กลยุทธ์การพัฒนาอุตสาหกรรมอู่ต่อเรือของเกาหลีใต้

นายนฤทธิพล ศรีสงกา

วิทยานิพนธ์นี้เป็นส่วนหนึ่งของการศึกษาตามหลักสูตรปริญญาศิลปศาสตรมหาบัณฑิต
สาขาวิชาเกาหลีศึกษา (สหสาขาวิชา)
บัณฑิตวิทยาลัย จุฬาลงกรณ์มหาวิทยาลัย
ปีการศึกษา 2553

SOUTH KOREA SHIPBUILDING INDUSTRY DEVELOPMENT STRATEGY

Mr. Naridtiphol Srisongka

A Thesis Submitted in Partial Fulfillment of the Requirements
for the Degree of Master of Arts Program in Korean Studies
(Interdisciplinary Program)
Graduate School
Chulalongkorn University
Academic Year 2010

Thesis Title	SOUTH KOREA SHIPBUILDING INDUSTRY DEVELOPMENT STRATEGY
By	Mister Naridtiphol Srisongka
Field of Study	Korean Studies
Thesis Advisor	Associate Professor Buddhagarn Rutchatorn,Ph.D.

Accepted by the Graduate School, Chulalongkorn University in Partial Fulfillment of the Requirements for the Master's Degree

..... Dean of the Graduate School

(Associate Professor Pornpote Piumsomboon,Ph.D.)

THESIS COMMITTEE

..... Chairman

(Professor Chaiwat Khamchoo,Ph.D.)

..... Thesis Advisor

(Associate Professor Buddhagarn Rutchatorn,Ph.D.)

Wichian Intasi ..... Examiner

(Wichian Intasi,Ph.D.)

..... External Examiner

(Associate Professor Park, Tae-Gyun,Ph.D.)

นฤทธิพล ศรีสงกา : กลยุทธ์การพัฒนาอุตสาหกรรมอู่ต่อเรือของเกาหลีใต้. (SOUTH KOREA SHIPBUILDING INDUSTRY DEVELOPMEANT STRATEGY) อ. ที่ปรึกษาวิทยานิพนธ์หลัก : รศ.ดร.พุทธกาล รัชธร, 105 หน้า.

ในภาวะที่ตลาดชบเซาจากวิกฤตเศรษฐกิจปีพ.ศ.2551 ผู้ประกอบการอู่ต่อเรือในเกาหลีใต้ต้องประสบกับปัญหาค่าจ้างแรงงานที่สูงขึ้น อุตสาหกรรมขนส่งสินค้าของประเทศที่อ่อนแอ และสถาบันการเงินที่ไร้ประสิทธิภาพ นอกจากนั้นยังต้องเสียส่วนแบ่งการในตลาดเรือมูลค่าต่ำให้กับจีน

การวิจัยครั้งนี้จึงมีวัตถุประสงค์เพื่อระบุปัจจัยสนับสนุนและอุปสรรครวมทั้งความสัมพันธ์ของปัจจัยเหล่านั้นที่มีต่อการพัฒนาอุตสาหกรรมอู่ต่อเรือของเกาหลีใต้ นอกจากนี้ยังเสนอแนวทางในการแก้ไขปัญหาให้ผ่านพ้นวิกฤติการณ์ในปัจจุบัน ผลการวิจัยที่ได้จากการศึกษาข้อมูลทางวิชาการผ่านการวิเคราะห์ปัจจัยแวดล้อมภายนอก วงจรชีวิตผลิตภัณฑ์ Porter's five forces model และ SWOT matrix พบว่าเกาหลีใต้ยังคงมีแรงงานที่มีประสิทธิภาพ มีเทคโนโลยีที่ทันสมัย และโอกาสที่จะสามรถบุกตลาดเรือที่มีมูลค่าสูง ซึ่งปัจจัยเหล่านี้จะเป็นปัจจัยสนับสนุนการพัฒนาอุตสาหกรรมอู่ต่อเรือได้โดยที่เกาหลีใต้ควรแสวงหาผลประโยชน์จากอุปสงค์ที่เกิดขึ้นใหม่ในตลาด ส่งเสริมและสนับสนุนตลาดเรือที่มีมูลค่าสูง และกระตุ้นให้เกิดการวิจัยและพัฒนาระหว่างหน่วยงานและบริษัท

สาขาวิชา.....เกาหลีศึกษา..... ลายมือชื่อนิสิต .....นฤทธิพล ศรีสงกา.....

ปีการศึกษา ..... 2553..... ลายมือชื่อ อ.ที่ปรึกษาวิทยานิพนธ์หลัก.....

5287606320 : MAJOR KOREAN STUDIES

KEYWORDS : SOUTH KOREA / SHIPBUILDING / STRATEGY /

NARIDTIPHOL SRISONGKA : SOUTH KOREA SHIPBUILDING INDUSTRY DEVELOPMENT STRATEGY. ADVISOR : ASSOC.PROF. BUDDHAGARN RUTCHATORN, Ph.D., 105 pp.

During this market downturn caused by financial crisis in 2008,. Korean shipbuilders have to deal with high labor cost, weak domestic shipping industry and infirm ship financial institutions. In addition, they also lose simple ships orders to China which gain advantage from lower labor cost.

This study has objectives to determine the supportive and obstructive factors, contributing to the development of shipbuilding industry and analyze the interacting factors which influence Korea shipbuilding development. Moreover, the efficacious strategies for South Korea shipbuilding industry to walk through and gain the advantage from the current situation will be suggested. By using descriptive secondary academic data, conveyed through macro-environmental analysis, product life cycle, Porter's five forces model, and SWOT matrix, the study found that South Korea still has skilled workforces, high technology based on R&D, and opportunity for high value-added ships. Therefore, South Korea Shipbuilding Industry should take competitive advantage by: taking advantage of new market demand, encouraging related units for high value-added products, and stimulating more inter-organizational R&D activities.

Field of Study : Korean Studies ..... Student's Signature .....

Academic Year : 2010 ..... Advisor's Signature .....

ACKNOWLEDGEMENTS

I would like to express my gratitude to my advisor, Associate Professor Buddhagarn Rutchatorn,Ph.D, whose expertise, understanding, and patience, to my graduate experience. My thanks and appreciation goes to my thesis committee members, Professor Chaiwat Khamchoo,Ph.D., Associate Professor Park, Tae-Gyun,Ph.D., and Wichian Intasi,Ph.D. Very special thanks goes out to Duck Hee Won. I appreciate his vast knowledge and skill in many areas, and his assistance in writing reports. I must also acknowledge Korean Studies staff; Nongluk Boonthiem for her assistance helped me along the way. The informal support and encouragement of many friends has been indispensable.

I would also like to thank my family for the support they provided me through my entire life and I recognize that this research would not have been possible without the financial assistance of ASEAN University Network, for all two years in Korean Studies program.

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Figure Page

CHAPTER I

INTRODUCTION

1. Research Background

Because of the invention of aircrafts in early 1900s, people seem to be less dependent on shipping for voyage. However, ship transportation can still be the most cost-effective mean for freight raw materials and commodities. More than 80% of international trade in goods is carried by sea, and an even higher percentage of developing-country trade is carried in ships[1]. So the world shipbuilding industry holds the largest portion of the global transportation sector and is continuously growing.

Throughout shipbuilding industry milestone, leadership in the building and technology of ships has changed frequently from one country or region to another. Until the first half of the nineteenth century, at a time when 90 percent of the world's merchant vessels were still made of wood, the American- Canadian seaboard shipbuilder was undoubted leader with its abundant supply of cheap timber[2]. When the first steel ships were built in 1850 and the steam-powered steel ship became the norm, this region lost its competitive advantage to the British shipbuilders, who by 1882 captured 80 percent of world's shipbuilding market, whereas shortly after the Second World War Germany and some other European countries took over leadership from Great Britain.

Since 1955, the takeoff of Japanese economy created much import and export so that generally economic environment provided excellent opportunity to domestic shipping industry, hence the shipbuilding industry because huge amount of import and export required a big fleet to support. In 1960s, the Western European shipbuilders lost their market share to Japanese. Japan firmly established its leadership and held on to it with 50 percent of the world market. Since 1973 South Korea has been building up and expanding its shipbuilding industry and since a couple of years Japan and

---

[1] United Nations Conference on Trade and Development (UNCTAD), Review of Maritime Transport, (New York and Geneva: United Nations, 2007).

[2] Andrew J. Cornford and Raymond B. Glassgow, "The Process of Structural Change in the World Economy: Some Aspects of the Rise of the Shipbuilding Industry in Developing Countries," Trade and Development, an UNCTAD Review 3 (Winter 1981): 103.

South Korea share world leadership in shipbuilding. In the early 1970s South Korea entered the stage. The country offered lower wages than Japan or Europe and chose to position shipbuilding as a strategic industry. Just as Japan did before, a carefully planned industrial program was successfully initiated, leading to a world market share of 25% by the mid-1990s and a world first position as of 2005[3].

Today shipbuilding is a backbone industry that can make profits on downstream and upstream industries such as steel, electric and machinery for South Korea. Moreover, this industry required the employment of large numbers of workers by both ship yards and the supporting industries, and it generated foreign currency that can contribute to current account balance by exporting ships. These positive effects of shipbuilding industry also allure China to enter to this market since 2000s and China try to become the leader by 2015. Unfortunately, the financial crisis in 2008 cut the shipbuilding orders and then over capacity problem. The current phenomenal stimulates the shipbuilding market more arduous and unstable.

2. Research Problem

South Korea achieved the leadership in shipbuilding industry since 2005 but the shipbuilding industry's environmental factors are not standstill. The recent environment such as decrease in demand, over capacity crisis and China's rise affect the South Korea shipbuilding's position. But are there any other environmental factors that can help Korean shipbuilders to hold in leading position? How current environments affect the shipbuilding market and Korean shipbuilders? What are the efficacious strategies for South Korea shipbuilding industry to walk through and gain the advantage from the current situation?

3. Hypothesis

In the current environment, South Korea faces both negative and positive factors for shipbuilding industry development. However, due to high technology and skilled labor, South Korea was able to take the competitive advantage by shifting strategy to focus on high value-added products. Thereby, maintaining the world number one shipbuilding industry.

---

[3] ECORYS, Study on Competitiveness of the European Shipbuilding Industry within the Framework Contract of Sectorial Competitiveness Study (Rotterdam: ECORYS, 2009), page 7.

4. Research Objective

1. To identify the supportive and obstructive factors, contributing to the development of shipbuilding industry.

2. To analyze the interacting factors which influence Korea shipbuilding development.

3. To suggest efficacious strategies for South Korea shipbuilding industry to walk through and gain the advantage from the current situation.

5. Scope and Limitation

This research intends to conduct an analysis of the interacting factors which influence Korea shipbuilding development both in internal and external factors by identify the supportive and obstructive factors, contributing to the development of shipbuilding industry, and the obstacles from the lack of readiness and from the pressure among the rivalry. But this study doesn't study the factors that affect the small and medium size shipyards which can be different.

6. Research Methodology

This thesis is employed to review shipbuilding history, industry characteristics and key factors for performance. Therefore, the approach used in some part of this study is historical approach. Most data used is descriptive secondary academic data, conveyed through analysis approach.

6.1 In this study, the following data collection instrumentation and analysis are used.

6.1.1 Document research; including preparation materials, technical documents, and other related material.

6.1.2 Research official report, article, academic evidence and related researchers.

6.1.3 Official Statistics and economic indicators.

6.2 In order to analyze various data, the following analysis instruments are used.

6.2.1 Michael Porter's five force model[4]

An analysis of the shipbuilding industry was done using Michael Porter's five force model to understand its nature. Michael Porter has identified five forces that are widely used to assess the structure of any industry.

6.2.1.1 Bargaining power of suppliers; supplier can exert bargaining power over participant in an industry by threatening to raise price or reduce the quality of purchased goods.

6.2.1.2 Bargaining power of buyers; buyer competes with the industry by forcing down prices, bargaining for higher quality or more services, and playing competitors against each other, all at expense of industry profitability.

6.2.1.3 Threat of new entrants; new entrants to an industry bring new capacity, the desire to gain market share, and substantial resources. Price can be bid down or incumbents' cost inflated as a result, reducing profitability.

6.2.1.4 Threat of substitutes; a substitute product is other products that can perform the same function as the product of industry.

6.2.1.5 Rivalry among competitors; Rivalry occurs because one or more competitors either feels the pressure or sees the opportunity to improve position.

Together, the strength of the five forces determines the profit potential in an industry by influencing the prices, costs, and required investments of businesses—the elements of return on investment. Stronger forces are associated with a more challenging business environment.

6.2.2 Macro-environmental analysis

The macro-environmental analysis for the shipbuilding industry is done using the PEST model. The four aspects of the environment and their impact on the shipbuilding industry are Political, Economic, Social, and Technological analysis.

6.2.2.1 Political factors are how and to what degree a government intervenes in the economy.

6.2.2.2 Economic factors include economic growth, interest rates, exchange rates and the inflation rate. These factors have major impacts on how industries operate and make decisions.

---

[4] Porter, Michael E., Competitive Strategy: Technique for Analyzing Industry and Competitors, (New York: The Free Press, 1980).

6.2.2.3 Social factors include the cultural aspects and include health consciousness, population growth rate, age distribution, career attitudes and emphasis on safety. Trends in social factors affect the demand for an industry's products and how that industry operates.

6.2.2.4 Technological factors include technological aspects such as R&D activity, automation, technology incentives and the rate of technological change. They can determine barriers to entry, minimum efficient production level and influence outsourcing decisions.

6.2.4 SWOT analysis

SWOT is an abbreviation for Strengths, Weaknesses, Opportunities and Threats. It is an important tool for auditing the overall strategic position of a business and its environment. Once key strategic issues have been identified, they feed into business objectives, particularly marketing objectives. SWOT analysis can be used in conjunction with other tools for audit and analysis, such as PEST analysis and Porter's Five-Force analysis.

The aim of any SWOT analysis is to identify the key internal and external factors that are important to achieving the objective. These come from within the company's unique value chain. SWOT analysis groups key pieces of information into two main categories:

The internal factors may be viewed as strengths or weaknesses depending upon their impact on the organization's objectives. What may represent strengths with respect to one objective may be weaknesses for another objective. The factors may include all of the 4P's; as well as personnel, finance, manufacturing capabilities, and so on.

The external factors may include macroeconomic matters, technological change, legislation, and socio-cultural changes, as well as changes in the marketplace or competitive position. The results are often presented in the form of a matrix.

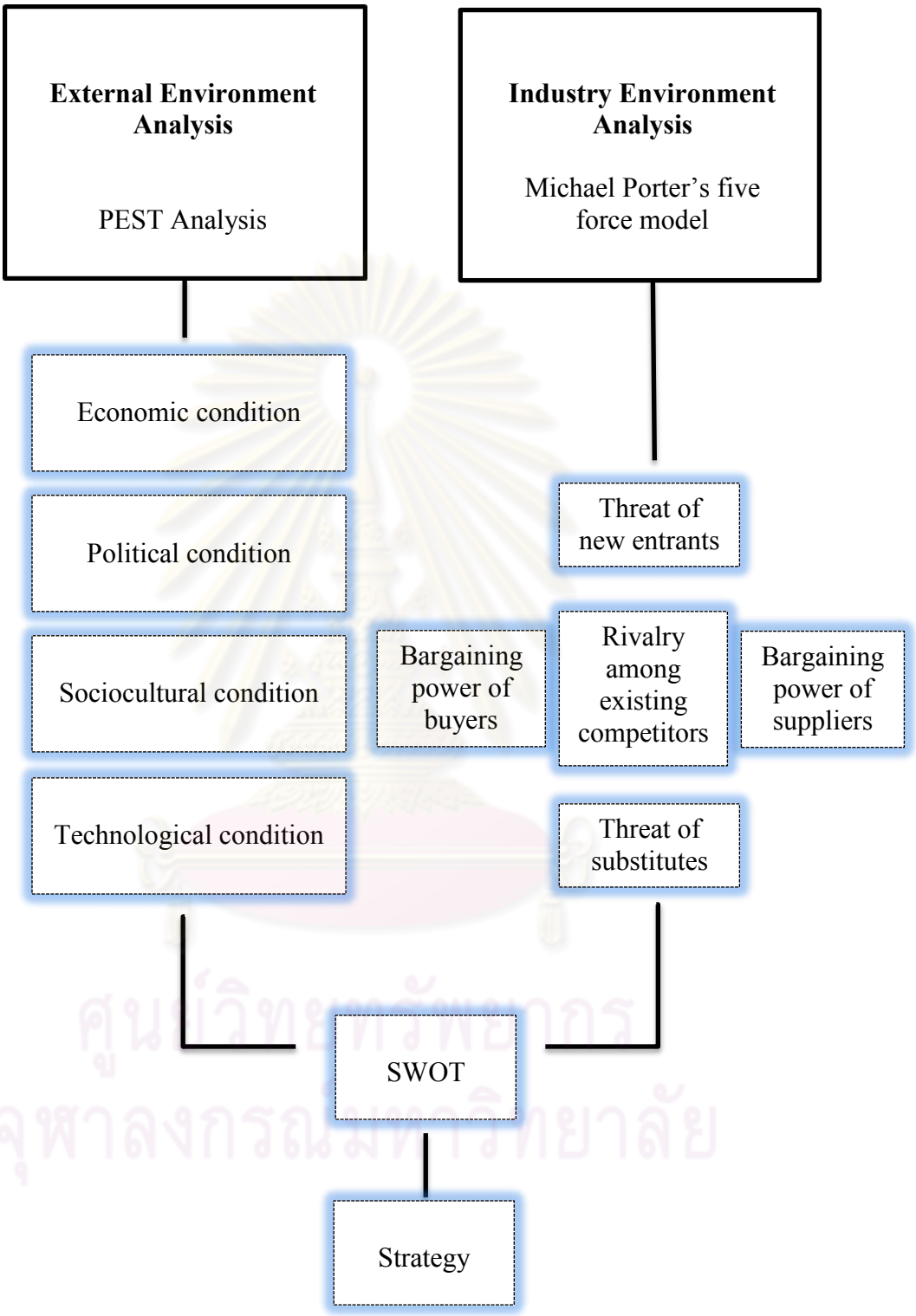
7. Research Significance

7.1 This study criticizes the factors that support and obstruct of South Korea shipbuilding industry.

7.2 This study formulates efficacious strategies for South Korea shipbuilding industry to walk through and gain the advantage from current shipbuilding market's situation.

8. Conceptual Framework

According to the related theories, this thesis which aims to study the development strategy of Korean shipbuilding industry will be conducted by the conceptual framework as follow:



CHAPTER II

LITERATURE REVIEW

This chapter presents a framework of theoretical references, which is considered to be a tool for the analysis of research problems. The macro-environment analysis or PEST and Michael Porter's five force model[1] will be used as a general background in analyzing the Korea shipbuilding industry in both internal and external environment. Moreover the international product life cycle[2] will be used as a contribution to indicate factors which affect the new entry in the Michael Porter's five force model. The strategy analysis is based on SWOT analysis for auditing the overall strategic position of a business and its environment.

1. Definition of Strategy

There are many professors identify the definitions of strategy. Some of the definitions are shown as below;

James R. Evans and James W. Dean, Jr.[3] defined a strategy is a pattern or plan that integrates an organization's major goal, policies, and action sequences into a cohesive whole. A well formulated strategy helps to marshal and allocate an organization's resources into a unique and viable posture based on its relative internal competencies and shortcomings, anticipated changes in the environment, and contingent moves by intelligent opponent.

Peter Wright, Mark J. Kroll, and John A. Parnell[4] defined a strategy that it refers to top management's plan to attain outcomes consistent with the organization's mission and goals. One can look at strategy from three vantage points: (1) strategy formulation (developing the strategy), (2) strategy implementation (put strategy into action), and (3) strategic control (modifying either the strategy or its implementation to ensure that the desired outcomes are attained.)

---

[1] Michael E. Porter, Competitive Strategy: Technique for Analyzing Industry and Competitors, (New York: The Free Press,1980).
[2] Vernon, Raymond, "International investment and international trade in the product cycle," The Quarterly Journal of Economics, (1966): 80.
[3] James R. Evans and James W. Dean, Jr., Total Quality Management Organization and Strategy, (South-Western College Publishing, 200).
[4] Peter Wright, Mark J. Kroll, and John A. Parnell, Strategic Management Concept, (Prentice Hall, 1996)

John M. Bryson and Robert C. Einsweiler[5] identified and described more than 15 used and available choices. There are many different definitions and approaches, but almost all tend to view in strategic planning as a method for creating and improved set of organizational payoffs and consequences in face of competition, obstacles, or adversity.

2. Characteristics of the Shipbuilding Industry

Cho Dong-sung[6] explained the shipbuilding industry that it is generally classified as a subset of heavy industry, whose characteristics are capital intensiveness, mid-term cyclicality, and the need for industrial marketing channels. Sometimes, the shipbuilding business is considered analogous to the construction of big building because of such characteristics as a custom-made production system, big linkage effect backward (assembly industry), and labor intensiveness. Because of strategic importance of ships in wartime, as well as the industry's substantial effect on employment and backward linkage, government is heavily involved in the industry. Due to absolutely perfect mobility of the product itself, together with various other reasons that are explained later, the industry must be perceived as s globally integrated industry and managed accordingly. These characteristics are illustrated in Figure 2.1.

2.1 Custom-made production system

According to H. Namkung[7] comment, shipbuilding is based on custom-made production and generally does not allow for mass production. A huge investment is committed by a ship owner when he builds a ship, which becomes a valuable asset to his portfolio. Therefore, he tends to place a shipbuilding order with a number of attached requirements, which hamper shipbuilders' efforts to standardize the production system.

2.2 Backward linkage effect (assembly industry)

The shipbuilding industry is a typical assembly industry. Shipbuilding is like building a plant, which requires more than 200 prefabricated components to be assembled. Because of the need for huge amounts of raw materials such as steels,

---

[5] John M. Bryson and Robert C Einsweiler, eds., Strategic Planning: Threats and Opportunities of Planners **,** (Chicago : American Planning Association, 1988).
[6] Cho Dong-sung, Shipbuilding Industry: Trends, Characteristics, and Global Competition, (Institute of Development Economies, July 1984), pp. 10-15.
[7] H. Namkung, Korean shipbuilding Industry, (unpublished paper, 1976), p. 8.

engines, and power transmission system, electrical and electronic components, and chemical products, the industry has a big linkage effect back ward to iron and steel, machine, electric, electronic, and chemical industries.

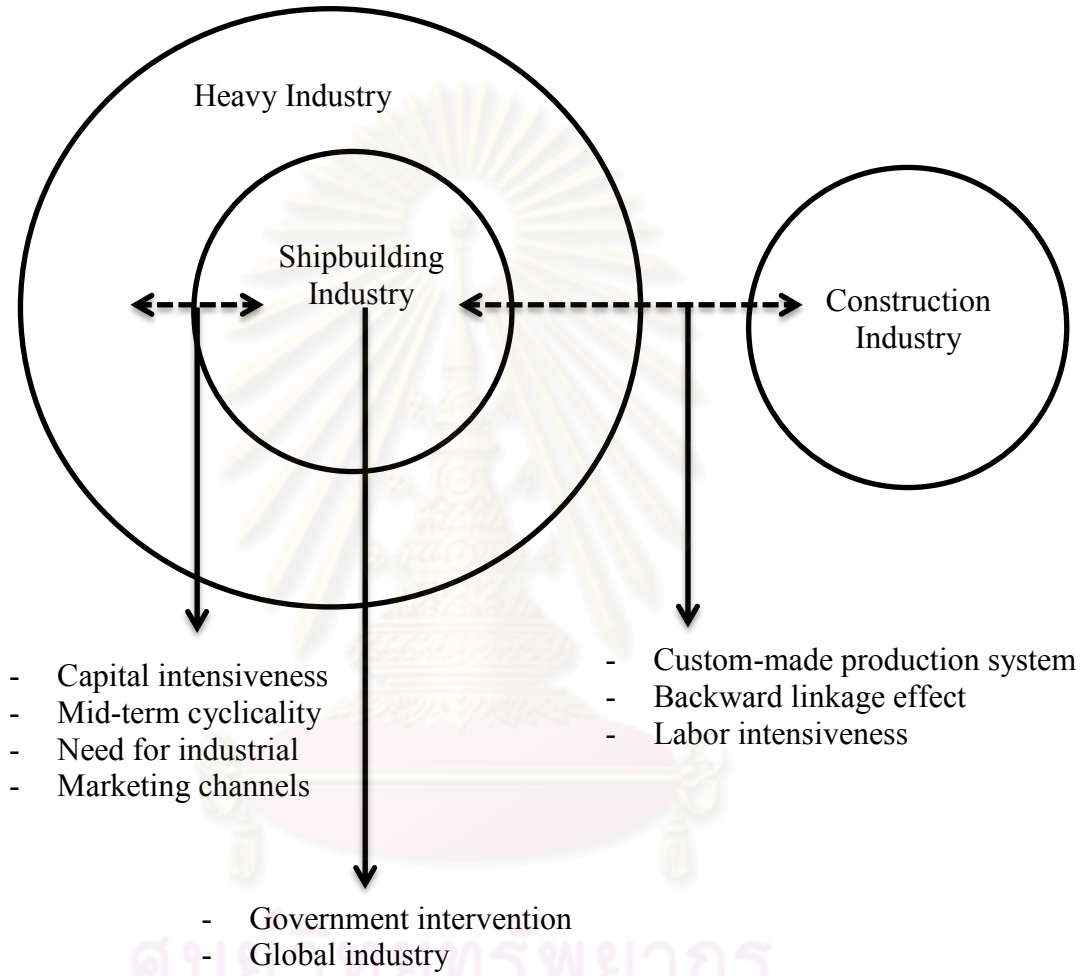


Figure 2.1 Characteristics of Shipbuilding Industry

2.3 Labor and capital-intensive industry

Labor cost accounts for roughly 20 percent of the total production cost. The custom-made nature of the industry results in many product stages, each of which requires sophisticated manual labor in machining and fabrication. Therefore, automation of production is almost impossible in assembly works.

The industry is also capital intensive, with huge sums needed for the purchase of shipbuilding sites and elaborate equipment.

