MBA International Business (2013-2014)

Masters Internship Report

Strategic Analysis of C4FF 'S LeanShip

A project submitted in partial fulfillment of the requirements of the

Coventry University MBA International Business Programme

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Glossary of Terms

EU	European Union
FP7	Seventh Framework Project
C4FF	Centre for Factories of the Future
MARPOL	International Convention for the Prevention of Pollution from Ships
EEDI	Energy Efficiency Design Index
EEOI	Energy Efficiency Operational Index
SEEMP	Ship Energy Efficient Management Plan
ECA	Emissions Control Area
EMSA	European Maritime Safety Agency
SOX ,NOX ,CO2	Sulphur Oxide. Nitrous Oxide, Carbon dioxide
EC	European Commission

Executive Summary

The purpose of this report is to study and analyse the C4FF proposed product (LeanShip) for identifying marketing opportunities by strategically analysing the product using existing frameworks. This report also helps in providing a commercialisation plan to take LeanShip into Europe and across the globe as well. Depending on the data collected and discussions with the members of organisation a strategic plan for marketing their product was developed.

Chapter 1 – Introduction and Objectives

This chapter gives brief information about the marine environment and the maritime transport, the need for efficiency of a system in ships along with the C4FF company profile and their purpose. Research questions ,aim and objectives have also been covered in chapter 1 as well.

Chapter 2 – Literature Review

This chapter critically analyses and reviews the concepts and theories involved in topics such as (i) Energy efficiency in a Global Climate (ii) Standards of IMO in regulating the emissions (iii) Feasibility of integrating the new product (Leanship) (iv) Future need of shipping industry.

Chapter 3 – Research Plan

This chapter explains in detail the methods and the ways on how the research was undertaken. Qualitative (deductive) approach was adopted since existing reports, theories were used to obtain the research aim and objective. A case study approach strategy was found to be the most suitable in case of research design. Details on how the primary data and the secondary data were collected are also discussed in detail in this chapter.

Chapter 4 - Data Collection, Presentation, Analysis and Findings

This chapter briefs on the details of the analysis undertaken in developing the commercialisation plan. The following analyses were undertaken for achieving the research objective.

- A PESTLE analysis tool for analysing the environment information on which the C4FF operates
- SWOT analysis to identify the effects of the internal and external environment.
- Industry analysis was also carried out to identify the competitiveness existing in the marine and marine equipment (especially retrofit) industry.
- Market Comparison was done to identify the principal projects related to the proposed product and their relevance.
- Market place analysis was also carried out to identify the market place of LeanShip in the market and its position.
- Competitor analysis was carried out to identify the competitors existing and LeanShip challenges for overcoming its competitors.
- Customer analysis was done to identify the direct and indirect customers along with the behavioural analysis.
- A risk analysis was undertaken to identify the uncertainties and to carry out the risk assessment.

- Distribution strategy was undertaken to identify different distribution channels for marketing the product worldwide.
- Marketing communication is further analysed to identify the differences and best promotional tools available in the market.
- Finally, sales and marketing forecast was analysed to estimate the sales, forecasting the future. Thus the analysis helped in developing a marketing plan.

Chapter 5 – Conclusions and Recommendations

Finally, Chapter 5 ends up drawing conclusions and recommendations based on the aim and objectives of the report. These conclusions and recommendation helped the Company, Centre of the Factories of the Future to take LeanShip successfully into the market.

Chapter 1:

Introduction and Objectives

1.1 Background

The maritime environment covers almost two-thirds of our global area and provides a massive potential for inhabitant's well-being, with a variety of resources being the source for various economic and commercial activities. The EU's marine environment accounts for more than 40% of its GDP with its economy around 3 to 5 %. (Marine 2013) However, in the perspective of increased competition in global trade, human accomplishments are exerting burden to the environment, causing a major threat to maritime ecology and sustainable activities. In particular, unless appropriately addressed, the growing demand for marine transport, development in coastal areas, security, tourism, fisheries and aquaculture, and so on will pose a big threat to the maritime environment and biodiversity. Innovation and technology provide one of the bases for the settling of improvement in sustainable commercial growth in ocean and sea-based activities with ecological conservation.

- The competition in an exposed global market, for advanced economies like the EU shoots from their ability to produce high value-added and pioneering goods and amenities. Therefore, research and development efforts are essential for increasing their eco-efficiency and to offer solutions for overcoming the use of unsustainable resources. (Maritimesun 2013)
- Many maritime and marine research activities are continuing in the EU; these initiatives need to be coordinated in the most effective manner.
- Exhaust gases are the primary source of emissions from ships. Due to the increase in traffic in the marine environment the emission rate of exhaust gases is increasing day by day. The proportion of emissions from ships is comparatively lower than other transport such as road, air and so on. Recent increase in global trade accounts for nearly 90% of increase in the rate of emissions.
- NOX, SOX and CO2 are the three gases forming the basis of greenhouse gases (GHG).
- Among the exhaust gases, CO2 plays a very important role in causing an increase in the global warming. So measures specifically for the reduction of CO2 are concentrated.
- IMO has and is continuing to play an important role in shaping the environment by setting the regulations for the control of emissions. (IMO 2012)
- IMO regulations address the efficiency of systems and the control of emissions and it was introduced on January 1, 2013. It includes EEDI, EEOI and SEEMP to be followed, especially in the Emission Control Area.
- IMO still closely monitors the prevailing international regulation, while functioning on new requirements causing an improved awareness of safety elements and ever changing aspects of the maritime industry.
- EU needs to focus on high quality maritime transport sector to compete the world by providing high service quality and high levels of safety, environmental protection and operational efficiency winning over low cost substandard services and protectionism.(IMO 2012)

- Compliance is made challenging by a huge number of aspects that includes technological immaturity, monetary restrictions and uncertainty regarding implementation and the concerns of non-compliance.
- Hence, a global approach for effective emission control and development of energy efficiency systems is led by the IMO on account of the continued rapid growth of the world trade in the maritime transport. (IMO2012)

Since, the life expectancy of a ship is more than 30 years, development of advanced technologies for reduction of pollutants and fuel consumption still remains as a main challenge. The European Commission, therefore, encourages on developing technologies and projects by proposing initiatives like FP7 generally termed as 7th Framework for Research and Development. (EC 2013) FP7 acts as a key tool in providing solutions for Europe's need, having a 'European added value'.

- C4FF Company has been at the cutting-edge of innovation and technological development and has been involved in developing European maritime education and training initiatives, with the support of the EU's funding streams since its inception.(C4FF 2014)
- This company also established Mari Future, an international partnership of academic and vocational training institutions which supports innovation in the maritime industry. C4FF Chairman says ***"Mari Future will develop the future of the European maritime industry through innovation"*** and hence develops an energy efficient system (LeanShip) for meeting the upcoming needs of European marine industry for effective emission control on account of the European Commission's proposal.(C4FF 2014)

C4FF initially developed a product 'Idealship ' with respect to the requirements proposed by the TSB (Technology Strategy Board) in the UK. IdealShip is a product whose main objective was to increase the efficiency of ships. The LeanShip is a replica of IdealShip with more advanced features that involves the replacement of low cost laser CPS used in IdealShip with higher laser version trying to address the future regulations and needs in the European maritime markets.

Hence, a strategic approach and analysis, is therefore required to make this product (LeanShip) market globally. So, the company has taken an MBA student from Coventry University as an intern for critical evaluation of the product before it is taken into the market.

1.2 Research Questions

The research questions are formulated as follows:

- What are the C4FF's specific objectives in relation to the LeanShip?
- What is measurable, realistic and achieveable in improving the energy efficiency of Ships?
- What integration of new knowledge and innovation capacity is required for strengthening the competitiveness and growth of the company?
- What is the marketing and promotional strategics tools that can be used to better accomplish the marketing goals?

1.3 Research Aim

The aim of this internship is to propose an effective marketing communication strategy to achieve the best innovation model of integrating the new knowledge to fulfil the needs of European and global markets to the existing system.

1.3 Research Objectives

The primary objectives of this research are listed as follows:

- To critically evaluate the innovation potential of LeanShip with other products and services on the market.

- To critically investigate ways of improving the innovation capacity and integration of new knowledge to meet the needs of European and global markets for the existing product.
- To critically assess the social and environmental impacts for strengthening the competitiveness and growth of the companies and specific analyse the legal requirements of the project.
- To critically evaluate any national or international research, innovation activities directly or indirectly linked with LeanShip project.

Chapter 2:

Literature review

2.1 Introduction

This review takes into consideration the theoretical and practical underpinning of strategy and the need for taking LeanShip into the market with a clear focus to support the research aim and objectives with further analysis on below classifications and in subsequent chapters.

