

COSCO Shipyard Group	COSCO	One Newbuilding Yard: Nacks
Changjiang National Shipping Corp. of Yard	Changjiang National Shipping Corp.	Five new building yards include Jinlin Shipyard
Fujian Shipbuilding Industry Group Corp	The Government of Fujian Province	Five New Building Yards
Jiangyang Shipbuilding Group	Provincial Owned	Two New Building Yards

Table 4.4 Owner ships of 3 shipbuilding groups, Source: Compiled from China's Shipyards, Capacity, competition and Challenges

It might be strange that China Shipping Group Company is missing from above mentioned table. In fact, China shipping, the second large shipping company in China has strong abilities in the field of ship repairing, which was under the jurisdiction of China Shipping Industrial Company. There are lots of rumors in relate to this shipping giant who has ambitious for shipbuilding business. Recently, The market is full of information with regarding to Samsung HI of Korea, who is negotiating with China shipping for setting up of a Joint Venture shipyard in China.

4.5.3 Other Yards

There are many smaller shipyards in China. Under the background of developing Chinese economy and increasing demand of ship building market, these yards are growing rapidly in scale of facilities and capabilities during the years. Nevertheless, the yards are mainly targeting at international market, which means they are more vulnerable to the fluctuations of the shipbuilding market and the shipping cycle. Anyway, a few of them have already set up the reputation among the international buyers. They are good supplementary to mainstream of Chinese shipbuilding industry.

4.6 Shipbuilding Capacity

In the past few years, Chinese yards' development in expanding ship building capacity is in an astonishing rate and scale. The issue of the shipbuilding capacity is a sensitive topic of international shipbuilding community. Main concern of international shipbuilding community falls to the issue of overcapacity, which exists for a long time after Oil Crisis in 70's. The issue of overcapacity will be discussed in later chapter in regarding threat to Chinese shipbuilding Industry.

It is mentioned in previous chapter, OECD have employed meaningful unit, Gross Compensated Tonnage, for measuring the shipbuilding capacity worldwide. Repeatedly, Gross Compensated tonnages largely rectify the distortion, which was caused by the measurement taken by Deadweight Tonnage or any other measurement unit, because Gross Compensated Tonnage takes building complexity of varied ship types into account.

According to the methodology of OECD, Drewry Shipping Consultant Ltd estimated that the shipbuilding capacity of top 20 shipyards in China was over 2.4 million CGT by end of 2002. The estimation was made on the basis of individual shipyards in according with the building facilities available by end of 2002, taking into account of product mix as well as average shipbuilding performance throughout 3 year period (from 1999 to 2002).

In combination with capacity of other shipyards in China includes a newly built modern shipyard, Waigaoqian Shipyard that is, currently, the biggest shipyard in China. Total shipbuilding capacity of the Chinese shipbuilding industry is at nearly 3.2 million CGT. Although the estimation upon shipbuilding capacity of other shipyards was based on average performance through the same period, rather than individual performance, the figure is mostly presenting overall shipbuilding capacity in China. Following table shows in detail.

	Output in 000 CGT	% Utilization	Capacity 000 CGT
Top 20 yards	1,159	55	2,412
Waigaoqiao			165
Yards for ship > 10,000Dwt			498
Yards for ship < 10,000Dwt			112
Total			3,187

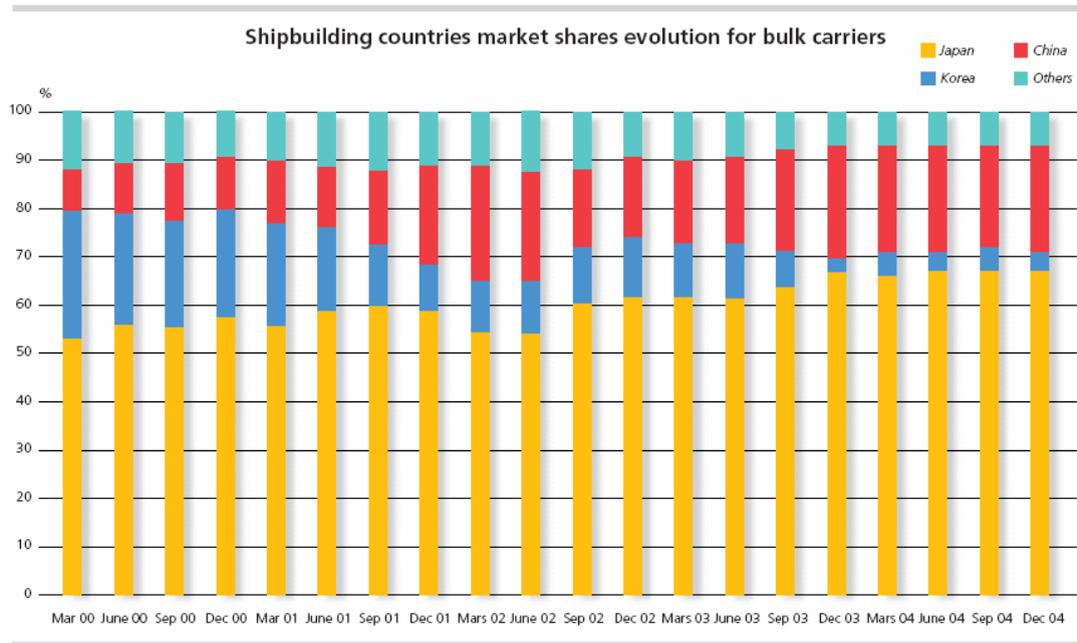
Table 4.5 overall shipbuilding capacities in China, Source: Drewry Shipping Consultant

It shall mention the utilization of smaller shipyards, which are building the ships below 10,000 DWT, are lower in performance than larger shipyards, by this, the actual ship building capacity of the industry might be lower than the figure mentioned above. However, It is believed, in recent year, the performance of the shipyards has increased, which is likely the case for top 20 shipyards, this is to say, the shipbuilding capacity in China has further growing because much shorter construction time of new building are realized in bigger shipyards.

4.7 Main ship products of the industry

4.7.1 Bulk Carriers and Tankers

Bulk sector is absolute the field where Chinese shipbuilders are very active. In 2000, the market share of bulk carriers made by Chinese yards was below 10%. With the years moving forward, Chinese yards have been awarded more orders, the figures from below graphs present the capability of Chinese shipbuilding industry at bulk carrier market, which is the second largest producer for bulk carriers after Japanese.

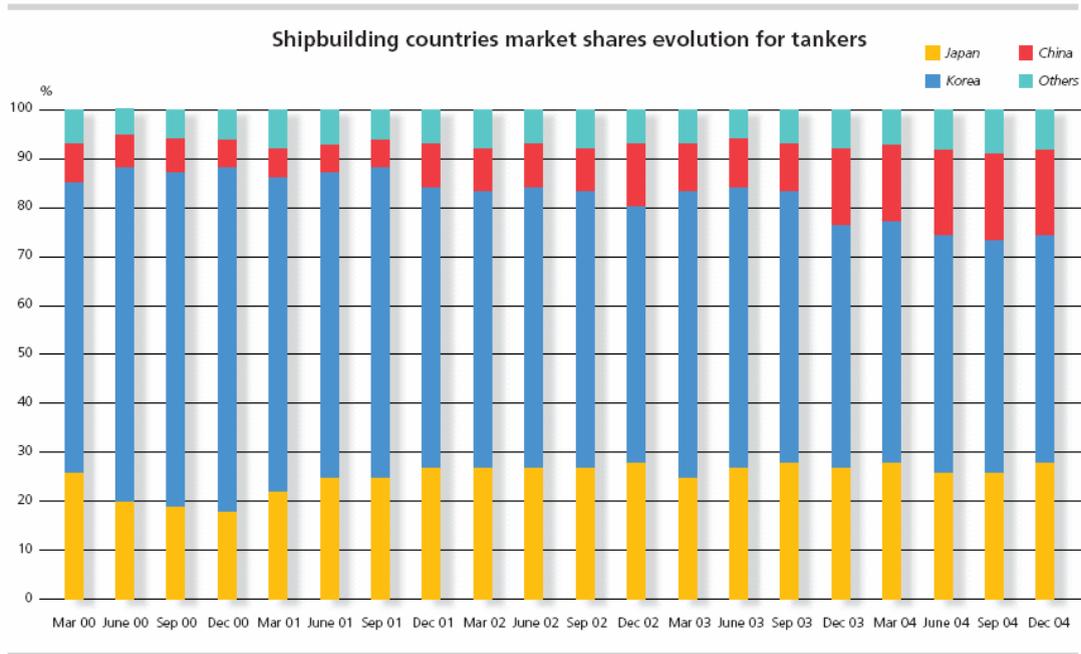


Graph 4. 3 Shipbuilding countries market shares evolution for Bulk Carriers, Source: BRS

According to the ISL statistics, the order intake at bulk sector (include Bulk/Ore/bulk Oil tankers) as of July 2004 indicated that the industry accounted for 20.7% and 20.1% of world total in CGT and GT respectively.

There are 151 new buildings distributed to the Chinese shipbuilders with Hudong-Zhonghua Shipbuilding Group the largest order taker, who received 19 ships. Chinese shipyards started to deliver VLCCs in 2001, the dry docks that are large enough to produce such large ships have been increasing from 1 to 8 units. Currently, at least 6 shipbuilders are able to produce VLCC, which means China has been ready to produce large ships that are not necessarily by VLCCs only.

The following graph presents the performance of the industry at Tanker market in recently year.



Graph 4.4 Shipbuilding countries market share evolutions for tankers, Source: BRS

4.7.2 Container Ships

In general cargo ship sector, the highest growth rate of completion of cargo carrying ships over 3 year period (from 2001 to 2003) by the industry is containership, which was average 162,000 CGT annually.

Before 2001, the industry had less experience for building larger containerships. It was NACKS who first built containership over 5,000 TUE with account to its shareholder, COSCO.

Current industrial order book shows the average size of containerships on orders was about 2,400 TEU per ship. In comparing to other major shipbuilding nations, the gaps are still wide. The order book of South Korea and Japan at container ship market are not only much bigger in number of ships but also much bigger in ship sizes.

For your information, South Korea has an order book as of July 2004 with 322 ships; average ship size is about 5,700TEU, whereas although Japan has smaller number of ships on order, average size of ship is about 5,500 TEU. This is to say, at the market of large container ships, the main players are South Korea and Japan.

However, NACKS of COSCO/KHI was reported again to receive orders of new buildings of four 10,000TEUships from COSCO, which implies the Chinese shipbuilding industry has started to enter the sector of larger containership.

4.7.3 High Value-added Ships

Regarding specialized vessels, in 2004, Hudong-Zhonghua Group was reported to start producing LNG carriers with the full set of technological supporting from Chantier De l'Atlantique France for the LNG project in South China, which symbolized the industry is able to build LNG carrier as one of most sophisticated ship types. The size of the LNG carriers under construction is 147,000cbm for delivery in 2006 and 2007. With digesting new technology and improved efficiency in building such complexity ships by the Chinese shipbuilder, the sector of Large LNG carrier will be another field, in which China can compete with South Korea, Japan and European shipbuilders in few years later.

In terms of Ferry and Roro ships, due to its building complexity, no Chinese shipbuilders have entered to this sector in commercial term. For instance, Guangzhou International of CSSC have once supplied a high class of Passenger/Cargo ship to an European Owner with capacity of carrying 1,500 passengers and 300 trucks, but the problems during the producing as well as delay in delivery caused huge financial loss. The losses generated by these orders have slackened the intension for the industry to enter this market since 2003.

4.7.4 Other Ships and offshore Construction

The Chinese shipbuilder are able to build offshore structure, due to Bohai Bay in the North China is abundant in offshore gas. The shipyards in the North are more active in construction of semi-submersible rigs as well as FPSO. Dalian New shipyard is one, another representative is Yantai Raffle that is an offshore-oriented yards. In addition to major ship types, Chemical tanker, Military ship is also the ordinary product of the industry.

To sum up, the Chinese shipbuilding industry is able to build all ship types except cruises ship. Among them the ships of bulk sectors, bulk carriers and Oil tankers, are main products of the industry. The market share of the containership is relative smaller in comparing to South Korea and Japan. However, China has started to build larger containerships. Furthermore, few Chinese shipyards begin produce LNG carriers, which is one of most sophisticated ship types in the shipbuilding so far. And finally offshore construction is another market where Chinese shipyards can play.

