

**A STUDY ON INDIGENOUS WARSHIP BUILDING IN THE
CONTEMPORARY GEOPOLITICAL ENVIRONMENT**

**A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE
REQUIREMENT FOR AWARD OF DEGREE OF MASTER OF
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CHANDIGARH**

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CERTIFICATE

I have the pleasure to certify that Capt Thaju Mohamed, VSM has pursued his research work and prepared the present dissertation titled “**A Study on Indigenous Warship Building in the Contemporary Geopolitical Environment**”, under my guidance and supervision. The dissertation is the result of his own research and to best of my knowledge, no part of it has earlier comprised any other monograph, dissertation or book. This is being submitted to the Panjab University, Chandigarh for the Master of Philosophy in Social Science in partial fulfilment of the requirement for the Advanced Professional Program in Public Administration (APPPA) of Indian Institute of Public Administration (IIPA), New Delhi.

I recommend that the dissertation of Capt Thaju Mohamed, VSM is worthy of consideration for the award of M Phil degree of Panjab University, Chandigarh.

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Mar 2020

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DECLARATION

I, the undersigned, hereby declare that this dissertation entitled, “**A Study on Indigenous Warship Building in the Contemporary Geopolitical Environment**”, is my own work, and that all the sources I have accessed or quoted have been indicated or acknowledged by means of completed references / bibliography. The dissertation has not been submitted for any other degree of this university or elsewhere.

Mar 2020

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ABBREVIATIONS

AoN	Acceptance of necessity
BG	Bank Guarantee
CFA	Competent Financial Authority
CSL	Cochin Shipyard Ltd.
CT	Corporate Tax
CSSC	China State Shipbuilding Corporation
DAC	Defence Acquisition Council
DCI	Dredging Corporation of India
DPP	Defence Procurement Plan
DND	Directorate of Naval Design
DRDO	Defence Research and Development Organization
DWT	Dead Weight Tonnage
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
ERV	Exchange Rate Variation
EU	European Union
FAC	Fast Attack Craft
FDI	Foreign Direct Investment
FERV	Foreign Exchange Rate Variation
FICCI	Federation of Indian Chamber of Commerce and Industry
FTP	Foreign Trade Policy
GAIL	Gas Authority of India Limited
GoI	Government of India
GDP	Gross Domestic Product
GRSE	Garden Reach Shipbuilders & Engineers
GSL	Goa Shipyard Limited

GST	Goods and Services Tax
GT	Gross Tonnage
<i>IN</i>	Indian Navy
IAC	Indigenous Aircraft Carrier
IDSA	Institute of Defence Studies and Analyses
IL	Industrial License
IOR	Indian Ocean region
IWAI	Inland waterways Authority of India
L&T	Larsen & Toubro
MDL	Mazagaon Docks Ltd
MCPP	Maritime Capability Perspective Plan
MCMV	Mine Counter Measure Vessel
MMF	Merchant Marine Fund
MoD	Ministry of Defence
MoS	Ministry of Shipping
MSDE	Ministry of Skill Development & Entrepreneurship
NATO	North Atlantic Treaty Organisation
NCLT	National Company Law Tribunal
NSDRC	National Ship Design & Research Centre
NIRDESH	National Institute for Research and Development in Defence Shipbuilding
OEM	Original Equipment Manufacturer
Ofs	Ordnance Factories
ONGC	Oil & Natural Gas Commission
OPV	Offshore Patrol Vessel
OSR	Outline Staff Requirement
PDM	Product Data Management
PLM	Product Lifecycle Management
PLAN	People's Liberation Army Navy

PSR	Preliminary Staff Requirement
PSU	Public Sector Undertaking
QAP	Quality Assurance Plan
R&D	Research and Development
RDEL	Reliance Defence & Engineering Ltd
RFI	Request for Information
RFP	Request for Proposal
SCI	Shipping Corporation of India
SLOC	Sea Lines of Communication
SMEs	Small and Medium Enterprises
SR	Staff Requirement
SRI	Self-Reliance Index
ToT	Transfer of Technology
US	United States of America
WC	Working Capital

Chapter 1

Introduction

“If you want to build a ship, don’t drum up people to collect wood and don’t assign them tasks and work, but rather teach them to long for the endless immensity of the sea.” –

Antoine de Saint-Exupery

“Whoever rules the waves rules the world”- Alfred T. Mahan

Introduction

India is placed at a cusp of geographically vast coastline of 7,500 km and its strategic location along most major shipping routes, to propel into one of the strongest maritime nations in the world. However, the ship building sector in our country as a whole has been a story of yet another missed opportunity. This sector has huge potential to become, “the engine of growth” for India. Increased investments together with the ‘Make in India’ impetus could have substantially improved the indigenous ship building capabilities and thereby increase the sector’s contribution to GDP and trade volumes. The development of a successful shipbuilding sector has been pivotal to the rapid and robust economic development in most countries in the world with long coastal boundaries. The sector has an immense direct and indirect positive impact on most other leading industries such as steel, aluminum, electrical machinery and equipment etc., besides its huge dependence on

infrastructure and services sectors in an economy. As a result of its multiplier effect on most manufacturing ancillary industries and on account of its large scale employment generation capability, the shipbuilding industry is also known as a mother industry. Most countries have laid immense emphasis on development of their shipbuilding sectors which has in a way also contributed to national economic development in such countries.

History shows us that the evolution of nations as manufacturing powerhouses during various periods of time has a strong association with its shipbuilding output. The English during 19th century and early part of 20th century, the Americans post World - War II, the Japanese during 1960-90, the Koreans post 1990 & recently the Chinese have emerged as major shipbuilding nations accounting for over 40% (sometimes more than 70%) of annual world ship production in terms of tonnage (Pant, 2012). It is interesting to note that the period of rise of these countries as economic powerhouses and as major shipbuilding nations overlaps. The shipbuilding industry, in addition to securing vital national security and economic interests, is critical in the development of other sectors such as steel, manufacturing, and other ancillary equipment & product industries.

Historic Perspective

India is a country with a rich maritime tradition spanning over 4,000 years. This maritime tradition is deeply imbibed in the psyche of our coastal population and manifests itself in their customs and practices. In Indian mythology, the ocean is considered as a source of creation of the universe. The Indian seaboard had always witnessed peaceful maritime activity, with trade as the prime driver. Indian folklore, ancient Indian texts and Buddhist

Jatakas, all allude to the fact that the Indus Valley Civilization of Mohenjodaro, Lothal and Harappa thrived due to maritime activity between ancient India and the countries of Africa, Arabia, Mesopotamia and the Mediterranean.

The Indus valley civilization was known to use boats around 3000 BC. It was well known for their skills in constructing boats and sail ships. Lothal in Gujrat, which was part of their civilization, appears to have been the boat-building centre, as it could get building materials from the Gujrat forests. Five anchors made of stone have been found at Lothal. Lothal also had the world's first dock, which was trapezoid-shaped measuring approximately 214m x 36m built before 2000 BC. The archaeological findings from this civilization reveal that there was a vibrant and dynamic maritime network, using a variety of watercraft, during the 2nd millennium BC. A double-ended vessel, with a crescent-shaped hull- probably made of reeds bundled with lashing is observed in a stone seal from Mohenjodaro. A graffito from the same place represents a vessel with a mast and steering oars or side rudders at the stern of the ship, while a terracotta boat model from Lothal represents a square-stern vessel with a sharp bow, with fittings for rigging (Agrawal & Tiwari, 2001) .

Before recorded history, the fishing community living along the coast of south India had built boats by tying wooden logs together with coconut coir rope. In the Tamil language, 'tied wood' is known *Kattu Maram*, and these boats known as *Kattumaram* are popularly used for fishing even today. It is from this name that the modern day terminology of *catamaran* has been derived (Note A.P).

Thus, India has an age old history dating as early as 3000 BC in the manufacture of boat hulls and an in-depth know-how on this subject. This art of manufacture of the boats started to fade after the Mughals established their supremacy on the Indian subcontinent, as the Mughals believed in land based warfare and was not exposed to the sea. In order to restore ship building in India, there is a requirement to study the ship building practice in India and implement required corrective actions in a time bound manner. India is a major maritime nation with vital economic and security interests linked to the seas. India requires a vibrant and strong shipbuilding industry for economic as well as strategic growth. For a country that is predominantly peninsular in nature with a coastline of 7516.5 km and 1197 islands, India's shipbuilding capabilities have not kept pace with its economic development or market demand of the country. Since Indian Ocean Region is of great importance to India it is more important from the national security point of view. US and Chinese interests in the region pose challenges which have deliberate implications for India's security. To ensure that India attains its rightful position in the region, politically, there is a need to take steps for meeting the challenges through use of its economic capability, political stability, social order and military potential. Towards this, a well developed indigenous ship building capability is of utmost importance.

Benefits and Peculiarities of Shipbuilding Industry

Shipbuilding is a labor intensive industry. Heavy engineering industry and many ancillary industries are integrated with various core sectors for its demand. Being an intermediate industry, its demand depends on industries which are the end-users viz, crude and

petroleum, chemical, auto industries, etc. Investment in shipbuilding can trigger additional investment in related sectors such as steel and engineering goods manufacturing and consumables. Such scale of investment also lead to significant multiplier benefits in terms of employment generation and investment in other manufacturing sectors. The economy in general and the shipping market for trade in particular play a very important role in performance of the shipbuilding industry.

Shipping markets are generally cyclic in nature which extends over decades. With the growth in trade, there is a general trend to order more ships and subsequent shipbuilding bubble; as more number of ships are added to the world fleet they inflates the fleet size. However, the demand for shipping doesn't rise at an equal pace. This creates an imbalance. This was mainly because capacity expansion is a medium- to a long-term process involving years of funding that companies often are not able to reverse. This leads to a drop in charter rates resulting in increased time for meeting the breakeven cost per vessel, making the shipping business unviable. This leads to the scrapping of vessels which again balances the demand-supply gap.

The business segments in shipping are mainly freight & shipbuilding, which are highly capital intensive. It requires huge investments and in turn has high gestation periods thus pushing break-even time to years. This capital-intensive nature of the shipping business acts as a barrier to entry and in a way protects those already in the business. In addition there is also a ship breaking business, which is a very limited segment being hazardous to environment and safety of workers.

Indian Navy and Indigenisation Efforts

Although the Indian Navy's primary role revolves around deterrence to security threats, yet by virtue of India's emerging economic strength and its geography, the Indian Navy has a significant peacetime role in maintenance of sea lines of communication (SLOC) as well. Hence, it is imperative that the Indian Navy be equipped with the requisite number of ships in a timely manner. The Indian Navy's present force level comprises about 150 ships and submarines (MoD report 2020). The Indian Navy's perspective-planning in terms of 'force-levels' is now driven by a conceptual shift from 'numbers' of platforms - that is, from the old 'bean-counting'¹ philosophy - to one that concentrates upon 'capabilities'. The Navy's current Maritime Capability Perspective Plan (MCPP) has been prepared in terms of force accretions in the immediate future. There are presently more than 50 ships and submarines under construction (MoD report 2020).

Accordingly, towards achieving self reliance indigenous warship construction commenced in a small measure since 1950, thereafter, Ministry of Defence acquired a number of shipyards under its administrative control and decided to construct *Leander Class* frigate at the newly acquired Mazagaon Docks Ltd. The indigenous warships construction has come a long way since the commissioning of INS Nilgiri on 03 Jun 72. Over the years, the Indian Navy has taken a conscious decision to encourage other shipyards, including private yards, to enter the specialised field of warship-construction.

¹ Bean Counter is a person, typically an accountant or bureaucrat, perceived as placing excessive emphasis on controlling expenditure and budgets. The philosophy of assessing the force levels based on the numbers and not their capabilities.

The response has been encouraging. Contracts have been concluded with M/s Pipavav Shipyard Ltd and ABG Shipyard for construction of a few Naval Offshore Patrol Vessels and a couple of Cadet Training Ships, respectively (MoD report 2020).

In spite of all these measures, the shipbuilding industry has not been able to meet the growing requirements of the Navy in a timely and cost efficient manner. This has resulted in a huge gap in the maritime force levels and increased the loading on the existing platforms.

Literature Review

Bhagwat Alok and Chitrao PV (2019), identify that Indian industries should undertake capability building in areas of niche technologies, through support from industries, research and academia. Further, the Acquisition cost of equipment from abroad would be lesser than those developed in India, however the life cycle cost would be very high.

Jha VK (2018), concluded that the Commercial and warship building are interconnected and Indian Shipyards private and public combined could meet *IN's* requirement of ships in an enabling environment. He has in addition suggested tax breaks, infra augmentation, improving efficiency and resolution of contractual issues for improving the ecosystem, also proposed for Make in India-2.

Erickson S Andrew(2016), in his study has concluded that China's ship building industry has grown more rapidly than any other in modern history and PLAN is poised to be the

second largest Navy by 2020 and at par with US Navy by 2030. In addition, the PLAN, regardless to economic future of China would be contesting the US sea control across the globe.