Certainly, sophisticated technologies are required for the design and production of ships, but in a time of recession, money can buy most of technologies required. Management of large-scale shipyards and facilities is no mean task at all, but recent development of CAD, CAM[8], and other computer-aided systems have greatly reduced the burdens traditionally assumed by managers in the industry.

2.4 Need for industrial marketing channels

Phillip Kotler[9] defined that an industrial market is made up of the individuals and organizations who acquire goods and services in order to use them in the production of other products or services that are sold, rented, or supplied to others. The market for the shipbuilding industry can be considered an industrial market, because in most cases ships are purchased and used to facilitate shipping service by merchant shipping companies. Besides, the market for the shipbuilding industry possesses various characteristics such as follows:

2.4.1 Profit-seeking motive of buyers

Philip R. Cateora and John M. Hess[10] mentioned that ship buyers place orders for ships in order to make profits by serving their clients' need.

2.4.2 Limited number of buyers

The prospective number of ship buyers is narrowly limited to transporters of seaborne trade such as shipping companies and oil companies.

2.4.3 Geographical concentration of markets

More than half of the orders for new ships half of orders in 1980 for new ships worldwide are concentrated in some countries such as Liberia, Greece, Japan, Panama and U.S. Since some of these countries are known to be countries of "flags of convenience," owner of vessels are even more concentrated than indicated by orders of new ships.

2.4.4 Large cost of projects

New shipbuilding projects, more often than not involve hundreds of millions of dollars, which is almost without a match in other industries. This fact makes it difficult for shipbuilders to apply creative marketing and to encourage potential ship buyers to order a ship that is not in immediate demand.

2.4.5 Organizational purchase

---

[8] CAD stands for computer-aided designing; CAM stands for computer-aided manufacturing
[9] Phillip Kotler, Principles of Marketing, (Prentice-Hall, Inc., Cliffs, N.J., 1980), p. 267.
[10] Philip R. Cateora and John M. Hess, International Marketing, (Richard D. Irwin, Inc., Homewood, III., 1975), p. 361.

Since ships are relatively long-lived and involve large sums of money, their purchase represents a major decision for an organization. Negotiations often extend over a period of several months and involve the participation of numerous decision makers. In many cases, ship buyers must be provided with technical expertise by shipbuilders.

2.5 Cyclicality

The shipbuilding industry is subject to very volatile fluctuations. The industry has survived nine major cycles since 1893. By 1933 the industry had shrunk by 84 percent. Severe volatility together with a very short time horizon of the industry cycle is characteristic of the industry.

The cyclical nature of demand for shipbuilding is due to the following features of ships:

- Merchant ships are relatively long-lived, and building of a new ship requires large sums of money.
- It often takes more than one year from negotiation to delivery of a ship.
- Purchasing a ship itself is a massive investment and one somewhat speculative in nature.

2.6 Government intervention

Because of the importance of the industry in affecting other related industries, employment, and national defense, government is deeply involved in the development of the industry through various direct and indirect means.

2.7 Global industry

According to Michael E. Porter[11], a global industry is one in which the strategic position of competitors in major geographic or national markets are fundamentally affected by their overall global position. In worldwide shipbuilding market, there are no significant trade barriers such as tariffs, transportation costs, and the overhead of establishing a distribution network, which have the effect of protecting a home market and thus to discourage international competition. Therefore, shipbuilders perceive the whole world as a single market rather than as a set of independent national markets. In this regard, the shipbuilding industry can be considered an example of a global industry where shipbuilders confront intensive competition from various sources.

[11] Michael E. Porter, Competitive Strategy, (New York: The Free Press,1980).

3. External Environment Analysis

PEST Analysis

In analyzing the macro-environment, it is important to identify the factors that might in turn affect a number of vital variables that are likely to influence the organization's supply and demand levels and its costs[12]. The "radical and ongoing changes occurring in society create an uncertain environment and have an impact on the function of the whole organization"[13]. A number of checklists have been developed as ways of cataloguing the vast number of possible issues that might affect an industry. A PEST analysis is one of them that are merely a framework that categorizes environmental influences as political, economic, social and technological forces. Sometimes two additional factors, environmental and legal, will be added to make a PESTEL analysis, but these themes can easily be subsumed in the others. The analysis examines the impact of each of these factors and their interplay with each other on the business. The results can then be used to take advantage of opportunities and to make contingency plans for threats when preparing business and strategic plans[14].

Phillip Kotler[15] claims that PEST analysis is a useful strategic tool for understanding market growth or decline, business position, potential and direction for operations. The headings of PEST are a framework for reviewing a situation, and can in addition to SWOT and Porter's Five Forces models, be applied by companies to review a strategic directions, including marketing proposition. The use of PEST analysis can be seen effective for business and strategic planning, marketing planning, business and product development and research reports.

Michael E. Porter[16] defined PEST also ensures that company's performance is aligned positively with the powerful forces of change that are affecting business environment. PEST is useful when a company decides to enter its business operations into new markets and new countries. The use of PEST, in this case, helps to break free

---

[12] John P. Kotter and Leonard A. Schlesinger, Choosing strategies for change, (Harvard Business Review, 1991), pp. 24-29.
[13] Gerry Johnson and Kevan Scholes, Exploring Corporate Strategy – Text and Cases, (Hemel Hempstead: Prentice-Hall, 1993).
[14] Lloyd L. Byars, Strategic Management, Formulation and Implementation – Concepts and Cases, (New York: HarperCollins, 1991).
[15] Phillip Kotler, Marketing Management – Analysis, Planning, Implementation, and Control, 9th Edition, (Englewood Cliffs: Prentice-Hall, 1998).
[16] Michael E. Porter, Competitive Advantage, (New York: The Free Press, 1980).

of unconscious assumptions, and help to effectively adapt to the realities of the new environment.

Main Aspects of PEST Analysis

3.1 The economic condition

John Thompson[17] claimed that economic conditions affect how easy or how difficult it is to be successful and profitable at any time because they affect both capital availability and cost, and demand. If demand is buyout, for example, and the cost of capital is low, it will be attractive for firms to invest and grow with expectations of being profitable. In opposite circumstances firms might find that profitability throughout the industry is low. The timing and relative success of particular strategies can be influences by economic conditions. When the economy, as a whole or certain sectors of the economy, are growing, demand may exist for a product or service which would not be in demand in more depressed circumstances.

Similarity, John Robinson, Bob Hitchens, and David Wade[18] also commented that the opportunity to exploit a particular strategy successfully may depend on demand which exists in growth conditions and does not in recession. Although a depressed economy will generally be a treat which results in a number of organizations going out of business, it can provide opportunities for some.

Economic conditions are influenced by political and government policy, being a major influence affecting government decisions. The issue of whether European countries join, or remain outside, the single European currency is a case in point. At any one time either exported or imported goods can seem expensive or inexpensive, dependent upon currency exchange rates. There are many other ways, however, in which government decisions will affect organizations both directly and indirectly, as they provide both opportunities and threats.

Jeffery Harrison[19] determined the most critical economic environment factor below;

- Economic Growth
- Interest Rates
- Inflation

---

[17] John Thompson, Strategic Management, 4th Edition, (London: Thomson, 2002).

[18] John Robinson, Bob Hitchens, and David Wade, "The directional policy matrix-tool for strategic planning", Long Range Planning Journal, Vol. 11, (1978): 8-15.

[19] Jeffery Harrison, Strategic Management of Resources and Relationships (New York: John Wiley and Sons, 2003).

- Exchange Rates
- Trade Deficits

3.2 The political condition

While economic conditions and government policy are closely related, they both influence a number of other environmental forces that can affect organizations. Capital markets determine the conditions for alternative types of funding for organizations. They tend to be a subject to government controls, and they will be guided by the prevailing economic conditions. The rate of interest charged for loans will be affected by inflation and by international economics and, although the determining rate may be fixed by a central bank, as it is the case with the Bank of England, that will also be influenced by stated government priorities. According to John Thompson[20], government spending can increase the money supply and make capital markets more buoyant. The expectations of shareholders with regard to company performance, their willingness to provide more equity funding or their willingness to sell their shares will also be affected.

Jeffery Harrison[21] defines a four influence political drivers below;

- Lawmakers
- Regulatory agencies
- Revenue-collection agencies, and
- The court

3.3 The sociocultural condition

John Thomson[22], John Pearce and Richard Robinson[23] defined that the sociocultural environment encapsulates demand and tastes, which vary with fashion, disposable income, and general changes, can again provide both opportunities and threats for particular companies. Over-time most products change from being a novelty to a situation of market saturation, and as this happens pricing and promotion strategies have to change. Similarly, some products and services will sell around the world with little variation, but these are relatively unusual. Organizations should be aware of demographics changes as the structure of the population by ages, affluence, regions, and numbers working and so on can have an important bearing on demand as

[20] John Thompson, Page 132.
[21] Jeffery Harrison, Page 83.
[22] John Thompson, Page 133.
[23] John Pearce and Richard Robinson, Strategic Management, 9th Edition, (New York: McGraw-Hill, 2005).

a whole and on demand for particular products and services. Threats to existing products might be increasing: opportunities for differentiation and market segmentation might be emerging.

Jeffery Harrison[24] recommended that an analysis societal trend is important from at least four perspectives.

- Broader societal influences can create opportunities for organizations.
- Awareness of and compliance with the attitudes of the society can help an organization avoid problems associated with being perceived as a bad corporate citizen.
- A positive organizational reputation among stakeholders may increase demand for products or lead to increased business opportunities.
- Correct assessment of social trends can help businesses avoid restrictive legislation, which can be a threat to organizational success.

3.4 The technological condition

Noel Capon and Rashi Glazer[25]; Gerry Johnson and Kevan Scholes[26], and Yin-Ching Jan[27] commented in the same way that technology is widely recognized by various literatures on strategic management, as part of the organization and the industry part of the model as it is used for the creation of competitive advantage. However, technology external to the industry can also be captured and used, and this again can be influenced by government support and encouragement. Technological breakthroughs can create new industries which might prove a threat to existing organizations whose products or services might be rendered redundant, and those firms which might be affected in this way should be alert to the possibility. Equally, new technology could provide a useful input, in both manufacturing and service industries, but in turn its purchase will require funding and possibly employee training before it can be used.

Moreover, Jeffery Harrison[28] said that the technological development is difficult to predict but they are not impossible to predict. He also recommended the

---

[24] Jeffery Harrison, Page 85.
[25] Noel Capon and Rashi Glazer, "Marketing and technology: a strategic coalignment," Journal of Marketing, Vol. 51 Issue 3, (1987) pp. 10-21.
[26] Gerry Johnson and Kevan Scholes, Page 322.
[27] Yin-Ching Jan, "A three-step matrix method for strategic marketing management," Marketing Intelligence and Planning, Vol. 20 Issue 5, (2002): 269-272.
[28] Jeffery Harrison, Page 85.

three characteristics of innovation can help an organization to develop a plan for monitoring technological change.

- Innovations from existing technologies
- Adoption of a dominant design
- Radical innovations from outside the industry
- Dealing with technological change

4. Industry Environment Analysis

Michael Porter's five force model

Porter[29] provided a dynamic and focused structural analysis of an industry called Porter's Five Forces analysis. This analysis is a simple but powerful model to determine competition level in an industry. In term of Porter's Five Forces framework, the strengths of the company are determined by its competitive position under five forces. Managers and academicians can use Porter's Five Forces analysis to determine the competition level and attractiveness of the analyzed industry, evaluate its position, and construct strategies to gain competitive advantage.

Jobber[30] states that in order to define the market situation, or micro environment, an industrial analysis is a good approach where companies define size and number of their competitors, size and number of their customers, new entries, suppliers and substitutes. To define those factors we have chosen the Porter's five forces framework.

Porter[31] argues that the extent of competitiveness within the market is dependent on three forces from 'horizontal' competition: threat of substitute products, the threat of established rivals, and the threat of new entrants; and two forces from 'vertical' competition: the bargaining power of suppliers, bargaining power of customers. (See Figure 2.2)

[29] Michael E. Porter, Page 267.
[30] David Jobber, Principles and Practice of Marketing: Fourth Edition, (Berkshire, McGraw-Hill, 2004), p. 679.
[31] Michael E. Porter, Page 236.

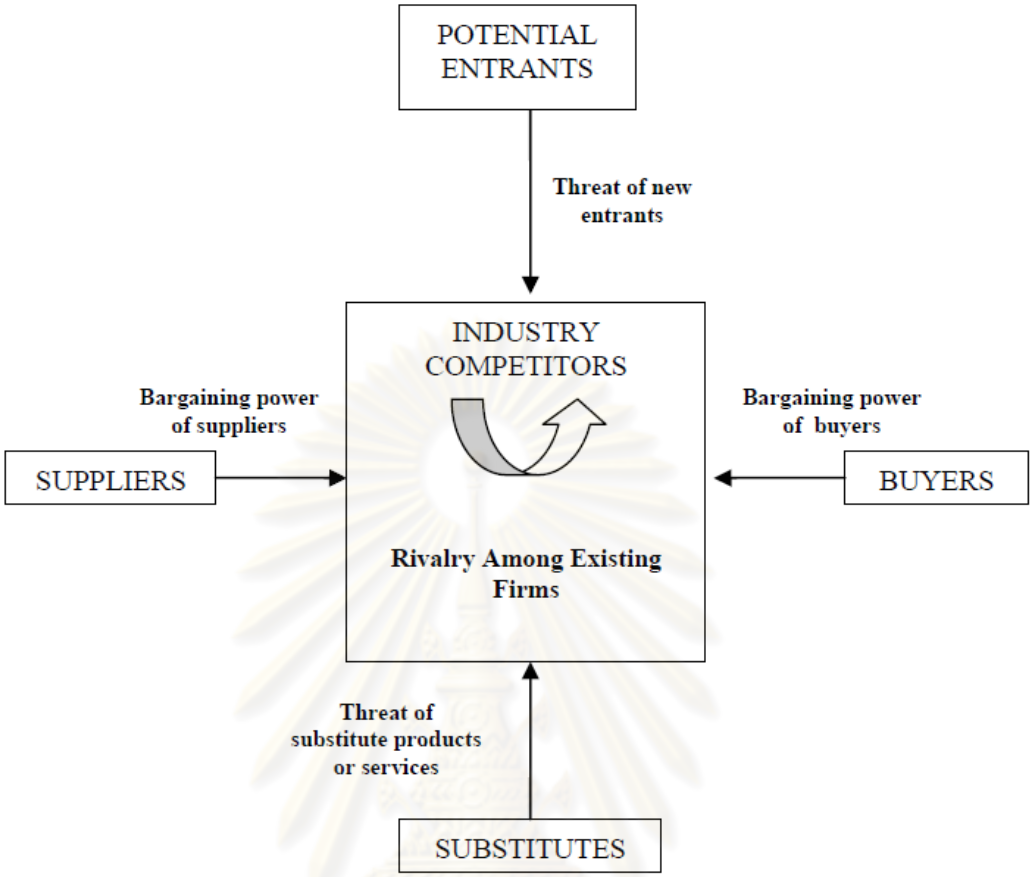


Figure 2.2 Porter's Five Forces Model

4.1 The threat of new entrants

The threat of new entrants refers the ease with which new companies of competitors can enter the market. The new entrants to an industry can threaten existing competitors, because they bring additional production capacity.

According to Kottler and Keller[32], new entrants to an industry bring new capacity, the desire to increase market share and often substantial resources. Resistance to new entrants will determine on the reaction of current players and the barriers present. An attractive market would, according to theory, consist of high entry barriers but low exit barriers. This would mean that few players will be able to enter and at the same time, should the entrants not be successful, have the ability to

[32] Philip Kotler and Kevin Keller, A Framework for Marketing Management third edition, (New Jersey, Pearson Prentice Hall, 2007)

exit with low risk and expense. The opposite of low entry barriers and high exit barriers would mean that competition would be fiercer, margins lower and due to more rivalry less attractive.

According to Porter[33] there are six major obstacles to would-be entrants:

4.1.1. Economies of scale, which mean that the unit cost of a product or service falls with rising volume per unit of time. The economies of scale deter new entrants by forcing them either to start out on a massive scale, which calls for heavy investment, or to risk crushing retaliation from established companies in the industry.

4.1.2. Differentiation of production, which means that established companies hold recognized trademarks and enjoy brand loyalty as a result of marketing efforts or tradition. The new entrant must spend a lot of money to break down existing loyalties.

4.1.3. Need for capital, which makes it difficult to get started in cases where it takes a large capital stake to be able to compete. This hurdle naturally grows higher with the uncertainty factor. Capital may be needed not only for production but also to extend credit to customers, build up stocks and cover initial losses. Rank Xerox set up an effective barrier to new entrants in the office copier business by renting machines instead of selling them, thereby upping the capital ante for potential competition.

4.1.4. Conversion costs, a one-off expense for buyers who switch suppliers. These costs may include retraining of personnel, new production equipment, need for technical service, new production design and risk of production stoppages.

4.1.5. Lack of distribution channels, which may make it impossible for new entrants to establish a foothold in the trade. New players must resort to cut-price offers, subsidizing advertising and other inducements to persuade established distributors and outlets to accept their products, thereby cutting into their profit margins.

4.1.6. Other cost obstacles unrelated to the economies of scale may, according to Porter, arise from advantages enjoyed by established companies in the industry. These include:

• Patented product technology

[33] Michael E. Porter, Page123.

- Access to raw materials on favorable terms
- Advantageous location
- Priority claim on government subsidies
- Lead in know-how or experience

4.2 The threat of substitutes

A substitute performs the same or similar function as an industry's product or service by different means. An example would be videoconferencing as a substitute for travel. Substitutes can be easily overlooked if no proper market survey is conducted regularly. A substitute product or service limits an industry's profit potential either by placing a ceiling on prices or by affecting the market share.

In an industrial analysis it is important to be aware of the close substitutes that occur[34]. If there are close substitutes to the product or service, the customer might favor the substitute instead, if the prices are relatively lower or the performance is higher. Jobber[35] further states that other factors that affect the buyers are their willingness to use substitutes and the cost of switching over to the substitutes. Dwyer and Tanner[36] claims that if the substitutes provide the same value or if it is easy to switch to the substitutes, the buyer will favor it over the primary product.

4.3 The bargaining power of buyers

Buyer power allows customers to writing industry margins by forcing competitors to reduce prices or to increase the service level without due compensation[37]. Jobber[38] mentions that if there is a possibility for backward integration within the industry the bargaining power will increase. Backward integration means that the buyer will purchase the supplier in order to produce the product instead of purchasing it. Dwyer and Tanner[39] states that when there are few dominant buyers and many sellers, the buyer can choose from several suppliers. If the products are standardized the bargaining power is greater. Finally, Jobber[40] states that the bargaining power for the supplier will be stronger if the buyer does not depend on

---

[34] David Jobber, pp. 680-681.
[35] Ibid.
[36] Robert F. Dwyer and John F. Tanner, Business Marketing: Connecting Strategy, Relationships, and Learning, 3rd Edition, (McGraw-Hill/Irwin, 2006), p.172.
[37] David J. Collis and Cynthia A. Montgomery, Corporate Strategy- A Resource-based Approach second edition, (New york: McGraw-Hill, 2005)
[38] David Jobber, Page 680.
[39] Robert F. Dwyer and John F. Tanner, Page 171.
[40] David Jobber, Page 680.

the supplier for their operation. Hence, the buyer can continue its operation without the particularly product or service.

A group of buyers is powerful if it meets the following criteria:

• It is concentrated, or buys large volumes in relation to the volume of suppliers' sales.

• The products it buys from the industry represent an important proportion of its own costs or volume of purchases.

• The products it buys from the industry are standardized or undifferentiated.

• It is not sensitive to conversion costs.

• Its profit margins are small.

• The industry's product is not crucial to the quality of the buyers' own products or services.

• It is well informed.

4.4 The bargaining power of suppliers

Supplier power refers the power of suppliers to drive up the prices of raw materials, supplies, equipment or inputs. If the suppliers can change the price of product and drive up prices easily, they have power. Few suppliers, no substitutes to the supplier's products and high switching costs from the supplier increase supplier's bargaining power.

Jobber[41] points out that companies' profitability is very dependent on their suppliers. If the suppliers have strong bargaining power, the costs for the buying company will increase. The bargaining power of the supplier is stronger when there are many buyers and few dominant suppliers. The bargaining power of the supplier is also affected by the type of product. Dwyer and Tanner[42] claims that if the products are differentiated and highly valued the bargaining power of the suppliers are higher. If there is a risk for forward integration from the supplier or if the buyer does not threaten to integrate backward, the bargaining power for the supplier will be stronger. Jobber[43] mentions another factor that increases the bargaining power for supplier which is if the industry is not a key customer to the supplier. It will then not matter will purchase from that supplier.

---

[41] Ibid.
[42] Robert F. Dwyer and John F. Tanner, Page 172.
[43] David Jobber, Page 681.

So a group of suppliers is powerful if it meets the following criteria:

4.4.1. It is dominated by a few companies and is more concentrated than the industry it sells to.

4.4.2. It is not forced to compete with substitutes for the products it sells to the industry.

4.4.3. The industry concerned is not one of its most important customers.

4.4.4. Its products are crucial to the industry's business.

4.4.5. Its products are differentiated.

4.4.6. It poses a credible threat of forward integration, that is, of establishing itself in the industry.

4.5 The rivalry among existing competitors

The final part of Porter's Five Forces is the size of competition. According to Jobber[44] the competition on a market will be higher when there are many small competitors or few equally balanced competitors. High fixed costs will also create higher competition because the company will reduce their prices in order to fill their capacity. Dwyer and Tanner[45] states that when switching costs are low or the products are standardized, the rivalry will higher given that it is cheap to produce the same products. Another factor Jobber[46] mention that leads to high competition is if the companies are pursuing build strategy, since they fight in purpose of gaining more customers.

The degree to which rivalry drives down an industry's profit potential depends upon the intensity with which companies compete and on the basis on which they compete. The factors that usually lead to intense rivalry are:

- Numerous or equally balanced competitors, generally, in both cases rivalry is more intense and the force is stronger.
- Slow industry growth, which leads to a fierce battle for market share and decreases profits.
- High fixed or storage costs, which leads to strong competition for increasing capacity and price cuts.

[44] Ibid.
[45] Robert F. Dwyer and John F. Tanner, Page 172.
[46] David Jobber, Page 681.

- Lack of differentiation or switching costs, which means that the buyers' priorities are price and service.
- Capacity augmented in large increments; in these cases the industry may face periods of overcapacity and again price cuts.
- Diverse Competitors, which refers to the case where competitors are following different strategies and have difficulty in identifying others' future moves, thus increasing uncertainty.
- High strategic stakes have a negative effect on an industry's attractiveness when for example some diversified firms particularly need to achieve their targets in the specific industry.
- High exit barriers which usually derive from: the inability to sell assets, strategic interrelationships, emotional barriers and governmental restrictions.

6. Strategy Analysis

One of the familiar methods in analyzing firm strategy is SWOT analysis. SWOT is an acronym for the internal Strengths and Weaknesses of a firm and the environment Opportunities and Threats facing the firm. SWOT analysis is grounded in the basic principle that strategy-making efforts must aim at producing a good fit between a company's resource capability and its external situation[47].

Gronenendijk and Dopheide[48] explained the SWOT analysis contains following analysis.

6.1 External analysis

External analysis takes into account the actual situation (existing threats, non-exploited opportunities) as well as possible trends and developments. The latter have to be realistic, with clear indications and without major speculations. Moreover, the effect on the performance of the organization should be substantial.

An opportunity can be defined as an external fact or development that, if taken advantage of, can substantially contribute to the realization of the organization's mission. Examples of opportunities include new possibilities for cooperation, favorable government policies and regulation, a new target group, the demand for new

[47] Arthur A Thomson, Jr., Stricland, "A. Competitive Assessment of the U.S. Pharmaceutical Industry", International Competitive Series,(Colorado: Westview Press, 2003).
[48] Liza Groenendijk and Emile Dopheide, Planning and Management Tools, (The International Institute for Geo-Information Science and Earth Observation, Netherlands, 2003), pp. 45-46.

services. A threat can be defined as an external fact or development that has or can have a substantial negative effect on an organization's performance. Threats are challenges posed by unfavorable trends in the environment that will lead to erosion of the organization's position if no corrective action is taken. Example of threats include other projects coming in with similar products, change in donor policies, change in government policies and regulations, diminishing resources. Opportunities and threats can be identified in number of way, but the instrument that can be useful for identifying opportunities and threats in this thesis is PEST analysis.

6.2 Internal analysis

The internal situation is discussed on the basic of the existing situation and explores existing strengths and weaknesses. An organization's strengths and weaknesses are internal factors that critically determine its performance.

A strength is therefore defined as an internal characteristic that contributes substantially to the realization of the organization's mission. A strength is any existing internal asset well placed to help to exploit opportunities and fight off threats. A weakness is an internal characteristic that threatens the functioning of the organization. Weaknesses are internal conditions that erode the organization's position, hamper cooperation with others or obstruct the exploitation of opportunities. To identify strengths and weaknesses systematically, in this thesis will use Porter's Five Forces Model as a useful tool.

7. Related thesis

Charles Harvie and Hyun-Hoon Lee[49] study a remarkable transformation of the South Korean economy in period of 1962-89. This transformation was achieved through the adoption of an outward oriented industry led strategy, based, particularly during the period of the 1970s, upon the development of large-scale industrial conglomerates and the attainment of economies of scale and technology to achieve international competitiveness and the issue of whether Korea's performance during this period can be described as an economic miracle is reviewed in this research.

[49] Charles Harvie and Hyun-Hoon Lee, "Export Led Industrialization and Growth-Korea's Economic Miracle 1962-89," (Working paper, Department of Economics, University of Wollongong, 2003)

Duck Hee Won[50] develops potential strategies for Korean shipbuilders for sustainable growth by understanding the characteristics of the shipbuilding industry and the current market situation. He addresses current status of the shipbuilding market, project a market forecast, and analyze financial status of Korean shipbuilders and he suggests for Korean shipbuilders some potential business strategies as follow: focusing on offshore units, exploiting new market demand, and considering business diversification.

Lar c. Bruno and Stig Tenold[51] looks at the formative period of South Korean shipbuilding, the period from 1970 to 1990, which appears to be an unlikely time for the escalation of shipbuilding activities. His explanations are based on both international and domestic factors, with specific emphasis on the role of policies and technological learning.

