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# **Competitiveness assessment of the shipyard in Meyer Turku**

Comparison with Shanghai Waigaoqiao  
Shipbuilding CO. belonging to CSSC (China  
State Shipbuilding Corporation)

KANSAINVÄLINEN KAUPPA  
2022

Author(s) Eremenkov, Konstantin	Type of Publication Bachelor's thesis	Date June 2022
	Number of pages 35	Language of publication: English
Title of publication <b>Competitiveness assessment of the shipyard in Meyer Turku</b>		
Degree Programme Kansainvälinen kauppa		
Abstract <p>The purpose of the thesis is to open to the reader to compare of shipbuilding in the market at the Finnish Meyer Turku shipyard against a Shanghai Waigaoqiao Shipyard. This thesis will go through competitiveness assessment of the shipyard Turku against Comparison with SWS (Shanghai Waigaoqiao Shipyard) belonging to CSSC (China State Shipbuilding Corporation).</p> <p>At the beginning of the thesis, we get to know what shipbuilding is and what the current market situation is like. The study was examined with the shipyards' own reliable sources as well as with the statistics that were available. The work examined what kind of projects are currently underway on both sides, as well as their logistics and technology. In addition, it was clarified what kind of equipment each side has for shipbuilding. In the thesis it was found out what criteria will be used to compare both shipyards. At the end of the thesis, these criteria are used to compare shipyards and provide a summary.</p>		
Keywords Ro-Pax ferry, CSSC, Meyer, shipbuilding, cruise-ship.		

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## 1 INTRODUCTION

This thesis will compare two large shipyards from two different continents. One of European fast – growing shipbuilding shipyard Myer Turku and Shanghai Waigaoqiao shipyard which belongs to CSSC (China State Shipbuilding Corporation). The purpose is to give reader a general understand of shipbuilding competitiveness and what factors affect the outcome of fierce competition.

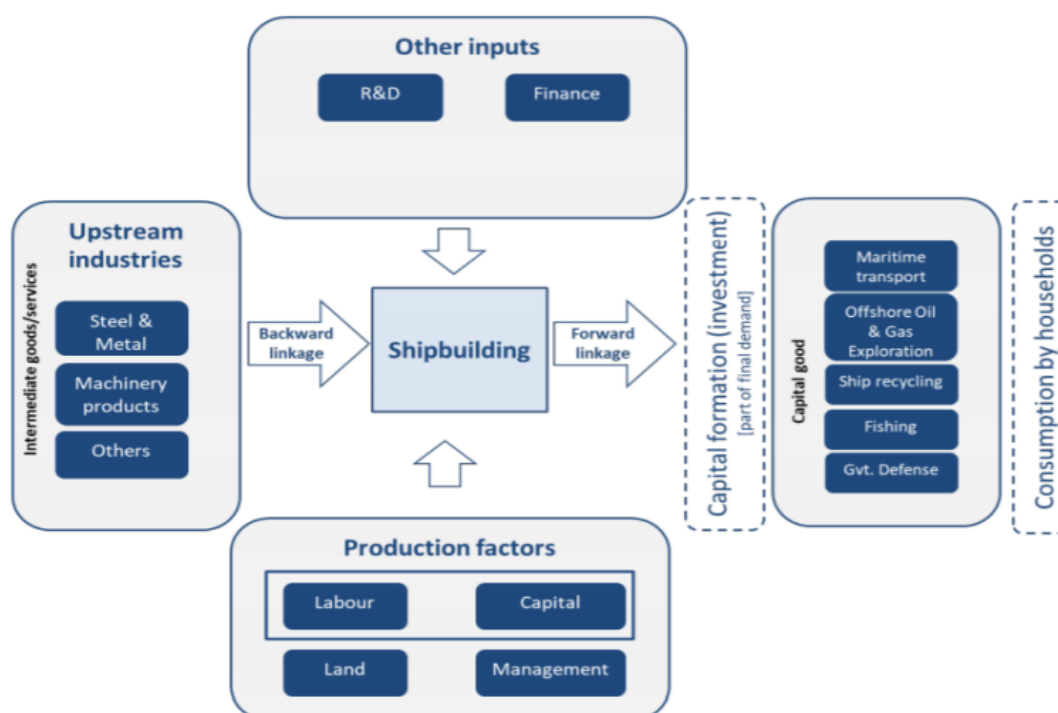
Shipbuilding is regarded as one of the world's oldest, most accessible, and most competitive markets. Even though the shipbuilding sector has a lot of experience in weathering economic ups and downs, the present global crisis has impacted the industry hard. There are two types of variables that impact the shipbuilding industry: economic stability, oil prices and political prosperity and market factors.

For a while, Japan and Europe owned 90 percent of the market, but Japan steadily gained control. Following the pattern of its neighbour, South Korea declared shipbuilding a key sector in the 1970s, and together with cheap labour costs, began to rise to the top. China, the next Asian player, caught on to the industrial growth plan in 2006, surpassing Japan and South Korea in 2009 (Rima Mickeviciene, 2010)

Nowadays according to statistics, China currently has more than 1,200 shipyards, accounting for about 90% of all shipyards in the world. In contrast, there are only 150 large shipyards in Europe. Shanghai Waigaoqiao Shipbuilding Co is one of the largest shipyards in China, which is building ships of almost the same category as Meyer Turku.

