed)	.000	.556	.000	.349	.193	.001	.000	.077	.000	.000
	N	110	110	110	110	110	110	110	110	110	110
Value_proposition	Pearson Correlation	.722**	.718**	.622**	-.321**	-.060	.022	.131	-.530**	-.126	.002

	Sig. (2-tailed)	.000	.000	.000	.001	.535	.823	.173	.000	.190	.980
	N	110	110	110	110	110	110	110	110	110	110
Financial_Factors	Pearson Correlation	-.223*	-.354**	.162	.761**	.617**	.555**	.211*	.277**	.170	.310**
	Sig. (2-tailed)	.019	.000	.090	.000	.000	.000	.027	.003	.076	.001
	N	110	110	110	110	110	110	110	110	110	110
Competitive_Advantage	Pearson Correlation	-.256**	-.140	.150	.331**	-.215*	.201*	.752**	.691**	1	.473**
	Sig. (2-tailed)	.007	.146	.118	.000	.024	.035	.000	.000		.000
	N	110	110	110	110	110	110	110	110	110	110
Target_Clients	Pearson Correlation	-.003	.156	-.156	.323**	.146	.106	.437**	.359**	.473**	1
	Sig. (2-tailed)	.974	.105	.105	.001	.128	.270	.000	.000	.000	
	N	110	110	110	110	110	110	110	110	110	110
Full_Autonomous	Pearson Correlation	-.094	.083	-.123	.063	-.083	-.326**	-.182*	.081	-.081	-.133
	Sig. (2-tailed)	.254	.311	.134	.441	.313	.000	.026	.327	.398	.164
	N	150	150	150	150	150	150	150	150	110	110

Table 33 complete autonomous shipping with each business aspects

Correlations									
		Irreplaceable_Inimitable	Client_change	Client_Satisfaction_loyalty	Change_Client_operations	Autonomous_shipping_use	Value_proposition	Financial_Factors	Full_Autonomous
Distinct_value	Pearson Correlation	-.083	.099	.025	-.157	.365**	.722**	-.223*	-.094
	Sig. (2-tailed)	.310	.230	.762	.055	.000	.000	.019	.254
	N	150	150	150	150	110	110	110	150
Fulfilling_needs_expectations	Pearson Correlation	.214**	.202*	-.130	.217**	-.057	.718**	-.354**	.083
	Sig. (2-tailed)	.009	.013	.112	.008	.556	.000	.000	.311
	N	150	150	150	150	110	110	110	150
Operational_efficiency	Pearson Correlation	.187*	-.106	-.133	-.022	-.466**	.622**	.162	-.123
	Sig. (2-tailed)	.022	.198	.105	.793	.000	.000	.090	.134
	N	150	150	150	150	110	110	110	150
Revenue_generation	Pearson Correlation	-.183*	.117	.195*	.316**	-.090	-.321**	.761**	.063

	Sig. (2-tailed)	.025	.154	.017	.000	.349	.001	.000	.441
	N	150	150	150	150	110	110	110	150
Profitability	Pearson Correlation	-.392**	.072	-.010	.192*	.125	-.060	.617**	-.083
	Sig. (2-tailed)	.000	.379	.906	.019	.193	.535	.000	.313
	N	150	150	150	150	110	110	110	150
Equity	Pearson Correlation	.224**	-.055	.167*	.106	-.317**	.022	.555**	-.326**
	Sig. (2-tailed)	.006	.505	.042	.198	.001	.823	.000	.000
	N	150	150	150	150	110	110	110	150
Brand_recognition	Pearson Correlation	.107	.312**	.337**	.202*	-.360**	.131	.211*	-.182*
	Sig. (2-tailed)	.192	.000	.000	.013	.000	.173	.027	.026
	N	150	150	150	150	110	110	110	150
Market_share	Pearson Correlation	.063	.174*	.340**	.187*	-.169	-.530**	.277**	.081
	Sig. (2-tailed)	.445	.034	.000	.022	.077	.000	.003	.327
	N	150	150	150	150	110	110	110	150

Irreplaceable_Inimitable	Pearson Correlation	1	.146	.133	-.076	-.195*	.158	-.210*	-.043
	Sig. (2-tailed)		.075	.104	.352	.041	.100	.028	.604
	N	150	150	150	150	110	110	110	150
Client_change	Pearson Correlation	.146	1	.272**	-.009	.023	.100	.088	-.167*
	Sig. (2-tailed)	.075		.001	.912	.808	.299	.360	.041
	N	150	150	150	150	110	110	110	150
Client_Satisfaction_loyalty	Pearson Correlation	.133	.272**	1	.004	-.368**	-.104	.165	-.329**
	Sig. (2-tailed)	.104	.001		.959	.000	.280	.085	.000
	N	150	150	150	150	110	110	110	150
Change_Client_operations	Pearson Correlation	-.076	-.009	.004	1	-.274**	.014	.333**	.256**
	Sig. (2-tailed)	.352	.912	.959		.004	.887	.000	.002
	N	150	150	150	150	110	110	110	150
Autonomous_shipping_use	Pearson Correlation	-.195*	.023	-.368**	-.274**	1	-.063	-.125	.405**

	Sig. (2-tailed)	.041	.808	.000	.004		.514	.194	.000
	N	110	110	110	110	110	110	110	110
Value_proposition	Pearson Correlation	.158	.100	-.104	.014	-.063	1	-.209*	-.063
	Sig. (2-tailed)	.100	.299	.280	.887	.514		.028	.512
	N	110	110	110	110	110	110	110	110
Financial_Factors	Pearson Correlation	-.210*	.088	.165	.333**	-.125	-.209*	1	-.153
	Sig. (2-tailed)	.028	.360	.085	.000	.194	.028		.112
	N	110	110	110	110	110	110	110	110
Competitive_Advantage	Pearson Correlation	.510**	.310**	.411**	.160	-.375**	-.126	.170	-.081
	Sig. (2-tailed)	.000	.001	.000	.095	.000	.190	.076	.398
	N	110	110	110	110	110	110	110	110
Target_Clients	Pearson Correlation	.097	.672**	.693**	.509**	-.332**	.002	.310**	-.133
	Sig. (2-tailed)	.313	.000	.000	.000	.000	.980	.001	.164
	N	110	110	110	110	110	110	110	110

Full_Autonomous	Pearson Correlation	-.043	-.167*	-.329**	.256**	.405**	-.063	-.153	1
	Sig. (2-tailed)	.604	.041	.000	.002	.000	.512	.112	
	N	150	150	150	150	110	110	110	150

From the table given, it can be strongly reviewed that the complete autonomy is best suited with meeting client expectations. In the opinion of when the complete autonomy needs to be applied, then in such a regard, the associated values are also bound to change considerably. Therefore, enterprises must apply such partial autonomy, if their focus lies to engage in better value generation and sales.

4.7 Cross tab analysis

Partial_automatic * Value_proposition

*Table 34 Partial_automatic * Value_proposition*

Crosstab							
Count							
		Value_proposition					
		2.33	2.67	3.00	3.33	3.67	4.00
Partial_automatic	1	0	0	0	0	5	0
	2	5	5	0	5	5	10
	3	0	5	5	15	5	10
	4	0	0	0	5	0	0
	5	0	0	5	0	0	0
Total		5	10	10	25	15	20

Table 35 Continued

Crosstab			
Count			
		Value_proposition	Total
		4.33	
Partial_automatic	1	0	5
	2	0	30
	3	20	60
	4	5	10
	5	0	5
Total		25	110

Table 36 Chi square test

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	126.500[a]	24	.000
Likelihood Ratio	99.528	24	.000
Linear-by-Linear Association	.447	1	.504
N of Valid Cases	110		

a. 26 cells (74.3%) have expected count less than 5. The minimum expected count is .23.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Partial_automatic * Financial_Factors

*Table 37 Partial_automatic * Financial_Factors*

Crosstab							
Count							
		Financial_Factors					
		2.33	2.67	3.00	3.33	3.67	4.00
Partial_automatic	1	0	0	0	0	5	0
	2	0	10	5	0	5	10
	3	15	0	15	20	0	10
	4	0	0	5	0	5	0
	5	0	0	0	0	5	0
Total		15	10	25	20	20	20