[50] Duck Hee Won, "A study of Korean Shipbuilders' Strategy for Sustainable Growth," (Master's thesis, Management Studies Program, MIT Sloan School of Management, 2010)
[51] Lar c. Bruno and Stig Tenold, "The basic for South Korea's ascent in the shipbuilding industry, 1970-90," (Working paper, Department of Economics, Norwegian School of Economics and Business Administration)

CHAPTER III

OVERVIEW OF THE SHIPBUILDING INDUSTRY

In this chapter, the history of the modern shipbuilding industry leaders is explained to understand leadership changes during the 20th century. That illustrates common factors which enabled specific countries to dominate the shipbuilding industry and the reason why they lost their powerful position can be identified. Detailed explanations of main products, the shipbuilding process, and major players in the shipbuilding industry will provide an overall understanding of the shipbuilding industry.

1. History of Modern Shipbuilding Industry Leaders

In the early nineteenth century, the modern shipbuilding industry was emerged by the two technologies: the introduction of the steam engine and the use of iron and steel as shipbuilding materials. The steam engine which had been invented by James Watt became widely used in ships by the 1830s and iron by the late eighteenth century with an introduction of low-cost iron-making called the puddle-rolling method. The Great Britain was the first iron ship which equipped with a steam engine and undoubtedly quickly developed this new concept of iron steamships for merchant shippers and navy in the 1850s by British Shipbuilders. A few years later, the steel ship proved to be particularly effective as a naval vessel. This forced England to begin to transform its wooden and iron ships to steel ships in the 1860s and claimed supremacy as a naval power as a result.

Britain firmly established its strong presence in the late nineteenth century and it captured 80% of the world"s shipbuilding market in 1882[1]. This is the result from the seaborne trade volume of Britain and the fleets they owned at the same period. This shows the link between trade, shipping and shipbuilding was essential. In Britain a relationship existed between ship owners and shipbuilders that went beyond normal competitive ties. Many of the powerful British shipping lines had a longstanding association with particular shipyards. As Hobsbawm explains the rise of

---

[1] Michael E. Porter, Competition in Global Industries (Cambridge: Harvard Business School Press, 1986), page 551.

the British shipbuilding industry during nineteen century, he also comments the existence of this link in the following terms:

> During the age of the traditional wooden sailing ship Britain had been a great, but by no means unchallenged producer. Indeed her weight as a shipbuilder had been due not to her technological superiority, for the French designed better ships and the USA built better ones… British shipbuilders benefited rather because of the vast weight of Britain as a shipping and trading power and the preference of British shippers (even after the abrogation of the Navigation Acts, which protected the industry heavily) for native ships[2].

As mentioned above, well developed shipping industry is a precondition for the growth of shipbuilding industry. Between 1890 and 1914 the rate of growth of shipbuilding output exceeded that of the economy as a whole. Britain accounted for 60 % of world output of ships and controlled some 80 % of the world export market as late as 1913. British merchant fleets accounted for 33% of the world fleets in 1914, and therefore Britain became a world leader both in the shipping and shipbuilding market in 1900s.

---

2 Eric Hobsbawm, Industry and Empire: From 1750 to the Present Day, rev. and updated with Chris Wrigley, 2nd ed, (New York: New Press. 1999), pp. 178-179.

Table 3.1 Shipbuilding market share in the 1900s Units: ’000 GT

	Merchant Vessels		
	1892-1896	1901-1905	1910-1914
Britain	1,021	1,394	1,660
Germany	87	215	328
United State	85	347	253
France	26	123	15
Holland	10	52	97
Japan	3	33	57
Others	67	190	329
World Total	1,299	2,354	2,739
Britain/Total	78.6%	59.2%	60.6%

Source: “Annual Return,” Lloyds Register (London)[3]

However, this leadership began to change in the early twentieth century as the German and United States shipbuilding industries adopted significant innovations which are the diesel engine and the all-welded hull, and by the second half of the twentieth century as almost all major innovations in the industry were being adopted first by producers outside Britain such as Sweden and Japan who closely integrated production technology. Despite the fact that the coated welding electrode, which made possible the general adoption of welded connections in the 1930s, was a British invention, the British shipbuilding industry was the last to continue to use riveting for the assembly of ship‟s hull. It is frequently to see that pioneers in the field of technological development suffer a disadvantage relative to newcomers because of resistance to change, the effect of sunk costs and the inherent difficulty of introducing new techniques which do not conform to the specifications of existing plant and equipment. The British shipbuilding suffered for being the pioneer of the modern shipbuilding industry. By 1939, many British shipyards were badly out of date. The equipment installed was inefficient, production methods such as welding and prefabrication were regarded with great suspicion and dubiousness and the quality of design had fallen behind that elsewhere. The main reason for the decline of the British

[3] Sidney Polland, “British and World Shipbuilding, 1890-1914: A Study in Comparative Costs,” The Journal of Economic History Vol 17, 3 (1957): 426-444.

shipbuilding industry was the changing pattern of world demand for shipping. Actually British shipping industry was slower to adopt tankers. The failure to adjust promptly and suitably to the changing pattern of world demand for shipping and to the technological changes resulted in the fewer orders and lower productivity.

During WWII, the U.S. took the world leadership position away from the Britain because the U.S. needed to move long distances across the ocean and came to realize that seaborne support was critical, it expanded shipbuilding capacity and developed many innovations, especially in welding technologies. This caused a mass production of ships such as a standard dry cargo vessel of 10,902 dwt and T2 tanker of 16,543 dwt[4] for the American Liberty ship. In the period from 1940 to 1945, the market share of the U.S. shipbuilding industry reached its unprecedented peak in the world shipbuilding market, accounting for 90% of total production in the world[5]. Production commenced in 1941 and reached a peak in 1944 when a total of 19.3 million grt of new ships were launched in the United States, this is almost ten times the total world shipbuilding output in 1939. A total of 2,600 Liberty ships were built and 563 T2 tankers. After the war some of the Liberty ships were sold to private operators and others were traded.

Toward the latter half of the 1950s, the development of Japanese shipbuilding industry featured with well-planned program, which was initiated by Japanese government after WWII. First, the government-sponsored Keikaku Zosen provided minimum orders for the shipbuilders to maintain a steady level of operations, so they could compete in the international market with prices based on marginal costs[6].

Second, Japanese government chose a policy of supporting the recovery of the shipping and shipbuilding industries, since it had lost 80% of vessels because of WWII. The government recovery fund came from the U.S. and the Japan Development Bank (JDB) made this recovery plan possible. JDB offered favorable loans to local ship owners. The amount of funds flowing to marine sectors was huge, accounting for over 30% of the total loans which JDB providing to all sectors in Japan for about 20 years.

---

4 Martin Stopford, Maritime Economics (Routledge, 1997). page 22.

5 Lu Zhendong, Can China Become No.1 Shipbuilding Nation in 2015, (Erasmus University Rotterdam, 2005). pp.13-17.

6 Michael E. Porter, Page 552.

Third, the Korean War in June 1950 had a rapid impact upon world shipping. As a result freight rates, which had tended to rise when the war began, received an extra boost and by the end of 1950 a full-scale boom was in progress. Japan, like all other nations, gained from the general upturn in world trade, and her geographic position close to the battlefield in Korea gave her economy some additional benefits. The accumulation of the profit at that time was of great significance in the future expansion of many industries with engineering, metal, wood and textiles receiving the largest boost. Shipbuilding, especially, had experienced a momentary prosperity during the Korean War. Their main European rivals were already fully occupied in meeting the sudden boom, so the way was open for the Japanese industry to fill the gap between demand and supply. Moreover, the need to increase the size of tankers to offset the rising cost of carrying crude oil over longer distances from the Persian Gulf to Europe stemmed from the closure to the Suez Canal in June 1956. Because of the closure of Suez Canal, the tankers needed to make a detour around South Africa instead of passing through the Suez Canal, and therefore shipping companies needed larger tankers to offset the increased distances. Japanese shipbuilders cashed in on this opportunity unlike British shipbuilders[7]. The years from the ending of the Korean War in 1953 to the reopening of the Suez Canal in 1957 were crucial ones for the Japanese shipbuilding industry. It was during this period that Japan became the world's largest producer and established herself as an important exporter (Table 3.2).

7 Tim Colton, and Lavar Huntzinger, A brief History of Shipbuilding in Recent Times, (CNA Analysis & Solution,2002).

Table 3.2 Progress of Japanese shipbuilding, 1950-57[8]

Year	Order received (GT)	Percentage occupied by foreign order %	Tonnage completed (GT)
1950	310,354	16	368,370
1951	612,952	38	472,490
1952	486,472	9	541,076
1953	412,140	40	664,037
1954	935,370	69	430,392
1955	2,656,432	86	756,695
1956	2,904,311	64	1,781,058
1957	2,044,861	56	2,355,854

Fourth, in this period, successful development and adoption of block construction, with a transition of shipbuilding method from riveting to welding, enabled Japan's shipbuilding industry to establish economies of scale by constructing large ships and effectively expanding their production capacity. In the 1960s, Japan captured more than 50% of market share in terms of annual completion and strengthened its market leading position. Until 1999, Japan continued to dominate the world shipbuilding market, accounting for 43% of the world completion.

In the 1970s, Korea entered the world shipbuilding market during a shipbuilding boom before the oil crisis. A major investment program was planned, starting with the construction of the world‟s largest shipbuilding facility by Hyundai at Ulsan and just ranked number 70th in 1975. However, there was remarkable change at the end of 1980s. Korea grew rapidly and gained substantial share up to nearly 25%. In the 1990s, Japan suffered from an appreciation of the yen and increased labor costs; Korea benefited from the appreciation of the yen and the depreciation of the Korean won against the U.S. dollar caused by the Asian financial crisis. The weakening of the Korean won increased Korean shipbuilders profitability and enabled them to reduce their bidding prices. With reduced prices and increased capacity, Korean shipbuilders increased their market share from 25% in 1998 to 36% in 2000[9].

---

8 Tomohei Chida, The Japanese Shipping and Shipbuilding Industries, (1990).

9 First Marine Limited International, Overview of the international commercial shipbuilding industry, (First Marine Limited International, 2003).

Then Korea took the first position from Japan since 2000 and has kept the leading position until now. China has become the second largest shipbuilder since 2006. It shows Korea that China will soon establish a strong presence in simpler ship types.

2. Shipbuilding's Main Products

The main categories of merchant ships subdivided by First Marine Limited International[10] are bulk cargo carriers, other cargo carrying ships and niche sectors.

2.1 Bulk cargo carriers

The three main product types are as follows.

• Tankers: the use of the word tanker alone generally refers to oil tanker, carrying either crude oil or oil derivatives such as petroleum, kerosene or naphtha. Generally speaking crude oil moves in large amounts in very large ships which above around 100,000 tonnes dwt and products in smaller „parcels" in smaller ships which up to around 70,000 tonnes dwt but typically in ships carrying up to around 45,000 tonnes.

• Bulk Carriers: normally refers to „dry bulk" cargoes as opposed to tankers that carry „wet bulk" cargoes. The major bulk cargoes, including coal, grain and iron ore, generally move in large quantities up to around 170,000 tonnes. Minor bulk cargoes, including for example animal feed or bulk sugar, are typically transported in ships carrying up to around 50,000 tonnes.

• Container ships: carry containerized cargoes, sometimes referred to as „unitized" cargoes. There are a wide range of sizes of ships on a wide range of routes, typically following an established „hub and feeder" pattern. Very large ships carry boxes on trans-oceanic routes serving the main hub ports in the Far East, Europe, North America and Middle East. Smaller „feeder" ships then distribute the boxes from the main hub ports to local ports. The contents of the boxes are made up of „general cargo", and may include such diverse items as machinery, white goods, clothing, electronic equipment, and so on.

The above three ship types make up by far the largest portion of the fleet and a significant proportion of the output from the shipbuilding industry. These main volume products are normally further sub-divided into distinct sub-classes, as described in table 3.3. The main ship types and sub types listed in this table are

---

[10] Ibid.

according to common industry usage and the terminology used will be found in any documentation relating to the fleet. The main ship type is defined by the function of the ship and the sup types are defined by size classifications demanded by operators of the ship.

Table 3.3 Characteristics of volume ship types

Main type	Sub-type	Summary
Tanker	ULCC / VLCC	Standing for „Ultra-Large Crude Carrier“ and „Very Large Crude Carrier“ referring to tankers carrying above around 200,000 tonnes of cargo. ULCCs over about 400,000 dwt are relatively rare and the typical size of a VLCC is around 300,000 tonnes dwt.
	Suezmax	Referring to the largest tanker that can transit the Suez Canal fully laden, being around 150,000 tonnes dwt.
	Aframax	AFRA stands for „American Freight Rate Association“. This term has become the standard designation of smaller crude oil tankers, typically around 115,000 tonnes dwt.
	Panamax	Panamax refers to the maximum size of ship that can transit the Panama Canal, with a width restriction of 32.2m. This is a relatively new class in the products tanker fleet with a size typically around 70,000 tonnes dwt.
	Handysize / Handymax	Typical products tankers are between around 35,000 dwt and 45,000 dwt. The designation „handysize“ is taken from a similar ship size in the dry bulk fleet.
Bulk carrier	Capesize	Referring to ships that are too large to

		transit the Panama Canal and therefore have to route around Cape Horn. These ships carry major bulk cargoes on long haul routes and are typically around 170,000 tonnes dwt.
	Panamax	The maximum size of ship that can transit the Panama Canal, within the 32.2m width limit. The typical size is around 70,000 tonnes dwt.
	Handysize / Handymax	This is the predominant sector of the dry bulk fleet with ships typically between around 35,000 tonnes dwt and 45,000 tonnes dwt. This class of ship has typically been the „workhorse" of the dry bulk trades and thus earned the designation „handysize". The size of ships in this category has been gradually increasing over the past ten years, hence the relatively recent term handymax, designating a ship larger than traditional handysize. Handymax has no specific limit, as is the case for panamax and suezmax for example.
Container	Post-panamax	Referring to container ships that are too large to transit the Panama Canal. This class of ship tends to work on transoceanic routes and the largest ships now rival VLCC tankers in terms of physical dimensions. The size range is typically around 5,500 TEU up to over 8,000 TEU. The maximum size of ship is continuously increasing.
	Panamax	The largest ship that can transit the

	Feeder	Panama Canal, typically between 3,000 and 4,500 TEU. There is no particular sub-class below panamax size with a very wide range of ships to serve a huge number of routes. The smallest may measure only a few hundred TEU.

2.2 Other cargo-carrying ship types

Unlike the volume market sectors there are fewer distinct classes of ships within the other main types. The main products are described below.

• Chemical tankers: designed to carry relatively small parcels of higher value chemicals, such as acids or polymers. Ships are typically relatively small, up to around 25,000 dwt. Chemical tankers are classed according to categories dictated by the International Maritime Organization (IMO) that classes chemicals according to the level of hazard they represent. IMO class I represents the greatest hazard and requires ships with sophisticated tanks and cargo handling systems, often manufactured from stainless steel. IMO class II represents a lower class of hazard with relatively normal tanks and cargo handling systems. IMO class III refers to low hazard chemicals, such as many petroleum products. There is a blurring of the distinction between products and chemical tankers for these lower classifications.

• LPG tankers: designed to carry liquefied propane or butane under pressure, with typical sizes up to around 25,000 dwt. The level of sophistication in the cargo containment system is relatively high compared to crude oil or petroleum products tankers, but is far below the complexity of an LNG (methane) carrier.

• Roro: an acronym standing for „roll-on-roll-off", referring to the method of loading the cargo on wheeled vehicles or trailers via ramps that lower onto the quayside. Sub types include dedicated vehicle carriers for transport of cars and other vehicles from the manufacturer to the distributor. Such ships can be large and there is no typical size. The characteristics of this ship type are large cargo volume and multiple internal decks. The complexity in building largely arises out of the complexity of the structure, the thin nature of the plate from which the ships are fabricated and sophisticated hydraulic ramps and other cargo loading systems.

• Ferry: designed for transporting passengers and often vehicles in addition, the market divides into three main groups. Roll-on-roll-off (Roro) ferries tend to be large ships, often operating on relatively short routes such as across the English Channel or the between Greek islands. A new generation of ships is emerging for longer routes, known as cruise-ferries that offer a higher standard of passenger accommodation and some of the facilities offered by cruise ships. Finally there are fast ferries that tend to be smaller, may have multiple hulls (catamarans) and are often built from aluminum rather than steel.

2.3 Niche ship types

Construction of niche ship types is restricted to a small number of builders. Entry costs are very high due to high capital costs and a high cost of technology development to meet the demands of these most technologically sophisticated of ship types. The main products are described as follows:

• Cruise: the characteristics that mark cruise ships out from other market sectors are the complexity of the product and the standard of finish required. The size of ships has been increasing over time and the Queen Mary II, currently under construction in France, will be the largest passenger ship ever built at around 140,000 GT. To put this into perspective the Titanic had a GT of around 30,000 tons and a typical modern cruise ship has a GT of around 75,000 tons. The construction has a cycle time measured in years, rather than in months as is the case for bulk ship types, and much of the work involved in construction is related to fitting of public spaces aboard the ship and the complex systems for running the vessel.

• LNG: liquid natural gas (methane) is carried at temperatures of around –160° C and as such presents very significant technical difficulties in the design of the cargo containment system. The ships are large and the potential hazard represented by the cargo dictates that the standards of construction are higher than any other class of ship. Construction is restricted to a small number of licensed builders and entry costs into this sector are very high. Two containment systems have been developed. The original system uses spherical tanks and is based on a design by Moss Rosenberg. These ships are often called „Moss type“ or „spherical type“. The alternative system uses more conventionally shaped tanks based on designs by Gaz Transport or Technigaz, normally referred to as „membrane type“.

For another option, the Korea Shipbuilders Association divides the merchant ships into three categories: cargo ships, passenger ships and special offshore units.

Cargo ships can be categorized by freight they carry, and further by their relative size. As seen in table 3.4 below, Cargo ship products can be broadly divided into wet cargo ships and dry cargo ships. The wet cargo ships, so-called tankers, consist of crude oil tankers, gas carriers, and chemical tankers; the dry cargo ships consist of bulk carriers, container ships, and 6 others. In addition, there are offshore units such as drill-ships, FPSOs, and FSRUs.

Table 3.4 Main product types

Category		Types	Carriage of freight
Cargo	Wet Cargo	Crude Oil Tanker	Crude Oil
		Product Carrier	Oil Derivatives (Petroleum, Kerosene)
		Chemical Tanker	Naphtha
		Gas Carrier	LPG, LNG
	Dry Cargo	Bulk Carrier	Iron Ore, Coal, Gain, Cement
		Container Ship	Container
Passenger		Ferries, Cruise	
Offshore Units		FPSO	Floating Production, Storage and Offloading
		Drillship	Offshore Drilling Unit
		LNG FSRU	Floating Storage & Regasification Unit

Source: The Korea Shipbuilders Association

3. Shipbuilding Production Process

The merchant ship is the world‟s largest factory-produced product with a specific process and additional capacity that can‟t be obtained in the short run. A 30,000 dwt bulk carrier might typically contain 5,000 tons of steel and 2,500 tons of other components ranging from the main engine to many thousands of minor items of cabling, pipes, furniture and fittings. Over half of the cost of the ship is materials. Figure 3.1 shows a rough breakdown of the main items. Steel represents about 13 % of the cost, the main engine 16 % other materials such as fabric and glass 25–35 %. The remainder of the cost is direct labor and overhead. The material content is higher for high outfit ships like cruise liners and lower for simple cargo ships such as large bulk carriers. Because of their size and value, virtually all merchant ships are built to order and the construction period is a long one, falling anywhere in the range 12

months to 3 years, depending on the ship size and the length of order book held by the shipbuilders.

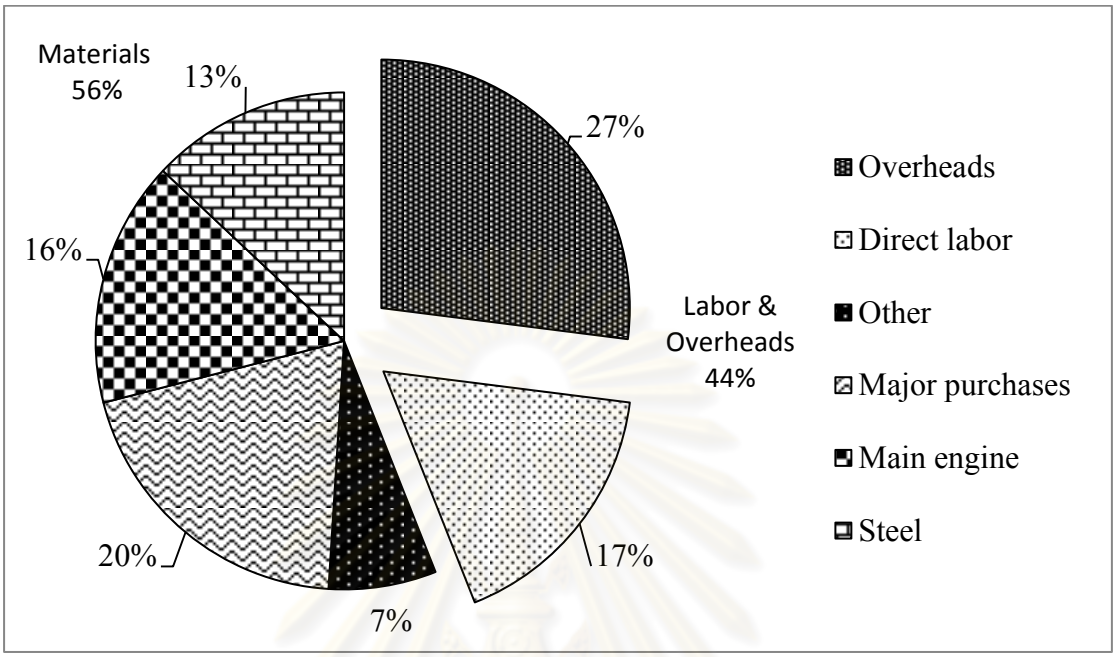


Figure 3.1 Cost structure of merchant ship
Source: Martin Stopford, 1997

The basic structure of the merchant ship is quite simple. The hull is a box built from thin steel plate, reinforced by internal bulkheads and sections to give strength. Within the hull are various items of equipment required to propel and control the ship, handle cargo and monitor performance. The complexity in shipbuilding lies in minimizing the materials and labor required to construct a ship to the structural standards lay down by the Classification Societies who is a non-governmental organization that establishes and maintains technical standards for the construction and operation of ships and offshore structures. The society will also validate that construction is according to these standards and carry out regular surveys in service to ensure compliance with the standards. The way naval architects resolve this problem depends on the nature of the ship. The bulk carrier hull uses steel plate to construct the sides, double bottom, shedding plates, bulkheads and shaped components such as the transverse web. Sections are welded to the flat plate, for example as side or bottom shell longitudinal, to give rigidity. Although this structure looks simple, it is quite complex. The main deck is broken up by hatch openings and the hull derives its

strength from the double-bottom, the shedding plates, the hatch combings and the frames which run along the hull. Into the hull are fitted the many components, main engine, auxiliaries, pipework, control systems, wiring, pumps. The entire structure must be coated with an efficient paint system, offering a long working life with minimum maintenance.

To build ships of this type the production facilities must accommodate three main operations; the design of the ship, the construction of the steel hull, and the outfitting of the hull with machinery, equipment, services and furnishings. These operations are not necessarily sequential and there is considerable overlap. The production process is essentially one of assembly, and few of the individual tasks require sophisticated technical skills. The skill comes in planning and implementing the tens of thousands of operations that contribute to the production of a merchant ship; materials must be ordered and arrive on time; steel parts, fabrication and pipework must fit accurately without the need for re-work. All of this requires considerable effort at the design and planning stage along with a production capability to manage material handling and production planning.

The major steps forward in shipbuilding techniques have been in these areas. For example, the introduction of pallets for material handling and the extensive pre-outfitting and painting of assemblies before installation in the ship. The application of these techniques yields dramatic results. For example, a shipbuilder using these techniques may take only half the man hours required by more traditional methods to build the same ship. In addition, one of the major bottle necks in shipbuilding processes is erection stage in a dock and it takes more than 2 years to build additional dock, improving operational efficiencies in the dock is critical for the shipbuilder to increase profitability. As such, shipbuilders improved operation efficiencies by developing fabrication method to build 4 or 5 ships in a dock at the same time. This can reduce the number of ship blocks fabricated in the dock. Bigger, and thus fewer, blocks enabled shipbuilders to shorten the assembly time. In short, the key to modern shipbuilding is organization.

Table 3.5 Shipbuilding process and building period Unit: Month

Contact	Design	Production			
		Pre-Stage	Yard	Dock	Quay
-Bid Proposal -Discussion on the Specifications and Agreement	-Basic -Detailed -Production	-Production Plan -Procurement	-Steel Cutting -Block Assembly -Pre-Outfitting -Painting	-Erection -Launching	-Outfitting -Trial Run -Delivery
Large Containers	11.0		4.5	2.5	3.0
LNG Carriers	12.0		5.5	2.0	8.5
Drill-ships	12.0		5.5	1.5	10.0

Source: IR reports

3. Major Shipbuilders

Since 1950s, the shipbuilding major players had moved to Asia until now and the competitive market in Asia is extremely high. Table 3.6 below provides the distribution of order book reported in the main shipbuilding countries and shipbuilders at the end of 2009. In 2009, China achieved 35% market share, and slightly surpassed Korea in terms of order book. Compared to 2000 statistics where China's market share was only 7%, the 35% market share is a result of substantial growth.