Behera, Laxman Kumar and Misra SN (2012), had opined that, though the Govt has taken important initiatives for indigenous ship building , the industry as a whole does not seem to grow in a healthy manner. Therefore, there is a need to have competition between PSU and private shipyards to improve efficiency and output.

Boquérat Gilles (2018), had discussed the role of India in dominating the Indian ocean region and the programs initiated under ‘Look East’ policy to engage with the south east Asian countries.

Public Accounts Committee (2015-16) MoD, “Indigenous construction of Indian Naval Warships” thirty second report, Sixteenth Lok Sabha elaborate all the nuances of indigenous warship building.

Papers presented during the Federation of Indian Chamber of Commerce and Industry (FICCI) Seminars held in October 2016 and 2019 also provide a good insight into concern of indigenous shipbuilding sector with special emphasis on warship building in India. However no papers address the issue of maintaining a regular order book for shipyard as the sector is highly investment intensive and cyclic in nature.

Another work by Thangam Muthuchelvi K and Sureshkumar (Jul 2015) in International Journal of Innovative Research and Development, titled “ Competitiveness of Indian Shipbuilding Industry” highlights the strength and weakness of Indian shipbuilding sector in comparison to the world leader in the industry. However the nuances of progressing both naval shipbuilding and commercial shipbuilding in one shipyard needs further exploration.

Another interesting article by Dasgupta Srinjoy, Chief Engineer (Mercantile Marine); EPGP, IIM Indore (2017), provides a useful insight to the state of shipping industry in light of the economic growth and the slump being experienced. He also highlights the untapped opportunities of shipping within the Indian subcontinent. The requirement of tapping the shipbuilding market to improve the inland waterways and coastal shipping in light of the inefficient road transport sector could provide a boost to the shipbuilding sector.

Statement of the Problem

The warship building programs in Indian Shipyards are mostly delayed due to various reasons, both intrinsic and extrinsic in nature. The role of a shipyard is mostly of an integrator. Once the hull form is designed and constructed, which is within the control of the shipyard, it is the timely availability of critical systems and efficiency of the shipyard’s work force that decides the timelines of ship production. On time availability of the right equipment and systems depend on various factors, like availability within India, import from other countries with or without ToT and other geopolitical reasons. It

is observed that the delays in the shipbuilding programs result in an ever increasing gap between need and availability of platforms for operational requirements. In addition, the PLA Navy now has about 400 ships and submarines and by 2030, could have more than 530 warships and submarines (Lague & Lim, 2019). Therefore, it is essential to examine the warship building environment in the country in light of the geopolitical situations in South Asia and the Make in India initiative. India has taken a quantum jump towards indigenous production with the announcement of Make in India initiative in 2014. Five years is considered a right time interval to examine the efficacy of the initiative and to recommend suggestions to make course corrections.

There is a need to understand the model of ship construction followed by our adversaries and the requirement to reduce the time line of production which could be attempted through the efficient use of the Make in India initiative.

Research Objectives

The milieu of Ship building sector in general and warship building in particular, in the country is plagued with challenges of technology, manpower and contractual issues, resulting in time and cost overruns. In light of the above, the main objectives of the research are:-

- (a) To examine the gap between need and availability of warships for *IN*, in light of the contemporary geopolitical environment.
- (b) To analyse the processes involved in various stages of indigenous warship building .
- (c) To assess the impact of “Make in India” initiative in the warship building sector.

Research Questions

A warship construction program is a very complex activity with long gestation period due to various factors required to ‘Float, Move and Fight’, starting with intricate design, powerful propulsion systems and lethal weapons and sensors. This research therefore seeks to ascertain the following:-

- (a) What is the status of the availability of warships?
- (b) What demands have been projected by the Navy and other strategists?
- (c) What are the reasons for not achieving these requirements?
- (d) What are the processes at every stage presently?
- (e) Who are the important stakeholders in warship building?

- (f) What are the reasons for time and cost overruns in indigenous ship building?
- (g) How many / what initiatives (No. of contracts/ agreements) taken post “Make in India” initiative?
- (h) What is the progress of such projects vis-à-vis timelines?
- (i) What has been the impact of Make in India on other ancillary sectors that are directly involved with indigenous shipbuilding?

Rationale / Justification

With the increase in complexity of warships under production, inordinate delays are being experienced in the delivery of warships to Indian Navy, resulting in excessive stress on the available platforms to meet the operational requirements.

Indian Defence Public Sector Undertaking (DPSU) M/s Mazagon Dock Ltd. (MDL) started indigenous production of warships with license production of *Giri* class of frigates way back in 1964. However, the DSPU shipyard has not been able to capitalise on this early start or develop an ecosystem to support efficient production. On the contrary China who has been a late starter is launching ships at a rate similar to ducklings being thrown into water. Though GoI has been able to sell the idea of Make in India in 2014, there is a need to assess the improvement in the eco system of the ship building industry.

This research will enable to suggest measures to improve the time line of production after identifying the reasons for the delays in warship building, comparing the production models of our adversaries and assessing the change that Make in India initiative has brought in the environment of ship building.

As the Make in India initiative announced in 2014, has completed four years, it is considered apt to study the efficacy of the initiative and thereafter suggest changes in policy structure post a causal study of all variables.

Methodology

The study is exploratory as the study aimed to assess the requirement of warship vis-à-vis their availability in the prevailing geopolitical situation in the Asian region. Further, in order to ascertain effects of various processes involved in the ship building viz, design, construction, identification of technical partners, etc. descriptive design model has been used.

The research was undertaken by analysis of the secondary data from various organizations and industries leaders viz, the reports generated by GoI (Ministry of Defence and Mo Shipping) including data related to performance of industries in both private and public sector. Secondary data from journals, books and article publish from time to time has also been used for research. Opinions indicated by industry leaders and media briefings by key officials of GoI, regarding the ship construction and shipping sector has also been used for enriching the research. The processes and practices of other

countries have been assessed through journals, books and publication of various research houses. The topic was also discussed with various industry experts, analysts and stake holders to get an all round view on the research.

Scope / Limitations / Delimitations

Considering that delays in ship construction have an effect on the operational readiness of the Navy, the research has the limitation with regards to access to documentation and statistics of the Navy. Notwithstanding the constraints resulting in non availability of platforms could be surmised from the reports and documents available as part of various studies conducted by Navy foundation, IDSA, etc.

Chapterisation Scheme

In order to achieve a 100% indigenization in the ship building sector the R&D of all ancillary industries and quality of products rolled out by them need to gear up to face the challenges of international market. Just Integration of subsystems of a platform in India is not what the 'Make in India' stands for. There is a requirement of holistic improvement in the technical prowess of the nation in the field of design, technically qualified workforce, testing of quality products and continuous support to downstream industries. The issues plaguing the indigenous warship building program was analysed in light of the Indian Naval requirements during the study. The broad Chapterisation scheme for this research report is as follows: -

- (a) Chapter 1. Introduction
- (b) Chapter 2. Trends in global ship building
- (c) Chapter 3. Warship Construction- A process Study
- (d) Chapter 4. Indigenous Warship Building
- (e) Chapter 5. Gaps in Ship Building Industry
- (f) Chapter 6. Conclusion- Findings & Recommendations

Chapter 2

Trends in Global Shipbuilding

“Ships are the nearest things to dreams that hands have ever made, for somewhere deep in their oaken hearts the soul of a song is laid.” — Robert N. Rose

Introduction

It is an established fact that circulation of money is essential for generation of wealth. Therefore, for growth of a nation, flow of money in the society is a very essential factor. The shipbuilding industry has the potential to facilitate flow of money across large segments of manufacturing industries, and consequently the downstream industries have a tremendous potential to improve their bottom lines and thereby growth of the national economy. In addition, shipbuilding sector is a key enabler for the financial services and Human Resource sectors.

During 2011 India ranked as the 4th largest global exporter of ships amounting to 3.7% of global export. It was when around 80% of the orders being executed by the Indian shipyards were for export (EXIM Bank WPS, 2014). The sale/purchase deals of all export orders of ships are undertaken in USD/Euro. Therefore, this sector has tremendous opportunities to bring in foreign exchange into a country. Shipbuilding sector, as an export-oriented industry could be leader of any economic resurgence of a nation. As shipbuilding has the potential to circulate large amounts of capital, it facilitates the

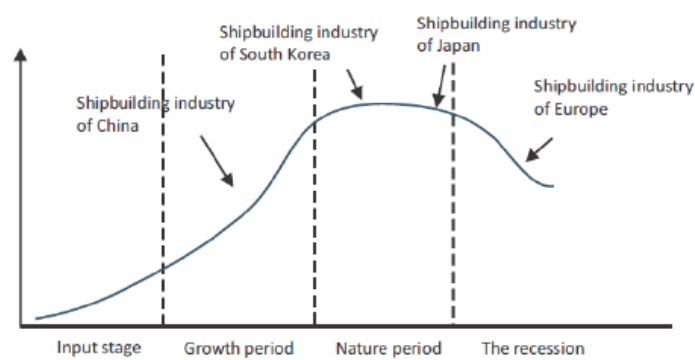
growth of the economy and thereby the GDP of a country. Towards this, the number of ships manufactured in a country should be high and they should maximise the sourcing of their raw material from the indigenous ancillary industries.

It is very important to note that various leading shipbuilding countries such as Korea and China have their shipbuilding industry contributing in a major proportion of their national GDP. China presently manufactures 90% of the world's containers. The throughput of cargo and containers at China's ports has been the largest in the world for the past five years (2015 -2019), with an annual growth rate of 35% (The Wire, 2019).

Trends in Global Shipbuilding

World War II triggered a huge rise in demand for shipbuilding. Post war, US and European shipyards dominated the Shipbuilding Industry. By 1950s, Japan had overtaken the European Shipyards due to its emergence as a global economic powerhouse. 1970s saw a major crisis in shipping sector and there was a global shipbuilding slump. This led to massive downscaling and even yard closures in western European countries till 1990s. South Korea then had just entered the shipbuilding sector, but continued expanding from then on as a result of positive and supportive government policies and better productivity and delivery timelines with cheap labour cost (OECD, 2018)².

² The largest shipbuilding Yards in Korea, The Korean Big Four – KSEC, Hyundai, Daewoo and Samsung were established.

Figure 1. Status of World Shipbuilding Industry – Focus ‘Asia’

[Source: Clarkson's Research Services, 2013]

Having overtaken South Korea in 2009, China has emerged as the largest shipbuilding nation in the world, currently accounting for as much as 40% of global shipbuilding order book, followed by South Korea (33%) and Japan (14%) in 2013 (Yujing & Qian, 2014). These three nations together account for around 87% of global shipbuilding. Due to globalization, new players entered the stage, with India, Vietnam, Philippines, and Brazil acquiring substantial order books in the last decade.

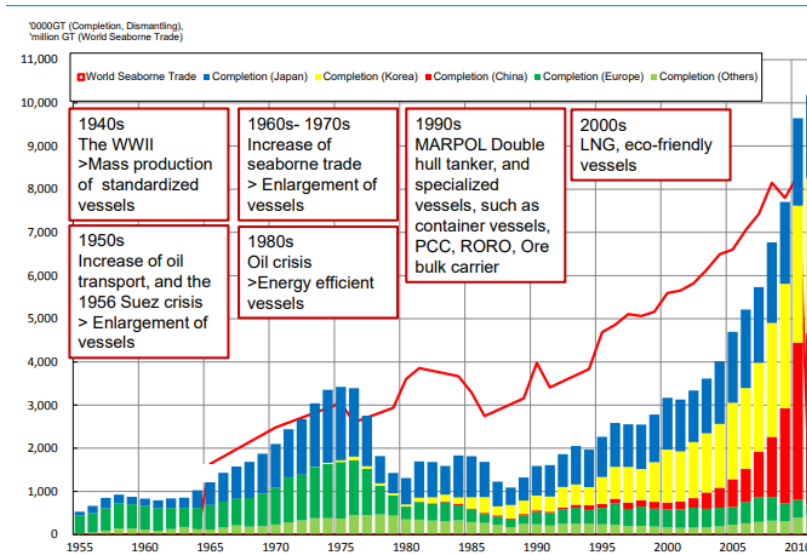
Table 1. Global Shipbuilding (>100 GRT) – Orderbook at Year end – 2013 (% share)

	2006	2007	2008	2009	2010	2011	2012	2013
China	21.4	29.6	33.7	37.0	39.5	38.7	39.6	39.9
Korea	37.0	38.4	37.4	34.7	34.3	35.0	32.5	33.2
Japan	27.3	19.4	17.3	17.3	16.3	15.8	16.1	14.2
Philippines	0.9	1.6	1.6	2.2	2.7	2.2	1.5	2.6

Brazil	0.1	0.6	0.7	0.7	0.9	1.2	2.5	2.3
Taiwan	1.1	0.9	0.7	0.7	0.7	1.0	1.0	1.1
Vietnam	1.0	1.0	1.2	1.0	0.9	1.0	0.8	1.1
Romania	0.8	0.9	0.9	0.6	0.4	0.5	0.5	0.9
US	0.3	0.2	0.2	0.2	0.1	0.3	0.5	0.7
India	0.4	0.8	1.0	1.1	0.9	0.9	0.8	0.6
Germany	2.0	1.3	1.0	0.7	0.6	0.6	0.8	0.6
Italy	1.0	0.8	0.5	0.7	0.5	0.5	0.5	0.6
Total of above	93.3	95.5	96.9	96.9	97.8	97.7	97.1	97.8
World Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0

[Source: Shipbuilding statistics 2014 by Shipbuilder's Association, Japan]

Global shipbuilding, after registering a steady rise up to the year 2008, has witnessed a steady contraction thereafter, in line with the trend in global trade. Table 1 presents the trend in global shipbuilding industry, by order book position, during the period 2006 to 2013. In line with the sharp contraction in global trade since 2008, global shipbuilding industry has witnessed a sharp and continued down trend (see Fig 2), from 368.1 mn Gross Tonnage (GT) in 2008 to 160.4 mn GT in 2012.