Table 38 Continued

Crosstab		
Count		
		Total
Partial_automatic	1	5
	2	30

	3	60
	4	10
	5	5
Total		110

Table 39 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	122.833[a]	20	.000
Likelihood Ratio	129.781	20	.000
Linear-by-Linear Association	.146	1	.703
N of Valid Cases	110		

a. 20 cells (66.7%) have expected count less than 5. The minimum expected count is .45.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Partial_automatic * Competitive_Advantage

*Table 40 Partial_automatic * Competitive_Advantage*

Crosstab
Count

		Competitive_Advantage					
		2.67	3.00	3.33	3.67	4.00	4.33
Partial_automatic	1	0	0	0	0	5	0
	2	5	10	0	5	5	0
	3	20	10	10	10	5	5
	4	0	5	0	5	0	0
	5	0	0	5	0	0	0
Total		25	25	15	20	15	5

Table 41 Continued

Crosstab			
Count			
		Competitive_Advantage	Total
		4.67	
Partial_automatic	1	0	5
	2	5	30
	3	0	60
	4	0	10
	5	0	5
Total		5	110

Table 42 Chi square tests

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	105.722[a]	24	.000
Likelihood Ratio	89.063	24	.000
Linear-by-Linear Association	4.776	1	.029
N of Valid Cases	110		

a. 27 cells (77.1%) have expected count less than 5. The minimum expected count is .23.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Partial_automatic * Target_Clients

*Table 43 Partial_automatic * Target_Clients*

Crosstab							
Count							
		Target_Clients					
		2.33	2.67	3.00	3.33	3.67	4.00
Partial_automatic	1	0	0	0	0	0	5
	2	10	0	10	5	0	5
	3	0	25	5	25	5	0
	4	0	0	5	0	5	0
	5	5	0	0	0	0	0

Total	15	25	20	30	10	10

Table 44 Continued

Crosstab		
Count		
		Total
Partial_automatic	1	5
	2	30
	3	60
	4	10
	5	5
Total		110

Table 45 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	168.819[a]	20	.000
Likelihood Ratio	145.028	20	.000
Linear-by-Linear Association	7.497	1	.006
N of Valid Cases	110		

a. 21 cells (70.0%) have expected count less than 5. The minimum expected count is .45.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Remote_controlled * Value_proposition

*Table 46 Remote_controlled * Value_proposition*

Crosstab							
Count							
		Value_proposition					
		2.33	2.67	3.00	3.33	3.67	4.00
Remote_controlled	1	0	0	0	5	0	0
	2	0	0	0	0	5	0
	3	0	0	5	5	5	10
	4	0	10	5	10	5	5
	5	5	0	0	5	0	5
Total		5	10	10	25	15	20

Table 47 Continued

Crosstab			
Count			
		Value_proposition	Total
		4.33	
Remote_controlled	1	0	5
	2	5	10

	3	0	25
	4	15	50
	5	5	20
Total		25	110

Table 48 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	93.958[a]	24	.000
Likelihood Ratio	97.452	24	.000
Linear-by-Linear Association	.985	1	.321
N of Valid Cases	110		

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Remote_controlled * Financial_Factors

*Table 49 Remote_controlled * Financial_Factors*

Crosstab							
Count							
		Financial_Factors					
		2.33	2.67	3.00	3.33	3.67	4.00
	1	0	0	5	0	0	0

Remote_controlled	2	0	0	5	0	0	5
	3	5	0	0	10	5	5
	4	10	5	10	10	10	5
	5	0	5	5	0	5	5
Total		15	10	25	20	20	20

Table 50 continued

Crosstab

Count

		Total
Remote_controlled	1	5
	2	10
	3	25
	4	50
	5	20
Total		110

Table 51 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	63.800[a]	20	.000

Likelihood Ratio	75.650	20	.000
Linear-by-Linear Association	.113	1	.737
N of Valid Cases	110		

a. 24 cells (80.0%) have expected count less than 5. The minimum expected count is .45.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Remote_controlled * Competitive_Advantage

*Table 52 Remote_controlled * Competitive_Advantage*

Crosstab							
Count							
		Competitive_Advantage					
		2.67	3.00	3.33	3.67	4.00	4.33
Remote_controlled	1	0	0	0	0	0	0
	2	0	5	0	0	5	0
	3	5	5	5	5	0	5
	4	20	5	10	10	5	0
	5	0	10	0	5	5	0
Total		25	25	15	20	15	5

Table 53 Continued

Crosstab			
Count			
		Competitive_Advantage	
		4.67	Total
Remote_controlled	1	5	5
	2	0	10
	3	0	25
	4	0	50
	5	0	20
Total		5	110

Table 54 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	177.742[a]	24	.000
Likelihood Ratio	114.713	24	.000
Linear-by-Linear Association	12.635	1	.000
N of Valid Cases	110		

a. 28 cells (80.0%) have expected count less than 5. The minimum expected count is .23.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Remote_controlled * Target_Clients

*Table 55 Remote_controlled * Target_Clients*

Crosstab							
Count							
		Target_Clients					
		2.33	2.67	3.00	3.33	3.67	4.00
Remote_controlled	1	0	0	0	5	0	0
	2	0	0	5	5	0	0
	3	0	10	5	0	5	5
	4	10	15	0	20	0	5
	5	5	0	10	0	5	0
Total		15	25	20	30	10	10

Table 56 Continued

Crosstab		
Count		
		Total
Remote_controlled	1	5
	2	10

	3	25
	4	50
	5	20
Total		110

Table 57 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	96.067[a]	20	.000
Likelihood Ratio	125.870	20	.000
Linear-by-Linear Association	3.769	1	.052
N of Valid Cases	110		

a. 23 cells (76.7%) have expected count less than 5. The minimum expected count is .45.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Full_Autonomous * Value_proposition

*Table 58 Full_Autonomous * Value_proposition*

Crosstab	
Count	
	Value_proposition

		2.33	2.67	3.00	3.33	3.67	4.00
Full_Autonomous	1	0	0	0	5	0	0
	2	0	5	0	0	0	5
	3	0	0	0	10	5	5
	4	5	5	10	10	10	5
	5	0	0	0	0	0	5
Total		5	10	10	25	15	20

Crosstab			
Count			
		Value_proposition	Total
		4.33	
Full_Autonomous	1	0	5
	2	0	10
	3	20	40
	4	5	50
	5	0	5
Total		25	110

Table 59 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)

Pearson Chi-Square	110.688[a]	24	.000
Likelihood Ratio	103.376	24	.000
Linear-by-Linear Association	.435	1	.510
N of Valid Cases	110		

a. 27 cells (77.1%) have expected count less than 5. The minimum expected count is .23.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Full_Autonomous * Financial_Factors

*Table 60 Full_Autonomous * Financial_Factors*

Crosstab							
Count							
		Financial_Factors					
		2.33	2.67	3.00	3.33	3.67	4.00
Full_Autonomous	1	0	0	0	0	0	5
	2	0	5	0	0	0	5
	3	5	0	15	15	5	0
	4	10	5	10	0	15	10
	5	0	0	0	5	0	0
Total		15	10	25	20	20	20

Table 61 Continued

Crosstab

Count

		Total
Full_Autonomous	1	5
	2	10
	3	40
	4	50
	5	5
Total		110

Table 62 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	114.675[a]	20	.000
Likelihood Ratio	116.368	20	.000
Linear-by-Linear Association	2.537	1	.111
N of Valid Cases	110		

a. 20 cells (66.7%) have expected count less than 5. The minimum expected count is .45.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Full_Autonomous * Competitive_Advantage

*Table 63 Full_Autonomous * Competitive_Advantage*

Crosstab							
Count							
		Competitive_Advantage					
		2.67	3.00	3.33	3.67	4.00	4.33
Full_Autonomous	1	0	0	0	0	0	5
	2	0	5	5	0	0	0
	3	20	0	0	20	0	0
	4	5	15	10	0	15	0
	5	0	5	0	0	0	0
Total		25	25	15	20	15	5

Table 64 Continued

Crosstab			
Count			
		Competitive_Advantage	Total
		4.67	
Full_Autonomous	1	0	5

	2	0	10
	3	0	40
	4	5	50
	5	0	5
Total		5	110

Table 65 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	231.000[a]	24	.000
Likelihood Ratio	177.923	24	.000
Linear-by-Linear Association	.721	1	.396
N of Valid Cases	110		

a. 25 cells (71.4%) have expected count less than 5. The minimum expected count is .23.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

Full_Autonomous * Target_Clients

*Table 66 Full_Autonomous * Target_Clients*

Crosstab							
Count							
		Target_Clients					
		2.33	2.67	3.00	3.33	3.67	4.00
Full_Autonomous	1	0	0	0	0	5	0
	2	5	0	0	5	0	0
	3	0	15	10	10	0	5
	4	10	5	10	15	5	5
	5	0	5	0	0	0	0
Total		15	25	20	30	10	10

Table 67 Continued

Crosstab		
Count		
		Total
Full_Autonomous	1	5
	2	10
	3	40
	4	50
	5	5
Total		110

Table 68 Chi square

Chi-Square Tests			
	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	104.408[a]	20	.000
Likelihood Ratio	86.808	20	.000
Linear-by-Linear Association	1.943	1	.163
N of Valid Cases	110		

a. 22 cells (73.3%) have expected count less than 5. The minimum expected count is .45.