- Energy efficiency in a Global Climate
- Standards of IMO in regulating the emissions
- Feasibility of integrating the new product (LeanShip- Autoset)
- Future need of shipping industry

2.2 Energy efficiency in Global Climate

2.2.1 Energy Efficiency

The ships's energy efficiency depends not only on the amount of fuel consumed, but also on the quantity of work undertaken on account of transportation and also on the level and amount of actions and so on. Indeed, efficiency is defined as 'the difference between the volume of energy fed into machine in the form of fuel , effort and the volume that comes out(in form of movement) as a result of energy fed '.Limiting the observing requirements to consumption of fuel would provide only the input (i.e the volume of energy consumed)which is one part of the equation but it does not consider the output produced by the combustion, which can be calculated further by measuring the terms of distance sailed, available capacity, cargo carried, ship speed and so on.(IMO 2013)

1. We are living in a carbon- constrained world, where the future development of the ships bound to stabilize the emissions of GHG to a level, on account of which the global climate change can be prevented to some extent.
2. Energy efficiency is estimated to be a main feature for all the firms that operate ships, including the marine equipment industry. (IMO 2013)

The growth of the world economy and the shipping sector are increasing exponentially hand in hand.This increase has also caused a substantial increase in GHG emissions, as the ships are run on fossil fuels. The emissions from ships can be illustrated in the Figure 1 below:

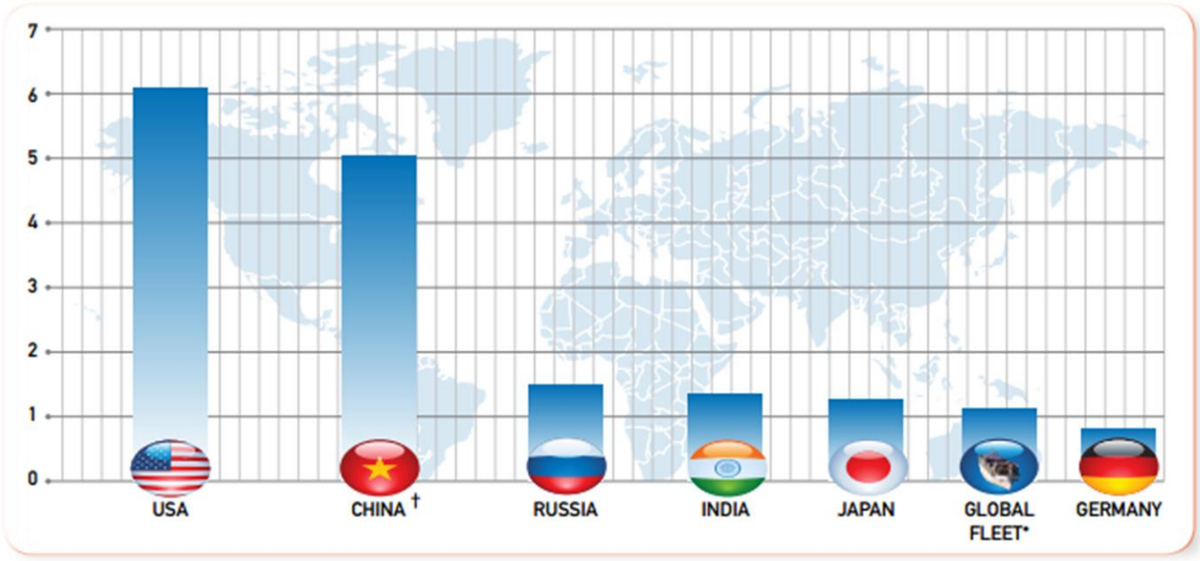


Figure 1: CO2 emissions from shipping in comparison Source: Oceana

According to second IMO GHG study, Buhang et al (2009) argues that, about 870 million tonnes of CO2 have been estimated to be emitted from the international shipping and it is expected to grow by 200% to 300% by the end of 2050, in the absence of regulations. So, cost effective strategies have to be undertaken in order to reduce the emissions and to avoid dangerous climatic changes by reducing the emission rate from 25% to 75% below the current levels. The upcoming maritime regulations are mentioned in the Figure 2 below.

Figure 2: Upcoming Maritime regulations Source: GL

In this competitive world, developing an energy efficiency system should answer all the questions which were posed by the partners of C4FF (mentioned in Appendices) for proving the excellence of the system as listed below:

- Will the system benefit the ship owners in safe operations?
- Can we measure the gain in terms of improved safety?

- Will the system benefit the shipyards in allowing them to get a better set of competencies?
- Will the marine equipment suppliers be better placed off to provide the exact products to the ship owners and the yards?
- If so, how will it enable to work for better regulatory frameworks?

Though, many efficiency systems already exist in the industry, the changing regulatory requirements and increase in the global trade and fuel rates forces the development of a new system for handling the above scenario.(Climateactionprog 2013)

A clear outlook of the roadmap for reduction of emissions from ships was identified by having a review of recent publications, IMO reports and various reports from classification societies, learnt societies especially the German Lloyd's Academy. These reports provided guidance for all the ship operators, ship owners and shipyards that are looking to implement EEDI on the current vessels and also on the future mandatory requirements of the ships.

Kollamthodi et al (2008) claims from an interview with the Norwegian ship association that, the charterers (contractors) are ready to pay higher amounts for energy efficient ships when comparing other normal vessels. (Sustainable shipping, 2012).

On the other hand, Faber et al. (2011) concludes that, the ship owners investing in ships that are fuel efficienct will not be able to recoup their investments unless otherwise their own ships are being operated or by having a long term agreement with charterers. But an argument, on the other side is, investments in the energy efficiency vessels increase the rate of success for winning contracts and hence provides a better utilisation of ships. A recent view by Lloyd's List (2012) claims that many major operators in the market of different vessel types might not be ready to pay premium rates for energy efficient vessels, but they are forced to take the best ship complying with the environmental performance. Congruently, ships that are low efficient are forced for short-term contracts or lower rates than those that with the higher efficient ones.

2.3 Standards of IMO in regulating the emissions

According to the IMO (2013a), a significant potential strategy for reducing GHG emissions in maritime transport can be fragmented into three categories:

- Operational efficiency changes lessens the consumption of fuel taking into account the variations in environmental conditions.
- The practicalities of the voyage and commercial realities of operations and technological advancement that improve ship fuel efficiency.
- Alternative energies(especially fuel) with lower net lifecycle of GHG emissions.

International shipping is a highly regulated industry, key regulations are coming into force by IMO, the main regulatory body for controlling the maritime transport emissions. (IMO, 2012)

According to GL (2012), IMO has mandated certain measures related to energy efficiency in international shipping as listed below:

- **Energy Efficiency Design Index (EEDI)** mandates energy efficiency standards for new ships
- **Energy Efficiency Operational Index (EEOI)**

- **Ship Energy Efficiency Management Plan (SEEMP),** a management tool for ship owners.

These three standards came into force on January 1, 2013 within a new chapter of MARPOL Annex VI. Also, it has been mentioned that EEDI will be applicable only to certain ship types such as General cargo ships, Passenger ships, Container ships, Bulk carriers,Ro-Ro cargo ships (which includes vehicle carriers)combination carriers , Gas carriers , Ro- Ro passenger ships that excludes shipping with diesel electric, steam turbine and hybrid propulsion and finally the Tankers.Complex technologies will be involved in building a ship efficiency system by the marine suppliers since the life expectancy of vessels is estimated to be around 30 to 40 years and also of the mandatory regulations to be met as set by IMO. (Oceana 2013)

2.3.1 The EEDI (Energy Efficiency Design index)

EEDI is made compulsory for all the newly constructed ships. This technical measure is more important and aims at promoting the usage of more energy efficient engines and equipment in the ships for controlling the emissions. EEDI is a performance-based mechanism and it leaves the option of technologies to the used for the design of a ship to the industry. (Fathomshipping 2011)

2.3.1.1 Principles of EEDI

- The acceptable EEDI (base line definition) depends solely on the deadweight of the ship and the ship type.
- A ship is seen as 'efficient' if it is slow and big.
- The base lines are developed from regressions over existing databases.
- A new building, then must have an EEDI below the prescribed baseline.
- All ships above the baseline will be excluded from the market.

IMO (2013) aims to improve the energy efficiency of ships by implementing the EEDI in new ships. The EEDI comprises of highly complex equation and expressions to calculate the amount of CO2 as a result of the ship's transport voyage. The equation for EEDI is shown below:

EEDI = (CO2 emission) / (transport work)

The ship types which does not satisfy the formula above, steps are taken by IMO to design a new formula for addressing larger emitter ships in future.

2.3.2 Energy Efficiency Operational Index (EEOI)

Energy Efficiency Operational Indicator (EEOI) is an indicator developed by IMO that deals with the information regarding the ship's efficiency in operations. This EEOI calculation is based on an individual ship's consumption of fuel and data on the achieved transport work (e.g. The total count of passengers carried, Cargo mass, and so on.) resulting in a figure of emission of CO2 per ton nautical mile. Unlike the EEDI, this indicator is not limited to new vessels and can be used to gauge the 'real' efficiency of a ship in operation and to measure the effects of any changes, such as hull and propeller cleaning, slow steaming, improved voyage planning, etc. However, as the EEOI calculation depends on ship activities and operations, it will vary, possibly considerably, over time and between voyages. It cannot therefore be used to establish a fixed figure – e.g. a 'label' reflecting the ongoing performance of a vessel. (DNVNL 2013)

EEOI = (Fuel Consumption * Carbon Conversion)/ (Distance sailed * Cargo Transported)

The EEOI can be improved by increasing the amount of cargo transported or by applying any measure aiming at reducing fuel consumption (e.g. slow steaming, vessel modifications, weather routing, etc.).