4.8 Financial Status of Chinese Shipbuilding Industry

It is rather difficult to obtain first hand data regarding financial status of the industry. The overall condition is predicted to be same as the status of world shipbuilding industry in year 2004 on ward. The surge in demand of the shipbuilding market in 2004 did increase the price of new buildings to the same level as it was in early 1990. The

following table presents price variables over 10 years period.

Newbuilding prices variations (in million US\$)

		1993	4Q 2001	4Q 2002	4Q 2003	4Q 2004
Tankers	VLCC	100	70	64	76	107
	Suezmax	62.5	45	43.5	50	70
	Aframax	45	36	34	42	60
	MR Product	32.5	26	27	31.5	39
Bulkers	Capesize	48	36	36	40	63
	Panamax	29	20	21.5	24	35.5
	Handymax	25	19	20	21.5	29

Source BRS

Graph 4.5 New building prices variation, Source BRS

Although the Chinese shipbuilders are relatively stronger in these sectors in the table, a higher price in 2004 does not help for the industry to have optimal financial outcome. It was mainly attributed to the rapid increasing of steel price worldwide.

The shipbuilders in China who received the orders in 2001 or 2002 with lower prices of new buildings run in difficulty. It was reported that the steel plates for the shipbuilding increased significantly from RMB3, 650/ton (which is equivalent to USD445) in Jan/2003 to RMB7, 000/ton (which is equivalent to USD883) in Mar/2005 in China. Due to the high rise of steel prices, other cost in related steel or metal inescapably escalate, such as the cost of pipes and cable etc. Furthermore, weak US dollars against Japanese Yen or Euro played another role to aggregate the situation because Chinese shipyards traditionally purchase a big proportion of marine equipments such as main engines, generators from other major shipbuilding nations; thus, the financial status of Chinese shipbuilding industry is unpleasant.

4.9 The Scheme of Chinese Government and Major Expansions

The majority of the Chinese shipbuilding industry are state-run enterprises. After restructuring in late 1990s, more and more shipyards are run in according with market mechanism, this explains current success of the industry is attributed to the efforts taken by the shipbuilders. Nevertheless, the role of government as a regulator is crucial. The ownership structure of the industry defines the government still has great impacts in terms of strategic decisions for entire industry, although, nowadays, it is mostly imposed by macro-economic tools such as taxation policy and interests rates.

COSTICN is the regulator of the industry, who is in charge of the direction of

development of the industry. At the news press of China State Department in 2005, the leader of COSTICN announced ambitious scheme for the development of the Chinese shipbuilding industry, which is that the industry is scheduled to own 25% of market share in 2010, and finally in the year 2015, China becomes the world leading shipbuilding nation in terms of tonnages completed, which is 24 millions dwt or 35% of market share equivalent.

In effect, the ambitious plan of the Chinese government for developing the shipbuilding industry could be found at central government plan as early as the year of 2001. *In the tenth 5th Year plan (covers 2001-2005), the Chinese government commitment to this and projected an increase in new building capability to 8.5 to 9.0 million deadweight p.a. by 2005 (Drewery Shipping Consultant).* The scheme for development in China absolutely signals to world shipbuilding industry a massive expansion in shipbuilding capacity in years ahead.

Since 2001, two main giants of Chinese shipbuilding industry started their expansion project according to national scheme with the supporting by both central and provincial governments. Details show as below:

In north part of China, which is the territory of CSIC decided and committed funds to expand shipbuilding capacity from 400 millions dwt in 2003 to 600 million dwt in 2010, the target of 2015 would be 900 millions dwt.

In the mid of seacoast, CSSC, the largest shipbuilding group, have committed \$3.5 billion to develop a new shipbuilding base in Changxing Island of Shanghai. Changxin shipbuilding base of CSSC, when it is finished construction, would be the largest shipbuilding base in the world. The project is divided into 2 phases. The first phase will build four large docks, which will be assigned to Jiangnan shipbuilding group of CSSC. Jiangnan shipyard group is scheduled to entirely move from downtown of Shanghai city to Changxing Base. The 2nd phase including additional 3 docks will finally form total shipbuilding capacity of this base at 1,200 millions dwt by 2015.

In south of China, CSSC committed again huge fund to build shipbuilding base in Guangzhou. The project is worth RMB4.5 billions, which is equivalent to \$0.55 billions.

Therefore, in 2015, by adding above 3 new sites, together with current distribution of China shipyards, three large shipbuilding bases of the Chinese shipbuilding industry are to be set up, thus, finishing the strategic layout of the shipbuilding in China. Details of locations for 3 Chinese Shipbuilding Bases (please refer to appendix four: a map of 3 shipbuilding bases in China by 2015)

Chapter Five SWOT Analysis of the Chinese Shipbuilding Industry

5.1 Introduction

In previous chapter, critical success factors for a growing shipbuilding nation have been obtained through a study on current world leading shipbuilding nations, Japan and South Korea. In this chapter, on the basis of the critical success factors, a SWOT analysis is made for the Chinese shipbuilding industry. The aim of the analysis is to identify the gaps of the industry.

5.2 Strengths of Chinese Shipbuilding Industry

5.2.1 Abundance in cheaper labors

China is the world largest developing country with a population of over 1.3 billions. According to basic economic theory, generally, labor is one of the important ingredients for growth. Due to the abundance in labor, Chinese economy has fewer problems on labor supply although Chinese economy is fast in development in the past two decades. In contrast to the situation in Japan between 1955-1970, which was the highest growth period in Japanese developing history, Japan had almost full employment. Therefore, the Japanese Shipbuilding industry had to compete with other industry sectors heavily by offering attractive salaries to workers. However, in China, it has not been an issue so far.

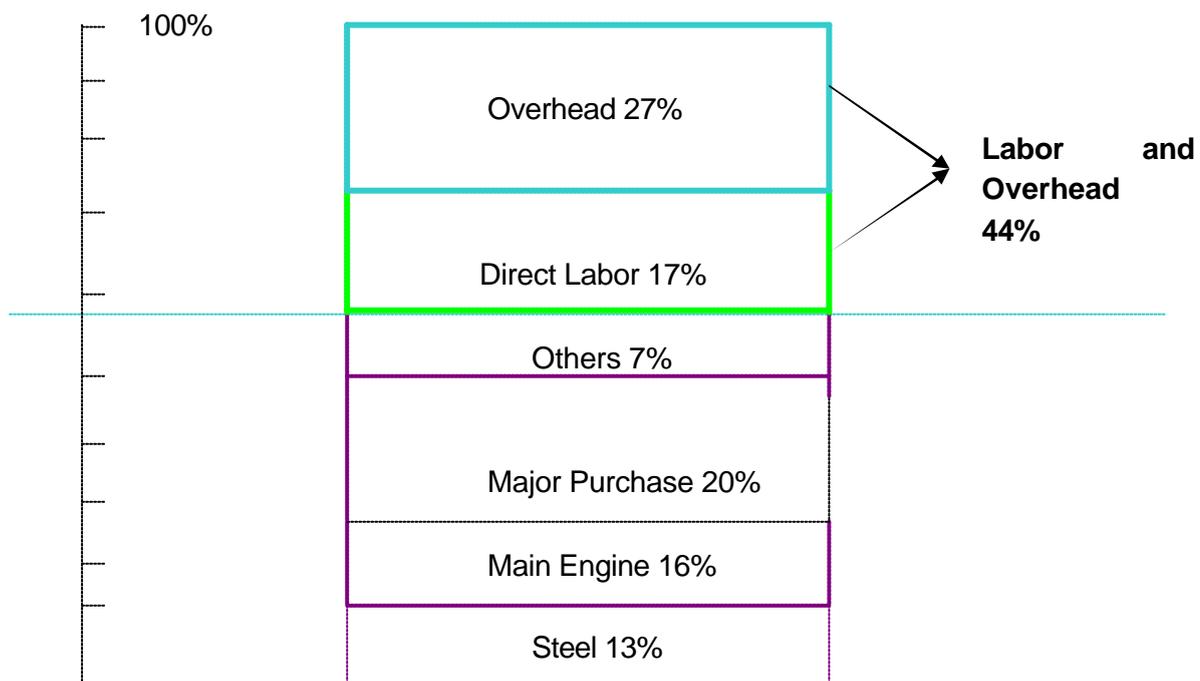
Meanwhile, younger people in China realize the potential of the Chinese shipbuilding industry. They try every effort to obtain the chances for entry into the industry, which means that they are willing to develop their own careers along with the future growth of the industry. Nevertheless, in terms of high-income nations, younger generation and the society as a whole considers the shipbuilding industry as a “sunset” industry so that it is less attractive to people to take part in.

Nowadays, International shipbuilding community has defined the industry as labor, technology and capital intensive. It is really true that technology and capital play great roles in determining the capability of the shipbuilding, which explain the reason why the Japanese Shipbuilding industry is very active, although Japan is one of high income nation in the world, whereas cost of labor still influence the competitiveness of the industry in a nation, particular in major ship types such as Bulk Carriers and Tankers. The following graph well illustrates the cost structure of a merchant ship. The structure concerned was estimated on the basis of a 30,000 bulk carriers, since bulk carrier is quite common ship type, many bulk carriers were built every year.

The cost structure of different types of ship are various, especially for high valued ships, but, mostly, labor cost, as per the analysis done by the Chinese shipbuilding industry association accounts for 30%, on average, of the construction cost for a ship.

Therefore, cheap labor in the Chinese shipbuilding industry is an apparent strength in comparing to other major shipbuilding nations.

Statistics of World Bank in 2003, which is currently available on its website, presents GNP per capita in China is \$1,100, whereas Japan has the highest one, which is \$34,180. In terms of Korea, GNP per capita is \$12,030. It is worth mentioning that GNP per capita is a useful indicator for scaling the living standard of a nation as well as the income of residents in a nation. This is to say that the income in Japan and Korea is much higher than China. The figure of GNP per capita offers a general view of income discrepancy among major shipbuilding nations i.e. China, Japan and South Korea etc. In reality, the shipbuilders in Japan and South Korea pay 10 to 15 times more salaries to labor than their counterparts in China, in other words, cheaper labor cost relatively compensates the weaknesses of Chinese shipbuilders in many aspects including relatively low in technology and management level. It should be remembered that the entry of Chinese shipbuilders into the international market in early 1980 was low cost strategy, which proved to be effective. It is believed that the strength of cheaper labors will still play a role to contribute the industry with securing properly large market share in main sectors of the market and lay the ground for international competitiveness.



Graph 5.1 Cost Structure of 30,000dwt bulk carriers

Source: compiled from chapter 13 of *Maritime economics, the economics of shipbuilding and scrapping*.

The following table further depicts the differences in incomes of major shipbuilding nations.

Country	GNP per Capita in USD
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South Korea	12,030.00
Japan	34,180.00
China	1,100.00
Poland	5,280.00
Germany	25,270.00
Italy	21,570.00
France	24,730.00
OECD	29,360.00

Table 5.1 GDP per Capita of Major shipbuilding Nations Source: World Bank

5.2.2 Shipbuilding industry – national project

Chinese central and local governments have decided to utilize the shipbuilding industry as one of “ engines” to empower the national economy. Most importantly, the developing project of the Chinese shipbuilding Industry has been brought into national scheme, so that, governmental supports or even uncommon supports and governmental involvements like Japan and South Korea did in the past has been in place. Further support from the governments is foreseeable.

In the 9th and 10th 5-years national plan, the national leaders have clearly quantified the targets for the expansion of the shipbuilding capacity in 10 years. For instance, the target for 9th 5-year plan (2000-2005) is to increase the shipbuilding capacity by 45 millions deadweight tonnages. As major executors of the national scheme, two major state-run shipbuilding groups, CSSC and CSIC, have launched ambitious projects in three regions in China: Baohai Bay, Shanghai, and South China.

Moreover, the Central government has committed to encouraging local owners to build ships domestically by providing financial aids. Taking crude oil tankers as an example, the government would pay 17% of construction costs out of public money to ship owners to compensate the gap between domestic and international prices, since Chinese shipbuilders have a two-quotation system, domestic price and international price. Domestic owners can only be treated with domestic selling prices. Meanwhile, financial aids would also be offered to Chinese shipyards that take the orders from local owners. The government pays the interests to commercial banks where ship builders borrow funds for building these crude oil tankers.