The crosstab results between the variables depict that the independent and dependent variable have an agreement with one another and that the participants mostly have a positive response towards the statement. The chi square variable reflects a close association between the variables.

4.8 Key Findings

As per the Cronbach's alpha reliability and KMO Bartlett's validity analysis it has been found that the collected data is acceptably reliable and moderately valid. Therefore, the collected dataset, the analysed results and interpretation re reliable and valid. the male and female population is almost equally distributed within the respondents whereas the proportion of male is slightly higher than the male population. Through these findings, it can be rightly understood and significantly examined that the opinion of all participants has been included in the study. For age group and entrepreneurial experience as well, the opinion of all groups has been well incorporated within the context of the research. Through this, it can be successfully identified that all participants although belonging from varying backgrounds and contexts are under a strong belief that the autonomous shipping has varying connotations contributing to the domain of the research. The participants are from young and middle age and in this age group the

Technology related awareness is high. Most of the participants have 1 to 20 years of experience in this field and therefore, they have adequate level of understanding regarding the organisational procedures. The new Autonomous shipping technologies have been adopted from less than 1 year to 4 years of time period.

It can be said that in the descending order the adaptation of the autonomous shipping system is mostly based on Remote controlled ship, Full Autonomous ship and Partial automatic ship. In descending order, the essential value proposition factors after adaptation of autonomous shipping are Distinct Service Value, Operational Efficiency and Fulling Needs and Expectations. After implementing Autonomous shipping, the highest to lowest level of financial factors are Profitability, followed by Equity and Revenue. In terms of competitive advantages, the most to least essential factors are Irreplicable and inimitable, brand recognition and market share. In terms of target client related factors, the essential factors are Change in client operations followed by client satisfaction and loyalty and change in target clients.

In the order of most affected to least affected factors, the impact of Autonomous Shipping can be found on Competitive Advantage, Financial Factors, Target Clients, and Value Proposition. In terms of Value Proposition, Use of Autonomous Shipping can have major impacts on Distinct value and Operational Efficiency of the company. Impact on the ability to fulfil the needs and expectation from the services is comparatively low. Use of Autonomous Shipping has significantly influenced the revenue generation ability of the company followed by the Equity, whereas the impact on profitability is comparatively low. In terms of the competitive advantages, Use of Autonomous Shipping can influence the Brand Recognition as well as Irreplicable and Inimitable brand value to some extent. Full Autonomous shipping process has strong impact on the positive change in the Value Proposition related components. The impact of Autonomous Shipping on the increment of the market share is comparatively low. Use of Autonomous Shipping has significantly influenced the revenue generation ability of the company followed by the Equity, whereas the impact on profitability is comparatively low. Full Autonomous Shipping and no other shipping usage has no influence on the Revenue generation and Profitability. Full Autonomous can only increase the equity.

Use of Autonomous Shipping can influence the Brand Recognition as well as Irreplicable and Inimitable brand value to some extent. The impact of Autonomous Shipping on the increment of the market share is comparatively low. Full Autonomous shipping adaptation has the strongest positive impact over the Competitive Advantages where the significant impacts can be found in increment of brand recognition and making the brand irreplaceable and inimitable.

As a result of Autonomous Shipping no significant impact has been found in changed target clients whereas it increased the client satisfaction and loyalty significantly. The use of Autonomous Shipping also changed the client's operational structure to some extent. The Full Automation ship usage has strongest impact on client satisfaction and loyalty whereas the impact on changing the client's operations is lower than the impact of remote-control shipping method on changing clint's operations.

The findings can be identified to be rather unique as they make several implications within the context of the research. The business model of any business enterprise essentially comprises of several aspects which can be rightly assessed to be associated with the client satisfaction, financial parameters, marketing and other operational parameters. The study has identified a strong association between autonomous shipping and the client satisfaction. This signifies that when the different enterprises tend to make use of the autonomous shipping engagement, then in this regard, the clients would be satisfied to the greatest extent. Here, it is significantly important to identify the fact that when the overall analysis has been done, the competitive advantage was also identified to change consider when the autonomous shipping has been identified. Here, it is significant to identify the fact that when such aspects of the business have been impacted significantly, then in such a regard, it becomes suitably significant to examine and understand the fact that it has been significantly influencing the business model and in regard to this, the shipping enterprises would be obligated to ensure that they are making a considerate use of the autonomous shipping systems and technologies. Hence, although significant studies have been studied in the domain, in this regard, the current study has contributed significantly to assessing and establishing the best way in which the relationship between the autonomous shipping and business operations can be well established.

4.9 Surprising element in findings

When the study was undertaken, it was expected that the study would positively be able to involve in classifying and measuring the best way in which the impact of autonomous shipping could be examined suitably on various aspects such as the finance, marketing, value proposition and the target audience of the enterprise. Although it was expected that the autonomous shipping would significantly be affecting the overall way in which the company operates in terms of its value proposition and financing by saving the costs, however, the relationship between the marketing and the target audience of the enterprise could be assessed to be a surprise. In this regard, the benefits of the autonomous shipping within the literature have often

been limited to influences in the field of the technical aspects, routing and the edge it gives the company in addition to the cost savings. However, getting an associated relationship between the autonomous shipping and the marketing and target audience endeavours could be stated to be a unique finding which was not expected. Hence, when I gained a relationship between the variables, then in such a regard, I understood that the different commercial enterprises who want to engage in the shipping procedure tend to benefit greatly as well in a scenario such that they want their enterprise to be making use of the latest tools and techniques. In the same way, the marketing engagement of the enterprise becomes an easier procedure when the enterprise engages in autonomous shipping as the procedure tends to market for itself. Enterprises like to associate with companies which use the latest trends and hence, one can control a association between the two variables.

5 CHAPTER 5: DISCUSSION AND CONCLUSION

5.1 Summary of The Study

As per the already existing studies it has been identified that an Autonomous ship in a completely unmanned cargo transporter that functional autonomously through using fleet of sensors and AI algorithms. It has been also found that the companies are searching for options to run their operations efficiently while incurring little costs and maintaining high standards of quality. It has been found that examination of the effectiveness of Autonomous Shipping system is essential to make a revolutionary change as per its potential of the new technology while ensuring the optimisation. The study is aimed at finding the impact of the autonomous shipping methods on the different aspect of commercial shipping companies' business model while finding the relationship with the value proposition, revenue generation, competitive advantage and target customers. The goal of the study was not only finding these relationships but also find their inter-dependency with each other that can help to find the current limitations of the implementation methods of autonomous shipping. Through these findings this study aimed at developing recommendations for the future.

A literature review has been conducted to develop the foundation idea about the commercial shipping industry, scope of using Autonomous Ships and their potential impact on different business factors. A survey questionnaire based primary research has been conducted, where participants were asked about what types of Autonomous Shipping system is being used, changes in value proposition, revenue generation, competitive advantage and target customers. Total 150 responses were randomly selected using sampling and the hypothesis are tested using the data analysis method. Three companies that are currently operating as shipping company have been considered for the data collection process. From each company 50 participants have been recruited. The random sampling method have been used. Through the statistical results the effects of autonomous shipping on value proposition, revenue generation, competitive advantage and target customers have been found. The different impact of different methods of autonomous shipping system have been also explored and tested. The hypothesis has been tested successfully using inferential findings from MANOVA outputs. The SPSS results were presented and interpreted that helped to find the implications.