Figure 2. Global Shipbuilding Cycle

[Source: Clarkson's Research Services, 2013]

Japan, Korea and the Chinese Shipbuilding Industry-2000 to 2010

Since the last 60 years, Japan, Korea and China have promoted shipbuilding as an industry strategic to social capital, one that is also major source of employment for the labour. Starting in the 1950's Japan became the market leader in the 70's, through a combination of low labour costs, investment in modern shipyards, and development of new shipbuilding techniques. In a similar push the South Korean Government decided to promote shipbuilding as a major source of employment for its emerging economy since 1960 and by the mid -1990's South Korea became the global leader in Shipbuilding. In mid-1995, The Chinese had a deliberate aim to become the number one shipbuilding nation and made it a national policy. China in 2006 had a world market share of 18% of

the world's shipbuilding market and by August 2008, China with a 30% market share overtook Japan (17.5%) (Mickeviciene, 2011). In time, wood was replaced by iron and steel, leadership in the global shipbuilding (in GT, CGT) went from hand to hand: from G. Britain to Japan, then to S. Korea, and finally to China (Table 2).

Table 2. Leadership in the global shipbuilding

Duration of the leadership	Country	Stage of business cycle	Causes
1860's – 1950's	G Britain	Lost leadership	Failure to modernize shipbuilding industry
mid1950's – mid1990's	Japan	Post-maturity, weakening of competitive power	Ageing and high cost human resources. Reduced by shipyards R&D budget to less than 1%. The gap between the demand and supply for steel, increased prices of steel.
From mid1990's	South Korea	Post-growth, maintenance of competitive power	High cost human resources. The gap between steel demand and domestic supply increased steel prices. The appreciation of Korean Won has worsened the competitiveness of Korean shipbuilding.
Since 2010, earlier than it was planned	China	Acceleration of growth	The lowest labour cost. Ambitious State programmes for the development, growing shipyards capacity, governmental subsidies.

[Source: Rima Mickeviciene Klaipeda University Lithuania, 2011]

India's Shipbuilding Industry

The Indian shipbuilding is mainly centred around 27 shipyards comprising 8 public sector and 19 private sector shipyards. The shipyards have 20 dry-docks and 40 slipways between them with an estimated total capacity of 281,200 DWT (Dead Weight Tonnage). India's shipbuilding witnessed a rise from 0.8 mn GT (Gross Tonnage) in 2006 to reach 3.5 mn GT in 2008, which was maintained at 3.4 mn GT in 2009. However, the industry witnessed a steady decline thereafter to 1.1 mn GT in 2013. As a result, the share of India in global shipbuilding rose from a marginal 0.4% in 2006 to touch 1.1% in 2009, but has declined steadily thereafter to 0.6% in 2013. Reflecting the sharp rise in India's order book position during 2006 to 2009, India's ranking amongst the major shipbuilders rose from the 10th position (0.4% share) in 2006, to the 6th position in 2008, and further to the 5th position in 2009 (EXIM Bank WPS, 2014).

Table 3. Summary of Comparison of Leading East Asian and Indian Shipyards

Parameter	Leading East Asian Yards	Indian Shipyards
Product Variety Volume Mix	Few varieties with large volume and many varieties with small volume	Low volume, Moderate-to-High variety
Production Volume	Very Large	Small
Layout	Product Oriented	Process Oriented
Capacity of Facilities	Expanding to meet demand	Insufficient to meet demand
Ship Design	Early Start, Done in-house	Late Start, Outsourced

Parameter	Leading East Asian Yards	Indian Shipyards
Design & Planning Synergy	Extensive	Limited (Very less)
Scheduling	Exact Algorithm/ Heuristics	Manual – rule of thumb
Automation Level	High	Minimal
Pre-Outfitting	80%	10%
Skilled Workforce	Sufficient	Inadequate
Inventory Policy	Just in time	Project basis (Large Inventory)
Vendor Location	Very Near (1 hour drive)	Very Far – Across Continents
Vendor Integration	Very High	Low
Outsourcing	Complex blocks outsourced	Simple blocks outsourced

(Source: FICCI Seminar 2019 - Nation Building Through Ship Building)

Thereafter, however, India's ranking has steadily declined, and in 2013 India ranked at the 11th position. In India, the major policy support mechanism for the shipbuilding industry has been the Shipbuilding Subsidy Scheme 2002, which provided a 30% subsidy and extended to also cover private shipyards. However, the subsidy scheme was withdrawn in August 2007. The withdrawal of Subsidy scheme coupled with the Global recession in the Shipbuilding industry since 2008 dealt a body blow to the private shipbuilding industry which has been saddled with large unfulfilled order books and huge corporate debts. The comparison of a typical Indian Shipyard vis-à-vis other East Asian Shipyards have been summarised at Table 3 above.

Policy initiatives & Institutional Support Framework in Shipbuilding Nations

A summary of favourable policy initiatives and institutional support framework for the Shipbuilding industry in various countries have been summarised as under (Daniel& Yildiran 2019): -

Ser	Country	Policy Initiatives/ Government Support
(a)	China	<p>(i) Establishment of China State Shipbuilding Corporation (CSSC), for developing shipyards and ancillary industries.</p> <p>(ii) 5-year Economic Plans with specific mention of the maritime sector with promotion of Joint Ventures & MoUs with Korean and Japanese Yards.</p> <p>(iii) Export credits to borrowers of up to 80% of the value of commercial contracts.</p> <p>(iv) Export tax rebates for the construction of vessels for export.</p> <p>(v) Investment funding reforms allowing Shipbuilding companies to raise capital for plant and site development from public issues or corporate bond sales.</p> <p>(vi) Stabilization of material costs by targeting availability of more than 80% of raw material including steel through domestic manufacturers.</p> <p>(vii) Special Economic Zones for foreign investors with preferential tax, tariff, and investment treatment.</p>
(b)	Brazil	<p>(i) Special financing from Merchant Marine Fund (MMF) operated by Brazilian Development Bank (BNDES).</p>
(c)	Phillipines	<p>(i) Domestic Shipping Development Act 2004 with tax exemption on imports of shipyard equipment and</p>

Ser	Country	Policy Initiatives/ Government Support
		<p>other capital equipment and spares, required for construction, expansion, upgrading, modernization of shipyards and facilities.</p> <p>(ii) Industry accorded “Priority Status”, with investment incentives by the Board of Investment.</p>
(d)	Malaysia	<p>(i) “Malaysian Shipbuilding and Ship Repair – Industry Strategic Plan (SBSR) 2020.</p> <p>(ii) 70% income tax exemption of shipping company, as well as income tax exemption of persons working on board a Malaysian ship; and income tax exemption for 5 years for shipbuilding and ship repair.</p> <p>(iii) Global Maritime Ventures Berhad (GMVB), as a subsidiary of BPMB, to accelerate the development of the country’s maritime industry.</p>
(e)	Vietnam	<p>(i) Retention of corporate income tax and capital-use tax for re-investment; preferential corporate income tax; special incentives in industrial zones; protection to domestic shipbuilding industry; import tax exemption; and promoting joint ventures to facilitate technology transfer.</p> <p>(ii) Restructuring Scheme of 2010 has identified 3 major areas for the Vietnam Shipbuilding Industry.</p> <p>(iii) Group (VINASHIN) to become the core of the shipbuilding and repair industry in Vietnam.</p>

Warship Building – Global Scenario

The naval acquisition plans of major maritime nations by 2043 is likely to see an investment of over US\$ 835 billion into new warship and submarine construction (Table 4).

Table 4. World Naval Market Forecast

Vessel Type	In Progress		Planned		Projected		Total	
	No. of Hulls	US\$B	No. of Hulls	US\$B	No. of Hulls	US\$B	No. of Hulls	US\$B
Aircraft Carrier	9	49.8	2	4.0	2	3.0	13	56
Amphibious	129	29.5	204	33.9	33	3.4	366	66
Auxiliary	57	8.1	112	40.1	16	3.1	185	51
Corvette	51	7.1	43	13.1	23	5.8	117	26
Cruiser	2	2.6	6	3.6	-	-	8	6
Destroyer	55	55.3	90	113.8	3	2.9	148	172
FAC	147	5.5	45	3.5	34	2.8	226	11
Frigate	193	68.8	75	42.4	44	17.0	312	128
MCMV	28	4.5	71	6.4	28	2.6	127	13
OPV	121	12.5	139	16.7	31	3.1	291	32
Patrol Crafts	1121	9.7	482	7.5	157	1.6	1760	18
Submarine	154	142.3	142	100.7	27	11.5	323	254
Total	2067	395.7	1411	385.7	398	56.8	3876	838

[Source: AMI International, “2013 Naval Market Forecast”, www. amiinter.com]

US Naval Acquisitions (US Congress 2019). The US Navy, under the 2019 plan, would buy a total of 304 ships over the 30-year period from 2019 to 2049, which will include 247 combat ships and 57 logistics and support ships. This includes building one carrier every 5 years, two future ballistic missile submarines, and two advanced destroyers every

year, at an annual expenditure of US\$ 28.8 billion per year, in the period 2019 to 2049, which is US \$ 865 billion over 30 years.

Asia Pacific Region. As per the forecast by AMI International in 2013 (Kulkarni,2015), the Asia-Pacific naval market will overtake the US to become the world's largest naval market by volume, comprising 1066 vessels or approximately 28% of the market over the next 20 years. This includes over 650 major and minor surface combatants and 116 submarines worth over US\$ 167 billion in the next two decades. India and China lead the Asia-Pacific region in projected naval spending. These countries are expected to order 100 new naval ships and submarines, each, by 2032. The two countries combined would account for 30% by volume and 45% by value of these 1048 naval vessels worth US\$ 200 billion. China is forecasted to add 16 conventional and nuclear-powered hulls to its fleet over the next 5 years, the greatest number of new hulls by any Asia-Pacific country for this period.

Europe. In this time of tight defence budgets, the increase in cost of defence technology has led to a decrease in the number of ships planned to be deployed by European navies (Karoline, 1996). Many NATO North Atlantic Treaty Organization countries (excluding the US) continue to restructure their navies and realign new ship programmes to optimize fleet structures in a resource-constrained environment. Future procurements remain relatively flat with 524 ships and submarines forecasted to be built up to 2032, totalling US\$ 179 billion. Turkey is the only country in NATO Europe, which is expected to

procure almost 100 new hulls worth an estimated US\$13 billion, in this period (AMI International, 2013).

Table 5. Global Fleet Strength

Country	Aircraft Carriers	Destroyer	Frigate	Corvette	Submarine	Others*	Total Fleet
US	19	63	08	0	70	255	415
Russia	01	15	06	81	63	186	352
China	01	35	51	35	68	524	714
India	02	11	14	23	15	230	295
Japan	04	42	0	06	17	62	131
South Korea	01	12	13	16	15	109	166
UK	02	06	13	0	11	44	76
France	04	04	11	0	10	89	118
Germany	0	0	10	05	06	60	81

* Others include Fleet Support ships, LPDs, LCUs, OSVs etc.

[Source: HDFC Retail Research on GRSE, Sep 2018]

Shipbuilding, as an assembly industry, relies heavily on intermediate inputs, similar to the automotive industry. In major shipbuilding economies, direct value added accounts for between 20% and 30% of shipbuilding output value. In turn 70- 80%, the lion's share of the value of output, comes from intermediate inputs. With increasingly globalised production networks, not all of this value generation takes place domestically. While China, Japan and the European Union (EU) each had a domestic value added share of over 80% in 2015, the same measure, as expected for smaller economies, was lower in Korea with 65%. The top five supplier industries to shipbuilding are iron and steel, shipbuilding (i.e. intra-industry transactions), wholesale trade, machinery and equipment,

as well as fabricated metal products. The differences in cost shares across economies may partly be a result of variations in the product mix of shipyards. An analysis of differences in sourcing patterns reveals that China is rather self sufficient and inward-focused, followed by Japan and the EU. Korea, in contrast, seems to be more globally integrated and participates more strongly as a user of foreign intermediate inputs (Gourdon, & Steidl 2019).