2.3.3 Ship Energy Efficiency Management Plan (SEEMP)

SEEMP is an operational measure developed by IMO that establishes a cost-effective mechanism in improving the ship's energy efficiency. This measure also assists the shipping companies in providing an approach for managing ship and fleet efficiency performance over time with the help of the Energy Efficiency Operational Indicator (EEOI) as a monitoring tool. The assistance on the development of the SEEMP operational measure for new and existing ships includes best practices for efficient ship's operation, as well as procedures for deliberate use of the EEOI in new and already existing ships (MEPC.1/Circ.684). The EEOI measure also enables ship operators in measuring the ship's fuel efficiency in operation and also to monitor the effect of any variations in operation, e.g. more frequent propeller cleaning or improved voyage planning or introduction of technical measures such as a new propeller or waste heat recovery systems. The SEEMP further urges the operator and ship owners at each phase of the plan to consider new practices and technologies when looking to optimise the ship's performance.(BTG 2014)

2.3.3.1 Why SEEMP?

• A plan to improve the energy efficiency implementation in a ship' operation.
• Fuel cost is the prime cost element for shipping companies. The type of vessel helps to predict 35-65% of operational costs.
• Improvements in Energy efficiency provides cost savings of 5-15% and helps in bringing down GHG emissions
• Environmental impact based port fees.
• Global players such as a (IKEA, DHL, etc.) are demanding the data related to the emissions.

2.3.3.2 Who should implement SEEMP?

• Ship operator, ship- owner or charterers can develop SEEMP as it is a ship specific plan.
• Based on the characteristics of individual ships and companies the SEEMP plan can be adjusted.
• SEEMP is a management tool restraining the on-board executive burden.

2.4 Feasibility of integrating the new product

An assessment on what the state-of-art is, in terms of energy efficiency for determining where the focus of the research should be, can be found by answering the question **'How energy efficiency of the ships can be increased in future?'** (Ziarati 2012) Energy efficiency is the most important feature in terms of cost and revenue in industries that are operating ships

- On considering the surplus of ships, slow steaming was opted to be the best solution in reducing the emissions, but as the business demands, this created a big issue and was not a feasible solution.

- In contrary to the above statement, Jafarzadeh and Utne (2014) that the matching of the turbochargers in engines would effectively reduce the emission rate. In addition, the researchers should focus more on improving the hull resistance and propeller efficiency to further cut down the emission rates.
- On looking into longer time scale, cheap transportation formed the medium for supporting the shift from fordian to post fordian production as well as globalization. This requires more attention and findings from researchers who develops solutions.(Agnolucci 2014)
- Vergera et al (2012) argues that reducing the emissions in the marine environment is complex as compared with other sectors, due to the restrictions in the atomized nature, weight and structure of the ships both technically as well as operation. He also identifies certain policies and methods, focusing on some of the issues such as ship resistance, propulsion augments and new fuels.

According to Johnson (2013), the ship's resistance can be reduced by radically eluding the wave formation at a greater speed ratio. While Vergera et al (2012) concludes stating that the rate of initial and final emission depends on the growth rate of the maritime transport. Use of solar energy and LNG would best replace the emission of CO2 into the atmosphere.

In reference to the above reviews and arguments, continuous growth in the retrofit market is booming, on account of the changing regulation to meet the global standards. Hence the methods for emission reduction should be focussed more on forecasting the future with high complex technology for showing better results.

2.4.1 LeanShip

Leanship, a product which intends to use the results of EU funded and several successful projects by combining the functionalities as follows:

- A tool for monitoring sea surface condition
- A tool for ship hull stress concentration and navigational movement for relieving the pressure
- A tool for ship hull resistance and for wave making resistance to support the work done by IACS for minimizing the power requirements
- A tool for engine management and control,
- A tool for navigation guidance and control.

Figure 3: Ship Autoset system

Better results to meet the future regulation of IMO can be obtained by combining the above results into a single decision support system and high laser system for handling the emission rate. (Ziarati 2012)

2.4.2 Challenges faced by new system

As complex technologies are involved, the proposed system might face challenges when implemented in all types of vessel. In addition to this the enactment of this system into the existing ships proves to be more challenging. Extended Enterprise concept has to be taken into consideration since the ships cannot be operated in vacuum. (Marifuture 2013)

On the whole, the proposed system is anticipated to deliver a user friendly, cost quality product and is expected to achieve efficiency gains and emission reductions going beyond the normal progress and also by benchmarking the existing regulatory regimes at the lowest cost. This yields fuel efficiency gains of at least 15% (in Cruise ships 8-12%) and other types 30%. Ziarati et al (2013) convinces that proposed system along with the use of new energy sources such as the alternative fuel, hybrid and electric solutions achieves the feasibility of zero emission or near zero emissions vessels.

2.4.3 Market Barriers

Although, the proposed system adds more value to the industry, still there exist few market barriers that hinder the awareness of development of such a system. Some of market barriers are listed below:

- Split incentives occurs where the ship owners do not understand the benefit of such a system
- Lack of knowledge about the efficiency of already existing systems
- Commercialisation practises carried by the industry thwarts the existence of cost effective solutions altogether impeding the development of such a system.

The research on proposed system ensures that there is a right balance between the environment, safety and economic performance by adapting multi-objective optimisation, minimum powering requirements and integrated designs for holistic operational performance, guaranteeing safe applications. (Ziarati 2012)

2.5 Future emphasis of shipping industry

While discussing about further enhancements, Hull cleaning and paint technology to reduce resistance are areas that need further exploration for increasing the overall efficiency of the ships.

The European Union is focusing to reduce 40% to 50% emissions by 2050 compared to 2005 (EC, 2013) .Although, there exists many cost effective retrofit equipment in the market that has been assessed to reduce emissions, it still remains a paradox. In spite of huge implementation measures the potential of the retrofit market have not been fully reached.Interests in energy efficiency systems in ships faded away when the prices of the fuel were very less, and its impact stayed for decades. But as the fuel price increases along with the global trade, concurrent debates on the global interests in energy efficiency systems started to boom has increased the competitiveness in the retrofit industry as a whole. (UNCTAD 2013)

Even though the emissions are being reduced constantly on account of new regulatory requirements, there needs a research to focus on potential new trading routes. One area that is being acutely observed in this aspect is the Arctic, but an interest in the opening up of trade routes in Arctic brings with it environmental protection on account of the permanent ice pack that recedes .(EC 2013)

According to the IMO (2013), in the recent years a tenfold rise has been noticed in the number of ships using the Northern Sea route, with 46 ships documented in 2012, compared with 34 in 2011 and only four in 2010. According to Worldshipping 2013, latest records show 71 large ships, operating mostly with Russian icebreakers, traversed the route in 2013 on the other hand Russia anticipates a 30-fold rise in shipping by 2020 and ice-free water by 2050 over most of its length. There are supplementary problems related to territorial waters in the Arctic region, which leads to concern about the nature and degree of the responsibility borne by states in the coastal area for the support and maintenance required for Arctic navigation.The future of shipping for reducing the emissions have still not been explored much in academic literature, and hence our literature review uses the anecdotal references and evidences from the industry reports and news articles especially of C4FF reports, IMO and European Commission to have a more insight.

Chapter 3

Research Plan

This chapter details the analysis of different research methodologies involved in carrying out the research work. It also provides a blueprint of how the data are collected and critically reviews the design, methods and the key limitations that are applicable for this research to achieve the aim of this report.

3.1 Research Approach:

There are two main types of research approach: One is quantitative (deductive) and the other is qualitative (inductive). While considering the approach for this report, the research is more subjective and it involves collecting and interpreting of data focusing, mainly on individuals and a small team of experienced professionals where in-depth interviews are conducted. Also, the report objective is obtained through the research of many existing theories and concepts, and hence analysis of case studies are involved more to carry out this research. This method is also referred as the 'bottom-up' approach since it makes observations more specifically and then moves to a broader theories and generalisations. Hence, an inductive research method is followed to carry out the analysis. (Saunder,Lewis and Thornhill 2012)

3.2 Research Design

Research Design outlines the study type, data collection methods, hypotheses and research questions for analysing the data and is defined to be correlational, descriptive and experimental. Though, it is tough to select a particular design however for an inductive approach, a comparative case study design proves to be a more suitable method. A direct observation of the facts and interaction with the subject for carrying out strategic analysis which includes the exploration of innovation potential for the energy efficiency system, market analysis, competitor analysis, and industry analysis, risk analysis along with marketing and sales strategy for drawing various results are analysed to achieve the research objectives. (Saunder,Lewis and Thornhill 2012)

3.3 Data collection and Analysis

Data collection and analysis is done in two ways .One is secondary data and the other is through primary data. Both the data is used to analyse and evaluate the research objectives for drawing out conclusions.