5.2 Discussion of the Findings

As per the above findings from the statistics analysis it can be said that both descriptive and inferential findings of this study helped to answer the research questions appropriately while accomplish research goal. In the following section, it has been assessed whether all the research questions have been addressed by this study. It has been found that some findings of this study supports and already existing knowledges from the literatures and some of them have argued the conventional information available in the existing literatures. In the following section both supporting and argumentative findings have been presented while answering the research questions through interpreting the findings of the study and their implications. The findings from the literatures have been also presented with comparative and supportive discussion.

- To determine how autonomous shipping affects commercial shipping companies' business value propositions.

The first research objective was to control how autonomous shipping affects commercial shipping companies' business value propositions. From the primary research it was found that the essential value proposition factors after adaptation of autonomous shipping are Distinct Service Value, Operational Efficiency and fulfilling needs and Expectations. Similar information has been obtained from the secondary research as well. Papathanasiou, Cole and Murray (2020) opine that the introduction of autonomous vehicle has resulted in creation of distinct service value and operational efficiency. First of all, using a shipping firm to export or import goods is one of the most trusted, effective, and affordable choices available to businesses. Choosing commercial shipping over other forms of transportation can improve your company's business and growth in the long run, despite the fact that many organisations think their business is too big or too busy to consider working with commercial shipping organisations. This idea is frequently used by companies in the global commercial shipping industry as a value proposition. Commercial shipping companies handle the delivery of orders from the point of origin to the destination (Mallam, Nazir and Sharma 2020). Considering the proficiencies provided by the advanced commercial shipping in this era. More and more business-to-business organizations have been found to be relying on these services for handling their logistics as well as shipping. a wide range of advantages are gained by these brands as a result of this these brands gains a wide range of advantages that include consolidating all the shipping costs into a predictable ingle monthly bill and negotiating lower number of expenses with a 3rd party logistics provider. It has also been found that social media platform is used by a wide range of commercial shipping organizations in order to promote their products.

Autonomous vessels are also promoted through social media platforms for gaining value proposition. Ziajka-Poznańska and Montewka (2021) have highlighted that since autonomous vehicles provides lower number of risks for human in seas it is promoted as a distinct value added to commercial shipping. Chaal et al. (2020) have highlighted that no major changes in efficiency can be noticed by organizations who have introduce autonomous shipping. However, Bolbot et al. (2021) have highlighted that, in order to remain competitive, the commercial shipping organizations keeps their price lower than its competitors. It has been found that in order to provide the consumers with higher quality of services than its competitors the manufacturers of the shipping industry are highly focusing on its research and development (R&D) department. Approximately 37 percent of its total investment cost of Schenker Inc is spend on its research and development. The autonomous shipping can be considered as one of the most effective innovations of the commercial shipping organization.

In addition to this, it was found that introduction and usage of autonomous shipping enhances the operational efficiency and distinct value reaction of the organization. However, fulfilment of the needs and expectations of the consumers from the services is comparatively low. The value created by the autonomous ships in the business ecosystem needs the input from a wide range actor. For an ecosystem actor for delivering value of their products as well as services, it is highly necessary to develop a specific alignment with a wide range of other ecosystem factors, whose value propositions are complementary. In general, the operational efficiency has been found to be directly associated with the cost leadership value proposition, whereas the service effectiveness is associated with differentiation value proposition. The risk and protection digital applications that are most commonly used on management and shipping company ships are probably those that combine cybersecurity with hazard control reporting. Additionally, the connected ships have significantly increased the flow of ship operational data between the ship and the land, improving the health and productivity of the ships.

Furthermore, it has been found that Remote Controlled shipping adaptation is not beneficial for the value proposition, whereas Full Autonomous shipping process has strong impact on the positive change in the Value Proposition related components that mainly includes creating distinct value and increase operational efficiency. Similar information has been found from secondary researchers. They emphasised four essential issues: trust, knowledge and comprehension, control and training, as well as work organisation, in connection to the human components and independence in complex safety systems. They contend that as a result of automation, future maritime operators (in the SCC) will eventually transition into supervisory

roles that are physically separate from sharp-end tasks. A lot of traditional nautical abilities have been altered by technology, making them neither necessary nor useful today.

- To investigate the financial impact of autonomous shipping on commercial shipping companies.

The second research objective was to examine the financial impact of autonomous shipping on commercial shipping companies. From the primary research, it has been found that after implementing the autonomous shipping, the current financial factors in descending order are Profitability, followed by Equity and Revenue. This fact has been supported by secondary research as well. As per Chen et al. (2020), for shortage of ships, Germany is still considered one of the largest markets that is followed by UK. For deep sea ship owners, both China and USA are highly crucial markets. Both UK and Norway are considered to be highly crucial for the offshore as well as rig organizations. These markets are easily captured by Autonomous shipping making autonomous shipping an effective investment for commercial ship manufacturing organizations. Ziajka-Poznańska and Montewka (2021) have highlighted autonomous merchant ships have been found to more beneficial than other kind of ships. However, it has also been highlighted that without real time data, the degree to which autonomous shipping will be beneficial financially for a specific industry, cannot be understood without proper real time execution. Therefore, it is highly crucial for shipping organizations to opt for autonomous shipping. The low cost of staff upkeep is one of the major reasons influencing the rising level of profit from autonomous vessels, according to Montewka et al. (2018). The autonomous vessel's engine room, auxiliary plants, supply systems, electric and automation systems, among other systems, are looked after by a boarding crew. Nine engineers and technicians are expected to do the task while the ship is berthed or waiting for (Tusher et al. 2022). Kretschmann et al. estimate that associated costs per ship per year (including 15 percent for profit and other expenditures) are around USD 135,000. (2015).

Secondly it has been found that the Autonomous Shipping has significantly influenced the revenue generation ability whereas the impact on profitability is comparatively low, and a moderate impact can be found on Equity. The government's current tax laws for the shipbuilding sector show a lack of support for the home shipping companies. The created laws often benefit international shipping corporations more than they do domestic delivery companies. These policies include, among many other things: a) no VAT fees for international shipping companies utilising boxes; b) uneven VAT categorization for port services; and c) anticipated lower rates of taxation based on the former revenue tax regime, which had

moderately high-income tax rates. The development of the local marine sector is supported by the Indonesian government. National shipping companies benefit from lower taxes as a consequence (Papathanasiou, Cole and Murray 2020).

Full Autonomous Shipping and other shipping usage has no influence on the revenue generation and profitability, whereas the Full Autonomous can only increase the equity significantly. However, this point has been contradicted by secondary studies. It has been found that autonomous shipping positively influences on the revenue generation and profitability along with equity. Use of Autonomous Shipping has significantly influenced the revenue generation ability of the company followed by the Equity, whereas the impact on profitability is comparatively low. In terms of the competitive advantages, Use of Autonomous Shipping can influence the Brand Recognition as well as Irreplicable and Inimitable brand value to some extent. Chen et al. (2020), have stated that the capacity of the corporation to generate revenue has been greatly impacted by the use of autonomous shipping, but the impact on profitability has been very little. No other shipping methods are used, and full autonomy in shipping has no effect on revenue and profitability. Only Full Autonomous can raise equity.

- To impact of autonomous shipping on determine the competitive advantage of commercial shipping corporations.

The third research objective was to analyze impact of autonomous shipping on determine the competitive advantage of commercial shipping corporations. From the primary data analysis, it has been found that the most to least essential factors are Irreplicable and inimitable, brand recognition and market share. Effective ship mobility is one of the main factors contributing to the shipping industry's increased degree of competitiveness, claim Kuo, Lu, and Le (2020). First, there are a number of marine routes that give access to all of the major transport routes in the world. They are not limited to a particular set of courses, unlike inland canals and railroads. In contrast to railroads, boats are not constrained to a certain route. If one ceases being lucrative, they can be launched on alternative routes without suffering any time or money losses. Mallouppas and Yfantis (2021) claim that the larger ship size and frequent mobility make shipping more competitive.

It has been also determined that competitive advantage is the most sensitive factor where the impact of using Autonomous Ship is maximum compared to three other chosen business-related factors. Use of Autonomous Shipping can influence the Brand Recognition as well as Irreplicable and Inimitable brand value to some extent, whereas impact on market share is comparatively lower than others.

Additionally, the use of remote-control shipping is not contributing the competitiveness of the companies, whereas the partial automatic shipping method reduces the market share.

Full Autonomous shipping adaptation has the strongest positive impact over the Competitive Advantages, where it can be concluded that it can significantly increase the brand recognition while making the organisations and their services irreplaceable and inimitable.