Seaborne trade is essential to global prosperity on the one part and depends on world economy on the other part. Security of the shipping sector depends on how strong is world shipbuilding industry. Shipbuilding in majority of main players' countries with exception of Japan is export-oriented industry therefore most of governments try to support this industry. A flag of the shipbuilding leadership goes from hand to hand. Asian countries have been gaining the leadership through the similar scenario: assigning national shipbuilding industry as strategic, developing and implementation industry support policy. The global economic crisis has deeply affected the shipbuilding industry worldwide. The deep demand gap in combination with global shipbuilding overcapacity threw down new challenges to all shipbuilding countries. Further competition takes a cruel character. Analysis shows that world shipbuilding order book is shrinking fast because of decreasing of new orders and cancellations. New players have taken portion of new orders from Europe and Japan. The global competitive position of the European industry is under severe pressure due to the difficult market environment and in particular due to extensive support measures in competing countries. The facts speak that the large shipyards oriented to mass production may keep their market shares more successfully

therefore merger of shipyards is a trend in China and Japan. Due to small and medium enterprises (SMEs) domination among European shipyards, competition with Asian shipyards is not equivalent on the one part but SMEs are more flexible in adoption of innovations on the other part. This could be advantageous to the European yards (Mickeviciene,2011).

Chapter 3

Warship Construction - A Process Study

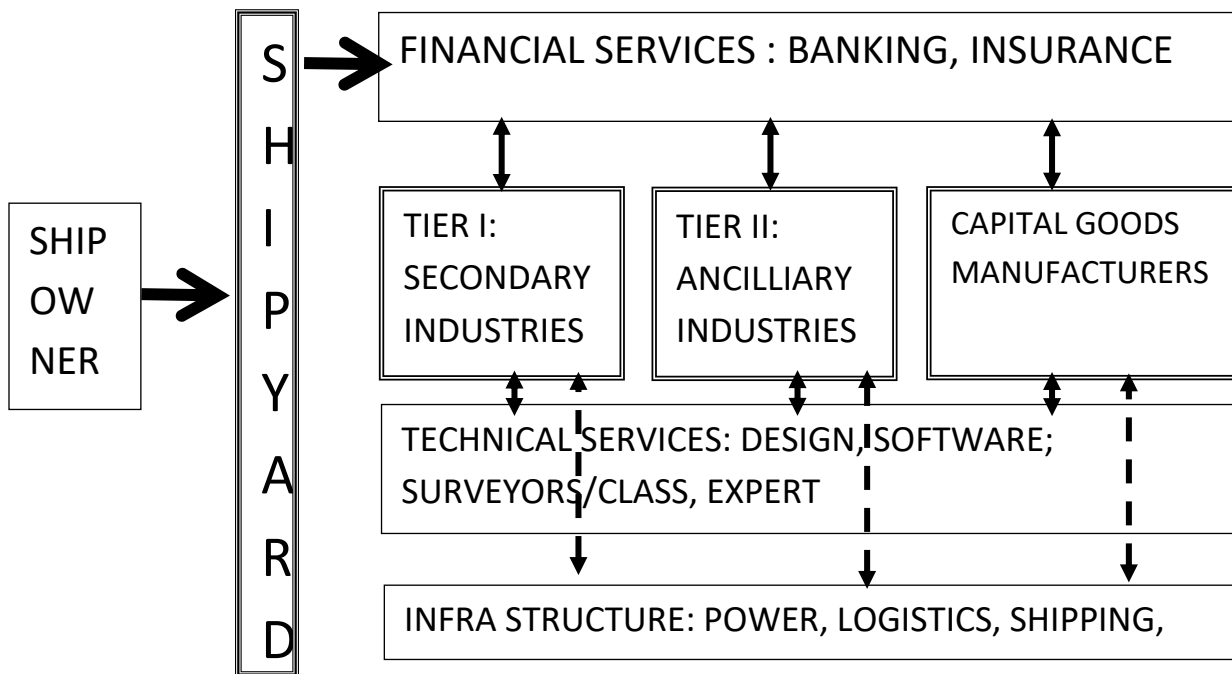
Introduction

Warship building historically is reflective of a nation's industrial capability. The growth of a truly effective Navy is anchored in its indigenous capabilities to design and manufacture of warships. A Ship is a platform that can float and move with provisions to carry cargo or war payload depending upon the role assigned. Ships are an integration of various equipment and systems pertaining to propulsion, cargo handling, weapons etc. Shipbuilding starts with the fabrication of ship's hull in dry-dock or on slipways and outfitting of the hull with equipment and systems are undertaken in the wet basin.

A modern well designed and built ship has all the facilities that a city has. Diverse types of raw materials are required for the shipbuilding industry. Constructing a commercial ship requires around 300-400 types of raw materials and equipment, this varies depending upon the type of the platform. In terms of value, the material cost would be around 60% - 70% of the total cost of the vessel. In the case of a warship this can be significantly higher for complex platforms going up to about 70 to 75% of the total cost (Bose 2019). A ship builder has to source these raw materials and equipment from various ancillary industries. Therefore, a shipyard can be regarded as a mother industry which is responsible for money flow between the shipyard and ancillary industries in exchange of the products and services provided by them. Tier I industries are the industries that receive direct orders from the shipyards. They comprise of Steel, Major

machineries, Electrical Equipment, Air Conditioning Equipment, Paints & Chemicals etc. These industries in turn place further orders, for their production requirements onto ancillary industries such as Iron & Steel, Basic Metals, Foundries, Chemicals, Fuel & Oils, Electrical, Mining etc. The financial flow is thus thereon into other Tier II industries. The financial flow or distribution of cost is depicted graphically in Figure 3.

Figure 3: Impact on Ship Building on Economy



[Source: Prosperous nation building through shipbuilding 2013]

Warship Building - Strategic & Geo-Political Imperative

Warship building flows from the strategic imperatives and economic wherewithal of a nation. Sea power is not a synonym for naval might, nor can it be strictly associated with

military matters. The enlarged understanding of sea power is the capability of a state to accelerate its technical and industrial progress backed by research and development in the field of seabed resources, fishing and merchant seafaring with a navy to safeguard these interests. To realise the extent of maritime wealth across India's coastline, there is a need to further nurture and sustain all aspects of maritime capability in a cohesive and coordinated manner. A strong shipbuilding (both warship and commercial ships) and shipping infrastructure is imperative for enhancing the maritime capability of any country. In the changing global environment, where economic activity is paramount, the maritime sector has gained substantial importance. Trade, the most essential aspect of a nation's economy, is largely sea-based. India's trade figures resemble those of other littorals—70 per cent in value and 90 per cent in volume of the country's trade is by sea (Bose 2019). The need to secure the merchant fleet and to safeguard the sea lines of communication (SLOC) under-scores the requirement to strengthen of both the capability and capacity of the Navy. Another imperative to enhance the capability of the Indian Navy is that the Indian Ocean region is India's strategic backyard where many traditional and non-traditional security challenges are being played out.

As a logical consequence of the above rationale the Maritime Capability Perspective Plan (MCP) has envisaged certain force levels of marine combatants that necessitated a sustained warship building plan. Further taking cognisance of the geo-political environment, export of warships to friendly and strategically important nations are also being furthered. These dual factors are leading to sustained warship building orders. This

needs furtherance so that it can be used as a growth engine for the entire national economy.

Warship Construction

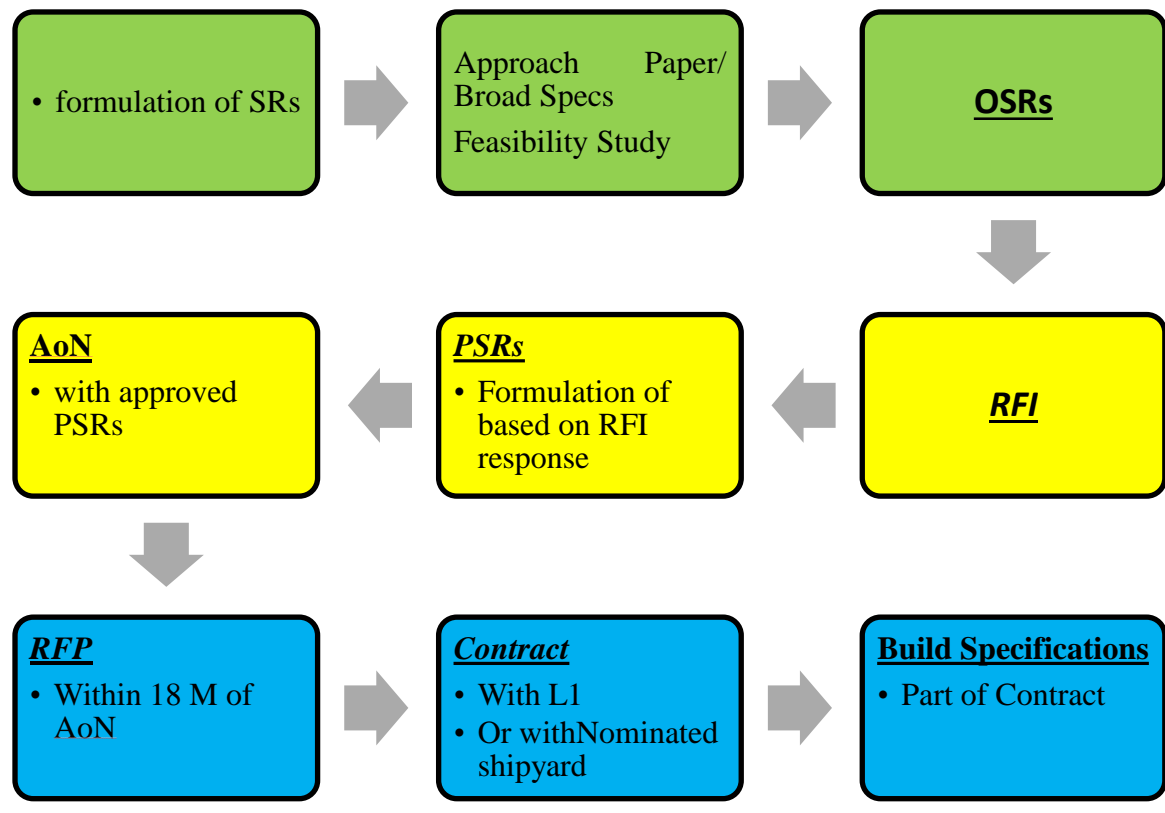
Warship building is a complex multidisciplinary and highly technology centric activity. It involves identification, selection, procurement and integration of numerous systems of varied technology. In addition to propulsion, power generation, auxiliary system, facilities for crew, fuel and provisions, a warship requires a huge array of weapons, sensors and surveillance equipment. Hence, in spite of foundational similarities with commercial shipbuilding, warship building necessitate significant additional competencies in terms of integration of a large number of equipment, incorporation of high end technology, criticality of design, etc. However, innate competencies in each sector often lead to spill over, which may result in a mutually beneficial symbiotic relationship. Further, warships range in complexities from state of art weapon intensive destroyers and frigates, to fleet tankers and relatively simple patrol craft. A significant modern trend in shipbuilding is 'modular construction' wherein a sizable portion of the ship, according to the crane capacity of the shipyard, are manufactured independently along with their equipment, electrical wiring, pipelines, etc and then fitted to neighbouring blocks precisely. This helps in parallel construction of the ship in blocks and thereby promotes outsourcing of these blocks to other Shipyards by the primary Shipyard, who would integrate these blocks into a single platform. The concept has been effectively used in both commercial and military ship building. India is taking

incremental steps towards this, with gradual up gradation of infrastructure, most notably in crane capacity.

Warship Construction – Process Flow

The process of warship building by the Indian Navy can be studied in two parts first being the pre-contractual processes at the Naval HQ and then the actual ship building undertaken by the shipyard. A flow chart indicating all the stages and process involved in the shipbuilding process till contract signing is as enumerated in the flow chart below:-

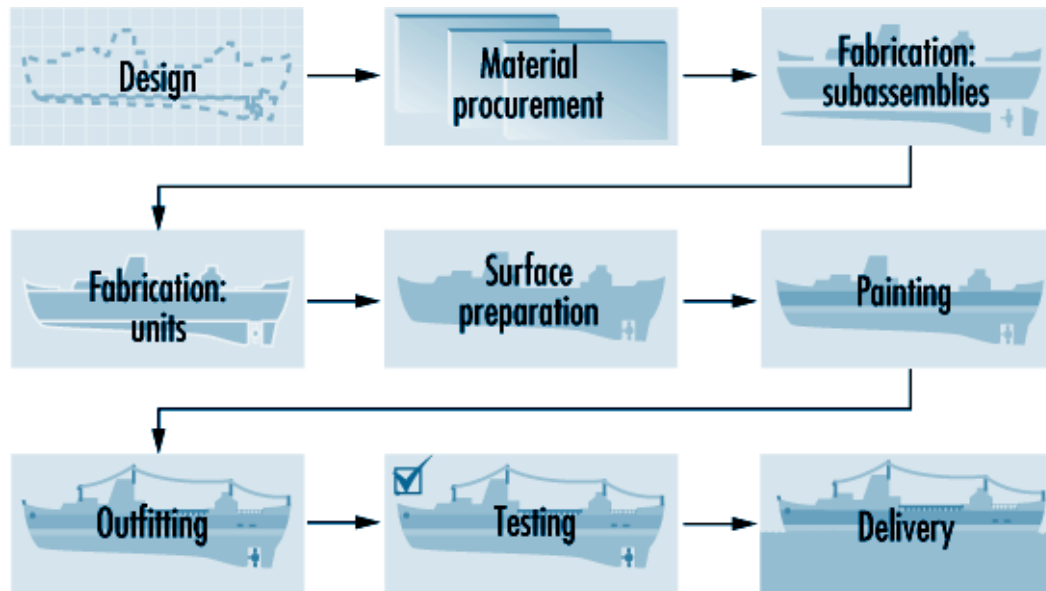
Figure 4: Flow chart depicting process flow of pre-contractual processes



[Source: Author's description]

A staff requirement (SR) of the indented platform is drawn out by Indian Navy (*IN*). Thereafter, based on the SR a broad specification of the platform is put together. This specification and the SR then undergoes a feasibility study by design group within *IN*. Based on the results of the feasibility study an outline staff requirement (OSR) is arrived at. A Request for Information (RFI) is published on the web for construction of ships based on the OSR. Shipyards interested in the tendering process respond to this RFI. Based on the RFI responses for various shipyards, DRDO and other stake holders the OSR are modified into a preliminary Staff requirement (PSR).