In terms of the supports from local governments, CSSC obtained lands in the Shanghai region to develop the largest shipbuilding project of the group in Changxing Island. The project of CSSC in Shanghai costs \$3.5 billions. By year of 2015, 7 large docks would be constructed, which make the island the biggest shipbuilding base in the world. As it is known that Shanghai, one of most developed city in China, is the financial, shipping and trade center in China. The lands in Shanghai are so scarce that many industries compete for them. The administrator decided to provide spaces to the shipbuilding

industry since they believed Shanghai will benefit from the project as world shipbuilding center in the future.

Shipbuilding is an international business, political support as one of main factors to influence the industry has been certified many times in the past decades. The downfalls of the British and Swedish shipbuilding industries and the successes of Japanese and Korean shipbuilders were direct outcomes of losing or gaining political supports respectively. Although other factors, such as comparative advantages do have impact on international competitiveness, political support is utmost important, the Chinese shipbuilders have been gaining more supports from the governments so that it is an absolute strength for the industry to develop.

5.2.3 Know-how and client base

The Chinese shipbuilding industry is one of few industrial sectors in China that has gained international reputation. The industry experienced a process from domestic-oriented industry to international-based industry. The Chinese shipbuilders are able to build LNG carriers, large container ships of 10,000TEU, and all kinds of ships except cruiser ship. The Know-how gained by the industry is attributed to the accumulations made by the industry itself through satisfying the requirements of international customers and through diligently studying and tracking international standards of the shipbuilding. So far, some 70% of orders for new ship buildings in the industry are from outside China, which means, International shipping companies have largely endorsed and recognized the quality of ships made in China, given the prices offered are competitive enough in comparing with the prices of leading shipbuilding nations. Almost all global shipping companies have repeatedly ordered their ships from the Chinese shipbuilders for years. For instance, AP Moller started their ordering ships from China since 1990. This is to say, despite certain unsatisfactory of customers, that overall standard and general competitiveness of the industry has been well established in the past decades. China has been the No.3 shipbuilding nation in the world for 10 years; further development of the industry is foreseeable provided that the market, political supports and other important elements of the industry all go to positive direction.

5.3 Weaknesses of Chinese shipbuilding Industry

5.3.1 Low productivity and efficiency

Chinese shipbuilders has comparative advantage of labor, however, international competitiveness and market shares shall not depend on cheaper labor alone. In the 1960s and the 1990s, the reputation of Japanese and Korean shipbuilders mainly came from consistent improvement on productivities and efficiency. China lags behind in these aspects. Some industrial indicators well explain the gaps between China and world leading shipbuilding nations.

According to the researches done by China Shipbuilding Associations, firstly, in light of annual turnover of dock, which is overall dock productivity, Japanese shipbuilders are generally able to produce 12 ships per dock a year, whereas, the figures in the Chinese counterpart is only 2.6 ships, which is 20% of the capability of the Japanese shipbuilders. Secondly, when the comparison comes to the construction hours for a ship, generally, Chinese shipbuilders spend 5 times more than Japanese shipbuilders. Thirdly, the productivity in labor is even worse, Chinese labor is 1/10 of the productivity that the Japanese has. Therefore, if taking all the elements above into account, the advantage of cheaper labor is almost offset by low productivity and efficiency. The main reasons for Japanese shipbuilders leading in all aspects are their unique and uncommon ability in organization of production as well as management. Factory layout and advanced facilities are also another critical.

Items for Comparison	HHI	SWS
Sales (year 2004 ships building)	70.40 billions RMB	2.02 billions RMB
Docks Maximum Size	640×92×13.4m	480×160×12.3m
Numbers of Docks	9 docks	2 docks
Maximum dock capacity	1 million dwt	0.3 millions dwt
Main products	10000 TEU CONTAINER SHIPS? LNG? FPSO? FSRU,VLCC, ULCC	Capesize bulk carrier? Aframax tanker and FPSO etc.
The completion of FPSO in 2004	340,000 dwt	170,000 dwt , (300,000 dwt - prediction in 2006)
Completion in 2004	6,900,000 dwt/104 ships	1,745,000/10 ships
Annual building capacity	7,000,000 dwt	1,050,000 dwt
Space in square meters	7,200,000 sqm	1,440,000 sqm
Numbers of employee	11100 person	3500 person
Average completion	621.6 dwt/person	498.57dwt/person

Table 5.2 comparisons between Hyundai and SWS Source: LISLISTIS

In order to further analyze the gaps among Chinese shipyards and leading shipyards in the world, Library Institute of Scientific & Technology Information of Shanghai (refer to as LISTIS) conducted a research in terms of productivity and efficiency recently. LISTIS took Hyundai Heavy Industry, the biggest shipbuilder in Korea (refer as HHI) as an example to compare with Shanghai Waigaoqiao Shipbuilding (SWS), which is the biggest shipyard in China with the most modernized facilities. The outcome is shown in above table (*refer to Table 5.2 comparisons between Hyundai and SWS Source: LISLISTIS*)

The original purpose of the comparison is to show the improvement or achievement of Chinese shipyards in terms of annual tonnages completed, since the average

completion per person in SWS has reached 80% of HHI; however, it just shows some improvements on productivity, because, in terms of sales, HHI is 35 times larger than SWS despite only 7 times bigger in the shipbuilding capacities, which reflects that the strength of HHI is at higher values market. In other words, the complexity of the shipbuilding is rather different between two shipyards. In the case of SWS, main products are bulk carriers and tankers that are relatively easier to build so that overall productivity and efficiency is still low. It is worth noting, that SWS is, currently, the most advanced shipyard in China. It could mostly represent the highest level of top Chinese shipbuilders but not overall level of the industry. As it is mentioned in previous chapters, the structure of the Korean shipbuilding industry is that 5 major shipyards account for 95% of the national throughput, the level of productivity and efficiency among the top 5 are the same, whereas the productivity and efficiency are very different in 70 Chinese shipyards that work for international market. Therefore, the overall gap between two countries is obvious.

5.3.2 Supply chain of shipbuilding industry

Nowadays, shipyard is mostly an assembly plant, which relies on the capabilities of the entire supply chain. The competition between shipyards, however, has escalated to the competition between supply chain management. The efficiency of the supply chain finally defines the competitiveness, which leads to the success of the business.

It might be rather troublesome to describe entire supply chain of the shipbuilding industry, especially in the context of overwhelming trend of globalization. It is true that the shipbuilders shall consider a wide range supply sources within a global framework, however, a stable supply chain is instrumental to the shipbuilders, because ship is a very expensive commodity, a VLCC today costs about \$100 millions, any interruptions and delay of the supplies would inevitably cause problems to the shipbuilders, sometimes, even the survival of the shipbuilders. For instance, Chinese marine diesel manufacturers are able to produce main engines for VLCCs. Due to the fact that all spare parts of main engines rely on import, at the time of shortage in spare parts, the manufacturers can not accept orders from the shipbuilders even if part of its producing capacity is idle. This, in turn, has an impact to the shipbuilders if the time required for ordering the spare parts internationally is so long that the opportunity for taking such a big order by the shipyards became smaller.

A realistic solution to stabilize the supply chain is trying to obtain as much as possible supplies nearby or domestically. Strictly, no ships that are built by one shipbuilder are same, the characteristic of the shipbuilding is order-made in according with unique needs of clients, despite shipbuilders do have standard types of ship for the market. Even if some demands driven by speculative behaviors may have less consideration on specifications of the ship, the desires of clients to have cost-effective ships and

shorter construction time is foreseeable. This is to say, the supply chain of the shipbuilders shall be efficient, and in other words, low cost and higher rate of domestic availability of supplies is crucial.

In comparison to the world leading shipbuilding nations, Chinese shipbuilding industry still needs to improve on this aspect. In general, the Japanese shipbuilders can find 97.8% of supplies for building a ship domestically, the rate of domestic availability of supplies in Korea is about 85%, whereas, China is very low, at 38% only.

Because of the high rate of domestic availability of supplies in Japan and Korea, the shipbuilders have better estimations of cost and readiness of supplies, resulting in much better proposals to clients and much better production process controls. As such, international competitiveness is established.

However, it would takes time for China to improve its overall level of supply chain, because any products or appliances that are allowed to be fixing on board shall need approvals of classifications, shipyards and ship owners. Important equipment such as main engines and generators are embedded in high technology, therefore, the lifting of entire industrial and technology level in China could not be achieved very soon.

5.3.3 Ship design – Bottleneck

The common consensus in the industry is that Ship design in China is the weakest part of the industry. *Ships could be divided into 16 categories; China has ability to design 6 kinds of them, and is capable of building another 8 kinds but need to be supplied with designs from foreign companies. (Cao Yushen, vice director of economic research center of Chinese shipbuilding Association).*

Although above words made by Mr. Cao largely expressed the status of ship design in China, the problem of ship design is not simply attributed to low capability and low level of the Chinese ship designers. Certainly, the designers lack of basic competence, for instance, economic sense; but the important reason for such low level in ship design is that the industry provides less funds for R&D. the following example explain the problem in ship design.

Shanghai Waigaojiao Shipbuilding Group Company has compared the design of Aframax Tankers between the Chinese and Korean designers. Chinese designer is rather “conservative” and pays much attention to the strength of ship structure. Chinese design suggests using thicker steel plates to build the hull so that the total weight of ship is 1,000 tons more than if it is built according to Korean design. It is worth noting, that additional 1,000ton weights means additional costs for steel plate for the shipbuilder. Most importantly, the heavier ships cost more fuels on daily operation

and less space for cargoes. This is to say, ship owners will not be happy with that. The “conservativeness” of Chinese ship designer really indicates huge gap between the Chinese level and world-class level.

DNV surveyors also complain about the non-standard pattern of the ship design made by the Chinese designers. This is to say that Chinese shipbuilders must wait for more time for design approval, resulting in the reduction of international competitiveness because of longer construction time required. However, the designs of Korean designer are much better in views of the DNV surveyors

Ship design is an important aspect of the shipbuilding. In earlier years, the Japanese shipbuilders indulged themselves in ship design and invented famous economic class ships, both ship owners and shipbuilders benefited from constructions and operations. The unflinching innovation on ship designs and building technology finally set up the reputation of the Japanese shipbuilding industry in 1960s. In one word, ship design is a major bottleneck of the industry in China and need to be envisaged seriously.

5.3.4 Less co-operation among the shipbuilders

In China, the relationship among the shipbuilders, particularly among major shipbuilding groups, is competition rather than co-operation. Evidence of this phenomenon is that major shipbuilders usually have much higher productivity than smaller shipbuilders. China has the shipbuilder’s association, but mainly serves for two major shipbuilding giants, CSSC and CSIC. Major shipbuilders excessively protect the know-how from being learned by other shipbuilders, so that smaller shipbuilders have few channels to obtain the know-how. One of main strategy for smaller shipbuilders to receive advanced technologies is to employ existing staffs and retried staffs from major shipbuilders, As such, the diffusion of know-how in the industry is slow and less efficient to lift overall competence of the industry up. Major shipbuilders abhor such behaviors, as an outcome, they protect the know-how more rigorously. It is often seen that the bigger shipbuilders compete with smaller shipbuilder heavily although the order of new building is not attractive to the bigger ones.

5.4 The opportunities of the Chinese shipbuilding industry

5.4.1 Industrialization of Chinese economy

The historical and successful experiences of other countries indicate that a significant growth of the shipbuilding industry of a nation always goes with explosively increase in trade activities and overall economic growth. It was the case in Japan in 1960s and South Korea in 1980s.

At present, many economists believe that the Chinese economy is transferring from agrarian to industrial basis so that the high growth rate of Chinese economy would continue for a long period. The statistics of WTO in 2003 confirmed that the volume of imports and exports in China ranked as No. 4 position in the world. Chinese Customs announced that the figures in US dollar term for imports and exports in 2004 was 851,2 billions. Imports and exports increased vastly by 39.9% and 34.6% respectively on the basis of figures in 2003.