Table 3.6 Order book by countries and shipbuilders in 2009

Rank	Country	Mil. CGT	%	Company	Country	Ship	Mil. CGT	%
1	China	54.7	34.9	Hyundai H.I	Korea	219	8.6	5.5
2	Korea	53.8	34.3	Samsung H.I	Korea	179	8.4	5.4
3	Japan	24.3	15.5	Daewoo	Korea	174	8.1	5.2
4	Philippines	2.5	1.6	STX	Korea	168	4.8	3.1
5	Vietnam	2.3	1.5	H. Mipo	Korea	203	4.2	2.7
6	India	2.2	1.4	H. Samho	Korea	113	4.2	2.7
7	Germany	2.0	1.3	Dalian	China	105	3.4	2.2
8	Italy	1.6	1.0	Jiangnan	China	109	3.0	1.9
9	Brazil	1.3	0.8	Jiangsu	China	81	2.7	1.7
10	Turkey	1.3	0.8	Sungdong	Korea	85	2.4	1.5
	Other	5.2	3.3	Other		6,832	106.9	68.2
	Total	156.7	100	Total		8,268	156.7	100

Source: Clarkson

However, the world shipbuilding market is still dominated by Korean big players. Their production capacities are almost two times greater than other shipbuilders' capacities in China and Japan. It means that Korean shipbuilders enjoy more competitive advantages by economies of scale than other shipbuilders in China and Japan. Furthermore, an average CGT (Compensated Gross Tonnage) per ship of Korean shipbuilders' order book is 28,600 which is 1.7 times greater than that of Chinese shipbuilders', 16,800. Considering the concept of CGT, Korean shipbuilders are building 1.7 times more complicated or bigger size vessels than Chinese shipbuilders.

Even though the shipbuilding industry has experienced geographic leadership changes, Europe, Japan, Korea, and China still have their competitive advantages in specific product categories. The figure 2.2 below graphically provides the major products they build and relative size and complexity of ships.

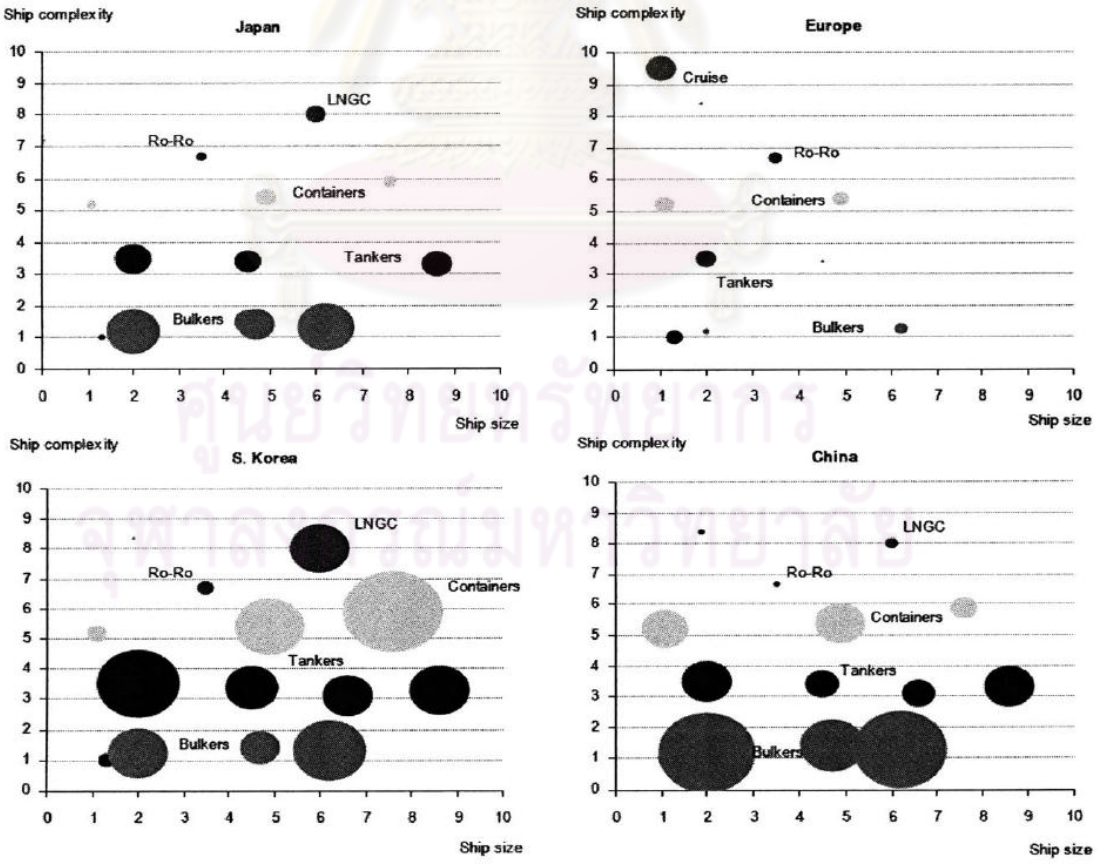


Figure 3.2 Order book mixes by region

Source: Clarkson

Chinese shipbuilders' major product category is bulkers; Korean shipbuilders' major product categories are tankers, containers, and gas carriers. In containers, economies of scale in shipbuilding costs and shipping costs per TEU lead ship buyers to place orders of large containers. Korean shipbuilders concentrate only on large containers, because a handful of Korean shipbuilders are able to build them, and therefore price competitions in large containers are not as severe as those in bulkers and medium-sized containers. Despite high labor costs, Europe still has a strong presence in cruise ships, and this simple fact speaks of where the business opportunity lies for Korean shipbuilders.

CHAPTER IV

MAJOR ENVIRONMENTAL FACTORS FOR PERFORMANCE

In this chapter, major environmental factors which affects shipbuilding industry"s performance will be divided into four factors according to the PEST model; political/regulatory, economic, social and cultural and technological factors. These factors can explain the Korea shipbuilding environment and can use to indicate in SWOT model.

1. Political/Regulatory Factors

There is a unique characteristic in the industry, market share of the shipbuilding in a nation are closely related to the policies the government employs. When the government adopts the policy to encourage the shipbuilding business, the market share of the shipbuilding industry could be, to certain extent, maintained or even enlarged. Before 1970, the shipbuilding industry in Korea was virtually non-existent. From 1945-1970 the only shipbuilding activities carried out by the stat-owned enterprise names Korea Shipbuilding and Engineering Corporation (KSEC). In the 1970s shipbuilding was selected as a targeted sector by the interventionist central government led by Park Chung-hee. In order to close the industrial and technological gap with the West, South Korea followed the route of this developmental or plan-rational state, rather than market-rational or plan-ideological state, characterized by a strong authoritarian, which deliberately and strategically supported large enterprises and industrial competitiveness[1].

Industrial policy was particularly prominent in the 1970s and shipbuilding was one of the prototypic industries supported by this policy. The policy debuted in Five Year Plans, in which promising strategic industries were identified as a financial and technical support targets. By having large control over the financial sector, the government was able to channel investment funds to these industries. In return for the support priority industries received from the government, they were also heavily

---

[1] Jeffrey Henderson, "The Role of the State in the Economic Transformation of East Asia," in Economic and social development in Pacific Asia, Dixon, C., D. Drakakis-Smith, editor (London: Routledge, 1993).

controlled by the state. The heavy and chemical industrialization (HCI) drive, which was launched in the third and fourth Five Year Plan (1971-1981), can be regarded as the most prominent example of supporting 'promising strategic industries' in Five Year Plans. It was at this time that the state set up the shipbuilding industry.

After Park‟s declaration of heavy and chemical industrial promotion, the government started on taking specific measures for inducing businessmen‟s investment in the HCIs. The state managers relied mainly on such financial supports as public financial investment and loans, bank policy loans, and foreign loans and direct foreign investment. Additionally, they took advantage of tax reduction and exemption for heavy and chemical industrial firms, infrastructure investments for industrial complexes, and quantitative import restriction and tariff protection for heavy and chemical industrial products which shows in Figure 4.1.

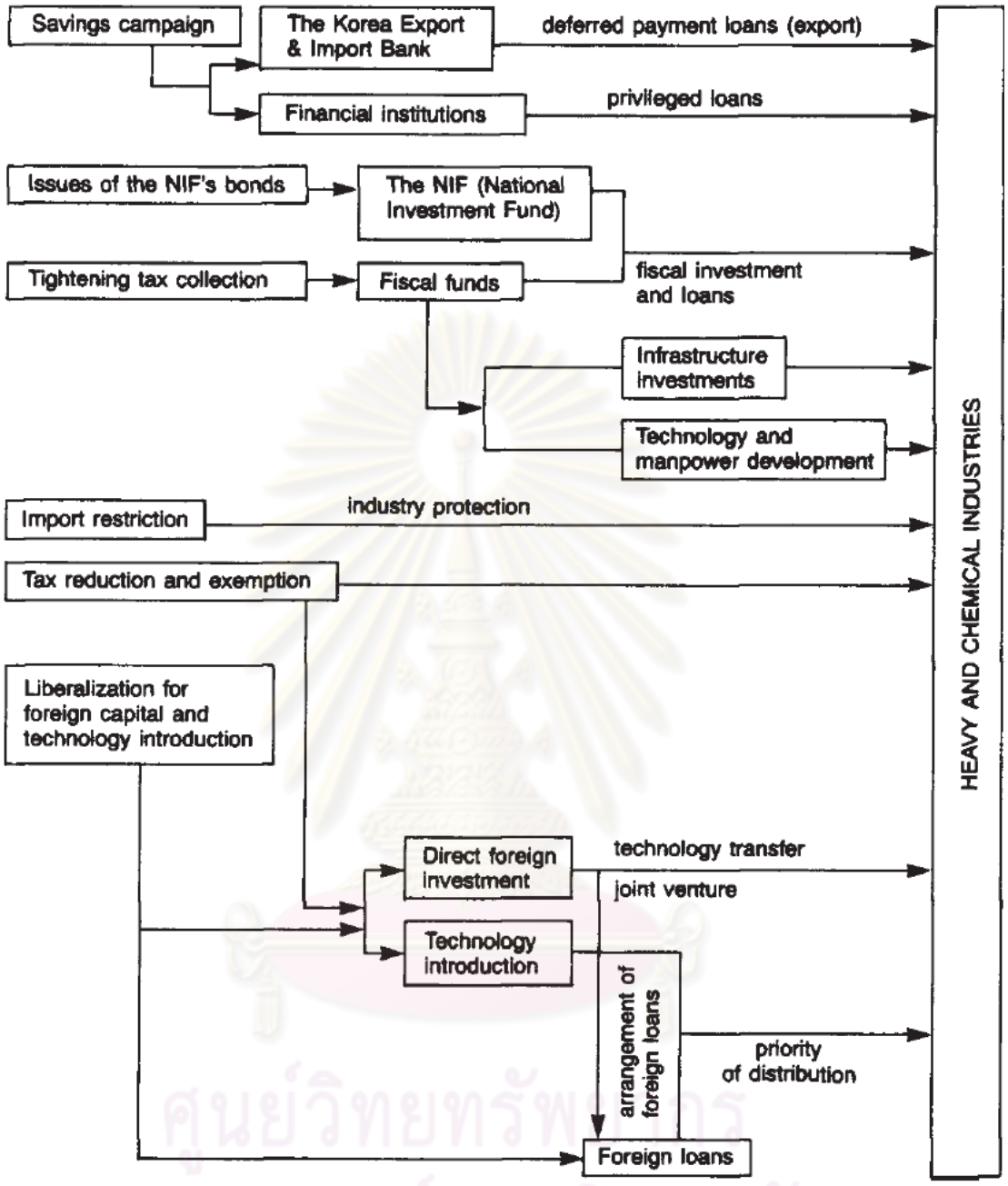


Figure 4.1 Support policies for heavy and chemical industries

Source: Lim Jin-sook[2]

[2] Lim Jin-sook, "State-Capital Relationships in Peripherals Capitalism: The Korean Policy of Heavy and Chemical Industrailization," (Master"s Thesis, Seoul National University, 1985), p. 54.

1. Direct subsidies from government"s policy

- Domestic capital

The most essential domestic financial resources for heavy and chemical industrialization had been preferential policy loans and the National Investment Fund (NIF), whose law was enacted in January 1974. The major sources of the NIF had been issues of the NIF"s bonds, government expenditure, and temporary loans from the Bank of Korea. The NIF"s bonds would be acquired mainly by compulsory deposits from financial institutions, national savings associations, insurance and trust companies, the planned National Welfare Pension Fund, and various public funds managed by central and local governments and other public organizations. The NIF had been used for heavy and chemical industrial facilities and operation funds and for funds for industrial complex construction. During the period of 1974–79, an average of 59 percent of the total NIF had been invested in the HCIs[3].

- Foreign capital

During the 1970s, a massive amount of foreign capital of which over 90 percent was loans had flowed into the Korean economy. During the period of 1973–79, the Economic Planning Board (EPB) had allocated 32 percent of the total foreign loans to the HCIs, of which payments were guaranteed by the Korea Development Bank (KDB) and other banking institutions. In particular, public foreign loans had increased rapidly to finance infrastructure investments in heavy and chemical industrial estates[4].

Foreign borrowings had been screened and approved, guaranteed, and directly or indirectly distributed by the government. The state-controlled inducement of international borrowings resulted in further state intervention in domestic credit allocation to the HCIs. The largest business groups were the largest users of foreign loans, for examples of foreign loans for shipbuilding, see Table 4.1. Foreign loans had brought privileged benefits to the borrowers. Interest rates of foreign loans were below 10 percent and lower than domestic bank lending interest rates from 15.5

---

[3] Choi Byung-Sun, "Institutionalizing a Liberal Economic Order in Korea: The Strategic Management of Economic Change," Ph.D. Diss. (Harvard University, 1987), pp. 23–25.

[4] Choi Byung-Sun, pp.120-121.

percent to 19.0 percent. Their real interest rates were negative due to the rate of inflation from 13.4 percent to 29.5 percent[5].

Table 4.1 Major foreign loan projects for shipbuilding 1971-1985

Loan Recipient	Projects	Country Providing Loan	Contract Value (Million)	Year of Contract Validation
Hyundai Heavy Industry	Ulsan Shipyard construction	UK, German, Spain, France, Sweden	50 USD	1971-72
Daewoo Shipbuilding & Heavy Machinery	Okp‟o Shipyard construction and machine purchase	UK, Sweden, Denmark, Finland	30 USD	1978
Daewoo Shipbuilding & Heavy Machinery	Okp‟o Shipyard construction and machine purchase	Hong Kong	30 USD	1980
KSEC	Construction of export ships	Hong Kong	31 USD	1981

Source: Gabriel Jonsson[6]

As previous information, the priority shipbuilding industries were heavily controlled by the state in return for governmental support. The government‟s aim to support industries with a certain minimum scale of efficient production led to the intentional creation of chaebol. As all chaebol diversified in the same kind of industries, they competed fiercely with each other, also to bid for governmental support. Despite their wide diversification, chaebol were characterized by a hierarchical, top-down style of management and a high degree of central control. Shipbuilding was set up by the chaebol in close co-operation with the central

5 Park Byung-yun, Chaebols and Politics, (Seoul: Hankook Yangsu Pres, 1982), pp. 209-13.

6 Gabriel Jonsson, Shipbuilding in South Korea: A Comparative Study (Stockholm East Asian Monographs, Stockholm: Stockholm University, 1995). Page 80.

government. Hyundai Heavy Industry, the pioneer who supported by government, started target to build large ships by investing in larger docks and facilities at Ulsan. The shipyard clearly focused on the building of VLCCs. The successful story of Hyundai Shipyard induced other Korean shipbuilders to commit tons of money for shipyard extension. After nearly 20 years‟ development, five mega-shipbuilders appeared in this country in 1990s. Also of great importance was the promotion of steel industry through the state-owned Pohang Iron and Steel Company (POSCO). The shipbuilding industry gave POSCO increased economies of scale and POSCO gave the shipbuilding industry steel as a vital input at comparatively low price.

After the shipbuilding industries ran in a stable position which led by heavy financial supported chaebol, the policy shift from industry to technology policy led to a sharp increase in R&D expenditure levels in general from the 1980s to 1990s and most of the project spent by the private sector. In addition, the Shipbuilding Industry Promotion Act was repealed in 1986. This was following the abolishment of the government‟s former industrial policy, which had separate policies for each industry. Since then, the shipbuilding industry has been treated in the same way as other industries without any particular treatment or support. The focus of government‟s role is to establish infrastructure necessary to the whole industry in common, as well as the institutional basis to promote fair competition. Also, due to the increasing number of rules being created in the international market, the government is also expanding activities in international organizations and enhancing its role as an active rule-maker.

Korea is playing an increasingly active role as a rule-maker for regulations in the international shipbuilding industry by engaging in various conferences and rule-making sessions. Korea continues to be an active participant in bilateral and multilateral forums with other major shipbuilding nations, despite the suspension of the New Shipbuilding Agreement Negotiations in September 2005. With the increasing influence of international safety and environment regulations on the industry, Korea is expanding public private participation in the International Maritime Organization (IMO), International Organization for Standardization (ISO), International Association of Classification Societies (IACS), and other international channels.

2. Economic Factors

2.1 Exchange rate

Since the world economy moved to floating exchange rates after the breakdown of the Bretton Woods system in 1971, shipbuilders have faced a major problem with exchange rates. Unit costs vary proportionately with the exchange rate and most of shipbuilding contracts are made by U.S. dollar basis, the exchange rate between local currency and U.S. dollar is an essential factor for shipbuilders. Moreover, the importance of hedging exchange rate is amplified when shipbuilders sign foreign currency based contracts and procure materials and equipment in local currency from domestic suppliers. Net exposure of currency risks increases because of no opportunity to automatically offset foreign currency inflow by outflow. Therefore, of late, most of Korean shipbuilders are trying to cover currency risks by taking long or short positions in derivatives or shifting the contract basis from the U.S dollar to the local currency.

However, the spot exchange rate on the contract date is critical for shipbuilders' profitability even though they hedge currency risks. When a shipbuilder enters a forward contract on the contract date, the forward exchange rate of derivatives inherently reflects the spot exchange rate on the contract date. For instance, the forward exchange rate is higher when the spot exchange rate is 1,200 Won/$ rather than 800 Won/$.

Because of the depreciation of Korean won caused by Asian crisis that occurred in mid-1997, Korean shipbuilders gained huge profits by entering U.S. dollar short forward contract. The Korean won, meanwhile, weakened to more than 1,700 won per dollar from around 800 won per dollar. At the same period, however, the exchange rate for Japanese yen to U.S. dollar increased only 20%. Even though the Korean economy suffered severely from Asian financial crisis, Korean shipbuilding industry, on the contrary, benefited from the decline in currency. Korean shipbuilders could increase their sales and profits from the new contracts that were signed at the high exchange rate. As such, during that period, Korea took the market lead by winning over a portion of the market of Japanese shipbuilders.

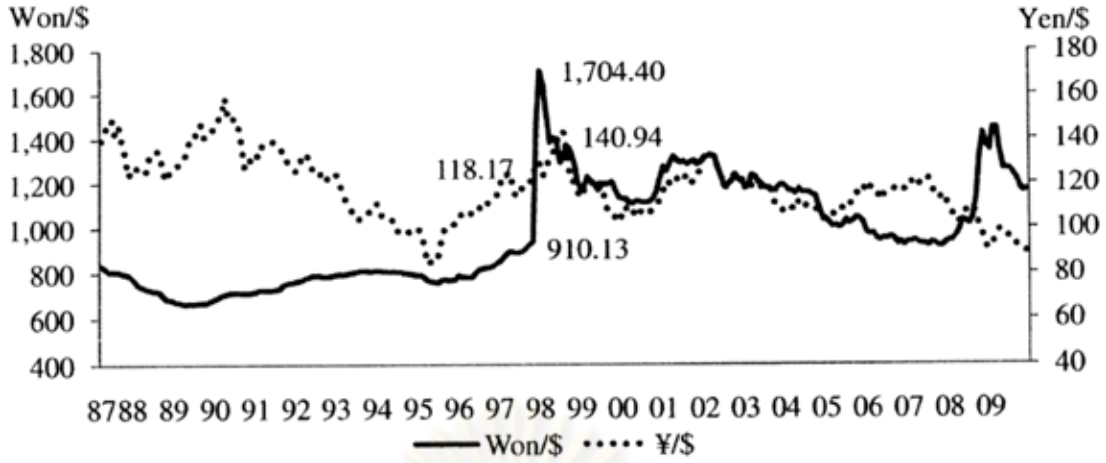


Figure 4.2 Exchange rates to the U.S. dollar

Source: The Bank of Korea

2.2 Global growth rate and seaborne trade

GDP, seaborne trade, and shipbuilding price were closely related. In the fact, overall GDP growth rate impacted the volume of seaborne trade and sequentially, the volume of trade affected the shipbuilding demand and price. As a result, as shown in figure 4.3 below, the degree of their volatilities, so-called standard deviations, increased in an order of GDP, seaborne trade, and shipbuilding price index. The standard deviation of shipbuilding price index is 11.0%, 8 times greater than that of GDP, 1.4%.

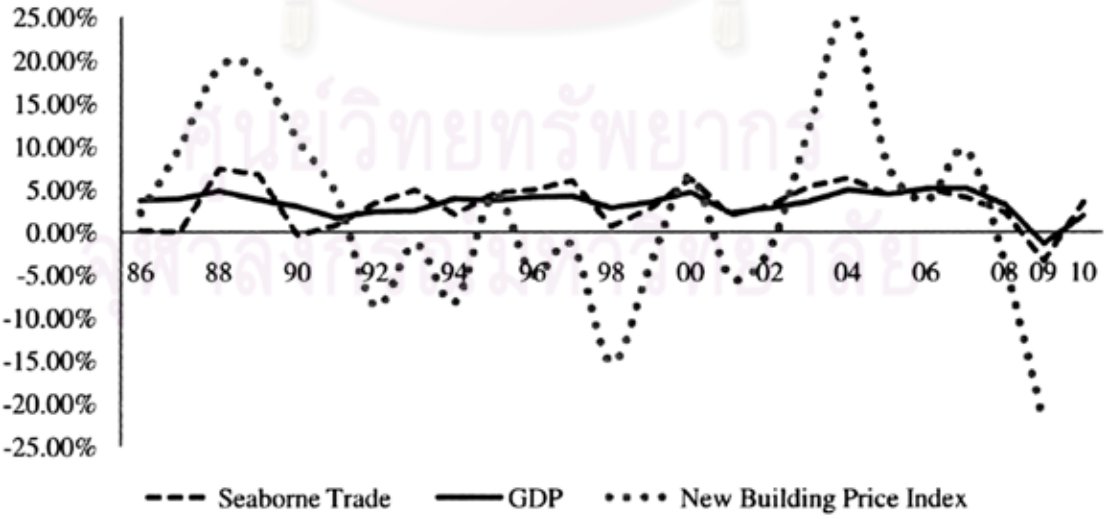


Figure 4.3 Correlation among GDP, seaborne trade, and shipbuilding price index

Source: Clarkson, IMF, Korea Maritime Institute

2.3 Steel price

The main portion of shipbuilding costs is material costs that can be divided into steel and equipment costs. As such, the increase of steel price can have a detrimental effect on the profit of shipbuilders. Steel costs are approximately 15% of COGS and 13% of sales, which means that a 10% increase in steel price can decrease gross margin by 1.3%. Unlike exchange ratio, steel is a difficult commodity for the shipbuilder to hedge against the volatility of the price.

However steel is also supplied from within the region. There are major 10 players in South Korea, with POSCO accounting for roughly 60% of output. The world‟s largest steel producer, POSCO, is namely located in Pohang, north of Ulsan. It secures material price advantages over the European shipbuilding industry on the basis of its productive efficiency. In addition, large Korean yards, such as Hyundai, which order 90% of their steel demand at POSCO, secure further price advantages[7].

2.4 Oil price

In the 2000s, because of the Iraq War, Hurricane Katrina, and concerns about the shortage of oil, oil prices skyrocketed up to $150 per barrel. This rise in oil prices had both a positive and a negative effect toward the major shipbuilders in Korea. The positive effect was that oil majors, with an optimistic aspect of high oil prices, awarded a lot of offshore plant and drillship contracts and Korean shipbuilders won most of these contracts. HHI, for instance, accomplished 11% increase in offshore division's sales in 2009, and extended offshore division's sales portion up to 16% of total sales.

In the meantime, considering the fact that oil is needed to operate facilities and to test driving performance before delivery, the rise in oil prices can be a cost burden to the shipbuilders. Also, the high oil price can reduce the volume of seaborne trade and sequentially, the reduced seaborne trade will affect the demand for shipbuilding.

---

7 Eich-Born, M. and Hassink, R. “On the Battle between Shipbuilding Regions in Germany and South Korea”, Environment and Planning A, Vol. 37(2005).

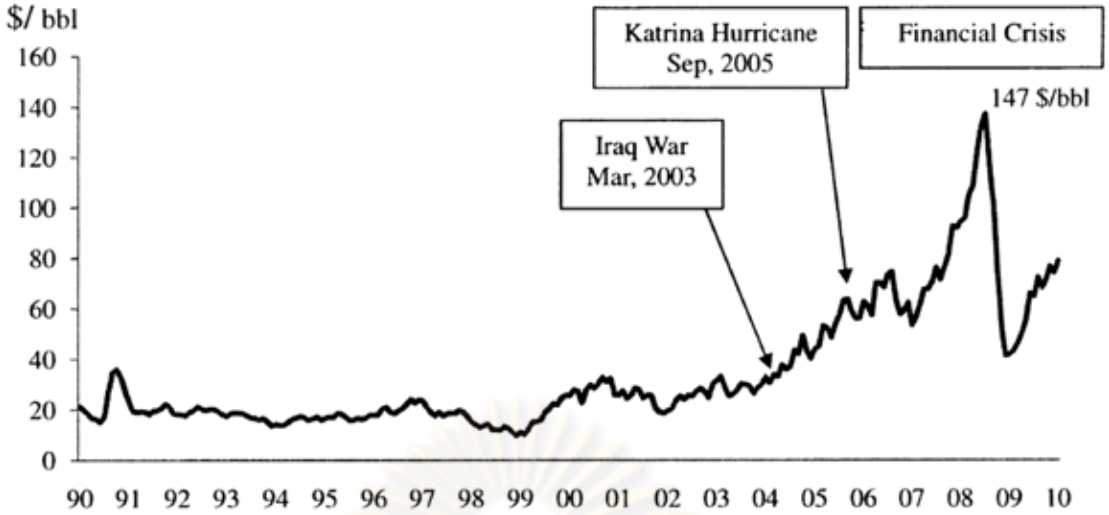


Figure 4.4 Crude oil prices

Source: Korean Ministry of Knowledge Economy

2.5 Domestic Shipping Industry

The shipbuilding industry has been heavily affected by seaborne trade influenced by the global economic growth as see in Figure 4.5. On the other hand, if domestic shipping industry owns a large number of ships, the oscillation of the domestic shipbuilders' performance will be decreased and shipbuilding industry will be strengthened.