Once the PSR is formulated, *IN* takes up the proposal for the platform with the ministry, MoD, for accord of Acceptance of necessity (AoN) of the proposal. The Request for Proposal (RFP) is floated within 18 months of accord of AoN to shipyards that clears the capacity assessment undertaken by the appointed board of specialists. After submission of the proposals by the shipyard, the L1 shipyard is identified on competitive basis subsequent to clearance of the Technical evaluation of the proposal and benchmarking of the expected cost. Thereafter the contract is signed after negotiations on contract and Build Specification are acceptable to both the parties. The aforesaid process of formulation of SR to contract signing could take 2 to 5 yrs depending upon the complexity of the platform. There are large amount of time floats available in the abovementioned process, which could be crashed to reduce the timeline for contract signing.

Figure 6: Flow Chart of Shipbuilding Process

[Source: Author's description]

At the shipyard end, the process of warship building starts with the design of the platform. At the RFP stage the shipyard arrives at the profile design of the ship that is offered in their proposal. After the conclusion of the contract the design is matured with inputs from ancillary industries with regard to details of equipment and sub systems envisaged for fitment on board the warship. Therefore the material procurement also commences side by side and the shipyard firms up and completes the detailed design of the platform. Subsequent to generation of production drawing from the detailed design the shipyard starts the fabrication of subassemblies followed by fabrication of unit of the hull, which is later integrated as a single structure. This structure undergoes surface preparation and painting prior to launch of the warship. Outfitting of the entire ship is

completed post launch and the platform undergoes extensive trials to assess the capabilities as per the build specification prior to delivery of the platform.

Intricacies of Warship Building

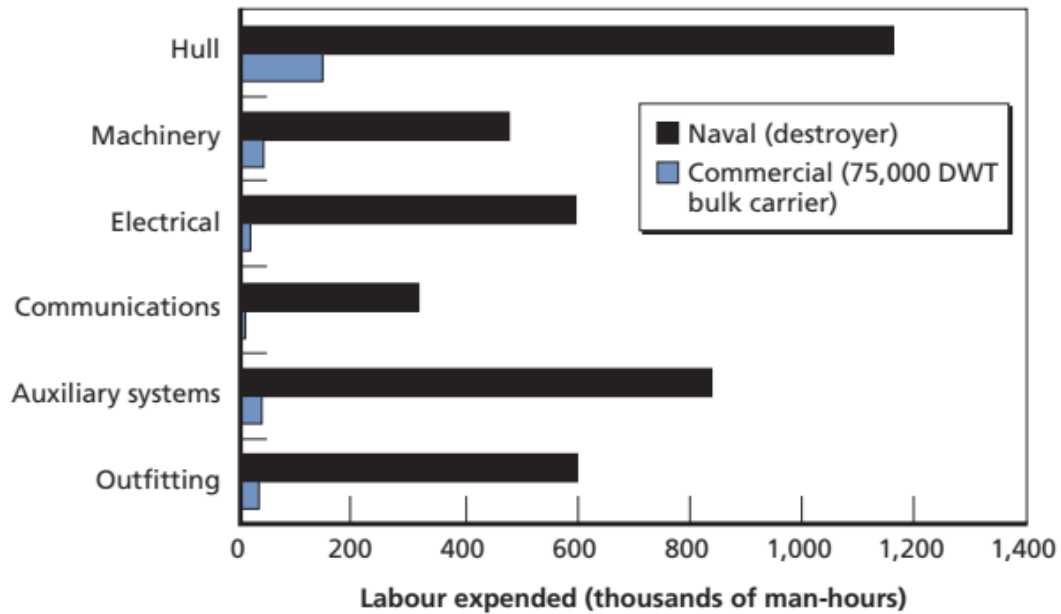
Warships are sea going platforms with large number of sensors, weapons and other support systems viz, surveillance equipment, facilities to launch boats and helicopters etc., required to face any eventuality at sea. The design and construction of warships are more complex and time consuming than commercial platforms. The salient differences between commercial and Warship building are as under: -

- (a) **Ship Size and Complexity** - Being a complex multidisciplinary engineering activity involving integration of multitude of equipment and systems, Naval shipbuilding requires significantly higher shipyard effort and dependence on a large number of agencies/OEMs.
- (b) **Contracting Procedure** – Warships includes weapons and sensors, complex structural requirements to meet stealth features and specific speed with better manoeuvrability. Therefore the contracting process is more complex.
- (c) **Design** - Complex ab-initio project specific designs with integration of complex systems both mechanical and electronic.

(d) **Production** – Warship production is not an assembly line manufacturing. It is a limited numbers for production. Generally, a class of ship is not more than four ships, in India.

(e) **Workforce** - Warship construction requires larger workforce with special skills as compared to commercial shipbuilding. A comparison of labour demand in different sections between warship building and commercial shipbuilding is shown in Figure 6 below.

Figure 6: Warship construction requires much larger workforce.



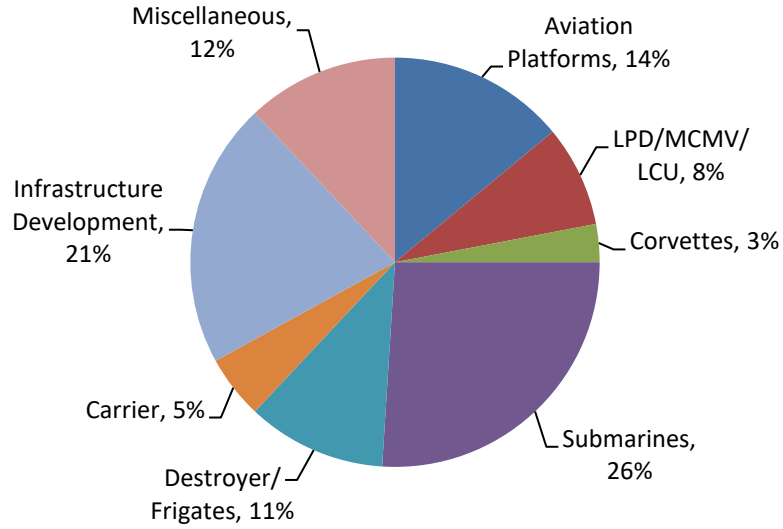
[Source: Differences between Military and Commercial shipbuilding, RAND 2018]

- (f) Low Volume & High Risk Product.
- (g) **Quality Control** - Stringent Quality Control and compliance to Naval requirements of Shock, Vibration, Blast Loads, Electromagnetic Interference (EMI) and Electromagnetic Compatibility (EMC) etc. in comparison to commercial ships
- (h) **Sea Trials** – Multi-phased sea trials with coordinated test and trials of weapon system integration.

Indigenous Naval Shipbuilding in India

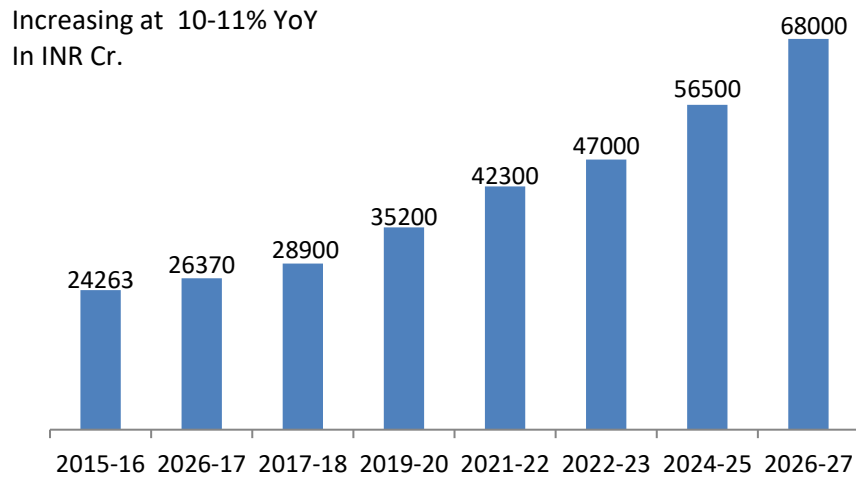
India is a major maritime nation with vital economic and security interests linked to the seas. Although the Indian Navy's primary role revolves around deterrence to security threats, yet by virtue of India's emerging economic strength and its geography, the Indian Navy has a significant peacetime role as well. The Indian Navy in its Maritime Capability Perspective Plan (MCP), aspires for a 200 ship-strong navy by 2027 (Economic Times 2018). The maritime projection for the period is as shown in Figure 7. This gives an average yearly order placement value of over INR 3,200 Cr, with a 10-11% increase in business potential year on year, in the field of warship building as shown in Figure 8 below.

Figure 7: Maritime Projections 2014 – 27



[Source: Article 1 of Compilation of Papers for FICCI Seminar, 2016]

Figure 8: Business Potential in Warship Building in India



[Source: "Eye on Defence", Mar 2015 by EY]

The Defence PSU Shipyards viz. M/s Mazgaon Dock Limited (MDL) at Mumbai, M/s Garden Reach Shipbuilders & Engineers (GRSE), Kolkata, M/s Hindustan Shipyard Limited (HSL), Visakhapatnam and M/s Goa Shipyard Limited (GSL), Goa contribute majorly towards indigenous Naval Shipbuilding requirements of the country. M/s Cochin Shipyard Ltd (CSL), Kochi is the only non - Defence PSU shipyard undertaking the construction of the Indigenous Aircraft Carrier (IAC) – Vikrant and the Anti Submarine Warfare Shallow Water Craft. During interactions with stakeholder, it emerged that, besides these, private shipyards such as M/s Larsen & Toubro Shipbuilding, Katupalli, M/s Reliance Defence & Engineering Ltd (RDEL), Pipavav and M/s ABG Shipyard, Dahej etc have also bagged orders for construction of auxiliary vessels for *IN*. In addition, several small private shipyards across the country have delivered yard-craft and barges to the *IN*.

Demand – Supply Gap in Warship Construction

Due to various constraints, the Defence PSU shipyards which have won the bulk of the contracts have the capability of delivering an average of four ships per year, as against *IN*'s requirement of induction of a minimum of eight ships per year to attain its envisaged force levels (Behera & Misra 2012). Moreover, as far as the construction of frontline warships (such as Frigates, Destroyers, and Submarines) is concerned the capability is mostly limited to M/s MDL, Mumbai and M/s GRSE, Kolkata.

Ancillary Industry in Indian Shipbuilding

The ancillary industry supporting commercial shipbuilding in India is at a very nascent stage. Even though, there is a fair amount of indigenisation in the Indian Warship building, the efforts in the commercial shipbuilding is poor. There is very low percentage of the raw materials used for commercial shipbuilding which is indigenously sourced. However, in leading shipbuilding nations such as Korea and China, this is around 40-80% (Brun & Fredrick, 2017). Each of these nations is trying to maximize the percentage use of indigenous items, because it is the only means by which the cost of the input material could be reduced and sustained in the shipbuilding market.

In India, the ancillary industry supporting commercial shipbuilding has been neglected as the volume required by the ship building industry is low and indigenisation is not cost effective. However, the ancillary industry that provides raw material for defence shipbuilding is relatively better developed. There are several Indian vendors manufacturing defence shipbuilding equipment. This is because the Indian Navy is focusing on indigenization and supporting the ancillary industry. Therefore, commercial shipbuilding sector could tap the available services of these ancillary industries. Only if the ancillary industries are supported, will they be able to deliver quality goods at a cheaper price, which will eventually reduce the cost of building ships.

Economic Inequality: Indian Shipbuilding

In the present Indian scenario, there is economic inequality in the shipbuilding sector on multiple fronts like taxes on procurement of raw material, payment of income tax, taxes on sale of ships, etc. The disadvantages that the Indian shipbuilders presently experience in terms of government taxation in comparison with some of the rising ship building nations are discussed in the succeeding paragraphs.