Industrialization requires a massive volume of raw material like Coal and Iron ore. In the year 2003 and 2004, the booming shipping and shipbuilding markets worldwide were largely contributed to "China effect". In bulk sectors, China accounted for 48% of world ore transportation, this initiated the massive new orders of the capsized bulk carriers. Meanwhile, the demand for crude oil in 2004 reached to 10 billions tons in China, which made China the world 2nd largest oil consumer. Additionally, In general cargoes sectors, tons of end products made in China were shipped to USA and the European countries, together with imports; Chinese ports handled the most numbers of TEUs in 2004. In one word, Chinese economy has already had important impacts on both the international shipping market and the shipbuilding market, in this context, Chinese leaders chose shipbuilding industry as one of "engines" to expedite the process of industrialization is desirable. Both macro and micro economic environments in China provide god-given opportunity to the Chinese shipbuilding industry.

China is the 7th largest economy in the world according to World Bank in 2004, not like other major shipbuilding nations, China is on the way to industrializations so that the demand for ships to carry energy, crude oil is significantly increasing. This alone generates huge demand for Crude Tankers in coming years by Chinese themselves. Policy makers in China have decided to employ a policy of "national flag ships, national made". Other policy also emphasizes a principle of "National cargoes" being carried by national ships, particularly in strategic commodity, crude oil.

Recently, officials from the central government have decided to set up a large national fleet to carry crude oil. Currently, 1/3 of capacities of world oil tanker fleet are hired by Chinese oil majors to carry crude oils for China. Nevertheless, China has fewer tonnages to carry own cargoes at present. The size of oil tanker fleet controlled by Chinese, which is suitable to carry crude oil from Persian Gulf, European countries as well as African countries, is only 421 million tonnages. The cargoes the fleet is able to carry only accounts for 2 % of total volume of imports from of crude oil. In this connection, under the encouragement of government, major state-owned shipping giants have stated to set up tanker fleets to meet increasing demand of transportation at present and for the future.

The following table shows national scheme of additional demand of oil tankers that need to be built in 20 years time, at that time, nearly 80-90% of crude oil to China will be carried by Chinese controlled ships

Year	Capacity of tanker fleet in China
2004	4.21 million tonnages
2005	50 million tonnages
2010	75 million tonnages
2020	130 million tonnages

Table 5.3 demands for tankers in 15 years in China, Source: Compiled from various sources

According to the scheme, the required tonnages will be VLCCs, Suezmax tankers. As mentioned in the previous section, the Chinese government has decided to provide financial aids to domestic shipping companies; in return, they will place orders of new buildings to the Chinese shipbuilders.

Besides, The new tonnages requested by 3 major state-owned shipping companies, COSCO, China Shipping and Sinotrans have been listed into 10th 5 year-plan of the state. This is to say; the majority of domestic demands have been fixed for the period from 2005 to 2010, which are 10 million tonnages in total. This again presents the opportunity for the Chinese shipbuilding industry.

5.4.2 Know-how and advanced technologies from leading shipbuilding nationals

The comparative advantage of China has attracted the attentions of leading shipbuilding nations. In order to take advantage of cheaper labor as well as the growth of Chinese economy, the Shipbuilders in leading shipbuilding nations invested the shipbuilding facilities in China and started to build the ships and ship hulls in China. It is believed, the trend will continue in the coming years. This provides the opportunity for the industry to learn know-how and advanced management skills, which will inevitably benefit the industry in the long run.

The entry of world leading shipbuilders to China started in 1996, when Samsung Heavy Industry (Refer to as SHI) set up a 100% owned plant in Zhejiang Province to produce super large section block for the parent company in Korea. The purpose of having a plant in China is to take advantage of cheaper labor because the works for ship hull is considered as the most labor-intensive job in the shipbuilding. Some commentators in the industry recently claimed such investment was a step that implies the ambitious of leading shipbuilder to take the business in China. Anyway, there is no “free lunch” in the world. However, the comings of world leading shipbuilders do bring

new technologies of production and leading management philosophy. The investment of SHI in Zhejiang Province was successful, in year 2005, SHI decided to expand the scale of plant with additional capital of 700 millions US dollars.

In 1998, COSCO and Kawasaki Heavy Industry (Refer to as KHI) formed a shipbuilding company named NACKS in Jiangsu province. This shipyard is able to build the ship up to 300,000 tonnages. COSCO has less experience in the shipbuilding so that KHI manages the shipyard under the Japanese philosophy. This is to say, the shipyard follows 100% Japanese style of management and production so that this joint-venture enterprise is very successful in operation. In 2004, profit margin at the shipyard reached to 13%, which was really remarkable in comparison to average profit level of the Chinese Shipbuilding Industry, which is only 2 or 3%. During the preparation period of the shipyard in 1998, at least, 200 Chinese younger professionals were sent to Japan for training. Today, many people in the industry visit the shipyard for technological exchanges. And local Chinese suppliers serve NACKS according to the Japanese industrial standard, which implies gradual diffusions of world leading technology and management principles to the Chinese shipbuilding industry and the suppliers.

Moreover, Daewoo Heavy Industry (DHI) just confirmed in July/2005, that it had committed and signed land-leasing agreement with local government in Yantai of North China to set up a shipyard with US\$ 1 billions investment. Therefore, the entry of world leading shipbuilders into China continues. Apart from competition with the Chinese shipbuilders, the Know-how of the shipbuilding as “by-product” will contribute to the elevation of entire industry.

5.5 Threats of Chinese shipbuilding industry

5.5.1 Overcapacity of World shipbuilding industry

The issue of overcapacity has annoyed world shipbuilding industry for 30 years. Despite current booming of shipbuilding market, which is evidenced that most shipbuilders in the world have lengthy order books up to 2007 or even 2008, the shipbuilding market is cyclical in nature. When the market collapses, orders of new buildings decrease and cancellations of existing orders are quite normal. Overcapacity issue can be further certified by the prices of new buildings, which were wandering in low region in the most of time after 1999. Following table (*refer to Graph 5.2*) shows clearly.

The rise of the ship price in early 1990 was the outcome of elimination of the shipbuilding capacity by both European countries and Japan in 1980s. After that, the shipbuilding capacity in the world expanded again due to the expansion projects done in China and East European countries. The depreciation of Korean currency in 1997

even further lowered the prices. And finally, leaving the prices of new buildings fluctuating at low part of the graph.



Graph 5.2 the variation of new building price, Source: Background report of European union- overview of international commercial shipbuilding

The issue must be mentioned here is that, in 10 years time, the overall shipbuilding capacity in China alone will be increased significantly, the available statistics indicates CSSC alone in Shanghai is going to have shipbuilding capacity of 12 millions deadweight tonnages by 2015. Considering the shipbuilding industry as important employers or strategic industry in many countries, no governments will allow their own facilities to leave the market easily so that subsidies and other supports will play a role to keep existing capacity staying in the business. Additionally, the improvement of productivity worldwide would inevitably happen all the time, in other words, the shipbuilding capacity increases all the time even if no additional increase in new facilities. Finally, when all the elements account together, the overcapacity issue might not be easily solved so that the price level of new buildings may be kept low at most of the time in the years ahead.

The fact is that the Shipbuilding business is an international business, the Chinese shipbuilding industry can never profit with low prices of new buildings worldwide alone, therefore, the process to become world leading shipbuilding nation will probably be postponed or even be difficult to achieve due to overcapacity of shipbuilding. Suppose the Chinese shipbuilders can enlarge market share at low price level, but international disputations will always annoy the industry. Without international co-operations and the introductions of leading technologies from major shipbuilding nations, the Chinese shipbuilding industry may have to pay more cost than necessary to achieve the target.

5.5.2 Low profitability and the pressure of appreciation of local currency

The financial status of the Chinese shipbuilding industry was not optimistic in recent years. Although there is no authoritative data available to know the exact financial condition, the statistics of China Shipbuilding Industrial Association in 2002 can be an indicator to know the situation generally. In the year 2002, the industry (including shipbuilding and ship repair business) exported 1,633 ships, which was equivalent to \$1.87 billions. Despite the sale of the industry increased nearly 30% from 2001, the profit of the industry was merely RMB 336 millions, which was about \$41 millions excluding tax refunds. The problem was that the profit mentioned above was largely the profit of ship repair business. Actual profit out of the shipbuilding was merely \$4.8 millions excluding tax refunds. In this connection, the profit level of the shipbuilding in China was very low.

In general, the commentators in China believe that the average profits of the Chinese shipbuilders are about 2 – 3 % in normal years, Whereas, NACKS, the COSCO and KHI joint venture shipyard in China, was reported run with profitability at 13% annually. It implies general incompetence of earning at most of the Chinese shipyards in comparison to leading shipbuilders.

Low profitability means the shipbuilders are vulnerable to any unpredictable fluctuations on raw material and exchange rates. It was impressive that steel prices in China rose rapidly at first quarter of 2002 by 30% so that the orders of new buildings, which were taken before or during the period, were certainly the loss makers. In one word, low profitability of the industry weakened the stability of the industry, let alone development.

Besides, The growing Chinese economy has put enough pressure on Chinese monetary policies. Many countries think that Chinese Yuan is undervalued. Certainly, it is not the topic of this article to discuss the actual value of Chinese Yen, but exchange rate as an important element that influences the industry shall never be disregarded.

Recently, Chinese government employed a new policy of foreign exchange, under pressures from USA and EU; Chinese Yuan to USA has appreciated about 1 to 2 % in August/2005. It is predictable that Chinese Yuan is scheduled to appreciate further along with the economic growth in China, Thereby, the appreciation of local currency will be a threat to the profitability of the industry as well as competitiveness for receiving orders of new buildings.

Finally, it should not underestimated the impact of long-term depreciation of US dollar to the currencies of major shipbuilding nations, which also bring problems to Chinese, because nearly 60% of equipments and appliances for new buildings made in China

would be supplied from Japan, Korea and European countries, which are additional and unavoidable risks to the industry, thereby, domestic availability of marine supplies might be a solution to get rid of the issue in the long run.

5.6 Overview of SWOT analysis

In order to summary the analysis made above, the following graph depicts the outcome more clearly.

<p>Strengths:</p> <ul style="list-style-type: none"> -Abundance in cheaper labor -Know-how and client base -Shipbuilding-national project 	<p>Weakness:</p> <ul style="list-style-type: none"> -Low productivity and efficiency -Supply Chain -Ship design – bottleneck -Less industrial co-operations
<p>Opportunities:</p> <ul style="list-style-type: none"> -Industrialization of Chinese Economy -Know-how and advanced Technologies from leading Shipbuilders 	<p>Threats:</p> <ul style="list-style-type: none"> -Overcapacity of World shipbuilding industry -Low profitability & pressure of appreciation of local currency

5.7 Conclusion

Chinese shipbuilding industry has strength of cheaper labor, and political support from the state, the industry will play more important role in the world shipbuilding industry. Current know-how and client basis made the Chinese shipbuilder to be ranked as No.3 position in the world, which is attributed to the efforts made by the industry itself. It might be rather easy to expand the shipbuilding capacity by pouring more funds, but the key to improve overall level of the industry is to improve the efficiency and productivity, Ship design is still a bottleneck of the industry, which presents low level of designers who lacks the competences in comparison to leading shipbuilding nations. Overcapacity issue annoys international shipbuilding community for years; direct outcome of the issue is the low prices of new buildings at the most time of shipbuilding cycle. Shipbuilding industry is cynical in nature. There are fewer co-operations among the shipbuilders, which leads a relatively slow diffusion of the building technologies in

the industry.

The industrialization of the Chinese economy provides the opportunities for the industry to grow. Whereas the appreciation of local currency is one of the potential threats to the industry due to weaker earning capabilities of the industry so far, which also implies the vulnerability of the industry to market fluctuation as well as the fluctuations on main raw materials for the shipbuilding.

It might be a better solution for Chinese shipbuilding industry to have an efficient and reliable supply chains, since, nowadays, the competition happens among supply chains rather than individual companies. Foreign shipbuilders have interests in the Chinese market or have taken advantage of the strengths of Chinese shipbuilding industry; meanwhile, they do bring know-how and advanced technologies to the industry. In the following chapter, recommendations will be presented.

Chapter six Perspectives and Recommendations

6.1 Perspectives of world ship completion and China ship completion in 2015

6.1.1 Prediction made by Chinese official

The goal of the Chinese shipbuilding industry is to become world No.1 shipbuilding nation by the year 2015 in terms of tonnages completed, which is 24 millions deadweight tonnages or 35% of market share at the world shipbuilding market.