## 2 SHIPBUILDING INDUSTRY

Shipbuilding is one of those sectors of the economy that have high scientific, technical and production potential and can significantly influence the development in related industries. The shipbuilding value chain can be visualized as follows:



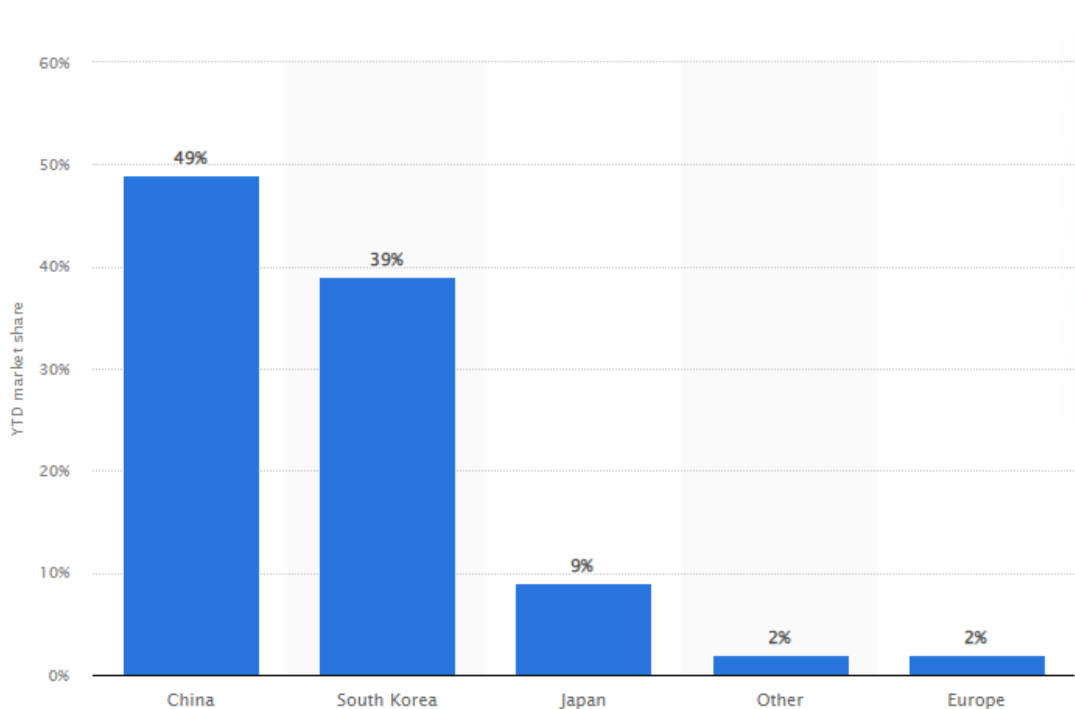
Picture 1. Overview of main industries involved in the shipbuilding value chain

Source: Chart taken from K. Gourdon and Ch. Steidl, ‘‘Global Value Chains and the Shipbuilding Industry’’, OECD Working Papers 2019, 16.

Shipbuilding is a labor-intensive branch of mechanical engineering. The average added value of each ship is only about 20% to 30%. In the 20% to 30% added value, the labor cost accounts for as much as 80%. Many countries, developing shipbuilding, have received a high level of development of related industries.

Several decades ago, there was a pronounced specialization in the global shipbuilding market. In East Asia, there were bulk and tanker fleets, in Europe – container ships, passenger ships.

Since 2000, the situation on the world market has started to change dramatically. The shipbuilding of Asian countries has displaced other regions in almost all parts of the shipbuilding market. The Asia-Pacific region is home to the main shipbuilding enterprises and by the end of 2021, the share of China, Korea and Japan dominate global shipbuilding with an impressive 96% from the total volume.



Picture 2. (Regional breakdown of the global shipbuilding market as of October 2021, based on contracting activity, 2021)

The large capital intensity of shipbuilding justifies the concentration of industry enterprises, therefore, the integration process took place in the EU countries and ended with the creation of large clusters at the beginning of the 21st century.

The European Network of Maritime Clusters was established in 2005 as a platform for the exchange of information, and networking between the maritime cluster organizations of European member states. Now it includes national maritime clusters

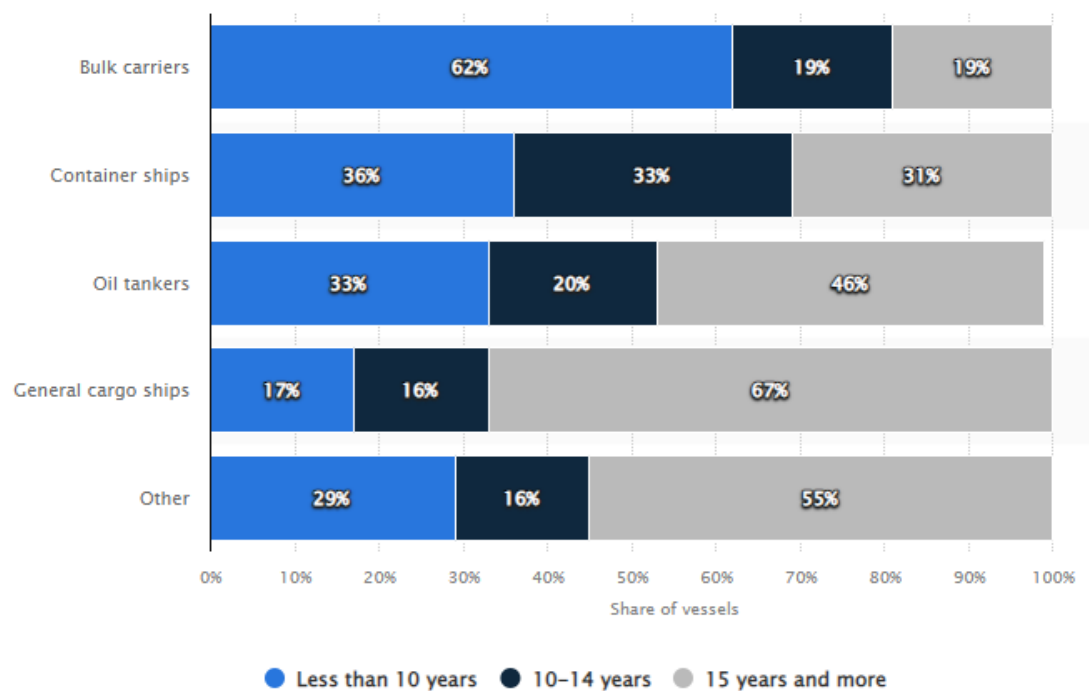
from 20 countries including Finland. It helps shipbuilders of the EU to share information and influence EU decision makers (ENMC, 2022)