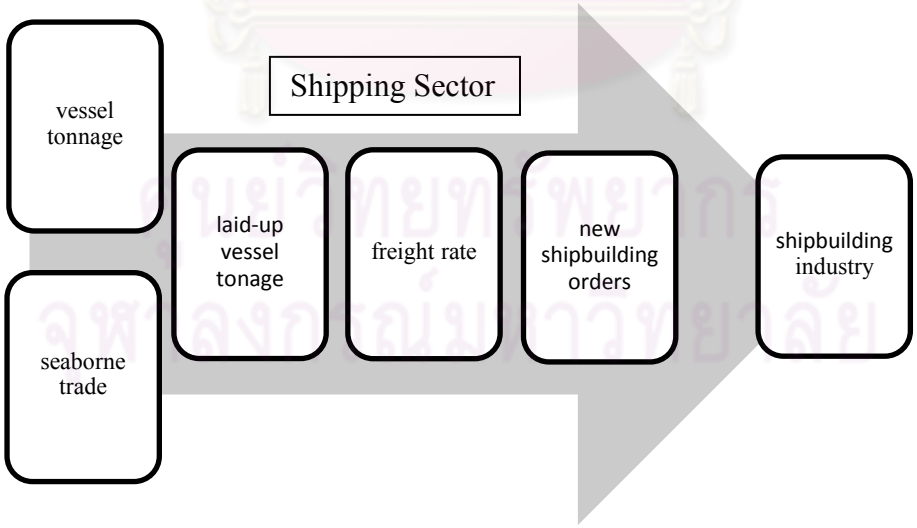


Figure 4.5 Correlation of shipping and shipbuilding industry

Government support to shipbuilding has been provided in various direct and indirect ways, including government ownership of shipyards, provision of building

subsidies and planned shipbuilding for domestic shipping companies. The good example is in Japan, in 2009, 43% of Japanese shipbuilders‟ order booked came from the domestic shipping companies and this portion is expected to increase.

Table 4.2 Domestic portion in the order book

	Japan	Korea	China
Domestic Portion	43%	7%	23%
(Rank)	1	3	1

Source: The Shipbuilder‟s Association of Japan

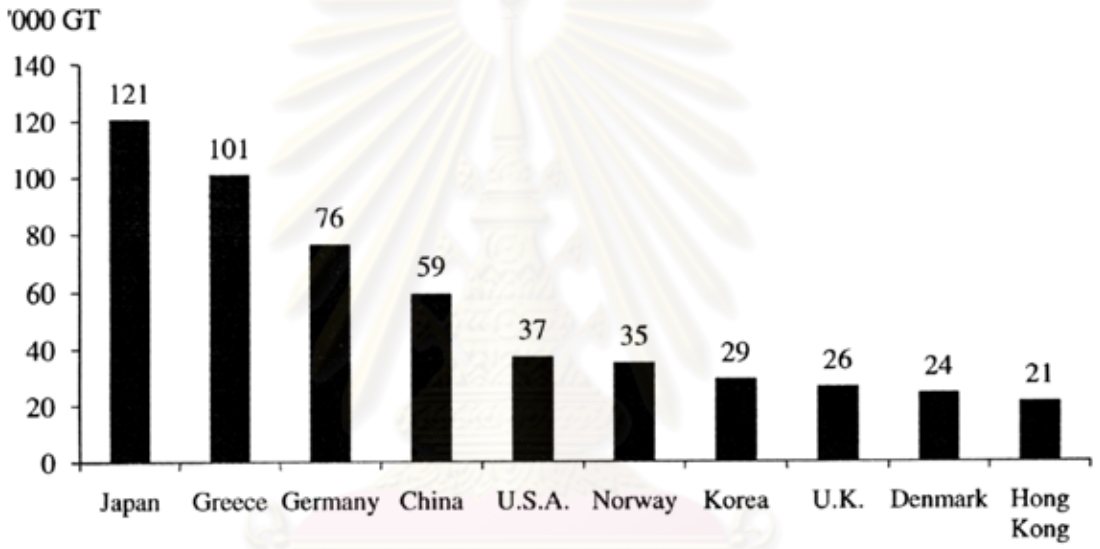


Figure 4.6 World fleet by nationality of owners

Source: Lloyd‟s Register of Shipping, 2008

3. Social and Cultural Factors

3.1 Workforce

The shipbuilding industry is labor-, capital-, and technology-intensive and very closely connected with other industries. As an export-oriented industry, the shipbuilding industry has made a significant contribution to national development in Korea. In the past, South Korea developed its economy, focusing on the development of heavy industry. The shipbuilding industry has great variety with respect to the type of and materials used for vessels. The manufacturing process is discontinuous, while the standardization of vessel components is still required. The shipbuilding process is

very complicated, being comprised of various stages from receiving ship orders to delivering the ship.

As the shipbuilding industry is characterized as labor intensive, a skilled workforce is the first requirement for shipbuilders to increase their competitive edge. The most important factors in evaluating the workforce are as follows: total number of workers, skill level of workers, constant supply of workers, and average age of workers. Especially, since the shipbuilding industry's workers acquire technical skills by training and field experiences, maintaining a constant supply of workers and low average age are the best ways to prevent productivity from decreasing. One of the most important supplies for skilled and young labor is education. As shows in Figure 4.7, the ministry of education, science and technology gave the quota for the field of engineer which relate to the industry in 22.4%. This can sufficient provided the enough number of skilled but young work forces to drive competitiveness.

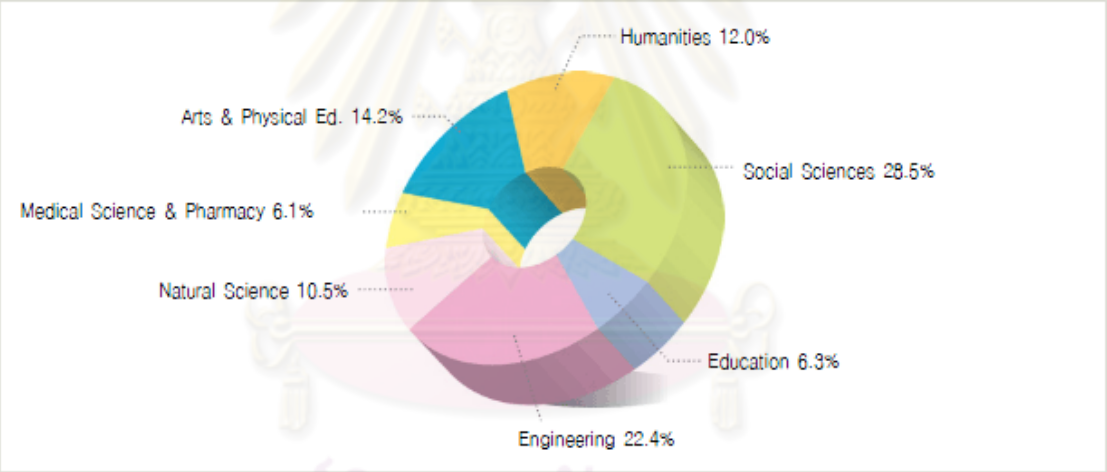


Figure 4.7 Freshmen quota by type of institution / field of study
Source: Ministry of Education, Science and Technology, 2007

By the supporting from the education system, the employees in the shipbuilding industry have increased in response to the changes in annual production level. As shown in Figure 4.8 below, the number of employees of the nine major Korean shipbuilders has gone up to 101,632 at 8.5% Compound Annual Growth Rate (CAGR). If small and medium sized shipbuilders' and equipment suppliers' employees are included, the total number of employees who are working in shipbuilding industry will be more than twice of the figure below.

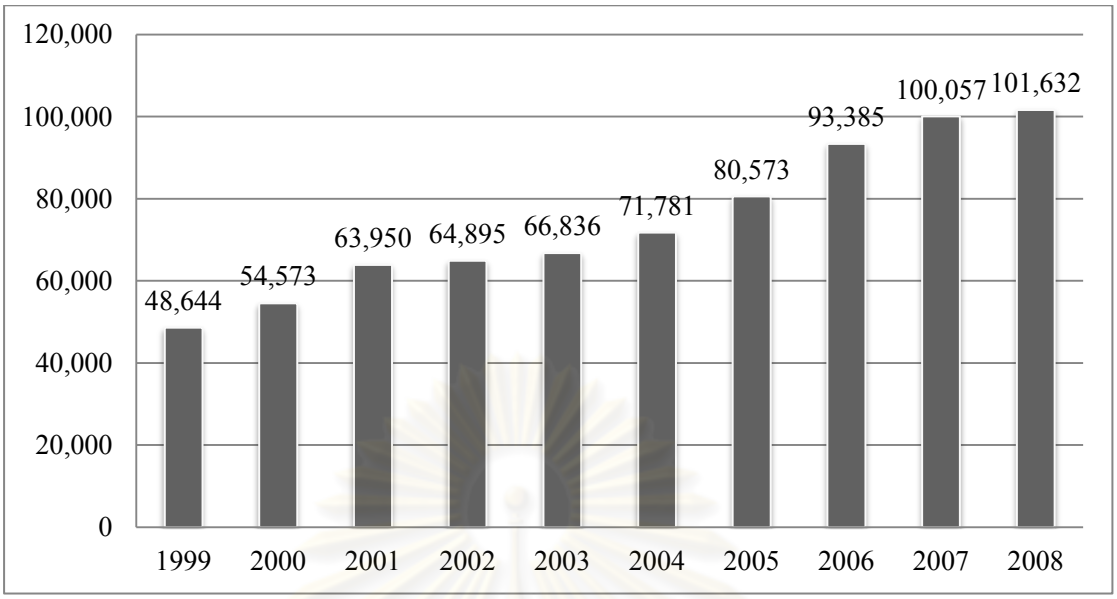


Figure 4.8 Employees in nine major Korea shipbuilders
Source: The Korea Shipbuilders‟ Association (KOSHIPA)

In detail observation, the overall composition of employees can be divided into design, production, management, and outsourcing part. As shown in Figure 4.8, design employees consist of approximately 10% of total employees and indirect employees who are working at management, sales, and procurement department decreased from 8% to 4%. The reduced proportion of indirect employees can be explained by economies of scale in an organization and enhancement of management system. Moreover, production workers including outsourced workers have increased from 80% to 84%. However, the composition of production workers has changed totally and, as a result, the portion of outsourced workers increased from 26% to 55%.

This was the outcome of Korean shipbuilders' efforts to raise flexibility in the production workforce and to reduce labor costs. Considering the fluctuation in the shipbuilding industry and the rigid labor market, it must have been a strain for Korean shipbuilders to increase internal production workers.

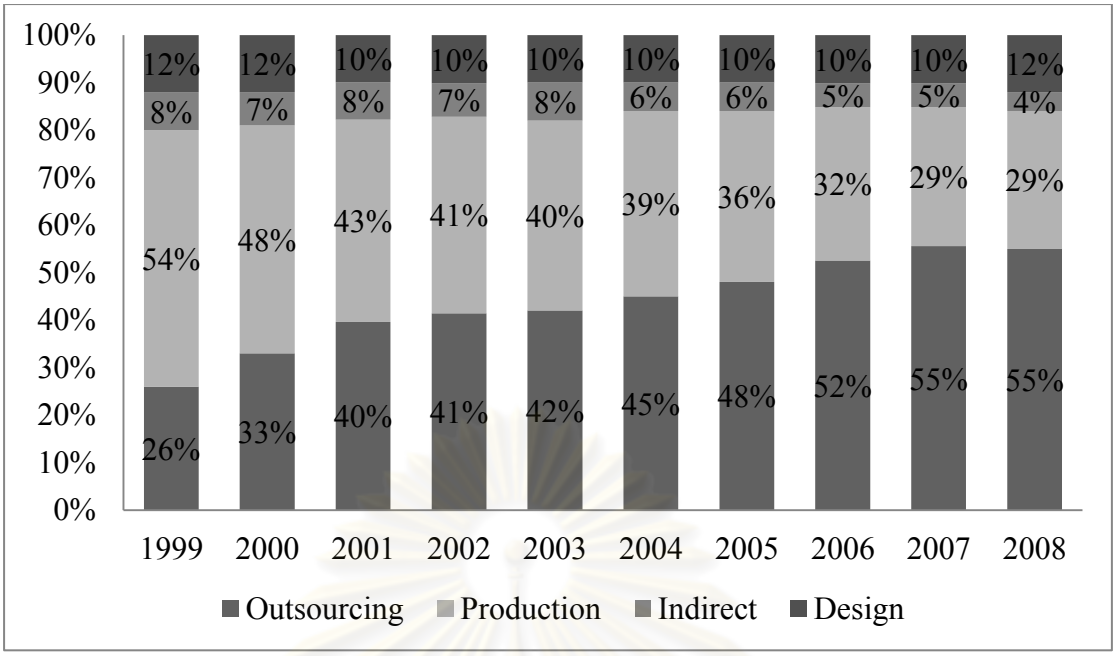


Figure 4.9 Composition of employees

Source: The Korea Shipbuilders‟ Association

Over six years, the average salary of employees in shipbuilding companies has increased at a 7.8% CAGR; the average sales revenue per person in shipbuilding companies has increased at a 15.4% CAGR. This means that the portion of labor costs out of sales has decreased. However, 15.4% annual increase of sales per employee doesn't simply indicate a huge productivity improvement because the increased outsourced employees are not counted.

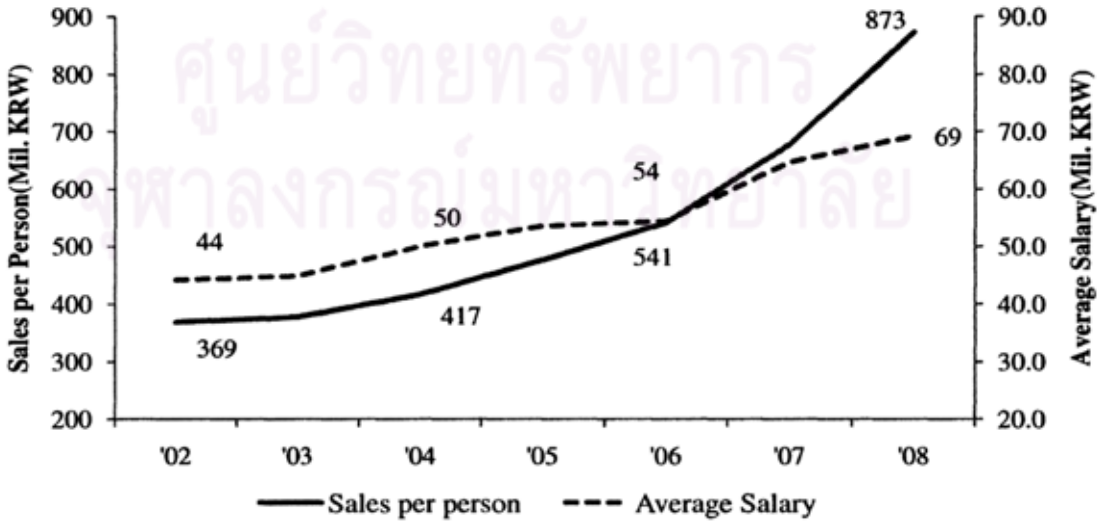


Figure 4.10 Average salary & sales per employees

Source: Annual Report of HHI, SHI, DSME, STX

China has a competitive advantage in labor costs because of abundant cheap workforce. As shown in Table 4.3, for Korean shipbuilders, 24% of total manufacturing costs are labor costs; while it is only 15% for Chinese shipbuilders. Regularly, labor productivity is measured by output per labor hour. However, considering the difference in wages between Korea and China, labor productivity should be compared in terms of output per wage. In this regard, Korean shipbuilders still spend 45% more on labor costs in building mid-sized bulk carriers. This is why Korean shipbuilders are losing their presence in the bulk carrier market. Also, strategically, this table shows that there is no reason for big Korean shipbuilders to stay in the bulk carrier market except for implementing marginal business to fill in the plant.

Table 4.3 Comparison of labor costs between Korea and China

		Korea (A)	China (B)	(A-B)/B
Percentage of Labor Costs in Cost Structure		24%	15%	60%
Panamax Bulk Carrier	Labor Cost (Mil. $)	24.2	16.7	45%
	Labor Hours (,000)	278	334	-17%
	Wage ($/Hour)	87	50	74%

Source: The Korea Shipbuilders‟ Association, J.P. Morgan

3.2 Environment

Another topic which should be concerned is environmental issue. Even shipbuilding industry brings huge revenues to countries and directly influences the welfare of the people by affecting the GDP. However, there are some negative effects the industry has on the environment. Despite this importance, the industry„s environmental credentials are relatively unknown in the public domain, and apart from some catastrophic oil spills there has been little focus on its environmental impact; especially when compared to other industries such as the air and ground transportation sectors.

In international aspect, as mention in political and regulatory factors, by the increasing influence of international safety and environment regulations on the industry, this had gave the International Maritime Organization (IMO) the important

role. The IMO is a specialized agency of the United Nations which is responsible for measures to improve the safety and security of international shipping and to prevent marine pollution from ships. It is also involved in legal matters, including liability and compensation issues and the facilitation of international maritime traffic[8]. The IMO regulates the ship owners in the field of environmental safety and shipbuilding industries also have to accept the ship owners" requirements.

The new trend that global shipbuilder should concern are fuel efficiency and lower carbon dioxide (CO_2) emissions. Even compared to air and ground transport, the environmental impact of shipping has received relatively little attention except from obvious oil spills. The primary reason for this is that shipping is generally considered to be more energy-efficient than other transport sectors and this has partially shielded it from greater attention being paid to its core activities. For example, shipping produces considerably less CO_2 emissions per ton/km than other transport modes as show in Figure 4.11.

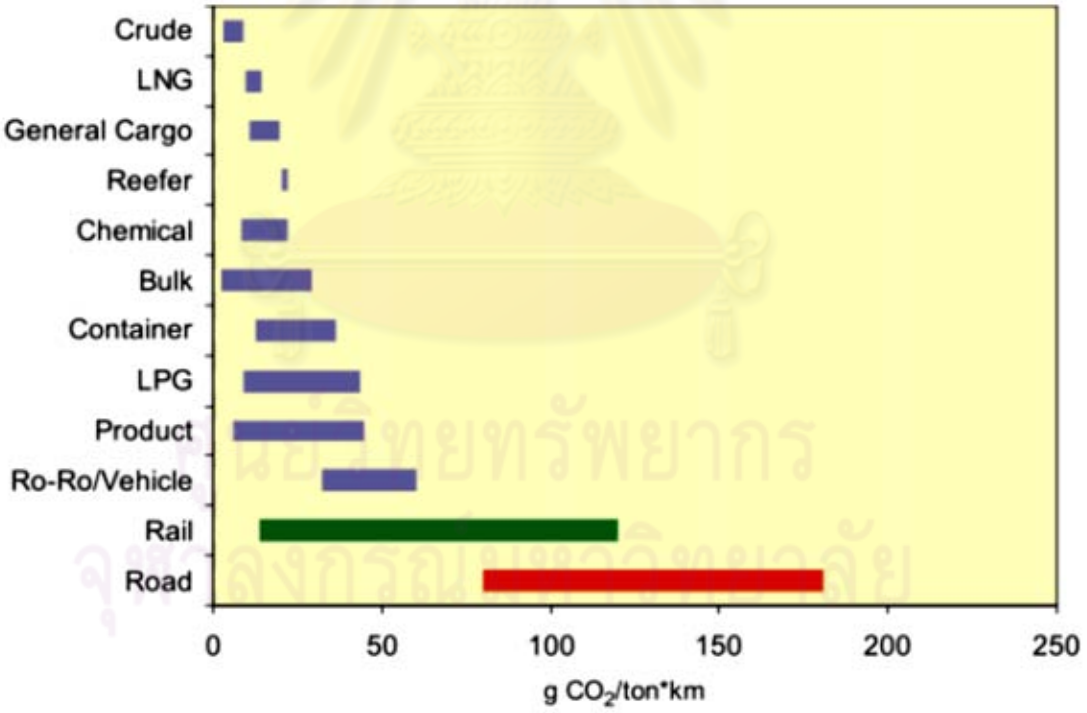


Figure 4.11 Typical ranges of CO_2 efficiencies of ships compared with ground transportation (Source: International Maritime Organization[9])

---

[8] IMO, About IMO [Online], 7 March 2011. Source http://www.imo.org/About/Pages/Default.aspx

[9] IMO, Second IMO Greenhouse Gas Study 2009, (International Maritime Organization: 2009).

However, growing environmental concerns, particularly over climate change are likely to intensify attention on maritime transport over the recent year. The proposed greenhouse gas regulation by IMO, from 2015 is expected to force shipping companies to buy more fuel-efficient vessels. The IMO will likely regulate CO_2 emissions through greenhouse gas (GHG) fund starting 2015 by forcing shipping firms to trade carbon credit. For example, a shipping line with poor fuel efficiency should pay 450 dollars for bunker prices as well as 150 dollars for carbon tax imposed by the GHG fund. The fund gives the received carbon tax to other shipping firms with better fuel efficiency as incentives. All in all, fuel- efficient shipping companies pay only 300 dollars with the help of 150-dollar incentive while non-fuel-efficient companies pay 600 dollars for fuel prices and carbon tax.

Hence, shippers and shipbuilders are likely to meet increasing pressures and requirements for higher environmental standards. Some Korean shipbuilders have already been on the move to meet increasing demand for fuel-efficient vessels. Hyundai Heavy Industries has developed a shaft generator that can alone result in fuel savings of up to 7 percent. STX Offshore and Shipbuilding received Energy Efficiency Design Index (EEDI) certification and proved its fuel efficiency is 20 percent better than existing vessels. New building contracts are subject to required EEDI with CO_2 reductions by 10 percent from 2015, by 20 percent from 2020 and by 35 percent from 2025 respectively[10].

In national aspect, The Republic of Korea"s carbon emissions have increased significantly during the past 20 years, making Korea one of the countries with the fastest growth of carbon emissions as shows in Table 4.4 These causes and consequences of climate change require urgent responses both with regard to mitigation of, and adaptation to climate change, including by injecting supplementary investments to lessen the damage caused by climate change.

10 Yoo Seungki, "S.Korean shipbuilding industry under massive restructuring," Xinhua [Online], 7 February 2011. Source http://news.xinhuanet.com/english2010/indepth/2011-02/07/c_13721505.htm

Table 4.4 Korea CO2 emissions in 2007

Country	CO_2 emissions	Percent change since 1990	CO_2 emissions per capita	CO_2 emissions per km^2
	mio. tonnes	%	tonnes	tonnes
Korea, Republic of	503.32	108.2	10.49	5,049.47

Source: United Nation

In responding to these challenges, Korean leaders are focusing efforts on the development of environmentally-friendly industries and technologies in order to stimulate the economy through additional investment, innovation, and employment generation, while having minimal adverse effects on the environment. In this context, President Lee Myung-Bak announced a low-carbon, green growth strategy as a new vision to guide the nation‟s long-term development in 2008. The Korean government has presented its Green Growth Vision as an innovative development approach involving a fundamental shift in the country‟s growth paradigm, from quantitative growth to qualitative growth. The new vision is based on a long-term strategy of green growth up to 2050, which is implemented through Five-Year Plans for Green Growth[11].

The main objectives of Green Growth strategy can be divided into three points. First, one of the main objectives of the green growth strategy is to create new engines of growth on multiple fronts with the aim of creating new investment opportunities. Second, the greening of key industries in the Korean economy is another important aspect of the envisaged shift. This involves a transformation of production processes in the steel, fiber and textile, petro-chemicals and the shipbuilding industries to increase resource and energy efficiency. In particular, the Korean Government is focusing its efforts to increase investment in research and development in addition to the upgrading of facilities. Third, technology is a crucial factor for industrial transformation. In the Korean green growth strategy, the development of green technologies is conceived as the pillar of the country‟s

11 UNEP, Overview of the Republic of Korea‟s National Strategy for Green Growth (UNNEP, April 2010)

economic transformation in the medium to long-term, following the first phase of investment in large infrastructure projects as part of the Green New Deal.

Greening the industry which use the green innovation in main industries directly affects the shipbuilding industry. The main point of greening the industry is to reduce GHG and secure new growth engine by develop and commercialize environment-friendly products. To reach this result, Korea government plans to efficient energy management of shipbuilding and facilities, develop new processes by expand investment in energy reduction technologies, and develop eco-friendly or high efficiency ships and components[12].

Moreover, The Korea government is embarking on a "Low Carbon, Green Growth" strategy that aims to increase the use of new and renewable energies (NRE) to 11% of total energy consumption which illustrates in Table 4.5. Wind is the one of

Table 4.5 Korea Energy Management Corporation NRE Development Projections (% of total NRE)

NRE Resource	2008	2010	2015	2020	2030	Annual Increase
Solar Thermal	0.5%	0.5%	0.5%	2.0%	5.7%	20.2%
PV	0.9%	1.8%	2.7%	3.2%	4.1%	15.3%
Wind	1.7%	2.9%	9.2%	11.6%	12.6%	18.1%
Bioenergy	8.1%	13.0%	18.8%	24.0%	31.4%	14.6%
Hydro	14.9%	12.8%	9.1%	6.6%	4.4%	1.9%
Geothermal	0.1%	0.6%	2.4%	3.1%	3.8%	25.5%
Marine	0.0%	0.9%	3.3%	5.2%	4.7%	49.6%
Waste	73.7%	67.4%	53.8%	44.3%	33.4%	4.0%
Total NRE (share of primary energy supply)	2.58%	2.98%	4.33%	6.08%	11.0%	

Source: Korea Energy Management Corporation

NRE which government aims to increase wind energy capacity from 199 MW to 7301 MW by 2030. This brings the shipbuilding industry to be the producer of offshore

[12] Seok Cho, Korea Green Growth Strategy [Online], 5 April 2010. Source www.greengrowth.org

wind turbine because the country‟s geographic conditions make domestic wind energy projects difficult. Korea has a small land mass and wind is limited in many regions. The Jeju region is the well-suited for wind energy endeavors and many of Korea‟s wind energy facilities are located in the Juju island region. The wind energy industry and the ROKG have adapted to these challenges and a number of domestic projects are currently underway in Korea. In November 2010, the country announced plans to construct an $8.3 billion, 2.5 GW off-shore wind farm off the western coast of the Korean peninsula[13].