3.3.1 Secondary data collection

Secondary data analysis is imperative in any research, as it uses the existing data for finding answers and it aims in addressing the new questions raised by the researchers by analysing the already existing and collected data. This secondary analysis of data critically assess the theory, findings and methods from existing research by combining the meanings taken from multiple studies. The secondary data at each stage helps in attaining more discerning analysis for providing a better research of the topic and outputs. Secondary data gives an insight into compressive aspects of the research questions complementing and supporting each dimension of the research. (Saunder, Lewis and Thornhill 2012)

Major sources for the collection of information and data for this report are from statistical bodies (OECD, Eurostat, and national statistical sources), suppliers, industrial associations, customers and the classification societies. The lists of sources used more frequently are shown in the table below:

Type of Sources	Reviewed Sources
Journals	➢ Transportation Research Part A : Policy and Research ➢ TransNaval Journal ➢ Journal of Transport Economics and Policy ➢ Journal of Ship Research ➢ Energy Policy
Books	➢ Jobber, D (2010*) Principles and Practice of Marketing*. 6th Edition, McGraw Hill ➢ Armstrong, G., and Kotler, P., (2011). *Marketing: An Introduction*. 10th Edition, Pearson.
Websites	➢ Centre for Factories of the Future website ➢ IMO website
Other	➢ Mintel ➢ Euromonitor ➢ Emeraldinsight ➢ Sciencedirect

3.3.2 Primary data collection

In this research, primary data collection is carried out by having interaction with the employees who are within the organization such as Chairman of the Company Professor.Reza Ziarati, the Director of the Company Dr.Martin Ziarati, and Operations Manager, Mr.Ugurcan Acar, who has an experience of being ship crew in the shipping industry. Everyone provided the author with different views of shipping industry from their practical experience and also on how the ships operate.

Qualitative tool used for collecting data was carried out by interviewing the Chairman of the company through Skype, who gave an insight into the research of the various efficiency systems quoted by his partners especially the development of LeanShip as well as an overview of reports and journals related to the efficiency systems in shipping. This collection of data from the experienced professionals helped in sorting the research questions and enabling me to do further analysis on solutions and to provide results. The interview conducted also helped in scrutinising the competitor analysis and also for doing a strategic analysis focusing the retrofit industry.

3.4 Research Limitations

Every research has some limitations and is discussed below:

3.4.1 Validity

Validity of the research plays the most important criteria in any research undertaken as it is concerned about the accuracy of the data and also about the results driven from those data. It intends whether the data

collected really measure what it intends to measure. Data was collected based on the research objectives and questions mentioned in chapter 1. A systematic approach was followed in collecting the data for ensuring the validity. Weekly reviews and the interviews were conducted for sharing and validating the data collected. Further, it was analysed and discussed with my supervisor, increasing the validity of the research further. (Saunder, Lewis and Thornhill 2012)

3.4.2 Reliability

The data is considered to be reliable only if the findings are consistent. The data collection methods and techniques if used by other researchers should yield the same observations which proves the data collection method used in this report to be reliable. Also, this report draws conclusions, from raw data by being more transparent. The conclusions and recommendations are drawn based on the criticism carried by the Literature review in Chapter 2, thereby making the report more transparent and reliable. (Saunder, Lewis and Thornhill 2012)

3.4.3 Generalisability

The review done in chapter 2 provides a general view of the ship efficiency of the ships, and the measures and the various solutions present for reduction of emissions , but the proposed solution(LeanShip) is specific and not of general view and is not affordable to be used by other shipping organisations. (Saunder, Lewis and Thornhill 2012)

3.4.4 Potential Limitations

Some of the potential limitations I underwent in carrying out this report were:

- Only a limited time was available in writing the management report and well as writing a business proposal /report for the company hand in hand. Also these works has to be done in accordance with the daily office routine.
- The expectation from the company was more in this short span of time which made it still more difficult to meet the stringent deadlines.
- Lack of information on the pricing strategy of other related projects as well development timeline made it more difficult to do any mapping and analysis further.

I overcame this, by having a regular meet up with the mentor and the director of the company in getting to know what has to be done and what needs to be analysed further.

3.5 Ethical considerations

The type of research conducted is registered in the CU Ethics portal and is approved by the Coventry University. All the data collected proves to be ethical and this research is identified as low risk project and the ethics form with Proj Ref ID: P23960 is attached in the Appendices.

Also, the secondary data collected is referenced and cited using Harvard reference style in order to avoid plagiarism.

3.6 Time Table:

The timetable of the activities involved during internship is mentioned below:

Activity	Duration	May-14		Jun-14				Jul-14				Aug-14	
	Number of days	W1	W2	W1	W2	W3	W4	W1	W2	W3	W4	W1	W2
Internship Duration	77												
Meeting Supervisor	5												
Research Objectives	10												
Ethics Approval	14												
Data Collection	77												
Introduction and Background	20												
Literature Review	15												
Research Plan	7												
Data Analysis and Findings	14												
Conclusion	14												
Recommendations	10												
Proof Reading	3												
Draft Turnitin	1												
Final Feedback	2												
Submit Report	1												

Figure 5: Timetable Source: The Author

Chapter 4:

Data Collection, Analysis, Presentation and Findings

4.1 Introduction

This chapter focuses on the data collection and findings to arrive at better results by centring the research objectives and finally reaching the aim of the research. Data analysis takes an iterative approach of using the initial results to shape the next phase of the collection. The main focus of the C4FF Company is to provide better maritime solutions leading to innovation, the result outcome is LeanShip. Strategic analysis was undertaken in order to draw conclusions relative to the research objectives. A detailed schedule plan of the duration of the internship and the respective work done is detailed in the figure below:

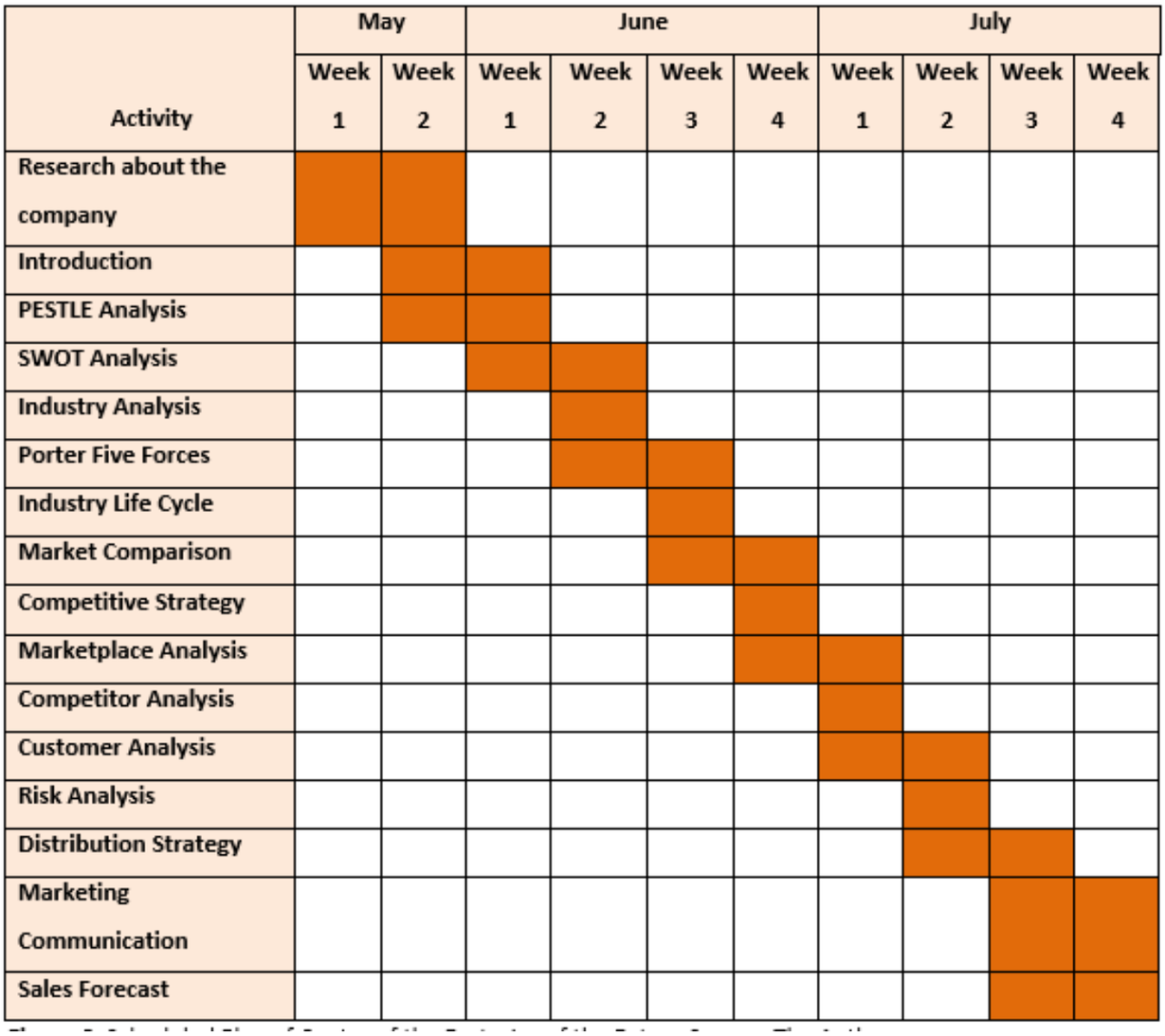


Figure 6: Scheduled Plan of Centre of the Factories of the Future Source: The Author

4.2 PESTLE Analysis:

PESTLE Analysis is a simple tool used for most effectively to identify the key drivers of macro environmental forces affecting an organisation. On the whole, it gives an outcome of current situation existing in the market. This analysis is done to assess the potential of a new market and its environment.