All maritime countries provide support for their shipbuilding. For instance, Japan can be considered the founder for using loans as a main form of support provided by the state to the shipbuilding industry. In 1958/1959, an Export-Import Bank was established to support the growing expansion of the Japanese shipbuilding industry. By the mid-60s, loans in Japan reached 80% in covering contracts with a repayment period of 8-10 years at 5.5% fixed rates (Koledova & Yakusheva, 1999)

Nowadays, the EU and China are characterized by a sharp separation of military and civil shipbuilding enterprises, as well as public-private partnerships. European shipbuilding industry, geared primarily towards the construction of cruise ships and offshore vessels.

Today, the global shipbuilding market depends not only on the general state of the economy, but also on technology. Due to economic crises, shipbuilders in the world began to change their guidelines for the development of more economical vessels. In this regard, there has been an increase in the average size of the vessel over the past 20 years. The increase in the size of the vessel leads to a decrease in the cost of transporting a unit of cargo, so ship companies want to increase the size of ships. Also, passenger liners with a larger capacity began to be built around the world.

It should be noted that all shipbuilding countries, and mainly China, face such an important problem as the lack of demand for shipbuilding capacity, and both small and large shipyards have found themselves in this situation due to the lack of orders. The update of the world is also delayed because today the world fleet is younger than ever.



Picture 3. (World fleet age, 2020)

The leaders of the world shipbuilding industry at the beginning of 2021 are China (48% of new construction), South Korea (45%) and Japan (3%). The rest of the world accounts for only 4% of all orders for the construction of new ships. It is worth noting that in terms of the growth rate of orders, China still lags South Korea.

According to the British analytical company Clarkson Research, container ships with a capacity of 12,000 TEU and LNG tankers from 140,000 cubic meters have been in the greatest demand since the beginning of 2022. They accounted for 67% of all new orders. Also, over the past month, contracts for the construction of VLCC, Suezmax and Aframax tankers have not been fixed (MI News Network, 2021).

According to some analysts, the upward trend is likely to continue in the container and tanker fleet segment. Especially LNG tankers. First, price stabilization can be expected for bulk carrier contracts. As the market demand for the services of these vessels will gradually be saturated, and the renewal of the dry cargo fleet will naturally be completed (Korabel, 2022)



According to the article referring to the Clarkson price index indicator, the cost of building ships has been growing for 14 consecutive months at the time of January 2022. The cost is increasing for all types of vessels except for Suezmax. For example, the price of construction of LNG tankers has increased in price from 210 to 214 million dollars (Korabel, 2022)

### 3 PRISE COMPETITIVENESS AND PRINCIPLES OF ITS ASSESSMENT

#### 3.1 Factors of enterprise competitiveness

In a broad sense, an enterprise's competitiveness can be characterized as its capacity to achieve its own goals in the face of competition from competitors for a set period. An enterprise's competitiveness is an economic category that represents its ability to develop competitive products and its competitive advantages in comparison to other firms in this industry in the country and overseas. The competitiveness of an enterprise can only be measured within a group of enterprises belonging to the same industry; therefore, while analyzing the degree of competitiveness of an enterprise, it is important to first pick basic objects for comparison. Competing enterprises selected for comparison must be comparable: characteristics of manufactured products according to the identity of the needs satisfied with its help, market segments for which the products are intended and phases of the life cycle in which the enterprise operates (Voronov, 2012).

#### 3.2 Enterprise competitiveness

The competitiveness of an enterprise is the ability to profitably produce and sell marketable products at a price no higher, and no worse in quality than other market

counterparties in its market. In this connection, the competitiveness of the enterprise consists of three main factors:

- resource (physical costs of resources per unit of finished product)

The enterprise itself at the micro level can control the resource factor for the growth of competitiveness, therefore, increasing labor productivity, capital productivity, and overall production efficiency is very important

- price (the level and dynamics of prices for all used production resources and finished products)

Organization of management, technological and financial potential of the enterprise can ensure the growth of the resource component of competitiveness. It is more difficult to control market prices for raw materials and semi-finished products, as well as for our own finished products, since the price level largely depends on the state of the global and national economy.