- To determine the impact of autonomous shipping on target clients of commercial shipping companies.

The fourth research objective was to determine the impact of autonomous shipping on target clients of commercial shipping companies. From the findings of the research, it could be rightly identified that the autonomous shipping did not have a significant influence on the target clients of the commercial firms. In this regard, it is essential to state the fact that, target clients are largely based on the brand image of the enterprise and are particularly focused on ensuring better operational efficiency. Considering this, it is suitable to note that the study has been thereby able to identify the lack of any impact of the autonomous shipping on the target clients of such commercial companies.

5.3 Theoretical and Practical Implications for the field

The research can be identified to have greatly contributed to the field of the study. It has given both theoretical as well as practical implications to the field. As per the theoretical perspective this study can have valuable details regarding the specific impact of different types of autonomous shipping on the different aspect of the business management. Besides, the hypothesis that have been tested highlights the relationship within different business-related factors whereas each factors includes three sub-components. These relationships can help to evaluate the relationship within the business aspects and their internal components further. The findings theoretically imply that an operational change in a shipping company through adopting the Autonomous ships can change financial, market, customer, value proposition related aspects of the business. It also highlights that essentiality of the optimisation of the operational structure while adopting the new shipping technologies.

As per the practical perspective this study highlights the different impacts of different level of autonomous shipping technologies. It highlights how the fully autonomous shipping method can be beneficial more than the remote-control shipping and how the existing adaptation of remote-control shipping methods are not contributing to business related benefits significantly. Additionally, another practicality has been added that highlighted impact of the fully

autonomous shipping on the financial benefit of the company. The essentiality of the optimisation can be also interpreted from the findings. It can be found from the findings and discussion that some shipping methods are contributing more than others whereas some autonomous shipping contributing more on specific business-related benefit. Therefore, it can be further interpreted that the commercial shipping company should adopt the autonomous shipping based on the scope of adoption and the aimed business-related benefits. Hence, for readers and practitioners in the field, the research contributes greatly to understanding the best way in which the autonomous shipping can be carried out successfully and the best way in which the research can successfully engage in the field of autonomous shipping and associated welfare. The research makes a mark in the field of technology and contributes towards understanding the best way in which successful autonomous technology may be utilised for the benefit of the business. Furthermore, it is also significantly essential to outline the fact that the use of the autonomous technology may not only be able to assist the core operations of the enterprise but their marketing activities as well.

5.4 Conclusion

As per the findings and debate of this paper it can be concluded that this study has successfully evaluated and examined the impact of the autonomous shipping methods on the different aspect of commercial shipping companies' business model while finding the relationship with the value proposition, revenue generation, competitive advantage and target customers. The survey questionnaire-based data collection enabled this study to examine the impact of the autonomous shipping from the perspective of the people of the organisation which can highlight the valuable insight that cannot be found from the annual projection of the organisations. Including multiple organisations in the data collection process also helped to develop the knowledge with more generalizability.

As per the findings it can be said that the study met all the objectives of this study. It has been found that the in descending order of adopting autonomous shipping the most to least adopted autonomous shipping methods are Remote controlled ship, Full Autonomous ship and Partial automatic shipping. As per the discussion it can be further said that Remote Controlled Shipping can be very easily adapted in shipping industry because it requires less complex technological facilitation than the fully autonomous shipping. From the findings and analysis, it can be further concluded that the impact of Autonomous Shipping can be found mostly on Competitive Advantage of the organisation followed by the Financial Factors, Target Clients, and with least effect on Value Proposition. As per the discussion it can be also concluded that

the operational accuracy driven service providing ability from autonomous shipping enables them to have more competitive advantages.

The first objective of this study was the to control how autonomous shipping affects commercial shipping companies' business value propositions. As per the findings and discussion it can be said that in descending order, the essential value proposition factors after adaptation of autonomous shipping are Distinct Service Value, Operational Efficiency and Fulling Needs and Expectations. Additionally, it can be also concluded that the use of Autonomous Shipping mostly increases the Distinct value and Operational Efficiency of the company, whereas the ability to fulfil the needs and expectation from the services is comparatively low. It can be further concluded from the study that Remote Controlled shipping adaptation is not beneficial for the value proposition, whereas Full Autonomous shipping process has strong impact on the positive change in the Value Proposition related components that mainly includes creating distinct value and increase operational efficiency.

The second objective of this study was to examine the financial impact of autonomous shipping on commercial shipping companies. Through the study it can be concluded that after implementing the autonomous shipping, the current financial factors in descending order are Profitability, followed by Equity and Revenue. It can be further concluded that the Autonomous Shipping has significantly influenced the revenue generation ability whereas the impact on profitability is comparatively low, and a moderate impact can be found on Equity. Full Autonomous Shipping and no other shipping usage has no influence on the Revenue generation and Profitability, whereas the Full Autonomous can only increase the equity significantly.

The third objective of this study is to examine the impact of autonomous shipping on determine the competitive advantage of commercial shipping corporations. According to the study it can be concluded that the most to least essential factors are Irreplicable and inimitable, brand recognition and market share. It has been also determined that competitive advantage is the most sensitive factor where the impact of using Autonomous Ship is maximum compared to three other chosen business-related factors. Use of Autonomous Shipping can influence the Brand Recognition as well as Irreplicable and Inimitable brand value to some extent, whereas impact on market share is comparatively lower than others. Additionally, the use of remote-control shipping is not contributing the competitiveness of the companies, whereas the partial automatic shipping method reduces the market share. Full Autonomous shipping adaptation has the strongest positive impact over the Competitive Advantages, where it can be concluded

that it can significantly increase the brand recognition while making the organisations and their services irreplaceable and inimitable.

The fourth objective of this study was to determine the impact of autonomous shipping on target clients of commercial shipping companies. As per the findings and discussion it can be concluded that the essential factors after implementing autonomous shipping in descending order are Change in client operations followed by client satisfaction and loyalty and change in target clients. As a result of Autonomous Shipping no significant impact has been found in changed target clients whereas it has been found that implementation of autonomous shipping method can significantly increase the client satisfaction and loyalty of the clients. Along with that it can also change the client's operational structure to some extent, because in order be aligned with the service provider, the customer should align their service procedure as per the autonomous shipping procedures. It has been further concluded that the Full Automation can have strongest impact on client satisfaction and client loyalty whereas the impact on changing the client's operations is lower than the impact of remote-control shipping method on changing clint's operations.

5.5 Limitation of Study

In regard to the findings of the study and the argument regarding the conclusive statement it can be said that the study has successfully answered it's all research questions while accomplishing the aim of this study. However, this study has some limitations as well. The major limitation of this study includes the possible bias in the collected data. From the data collection process, it can be said that the study is based on the reflective opinion of the participants of this study and therefore, the reflective opinions of the experience could be biased based on different environmental and demographical factors. At the same time, it has been assumed that all the participants have adequate experience and knowledge about the organisational market, finance and operation related knowledge which cannot be highly true. Apart from that, this study is based on a close ended data collection process where participants can answer the questions through using already existing options for answering the questions. These options were developed after conducting the literature review process. Therefore, the possible answers of the participants were limited within the knowledge developed from the literature review. The participants might have some other views or experiences that have been explored in the previously conducted studies. Therefore, the survey-based data collection process of this study could cause a blindness in the data collection, data analysis and the interpretation procedures.

5.6 Future Scope of Study

Considering the findings of this study and the limitations within the scope of this study it can be said that there are several scopes in future to conduct more in-depth research in the setting of Autonomous Shipping and the impact on the business management. In future an observational study can be conducted on a shipping business in order to find the changes in the operational efficiency of the company as a result of adopting the Autonomous shipping. It can be also done using the long-term longitudinal study conducted on multiple organisations. In order to inspect the impact on the financial performance long term financial projection of the organisations should be monitored and analysed to evaluate the impact of Autonomous shipping adaptation on financial performance. In future, further study can be conducted on different adaptation procedure and technical requirements for different Autonomous shipping, which can further help the organisations to develop their optimized adaptation strategies for Autonomous shipping.