Figure 4: PESTLE Analysis Source: The Author

4.2.1 Political and Legal

Political factors are the factors that affect the organization by the impact of the governing bodies whereas the Legal factors are the constraints or regulations imposed by a legal body for better functioning of the industry.(Porter 1979) Based on the regulatory requirements and the stakeholder pressure the following future scenarios were modelled as depicted in the figure below:

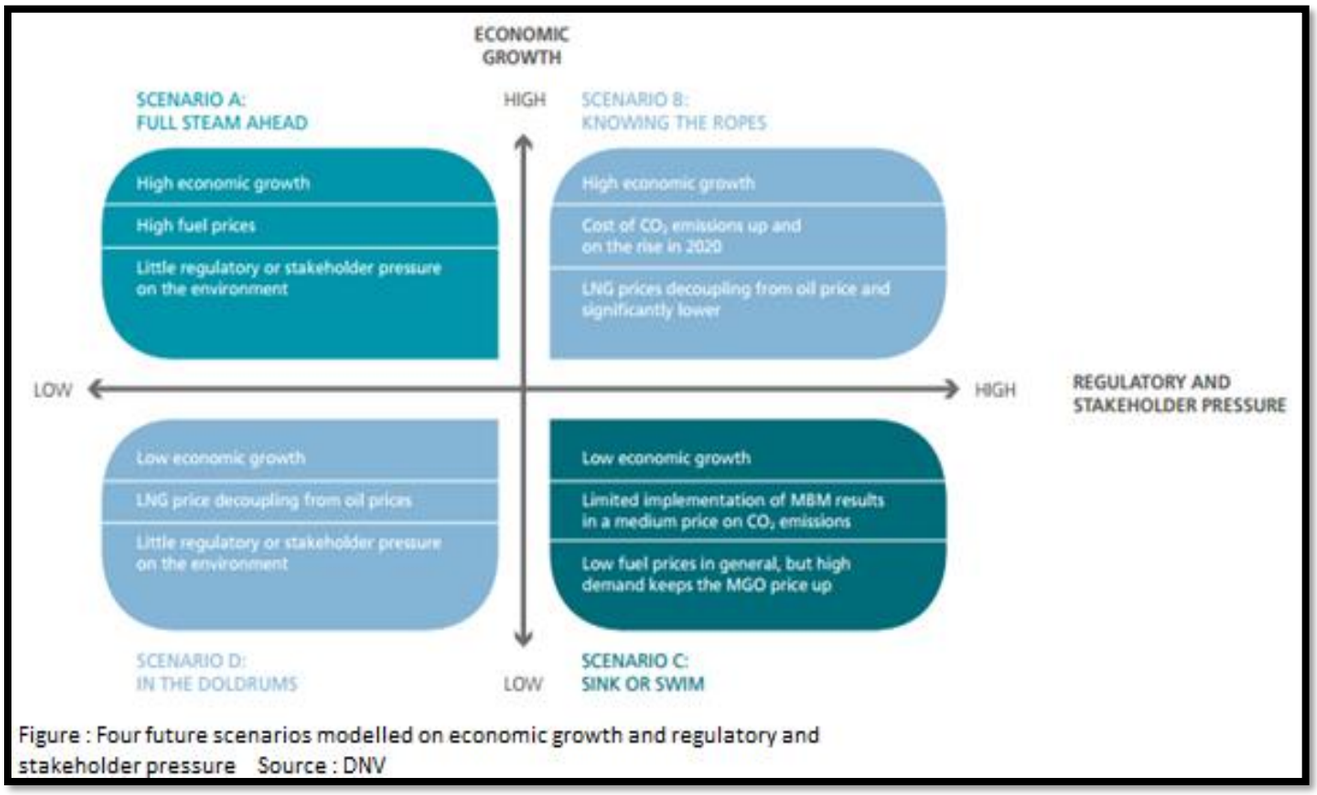


Figure 7: Model of economic growth and stakeholder pressure and regulations with respect to four future scenarios Source: DNV

- The legal requirements are to comply with the standards set by IMO. IMO mandated certain energy efficiency measures to be operated in ECA in international shipping.(IMO 2013)
- LeanShip is a product which is a collection of existing system and sub-systems considering innovative aspects from differing outlook rather than a general knowledge which does not require any proprietary rights.(Ziarati 2013)

4.2.2 Economic

Economic factors depend on the macro-economic factors affecting the organization. Some of the economic impacts based on reduced fuel consumption are listed below:

- Lower operating costs for vessel owners / operators
- Reduced revenues for oil companies due to decreased sales volumes.
- Lower operating costs for vessel owner / operators translates to lower overall shipping costs for goods, and this may be passed on to customers in the form of lower prices for goods. It also means that there are reduced economic barriers for importers of goods to other regions due to lower transportation costs.

According to the IMO (2013), the size of the marine supplies market in the world is estimated to be around 61 billion Euros. Typical labours costs account for 20% of the overall costs which implies that Europe clearly indicates higher labour costs when compared to the competitiors in Asia.

4.2.3 Social

Social factors are factors that are caused by the cultural changes within an environment affecting an organization. (Porter 1979) Socially, LeanShip helps in the reduction of the marine exhaust emissions revolutionising ships in the transportation sectors. This creates an impact, by having measurable efficiency and performance gains and also by the creation of new jobs in the sectors.

Some of the other social impacts on reduced fuel consumption are:

- Public health benefit through reduction of SOX and NOX emissions resulting from reduced overall fuel consumption. High levels of SOX and NOX emissions are known to have a material and detrimental impact on respiratory health.
- Reduce the damage from natural disasters that are related to climate change
- Reduce the number of people having to relocate their homes and businesses due to increasing sea levels

4.2.4 Technological

Technological factors are the factors that are based on the development of new technology that affects the organization.

- Testing of a series of high fidelity tools and new knowledge along with the development of a new integrated system combining the output is carried out.
- The results of the project will be communicated to the IMO and EMSA and to the scientific community for maximum impact (Ziarati 2013)

4.2.5 Environmental

Environmental factors are those that depend on the environmental issues affecting the organization. Environmentally, Leanship optimizes the navigation of the vessels at a given sea and also ship type. This is expected to result in substantial fuel savings and significantly reduced emissions.

Some of the other impacts as a result of reduced fuel consumption are:

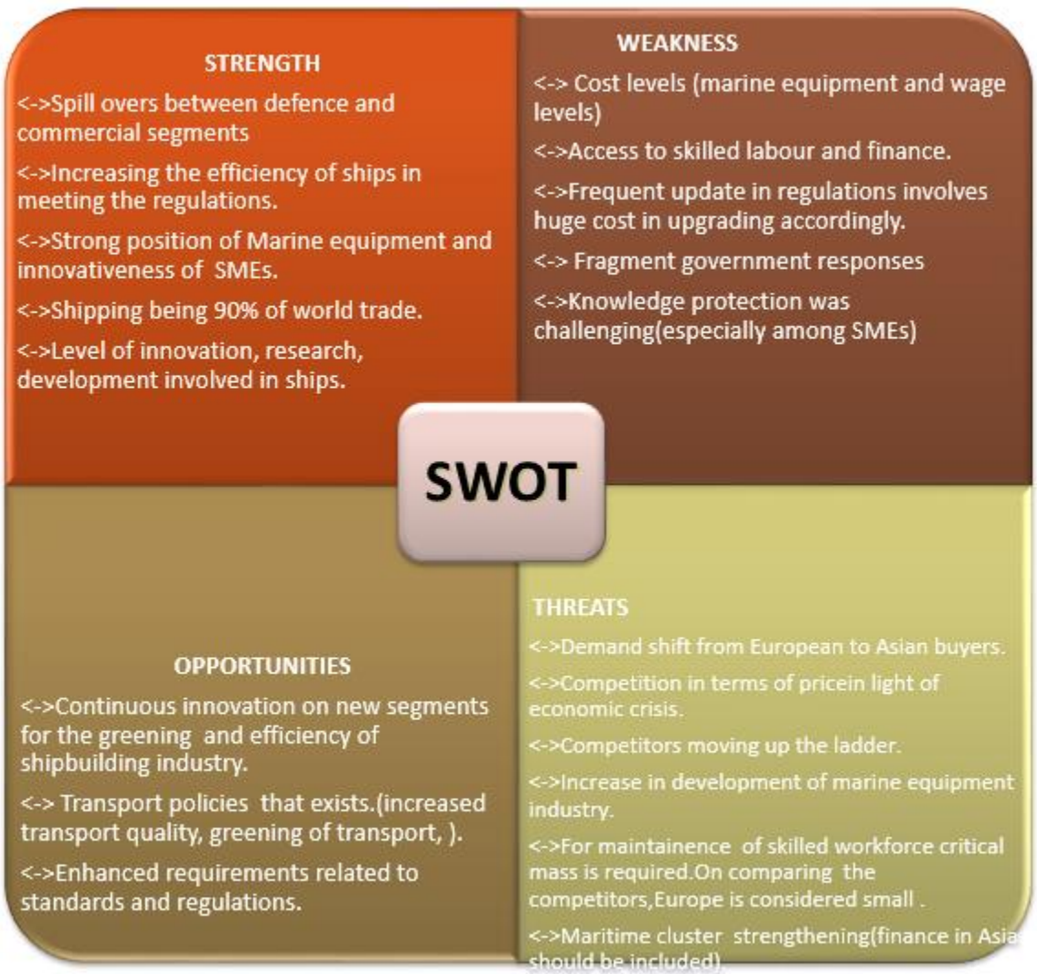
- Reduced CO2 and black carbon emissions, which will reduce the shipping industry's contribution to climate change;
- Reduced fuel use will also have a positive impact on air quality, through reduced emissions of SOX, NOX and particulate matter. SOX and NOX have an acidifying effect that contributes to the problem of acid rain and damages both natural ecosystems and the built environment.