- "Environmental factor" (economic policy of the state and the degree of its impact on the market counterparty)

The "environment factor" includes such components as the reliability of the banking system, bank interest, inflation rate, exchange rate, foreign trade tariff and others that directly affect the competitiveness of the enterprise

### 3.3 The main groups of factors affecting the level of competition

The technical and technological groups include factors that characterize the production equipment, the composition and technology of the work performed. This group of factors is largely determining, since the condition and quality of production equipment, the degree of their use, the level of mechanization and automation of production, the

perfection of the technologies used directly affect the operational efficiency of the enterprise (Voronov, 2012).

The organizational and management group contains factors that activate the technical and technological subsystem due to the organization of production and labor, recruitment of personnel, and the introduction of a progressive wage system.

Financial and economic concentrates the factors of the functioning of the enterprise from the standpoint of effective management of resources, profitability and financial stability.

Socio-psychological group of factors covers the personnel of the enterprise, its organizational culture, values, needs and interests of employees. It is necessary to create normal working and rest conditions for the development of needs for self-expression.

Market group of factors - the factors of this group include open access to the market of resources and new technologies, the uniqueness of the properties of manufactured goods, the well-functioning distribution channels for products and the effectiveness of the sales promotion system, a variety of after-sales service schemes (Voronov, 2012).

## 4 MEYER

### 4.1 Meyer Werft

Meyer Werft, a German shipbuilding enterprise owned by the Meyer family, has been in operation since 1795. Its focus has switched to passenger ships during the previous few decades. Meyer is now one of the world's leading manufacturers of specialist cruise ships. Meyer has two yards in Germany today: the main yard in Papenburg and

a smaller yard in Warnemunde, which is used to build smaller boats and big floating components for the Group's other yards (Meyer Werft, 2022).

#### 4.2 Meyer expands to Finland

Meyer took a big stride forward in 2014 when it purchased Finland's largest yard, the Turku yard — another cruise ship specialized yard. Mr. Bernard Meyer himself has commented on the expansion to Finland, saying that Meyer's enlargement to Finland was many strategic factors.

*Since I started my career in 1973 at Meyer Werft we were always competing with the Turku shipyard first in ferries and gas tankers and later on many, many years in cruise ships. The shipyard in Turku was always our hardest competitor because like we they have been always very innovative, very hard working people and delivering good quality in time – all the attributes which are also very important for us. It is not only important that we could grow with the acquisition of the new shipyard, very important for me was also that their DNA is very close to our DNA.* (Mr. Bernard Meyer, 2019, The seventh question)

## 5 MEYER TURKU

Meyer Turku specializes in the design and construction of extremely complicated, ecologically friendly cruise ships, car-passenger ferries, and unusual boats. Meyer Turku is one of the world's top cruise ship manufacturers, having sister shipyards in Germany, Meyer Werft in Papenburg and Neptun Werft in Rostock. The latest ship

built by Meyer Turku is the Costa Toscana, completed in 2021, which operates as a cruise ship. Currently, Meyer Turku plans to manufacture one cruiser each year until 2026.

The shipyard's operations directly employ roughly 4,100 people and indirectly employ 4,000 people in yearly work units. The annual work units (AWU) grew by 28% in direct employment and 54% in indirect employment in just two years.

The impact on overall employment is considerably bigger, although the influence of foreign enterprises and secondary suppliers on employment could not be determined within the scope of the study.

For cruise operators and other ship owners, the company delivers cutting-edge technological solutions and superior building techniques. Meyer Turku is a company that specializes in the construction of cruise ships, car-passenger ferries, and unusual boats. The shipyard has manufactured over 1,300 new ships for customers across the world throughout the years.



Picture 4. Meyer Werft yards location (breakingwaves.fi, 2019)

## 5.1 Meyer Group invest into Meyer Turku

In 2019, the Meyer Group took a big step to expand its shipyards in capacity.

The biggest changes and emphasis on capacity expansion were in Turku. The Meyer Group sees great opportunities at the Turku shipyard, because even now the latest technologies and ecology bring opportunities to the Meyer Group.

*The biggest capacity increase will take place in Finland where we delivered one mid-size cruise ship per year when we took over the yard. By 2020 Meyer Turku will be able to produce two large cruise ships a year. In Papenburg we are reaching already this year our expansion target by building two big cruise ships a year and one small size cruise ship. Our shipyard in Warnemünde, Neptun Werft, is supporting Papenburg and Turku with floating engine room units and they have been growing recently to supply the demand of engine room units for Papenburg and will further grow for the increasing demand of engine room units in Turku. Currently the whole Meyer group is employing about 7600 employees and will grow to 8500 by 2022. We will then be able to deliver from Papenburg about 400,000 gross tons and Turku about 400,000 gross tons each year. (Mr. Bernard Meyer, 2019)*

Mayer Turku's direct staff will continue to expand in the coming years, but the rise will become more consistent after that. The shipyard's age structure, according to projections, will keep the annual number of recruitments at a high level. In the future, there will be a greater demand for highly educated labor. With the network of supplier firms and the quantity of workers in the supplier network, the variance in the workload of the project work will be stabilized (Mäkinen, 2019).