Both Chinese officials and the industry share the view that there are greatest opportunities for China to achieve the goal. The prediction made by Chinese official present completion of new buildings will be 68 millions Deadweight Tonnages in the world. Although there is no detail information for understanding how was the prediction of Chinese officials made, basic assumptions and variables of prediction can be summarized as following:

- The phasing out of Crude oil tanker due to international regulation
- The replacements of old tonnages
- The growing demands due to the growth in world economy, particularly, Chinese economy

It is rather difficulty to judge if the prediction made by the Chinese regulator is over-optimistic or not. However, the Chinese shipbuilding industry has been already investing huge amounts of money to increase the shipbuilding capacity since 1998, especially for large docks and related facilities.

6.1.2 Prediction of ship completion by South Korea

The forecast done by the Korean Shipbuilder's Associate (refer to as Koshipa) had less optimistic view than the Chinese one. In the annual report of the association in 2005, the industry showed the prediction and industrial perspective as below

Korean Shipbuilding Industry Vision		2003	2015
Shipbuilding Volume (Global Market Share)	13.6 million GT (38.5%)	→	16.7 million GT (40%)
Exports of Shlps (Global Market Share)	US\$11.3 billion (27.5%)	→	US\$17 billion (35%)
Ratio of High Added-Value Ships	17.3%	→	40%
Exports of Shipbuilding Materials and Equipment	US\$0.4 billion	→	US\$2 billion

Graph 6.1 Korean Shipbuilding Industrial vision, Source: Koshipa Annual Report

The predicted market share of the Korean shipbuilding industry is about 40% of world total in 2015, which is 16.70 millions GT. In this connection, total ship completion in the world could be reckoned at about 42 millions GT in 2015. Normally, the figure in GT is bigger or equal to the figure in Deadweight Tonnage. Therefore, total tonnages completed as per the forecast by Koshipa is equal to or less than 42 millions Deadweight Tonnages.

6.1.3 Prediction of world ship completions and ship completion in China

It is interesting to predict world ship completion in 2015 to see how world shipbuilding market would develop. Generally, the prediction could be divided into two categories, short-term forecast, which is 2 or 3 years or long-term forecast, which is for 5 years or even longer period. When the prediction is made for many years ahead, the quality of the prediction gets worse, which means the figure is far more unreliable. The prediction, which was made by the author, is a long-term forecast.

It is hard to know the prediction methods used by the professionals both of the Chinese officials and the koshipa. Suppose they utilized more sophisticated methods for the predictions respectively.

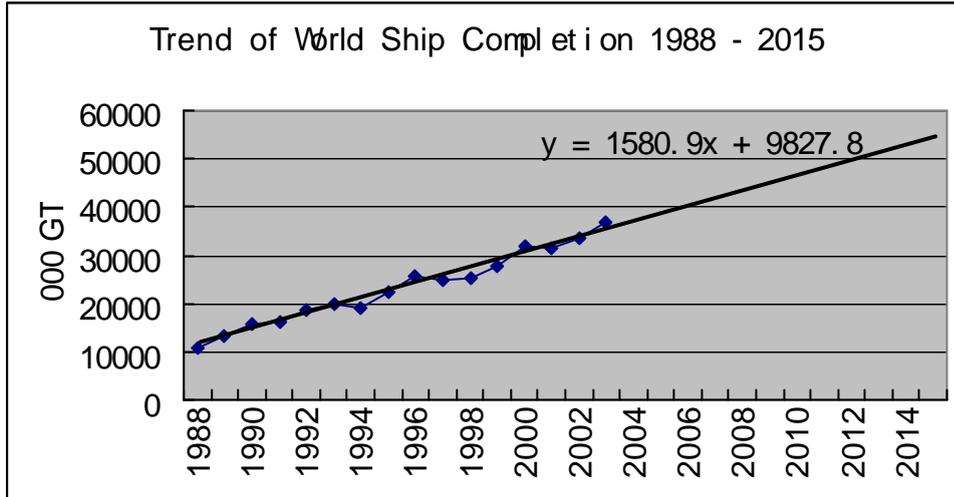
For more sophisticated models of prediction for the shipbuilding market, In the case of the prediction for a short period, some variables such as the Freight rates, financial terms and political imperatives must be included. When the prediction is for a longer period, important variables that are related to world trade as well as possible incidents such as oil crisis in 70s and 90s and the impact of possible changing technologies both in shipping and port sector, for instance, containerization, are necessary to take into account, but these incidents are really unpredictable, too.

However, The method of the prediction, which is selected by author, is a time series method. *Time series is a set of observations of variable measured at successive points in time or over successive periods. When the historical data are restricted to past values of the variables that we try to forecast, the forecast procedure is called time series method (Management Science, Quantitative Approaches to Decision making).*

6. 1.3 .1 Prediction of World Ship Completion in 2015

The prediction of world total completions of ships in 2015 is made on the basis of historic data regarding ship completion from 1988 to 2003. (*Detail calculation please refers to Appendix four to the thesis*) Main procedure and outcome is presented here.

The historic data available showed a clear upward trend over years, which could be easily found in the following graph. A linear relationship explains the trend of world ship completion in the years to come.



Graph 6.2 Trend for world ship completion from 1988 to 2015

Therefore, the regression function was obtained according to the operation of EXCEL. At last, the forecast of required period was developed for the year 2015.

The following table shows the outcome of the forecast done by the time series method as well as the predicted figures collected from professional bodies mentioned in the previous sections. It is clearly seen that the figure of the Chinese officials is very different from that of the Koshipa, which implies a distinct view in terms of the development of world shipbuilding market in 2015.

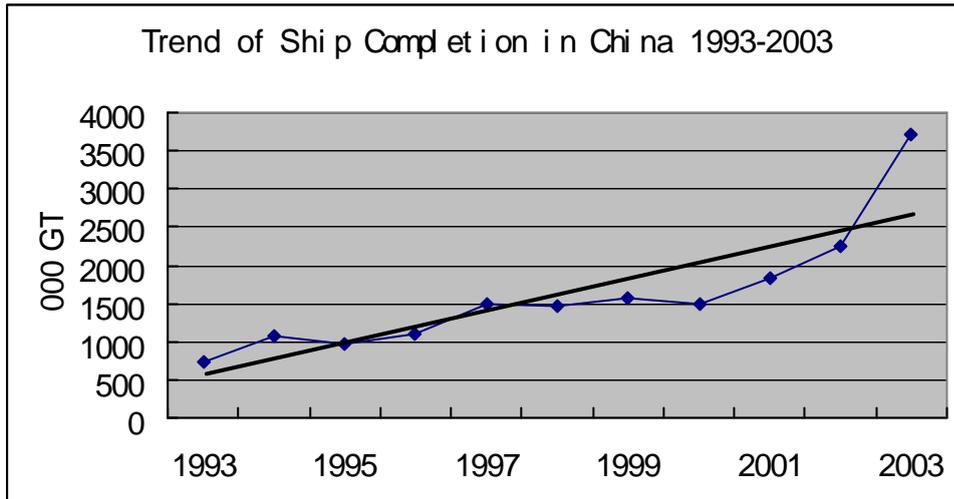
Chinese officials	Koshipa	Time Series method
68 Millions Deadweight Tonnages	42 Millions Gross Tonnages	54 Millions Gross Tonnage

Table 6.1 Prediction for ship completions in 2015

6.1.3.2 Prediction of ship completion in China

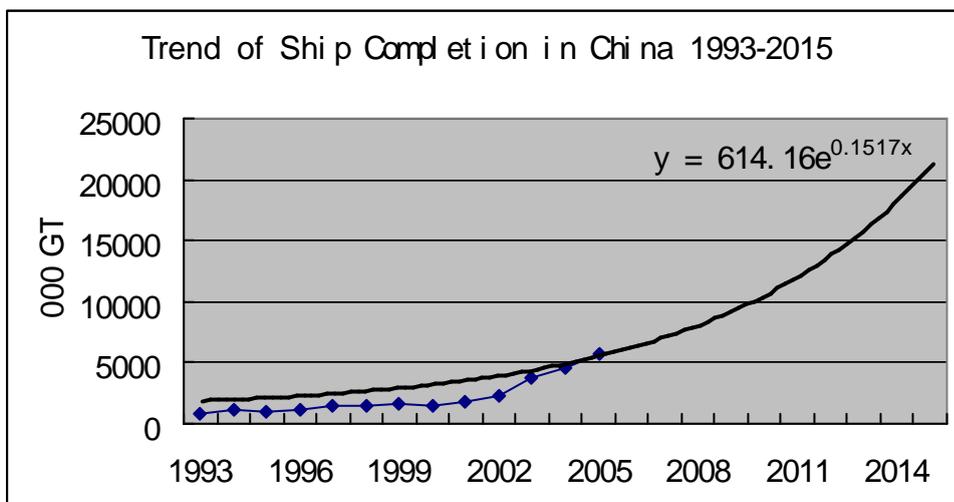
In order to obtain predictable market share of the Chinese shipbuilding industry, a familiar forecast method was developed to obtain possible throughput of the industry in 2015. It needs to mention that a linear function could not explain the trend of historical data about ship completion from 1993 to 2003 in China. The following graph (refer to graph 6.3) indicates that there was a leap in ship completion by the industry in 2003.

The growing trend of the industry in terms of ship completion is kept firmly in 2004 and 2005. It is found that the data in the period of from 2003 to 2005 had more influences to the outcome of the forecast. This implies a significant growth of the industry in recent years due to unprecedented booming of world shipbuilding market these years.



Graph 6.3 Trend of ship completion in China 1993-2003

After many trials, finally, the author decided to use exponential function to predict the possible output of the industry in 2015. In other words, the author assumed that the market would be as good as the market in the period of 2003 - 2005. The outcome showed that the industry may have a total of 20.12 millions GT in 2015. The following graph presents the trend of the output.



Graph 6.4 Trend of ship completion in China 1993-2015

In this scenario, the market share that the industry may have is about 37% of world total if the world ship completion in 2015 is 54 millions GT.

6. 1.3. 3 Perspective of the shipbuilding capacity in China

China already had a 2.73 millions CGT of ship completion by the end of 2004, which account for 13% of world total according to the statistics provided by CESA. The figure of OCED also confirmed that the tonnages completed by China was 8 million

Deadweight Tonnages in 2004, which accounts for 13% of world total as well. Anyway, the figure of ship completion in China in 2004 can be a good indicator for understanding actual shipbuilding capacity, since almost all Chinese shipyards were busy in production, so the capacity of the shipbuilding was likely released with current productivity in 2004.

Two major state-run shipbuilding giants, CSSC and CSIC, have been executing the expansion projects along with national scheme of the shipbuilding. Both will increase shipbuilding capacity enormously in the years to come. The following table shows the possible shipbuilding capacity of the Chinese shipbuilding industry in 2015. The calculation did not take new projects of CSSC in south China as well as the projects that are not listed in national scheme into account.

Year	2004	2010	2015
Shipbuilding Capacity	800	1550	2600
Unit: Millions Dwt			

*Table 6.2 Prediction of shipbuilding capacity
Complied from data Jiaotong University, China – digital library*

If everything goes smoothly in the coming years, China would, at least, has a total shipbuilding capacity of 26 millions Deadweight Tonnages. This implies that the shipbuilding capacity is large enough to accommodate the goal set by the Chinese government, which is 24 millions Deadweight Tonnages on ship completion in 2015.

6.2 Recommendations

6.2.1 The markets that the industry must dominate

According to national scheme, huge investment has been made and committed to the shipbuilding industry, this clearly indicates that China might be physically ready to compete for world leading nation of the shipbuilding in 2015. As it has been mentioned in previous section, the issue ahead the industry is where do the market share comes from and how to achieve the goal. In the following sections, recommendations will be given to the industry on the basis of the critical success factors to a growing shipbuilding nation in chapter 3 as well as the outcome of the SWOT analysis in Chapter 5.

It is obvious that current overall competence of the industry have no possible to compete for high value market, such as LNG carrier, cruiser ship and RO-RO Cargo ships market. Main focus must be put on three major ship types: Bulk carrier, Tankers, and Containerships.

Three major ship types usually compose the majority of the world shipbuilding market.

For instance, the orders of new buildings for three major ship types accounted for 75.9% of world total as per the statistics of LSL 2004. Unfortunately, the adversaries of the Chinese shipbuilding industry are very strong at the markets, so it is not likely for the industry to gain market shares from them without significant improvements on all aspects of the shipbuilding. Unless the Chinese shipbuilding industry dominate these markets, it is impossible to be No.1 shipbuilding nation in the world.