There are many Korean shipbuilding companies are entering into agreements to work on international renewable energy products while others are getting involved in the supply-chain side of wind energy, supplying turbines and other products.

Major shipbuilding companies in the Korean wind industry

- Daewoo Shipbuilding and Marine Engineers (DSME)

Specializes in Marine Technology and has recently entered the wind sector, aiming to become the world‟s third largest producer of wind energy equipment by 2020. DSME bought DeWind in 2009 and also began a joint venture in wind energy production in Nova Scotia this past year. It also aims to expand its manufacturing in the United States.

- Hyundai Heavy Industries

Hyundai Heavy Industries builds ships and offshore platforms as well as generators for turbines and “offers” 1.65 MW, 2 MW, 2.5 MW, and 2.5 MW turbines which it licenses from Windtec. It built its first wind farm in Korea in 2009 in cooperation with Hyosung, and is also working with Hyosung to build a plant to manufacture wind turbines. Hyundai also works with Wind Wave LLC, and is currently supplying the parts for the turbines at a wind farm in Wisconsin, which will be assembled and installed by Wind Wave LLC.

- Samsung Heavy Industries

This company is involved in the production of various types of equipment for the marine industry and produces a 2.5 MW turbine. It has been targeting the offshore wind industry in the United States, China and India, but has plans to move into the offshore sector in Europe and Asia as well. Samsung Heavy Industries was the first

---

13 Marine International Trade Centre, Opportunities for Maine Companies in Korean New and Renewable Energy (NRE) Markets , (Marine International Trade Centre: November 2010)

Korean exporter of wind power generators, which it supplied to Cielo (a US company) in 2009.

- STX Corporation, Ltd.

STX is involved in marine industries, and builds support vessels for offshore oil and gas rigs, but has been involved in wind energy for over ten years. The company installed its first wind turbine in 1999 and is also Vesta‟s “exclusive agent” for turbines in South Korea. In 2009 it bought Harakosan, the wind turbine manufacturer from the Netherlands. STX has partnerships with Euros and WIND innovation, two German companies.

4. Technological Factors

Shipbuilding technology can be categorized as production, design, and management technology. It can be easily assumed that the production technology is directly related to the productivity. However, the design technology, including basic, detailed, and production design is critical not only because it is required for reducing reworks but also because it can immediately reflect customers' needs. Recently, in high value added ships such as offshore units, the shipbuilder's ability to reflect change orders requested by customers during production is important. Also prompt and precise design ensures that shipbuilders receive much leeway to manage procurement and production processes within the lead time.

In the initial stage in the 1970s and 1980s of shipbuilding industry was lack of technological know-how. All of the shipyards were heavily dependent on imports for keys components and foreign technologies. As show in Table 4.6 provide the example of the technology that Samsung brought from abroad and Korea government saw it as the obstacle for innovate competitiveness.

Table 4.6 Samsung"s purchased technology license from abroad

Technology Area	Partner	Period	Detail
Managing Shipyards	B&W (Denmark)	1978-1984	Management
Managing Shipyards	B&W (Denmark)	1981-1987	Technological Consulting Design Contract
Managing Shipyards	IEC (Japan)	1987-1990	Management of Production Process
Design & Manufacturing	AUTOKON (Norway)	1982-1990	Computer Programs for Design
Design & Manufacturing	MARCON (Germany)	1983-1989	Design Technology
Design & Manufacturing	MONNECKE (Germany)	1983-1992	Design Technology
Design & Manufacturing	IHI (Japan)	1986-1989	Consulting Production Technology
Design & Manufacturing	Sanoyath (Japan)	1986-1996	Technological Training

Source: Woo[14]

However the shipyards have become more and more successful in internalizing the acquired knowledge of foreign technologies and further establishing their own R&D centers. Meanwhile the large shipbuilders all heavily invest in R&D. Hyundai, for instance, has a strong R&D center, Hyundai Maritime Research Institute, whereas also DSME has its Ship and Ocean Institute. Samsung established its Shipbuilding and Ocean Research Centre in 1985 to cover the technological areas of ship structure, wave, oscillation, and noise. In 1999, the Centre for Telecommunications Technology Research was established in Geoje. The Centre for Production Technology Research was set up in Seoul in 1996 to cover the technology in the areas of automation, robotics, welding, and painting. The three largest shipbuilders, Hyundai, DSME and Samsung all strongly co-operate both with Korean

14 Y-S Woo, "A Study on the Technology Cooperation Networks of Shipbuilding," Journal of the Korean Regional Science Association 19, 1: 19

universities specialized in shipbuilding engineering, such as Seoul National University, Busan National University and Inha University and foreign universities and research institutes. DSME‟s institute, for instance, carries out joint research projects with Det Norske Veritas, the University of Texas and MIT.

Moreover, the Ministry of Commerce, Industry and Energy initiated the so-called Technical Roadmap for the Shipbuilding Industry. In the framework of this roadmap, Korea‟s largest shipbuilders, the main shipbuilding engineering departments at universities and public research establishments jointly develop several projects, which have to be financed by industry itself. Based at the Korea Maritime University in Busan, the central government recently set up the Korean Marine Equipment Research Institute (KOMERI), which carries out R&D activities jointly with yard suppliers in Gyeongnam. 60% of the budget is provided by the central and local government, whereas about 40% of the income comes from companies.

Figure 4.12 Key institutions for collaboration supporting shipbuilding cluster

Finally the shipyards could boost their innovativeness by intensive co-operation. Although, as such, the shipbuilders heavily compete with each other, they co-operate well in two areas. They do not only team up when it comes to lobbying, as is demonstrated in the active stance of the Korea Shipbuilders against their common overseas competitors, but they also co-operate concerning technological issues as shows in Table 4.7 for example.

Table 4.7 Technological Co-operation between Major Shipbuilders

Technology/ Research Topic	Participants	Period	Million Won
Improvements of Manoeurablity for VLCC	Samsung, Hyundai, Daewoo, Hanjin, Samho, KRISO	1994-1996	1,200
Designing Technology for Building Small Passenger Ships	Samsung, Hyundai, Daewoo, Hanjin, KRISO	1995-1997	485
Technology Development for the Next Generation Ships Manufacturing	Samsung, Hyundai, Daewoo, Hanjin. KRISO	1995-2000	14,548
Measuring Manoeurability of Ships	Samsung, Hyundai, Daewoo, Hanjin. KRISO	1997-2000	300
Electronic Business in Shipbuilding Industries	Samsung, Hyundai, Daewoo, Hanjin. KRISO	2000-2000	200
Development of Analytical Program of ISO Speed Trial Standards	Samsung, Hyundai, Daewoo, Hanjin. Samho, Hyundai Mipo, Daedong, KRISO	2000-2001	151
Shipbuilding Industry	Samsung, Hyundai, Daewoo, Hanjin. KRISO	2000-2003	3,510
Revision of IMO Standards	Samsung, Hyundai, Daewoo, Hanjin, Samho, Mipo, Daedong, Shinah, SNU, KMU, KRS, KSSRI, KRISO	2001-2002	109

Source: Korean Cooperative of Shipbuilding Technology Research

Because of intensive R&D, shipbuilding industry had gradually improved and stable. While China has experienced overall strong growth, Korea still retains strong competitive advantage in high-value added ship production that can effectively hedge against China‟s rising influence. Indeed, over 50% of orders for Chinese shipyards in 2007 were for bulk carriers of a low value-added and technological level. On the contrary, Korea is leading the high value-added ship segment. In the same hand,

China‟s shipbuilders are still qualitatively behind Korean rivals. Even if Chinese workers are paid 1/6-1/5 of Korean workers‟ wages, their productivity is far lower erasing any competitive advantage arising from lower wage cost. China also tails Korea when it comes to technological competitiveness. Particularly, with regard to the management of cost and production, China is vulnerable. Finally, China is far more dependent on foreign parts and materials due to weak domestic part suppliers; China produces only 40% of necessary inputs domestically. Korea, on the other hand, has developed a robust domestic value chain producing nearly 90% of necessary inputs domestically.

Table 4.8 Technological Competitiveness Comparison between Korea‟s and China‟s Shipbuilding Industries

		2002		2005		2010	
		Korea	China	Korea	China	Korea	China
Design Technology	Basic Design	95	80	100	85	105	95
	Critical Design	105	60	105	80	110	95
	Production Design	105	60	105	70	110	80
Production Technology	Cutting	95	70	100	80	100	95
	Welding	90	70	100	80	100	95
	Outfit	90	60	100	70	100	80
	Loading	95	60	100	70	100	80
Management Technology	Costs Management	85	40	100	60	100	70
	Materials Management	85	50	100	60	100	70
	Production Management	90	40	100	60	100	70

Note: Above are relative figures, with Japan on the basis of 100.

Source: Ministry of Commerce, Industry and Energy

CHAPTER V

CURRENT STATUS OF SOUTH KOREA SHIPBUILDING INDUSTRY

In this chapter, I will focus on the current status of Korea shipbuilding industry in terms of market share, order book and current market situation. In current market situation, the market demand, supply and price will be explained. Moreover, the competitive advantages among South Korea, Japan and China will be shown to suggest where the business opportunity lies for Korean shipbuilders.

1. Market Share

Korean shipbuilders dominate in the world shipbuilding since 2000 in terms of top shipbuilders, new orders and completions. But in 2009, Korea was the leader only in the terms of new orders and completions because a rise of bulk carriers in China took the order book leader from Korea.

Figure 5.1 Relative market shares as of 2009

Source: The Shipbuilders' Association of Japan

2. Order Book

For stable the lead position, Korean shipbuilders used strategies by diversify their product mix and emphasis on high value added ships such as LNG Carriers, containerships, tanks and VLCCs by participating in bids selectively considering their hurdle rate and product mix. As shown in Figure 5.2, high value added ships bring Korea to still be the sophisticated ship market lead, compare to China which still lack of innovative aspect in this product category.

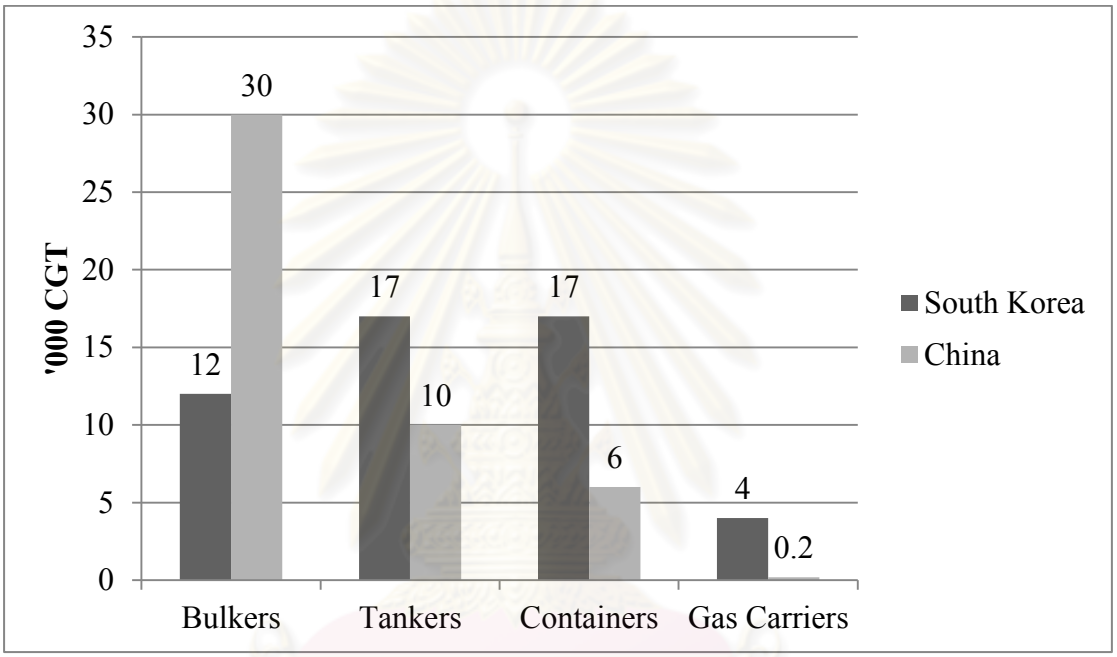


Figure 5.2 Order book mixes of China and Korea in 2009

Source: Clarkson

At the end of 2009, Korean big players' order book ranged from 2.2 years to 3.3 years, which means they can endure at least 2 years without additional new orders. This assumption is based on a calculation dividing the order book as of 2009 with implied capacity. They still seem to have sufficient orders in their order book. However, since the order book includes the workloads that are completed but not delivered because the order book numbers reflect ships that have been ordered but not delivered. So this means actual remaining workloads are far less than estimates in table 5.1 below.

Table 5.1 Current order book and capacity Unit: Mil. CGT

Country	World Rank	Company	Implied Capacity	2009 Deliveries	Order Book	Order Book/ Capacity
Japan			9.8	9.3	23.2	2.4
China			14.0	11.7	53.2	3.8
S.Korea			16.0	15.4	52.8	3.4
	1	Hyundai	3.9	3.6	8.4	2.2
	2	Samsung	2.5	2.4	8.4	3.3
	3	Daewoo	3.0	3.0	8.2	2.7
	4	STX	1.1	1.0	4.7	4.1

Source: Clarkson

Note: Implied capacity is assumed as the greater of the historical maximum completion amount since 2000 and the expected completion amount in 2010.

Moreover, Korean shipbuilders' order book is steady declining because of a collapse of new orders, so they are suffering from cash shortage. There are no advance receipts, which in turn will deplete cash reserves quickly. This situation reduces net advance receipts of the company as a result. Net advance receipts, Advance receipts less Accounts receivables, means cash amount received in advance that isn't recognized as sales. Considering the matching principle in accounting, most of the net advance receipts are not free cash but cash that has to be used for manufacturing costs. In 2009, net advance receipts decreased significantly as a result of the decrease in advance receipts and the increase in accounts receivables.

As shown in Table 5.2 below, STX experienced a lower decline of net advance receipts than other companies. In case of STX, CAGR of 24% is highly correlated with new orders received in 2009, accounting for 39% of new orders of four companies, which resulted in 4 years of work load.

Table 5.2 Net advance receipts

Net Advance Receipts	2005	2006	%	2007	%	2008	%	2009	%	CAGR
HHI	3,153	3,861	22%	5,571	44%	5,075	-9%	2,788	-45%	-3%
SHI	2,346	4,162	77%	5,828	40%	6,035	4%	1,463	-76%	-11%
DSME	942	1,832	94%	3,198	75%	2,032	-36%	465	-77%	-16%
STX	426	788	85%	1,766	124%	2,134	21%	1,008	-53%	24%

Source: Annual Reports

Furthermore, considering the typical installments of ship contracts, shipbuilders receive payment in advance and spend most of the construction costs later. If new orders stop, shipbuilders' cash inflow will decrease. On the other hand, their cash outflow will increase by new orders awarded in advance. In this respect, if the recession doesn't rebound quickly, several Korean shipbuilders who can't raise funds through capital market will be squeezed out from the shipbuilding market.

As a result, in 2009, four Korea big shipbuilding companies experienced a huge increase in interest bearing debt to equity ratio. Debt to equity ratio of SHI, for instance, increased from 0.07 to 0.72 in 2009. In the bad situation, middle-sized shipbuilders are suffering more from cash deficit and even several shipyards became insolvent. For instance, in Korea, credits of seven shipbuilders have been rated under investment grade; in Japan, two shipbuilders declared insolvency.

Table 5.3 Debt to Equity Ratio

Company	2005	2006	2007	2008	2009	CAGR
HHI	0.06	0.04	0.03	0.00	0.10	16%
SHI	0.04	0.06	0.07	0.07	0.98	117%
DSME	0.32	0.20	0.17	0.14	0.89	29%
STX	0.76	0.34	0.20	0.43	2.46	34%

Source: Annual Reports

3. Current Market Situation

3.1 Shipbuilding demand side

Even OECD predicted the global GDP growth -which affect global seaborne trade referring to shipbuilding prices and volume- that turns positive continuously since 2010 but, as previously mention, the occurrence of new order collapse makes the shipbuilding industry experience a downturn. There are two sides of the current market situation to make the shipbuilding demand recover easily or difficultly.

The drastic shrinkage in the shipbuilding demand may not easily recover. The reasons are as follows.

First, the current fleet volume is in an oversupply stage. Over the past six years, the current fleet volume increased at a 6.7% CAGR, reaching over 1,300 million DWT in 2009 from 870 million DWT in 2003. So the shipbuilding market was overheated in recent years. Moreover, the order book/current fleet ratio reached 49% in 2008, above the historical average of 10%. Considering the fact that current order book will be delivered in the coming four years, the fleet volume will reach 1,600 million DWT in 2013. Until the order book level and the current fleet volume are decreased to an acceptable level, shipbuilding order may not increase dramatically. The way to decrease the current fleet volume is that the demolition of ships has to be expedited. But the average life span of a ship is 25 years and 67% of ships were built after 2002, the demolition rate of ships may not increase in a short period of time then it will take much more time than expected to decrease the number of both the ships already in the market and the ships ordered but not delivered.

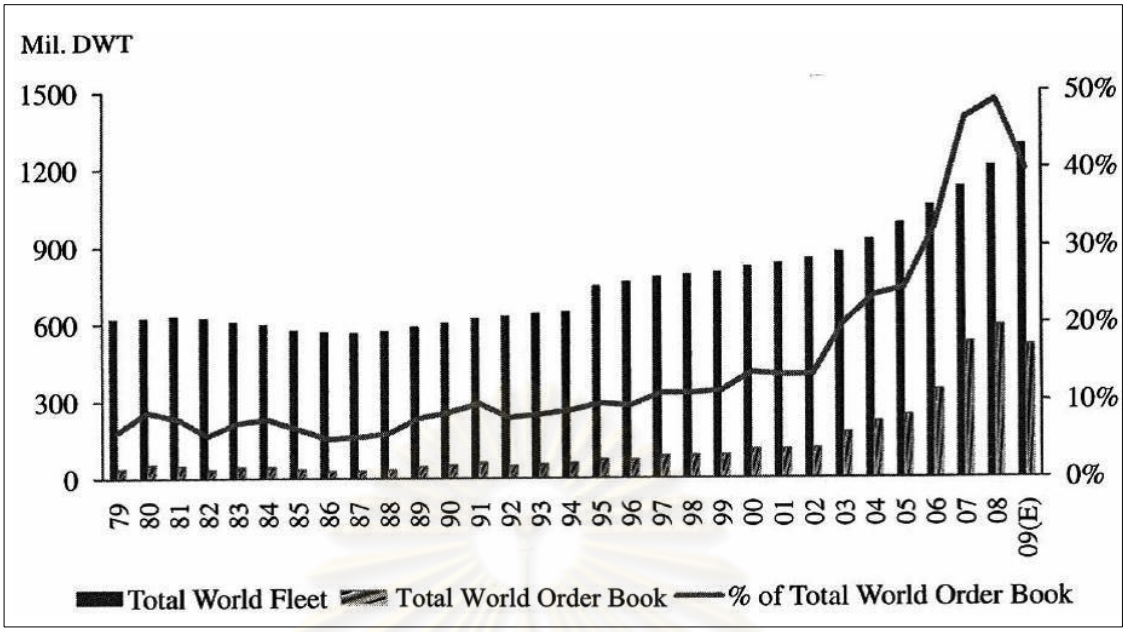


Figure 5.3 Trend of total world fleet and order book

Source: Clarkson

Second, the replacement demand of single hull tanker due to IMO and the replacement demand of old vessels built in 1970s, the peak for new vessels, is nearly in a last stage. Because the replacement demand was one of the main reasons for the recent peak, the increase in demand might be restricted.

Third, as mention previously, shipping industry and shipbuilding industry have a close relationship. Hence, freight rate which is shipping companies' income can be considered as one aspect for new orders. From the ship owners' perspective, purchase costs of ships, rather than operating costs, constitute the major portion of capital expenditure. The ship owners need to raise substantial capital in order to purchase a ship, whereas they can operate their business without a huge outlay of cash in the short term. But the recession of freight rate is still activate. According to Baltic Dry Index which is an international index to measure the cost of shipping raw materials, such as iron ore, coal, steel and cement, through the sea route, from its peak of 11,648 in 2008 due to the crude oil price to 1,045 in the early 2011 as shown in Figure 5.4. This shows the decline of freight price against the crude oil price which gradually increase.

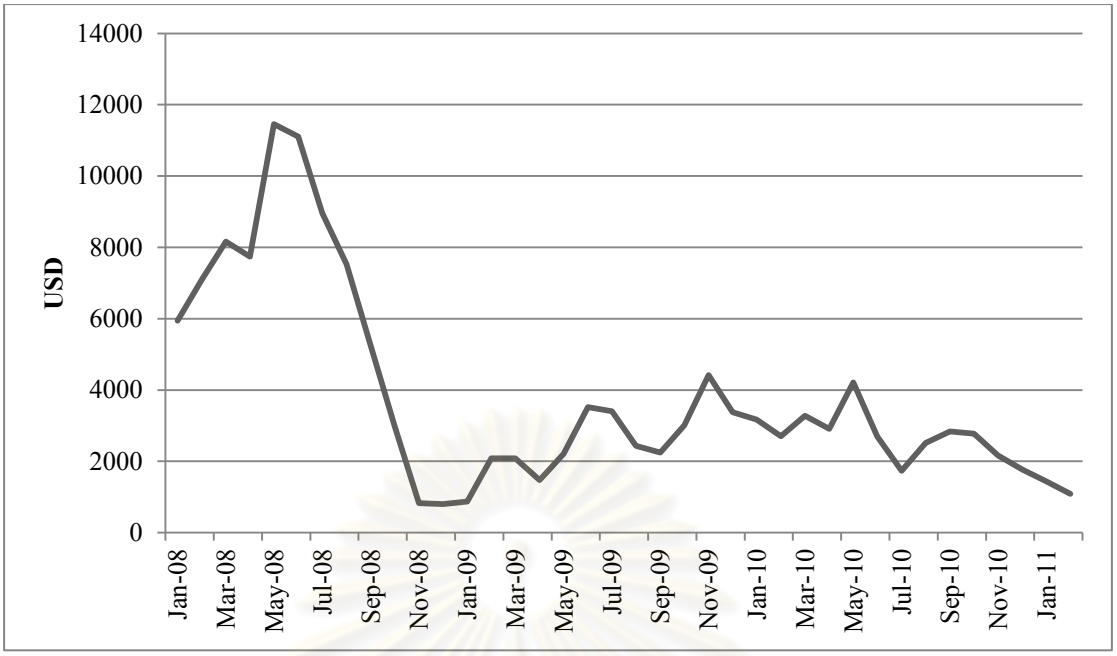


Figure 5.4 Baltic Dry Index

Source: Bloomberg

There are also positive factors that demand in current market may rebound in a short term. First, the appreciation of the Euro against the dollar continue rise, then this situation will give a positive effect on new shipbuilding price and demand. Appreciation of the Euro against the U.S. dollar has a positive effect to shipbuilding demand because 60% of ship buyers are European companies and shipbuilding contract is usually on a U.S. dollar basis. For example, according to the Shipbuilders' Association of Japan's statistic in 2010 more than 50% of Korea shipbuilding orders come from the European owners with 19.5% from Greece and 11.3% from Germany.

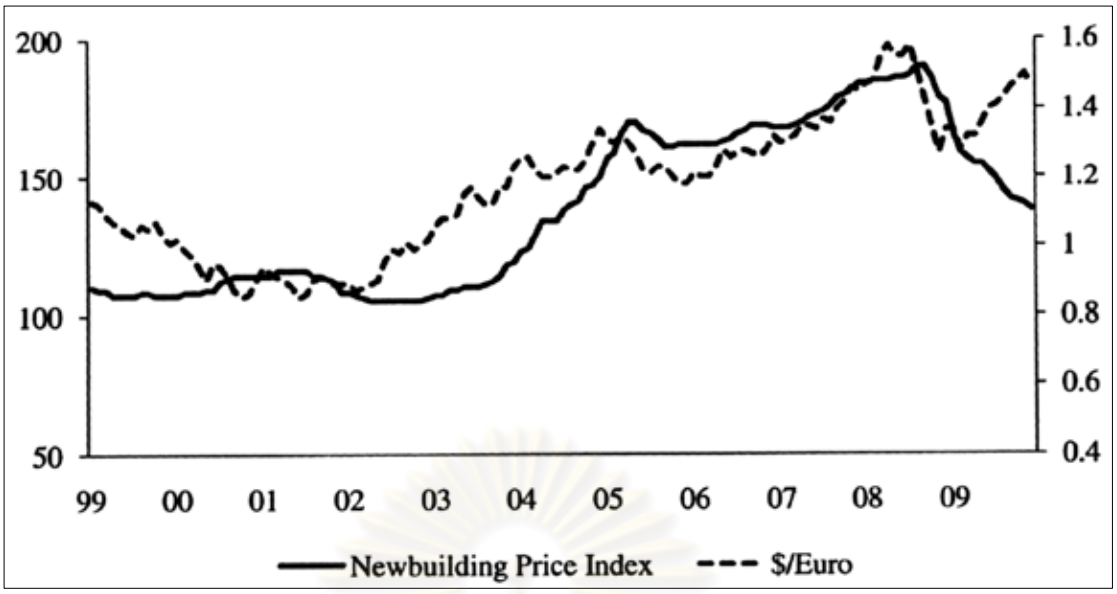


Figure 5.5 Correlation between USD/EURO rate & shipbuilding price index
Source: Clarkson

Second, new orders for offshore units have increased for the previous five years because of energy demand. The energy that forces offshore production can be divided into two aspects; for sustain oil reservation and for embrace wind power. On oil reservation aspect, Because of oil price increases and a demand for deep-water oil exploration, make the offshore production increases. Then major Korean shipbuilders had dramatic increases in the portion of offshore units in order book mix. For instance, in the case of SHI, 51% of order book in dollars is offshore units and 32% of total sales in 2008 came from offshore units.