## 5.2 Orders and turnover

When the Turku shipyard became fully owned by the Meyer Group in 2015, the shipyard faced major changes and extensive order lists. Meyer Turku and Carnival

Corporation & plc tentatively agreed in September 2016 to provide two LNG-powered cruise ships in 2020 and 2022. The new ships also mark Carnival Cruise Line's return to construction in Turku, as well as another push for Meyer Turku's future. Meyer Turku is expanding with contemporary investments in buildings and employees, thanks to an exceptionally lengthy order book that currently extends until 2022. Ships will be named Icon and Icon 2. For Meyer Turku, Icon of the Seas is both a great challenge and an opportunity to rise to the top of shipbuilding again. The construction of the ships began on a low profile as early as last spring, due to a major pandemic. Last summer, a major event was held for the official opening of the shipbuilding, announcing the official start of shipbuilding (Turun Sanomat, 2021).

#### 5.2.1 Order delays

The pandemic affected not only turnover but also the shipbuilding schedule. Icon was tentatively completed in 202, but due to the pandemic, the schedule moved one year ahead.

#### 5.2.2 Turnover

The turnover of Turku Shipyard has decreased slightly since 2019. This has been mostly affected by the pandemic. The change in schedules, staff reductions, and mostly material transportation and price list have contributed the most. The rise in the price of materials has affected the whole world and especially the shipbuilding industry. Currently, the price of shipbuilding is estimated to rise by 1-3%. The percentages are not high, but when it comes to the shipbuilding industry, it is many millions of euros.

## 6 CHINA STATE SHIPBUILDING CORPORATION

China has significant experience in the development of shipbuilding and is among the world leaders in the level of development of the shipbuilding industry. China has made an unthinkable breakthrough in shipbuilding over the past few decades. Especially large-scale construction of ships in China began in the second half of the 2000s, when the volume of raw materials imported by the country (iron ore, bauxite, coal, oil, etc.) grew to unthinkable volumes, and it was decided to prioritize using ships of its own production for transportation. A distinctive feature of China's shipbuilding industry is strong state support.

Transformations in the shipbuilding industry began in 1982, when the Chinese State Shipbuilding Corp. (CSSC) was established instead of the relevant ministry, and all the shipyards that existed at that time were transferred to its jurisdiction. In the companies, the lower levels of the management have gained much more independence than it was within the framework of the previous ministerial hierarchy. In 1999, civil shipbuilding was separated from military shipbuilding. Military shipbuilding was transferred under the control of the State Commission for Science, Technology and Defense Industry.

The high rate of development of the shipbuilding industry was achieved in the last decades of the 20th century. In 1994, for the first time, China took the third place in the world in terms of shipbuilding production, right after the recognized leaders of Japan and South Korea. However, it was not possible to say about equal rivalry with neighbors at that time. Even in 2001, China's share in the global ship market was estimated at 7% by produced gross tonnage, while R. Korea – 43%, Japan – 26% (U.S. Department of transportation, 2011).



But the quantitative gap has been overcome over the next ten years. In 2010, the share of China (38%) in the gross tonnage of manufactured ships exceeded Korean (37.3%) and Japanese (24.6%). These three countries together accounted for more than 92% of the global total (The shipbuilders' association of Japan, 2019, page 2).

Table 2 World completions 2008–2010

Year	Japan		S. Korea		China		Europe		Others		World Total	
	No.	1,000 GT	No.	1,000 GT	No.	1,000 GT	No.	1,000 GT	No.	1,000 GT	No.	1,000 GT
2008	562	18,656	520	26,379	861	13,956	311	4,288	988	4,410	3,242	67,690
2009	576	18,972	524	28,849	1,086	21,969	272	3,040	1,096	4,243	3,554	77,073
2010	580	20,218	526	31,698	1,413	36,437	254	3,122	975	4,958	3,748	96,433

Picture 6. (The Shipbuilders' association of Japan, 2019)

Despite the impressive increase in production over the first decade of this century, 15% of almost two thousand Chinese shipyards were unprofitable by the end of 2011. However, the difficulties did not generate a wave of bankruptcies of small enterprises but stimulated structural changes in the industry. Some Chinese shipyards have diversified their business to include the production of wind power-, mining-, warehouse-, and railway-equipment. Large companies have stepped up efforts to move towards shipbuilding with higher added value. For example, CSIC has chosen the production of drilling platforms for oil and gas production as a "breakthrough" direction. In the same year, the Chinese government announced its intention to consolidate the industry: the most financially stable and technologically successful companies should produce at least 70% of all ships.

Large-scale construction of ships began in China in 2000, when the volume of imported raw materials grew to huge sizes and the government decided to import it mainly on Chinese-made ship

The Chinese government pursues a policy of active state support for shipbuilding:

- 1) Two large state-owned shipbuilding corporations that have all the capacities for the construction of all types of vessels and occupy a large market share.
- 2) Creating conditions for the work of joint ventures with shipbuilding companies in Japan and South Korea. Organization and support of international cooperation in China's special economic zones.
- 3) Encouraging Chinese shipowners to place orders at Chinese shipyards, providing government subsidies and benefits.
- 4) Attraction of Chinese banks to finance the construction of both the Chinese fleet and ships for export at Chinese shipyards on terms of low interest rates.

Government support in China is typical for many import-related industries. The history of Valemax class vessels is indicative. This type of vessel is designed for the Brazilian company Vale SA, which supplies iron ore to China. Some of the first vessels of this class were built in the shipyards of China.