Bulk Carrier Market

The market leader is Japan. South Korea has left this market for higher value market since 2000. The Japanese shipbuilders mainly took the market share that South Korea left. Although China also benefited from retreat of South Korea at this market, further development is not easy. Since the Japanese shipbuilders are very efficient in producing bulk carriers. However, the Chinese shipbuilding industry must take a big proportion of the market share at this market, otherwise, the chance to become No.1 shipbuilding nation is small.

Tanker Market

The market leaders are South Korea and Japan. According to the annual report of the Koshiya in 2005, the Korean shipbuilders would gradually shift part of the shipbuilding capacity from Tanker market to higher value market again in 10 years, so the market share that is left by the Korean shipbuilders will be mainly competed between China and Japan again.

This market is the most promising sector for China to become market leader in the future, because China is able to build large tankers, such as VLCCs and Suezmax now. Internal demands for Crude Oil Tankers will contribute many orders of new buildings to the Chinese shipbuilders in 10 years. However, the orders of international shipping companies can be only awarded through significant improvements on all aspects. If the industry fail in this market, the national goal is hard to reach.

Containership Market

The market leader is South Korea and Japan again. In larger containership sector, South Korea is a dominator. Since the Chinese shipbuilding industry has just started to build larger containerships so it still needs time for the industry to catch up current leading nations. However, a relatively higher market share at this market is important to China.

6.2.2 Largely improvement of productivity and efficiency of the industry

One of critical success factors to a growing shipbuilding nation request the industry to develop technology and skillful labor. The aim is to largely improve in productivity and efficiency of the industry.

Firstly, the productivity and efficiency mainly come from effective management and

capability of organizing ship production. One short cut is to study the experiences and knowledge from world leading shipbuilders directly through co-operations and exchanges of managerial experiences. This suggests the industry shall be more active than before to get in touch and set up co-operations with international shipbuilding community. For instance, through attending international or domestic shipbuilding seminars of all levels, successful experience or sophisticated shipbuilding technology is reachable.

Secondly, the studies of world leading knowledge only provide the chance to catch up but not to overcome. This is to say that innovative approaches to the shipbuilding and innovative way of organizing the production are final weapons to win out.

Major shipbuilders shall become main force to innovate and the government shall facilitate co-operations among the shipbuilders, which make smaller shipbuilders have opportunities to grow with large ones. If the industry can fulfill this, China will satisfy two critical success factors to a growing shipbuilding nation, which are co-operation among the shipbuilders and involvement of government – aid and orchestration, resulting improvements on competences at industrial level.

Last but not least, the shipbuilders in China need to provide training opportunities to young professionals. For instance some qualified staffs shall be arranged to study aboard further so that the industry can always track leading management and leading philosophies of organizing ship production in the world. Most importantly, the universities in China shall educate young professionals properly and supply enough number of young professionals to the industry for a sustainable development of the industry. Furthermore, the government shall play a role to guide universities to set up relevant courses or programs by providing proper aids and policies.

All in all, the improvement on productivity and efficiency of the industry shall be achieved by the guidance of the regulator through polices or aids and active participations by the industry itself as well as the professional bodies outside industry. Once the productivity and efficiency is lifted up, as such, international competitiveness. As it was mentioned in Chapter 5 that the productivity of the Chinese shipbuilders, is only 1/10 of the Japanese shipbuilding industry at present, when it could be shortened to 1/2, the industry will have more power to compete at the markets.

6.2.3 Improvement of Supply Chain of the industry

As one of main weaknesses of the industry, the improvement on the supply Chain will provide an optimal circumstance for the industry to develop. In Japan and South Korea, the rate of domestic availability of supplies to new buildings is very high, the supply chains in the leading shipbuilding nation provides cost -effective supplies to the industries, This is a critical success factor to a growing shipbuilding nation. In order to improve the rate of domestic availability of supplies to the shipbuilding industry in

China, recommendations are given according to difference situations.

1. The products that Chinese can make but lack of international awareness

Chinese have been able to produce many items, which can be used on the new buildings. One barrier is that many manufacturers are small in production scale with weaker strengths of finance. In other words, they develop the products individually and produce in small quantity. Even if they have good products, lacking of funds to obtain international certifications prevent the products from using for many ships. Since any equipment or item, which is allowed installing on board, needs obtained the approvals of classification Societies and Ship owners. Obviously, aids from the government by providing cheaper loans or by launching policies to guide reorganizations of the manufacturing is a solution for enhancing the abilities of R&D, mass production as well as competitiveness. Furthermore, the manufacturers shall pay more attentions to marketing, it is important for clients to know the products and qualities of the Chinese products so that international maritime exhibition is one of platforms for increasing international awareness.

2. The items that Chinese cannot make

There are, certainly, some items or equipments that Chinese cannot produce at current stages, so that international co-operation is a solution. The government shall offer favorable or special policies to attract international manufacturers to have the products manufactured in China or encourage technological exchanges between the leading producers and the local producers. In addition, the shipbuilders in China need to participate together to ensure a market for the products.

The recommendations made above will largely increase the rate of domestic availability of supplies to the shipbuilding industry in short time, whereas, in the long run, innovation is an only effective strategy for the suppliers to support the shipbuilding industry.

6.2.4 Lifting the bottlenecks – Ship design

Ship owners only have interest in buying the ships that bring fortune in the future. Bad design of ships causes both more running cost and fewer spaces for cargoes. It is the situation in China for some ship types. The lifting of this bottleneck is not easy.

Firstly, Ship design must closely combine contemporary technologies with the needs of market. Any design that is not economic viable is short-lived and not marketable. Secondly, ship designers must interact with the shipbuilders each other. Sophisticated designers know shipbuilding technologies well, which help the shipbuilder to save costs but strengthen the structure of the ships. Thirdly, the main issue the industry faced is lacking of funds on R&D. Ship design, nowadays, requires advanced and

sophisticated computer system as well as competence professionals.

Therefore, the co-operation among the industry, academia and relevant industry is a solution. Government aid and orchestration play an important role to facilitate the co-operation.

6.2.5 Rational increasing in shipbuilding capacity

It is a fundamental element for China to have enough shipbuilding capacity, whereas, the issue of long-term overcapacity of world shipbuilding industry must keep in mind all the time.

It is true, in the long run, the equilibrium is to be reached by the market, but short-term variations at the market are still painful to the world shipbuilding industry as a whole. When the supply largely exceeds demand, eventually, the price level of the new buildings decrease, so the industry will not benefit from irrational expansion on shipbuilding capacity. Lower shipbuilding prices lead to low profits to the Chinese shipbuilders and result in financial difficulties for a sustainable development.

The proper strategy is to expand the capacity alone with the development of market and macro-economy circumstance. A growing leading shipbuilding nation must be a responsible “ nation ” to maintain the prosperity and stability of entire world shipbuilding industry. In one word, expansion project must be flexible and be developing in a rational manner. Over-investment only brings burden not benefit.

6.2.6 Increasing profitability and awareness of impact of exchange rate

The industry runs at low profit level for years. Many factors result in the phenomenon. Low efficiency and low productivity has been identified as an internal cause. And the inability of supply chain is an external cause of the trouble. The profitability will increase both by increasing overall efficiency of the industry and improving in the supply chain. When the financial strength of shipbuilders is enhanced, so does the ability for countering to market fluctuations.

At last, the possibility of appreciation of the Chinese Currency is foreseeable in the long run. It is rather difficult for the industry to avoid such risk. Proper method might be Risk Management, such as currency hedging. Anyway, the improvement in productivity and overall lifting of international competitiveness is a final solution to avoid this unavoidable risk in the long run.

6.2.7 List of Recommendations

1. Markets that the industry must dominate: Bulk carrier, Tanker and Containership

market

2. Largely improvement in productivity and efficiency of the industry
3. Lifting the bottlenecks – Ship design
4. Rational increasing in shipbuilding capacity
5. Increasing profitability and awareness of impact of exchange rate

6.3 Conclusion

As the outcome of predictions done by the author, the world ship completion in 2015 would be 54 millions GT. China might complete ships of 20.12 millions GT if the industry can keep the same growth rate as the industry achieved in the period from 2003 to 2005. The predictions of the author lead to a possible 37% market share of world total.

The growth of the industry from 2003 to 2005 could be considered as an unprecedented leap in terms of tonnages completed, so the figures during the period were found to have more impacts on the outcome of the prediction. This led to a distortion to the predicted outcome. In reality, it is not the case that the booming market is likely to continue without any variations. The shipbuilding market is cyclical in nature

The goal set by the Chinese government for the industry is to complete 24 millions Deadweight Tonnages or a 35% market share of world total in 2015. Therefore, according to the predictions made by the author, the goal is likely to be achieved if the Chinese shipbuilding industry can keep all shipbuilding slots busy and the shipbuilding market continue to grow in 10 years. Anyway, the industry needs several leaps in ship completion in the years to come, otherwise, it is difficult to reach both the goal set by the government as well as the market share predicted by the author.

Meanwhile, the shipbuilding capacity in China would increase to 26 millions Deadweight Tonnages, so China have enough shipbuilding building capacity to compete for the leading position of the shipbuilding in 2015. The issues ahead are: where does the market share come from? How to gain the market shares from current leading shipbuilding nations, South Korea, Japan.

The recommendations made by the author suggest that the industry must dominate at three major shipbuilding markets rather than the high value shipbuilding market, despite current maker leaders are very strong on all aspects of the shipbuilding. The market share can only increase by improvement in productivity and efficiency of the industry, improvement in supply chain and lifting the bottleneck – ship designs. It seems that the requirements made by the author are hard to achieve by the industry itself so that government aid and orchestration is critical in the long run.

A rational manner should be employed by the industry at the time of expanding on the shipbuilding capacity. Besides, attentions also need to be paid to the profitability of the

industry since these are very important to the industry for a healthy development.

When the industry can meet the all requirements made here, the market shares of three major shipbuilding markets can be gradually increased, which leads to No.1 shipbuilding nation in the future.

Chapter Seven Final conclusion

In the 2nd half of 20th centuries, the world shipbuilding center shifted from USA and Europe to Asia. Japan and South Korea are the current leaders of the world shipbuilding industry. The evolvement of the world leading nations in the past 50 years certifies a rule that a growing shipbuilding nation always go hand in hand with a growing national fleet.

The shipbuilding industry is deeply related to Shipping Market, the industry takes care of the whole life of the ships, from launching to dismantling. The fluctuations of shipping market have predominant impact to the blossoms or downfalls of the ship building market. Other incidents such as war, oil crisis, changing of technology accelerate the peaks and troughs of the shipbuilding market.

Many factors are important to the development of the shipbuilding Industry, among them, political impact is a paramount element, which is also a main reason to cause over-capacity of world shipbuilding industry for years. Ownership structure determines competitiveness of the shipbuilders, so is the impact of exchange rate. And environmental issue raises more attentions in recent years, which are less rigorous in the countries with fewer incomes. Although these factors are important to the shipbuilding industry, it only defines general competitiveness of a shipbuilding nation.

A study of leading shipbuilding nations found out there were 6 critical success factors for a nation to become a market leader. These factors are important so it is worth listing again as shown below.

1. *Development Phase from agriculture to industry – increase internal demands*
2. *Involvement of government – financial aids*
3. *Involvement of government – orchestration*
4. *Co-operations among yards*
5. *Competence supply chains – low cost supplies*
6. *Develop specialized technologies and skilled labors*

The Chinese shipbuilding Industry has accumulated lots of experiences at international market in the past 2 decades. In early 2005, the Chinese government decided to increase support to the industry. The goal of the industry is to be No. 1 shipbuilding nation in terms of tonnages completed in 2015.

A SWOT analysis, on the basis of current status of the Chinese shipbuilding and 6 critical success factors, found out that low efficiency & low productivity and inability of the supply chain are major weaknesses of the industry. Meanwhile, Ship design is another difficult issue that needs to tackle.

Many economic phenomena prove that the Chinese economy is in transferring from an

agricultural to industrial basis, which fits to one of critical success factors for a growing shipbuilding nation. This is an opportunity for the industry to grow because internal demand of ships resulting from the industrialization.