Corporate Tax (CT) In India, corporate tax on the overall profit generated by a firm is 22% for a company with turnover more than INR 250 crores. In China, equivalent of this tax, which is known as '*Enterprise Income tax*', was removed and made 0% when the Chinese shipyards were fiercely competing to establish themselves in the international market in the first decade of this century. After the Chinese shipyards captured the international market, this tax was gradually increased. In addition, many segment of shipbuilding have been notified as 'encouraged sectors', which has enabled companies to set off a minimum of 50% of total investment against the 'Enterprise Income Tax' within 05 years of commencement of production. Additionally, provincial governments like the Zhejiang province have allowed the shipbuilders to deduct the amount invested in domestically produced equipment from the company's income tax that accrues to the province(ITF,2019).

Goods & Services Tax (GST) All sales of ships attract GST of 5%³ for domestic customer whereas it is not in vogue in case of an export order. This means that if an Indian shipyard sells a ship to an Indian shipping company for INR 100 Cr, the shipyard will have to pay a GST of 5% which is transferred to the customer's account (which works out to be around INR 5 Cr). However, if the same ship is sold to a foreign company, then the shipyard does not have to pay this, which makes selling of ships to a foreign shipping company lucrative for the Indian shipyards. Therefore, in a competitive market, shipyard would pass on some percentage of this extra amount paid as GST to the customer (ship-owner) eventually. However, this discount is not passed over to the Indian customer. This also could be one of the reasons why an Indian buyer prefers to place an order with a foreign shipyard, even if Indian shipyards have idle capacity.

Tax on Capital Goods for Setting Up Infrastructure Capital goods imported for the purpose of setting up or upgrading the shipyards incur custom duty of 26 % which increases the initial investment costs.

Cost advantages in South Korea and Chinese Shipyards due to Better Taxation.

Indian shipyards face the following handicaps when compared with their counterparts in China and Korea:-

- (a) Differential impact due to statutory taxes and levies as discussed above.

³ GST rate on harmonized System Code 8906 - Other vessels, including warships and lifeboats other than rowing boats

(b) Differentials on account of financial charges, such as bank guarantee (BG) charges, insurance charges and interest on working capital (WC) and capital expenditure. The Working Capital (WC) loan for a shipyard is currently around 5-7 % more than the competing countries. Shipbuilding cycles are long and the time duration between each stage payment is high. The reduction in interest rates on WC could bridge the gap between the supplier credit period and inflow of stage payment.

(c) Differentials on account of import such as sea freight, clearing, forwarding and other external factors, such as discount on bulk purchase, forex rate etc

Shipbuilding Subsidy

In the past, in order to overcome the cost and price disadvantages that an Indian shipbuilder faces in the international competitive market, the government of India had introduced a subsidy scheme for shipbuilding in 1993 for a duration of 5 years and extended twice with certain modifications. During the last phase (2002-07) of this scheme, the private shipyards were also included. Under this scheme, the Indian government would refund 30% of the contract price to the shipyard; this facilitates the shipyard to bid at a lower price in the international market to secure a shipbuilding order. This scheme existed till 14 Aug 07 and thereafter the subsidies have not been extended. Details of subsidy given by GoI in the past is placed at Table 6.

Table 6: Details of Subsidy Schemes Implemented by the Government of India

Year	Scheme	Applicability
1993	30%subsidy on the price of an ocean-going vessel. This policy was for a duration of 5 year.	Public sector shipyards
1997	The subsidy policy was extended for 5 years, substituting loans at concessional rate by arranging loans through External Commercial Borrowing (ECB).	Public sector shipyards
2002	30% subsidy applicable to export ship orders and domestic ocean- going vessels of 80metres and above. This policy was applicable for a period of 5 years and expired on August 14, 2007.	Public sector and private sector shipyards

(Source: FICCI Seminar 2019 - Nation Building Through Ship Building)

It is pertinent to mention that subsidy has been provided by all the countries that have focused on the shipbuilding industry. Even in India, the shipbuilders association, and the Inland waterways Authority of India (IWAI) are of the opinion that the subsidy scheme, which was discontinued in 2007, should be reinstated. The MoS in its document ‘Maritime Agenda 2010-2020’ has also recommended that the subsidy scheme should be provided for the shipbuilding sector.

Economic Benefit to Human Resources

The ship building industry, in addition to facilitating the flow of funds also provides employment to people in the various sectors such as shipyard, the tier I and tier II industries, the capital goods manufacturing sectors and the service sectors. As shipbuilding is highly labour intensive it provides greater opportunity for employment. A shipyard supports a large pool of talented/ skilled human resources and approximately 20% of the total cost of building a ship goes toward paying the human resources employed in the shipyard (Exim Bank OP, 2010).

The shipbuilding industry has the potential to employ diverse categories of human resources across a broad educational spectrum viz, school pass outs, diploma holders, graduates, post graduates to doctorates. It can employ men as well as women and provide both blue and white collared jobs. The shipyard also employs people from different field of specialization such as skilled technicians, technical engineers, management specialists, information technologists (IT), financial and commercial personnel. A shipyard also provides employment and business opportunities for subcontractors and vendors. The Indian shipbuilding industry has the potential to additionally generate employment for 2.5 million persons (0.5 million in direct employment and 2 million indirectly) in coming years, in the core sector of shipbuilding and the ancillary industry.

In a country like India, where adequate human resource is available (India being the second largest populated country in the world), it is important that this resource is

gainfully utilised. The shipbuilding industry provides an excellent platform for employing the valuable human resource as well as uplifting the standard of living of this human resource. In addition to employing people, shipbuilding facilitates circulation of money through the people associated with this industry. This facilitates growth and development of the human resource as well as the economy of the country.

Chapter 4

Indigenous Warship Building

“Give a man fish and feed him for a day; teach him fishing and feed him for a lifetime.” –

Lao Tzu

The Indian Navy is fully invested in encouraging an indigenous ship-building ecosystem 50 years before ‘Make in India’ became a national Mission, the Navy took formative steps towards indigenous ship-building, through creation of an in-house ‘Central Design Office’ in 1964. The Navy has, to date, designed more than 90 warships across 19 different classes. With more than 130 platforms constructed in Indian shipyards since the first ship INS Ajay was constructed by GRSE in 1961 (Outlook, 2019), Naval ship-building could be counted as one of the success stories of India. This is testimony to the synergy between the Navy and industry, as also our commitment towards self-reliance. this journey from a ‘Buyers Navy’ to a ‘Builders Navy’ has been an arduous one. Today, whilst the Navy boasts of respectable percentages in ship-construction and equipment within ‘Float’ ‘Move’ and ‘Fight’ categories, but there remain enormous challenges ahead.

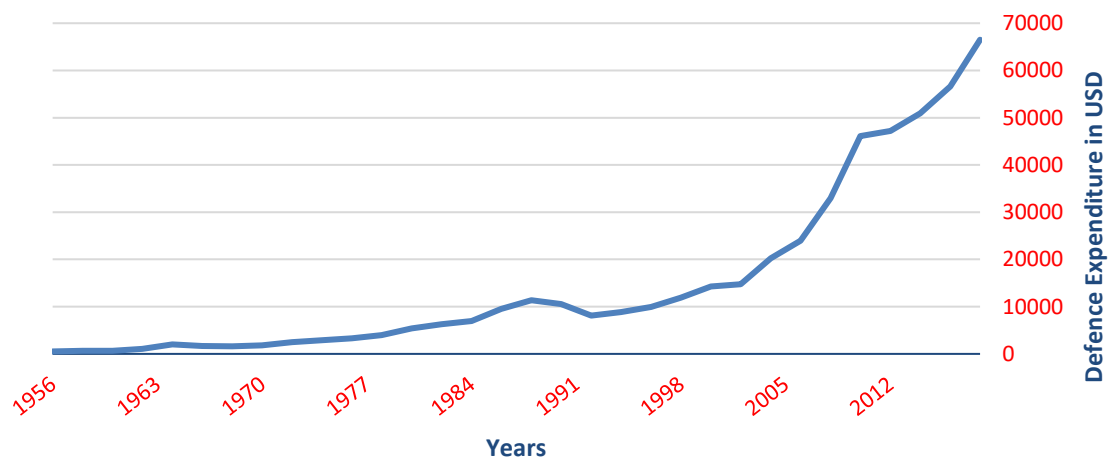
The Navy has, in its Maritime Capability Perspective Plan (MCP), projected a 200 ship-strong navy by 2027, including 90 front-line combat platforms (Economic Times, 2018). Considering the present geopolitical and economic situation, the Navy is poised to grow further along with development of robust and indigenous manufacturing capabilities

towards self-reliance. With almost 2 percent of its GDP spent on Defence and import of about 70 percent (Oak, 2019) of the equipment, the Country's requirements are only likely to increase in the future making indigenous development of modern hardware and technology an imperative priority.

Geopolitical Situation

The vast land mass of the Indian subcontinent extending south from the Himalayas geographically dominates the Indian Ocean. India is the predominant power in the subcontinent and in turn is the most powerful littoral state in the Indian Ocean region (IOR). Though most of Indian borders are oceanic, Indian strategic thinking historically had focused on the land borders of the country. Military threats were long been perceived as coming over land.

Figure 9 : Increase in Defence Expenditure



[Source: Stockholm International Peace Research Institute (SIPRI)]

Indian maritime strategists, led by the Indian Navy, are now seeking to expand the Indian ‘mental map’ to give the maritime realm greater priority. As can be seen from table 9, over the last couple of decades there has been a dramatic increase in India’s defence expenditure, which has transformed the Indian Navy into a blue water navy that can project power throughout much of the Indian Ocean.

China’s strategic interest in the Indian Ocean is the protection of its sea lines of communication (its so-called ‘SLOCs’) across the Indian Ocean, particularly the transport of energy. Beijing is keenly aware that its SLOCs in the Indian Ocean are highly vulnerable to threats from state and non-state actors, especially through the narrow ‘chokepoints’ through which most trade must pass. Some 40% of China’s oil imports transit the Strait of Hormuz at the entrance of the Persian Gulf and around 82% of China’s oil imports transit the Malacca Strait through Southeast Asia (US Department of Defense, 2012).

China began implementing plans to develop a ‘blue water’ navy in the 1980s. China’s maritime strategy is focused on the Taiwan Strait and elsewhere in East Asia, but it also has long-term implications for the Indian Ocean. Over the last two decades or so, China has embarked on a major naval expansion program, including the commissioning of its first aircraft carrier and is also developing anti-access area denial capabilities that have the potential to change the balance of power in the Western Pacific (US Department of Defense, 2012). Overall, China’s naval capabilities now exceed India’s by a considerable margin in both quantitative and qualitative terms, and that margin is likely to grow in

coming years. There are approximately 496 ships in active service which include two aircraft carriers, amphibious transport docks, landing ship tanks, landing ship medium, destroyers, frigates, corvettes, missile boats, submarine chasers gun boats, mine countermeasures vessels, replenishment oilers and various auxiliaries. In addition, there are also nuclear and conventional submarines presently in service (US Department of Defense, 2018).

Over the last decade or so, China has been pursuing what has been called the ‘String of Pearls’ strategy in the Indian Ocean which could become a threat to India (Khurana, 2008). During that period, Chinese companies have been involved in the funding and construction of commercial port facilities in Pakistan, Sri Lanka, Bangladesh and Myanmar. Although China has been careful to avoid any overt military presence or, in most cases, even any commercial role in the operation of these ports, some proponents of the ‘String of Pearls’ theory claim that China has negotiated secret access rights to allow the PLAN to use these ports as logistics hubs or naval bases across the northern Indian Ocean (David, 2014).

Self Reliance & Indigenisation

In the current scenario of Shipbuilding in the country, equipment and systems onboard an *IN* warship/submarine can be broadly classified into the following three categories:-

(a) **Float.** This category encompasses all material, equipment and systems associated with the hull structures and fittings.

(b) **Move.** Equipment under this category encompasses propulsion system and power generation diesel/ gas/ steam turbine engines, alternators, associated control systems, auxiliary mechanical systems like Pumping and Flooding, Heating Ventilation and Air-conditioning, Fire fighting and other ship systems including general electrical equipment.

(c) **Fight.** Equipment under this category encompasses all types of ship borne weapons and sensor systems that directly affect the combat capability of the ship.

The equipment and machinery fitted on board ships in the three categories of Float, Move and Fight has been indigenised to the extent of approximately 90%, 60% and 30% respectively (MoD, DOI, 2015). The analysis of these categories by navy indicates that while sufficient self-reliance has been achieved in the first category and reasonable in second category, there is a large shortfall in the third category of fight.

The Self-Reliance Index (SRI) which may be defined as the ratio of indigenous content of defence procurements to the total expenditure on defence procurements in a financial year, in the 1980's, was at an abysmal 0.3. In 1992, Abdul Kalam, then Scientific Advisor to the Raksha Mantri, constituted a Self- Reliance Review Committee to formulate a 10-year long-term plan to transit from a dismal SRI of 0.3 to 0.7 by 2005 (Singh,2013). This would have implied that the import content of defence procurements,

which includes import of weapon systems/ platforms by the armed forces as well as services sought from foreign vendors/ Original Equipment Manufacturers (OEMs) by Defence Public Sector Units (DPSUs) and Ordnance Factories (OFs), be brought down to 30 percent or less. Sadly this was the first and perhaps the last time such an exercise was undertaken and there is good reason to believe that the SRI has ever since remained stagnant at 0.3, if not dipped further.