The Chinese government banned the entry of Valemax into Chinese ports in 2012 for the sake of state-controlled logistics corporations, such as COSCO Shipping. The ban was lifted in 2015 after the sale of ships and shipping contracts to Chinese companies CMAS and COSCO. In 2017, it was decided to build additionally 20 Valemax class vessels at the national shipyards of China and South Korea (Financial Times, 2017) (Korabel, 2017).

Another example of state support for a domestic producer can be the agreement concluded by the Chinese oil and gas company Petrochina with the Russian shipping company Sovcomflot on the transportation of oil to the People's Republic of China. To fulfill the contract, the shipping company was forced to order about 20 large-tonnage tankers with indispensable construction conditions at Chinese shipyards.

In July 1999, during the general reorganization of the Chinese defense industry, the shipbuilding industry was divided geographically into two state corporations – China State Shipbuilding Corporation – CSSC, which controls the shipbuilding industry in the southern part of the country, and the China Shipbuilding Industry Corporation (CSIC), to which the northern part of the Chinese shipbuilding component was transferred.

CSSC Corporation is one of the largest shipbuilding organizations in the world, owns ten shipyards. The second CSIC corporation owns seven shipyards.

The corporations also include design and research institutes:

- 1) China Marine Design and Research Institute (China Marine Design and Research Institute),
- 2) China Shipbuilding Research Center (CSSRC – China Marine Research Center),
- 3) Shanghai Design and Research Institute of Merchant Shipbuilding (SDARI - Shanghai Research Institute of Merchant Ship Design).

In Japan and the Republic of Korea, scientific developments in shipbuilding are half funded by the state, in China this funding is 100% from the state.

Three sources for technological innovation are actively used in China:

- 1) import of new foreign technologies through foreign trade, including the transfer of copyrights and their licensing, as well as the import of high-tech means of production.
- 2) obtaining foreign equipment and technologies in the process of mastering foreign direct investment.
- 3) own technological innovations obtained due to the growth of national expenditures on research activities. The role of this source is growing every year.

But there are several problems in China's shipbuilding. The overall level of technology and organization of work significantly lags behind in comparison with foreign advanced enterprises. As a result, the specific labor intensity of production in the industry is 3-5 times higher than abroad, and the duration of ship construction is 2-2.5 times longer. Modern methods of large-block construction are little used at shipyards due to the lack of heavy-duty cranes.

Another problem is the low quality of ships, due to the sharply increased need for many ships necessary to maintain a high rate of development of the Chinese economy. Low-quality vessels have a huge negative impact on water transport and pose a great threat to the safety of water transport. In addition, the volume of low-quality and cheap shipbuilding slows down the development of the country's shipbuilding industry.

Table Analysis of modern shipbuilding in China

Strengths	Weaknesses
<ul style="list-style-type: none"> <li>• Low labor cost</li> <li>• Volumes and price of available steel</li> <li>• strong state support</li> </ul>	<ul style="list-style-type: none"> <li>• Weak development of shipbuilding technologies</li> <li>• Lack of production of key components in the country</li> </ul>

## 7 SHANGHAI WAIGAOQIAO SHIPBUILDING CO

Shanghai Waigaoqiao Shipbuilding Co (hereinafter referred to as “SWS”) is one of the leading shipbuilding enterprises in China. This relatively young company for the shipbuilding industry was founded in 1999. The shipyards are located along the mouth of the Yangtze River and cover an area of about 5 million square meters. The total length of the coastline is 4 kilometers. The company is wholly owned by the CSSC State Corporation (Chinasws.com, 2022).

The shipyard is equipped with two dry docks, one 800-ton gantry crane, three 600-ton gantry cranes and nine painting workshops. Also, the list of equipment owned by SWS includes:

- 2 pretreatment lines (pretreatment line) with a length of 3 and 4.5 meters
- 15 plasma cutting machines
- 1 flame cutting machine
- 1000-ton oil hydraulic press
- 2 three-roll bending machines (three-roller type bender): 21 and 12 meters  
(Chinasws.com, 2022)

There are over 10000 employees working in SWS (Shanghai Waigaoqiao Shipbuilding Co., Ltd.). In addition to the production of ships, the company is engaged in the design of ships, as well as the production and design of offshore products. The main focus is the design and construction of large vessels, such as Capesize bulk carriers, oil tankers and ultra-large container ships ULCV. According to statistics, 11 percent of all capsizing bulk carriers in the world and 8.3 percent of large oil tankers of the VLCC class were created on SWS. (Chinashipbuilding.cn, 2021)

Aframax crude oil tanker with a displacement of over 110,000 tons received the title of "Chinese Name Brand product"(Chinases.com, 2022). China has also joined the world's leading group in the field of design and construction of floating production storage and offloading (FPSO). The top product is a 3000-meter deep-water semi-submersible drilling rig. This is a deep-water semi-submersible drilling rig of the 6th generation with a working water depth of 3000 meters and a drilling depth of 10,000

meters. SWS manufactures self-lifting drilling rigs on a serial basis (Chinasws.com, 2022).

SWS also fully or partially controls several large enterprises. For example, Shanghai Waigaoqiao Shipbuilding & Offshore Engineering Co and CS Cruise Technology Development Co. Which also allows SWS to engage in the production and sale of marine equipment and do own ship design (Chinasws.com, 2022).

SWS Engineering has 760 employees, including 450 production design engineers, 185 marine design engineers, 80 research and development staff and 45 management staff.

The shipyard repairs large vessels and offshore products. In recent years, SWS has been China's largest shipyard. For example, the shipyard delivered 23 ships during the first three quarters of 2020 with deadweight tonnage 3.55 m (Katherine Si, 2021, Seatrade Cruise News).