4.3 SWOT Analysis

SWOT Analysis is a tool that identifies information from the environmental analysis and provides information about the internal data (strengths and weakness) and external concerns (opportunities and threats). (Pennington and Ball 2009) There are 2 main sectors in ship building industry which includes:

- Ship Construction
- Marine Equipment

Earlier ship building was carried out in shipyards without any need for other sectors, but in recent days the ship building relies 70% on marine equipment and 30% on the ship construction. The SWOT analysis of both sectors is considered to be similar after careful analysis and is listed below:



4.4 Industry Analysis

Every company has to evaluate the current situation in the market to develop a strategic plan for meeting its goals and objectives .Thus an industry analysis is done for evaluating the organization current position. Marine industries being a global market, EU marine suppliers have to compete with different sectors in the world

market. (Oceana 2013) The worldwide sourcing of marine equipment to the ship owners and ship builders by the EU is mainly based on the final decision and it depends on the following two questions?

- Technically-Does the equipment have the required specification and technical characteristics?
- Commercial – Does the product worth its price?

Based on this, the EU suppliers try to identify opportunities, by serving different end products in marine equipment and by providing many contracts and sub-contracts services. Major markets and customers identified in this case is retrofit market. Retrofitting is a special conversion market for ships that are following new regulations. Even though the customers and markets are identified and distinguished, still the customer base is overlapping to some extent. Best example for this is the retrofit market that applies only for certain period of time and is difficult to distinguish as it is driven by regular operational needs.

On account of the above ins and outs, retrofitting market is considered to be a favourable market with high prospective. In fact, this industry is presently driving the market development, and this becomes true, as the economies continues to develop and the willingness to work on the energy change and the level of oil price towards more environmentally friendly technologies increases even though it seems to be vulnerable.

4.4.1 Porter fives forces

Porter fives forces are used to analyse the competitive analysis in the industry and are discussed below:

Figure 8: Porter's Five Forces Source: The Author

Threats of New Entry:

- ✓ Governing bodies' restriction is less.
- ✓ Revenue margin is high.
- ✓ Probablity of expansion into new segment is very less.
- ✓ Capital requirement is high.

Shipping industry forms the basis of the many country's main economy.So full support is given by the governing bodies for a new entry.g On account of the lack of experience of the new entrants, the switching cost is and Monetary requirement is very high in the shipping industry, so the threat of the new entrants is

comparatively less. Since the exporters and importers knew that the best mode for transporting their goods is through ships, the capital is very large and correspondingly the profit is also too high in shipping industry.

The overall threat of the new entry is high.

Threat of substitutes

- ✓ The cost factor is less.
- ✓ Performance and quality of the substitutes are high.
- ✓ The cost of switching is high.
- ✓ The number of substitutes available is high.
- ✓ The rate of substitutes is also high.

An overall threat for the substitute is high.

Bargaining Power of Supplier

- ✓ The operating cost is high.
- ✓ The revenue of the suppliers is less
- ✓ The cost of switching of the supplier is high
- ✓ The total number of the suppliers available are high.
- ✓ Rate factor of the suppliers is high.

The overall power of suppliers is low.

Bargaining Power of Buyer

In shipping line business , buyers are one of the strongest factors and will exist in the form of clearing agent, freight forwarder, importer or exporter, or manufacturer of goods.

- ✓ The ability of a customer to demand is high.
- ✓ Customer's information and awareness are less.
- ✓ Switching cost is low.
- ✓ Numbers of the customers are high.

The cost of switching of customers is low because of numerous of suppliers available. Strong fit in technology could make the overall bargaining of the buyer is less.

So, the overall bargaining power of buyer is high.

Competitive Rivalry

- ✓ The total number of competitors available is very high.
- ✓ Cost leadership among competitors is very high.
- ✓ The cost of switching is low.
- ✓ The growth of the marine industry is high.
- ✓ The competitor's seeking to new customers is very low.

Because the profit margin is high in the marine industry the number of competitors are also high in the marine industry.Cost leadership for the market leader is very high and hence it is difficult for the minor players and the new entrants in the marine industry to sustain at a very low cost amongst the market leader. The growth of maritime industry is very high, so the chances of major players to exit from the industry is less. The competitor's moving to the new customers is very low because of the unawareness of their profile. The cost of switching is also low, because of the unpopularity of the new suppliers that may lead to disagreement or argument.

So, an overall competitor in the industry is very high.

4.5 Industry Life cycle:

Industry life cycle is of great importance in connecting business for decision making along with the development of outer intricacy of the industry. (Porter 1979) Every industry undergoes four phases of development and every phase demands a new and innovative business strategy. Based on the views from the above analysis, industry life cycle is depicted as shown in the figure below:

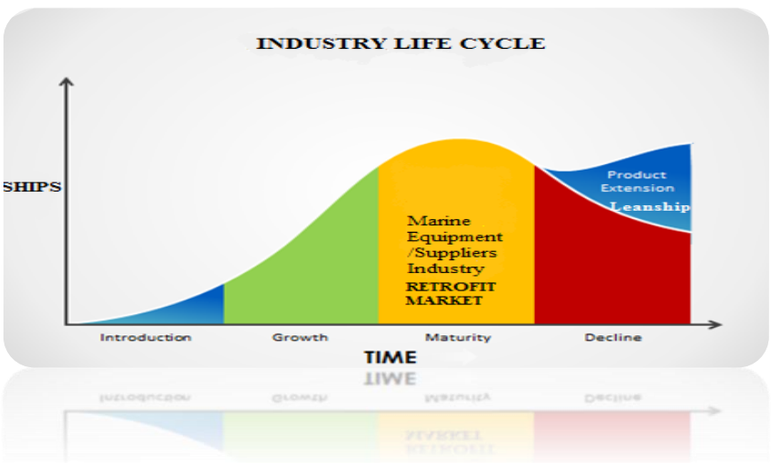


Figure 9: Industry life cycle Source: The Author

After careful consideration, the retrofit market is placed in the maturity phase by considering the following factors:

- Demand for customers knowledgeable and price sensitivity.
- Technology quest for improvements.
- Products tend to be differentiated
- Price competition increases
- Key success factors such as cost efficiency through capital intensity and scale efficiency.

4.6 Market Comparison

Market comparison helps in positioning the product or service in its marketplace. It also helps in identifying who will be our prime competitors and what are the products of competitors? How superior our product/service among the competitors, and how it differs?

After analysing a set of previous FP7 projects that are directly or indirectly related to **LeanShip,** it can safely be concluded that none of them has led to the proposed high technology, and methods for the precise and efficient analysis of safety and performance sensitive hydrodynamic problems in complex and/or extreme sea operational conditions,involving rolling, surfing,extreme motions, broaching and added resistance, encompassing intact stability performance and high fidelity . The list of principal sets of FP7 projects (Maritimebrokerage 2012) and their relevance is listed in the table below:

PROJECT	TITLE	RELEVANCE WITH LEANSHIP	RANKING
RETROFIT	**RETROFIT**ting ships improved overall environmental footprint with new technologies.	• Tools and methods to control emission and ship energy performance. • Decision support systems for energy optimisation and emission control over the entire service profile. •	1st in relevance by LEANSHIP consortium.
REFRESH	Green Retrofitting of Existing Ships	• Significant areas considered relevant optimisation of the air emissions and energy efficiency and operation. • Development of a management methodology and monitoring for operation.	2nd in relevance by LEANSHIP consortium.
DOCKING ASSIST	Improved Safety and Port Efficiency Using Differential Global Navigation Satellite System and a Novel Wireless Network to provide Enhanced Ship Navigation	• Port manoeuvring aspects to improve port traffic management, reduce cost and CO2 emissions. • This applies directly also to development of the intended AUTOSET and port-ship EEDI monitoring/communication.	3rd in relevance by LEANSHIP consortium.
FAROS	Risk-Based Ship Design Methodology in human factors.	• Safety issues and crew performance issues are of relevance in LEANSHP. • Fatigue is major problem and introduction of AUTOSET needs to take human factors fully into consideration.	4th in relevance by LEANSHIP consortium.
COMPASS	Scientific Approach for assessment of maritime industry and Commercial	• Improved environmental footprint of shipping in a region combining ship movements with accurate environmental footprint models.	5th in relevance by LEANSHIP consortium.

	Product .	• Aspects of forecasting could also help LEANSHIP when developing the LEANSHIP software systems.	
NAVTRONIC	Navigational system for efficient maritime transport	• Aspect of the sail planning system to optimise sailing time, means to reduce fuel consumption and greenhouse gas emissions as well as work on minimising maintenance cost using real-time remote and local observations and ship specific data collection has been factored in LEANSHIP proposal. • The 3D-radar, Earth Observation data, combined with several state-of-the-art nowcast and forecast numerical models is taken into consideration when developing the LEANSHIP proposal.	6th in relevance by LEANSHIP consortium.