5.7 Recommendations

Having understood the key benefits of autonomous shipping and the way in which it can revolutionise the industry, it becomes essentially critical to understand that there are several practical recommendations and implications which must be taken well into consideration before proceeding with any implementation strategies. As the autonomous shipping and technology may be identified to be a complicated procedure, it is strategically critical that initiatives are taken to make such tasks easier. These not only help in better outcomes but allows the different businesses to secure better understanding of how an enterprise needs to work successfully towards its goals. Felski and Zwolak (2020) opine that an autonomous ship generally gains its inputs from the different sets of electronic senses which then assist in informing an electronic brain. Considering this, the brain assists in computing and navigating safely. In this context, a ship would be obligated to establish as well as communicate the positional as well as surrounding information which helps them in making decisions which is vital to the autonomous operations. The aspects to autonomous shipping may be established as follows:

1.Firstly, the use of sensors should be made. The current sensor technology can be established to be largely competent and is largely present in different autonomous vehicles such as the cars. The various sensor technologies generally render a vessel or the operators an accurate viewpoint of the environment at all times and scenarios (Felski and Zwolak 2020). The inputs

achieved from the sensors such as the high-definition cameras, imaging devices, radars as well as the LIDAR may be utilised independently or used together by fusing the multiple sensor inputs so as to gain the best results. In this context, utilising the sensors in a systematic way may be identified as the current need help in securing the current information and technology in the best possible technique. Relating to this, it can be well established that the sensor technologies can be best use to understand and obtain an information on the operating and climatic conditions which are often subject to change.

2.Another recommendation which can be shared may be categorised as controlling algorithms. When the algorithms are controlled in a well-defined manner, then in such a regard, the navigation and collision avoidance can be well managed. Considering to this, it becomes significantly critical that with any amount of autonomy, some algorithms are important to place (Mallam and Sharma 2018). The decision algorithm is well blended into the interpretation of the rules and regulations which is an iterative procedure which is subject to simulation and testing.

3. The communication and connectivity can be identified as another key step which can be taken by the autonomous shipping. The connectivity between the crew and ship could be established as crucial. When the sensors and control algorithms are well applied then, communication and connectivity is significant. This assists in seamless functioning of an autonomous ship. The communications were obligated to be scalable, accurate, multi directional and supported by a large number of systems. In the opinion of Felski and Zwolak (2020), it becomes significantly crucial to gain an understanding of the fact that the communication in any domain of the business has a critically important role to play in ensuring that the enterprise is being able to manage the different business operations adequately. Hence, even though the shipping procedure is being labelled as autonomous in nature, the importance of communication within the domain cannot be undermined. Here it is critical to obtain an understanding and identification of the fact that when the different businesses are successfully able to maintain a strong level of association with the different shipping engagements, then in such a regard, better provisions in terms of the shipping success can be well obtained.

4.Another recommendation which can be made may be verified as engaging in top innovations. Post the global pandemic, it has become largely evident that the innovative evolution of the autonomous technologies within the automobile and the aviation industry has a significantly critical role to play in ensuring that the shipping industry can be revived. Hence, the use of the

collision avoidance system is recommended (Komianos 2018). Within the collision avoidance system, the focus lies on development of an intelligent navigation system which helps in detecting the objects and other related ships from a specific distance alongside alerting the crew with the help of a risk assessment. This makes use of the Artificial intelligence. Mallam, Nazir and Sharma (2020) opine that one of the key systems obligated in this consideration may be established as the to be the installation of the multiple sensors and low light cameras which are well installed on the vessel. This gives way to assuring better facilitations and helps in systematic navigation. The human errors often account for 75% of the marine liability losses and when the different vehicles are in close proximity with one another (Mallam, Nazir and Sharma 2020). The key issue faced may be identified as the narrow waterways and the low lighting conditions within the areas. Sonars and other similar systems have been essentially utilised for the marine navigation but requires constant monitoring and hence, new systems have to be applied to ensure better efficiency and bring about accuracy to mitigate the issues.

5.In addition to this, installing different systems within the existing system, it is critically significant to identify that the automatic ships have also become essentially popular. In this regard, the ship tends to have sensors such as lidar, radar alongside the infrared cameras which collects the positional data which therefore utilises the automation algorithms and assists in automatic manoeuvring as well. Through this technique, better automated mooring system can be assured. In this consideration, the Yara Birkeland is one such tool which has a good crew initially and would transit into the full autonomy. The ship's route and operational centres will be equipped to handle the different emergencies in a remote way and to better support the artificial intelligence decision making. Here an example of the autonomous ships can be given. On a regular basis to fertilize the route a number of tools are well utilised as it helps to reduce the current level of congestion, cut down on the pollution and improve the overall safety on the roads. It is a broader effort undertaken to incorporate the autonomy so as to engage in seafaring container vessels (Komianos 2018). The efforts adopted would also contribute to eliminating carbon dioxide alongside NOx emissions. This helps in improving road safety. In this context, it may be signified that several systems are now being installed to monitor the systems as present within the seas. Several crewless autonomous ships which are powered by Artificial Intelligence across the Atlantic Ocean. The ship is being propelled by the solar power and make journeys on the deep waters where there are chances where the satellite or the cloud connectivity would be unavailable. Hence, all the data processing and related requirements would be obligated to be installed in a way such that it can be on the ship itself.

6.One of the critical issues which are essentially faced by the enterprise may be rightly identified as the connectivity speed. When the different ships are in the different locations then very often, there may be a scenario that there are certain limitations in consideration with the wireless community (Mallam, Nazir and Sharma 2020). Hence, in order to resolve the issue, it is critical that the use of the mobile edge computing, supported LTE alongside the 5G technology is being applied well. Relating to this, it becomes evidently crucial to gain an comprehension of the fact that when such a technology is being well applied, it gives way to better comprehension of the key concepts and ensures better prediction of further routes and consideration.

7.The cyber security can be identified to be another related issue which may be faced by the enterprise at large when engaging in autonomous shipping. In this domain, as the connectivity for the autonomous ships is a critical consideration and hence, this may be resolved by the usage of the blockchain technology. When the blockchain technology would be well applied, it would thereby lead to better understanding of the different business aspects and assure a better association (Komianos 2018). The blockchain technology may be stated to be one of the most significant technologies used and therefore, it is recommended that it is well applied to secure better positioning.

8.Another key consideration involved in the field may be discussed as the avoidance of collisions. When the collisions as engagements would be avoided, it could secure better performance for the firms engaging in autonomous shopping to enable better performance management. In this regard, it becomes evidently crucial to understand that when the installation of the radars and other sensors are to be engaged in, it would secure better implementation of technology which can assist in avoiding the collisions. When collisions would be avoided, the costs can be managed well.

6 References

Abaei, M.M., Hekkenberg, R. & BahooToroody, A., (2021). A multinomial process tree for reliability assessment of machinery in autonomous ships. *Reliability Engineering & System Safety*, *210*, p.107484.

Ahn, J., Joung, T.H., Kang, S.G. & Lee, J., (2019). Changes in container shipping industry: Autonomous ship, environmental regulation, & reshoring. *Journal of International Maritime Safety, Environmental Affairs, & Shipping*, *3*(3-4), pp.21-27.

Akbar, A., Aasen, A.K., Msakni, M.K., Fagerholt, K., Lindstad, E. & Meisel, F., (2021). An economic analysis of introducing autonomous ships in a short-sea liner shipping network. *International Transactions in Operational Research*, *28*(4), pp.1740-1764.

Arnsdorf, I., (2014). Rolls-royce drone ships challenge $375 billion industry: Freight. *Bloomberg Online*.

Babicz, J., (2018). Encyclopedia of ship technology. *Second. Publisher: Wärtsilä Corporation*, *2*, p. (2019).

Balcombe, P., Brierley, J., Lewis, C., Skatvedt, L., Speirs, J., Hawkes, A. & Staffell, I., (2019). How to decarbonise international shipping: Options for fuels, technologies & policies. *Energy conversion & management*, *182*, pp.72-88.

Benitez-Correa, C., Gonzalez-Torres, P. & Vargas-Saritama, A., (2019). A Comparison between Deductive & Inductive Approaches for Teaching EFL Grammar to High School Students. *International Journal of Instruction*, *12*(1), pp.225-236.

Bolbot, V., Theotokatos, G., Boulougouris, E., Wennersberg, L.A.L., Nordahl, H., Rødseth, Ø.J., Faivre, J. & Colella, M.M., (2020). Paving the way toward autonomous shipping development for European Waters–The AUTOSHIP project.