The shipyard is implementing plans to enter the market for the construction of cruise liners. In 2017, an agreement was signed between Carnival Corporation and CSS on the construction of two cruise ships with the option of building 4 additional liners (China Daily, 2017).

In December 2021, the construction of the hull for the first liner was completed and the ship was launched several months ahead of schedule. The ship is now entering the internal outfitting and interior completion stage (Superstructure for Carnival's China Cruise Ship Newbuild is Done, 2021).

The first cruise ship will be able to comfortably accommodate 5,246 passengers with a length of 123 meters and a width of 37 meters. The gross capacity is 135,000 Gt, the maximum draft reaches 28 meters.

The vessel is planned to be equipped in accordance with the preferences of the national tourist market and is focused on serving lovers of sea travel from China. The liner should be handed over to the customer in December 2023.

The next stage in the development of shipbuilding in China in the segment of passenger ships will be the development of the first cruise ship project, which will be implemented exclusively by Chinese specialists and only at national enterprises. It is also reported that most of the parts, assemblies and mechanisms will also be manufactured in Chinese factories.

In December 2021, the Italian classification society RINA officially approved the preliminary design of the cruise liner submitted by China. The new liner will be larger than its two predecessors: with a length of 330 m and a width of 38.5 meters, its gross capacity will reach 150,000 Gt. Thus, in the medium term, China intends to "break the technological blockade" in passenger shipbuilding, overcoming dependence on foreign specialists in this field (Seatrade Maritime News, 2020)

## 8 FACTORS OF ENTER

China has made significant inroads into the European shipbuilding sector through intangible technology transfers such as direct investments, mergers and acquisitions, research cooperation, and the transmission of data in nonphysical form. China has already taken over enterprises or shifted production to places where it has not yet been impacted by Chinese competition in many circumstances. In other words, the European marine sector is on the verge of losing the continuing shipbuilding competition with China (Air University, 2020).

Northern Europe's marine industry has a robust supply chain, which China has tapped through either design collaboration agreements or acquisitions. China frequently replicates sophisticated creative ship designs, resulting in domestic replicas in as short as a year. If the copy is successful, China begins to build a local supply chain and purchases firms that have crucial supply chain technology, such as engine manufacturers (Air University, 2020).

The third phase is to achieve economies of scale by combining Chinese design expertise into a single huge corporation, such as China State Shipbuilding Corporation (CSSC). This state-owned company is the world's largest shipbuilder and receives significant financial support from the Chinese government. CSSC and China Shipbuilding Industry Corporation (CSIC), which have a combined worldwide market share of 20%, were amalgamated by the Chinese government in 2019. The new super-conglomerate is anticipated to improve China's shipbuilding sector and make it easier for the country to develop a formidable navy. China is shaping itself as an industrial civilian and navy shipbuilding superpower capable of considerably lowering the market share of Western corporations through illicit market economic activities (Air University, 2020).

Despite the substantial economic and security difficulties created by China's rise as a major power in the shipbuilding sector, the Commission's lack of forward thinking on China's industrial strategies and the ramifications for European shipbuilding has gotten practically little attention in Western debates. European manufacture of cruise ships, transport ships, and frigates is under threat. This may result in the loss of employment and profits. In the long run, it may result in a loss of standard-setting power, a trend that is already visible in several high-tech industries where China has grabbed the lead (Air University, 2020).



The Chinese shipbuilding company SWS was selected for comparison based on one criterion. This is the only company in China that has experience in building large-capacity cruise ships. To be more precise, this is the only shipyard building China's first two cruise ships.

Now, the Finnish shipyard, which has an impressive history and a wide range of built ships of various classes, is engaged in the production of exclusively the construction of cruise ships. In general, this is typical for the entire European civil shipbuilding industry.

The mentioned history of shipbuilding in Turku brings us back to the issue of choosing a Chinese shipyard. Despite the young age, the selected Chinese shipyard can be called one of the old-timers of Chinese shipbuilding. We remind you that SWS was founded in 1999, but in 20 years it managed to break into the leaders of Chinese shipbuilding.

There is a huge difference in the measures of state support. The Chinese government actively supports the domestic economy, including shipbuilding. Virtually all Chinese shipbuilding is controlled by state-owned corporations. The number of orders placed with private companies is constantly decreasing.

On the other hand, state support in Finland is mainly characterized by long-term assistance: taxation, support for specialized education and research activities. This is again typical of civil shipbuilding in Europe, except for Germany and Poland, where subsidization of medium and small-tonnage shipbuilding is carried out.

Characteristic is the history of STX Europe, the previous owner of the shipyard in Turku. The company applied for a loan from the Finnish government for a possible order of 50 million euros. The loan was denied, and the contract was lost. It should be clarified that the allocation of a loan did not guarantee the placement of an order at a Finnish shipyard. The loss of the order resulted in a request to the European Commission regarding the issuance of a loan by France to a domestic shipyard (Yle Novosti, 2014).

At the beginning of 2014, STX Finland lost the contract for the construction of two liners due to lack of financial support. After 6 months, the shipyard was sold with the condition of building two liners and the allocation of 10 million euros from the state budget by Finland to finance production (Yle Novosti, 2014).

These stories prove how important the shipbuilding industry is for Finland. And how the state is trying to help the shipbuilding industry, relying on all available means. Available funds include loans and even government subsidies.