Table 1: Principal project comparison related to LeanShip

4.6.1 Competitive Strategy

The competitive strategy of the product is analysed after considering the following:

- The system proposed under LeanShip was intended to be sold with low cost compared with other competitors with the installation costs and system components cost taken into consideration.
- Sophisticated neural networks developed by C4FF and navigation systems developed by TRANSAS will be used to monitor, log and analyse fuel-related parameters for more cost-efficient and ecology aware navigation.
- This product considers the sea condition and ship's position in a 3D map for reducing the resistance in ship motion by considering all design parameters to aim for the reduction of exhaust emissions and fuel consumption.
- This new solution does not compromise the safety factors of the ships such as the IMO recent regulation and legislations with safety as a critical success factor.

The above factors mentioned draws to a conclusion that LeanShip can be placed in both Cost Leadership and Differentiation strategy focusing Broad (industry wide) market. Though it is tough for an organization to be cost leader and differentiator, in order to be more competitive in EU and global market, the company manages to be able to sustain in both the stages. The competitive strategy is represented in the figure below:

Target/Market Scope	Advantage	
	Low Cost	Product/Service Uniqueness
Broad (Industry Wide)	**Leanship** Cost Leadership Strategy	**Leanship** Differentiation Strategy
Narrow (Market Segment)	Focus Strategy (low cost)	Focus Strategy (differentiation)

Figure 10: Strategic positioning of the product Source: The Author

4.7 Marketplace Analysis

Regulation from IMO and rapid increase in competitiveness of the industry are main drivers for technology innovation and implementation in the marine industry.(BTG 2014)

Earlier in 1970, the ship building work was carried out only in shipyards and there was no dependency on the marine equipment suppliers. Nowadays, 50% to 70% of the ship building is assessed to depend on the marine suppliers and 80% to 90% in more specialized segments. Hence, close ties exists amongst the ship yards and the suppliers of marine equipment to carry out the ship building process in the industry. (SSI 2013) Also, the EEDI and SEEMP became an important driver for the optimisation of vessels in the industry especially in the ship building. Ansoff's growth matrix for the marine retrofit industry has been represented in the figure below:

S

Figure 11: Ansoff's Growth Matrix Source: The Author

The combination of energy efficiency, environmentally friendly ships and new ship types plays an important in innovation of ship technology. The ranking of the necessary innovations is shown in the figure below:

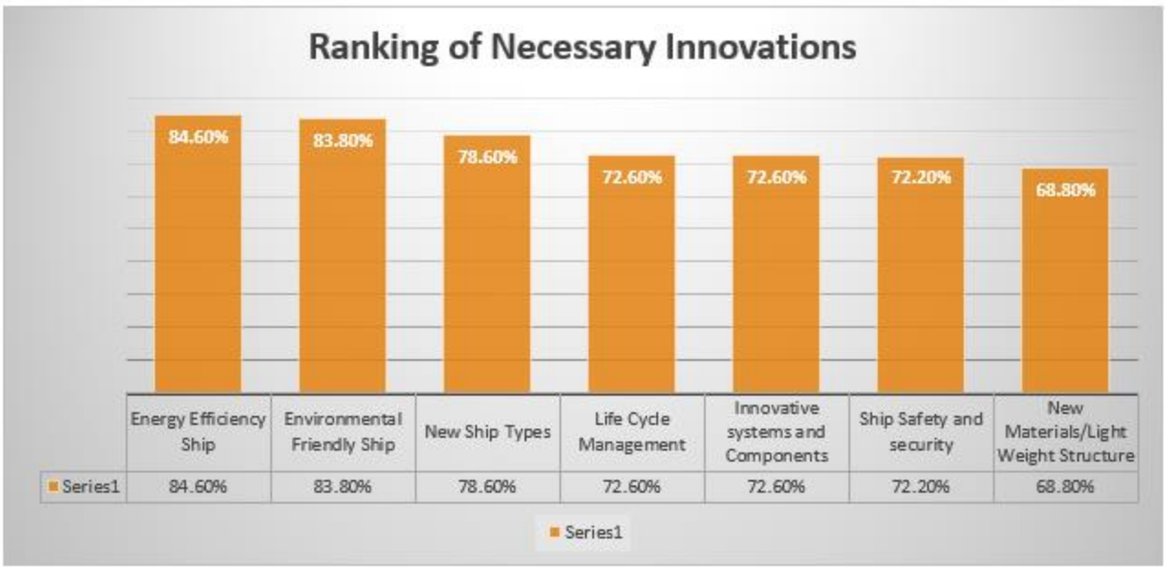


Figure 12: Ranking of Necessary Innovations Source: The Author

4.8 Competitor Analysis

Competitor analysis plays a major part in strategic planning process. A competitive advantage is creating through differentiation and differentiation is created through branding and imaging. (Fahy and Jobber 2012) Competitive advantage of a product depends heavily on factors such as level of sophistication of product and the country the product belongs. While comparing the competitors in the marine equipment industry, Europe relatively has a strong position in the market throughout the world and acts as a net exporter especially, in the high technology equipment renowned in propulsion, environment, safety measures and communication.

Within Europe, there exist four major competitors in this field which are Italy, Romania, Netherlands and Germany. Turkey is now entering into the competition of ship building and is booming for the past 5 years. Wartsila, a Finnish company and MAN B&W Diesel a German company are the major engine system manufacturers in Europe which has joint venture with many licensed Asian companies including China, Japan and Korea. Some of the competitors whose products are similar to that LeanShip other than Europe are added in the Appendices. (DNVNL 2013)

4.9 Customer Analysis

Customer analysis or target market analysis as it called plays a vital role in marketing plan analysis of an industry. Every product has direct or indirect customers who act as third party in selling the product. Some of the direct customers will be the ship owners in all sectors, ship builders, technology suppliers, seafarers and developers of Ship R&D and Technical Advisers all round the world.(Fahy and Jobber 2012)

A behavioural analysis of the product relies mostly on the two factors where the customers weigh and differentiate one product over the other. They are price and quality of the product being developed. As already discussed in the competitive strategy, LeanShip stands out in behaviour in terms of both quality and price.

4.10 Risk analysis

Risk Analysis is broadly demarcated to include the risk valuation, uncertainties, risk categorization and communication. (Porter 1979) Some of the risks identified are discussed below:

Overall commercial and management risks are low because of:

- The potentially large market;
- Project directly supports partner-organisation goals.

Key High & Medium risks involved are:

(i) **High**: Integration with existing C&C packages may be too limited. (TMUK has extensive experience in producing add-on packages for marine control systems).

(ii) **Medium**: Technical difficulties may be too great (downscale number of ECM sub-systems);

(iii) **Medium**: Aspects of control logic too complex for modelling in all instances (simplify control logic to suit project needs and/or redesign the control logic itself providing added value to partners).

(iv) **Medium**: Delays in the testing and sign-off of system elements (prioritise elements with greatest impact).

(v) Integration with existing C&C marine packages may be too limited, (use as stand-alone system).

In addition to the above certain other risk involved are mentioned in the table below:

Risk Code	Risk Issue	Technical	Commercial	Management	Environmental	Likelihood	Impact	Mitigation Strategy
R1	Complexity of sea, weather, engine and propeller interactions may be too great for efficient 'least-fuel-voyage' paths to be reliably identified.	✓	▪	▪	▪	**H**	**M**	Prioritise inclusion of interactions within modelling & analysis functionality based the relative magnitude of their effects.
R2	Some partners'	▪	✓	▪	▪	**L**	**M**	Ensure that a sufficiently robust

	may wish to restrict knowledge gained through the project to avoid passing competitive advantage to the market as a whole, resulting in reduced exploitation potential for the project.							Collaboration Agreement is in place at project inception. Resolve early in the project during detailed commercialisation and exploitation planning.
R3	Challenges with future market demand for commercialised LeanShip.	▪	✓	▪	▪	**L**	**M**	Exploitation planning to focus on all potential markets

Table 2: Analysis of additional risks Source: The Author

Following the above, distribution and marketing communication analysis along with sales forecast will be discussed further in detail.

4.11 Distribution Strategy

A global distribution network is required for every marine service or product for increasing its market awareness and also to take the product physically to consumers. (Jobber 2010) Although the direct contact between seller and customer cannot be replaced , a network exists that allows the seller to understand the customer needs , for supporting an ongoing local presence and also to develop and to build contacts and understand customer needs, and supports an ongoing local presence. Reputable distributors plays an essential part in introducing the reviewers, the key customers, the product to retailers and other influencers. The key customers includes the world's largest shipbuilders, major utility providers and the boat builders. A large numbers of sellers and buyers are brought together at marine trade shows by the distribution networks

making them essential hubs for directing businesses.