Bolbot, V., Theotokatos, G., McCloskey, J., Vassalos, D., Boulougouris, E. & Twomey, B., (2022). A methodology to define risk matrices–Application to inl& water ways autonomous ships. *International Journal of Naval Architecture & Ocean Engineering*, *14*, p.100457.

Bratić, K., Pavić, I., Vukša, S. & Stazić, L., (2019). A review of autonomous & remotely controlled ships in maritime sector. *Transactions on Maritime Science*, *8*(02), pp.253-265.

Çetin, İ.B., Akgül, E.F. & Koçak, E., (2018). Competitiveness of Turkish coaster merchant fleet: a qualitative analysis by short sea shipping perspective. *TransNav: International Journal on Marine Navigation & Safety of Sea Transportation*, *12*(2).

Ceyhun, G. Ç. (2020). Recent developments of artificial intelligence in business logistics: A maritime industry case. *Digital Business Strategies in Blockchain Ecosystems*, 343-353.

Chaal, M., B&a, O.A.V., Glomsrud, J.A., Basnet, S., Hirdaris, S. & Kujala, P., (2020). A framework to model the STPA hierarchical control structure of an autonomous ship. *Safety Science*, *132*, p.104939.

Chen, P., Huang, Y., Papadimitriou, E., Mou, J. & van Gelder, P., (2020). Global path planning for autonomous ship: A hybrid approach of Fast Marching Square & velocity obstacles methods. *Ocean Engineering*, *214*, p.107793.

Chen, Z., Chen, D., Zhang, Y., Cheng, X., Zhang, M. & Wu, C., (2020). Deep learning for autonomous ship-oriented small ship detection. *Safety Science*, *130*, p.104812.

D'agostini, E., (2022). The dynamics of value propositions through social media engagement in maritime transport networks: Maersk vs Mediterranean Shipping Company. *Maritime Business Review*, (ahead-of-print).

Davis, P.M., (2020). Statistics for describing populations. In *H&book of sampling methods for arthropods in agriculture* (pp. 33-54). CRC Press.

de Vos, J., Hekkenberg, R.G. & B&a, O.A.V., (2021). The impact of autonomous ships on safety at sea–a statistical analysis. *Reliability Engineering & System Safety*, *210*, p.107558.

de Vos, J., Hekkenberg, R.G. & Koelman, H.J., (2020). Damage stability requirements for autonomous ships based on equivalent safety. *Safety Science*, *130*, p.104865.

Di, Z., Mingyang, Z., Houjie, Y., Kai, Z. & Cunlong, F., (2019). Prediction model of human erro r probability in autonomous cargo ships. In *Proceedings of the international*

seminar on safety & security of autonomous vessels (ISSAV) & European stamp workshop & conference (ESWC) (Vol. (2020)).

Douet, M. & Cappuccilli, J.F., 2011. A review of Short Sea Shipping policy in the European Union. *Journal of Transport Geography*, *19*(4), pp.968-976.

Felski, A. & Zwolak, K., (2020). The ocean-going autonomous ship—Challenges & threats. *Journal of Marine Science & Engineering*, *8*(1), p.41.

Feng, Y., Diao, W., Sun, X., Yan, M., & Gao, X. ((2019)). Towards automated ship detection & category recognition from high-resolution aerial images. *Remote Sensing*, *11*(16), 1901.

Fonseca, T., Lagdami, K. & Schröder-Hinrichs, J.U., (2021). Assessing innovation in transport: an application of the Technology Adoption (TechAdo) model to Maritime Autonomous Surface Ships (MASS). *Transport Policy*, *114*, pp.182-195.

Hansen, C.Ø., Grønsedt, P., Graversen, C.L. & Hendriksen, C., (2016). *Arctic shipping: commercial opportunities & challenges*. CBS Maritime.

Höyhtyä, M. & Martio, J., (2020). Integrated satellite–terrestrial connectivity for autonomous ships: Survey & future research directions. *Remote Sensing*, *12*(15), p.2507.

Hunaid, M., Bhurgri, A. A., & Shaikh, A. (2022). Supply Chain Visibility in Leading Organizations of the Shipping Industry. *South Asian Journal of Social Review*, *1*(1), 8-20.

Im, I., Shin, D., & Jeong, J. (2018). Components for smart autonomous ship architecture based on intelligent information technology. *Procedia computer science*, *134*, 91-98.

Issa, M., Ilinca, A., Ibrahim, H. & Rizk, P., (2022). Maritime Autonomous Surface Ships: Problems & Challenges Facing the Regulatory Process. *Sustainability*, *14*(23), p.15630.

Jebb, A.T., Ng, V. & Tay, L., (2021). A review of key Likert scale development advances: 1995– (2019). *Frontiers in psychology*, *12*, p.637547.

Jokioinen, E., Poikonen, J., Jalonen, R. & Saarni, J., (2016). Remote & autonomous ships-the next steps. *AAWA Position Paper, Rolls Royce plc, London*.

Kalgora, B. & Christian, T.M., (2016). The financial & economic crisis, its impacts on the shipping industry, lessons to learn: the container-ships market analysis. *Open Journal of Social Sciences*, *4*(1), pp.38-44.

Karetnikov, V., Ol'Khovik, E., Ivanova, A. & Butsanets, A., (2019), December. Technology level & development trends of autonomous shipping means. In *Energy Management of Municipal Transportation Facilities & Transport* (pp. 421-432). Springer, Cham.

Kavallieratos, G., Katsikas, S. & Gkioulos, V., (2019). Cyber-attacks against the autonomous ship. In *Computer Security: ESORICS 2018 International Workshops, CyberICPS 2018 & SECPRE 2018, Barcelona, Spain, September 6–7, 2018, Revised Selected Papers 2* (pp. 20-36). Springer International Publishing.

Kavallieratos, G., Katsikas, S. & Gkioulos, V., (2019). Cyber-attacks against the autonomous ship. In *International Workshop on Security & Privacy Requirements Engineering, International Workshop on the Security of Industrial Control Systems & Cyber-Physical Systems* (pp. 20-36). Springer, Cham.

Kim, M., Joung, T.H., Jeong, B. & Park, H.S., (2020). Autonomous shipping & its impact on regulations, technologies, & industries. *Journal of International Maritime Safety, Environmental Affairs, & Shipping*, *4*(2), pp.17-25.

Kim, T.E., Perera, L.P., Sollid, M.P., Batalden, B.M. & Sydnes, A.K., (2022). Safety challenges related to autonomous ships in mixed navigational environments. *WMU Journal of Maritime Affairs*, pp.1-18.

Komianos, A., (2018). The autonomous shipping era. operational, regulatory, & quality challenges. *TransNav: International Journal on Marine Navigation & Safety of Sea Transportation*, *12*(2).

Kretschmann, L., Burmeister, H.C. & Jahn, C., (2017). Analysing the economic benefit of unmanned autonomous ships: An exploratory cost-comparison between an autonomous & a conventional bulk carrier. *Research in transportation business & management*, *25*, pp.76-86.

Kretschmann, L., Rødseth, Ø., Sage Fuller, B., Noble, H., Horahan, J. & McDowell, H., (2012). MUNIN Deliverable 9.3: Quantitative assessment. *MUNIN project*.

Krosnick, J.A., 2018. Questionnaire design. *The Palgrave h&book of survey research*, pp.439-455.

Kuo, K.C., Lu, W.M. & Le, M.H., (2020). Exploring the performance & competitiveness of Vietnam port industry using DEA. *The Asian Journal of Shipping & Logistics*, *36*(3), pp.136-144.

Kyusya, J.M., (2015). *Effect of logistics outsourcing on the operational performance of shipping industry in Kenya* (Doctoral dissertation, University of Nairobi).

Lee, C.B., Wan, J., Shi, W. & Li, K., (2014). A cross-country study of competitiveness of the shipping industry. *Transport Policy*, *35*, pp.366-376.

Lin, H.F. & Chang, K.L., (2017). Key success factors of international market development: An empirical study of the Taiwan bulk shipping industry. *Maritime Business Review*.

Mallam, S.C., Nazir, S. & Sharma, A., (2020). The human element in future Maritime Operations–perceived impact of autonomous shipping. *Ergonomics*, *63*(3), pp.334-345.

Mallouppas, G. & Yfantis, E.A., (2021). Decarbonization in shipping industry: A review of research, technology development, & innovation proposals. *Journal of Marine Science & Engineering*, *9*(4), p.415.