China provides loans and subsidies to the shipbuilding industry on a planned basis. The basic lending scheme is copied from South Korea and Japan. It has proven itself well over the past decades and continues to be carried out to this day. The customer, placing an order with the Chinese shipyard, gets the opportunity for a loan with low interest and a reasonable repayment period.

State lending and subsidizing of shipbuilding is strictly regulated by the agreement developed by the Organization for Economic Co-operation and Development (OECD) “Export credits for ships (SSU)”. The agreement has been ratified by Finland, but not by China, which is not a member of the OECD.

Below is a summary table that allows to compare the main production capacities:

	Meyer Turku	SWS (Shanghai Waigaoqiao Shipbuilding)
square meters	1,5 million meters	5 million meters 4 km coastline
Dry dock	365*80	(SWS has two dry docks) 480*106 360*76
Main gantry crane	1200 ton	800 ton
Secondary gantry crane	600 ton	600 ton

The dry dock is one of the most important facilities at the shipyard, since the size of the ships produced directly depends on the size of the dock. The second dry dock at SWS was extended by 200 meters in 2019 specifically for the construction of the first cruise ship.

There is parity in the main production capacities, especially if we discard the second dry dock existing at the Chinese shipyard.

China is famous for its steel industry. In 2016, half of the world's steel was smelted in China. This affects the cost of steel available for production. In Europe, the price level reaches almost 1,000 euros per ton, while in China the price is half that. On average, a cruise ship uses 250 000 tons of steel. By applying a simple formula, the customer can count on savings of around 100 million euros from the cost of steel alone (Trading Economics, 2022).

Steel prize for one ton:	China	Europe
500€ (price for China)	$500 * 250\,000 = 125\,000\,000€$	x
900€ (price for Europe)	x	$900 * 250\,000 = 225\,000\,000€$

Long gone are the days when the construction of the ship was carried out exclusively by the forces of one shipyard. Modern construction of any type of ship is impossible without an extensive network of suppliers. Here it seems to be a more advantageous position for the Finnish shipyard. The European market is saturated with offers and partners. Moreover, due to the development of the transport network, the logistics of the supply chain seems to be more reliable on the European continent.

In terms of education and technical literacy of workers, Finland has a huge advantage. Ten years ago, captains and chief mechanics of ships undergoing repairs at Chinese shipyards noted an extremely low level of technical education not only among workers, but among engineers. At the same time, there has been rapid progress in education.

The Finnish education system trains a wide range of specialists for all levels of production. Finland pays attention to the level of education and is rightfully highly rated all over the world.

In research activities, it is difficult to give the palm to one of the parties. On the one hand, Finland is well known for numerous technical innovations and extensive research collaborations between universities in Finland, Europe and the rest of the world. On the other side, the huge R&D work going on in China is also known. For example, if we talk about technologies related to autonomous surface vessels: 96 percent of all patents related to this technology are registered in China. At the same time, there is a need for autonomous and remote-controlled ships all over the world (Nick Chubb, 2021).

Comparation	SWS	Meyer Turku
Personal	Cheap labor	Educated
Equipment	Extra Dry dock	More advanced equipment
Supplement network	Under construction	High quality time-proven
Resourses price	Low cost	High cost
State support	Full support	Limited by OECD
R&D (research and development)	Growing (fully paid by state)	High quality time-proven

When considering the above table, it is necessary to consider that each row has a different weighting factor. For example, only the cheapness of resources allows customers to save about several million. Despite the imperfection, the summarized data demonstrates the reason for Europe's leadership in the construction of liners and ferries, where quality and increased safety are required.

## 9 SUMMARY

In the course of the work carried out, the comparison of shipyards grew into a comparison of the shipbuilding and related industries of the economies, financial systems, and even the state structure of China and Finland (the European Union). Without expanding the scope of the analysis, it seems impossible to fully assess the competitiveness of two shipyards from different parts of the world, existing in different economic systems.

If we confine ourselves solely to comparing shipyards, then only two factors will have to be used: equipment and personnel. And even then, we will be forced to ignore several factors: education is in the hands of states; Chinese shipyards have access to government subsidies to improve equipment; State subsidies in Finland are strictly regulated by the EC and OECD agreements.

Modern shipbuilding cannot compete in the world without state support, cooperation with suppliers and other shipyards. The current situation is characterized by the unification of already formed national clusters into supranational ones. On the one hand, the cooperation of shipbuilders and corporations of South Korea, China, Japan and Vietnam catching up with its neighbors is known. On the other hand, countries that are members of the European Union.

Maritime transport traffic will grow faster than expected soon due to the closing of land borders, which interrupted the rapid development of Europe-Asia rail transport. Now, in the global shipbuilding industry, there is an acute shortage of tankers and offshore products related to the transportation and processing of liquefied gas and oil, due to the redistribution of traffic flows.

European shipbuilding holds the lead in the construction of cruise ships and ferries, where high demands are made in terms of safety and comfort. However, in the long run, it looks like a race where the distance between the leader and the catchups is constantly shrinking. Therefore, there is a need to close the gap in other areas. Of

course, it is difficult to expect a reduction in the cost of steel in the European market and the cost of a man-hour. The most logical is the further deepening of cooperation between shipbuilders in Europe, support for the shipbuilding industry at the EU level and the liberalization of subsidy and credit policy, which is too strictly regulated by OECD agreements.

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