A prediction on world ship completion in 2015 was made by a time series method. The predicable tonnage completed is about 54 millions GT in the world. A familiar prediction was also made for the Chinese shipbuilding industry, the outcome showed that the industry might be able to produce a total of 20.12 millions GT in 2015. This leads to a 37% market share of world total. Anyway, It seems that the goal set by the Chinese government is likely to achieve on the basis of the growth trend that the shipbuilding market in the years to come is as good as the period from 2003 to 2005, but it is not likely the case in reality. Anyway, the industry needs several leaps in ship completion in 10 years; otherwise, it is difficult for the industry to reach both the goal set by the government as well as the market share predicted by the author.

The perspective of the Chinese shipbuilding capacity in 2015 do imply that the industry will has enough building space to compete for the world leading shipbuilding nations. Recommendations were made to the industry according to the outcome of SWOT analysis as well as on the basis of the critical success factors to a growing shipbuilding nation.

The final conclusion is that China is able to compete for the No.1 shipbuilding nations in terms of shipbuilding capacity in 2015, but the market share can be gained only on the basis of materialized improvement on all aspects of the shipbuilding, which is productivity, supply chain as well as ship design etc. China cannot be No. 1 shipbuilding nation, unless the Chinese shipbuilding industry can dominate three major shipbuilding markets, bulk carrier, Tanker, and containership market in 2015. Although China might not become No.1 shipbuilder in 2015, the role the industry plays in the international shipbuilding market will be more important in the future.

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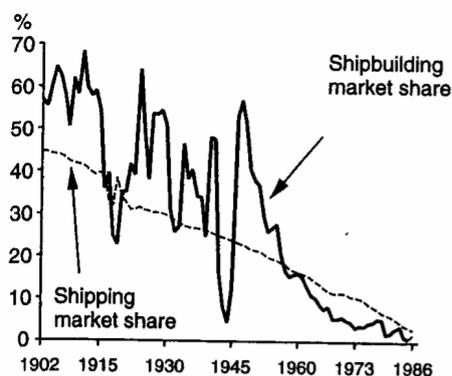
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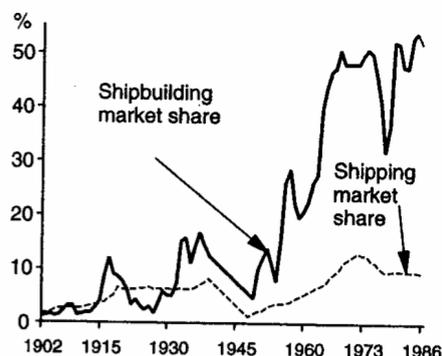
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Appendixes

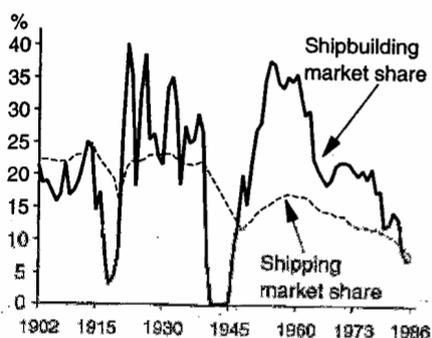
Appendix One: The link between shipping and shipbuilding market share by region



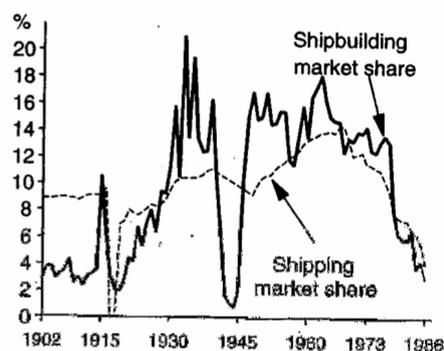
a Great Britain



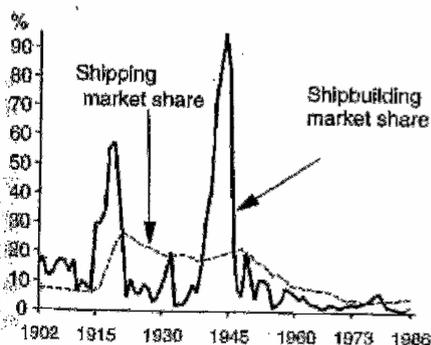
b Japan



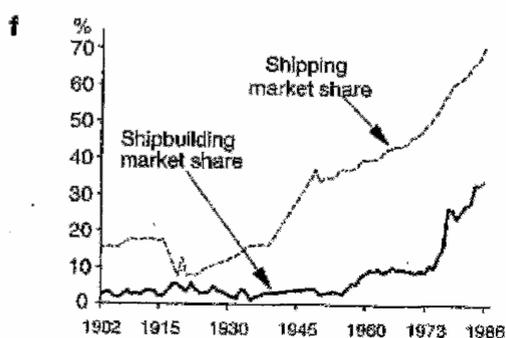
c Continental Europe



d Scandinavia



**e United States
(excluding reserve fleet)**

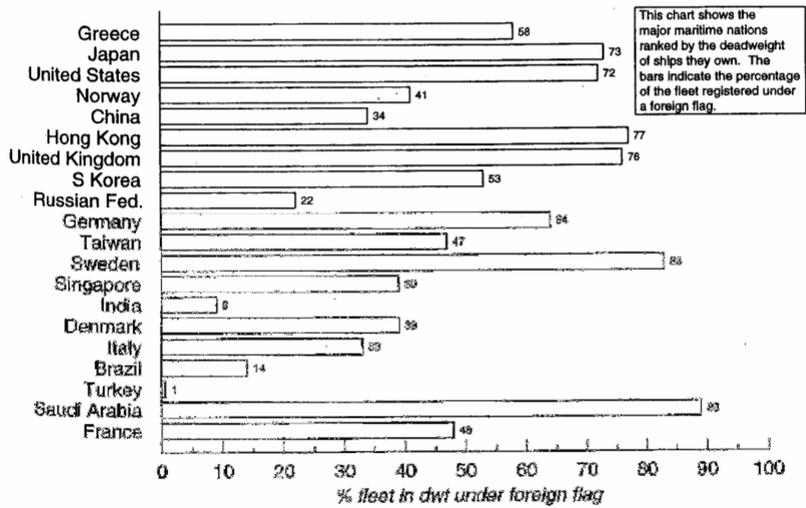


f Other countries

Source: Lloyd's Register of Shipping, Statistical table

Note: The figure shows, for each region, the merchant fleet as a percentage of the world fleet, and shipbuilding output as a percent of world shipbuilding output

Appendix Two: Principle merchant fleet using open-registry flag



Source: Review of Marine Transport 1995, UNCTAD, Geneva Table 10

Appendix Three: Change in percent of shipbuilding worldwide, 1980-1990

Country	1980			Country	1990		
	Output	% Total	1980 Rank		Output	% Total	1990 Rank
Japan	6,094	46.52	1	Japan	6,824	42.96	1
Brazil	729	5.56	2	S.Korea	3,460	21.78	2
USA	555	4.24	3	Germany	856	5.39	3
S. Korea	522	3.98	4	Taiwan	667	4.2	4
USSR	460	3.51	5	Yugoslavia	457	2.88	5
UK	427	3.26	6	Denmark	395	2.49	6
Spain	395	3.01	7	Italy	372	2.34	7
Germany	376	2.87	8	USSR	367	2.31	8
Poland	362	2.76	9	China	367	2.31	9
Sweden	347	2.65	10	Spain	363	2.29	10
E.Germany	346	2.64	11	Brazil	256	1.61	11
France	283	2.16	12	Finland	247	1.56	12
Italy	248	1.9	13	Netherlands	163	1.03	13
Taiwan	240	1.83	14	Romania	160	1.01	14
Norway	208	1.59	15	UK	131	0.82	15
Denmark	208	1.59	16	Poland	104	0.65	16
Buglaria	206	1.57	17	Bulgaria	80	0.5	17
Finland	200	1.53	18	Norway	80	0.5	18
Romania	170	1.3	19	Portugal	73	0.46	19
Yugoslavia	149	1.14	20	India	70	0.44	20
Others	716	5.46		Others	393	2.47	

Source: The Business of Shipbuilding, Chapter one - The market for ships

Appendix four: the map of 3 shipbuilding bases in China by 2015



Source: Digital library of Jiaotong University

Remark:

- In the north, Bohai Bey Shipbuilding Base
- In the middle: Mid China Shipbuilding Base
- In the South: South China Shipbuilding

Appendix Five: the forecast of world ship completions in year 2015

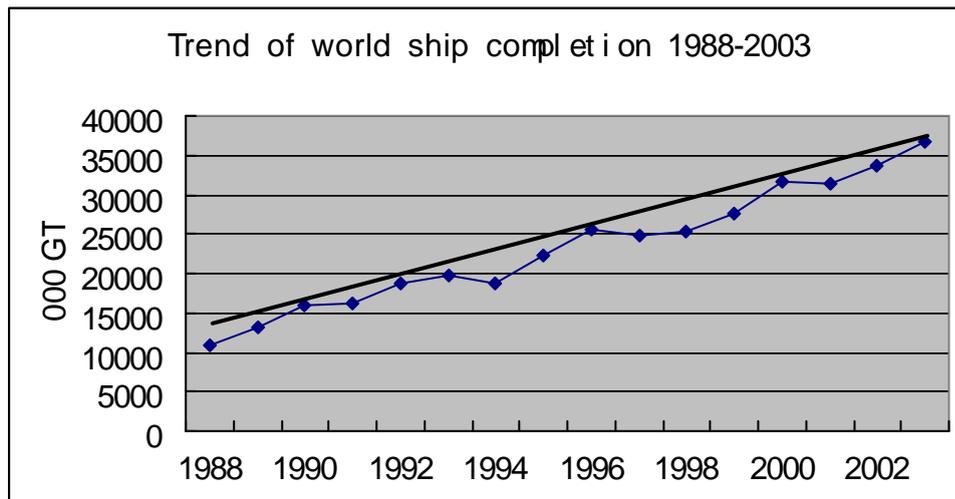
Step one: Calculations of required parameter

Merchant Ship completion by Principle type 1985– 2003

Completion in 000 GT (Yt)

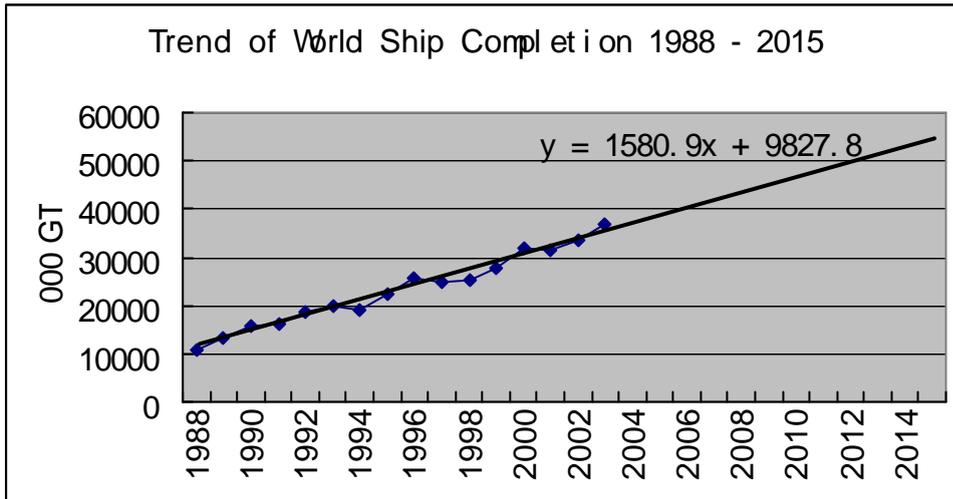
Year	Period (t)	(Yt)	Year	Period (t)
1988	1	10909	2004	17
1989	2	13236	2005	18
1990	3	15885	2006	19
1991	4	16095	2007	20
1992	5	18633	2008	21
1993	6	19714	2009	22
1994	7	18845	2010	23
1995	8	22236	2011	24
1996	9	25527	2012	25
1997	10	24828	2013	26
1998	11	25334	2014	27
1999	12	27649	2015	28
2000	13	31676		
2001	14	31342		
2002	15	33557		
2003	16	36786		

Table A5-1 Source: LSL/FAIRPLAY



Graph A5-1 Trend of world ship completion 1988–2003

Step two: Obtain function of time by EXCEL



Graph Trend of World ship completion 1988-2015

Step three: Develop the prediction for period 28 (the year 2015)

Y = 54,093,000 GT

Appendix six the prediction of ship completion in 2015 for China

1. The problem on data collected

Data availability varies in measurement units. For instance, data for the period of 1993 and 2003 collected from LSL and LR/Fairplay was reported in GT, whereas, data in 2004 from OECD and data in 2005 from China were reported in Deadweight Tonnages. It is hard to concert this figures to same measurement unit unless assumptions are made.