The Services on their part have established dedicated Directorates for Indigenisation in their respective Services. The Army and Navy, for instance, have even formulated a well-articulated 15-year Perspective Plan for Indigenisation with a mission to carry out purposeful indigenisation of spare parts, sub- systems, special maintenance tools, test equipment and entire equipment (non-war like) with a view to effecting significant savings in life cycle costs of imported weapon systems. This roadmap gives a clear perspective of technologies and defence products that are likely to be inducted. The *Indian Naval Indigenisation Plan 2015-30* has also been promulgated in July 2015, which attempts to formulate the requirements of the *IN* towards indigenous development of equipment and systems, over the next 15 years (MoD DoI, 2015). The document identifies capability gaps for indigenisation and lists out the equipment which can be taken up for indigenisation in the coming years. Since the launch of 'Make in India' in 2014, 80% AoNs on cost basis have been awarded to Indian vendors. Of the total 51 ships and submarines on order at various shipyards as on date, 49 are being constructed indigenously.

Hindrances towards Private Sector's Participation

By 2014, when Make in India was announced, MoD's Defence Procurement Procedures (DPP) had already undergone eight rounds of major revisions. However, it is the revisions carried out from 2006 onwards that created some private sector-specific opportunities, by way of articulating two crucial procurement categories: *Make and Buy and Make (Indian)*. Under these categories, the private sector was expected to execute major contracts like the public sector units. The late consideration apart, the opportunities opened through the Make and Buy and Make (Indian) categories also did not materialise due to the procedural difficulties, although several projects were given in-principle clearance by MoD. In addition to the practical difficulties in getting into big-ticket items, the private sector has also suffered from a lot other difficulties in its one-and-a-half decade journey since 2001. Some of the areas which hurt the industry the most are the process of grant of industrial license (IL); payment terms, and tax and duty structure followed by the government.

The government has taken a host of initiatives to incentivise the private sector's participation in defence production. These include a hike in FDI cap, streamlining of IL process, opening up of government-controlled testing facilities, articulation of export promotional measures, extension of Exchange Rate Variation (ERV) benefits to the private sector, and level playing field between the public and private sectors in so far as duty and tax are concerned. But there are many other concerns still pending for the government's attention. Some of these are as follows:-

(a) **Lack of Conducive Financial Framework.** Many countries provide a host of fiscal and other incentives to nurture and develop the defence production sector, which is undoubtedly a strategic sector. The prevailing duty/tax structure potentially bars private sector investment in defence production.

(b) **Lack of Representation at Defence Ministry.** The private sector considers MoD to be biased in favour of the public sector units as senior MoD officials are on the governing boards of the DPSUs. Presently there is no department in MoD to address the concerns of the private sector. In addition the government's continuance of the nomination approach, breaching its own commitment to open up the defence production is not sending the right signals.

(c) **Incentives Demanded by the Private Sector.** Some of the incentives demanded by the private sector defence industry broadly relate to cheaper cost of finance, infrastructure status, and deemed export status for certain types of sales. In order to provide a level playing field to the domestic manufacturers, the government under the Foreign Trade Policy (FTP) accords deemed export status to select specified cases which are notified from time to time. This is primarily for 'encouraging import substitution and mainly covers such supply of goods which are otherwise allowed at zero customs duty'. In case of Buy (Global) procurement, If an Indian company wins a contract in such a procurement category competing with foreign companies, it amounts to import substitution.

(d) **Poor R&D.** R&D is probably the biggest weakness in the Indian industries in general and private sector in particular. Any indigenous defence production can sustain only with strong R&D. The cost of R& D would ultimately get passed on to the customers and in a global competitive environment would make Indian products costlier. For example, the shipyards are sourcing simple navigational radar for fitment on ships from abroad, this portrays the poor R&D environment existing in the country today.

(e) **Skill Deficiency.** Unlike the public sector units, which are the established players and have a relatively better skilled workforce, the private sector does not yet have the kind of workforce required for a high-end manufacturing sector like defence. Most of the private sector works on outsourcing model to third parties to maximize profit. The shipyards need to conduct special skill tests for the workforce prior deployment. The national Mission of 'Skill India' under the aegis of Ministry of Skill Development & Entrepreneurship (MSDE) to impart relevant industry level skill training could aid to fill the existing gap in skill deficiency.

(f) **Delay in Acquisition Process.** Although the government has opened a host of big-ticket projects for the private sector's participation, these projects are at the very early stage of the acquisition process. As per the DPP, it takes somewhere between two and three years for a project to be awarded after the in-principle approval is given by the Defence Acquisition Council (DAC), the highest decision-making body of MoD headed by the defence minister. Thereafter the process towards contract conclusion would also require similar time frame if not more. A recently concluded contract for ASW shallow

water craft with M/s CSL and M/s GRSE took about seven year for conclusion of the contract.

(g) **Inspection Delays.** One of the major hindrances for the private sector participation in the Defence contracts is the delay attributable to the quality inspection process. This consists of lengthy documentation work including drawing and Quality Assurance Plan (QAP) approvals from several authorities prior to commencement of production. This invariably leads to delay in scheduled delivery of the item along result in levy of LD in most cases. The material and manufacturing costs due to rejection and deterioration are in addition. The time lapse since placement of Order to commencement of the manufacturing process sometimes could be about six to eight months for fresh vendors. It costs the vendors a few orders and some years to stabilise and understand the nuances of the Inspection procedures. With the Standard Operating Procedures being modified recently wrt drawing approvals and QAP formulation, only the time will tell if the same will act as fresh impetus for participation amongst interested vendors.

(h) **Order Books.** Despite the best efforts and investments in R&D by the Private Sector in development of technology, bagging orders and delivering big-ticket items, there is no guarantee of subsequent and repeat orders coming through their way. With rapid advancement in technology, the need for such an item and associated technology itself might vanish. This would further worsen the investment in R&D as well as their participation, as the marginal profits would not allow the industry to sustain in the long run. Poor R&D and cost cutting for being competitive enough will directly impact the

quality of the product and reliability of the industry in delivering top-notch equipment and technology to the defence sector.

Indian Shipbuilding Today

Almost all yards were flooded with orders with foreign firms waiting in queue with joint venture offers including the government support with 30 per cent subsidy. However, the bubble burst following 2008 global recession, leading many shipyards in the country to bankruptcy. The fact today is that less than 10 per cent of our cargo is carried by Indian flagships and below three per cent of our foreign going merchant ships are built in India. Majority of Indian ships proceed to foreign dry docks for periodical repairs thereby reducing the stake of Indian shipyards in the global shipbuilding to an abysmal 0.3 per cent.

Of the many orders executed for Indian Navy by Private/ DPSU/ PSU shipyards in the past many years, only a handful of them have been delivered in time (time is an important indicator of efficiency). The delay in the case of, four P-28, Kamorta-class corvettes, the contract was signed on June 11, 2012, constructed at Garden Reach Shipbuilders and Engineers Ltd Kolkotta at Rs 7852.39 Cr was 20, 28, 39 and 40 months respectively for the four ships. In case of P-75 class of ships being constructed at M/s MDL Mumbai, the cost was revised by around 1000 Cr and the lead ship was delivered after a delay of 57 months (Nair 2018). In case of Private shipyards as well the situation remains similar. A 3000Cr project for construction of Patrol Vessels at M/s Reliance Shipyard is delayed by more than 60 months and the shipyard is fighting an insolvency plea in the NCLT. In

another case M/s ABG shipyard was contracted for building two training ship in 2011 and *IN* had to short close the project in 2019 as the shipyard entered into insolvency proceedings. Therefore to meet the training demands, *IN* has had to divert its combat warship, assigning them for training purposes, limiting the operational availability of platforms (Spansen, 2018). One of the important reasons for this delay has been non availability of finances. Although these shipyards are highly capable technically, they are not strong financially. Irrespective of the size they rely heavily on rolling of funds. Even though Indian Navy has been a good pay master, and paying in stages, these shipyards have not been able to meet the requirements of delivery due to losses occurring on account of depletion of other business (both domestic/ international).

Further, Indian shipyards have a limitation on draught of vessels that they can handle due to low water depth available in the basin. Even with the best technology that they can handle, depth of basin puts a limitation on the types of vessels that can be constructed. Non-availability of in house design department is also a severe restriction. So, on the whole Indian shipbuilding, on its own, can only look at small size, low technology vessels. Though the Private shipyards have been employing foreign consultants/ designers of repute to assist in construction of slightly higher end Naval ships, the ability to pay the price for a continued service is marred by financial problems.

The DPSU/ PSU shipyards on the other hand are on a more comfortable wicket. There is an almost assured business which is available, and also funds are made available for modernization by the government. They have sufficient experience of handling high end

technology and have sufficient backing of in-house design department to support them through the production. Although they also have depth restrictions at the water front, they can build all types of vessels required by the Navy. However they have a restriction on the sizes that they can build for Merchant Marine, and also the high technology vessels such as the LNG carriers, Dredgers, etc.

Although the Indian Navy is putting considerable focus on Make in India for shipbuilding, the pie of “small” “low technology” vessels that can be handled by Private shipyards is small. In order to stay alive, these shipyards have been resorting to aggressive bidding which has also not helped the cause. Aggressive bidding has only reduced the margins available to shipyards to handle uncertainties. Cost cutting has been applied on employment of designer throughout the project, but without this “brain” the available “brawn” has not been able to deliver.

The DPSU/ PSU shipyards are on a reasonably comfortable wicket and would definitely sail through the troubled waters due to government support and assured orders. However, the Private shipyards need to brace for the difficult times and come out with some innovative methods to come out a winner during the coming decade. The first thing to do would be financial consolidation, i.e. restructuring of loans and pumping in of fresh funds. It is already being done, and some of the cash rich Indian companies are buying large private shipyards. But will this alone be sufficient to handle high end ship/ submarine orders being floated in the coming days; and deliver them in time.

The shipyards may therefore need to create their own “brain”, i.e. create their in house design expertise, or hire it. This facility cannot be a temporary marriage of convenience which is dependent on availability of funds, but it would have to be a permanent relationship which should withstand the rigours of the business environment and stay stable through thick and thin. One low cost option could be to take Governmental support to create this organisation centrally (such as NIRDESH) to give design assistance to all Private/ DPSU/ PSU shipyards for projects for which design is not provided by the owner (Directorate of Naval Design in case of Indian Navy). A few years ago, an organisation called National Ship Design & Research Centre (NSDRC) at Vizag provided such services under the aegis of Ministry of Shipping & Surface Transport.

Once the finances and the technology support is ensured, business opportunity needs to be created to support the venture. A plethora of organisations within the country could be tapped to ensure business for ship building as well as ship repair, i.e. Indian Navy, Coast Guard, Dredging Corporation of India (DCI), Shipping Corporation of India (SCI), Gas Authority of India Limited (GAIL), Oil & Natural Gas Commission (ONGC), Inland Water Authority (IWA), Para Military Forces, and many more. In a number of cases “build and operate” model could be adopted to ensure availability of sustained business.

Business opportunities could also be expanded by exploiting strengths resident in the shipyard, such as trained manpower (welding, cutting, fabrication& assembly), space and construction capacity/ infrastructure, to take subcontracting orders from the DPSU/ PSU shipyards. Efforts to create Joint Ventures between Private/ DPSU shipyards were

initiated some time back, but failed. However sub-contracting through competitive bidding may pass the rigours of the test. This strength could also be employed to target business of offshore structures such as oil rigs, floating quays/ jetties (for islands), etc.

Since the Private shipyards are being taken over by companies that have interest and expertise in products required by Army and Air Force also, a model could be considered where the strengths of purchased shipyards are used to deliver the new line of products, such as trucks, jeeps, armoured vehicles, aircraft components, mines, missile container, Underwater Autonomous Vehicle and torpedo components, etc. The facilities could also be exploited for business related to any other industry, such as green energy, ancillary industry, etc. Export (especially to third world countries) could also be looked at in a big way.

Make in India

Indian Navy has been in the fore front of indigenous construction of ship for a long time prior to Make in India becoming a national Mission. More than 60% of the naval budget is dedicated to capital expenditure and nearly 70% of this capital budget was spent on indigenous sourcing amounting to nearly Rs 66,000 Cr in the last five years. In addition, nearly, 90% of ship repair by value is undertaken by Indian vendors and mostly MSMEs, implying that in addition to the capital budget a high proportion of navy's revenue budget is also being ploughed back into the economy, (Financial Express, 2019).