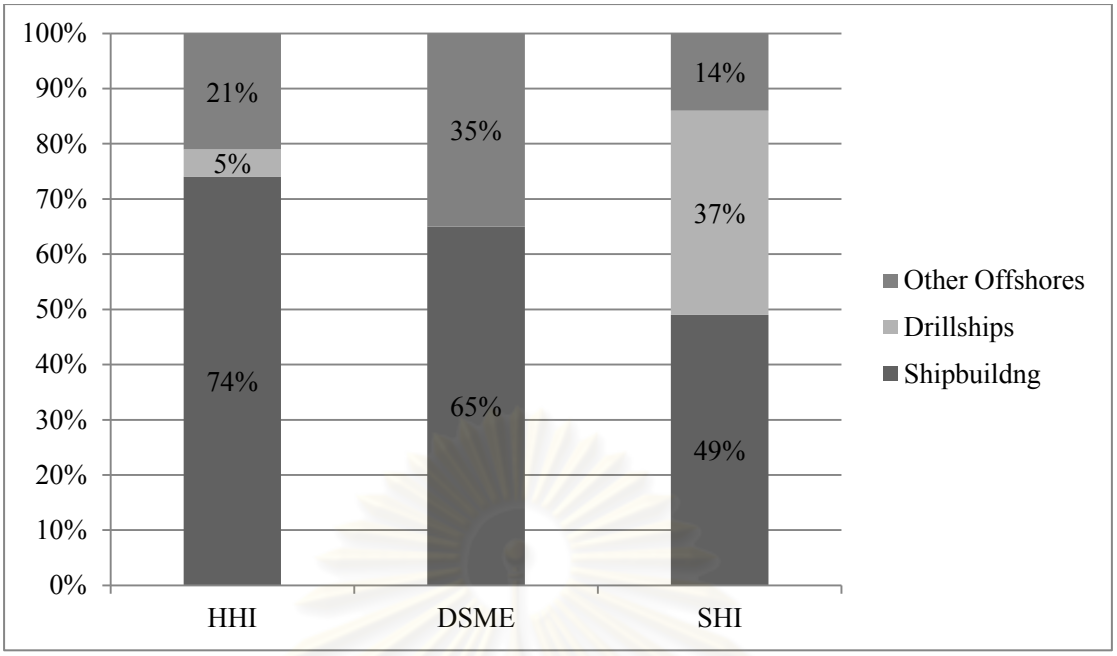


Figure 5.6 Order book mix in dollar

Source: IR reports

Note: Total is the sum of shipbuilding and offshore division. DSME's other offshore portion includes drillship order book.

On wind power aspect, over the past ten years, global wind power capacity has continued to grow at an average cumulative rate of over 30%, and 2008 was another record year with more than 27 GW of new installations, bringing the total up to over 120 GW due to the world deliberation to climate change. Wind energy equipment demand expanded out from Europe to Asia and recently Wind Turbine Installation Vessel. The Korean wind market has failed to take off to date partly due to the low feed-in tariff and partly due to public opposition. Recently, however, companies have come to realize the business opportunities in the wind power industry, which in turn has attracted increased investment. Many Korean shipbuilding companies entered into agreements to work on wind power products while others are getting involved in the supply-chain side of wind energy, supplying turbines and other products but still late behind China. According to Global Wind Energy Council (GWEC), 2010 was also an important year for Chinese wind turbine manufacturers, as four companies, including Sinovel, Goldwind, UnitedPower and Dongfang Electric, are part of the world's top ten largest wind turbine manufacturers, and are beginning to expand into overseas markets.

3.2 Shipbuilding supply side

Due to seaborne trade increase, the increase in demand of new ship forced the world leading shipbuilding nations such as Japan. South Korea and China as well as new developing nations such as Vietnam, India, and Brazil increased their investments to catch up this increasing trend. Unfortunately, Global Credit Crunch occurred, the total demand turn down, then the over capacity happened as a result. If the world shipbuilding doesn't receive the new orders before 2011, which most of construct orders receiving in advance will be deliver, it will experience a long-term recession.

Table 5.4 World new order and capacity forecast Unit: Mil. CGT

Category		2007	2008	2009	2010E	2011E	2012E	2013E
New Orders		91.6	47.9	9.8	31.5	31.8	33.4	30.1
Capacity	Total	40.0	45.8	52.3	59.3	63.8	63.5	55.0
	S.Korea	11.5	14.0	16.0	17.5	19.0	20.0	19.0
	China	6.5	9.0	12.0	16.0	18.5	19.0	18.0
	Japan	10.5	10.5	10.5	10.5	10.5	10.0	8.0
	EU	7.5	7.8	8.5	9.0	9.0	8.0	5.0
	Others	4.0	4.5	5.3	6.3	6.8	6.5	5.0
Over Capacity		-51.6	-2.1	42.5	27.8	32.0	30.1	24.9

Source: Korea Institute for Industrial Economics & Trade, 2008

3.3 Price

The new building price dramatically dropped from the high peak of 2008 in every type of ships as shown in Figure 5.7 below. However, the price of high value added ships like gas carrier declined only 16% less than low value added ships such as tankers and bulkers which dropped more than 35%. The new building price stopped falling down in 2010 and rose a little in second quarter but not continued in third quarter. From the buyers' perspective, they consider quality and delivery more important than cost so that they are less sensitive to the price. From the sellers' perspective, there are a handful of shipbuilders who have enough ability to build high

value added products. In other words, these shipbuilders who build high value added ships are price makers rather than price takers to a certain degree[1].

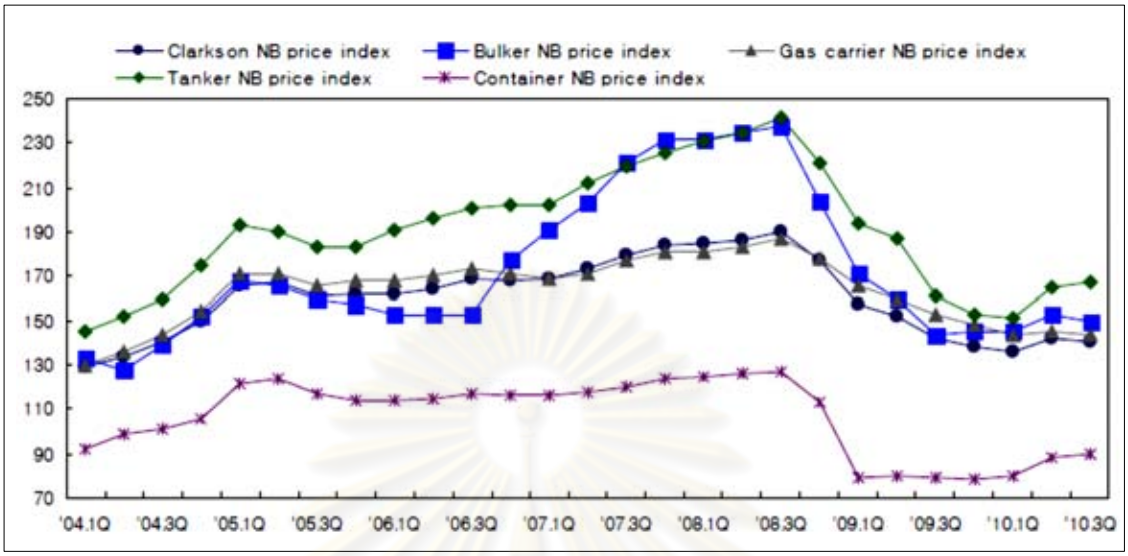


Figure 5.7 New building prices of each ship types

Source: Korea Export-import bank (Overseas Economic Research Institute), Clarkson

4. Competitive Advantages

Major shipbuilding players moved to Asia since 1960s and continuously increased competitive stress. For South Korea, Japan and China are redoubtable rivals in the current market. Korea Institute for Industrial Economics and Trade provides the comparison of competitiveness among South Korea, Japan and China as categorized in Table 5.5 by assigned 100 points as a standard to Japan and each point giving to South Korea and China is estimated based on the relative strength. The factors that are superior to those of Japan are estimated over 100 points. This information shows that Japan is better than Korea in terms of financing support and downstream industry. However, Korean shipbuilders are superior Japanese shipbuilders in terms of the skill of production and design workforce, overall system, and low labor costs. Korean shipbuilders surpass Chinese shipbuilders regarding all the factors except for cost factors.

In South Korea perspective, to maintain competitive advantages, they should concentrate on willingness of domestic shipping companies and financial institution because in current shipbuilding downturn, a strong domestic shipping as mention

---

[1] Duck Hee Won, "A Study of Korean Shipbuilders' Strategy for Sustainable Growth," (Master's Thesis, Science in Management Studies, Massachusetts Institute of Technology, 2010).

previously and recovery of ship finance are important portions for maintain in demand.

Table 5.5 Comparison of competitiveness among South Korea, Japan and China

Category		Japan	South Korea			China		
			2007	2010	2015	2007	2010	2005
Cost	Materials	100	100	100	100	106	102	101
	Wage	100	106	102	99	143	135	125
	Others	100	102	100	99	122	115	109
Non-Prices	Quality	100	100	101	103	76	80	88
	Performance	100	101	102	104	83	86	90
	Delivery	100	100	100	100	83	86	90
	Financing	100	94	97	99	78	84	89
	Credibility	100	100	101	103	74	79	85
Workforce	Average Age	100	107	105	105	116	114	111
	Production	100	106	106	106	95	97	101
	Design	100	110	111	112	79	85	90
Productivity		100	95	97	101	69	74	92
System		100	104	105	108	71	78	84
Related Business	Shipping	100	83	85	88	86	88	93
	Supply Chain	100	96	98	101	74	78	86
Total		100	100	100	101	88	91	94

Source: Korea Institute for Industrial Economics & Trade, 2008

Considering to ship finance, a shipbuilding industry is a capital intensive and its contracts are highly leveraged, with more than 70% of payments financed by debts. The syndicated loans establishing by financial institutions are significant for increasing the demand of ships. In this case, Korean Capital Market Institute describe that the correlation between the amount of ship finance and new orders is 0.8.

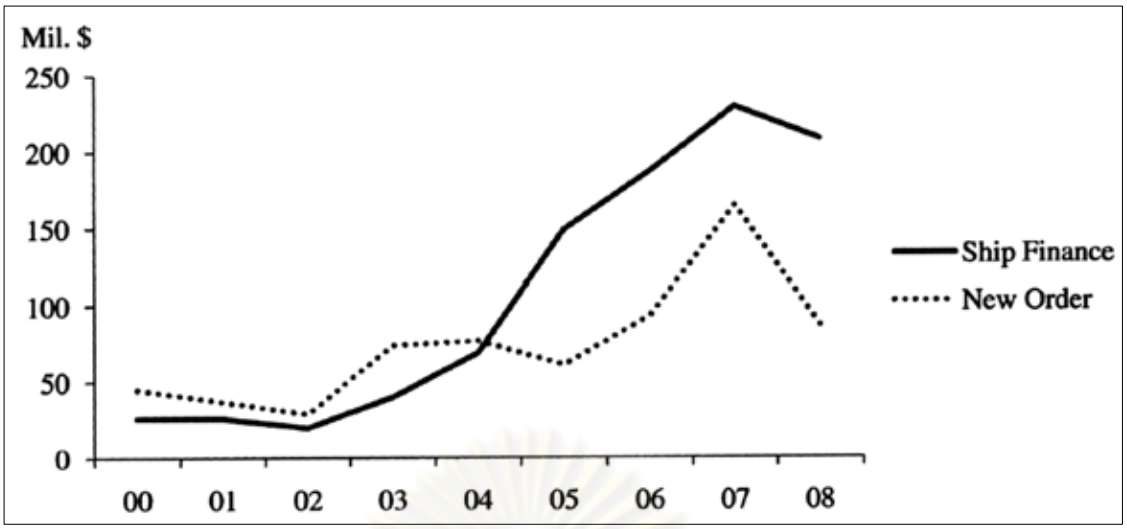


Figure 5.8 Correlation between ship finance and new orders

Source: Korean Capital Market Institute (Jong-Moon Yun), Lloyd's Register

CHAPTER VI

ANALYSIS OF STRATEGY FOR SOUTH KOREA SHIPBUILDING DEVELOPMENT

In this chapter, I will analyze the industry competition in the industry by Porter's Five Forces Model. Then, I will use SWOT matrix framework to summarize industry environment both internal and external factors which affect the South Korea shipbuilding industry. By all of these analyses, the sustainable strategy can be decided.

1. Porter's Five Forces Model

As described in Chapter 3, the shipbuilding industry has been and continues to be global in competitive characters. Porter[1] explained the state of competition in the shipbuilding industry in a function of five basic competitive forces which are rivalry among existing shipbuilders, threat of new entrants, bargaining power of ship buyers, bargaining power of suppliers, and threat of substitutes. However, in shipbuilding, rivalry and buyers affect the competitive position of participants most strongly. Government affects a number of forces in one way or another.

2.1 Rivalry among shipbuilders

Competitors in shipbuilding can be categorized by country or by firm. In shipbuilding, the competitive advantage of a participant in the industry tends to be more location-specific than firm-specific[2] because of intensive capital, labor and government support. Until now, major shipbuilding firms are appearing in more than fourteen countries. However, the significant players fall into four major groups: South Korea, Japan, China, and Western European countries as shown in Table 6.1. These groups have different sources of competitive advantage in terms of cost structure, financing capability, level of shipbuilding technology, quality standards and delivery time.

---

1 Michael E. Porter, Competition in Global Industries (Cambridge: Harvard Business School Press, 1986).

2 Ibid.

Table 6.1 Important world shipbuilding nations were ranked in 2007

Exporters	**Export Value in 2007 (million USD)**	**Share in world export (%)**
World	106790.10	100
South Korea	26631.96	24.94
Japan	15522.86	14.54
China	12220.11	11.44
Italy	5980.11	5.60
Germany	4915.01	4.60
Poland	3592.76	3.36
U.K	3332.92	3.12
USA	3160.37	2.96
Spain	2829.68	2.65
Netherland	2772.92	2.60
France	2685.69	2.51
Finland	2352.48	2.20
Norway	1821.78	1.71
Croatia	1404.12	1.31
India	1289.96	1.21
Others	16277.37	15.25

Source: International Trade Centre (ITC)

Rivalry among shipbuilders is intense, mostly in the form of price competition. As mention previously, in 2009, the shipbuilding price decrease by 27% due to the collapse of demand. Moreover, from 1992-2002, there was a 36% decrease in shipbuilding price because over capacity occurred. There are three factors have led to vigorous price competition over time. First, a high fixed cost creates pressure for all shipbuilders to fill capacity which often leads to rapidly intensifying price cuts when excess capacity is present. Second, shipbuilders are unable to build ships in advance without orders received. A shipbuilder cannot bear financial costs because the cost per ship usually ranges from a hundred million dollars to six hundred million dollars. Third, barriers to exit are high because shipbuilding companies' assets are so specialized that they have low liquidation value, and governments, concerned with detrimental effect on labor market, usually subsidize the shipbuilders.

2.2. Threat of new entrants

In the shipbuilding history, potential new entrants such as Japan and South Korea rose to prominence while a number of developing countries such as Brazil and Taiwan also entered to the market with potential scale in the 1970s but they did not succeed. I spite of relatively high entry barriers to the industry: economic of scale, economic of scope, product differentiation, capital requirement, and cost advantage[3]. Basically, there are low entry barriers in a simpler ship market and high entry barriers in a sophisticated ship market.

There is low entry barriers in the simple ship market because new entrants can easily establish new shipyards and expand their capacities by government financial support, and therefore accomplished economies of scale in certain degree. With this government have repeatedly helped finance entry. China with competitive advantage in labor cost emerged as the latest successful entrant in simple bulkers market. However, the entry barriers in the sophisticated ship market are so high and European shipbuilders still maintain their position as a leader in luxury ship such as cruise ship and offshore units with strong supply chain and design capability.

In Korean shipbuilders' perspective, it is necessary for them to keep an eye on the threats of entry by Chinese shipbuilders who also try entering into sophisticated ships market. Korean shipbuilders should pay attention to their resources and capability on raising the entry barriers in the high value added ship market while they are losing their leadership in simple ships to China because of high labor cost.

2.3 Bargaining Power of ship buyers

The business cycles of shipbuilding industry and shipping industry are closely correlated. This leads the ship buyers or shipping firms' bargaining positions relatively strong. There are several reasons which make ship buyers magnificent influence to shipbuilders. First, there tend to be a number of potential suppliers of ships of a given quality and technologies, through industry participants differ widely in technological ability. Second the ship price is very sensitive for buyers because their business is highly competitive. Third, major ship buyers purchase new ships in large volumes relative to shipbuilders' sale volumes. This creates leverage over

---

[3] Michael E. Porter, Competitive Strategy: Technique for Analyzing Industry and Competitors, (New York: The Free Press, 1980).

shipbuilders because their high fixed costs raise the encouragement to employ capability[4].

Ship buyers consider various factors when selecting a builder. As general rule, price is more important when buying simple vessels such as oil tankers, bulkers, and general cargo ships. On the other hand, when buying high-technology vessels, such as container ships, liquefied natural gas tankers, and passenger ships, quality is more important.

2.4 Bargaining power of suppliers

There are two categories of suppliers to the shipbuilding industry: labor; and suppliers of steel plates and auxiliary ship equipment. Labor costs account for a large portion of total production cost. As mention before, in the past time, South Korea gained competitive advantage from lower labor cost than European countries and Japan but nowadays the average salary of employees in shipbuilding companies has a 7.8% CAGR. The lower labor cost advantage moves to China with only 15% of labor costs in cost structure compare to 24% in South Korea.

Steel costs are approximately 15% of COGS and 13% of sales, which means that a 10% increase in steel price can decrease gross margin by 1.3%. Korean shipbuilders secure in this section by state-supported steel producer, POSCO. The shipbuilding industry is also supported by a large ecosystem of specialized suppliers producing shipbuilding related components (hull, engine, machinery and electronics components) as well as outfitting services. These more than 153 companies employ about 69,000 employees, with total revenues in 2003 of $3.6 billion[5]. However, Korean shipbuilders are facing problems in sourcing for components for high value-added ships, in particular cruise and scientific ships which is somewhat connected to the issue of weak domestic demand.

2.5 Threat of substitutes

The threat of substitutes in the shipbuilding industry is very low. The only available substitutes are airplanes, but these substitutes are not a threat because they have very high costs.

---

[4] Michael E. Porter, Page 544.

[5] Korea Marine Equipment Association, 20 September 2010. Source www.komarine.or.kr

2 . SWOT Analysis

SWOT analysis is a useful tool to analyze the key factors that will affect development of South Korea shipbuilding industry for sustainable competitive advantages. Strengths and weakness are from internal factors; opportunities and threats are from the external factors which affects by current market situation. As shown in Figure 6.2, there are significant factors that Korean shipbuilders should concern.

However, the factors that affect the South Korea shipbuilding not all of them can be control by the Korea shipbuilders such as depreciation of Korea Won, low demand of new ships or China's rise. Then Korea shipbuilders should focus on the controllable factors and forces them to accelerate the South Korea shipbuilding industry.

- Strengths: Economies of scale, high technologies, strong R&D, skilled workforce, and brand power.

- Weaknesses: Increasing of labor cost, incapable domestic shipping companies, weak ship financing market, and low diversification.

- Opportunities: Korean currency depreciation, growth of wind power, expanding of offshore market, and high awareness of climate change.

- Threats: China's rise, low market demand, and over capacity.

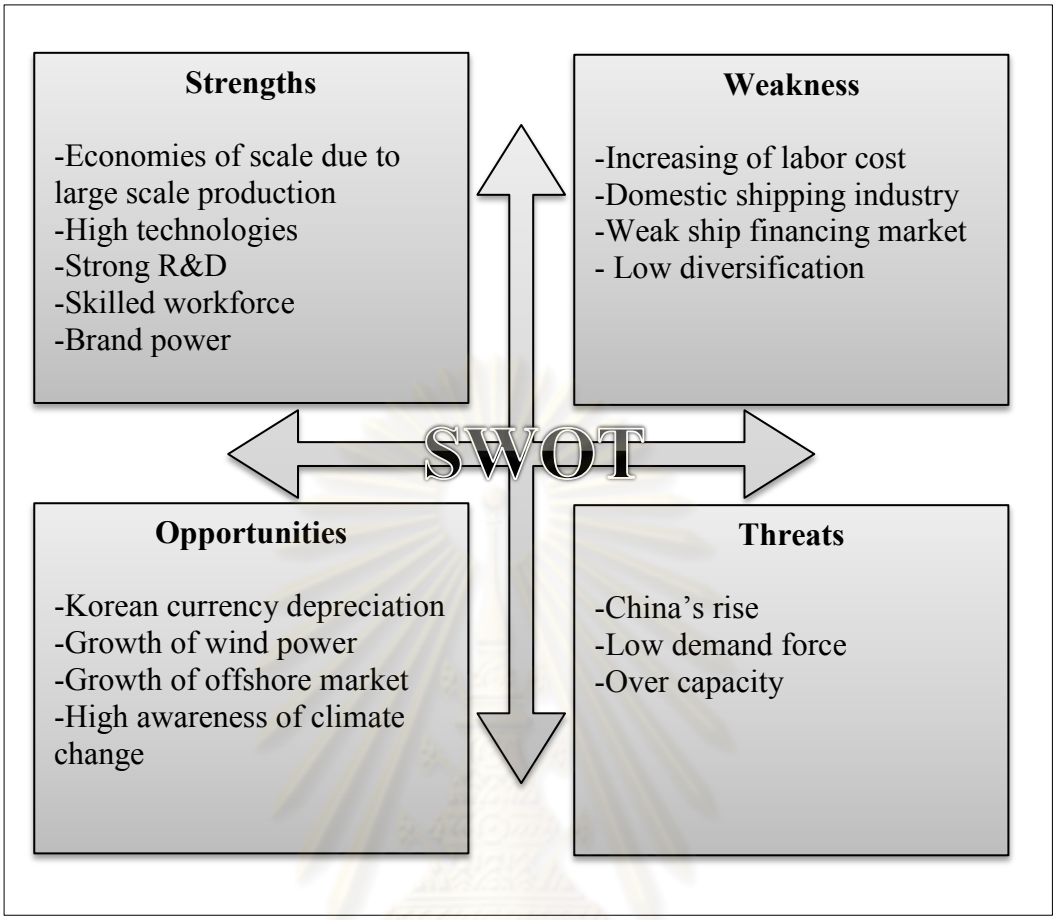


Figure 6.1 SWOT analysis of South Korea shipbuilding industry

Source: Author, 2011

CHAPTER VII

SUMMARY AND SUGGESTION FOR SOUTH KOREA SHIPBUILDING INDUSTRY DEVELOPMENT

In this chapter, I will summarize the all environment factors from the research to give overall picture of current South Korea shipbuilding industry's situation and I will recommend some perspectives to enhance Korean shipbuilders' competitive advantage. Some suggestions that South Korea shipbuilding should focus are: taking advantage of new market demand, encouraging related units for high value-added products, and stimulating more inter-organizational R&D activities.

1. Summary of South Korea shipbuilding industry's environment

Today shipbuilding is a backbone industry that can make profits on downstream and upstream industries such as steel, electric and machinery for South Korea. Moreover, this industry required the employment of large numbers of workers by both ship yards and the supporting industries, and it generated foreign currency that can contribute to current account balance by exporting ships. These positive effects of shipbuilding industry also allure China to enter to this market since 2000s and China try to become the leader by 2015. Unfortunately, the financial crisis in 2008 cut the shipbuilding orders and then over capacity problem. The current phenomenal stimulates the shipbuilding market more arduous and unstable.

In this market downturn, the environment can be both supportive and obstructive to the performance of industry development. There are four factors should be concern. Firstly, political or regulatory factors, the market share of the shipbuilding in a nation are closely related to the policies the government employs. Since 1970s, South Korea shipbuilding and related industries was heavily financial support by the government both form domestic capital and foreign capital. However, government had changed his focus to R&D and infrastructures, while the regulations provided by international institutions such as the International Maritime Organization (IMO) became more significant.

Secondly, economic factors, the fluctuations in the exchange rate in recent years led to higher profits for shipbuilders like Korea where the currency exchange

rate went up. Moreover, the lower oil price since 2008 and government supported steel price can spark the Korean shipbuilders' success. Not with standing, due to the present economic recession the demand for ships is lower than before. In addition, the lack of potential of domestic shipping company can ruin the correlated industry such as shipbuilding by insufficient domestic orders.

Thirdly, social and cultural factors, because shipbuilding is labor-intensive industry, a skilled workforce is the first requirement for shipbuilders to increase their competitive edge. South Korea has skilled workforce in the industry; on the other hand, the average salary of employees in shipbuilding companies has increased which caused South Korea lost competitive advantage to China. In environmental issue, there are some negative effects the industry has on the environment such as oil-spillage caused by many carriers. For this reason, IMO set up anti-fuel pollution rules for shipbuilders to protect the environment. Moreover, the trend of more fuel-efficient vessels and green ship also increase.

Lastly, technological factors, South Korea gain competitive advantage in term of technology because of intensive R&D. The cooperation among ministries, universities, private research and shipbuilding industry can sustain innovation for South Korea shipbuilding industry. However, the cooperation among the major shipbuilding companies still should be required in term of core technology.

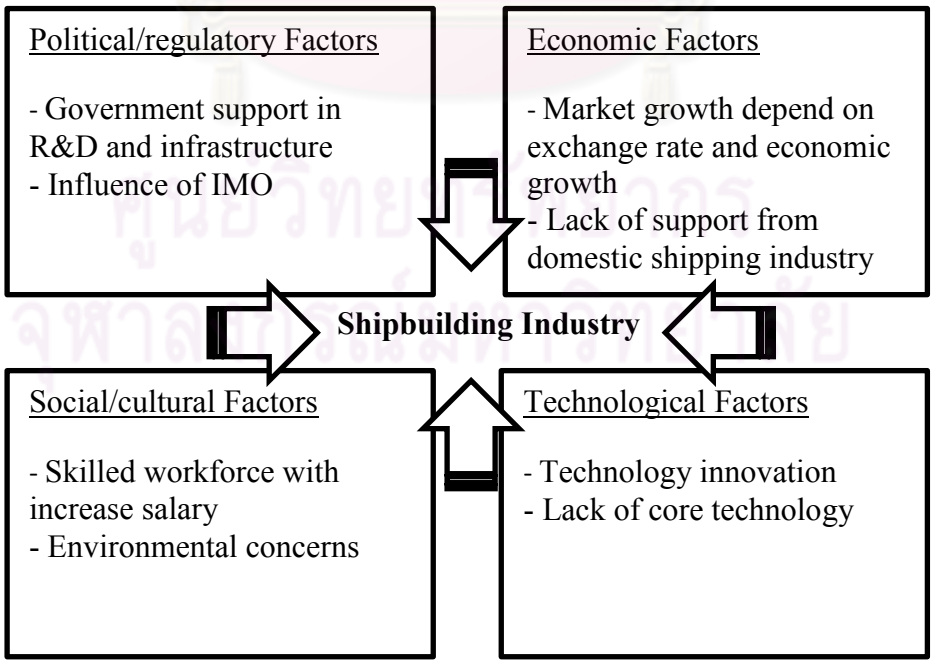


Figure 7.1 Industry Environments (Source: Author, 2011)

Another perspective that should be concerned is current market situation. While Korean shipbuilders dominate in the world shipbuilding since 2000 but in 2009, Korea was the leader only in the terms of new orders and completions because a rise of bulk carriers in China took the order book leader from South Korea. For stable the lead position, Korean shipbuilders used strategies by diversify their product mix and emphasis on high value added ships because high value added ships bring Korea to still be the sophisticated ship market lead, compare to China which still lack of innovative aspect in this product category.