Montewka, J., Wróbel, K., Heikkilä, E., Valdez B&a, O.A., Goerl&t, F. & Haugen, S., 2018, September. Challenges, solution proposals & research directions in safety & risk assessment of autonomous shipping. In *PSAM 14th Probabilistic Saf Assess Manag Conf*.

Muhammad, B., Kumar, A., Cianca, E., & Lindgren, P. (2018, November). Improving port operations through the application of robotics & automation within the framework of shipping 4.0. In *2018 21st International Symposium on Wireless Personal Multimedia Communications (WPMC)* (pp. 387-392). IEEE.

Munim, Z.H., (2019), October. Autonomous ships: a review, innovative applications & future maritime business models. In *Supply Chain Forum: An International Journal* (Vol. 20, No. 4, pp. 266-279). Taylor & Francis.

Papathanasiou, A., Cole, R. & Murray, P., (2020). The (non-) application of blockchain technology in the Greek shipping industry. *European Management Journal*, *38*(6), pp.927-938.

Porathe, T., Hoem, Å., Rødseth, Ø., Fjørtoft, K., & Johnsen, S. O. (2018). At least as safe as manned shipping? Autonomous shipping, safety & "human error". In *Safety & Reliability–Safe Societies in a Changing World* (pp. 417-425). CRC Press.

Quintão, C., &rade, P. & Almeida, F., (2020). How to Improve the Validity & Reliability of a Case Study Approach? *Journal of Interdisciplinary Studies in Education*, *9*(2), pp.264-275.

Ringbom, H., (2019). Regulating autonomous ships—concepts, challenges & precedents. *Ocean Development & International Law*, *50*(2-3), pp.141-169.

Sahay, A., (2016). Peeling Saunder's research onion. *Research Gate, Art*, pp.1-5.

Sahin, B. & Yip, T.L., (2017). Shipping technology selection for dynamic capability based on improved Gaussian fuzzy AHP model. *Ocean Engineering*, *136*, pp.233-242.

Sambracos, E. & Maniati, M., (2012). Competitiveness between short sea shipping & road freight transport in mainl& port connections; the case of two Greek ports. *Maritime Policy & Management*, *39*(3), pp.321-337.

Sharma, A. & Kim, T.E., (2022). Exploring technical & non-technical competencies of navigators for autonomous shipping. *Maritime Policy & Management*, *49*(6), pp.831-849.

Shin, Y., Van Thai, V., Grewal, D. & Kim, Y., (2017). Do corporate sustainable management activities improve customer satisfaction, word of mouth intention & repurchase intention? Empirical evidence from the shipping industry. *The International Journal of Logistics Management*.

Siedlecki, S.L., (2020). Underst&ing descriptive research designs & methods. *Clinical Nurse Specialist*, *34*(1), pp.8-12.

Silverajan, B., Ocak, M., & Nagel, B. (2018, July). Cybersecurity attacks & defences for unmanned smart ships. In *2018 IEEE international conference on internet of things (iThings) & IEEE green computing & communications (GreenCom) & IEEE cyber,*

physical & social computing (CPSCom) & IEEE smart data (SmartData) (pp. 15-20). IEEE.

Solangi, Z.A., Solangi, Y.A., Ch&io, S., bin Hamzah, M.S. & Shah, A., (2018), May. The future of data privacy & security concerns in Internet of Things. In *2018 IEEE International Conference on Innovative Research & Development (ICIRD)* (pp. 1-4). IEEE.

Španja, S., Krajnović, A. & Bosna, J., (2017). Competitiveness & business strategies of shipping companies. *Business Excellence*, *11*(1), p.123.

Sürücü, L. & MASLAKÇI, A., (2020). Validity & reliability in quantitative research. *Business & Management Studies: An International Journal*, *8*(3), pp.2694-2726.

Tamminen, K.A. & Poucher, Z.A., (2020). Research philosophies. In *The Routledge international encyclopedia of sport & exercise psychology* (pp. 535-549). Routledge.

Thombre, S., Zhao, Z., Ramm-Schmidt, H., García, J.M.V., Malkamäki, T., Nikolskiy, S., Hammarberg, T., Nuortie, H., Bhuiyan, M.Z.H., Särkkä, S. & Lehtola, V.V., (2020). Sensors & ai techniques for situational awareness in autonomous ships: A review. *IEEE transactions on intelligent transportation systems*.

Tsvetkova, A. & Hellström, M., (2022). Creating value through autonomous shipping: an ecosystem perspective. *Maritime Economics & Logistics*, *24*(2), pp.255-277.

Tusher, H.M., Munim, Z.H., Notteboom, T.E., Kim, T.E. & Nazir, S., (2022). Cyber security risk assessment in autonomous shipping. *Maritime Economics & Logistics*, pp.1-20.

Utne, I.B., Rokseth, B., Sørensen, A.J. & Vinnem, J.E., (2020). Towards supervisory risk control of autonomous ships. *Reliability Engineering & System Safety*, *196*, p.106757.

Ventikos, N.P., Chmurski, A. & Louzis, K., (2020). A systems-based application for autonomous vessels safety: Hazard identification as a function of increasing autonomy levels. *Safety science*, *131*, p.104919.

Vojković, G. & Milenković, M., (2020). Autonomous ships & legal authorities of the ship master. *Case studies on transport policy*, *8*(2), pp.333-340.

Wang, C., Zhang, X., Cong, L., Li, J., & Zhang, J. (2019). Research on intelligent collision avoidance decision-making of unmanned ship in unknown environments. *Evolving Systems*, *10*(4), 649-658.

Wang, X. & Cheng, Z., (2020). Cross-sectional studies: strengths, weaknesses, & recommendations. *Chest*, *158*(1), pp. S65-S71.

Wright, R. G. (2019). Intelligent autonomous ship navigation using multi-sensor modalities. *TransNav: International Journal on Marine Navigation & Safety of Sea Transportation*, *13*(3).

Zhang, M., Zhang, D., Yao, H. & Zhang, K., (2020). A probabilistic model of human error assessment for autonomous cargo ships focusing on human–autonomy collaboration. *Safety science*, *130*, p.104838.

Zhao, L., Roh, M.I. & Lee, S.J., (2019). Control method for path following & collision avoidance of autonomous ship based on deep reinforcement learning. *Journal of Marine Science & Technology*, *27*(4), p.1.

Zhou, X.Y., Huang, J.J., Wang, F.W., Wu, Z.L. & Liu, Z.J., (2020). A study of the application barriers to the use of autonomous ships posed by the good seamanship requirement of COLREGs. *The Journal of Navigation*, *73*(3), pp.710-725.

Ziajka-Poznańska, E. & Montewka, J., (2021). Costs & benefits of autonomous shipping—a literature review. *Applied Sciences*, *11*(10), p.4553.

7 Appendices

Appendix A: Questionnaire

1. Your gender

- Male
- Female
- Others

2. Your Age

- 20 to 30 years
- 31 to 40 years
- 41 to 50 years
- 51 to 60 years
- 60+ years

3. Your experience in shipping industry

- Less than 1 years
- 1 to 5 years
- 5 to 10 years
- 10 to 20 years
- 20 + years

4. From how many years the Autonomous shipping technology have been used in your organisation?

- Less than 1 year
- 1 to 2 years
- 2 to 4 years
- 4 to 6 years
- 6 + years

5. Rate the following types of automation shipping process as you have seen to be used in your organisation

• Partially autonomous with on-board Seafarer	1	2	3	4	5
• Remotely controlled ship	1	2	3	4	5

- Fully automated ship with advanced AI 1 2 3 4 5

6. How much the autonomous shipping in your company is able to serve the following value proposition factors

- Distinct value including safety & others 1 2 3 4 5
- Fulfilling the needs & expectations from service 1 2 3 4 5
- Fulfilling organisational operational efficiency 1 2 3 4 5

7. How much the autonomous shipping in your company is able to increase the following financial factors

- Revenue generation 1 2 3 4 5
- Profitability 1 2 3 4 5
- Net worth or equity 1 2 3 4 5

8. How much the autonomous shipping in your company results in good competitive advantages

- Br& recognition 1 2 3 4 5
- Market Share 1 2 3 4 5
- Irreplaceable & Inimitable 1 2 3 4 5

9. How much the autonomous shipping in your company results on target clients

- Change in target client 1 2 3 4 5
- Client Satisfaction & Loyalty 1 2 3 4 5
- Changes within client’s operations 1 2 3 4 5