Well-established channels include Nor-shipping, EURONAVAL ,METS, CIMPS, NAVDEX, SMM ,INMEX, IBEX, and Kormarine, APM. TRANSAS has its product and services successfully deployed in over 130 countries. Initially , LEANSHIP can be distributed through TRANSAS to make it known throughout the entire globe which further helps in marketing the product to ship owner in all sectors.(EC 2013)

4.12 Marketing Communication

Marketing communications for LEANSHIP will be more effective if it is done through either of the following ways:

Advertising	Business Directories, Magazines
Personal Selling	**Exhibitions and Trade shows** • Seawork – commercial boat builders' conference and fair. • Southampton and London Boat Exhibitions. • Aberdeen-All Energy fair and conference. • Renewable UK annual "Wave & Tidal" and "Offshore Wind" fairs and conferences. • DSEI security and defence conference and fairs. • UK Trade and Investment supporting networking events. • UK Government and European Commission European supports Marine Research Project brokerage Conference .
Digital Marketing	Company Websites , You Tube ,Blogging
Direct Marketing	Mail order Catalogues through TRANSAS, direct mailing to qualified contacts within

4.13 Sales Forecast

Sales Forecast is the most important part of the strategy and also the most difficult part of forecast in management.(Jobber 2010)

Revenue forecast estimations are as follows:

1. Total global market size is 86,300.

2. Over the first 5-year period after commercialisation, it is expected that 16 shipping companies, who represent existing customers of TRANSAS and C4FF, would purchase 200 LEANSHIP system units in Year 1 and in Years 1 to 5 of 850 units; This represents a conservative % market captured Year 1 of 0.25% and Years 1 to 5 of 1%. (Ziarati 2013)

3. A survey of maritime shipping consultants identified that the price, shipping companies would expect to pay for a system such as LEANSHIP would be ~£40,000. (Ziarati 2013)

Chapter 5

Conclusions and Recommendations

5.1 Conclusions

The market analysis for C4FF carried out so far was evaluated by thoroughly understanding the business plan ,day to day interaction with the organisation , exploring the business environment they are currently functioning in , by carrying out a detailed competitor analysis and finally by assessing the current marketing activities . The retrofit market is quite attractive but it depends on huge parameters. Technologies that deal in the reduction of emission in accordance with the regulations are always competitive. The higher competition endangers the early investments in the development. In general, the maritime retrofit market requires a great endurance and a close cooperation with the standardisation bodies to be aware of all changes during the rule definition process.

Firstly, from the research undertaken about the company, it has been seen that the C4FF is a growing research company and it is trying to increase its presence around Europe and further trying to focus the global markets by developing innovative product like LeanShip which has a more competitive advantage. They are trying to provide a customised solution depending on the needs proposed especially by the European Commission. Secondly, on comparing the features of LeanShip with other principal competitors, all the features not covered by other principal projects are covered by LeanShip which proves the innovation potential of LeanShip but since brand identity is not systematically developed marketing their product globally still remains a challenge.

Also, the ship owners will be driven by the new technology only if the following environmental, legal and environmental influences are satisfied:

- Assurance that the compliance with regulations by IMO and the related requirements
- Lessening of fuel costs paid by the owner of the ships.
- Increase of the anticipated charter rate
- Increase in the possibility for lucrative charter contracts
- Increase of the second-hand value of the vessel
- Reduction in the rate of emission from ships and increase in the efficiency of the system.
- As a final point, the system should be able to handle all types of vessels and the existing ships.

LEANSHIP addresses all the above factors.In the past energy efficiency was not a criterion for many ships, but it is changing and is becoming the most important factor. Also, the vessels lifetime of a ship is about 20 t0 30 years in the market, which enforces the installed technology to be flexible enough to deal with the upcoming requirements as well as it requires a global orientation to achieve a profitable business.

Though the company C4FF uses personal selling as its marketing communication for the other products they develop , marketing a product in a shipping industry is a very challenging one, because of the competition prevailing in the marine industry. As discussed in detail in Chapter 4 , the Porter's five forces analyse that the cost leadership with performance and quality is very high among the market leaders and hence it is difficult to

compete its competitors even though cost leadership is maintained. Hence creating a brand awareness globally is a challenge, but initially they can focus niche markets highlighting the uniqueness compared to other products of global leader and thereby creating a brand and then focusing the broader markets or by integration with any global or any established equipment leader in creating an identity. Initially, the investment involved is huge,but once the product is established and standards customers are identified , it is very difficult for them to move to other suppliers and the chances to exit are also low. The revenue involved is very high and hence the profit involved is also high. There are other marketing techniques and it discussed in the further paragraphs.

Various marketing techniques as identified in Chapter 4 would help in developing their product marketed globally, initially marketing their product with the brand partners through TRANSAS (i.e. direct marketing) and well as through personal selling would increase the rate of their product marketed globally, creating a global value ultimately help in the creation of brand identity. Many international projects have been identified that correlates more or less to LeanShip and integration of partnering them for the integration with their product like Liquid Robotics (wave glider technology) would enable their product to become a globally acceptable and unreplaceable product.

LeanShip benefits to the Shipping industry are numerous and there were a number of benefits arising to the C4FF people on account of this internship. The data collected was discussed and validated and the solution recommended by the author gave them a confidence that it is doable. To conclude, the internship carried out by the author on developing a marketing plan was very useful and beneficial to the company.

5.2 **Recommendations**

The following recommendations are given based on the conclusions drawn from the above analysis done in Chapter 4 with respect to the objectives and aim of the reserchand it comprises of the following key actions:

i) Brand licensing with leading marine equipment supplier for commercialising their product would help them take their product available globally and more quickly.

ii) Strengthening the brand image and creating identity through brand awareness would help them in acquiring more clients.

iii) Since the proposal is from European Commission, creation of brand can be started off from UK, to Europe and then targeting globally will make their product more visible.

iv) Focusing their exploration on technology further to operate efficiency vessels in the Polar region would still make their product unique in future.

v) Diffusion of innovation targeting the early adopters.

vi) Suggestions to focus on propeller efficiency and hull paint technology are also recommended.

vii) Media marketing can be used and customers view of the product can be initially known by forum discussions.

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Appendices

Appendix : List of particpants

The list of participants involved in the LEANSHIP project is listed as follows:

Participant No *	Participant organisation name	Country
1 (COORDINATOR)	CENTRE FOR FACTORIES OF FUTURE(MARITIME DIVISION)	UK
2	IMSSEA-FAIMM	IT
3	PIRI REIS UNIVERSITY	TR
4	SOUTHAMPTION SOLENT UNIVERSITY	UK
5	SATAKUNNAN AMMATTIKORKEAKOULU	FI
6	FT GENOATANKERS	IT
7	COSTA CROCIERE	IT
8	KAPTANOGLU SHIPPING	TR
9	EASY MARINE	IT
10	TRANSAS MARINE INTERNATIONAL AB	SE
11	MARITIME UNIVERISITY OF SZCZECIN	PO
12	INTERNATIONAL PROPELLER CLUB - PORT OF GENOA	IT
13	OPTIMA SHIPBROKERS LTD	GR

List of Technology /Products linked with Lean ship Project:

Marine Equipment Firm	Description	Product
BASS- Maritime Software Solutions	BASS is a leading provider of maritime software for ship management and fleet operations.	**BASSnet™ Fleet Management Systems**

Schneider Electric - Global Specialist in Energy Management	Schneider Electric, the leader in energy management, has more than 90 years of experience in the marine industry and a strong presence in major shipbuilding countries, including China, Korea and Europe, for the naval, merchant marine and offshore segments.	**Shore connection solution: emissions-free shore-to-ship connection system**
STADT - No-Loss Electric Propulsion Systems for Ships	STADT AS is a specialist in AC drives and integrated electric propulsion systems for ships.	**Stascho electric propulsion system**
TecnoVeritas - Marine Engineering and Energy Management	TecnoVeritas is a marine engineering consultancy company, providing a complete package of energy management services and products for the maritime industry.	**Voyage energy and emissions optimiser (VEEO)**
Amarcon - Ship Motion Monitoring, Forecasting and Decision Support	Amarcon provides state-of-the-art solutions to optimise routing and decision support for all types of vessels during weather-sensitive operations. Amarcon is the creator of OCTOPUS, a suite of hardware and software products that form a unique solution for the improvement of safety and efficiency for ships Operating at sea.	**OCTOPUS-Performance** is the best alternative possible when it comes to reducing fuel consumption and CO2 emissions. This extension within **OCTOPUS-Onboard** makes it possible to monitor and optimise the fuel consumption as a function speed, heading or trim of the vessel.

The main, and similar, available technologies on the market for fuel saving so far are:

TT-Sense Shaft Power Thrust Meter: The TT Sense thrust and torque measuring system is mounted on intermediate shafts after the thrust bearing. When a shaft is subjected to a thrust and/or torque, this results in a small strain at the shaft surface. LED's and extremely accurate optical sensors can detect these small displacements, in both axial and radial directions. The measured values are transferred continuously from the rotating shaft to the stator part through wireless data connection. Power transmission from the stator to the rotating shaft is performed by means of induction. The stator part consists of a power transmission coil, a data signal receiver and a control box equipped with digital or analogue output connections. These outputs can be linked directly to the vessels data network, monitoring- or control system. The stator part can optionally be connected to a Propulsion Efficiency Monitor, which displays propeller thrust, shaft power, torque and speed.

MetaPower® System: It measures torque and power transferred from the main engines to the propellers. Comparison between power output and fuel consumption gives valuable information avoiding over-stressing of the engine. The MetaPower® system measures the RPM (revolutions per minute), torque and power transferred from a ships main engine to the propeller(s).

The difference between LeanShip (LS) and these systems is that LS controls not only the speed and power of the engine of the ship, but optimises: i) the speed that the ship must maintain based on contractual agreement; ii) fuel consumption to ensure contractual obligations, and iii) maintain RPM and reduce power to reduce fuel usage. The above features are crucial because the ship must ensure the speed and fuel consumption are within the contractual terms. If the vessel does not maintain the speed or fuel consumption exceeds that stated in the contract, the shipping company may have to pay a penalty. As stated earlier, LeanShip is more than torque measuring system as it possesses a sophisticated ship management system comprising an novel engine performance model and neural networks.