Some market trends such as an oversupply stage of current fleet volume, the last stage of replacement demand, and the decline of freight price against the crude oil price can be obstacles for recovery of the shipbuilding demand. However, there are also positive factors which are; continuously rise of the appreciation of the Euro against the dollar, the increasing of new orders for offshore units in the previous five years because of energy demand. In term of supply, if the world shipbuilding doesn't receive the new orders before 2011, which most of construct orders receiving in advance will be deliver, it will experience a long-term recession. Moreover, shipbuilders should concentrate on the high value-added ships because shipbuilders who build high value added ships are price makers rather than price takers to a certain degree. Hence, in the current stage of maturity, South Korea shipbuilding industry can further maintain market share via product differentiation focusing on high value-added vessels.

These all environment factors affect the shipbuilding industry and South Korea shipbuilding industry should find the potential strategy to gain the competitive advantage against competitors. In the last section, I will give some suggestions for South Korea shipbuilding industry according to my thesis analysis.

Recommendation for South Korea shipbuilding industry

4.1 Taking advantage of new market demand

Korean shipbuilders will gradually lose their market share in simple ships such as bulkers and containers to the low labor costs such as China, India and Vietnam. However, in the future a strong demand in offshore units and high value-added ships can fill in their existing capacity. Thus they should take advantage of this new market demand.

The reasons for the latest market demand in the shipbuilding can be categorized into three factors. First, change of regulations forced to phase out single hull tankers due to prevent or reduce oil spills and replace by double hull takers. Second, ship buyers' needs such as 14,000 TEU containers for operational efficiency and ice breaking takers which is combination of ice breaker and oil tankers. Last, needs for others industries such as FSRU[1] which receives liquefied natural gas (LNG) from offloading LNG carriers, and the onboard regasification system provides natural gas send-out through flexible risers and pipeline to shore, and offshore wind turbine installing vessel from the booming of offshore wind farm.

Henceforth, Korean shipbuilders should catch the market trend and produce attractive ships. As mention before, the recent trend of high awareness of climate change forced the discussion of CO_2 emissions per ship. In this case, shipbuilders' competitive advantage will change from cost leadership to technology leadership and Korean shipbuilders can take this advantage by achieving fuel efficiency in this expected market.

4.2 Encouraging related units for high value-added products

Korean shipbuilders should more concentrate on high value-added units because in term of market value, South Korea proportionally gains lower return on production than some competitors as shown in Figure 7.2, especially European countries which have strong leadership in cruises.

[1] FSRU stands for LNG floating storage and regasification unit which is a floating storage and regasification system.

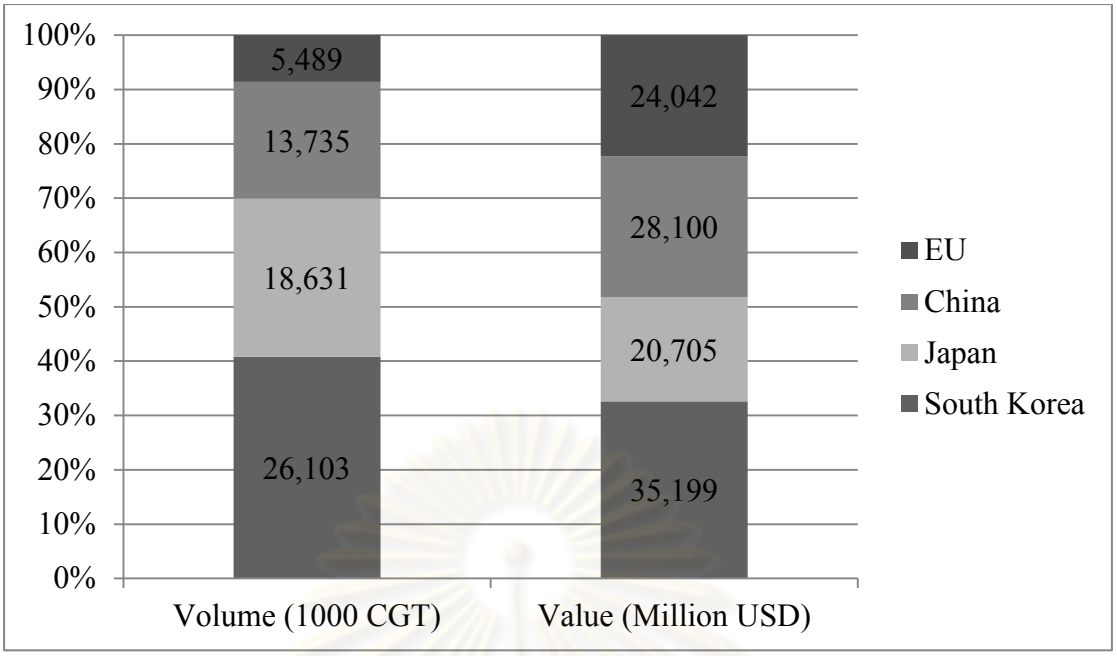


Figure 7.2 Market Share- Volume against Value

Source: Community of European Shipyards Association (CESA)

As the cruise ship sector, only accounts from 2% of production output but accounts for 20% in market value[2]. Even, it requires high advancement of shipbuilding technology but this is a better choice for South Korea instead of fighting in the standard ships intensive market. For encourage this segment, the domestic cruise ship should be developed to stimulate inbound tourism. So it requires cross functional inputs from other parts of the government but it will encourage the demand for cruise ship.

In aspect of offshore units, they also want encouragement. Even Korean shipbuilders are already focusing on offshore units due to its record in major Korean shipbuilders' order book mixes from 26% to 51%, but they still lack of basic design capability and strong supply chain. Korean shipbuilders usually take part in bidding for offshore units by making a partnership with subcontractors who are responsible for basic design, main equipment, mechanical test and transportation. The problem is that offshore units are highly customized rather than standardized, so that customers' change order requests result in revisions of basic design. Moreover, main equipment's suppliers have strong bargain power over Korean shipbuilders because they are not diversified and localized. For increase Korean offshore units potential, Korean

[2] John Chen,et al, "Shipbuilding Cluster in the Republic of Korea," (Final Project, Harvard Business School, 2010).

shipbuilders should improve their basic design capability and diversify vendors of main equipment.

Last but not least, the Korean government should promote ship finance, which has remained weak, and build up a human resources development system that fits the global shipbuilding industry's changing business model.

4.3 Stimulating more inter-organizational R&D activities

On the way to develop high-end ships equipped with more sophisticated technologies, it requires boarder and intensive R&D activities. But the Korea's protective industrial policies make the duplication of technological capacities among major shipbuilder Chaebols primarily because of the organizational and institutional structure[3]. The government should facilitate inter-organizational R&D activities that span institutional and disciplinary borders in new areas such as Green Ship or energy-saving ships.

[3] Mariko Sakakibara & Dong-sung Cho, Cooperative R&D in Japan and Korea: comparison of industrial policy [Online] 20 February 2010. Source http://biblioteca.universia.net

REFERENCES

Andrew J. C., and Raymond, B. G. The Process of Structural Change in the World Economy: Some Aspects of the Rise of the Shipbuilding Industry in Developing Countries. Trade and Development an UNCTAD Review 3 (Winter 1981): 103.

Bruno, L., and Tenold S. The basic for South Korea's ascent in the shipbuilding industry, 1970-90. Working paper, Department of Economics, Norwegian School of Economics and Business Administration.

Byars, L. L. Strategic Management, Formulation and Implementation – Concepts and Cases. New York: HarperCollins, 1991.

Capon, N., and Glazer, R. Marketing and technology: a strategic coalignment. Journal of Marketing 51, (1987):10-21.

Cateora, P. R., and Hess, J. M. International Marketing III, p. 361. Homewood: Richard D. Irwin, 1975.

Chen, J., et al. Shipbuilding Cluster in the Republic of Korea. Final Project, Harvard Business School, 2010.

Chida, T. The Japanese Shipping and Shipbuilding Industries. 1990. (Mimeographed)

Cho, D. Shipbuilding Industry: Trends, Characteristics, and Global Competition. Institute of Development Economies, (July 1984): 10-15.

Cho, Seok. Korea Green Growth Strategy [Online]. Available from: www.greengrowth.org [2010, April 5]

Choi, B. Institutionalizing a Liberal Economic Order in Korea: The Strategic Management of Economic Change. Doctoral dissertation, Harvard University, 1987.

Clarkson Research. Shipyard Order Monitor [Online]. Available from www.clarksons.net [2009, December 27]

Collis, D. J., and Montgomery, C. A. Corporate Strategy- A Resource-based Approach second edition. New York: McGraw-Hill, 2005.

Colton, T., and Lavar, H. A brief History of Shipbuilding in Recent Times. CAN Analysis & Solutions, 2002.

Cornford, A. J., and Raymond, B. G. The Process of Structural Change in the World Economy: Some Aspects of the Rise of the Shipbuilding Industry in Developing Countries. Trade and Development, 3, (Winter, 1981): 103.

Daewoo, S. & Marine, E. Annual Report [Online]. Available from: www.dsme.co.kr [2010, February 20]

Dwyer, R. F., and Tanner, J. F. Business Marketing: Connecting Strategy, Relationships, and Learning 3rd Edition, p.172. McGraw-Hill/Irwin, 2006.

ECORYS. Study on Competitiveness of the European Shipbuilding Industry within the Framework Contract of Sectorial Competitiveness Study. Rotterdam: ECORYS, 2009.

First Marine Limited International. Overview of international commercial shipbuilding industry. First Marine Limited International, 2003.

Eich-Born, M., and Hassink, R. On the Battle between Shipbuilding Regions in Germany and South Korea. Environment and Planning A 37.

Groenendijik, L., and Dopheide, E. Planning and Management Tools, pp. 45-46. The International Institute for Geo-Information Science and Earth Observation, Netherlands, 2003.

Harrison, J. Strategic Management of Resources and Relationships. New York: John Wiley and Sons, 2003.

Harvie, C., and Lee, H. Export Led Industrialization and Growth-Korea's Economic Miracle 1962-89. Working paper, Department of Economics, University of Wollongong, 2003.

Henderson, J. The Role of the State in the Economic Transformation of East Asia. In Economic and social development in Pacific Asia. London: Routledge, 1993.

Hobsbawm, Eric. Industry and Empire: From 1750 to the Present Day, rev. and updated with Chris Wrigley, 2nd ed, pp. 178-179. New York: New Press. 1999.

Hong, S. Global Competition and Defferentiation Strategy of Korean Shipbuilding Industry. Seoul: Korea Institute for Industrail Economic & Trade, 2008.

Hyudai Heavy Industeies. Annual Reports [Online]. Available from: www.hhiir.com/ [2010, February 20]

IMO. About IMO. [Online]. Available from http://www.imo.org/About/Pages/Default.aspx/ [2011, March 7]

IMO. Second IMO Greenhouse Gas Study 2009. International Maritime Organization: 2009.

James, R. E., and James, W. D., Jr. Total Quality Management Organization and Strategy. South-Western College Publishing, 2000.

Jan, Y. A three-step matrix method for strategic marketing management. Marketing Intelligence and Planning 20, (2002): 269-272.

Jobber, D. Principles and Practice of Marketing Fourth Edition, p. 679. Berkshire: McGraw-Hill, 2004.

Johnson, G., and Scholes, K. Exploring Corporate Strategy – Text and Cases. Hemel Hempstead: Prentice-Hall, 1993.

Jonsson, G. Shipbuilding in South Korea: A Comparative Study, p. 80. Stockholm East Asian Monographs, Stockholm: Stockholm University, 1995.

Korea Marine Equipment Association [Online]. Available from: www.komarine.or.kr/ [2010, September 20]

KOSHIPA. Korean Shipbuilding Industry: Growth and Mission. Seoul: The Korean Shipbuilders' Association, 2005.

Kotler, P. Marketing Management – Analysis, Planning, Implementation, and Control, 9th Edition. Englewood Cliffs: Prentice-Hall, 1998.

Kotler, P. Principles of Marketing, p. 267. Prentice-Hall, Inc., Cliffs, N.J., 1980.

Kotler, P., and Keller, K. A Framework for Marketing Management third edition. New Jersey: Pearson Prentice Hall, 2007.

Kotter, J. P., and Schlesinger, L. A. Choosing strategies for change. Harvard Business Review (1991): 24-29.

Levitt, T. Exploit the Product Life Cycle. Harvard Business Review 43, 6 (November-December 1965): 81.

Lu, Z. Can China Become No.1 Shipbuilding Nation in 2015. Master's Thesis, Erasmus University Rotterdam, 2005.

Lim, J. State-Capital Relationships in Peripherals Capitalism: The Korean Policy of Heavy and Chemical Industrialization. Master's Thesis, Seoul National University, 1985.

Marine International Trade Centre. Opportunities for Maine Companies in Korean New and Renewable Energy (NRE) Markets. Marine International Trade Centre, 2010.

Namkung, H. Korean shipbuilding Industry. 1976. (Mimeographed)

Park B. Chaebols and Politics, pp. 209-13. Seoul: Hankook Yangsu Pres, 1982.
Pearce, J., and Robinson, R. Strategic Management, 9th Edition. New York: McGraw-Hill, 2005.
Peter, W., Mark J. K., and John, A. P. Strategic Management Concept. Prentice Hall, 1996.
Polland, S. British and World Shipbuilding, 1890-1914: A Study in Comparative Costs. The Journal of Economic History 17, 3 (1957): 426-444.
Porter, M. E. Competition in Global Industries. Cambridge: Harvard Business School Press, 1986.
Porter, M. E. Competitive Advantage. New York: The Free Press, 1980.
Porter, M. E. Competitive Strategy: Technique for Analyzing Industry and Competitors. New York: The Free Press, 1980.
Robinson, J., Hitchens, B., and Wade, D. The directional policy matrix-tool for strategic planning. Long Range Planning Journal 11 (1978): 8-15.
Sakakibara, M., and Cho, D. Cooperative R&D in Japan and Korea: comparison of industrial policy [Online]. Available from http://biblioteca.universia.net/ [2010, February 20]
Samsung Heavy Industries. Annual Reports. [Online]. Available from: www.shi.samsung.co.kr/ [2010, February 20]
Seungki, Y. S.Korean shipbuilding industry under massive restructuring, Xinhua [Online]. Available from: http://news.xinhuanet.com/english2010/indepth/2011-02/07/c_13721505.htm [2011, February 7]
Stopford, M. Maritime Economics, p. 22. Routledge, 1997.
STX Offshore & Shipbuilding. Annual Reports [Online]. Available from: www.stxons.com/ [2010, February 20]
The Shipbuilders' Association of Japan. Shipbuilding Statistics [Online]. Available from: http://saj.sixcore.jp/e/ [2010 December 10]
Thomson, A. A., Jr. A. Competitive Assessment of the U.S. Pharmaceutical Industry. International Competitive Series. Colorado: Westview Press, 2003.
Thompson, J. Strategic Management, 4th Edition. London: Thomson, 2002.
Todd, D. The World Shipbuilding Industry. Sydney: Croom Helm Ltd, 1985.
United Nations Conference on Trade and Development (UNCTAD). Review of Maritime Transport. New York and Geneva: United Nations, 2007.
UNEP. Overview of the Republic of Korea's National Strategy for Green Growth. UNNEP, 2010.
Vernon, R. International investment and international trade in the product cycle. The Quarterly Journal of Economics 80 (1966): 190-207.
Won, D. A Study of Korean Shipbuilders' Strategy for Sustainable Growth. Master's Thesis, Science in Management Studies, Massachusetts Institute of Technology, 2010.
Woo, Y. A Study on the Technology Cooperation Networks of Shipbuilding. Journal of the Korean Regional Science Association 19, 1: 19

Appendices

Appendix A

Measurements of the capacity of the ship

Shipbuilding is generally quantified in terms of tonnage. However, there are several distinct measures of tonnage that are applied for different purposes.

- **DWT** (Dead Weight Tonnage) refers to the weight of cargo and commodities that a ship can carry in metric tonnes. It is less reliable as a comparative measure of size of ship than gross tons because it is strongly influenced by the density of the cargo. It is used generally to measure size of bulk cargo carriers and is a basis of price and fright rate of bulk cargo carriers.

- **GT** (Gross Tons) is the fundamental basis of the physical size of a ship. It refers to the volume enclosed by the ship's hull. All registered ships will be assessed for their gross tonnage and this is the parameter normally referred to when the size of a merchant ship is quoted in tons. It is used to determine things such as a ship's manning regulations, safety rules, registration fees and port dues. It is a standard to measure shipbuilders' capacity of completion and orders received.

- **CGT** (Compensated Gross Tonnage) is modified the GT by a compensation factor relating to the complexity of the building process. CGT was needed because gross tonnage alone was not adequate as an indicator of work content or capacity in shipbuilding. Production process and productivity relatively vary by size and type of ships. The system has now been highly developed and is fundamental to the analysis of shipbuilding activity.

- **TEU** (Twenty-foot Equivalent Unit) is the basic measurement of the cargo carrying capacity of a container ship. 10,000 TEU container ships can carry 10,000 containers at most.

- **Cubic Meter** (CBM) is the special measurement to calculate the capacity of gas carriers.

Source: (First Marine Limited International, 2003)

Appendix B

Major Korean Shipbuilders' Profile

1. HYUNDAI HEAVY INDUSTRIES CO., LTD.

"New History in World Shipbuilding"

As the world's leading shipbuilder, Hyundai Heavy Industries (HHI) has a 12% share of the world shipbuilding market. The shipyard had its ground breaking in 1972 and has since then delivered around 1,530 ships aggregating some 135 mil. DWT to 253 ship-owners in 47 countries. HHI prides itself on its sterling record of client satisfaction. HHI's shipbuilding facility is something that probably cannot be found anywhere else in the world. With a high level of automation and new production technologies ranging from welding robots, indoor production of 40m long blocks, to the environmentally-controlled painting shop, HHI offers a number of advantages: greater productivity gains, reduced building times and, above all, superb ship quality.

2. DAEWOO SHIPBUILDING & MARINE ENGINEERING CO., LTD.

"DSME, Your Partner with Trust & Passion"

Daewoo Shipbuilding & Marine Engineering Co., Ltd. (DSME) started construction in 1973, was established in 1978 as a member of the Daewoo Business Group and was reborn as an independent company in October 2000. DSME has positioned itself as a leading shipbuilder through the performance of various projects, including 742 commercial ships, 73 naval and specialty vessels, 7 passenger car ferries, 19 offshore drilling rigs and many other onshore & offshore plants to date. Its annual production capacity includes 70 large-scale commercial ships, 10 large-scale onshore & offshore plants, 2 submarines and 3 frigates. DSME has its shipyard at Okpo Bay on Geoje Island off the southeastern coast of the Korean Peninsula. Okpo shipyard is an ideal site for shipbuilding and manufacturing of various plants and offshore structures with its favorable environmental conditions including weather, water depth, tidal variation, easy access, etc. The headquarters for DSME is in Seoul, where sales and financing functions are carried out.

3. SAMSUNG HEAVY INDUSTRIES CO., LTD.

“High Technology, High Value, High Productivity”

We're building tomorrow’s ships... and much more. Samsung Heavy Industries got started in 1974 with a simple mission: contributing to global economic growth and prosperity by building faster, safer, more versatile, and eco-friendly ships. Located on the island of Geoje just off the south coast of the Korean peninsula, the company’s ultramodern 3.3-million-square-meter shipyard today boasts three dry-docks and four floating docks supported by an integrated and automated production system that’s helping it make good on the commitment to deliver defect-free vessels. In recent years, Samsung Heavy Industries also established itself as a global leader in several specialty areas such as drillships, floating production, storage and offloading facilities, LNG carriers, and ultra-large container ships while making a strong debut in the ferry and cruise ship fields.

4. HYUNDAI SAMHO HEAVY INDUSTRIES CO., LTD.

“Huge Strides in Productivity & Quality”

Hyundai Samho has the fifth-largest manufacturing capacity in the world and succeeded in making its first profit in 2001 with maximum expertise in order acceptance via the Hyundai business line since October 1999 and management of price and cost. Featuring a qualified workforce and highly educated, young personnel, the shipyard is achieving remarkable improvements in productivity and quality. With the accumulated experience in shipbuilding during the past two decades, Hyundai Samho Shipyard has successfully built and delivered over 380 vessels including VLCCs, Suezmax Tankers, Aframax Tankers, Ultra Large Containerships, 155K cbm LNG Carriers, 82K cbm LPG Carriers, 8,000-Unit PCTCs and Capesize Bulk Carriers. Hyundai Samho continues full efforts to provide high-quality vessels to clients and to move toward a brighter future as a reliable partner.

5. HANJIN HEAVY INDUSTRIES & CONSTRUCTION CO., LTD.

"Eco-Friendly, High-Tech Ships"

Established in 1937 as the first modern shipbuilding company in Korea, Hanjin Heavy Industries & Construction Co., Ltd. has built and delivered over 1,000 ships for diverse purposes with a pioneer spirit. Now the combination of HHIC's technologies with the Subic shipyard's competitive labor force will create a new challenge to be world best. The Subic shipyard has the capacity, which will reach 539,000 CGT by 2015, to build a wide range of high value-added vessels including 12,800 TEU containerships, VLCCs and LNG and LPG carriers. HHIC always works tirelessly to comply with customer needs, focusing on top quality vessels with well-accumulated technology and high-tech facilities.

6. STX OFFSHORE & SHIPBUILDING CO., LTD.

"Creativity & Challenge toward World Best"

Cherishing to be a "World Best" shipyard, STX Offshore & Shipbuilding continuously pursues its advance into world markets. STX has modern and advanced new building facilities. Its dry dock accommodates VLCCs and is efficiently arranged and reserved for the simultaneous construction of a VLCC and two MR beam ships in the semi-tandem method. Its SLS "Skid Launching System" is the newest shipbuilding method, in which a ship is built on the ground and loaded onto a skid barge for assembly and/or launching. Extending our dream to the world, furthermore, STX has reached out to embrace the infinite possibilities of China. Combining the highly-developed Korean shipbuilding technology with competitive manpower assets and a geographic advantage in China, STX Dalian Complex is recording a milestone for the global industry with a cutting-edge production base for ships, equipment and marine structures. STX Jinhae shipyard constructs up to VLCC, 210K class LNG carriers and 14,000 TEU containerships while its Busan shipyard accommodates small tankers and 9,000 CBM ethylene carriers and the Dalian shipyard constructs all kinds of commercial ships and off-shore structures. As a result, its containerships and product tankers have won international recognition for superb technology and productivity in the new building market. By acquiring Aker Yards (now STX

Europe), STX completed a global triangle of production bases - Jinhae/Busan in Korea, Dalian in China, and 15 shipyards in Europe.

7. HYUNDAI MIPO DOCKYARD CO., LTD.

"Tailored to Customer Demand**"**

Hyundai Mipo Dockyard Co., Ltd. (HMD), founded in 1975, has been acknowledged as one of the leading and most versatile shipbuilders in the sectors of medium-sized conventional ships and specialized vessels. Especially, HMD has achieved world-wide recognition for its medium-range product/chemical tankers and handy-Panamax containerships with optimized superior specifications and unchallenged quality gained by a competent design staff and highly qualified workforce. Unequaled flexibility based on HMD's customer-oriented marketing policy to meet the various requirements of buyers is another HMD advantage, which has led to its current unique position in the market. HMD has the vision to be one of the most reliable shipyards in the new building of medium-sized conventional ships and specialized vessels. Never resting on its past accomplishments, HMD will always move toward the future and hopes to share its vision of a bright future with customers.

8. SLS SHIPBUILDING CO., LTD.

"The True Expert in Building MR-size Oil Product & Chemical Tankers"

SLS Shipbuilding Co., Ltd. is well known as one of the market-leading shipyards with more than 60 years of shipbuilding history and cutting-edge engineering. The roots of the company go back to 1946 when it entered the shipbuilding industry in Korea. Based on its proven performance and accumulated shipbuilding know-how, SLS broadened the company's business areas into product/chemical tankers in early 2000 and has successfully delivered more than 100 MR tankers since then. The customer-oriented strategy of SLS enables it to offer customers a wide range of products in the fields of medium-range Product/Chemical Tankers. SLS continues an innovative spirit to characterize the company today - SLS and its design unit are one of the technological leaders in our business sector. SLS will thrive in pushing technological development so that it can continue to provide customers with the best solutions in the market.

9. DAE SUN SHIPBUILDING & ENGINEERING CO., LTD.

"Uniquely Positioned to Maximize Client Satisfaction**"**

Established in 1945, Dae Sun Shipbuilding & Engineering Co., Ltd. has since played an important role in the medium shipbuilding industry in Korea. Situated at the center of the port of Busan, which provides optimum geographical advantages, Dae Sun has built over 480 ships of various types including fishing vessels, oil tankers, bulk carriers, container carriers, etc. Dae Sun is equipped with up-to-date facilities capable of building all types of vessels up to 62,000 DWT. Based on accumulated experience and diversified technology acquired over the past 60 years, Dae Sun is uniquely positioned to satisfy the present and future requirements of its clients.

BIOGRAPHY

Name: Mr. Naridtiphol Srisongka

Date of Birth: 22 July 1986

Place of Birth: Chumporn, Thailand

Education: Bachelor of Arts (Linguistics) at Thammasat University 2004-2008

Scholarship: Master of Arts Program in Korean Studies by ASEAN University Network 2008-2010