Date Collected		000 GT
Year	Period	Completion GT
1993	1	742
1994	2	1079
1995	3	963
1996	4	1102
1997	5	1479
1998	6	1466
1999	7	1556
2000	8	1484
2001	9	1827
2002	10	2248
2003	11	3717

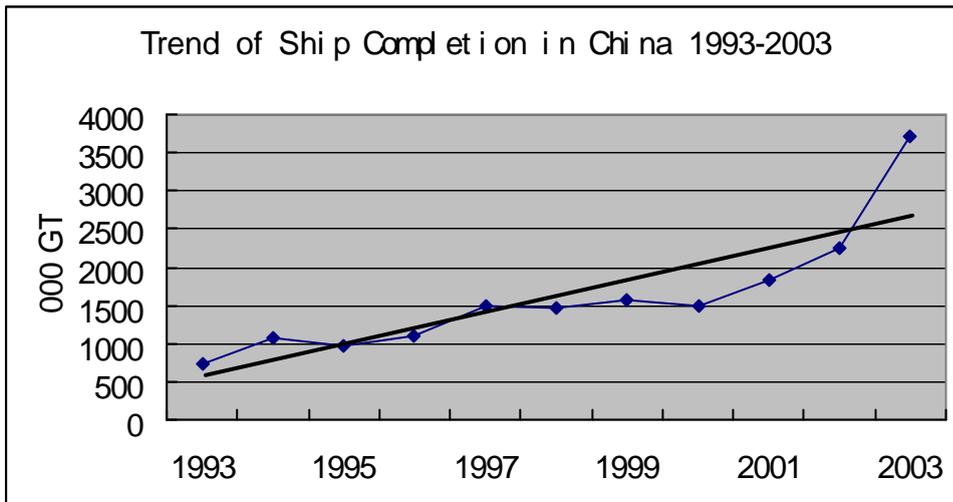
Table: A6 1-1 Source: LSL/FAIRPLAY

2. Prediction

2.1 Prediction without data in 2004 and 2005

2.1.1 Plotting all data into a graph to obtain the trend

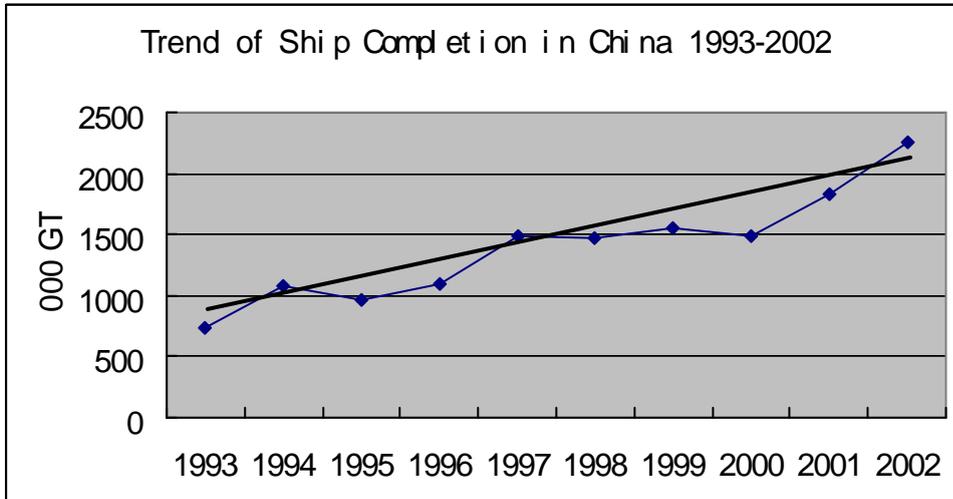
In order not to involve in the problem of measurement units, the author used data for the period of 1993 to 2003 only to do the prediction. It was hard to find a proper trend of data by plotting all figures into a graph. The following graph shows clearly that the figure in 2003 has too much influence.



Graph A6-1 Trend of ship completion from 1993 to 2003

2.1.2 Plotting all data excluding data in 2003

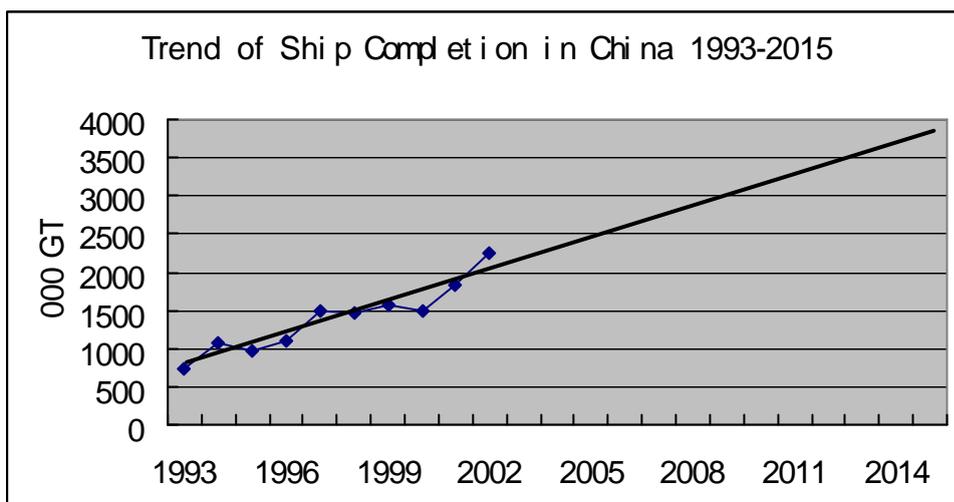
To find a better trend for the historical data, the figure in 2003 was excluded as per general rules for sampling. An updated graph below shows that a proper trend of historical data was obtained.



Graph A6-2 Trend of ship completion from 1993 to 2002

2.1.3 prediction of trend

In this way, the prediction for ships completion in China was done according to normal procedure. The following graph shows the trend for production period.



Graph A6-3 Trend of ship completion in China 1993-2015

2.14 Outcome of the prediction

The outcome proved to be problematic, because the forecast showed the ship completion in 2015 is below 4 millions GT, whereas, in reality, the throughput of the industry already reached 3.72 millions GT in 2003 by the Chinese Shipbuilding Industry according to the statistics of CESA. The following graph shows the trend of prediction on the basis of the data from 1993 to 2003.

The trend above suggests that the Chinese shipbuilding Industry is not able to reach the goal in 2015 that the Chinese government set, which is 24 millions Deadweight Tonnages. The outcome of the prediction seems to be questionable, since the predicable figure is far beyond the figure expected.

2.2. The prediction with all data available

2.2. 1. Assumptions:

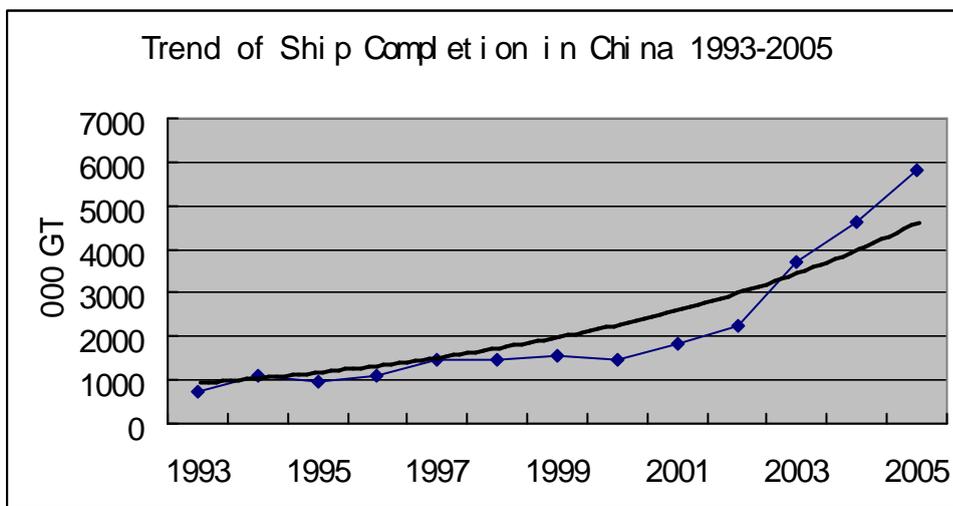
- The throughput of the industry in 2005 is defined as 10 deadweight Tonnage, as the figure could be found from various sources in China including information from the official website. The figure published by officials is reliable, since it is a kind of statistics according to the productions of the shipbuilders rather than a pure predicted figure
- The throughout in 2004 was 800 Deadweight Tonnages as per the figure from OCED
- Ship types built by the industry are assumed are same in the period from 2003 to 2005 so that the throughput in the year 2003 published in China, which was 6.41 millions Deadweight Tonnages, was linked to the figure of LSL at the same year to find the ratio between GT and DWT, therefore, the following table present the figures in 2004 and 2005 after conversions.

Year	GT	DWT
2003	3,717,000.00	6,410,000.00
2004	4,640,000.00	8,000,000.00
2005	5,800,000.00	10,000,000.00

Table A6 1-2 Conversion figures from DWT TO GT

2.2.2. Plotting data into graph to obtain trend of the historical data

The following graph provides an overview of the trend of ship completion from the year 1993 to 2005 in China.

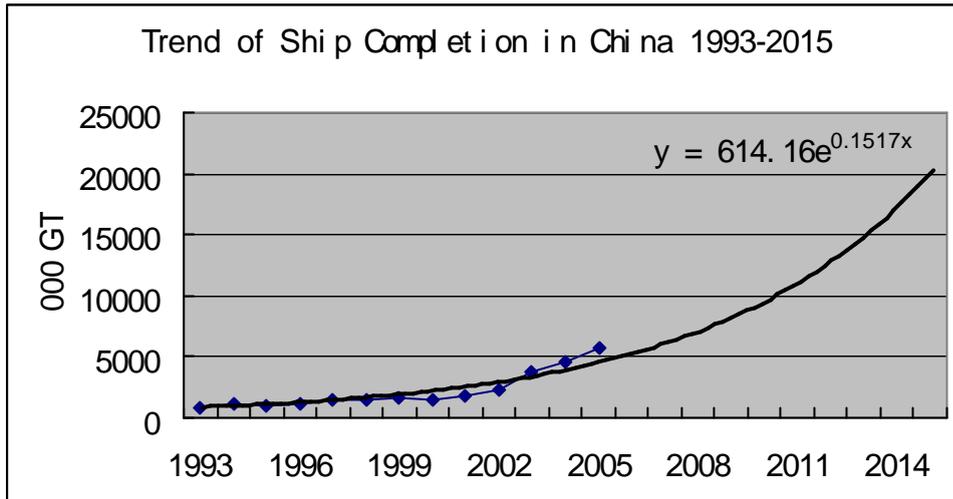


Graph A6-4 Trend of ship completion in China 1993 - 2005

2.2.3 Defining the trend of historic data

After many trials, the trend of the exponential explain the trend of the historical data well, other trends, such as linear trend did not fit.

2.2.4 Prediction on trend of the throughputs and obtaining the function of time



Graph A6-5 Trend of ship completion in China 1993-2015

The function of time is obtained through Excel, which is $y = 614.16e^{0.1517x}$ $y = 20.117$

2.2.5 Developing the prediction for the period of 2015

$$y = 614.16e^{0.1517x}, y = 614.16e^{3.4891}, y = 20.117$$

2.2.5 outcome of the prediction

The outcome of the prediction on the basis of historical data is 20.12 millions Deadweight Tonnage, which is close to the goal that the Chinese government set for the industry.

3. Outcome of the prediction

In 2015, the Chinese shipbuilding industry might have a total output of 20.12 millions Deadweight Tonnages.

Note: Data in 2003, 2004 and 2005 was found having more influence to the outcome, it was clearly seen that there was a leap of the ship completion in 2003 (refer to Graph A6-4). The strong growths were also found in 2004 and 2005, which implied that the prediction was made on a growing trend of the period from 2003 to 2005.