During the interaction with stake holders it was found that the *IN* has concluded four critical contracts with Indian Shipyards, post announcement of the Make in India mission. Three out of the four contracts were on competitive basis wherein the private shipyards were also participants in the tender. However all the four contracts were bagged by DPSU/PSU shipyards, details at table :-

Table 7: Details of contract concluded post Make in India Mission

S.No.	Project	Year	Shipyard	Cost(Approx)
(a)	4xSurvey Vessel Large	2018	GRSE	2000Cr
(b)	2x Diving Support Vessel	2018	HSL	2400 Cr
(c)	2x 1135.6 Frigate	2019	GSL	14700Cr
(d)	8x ASW Shallow Water Craft	2019	GRSE	6300 Cr
(e)	8x ASW Shallow Water Craft	2019	CSL	6300 Cr

[Source: Annual Report MoD 2018-19 & 2019-20]

A significant achievement in make in India Mission has been the conclusion of contract with Russian side for Transfer of technology (ToT) for construction of 1135.6 Frigates in Goa Shipyard Limited. India would be the only country other than Russia where these potent platforms would be constructed under assistance from Russian ship builders. This project would propel M/s GSL as third shipyard in India for construction of frigates,

which is presently been undertaken at M/s GRSE and MDL. This would in addition, is expected to provide lot of impetus to indigenous ancillary industries involved directly or indirectly in war ship building

There is no doubt that Indian shipbuilding has been through a very rough patch and is presently in need of a strong booster dose for its revival and recovery. The Government of the day has also understood the felt need, and has come out with a plethora of measures to ensure its speedy and sturdy recovery. Organisations such as Indian Navy and Coast Guard have always been supporting the Make in India effort, and have been the pioneers. At present there is considerable optimism in the air that Indian shipbuilding will come out of these troubled times with flying colours.

Although the above efforts may be just sufficient to ensure that Indian shipbuilding does not die off during the next decade, something more needs to be done to ensure greater glory is achieved by the efforts of all the parties concerned. One, the other organisations within the country have to give more business opportunities to our shipyards. And last but not the least, the shipyards themselves, in conjunction with the new owners have to come out with innovative business models to create markets for their product/ exploit the available facilities. They may also collaborate amongst themselves/ with Government shipyards to create business opportunities or create facility for design support. With concerted efforts put in the right direction by all stake holders we would certainly see quality ships being delivered in time.

Chapter 5

Gaps in Shipbuilding Industry

The Indian Shipbuilding Industry had aspirations to acquire a 7.5% share in global shipbuilding by 2017 (MoS Report, 2007). India, could have also emulated the Chinese model during the booming phase of large growth in commercial shipbuilding orders. However, for various reasons India seems to have missed the bus to benefit from the last boom in world shipbuilding and the current negligible share in world shipbuilding tonnage.

Indian yards face systemic disadvantages in several areas which negate their natural competitiveness and adversely impact their chances of succeeding in a globalised shipbuilding industry. Indian shipyards lack global competitiveness and inability to build in short timelines. The productivity concerns make the Indian owned shipping companies to order on foreign shipyards for cost and time saving, in spite of the current indigenous commercial shipbuilding capacity being more than 25 % of the domestic requirement for shipping. Some of the key gaps and issues afflicting competitiveness and capabilities of Indigenous shipbuilding in private sectors have been elaborated in succeeding paragraphs:-

(a) **Ship Design and Shipbuilding Processes.** The Indian Shipbuilding Industry could not develop build strategy adopting modern shipbuilding practices or acquire such know how despite building new infrastructure. There has been a mismatch between the

existing infrastructure and processes, compounded with a lack of application of modern technologies. Further, the industry was deficient in recognizing the need to encourage and promote Ship design capability within the country. Ship design is the foundation on which a ship is built and the single most important factor that determines quality, timely delivery and profitability. The industry did not significantly invest in process integration with infrastructure and enhancing the skills of shipbuilding personnel. Areas of improvement are technology intensive modern tools for 3D digital design, vendor base maturity to enable multicenter design, PDM/PLM implementation, commensurate human resource development, innovative build strategy and integrated shipbuilding and production for enhanced productivity.

(b) Supportive Government Policies and Cost Efficiency. The governments in all major shipbuilding countries have laid a thrust on development of the sector through formulation of supportive policies and measures such as subsidies, financial aid, easy finance, tax benefits, preferential orders etc. Japanese and South Korean shipbuilding industries received substantial government support during the 1970s and 80s, which helped them to emerge as top players in the world. In Korea, shipyard financing has matured and the evolved mechanisms to drive the cost lower. Over the last decade, the Chinese government has also taken several measures to foster the growth of its industry like direct aid, loss reimbursements, tax subsidies, etc. Further, the Chinese government provides sovereign refund guarantees for certain class of vessels, thus removing any related burden on the shipyard (Mickeviciene 2011). The excise and duties that have been levied to the Indian shipbuilding sector further affect their cost efficiency. Indian Govt.

supportive policies to the commercial shipbuilding industry would be fundamental in creating a level playing field against the established competing countries.

(c) **Working Capital.** Typically, a shipyard requires a working capital of around 25-35% of the cost of the ship during the entire construction period. The interest rates on working capital in India average 10-11% (Nagesh, 2016). In contrast, the interest rates presently offered to shipbuilding yards overseas are significantly lower at around 5-6% in Korea and around 4-8% lower in China. There are high interest rates on working capital in India with difference as high as 5-6% as compared to competing countries.

(d) **Foreign investments.** The South Korean government has taken active measures to stimulate FDI in the sector such as cutting corporate taxes, providing tax incentive packages along with low cost plant sites and rent free land lease in Foreign Exclusive Industrial Complexes. The foreign investment in ship building and shipping machinery sector has helped the Korean ship building industry in receiving world class technology, which puts it at almost par with the Japanese counterparts. In India, present system to obtain multiple clearances covering land acquisition, environmental clearance, power and water etc., from various departments' acts as a deterrent to the investors.

(e) **Ancillary Industries.** Development of ancillary industries is critical for increasing cost competitiveness of shipbuilding and repairs. Japan, South Korea and China have formulated suitable fiscal as well as industrial policy for the shipbuilding and ship repair ancillary industry enabling them to develop scale as well as a cluster of ancillaries. The

manufacturers in India suffer from the disadvantages accruing from small scale of operations. These advantages of scale are not available to Indian shipbuilding industry, which imports most of its input materials and is therefore unable to leverage advantages offered by bulk purchases and Just in Time supplies.

(f) **Process Time.** Process time refers to the total time taken by a firm in manufacturing and ensuring that the product reaches the target market which is an important measure of competitiveness of the sector. Countries which are able to achieve faster turnaround time and have quicker time to market enjoy competitive advantage in the market. Indian shipbuilding industry has poor infrastructure support in terms of transport and logistics facilities. There is relatively low hinterland connectivity for most of the ports and cargo handled in the country within the ports. This delays the entire production and distribution cycle for Indian industry. Inadequate port facilities in India have become a bottleneck to the development of shipbuilding sector. This has often resulted in higher turnaround time at ports and high cost of administrative delays. According to an analysis (KPMG,2007) the turnaround time at ports for India has been 84 hours when compared to 7 hours in countries such as Hong Kong and Singapore.

(g) **Focus on skill development and R&D.** The major shipbuilding countries have taken special efforts towards skill development and R&D of the shipbuilding industry. However, in India there is limited investment in R&D in ship designing and innovation. Indian shipbuilding industry is at an early stage but has to compete against established yards in Korea and China to grab a share of the market. Its lower scale leads to several

disadvantages in design and manpower costs. Indian players have a lot of catching up in hand to meet the international players in ship automation and technology.

(h) **Labour Cost and Availability of Critical Material.** India has the lowest labour costs amongst the countries like China, Japan & Korea (KPMG,2007). However, this advantage is not translated into cost effectiveness because of factors like reliance on imports of critical raw materials and higher financing costs.

(j) **Labour Productivity.** India has a huge disadvantage against the competing countries with labour productivity. There is a shortage of basic skills in the industry with lack of manpower with techno-economic specialization in shipbuilding. The scale of operations is also small and in many cases workers working as platers, welders, fitters, etc. are less educated. The shipbuilding sector in China and South Korea has received government fiscal and policy support, enabling them to develop scale as well as a cluster of ancillaries. These advantages of scale are not available to Indian shipbuilding industry, and hence dent the overall labour productivity.

Indigenous Warship Design and Construction

The indigenisation drive of warship design and construction first launched by the Indian Navy in the 1960s has, over time, matured into a success story worthy of both adulation and emulation. Indian warship building industry over the past few decades has significantly grown into a well established industrial base and has attained a prolific track

record in indigenous design and production of warships and auxiliary vessels. The Directorate of Naval Design (DND) is the bedrock of all warship design activities in the country and has to its credit 19 different design types ranging from small craft, stealth frigates, missile corvettes, guided missile destroyers and most notably an aircraft carrier, to which more than 85 warships have been built till date (Nagesh, 2016). Naval ship building in contrast to commercial ship building has shown an increasing trend with large number of orders being placed for warships, patrol vessels and auxiliary craft on Defence Public Sector Units (DPSUs), public and privately owned yards in the country. Weapon intensive destroyers and frigates have been constructed and delivered from PSU shipyards, while Auxiliary vessels such as Yard Crafts have been delivered from private shipyards in India. Currently, Indian shipyards have as many as 46 indigenously designed warships in various stages of construction. Smaller equipment and systems have also been indigenised to the extent that, in the recently built Corvettes, nearly 90% indigenisation is said to have been realised.

Warship Construction at DPSUs In an otherwise bleak scenario of commercial shipbuilding, the DPSUs have been fairly well-off, owing to an expanding Indian Navy with its warship building programs at DPSUs through nomination. For the MoD owned shipyards, their biggest advantage lies in long exposure to shipbuilding, enabling them to acquire warship construction skills, design capability and technology. These aspects are crucial for naval shipbuilding, which unlike the commercial shipbuilding is a difficult task given the complex nature of marrying a vast amount of weapons and sensors in an environment of high density fit in warships. However, there are higher expectations in

respect of handling complexity of modern naval platforms required to support modern blue water Navy and also stem the time and cost overruns encountered in warship acquisition projects. Govt. with a focus on realizing improved build periods at DPSU shipyards has funded their infrastructure upgrades, as part of the Naval Shipbuilding Projects. These infrastructure augmentations have been commissioned in the recent past and many expected to be completed in the coming years. While these upgrades are significant in shoring up the infrastructure, they are still much smaller in comparison to the infrastructure available in Korean, Japanese or Chinese shipyards.

Disadvantages with DPSUs The DPSUs have prospered with government protection and assured loading of the yards through nomination. Accordingly there have been cases of delayed deliveries and cost overruns. The biggest disadvantage the PSU shipyards face is the decision making constraint due to their limited operational and financial autonomy. It depends on the Govt. for approval of key decisions, which are often taken at a slower pace. In contrast the private sector has complete autonomy in decision making, which facilitates them to meet necessary infrastructural needs at a faster pace. Some other areas requiring further attention at DPSUs include process engineering changes, augmentation of design and manufacturing tools, multicentre design, integrated construction for shorter build periods, effectiveness of supply chain management, e-documentation, scaling up of design HR skills, modular construction etc.

Competitive Bidding and Inclusion of Pvt Shipyards in Warship Construction Naval ship requirements and accordingly acquisitions have increased over the years and it was

seen that DPSUs were unable to keep up with the required shipbuilding rates. A dedicated section on competitive bidding was introduced in DPP2011. Competitive tendering in warship construction was introduced to realize growing naval demand and rate of ship acquisition, wider choice of shipyards, real price discovery, cost advantage, timely delivery and improved quality of ships. However Private shipyards are exposed to the commercial shipbuilding downturns /cycles and associated turmoil. The idea mooted as a panacea to the difficulties of naval ship acquisition through PSU, has run into challenges off late, resulting in time over runs, management and quality issues in warship construction projects at private shipyards.

Performance of Private Shipyards in Naval Shipbuilding Projects

The private shipyards have been severely impacted by downturn in the economy and adverse cycles in commercial shipbuilding, which in turn have adversely impacted the naval shipbuilding embarked upon by them. Major private shipyards are currently undergoing acute financial stress with adverse cash flows and inability to service debts which stands escalated to an excess of \$ 4 billion (Jyoti, 2018). With highly leveraged positions and falling incomes, the major private shipyards are currently undergoing Corporate Debt /Asset Restructuring. The severely stretched finances and adverse cash flow situation at the major private yards have also affected the timelines of Naval vessel construction projects undertaken by them. With lack of experience and expertise in building warships, the private sector lags behind in technological and design assistance in comparison to the DPSUs. Further, the private shipyards have been afflicted with

aggressive costing to win contracts, which manifested in unfavourable cash flows with cascading effects on project time lines. Some of the pertinent gaps and issues of naval shipbuilding at private shipyards are as follows:

(a) **Working Capital.** Private shipyards which have been primarily engaged in merchant ship construction are susceptible to shocks and reverses in Commercial Shipbuilding which are now spilling over to Naval Ship building. Cancellations of commercial orders and highly leveraged balance sheets have adversely affected Cash flows and Working Capital for the construction of the Naval Ships in hand.

(b) **Bank Guarantee (BG) and Cash Flows.** In some cases performance BG is released post 90 days of delivery and supply of Base and Depot (B&D) spares in spite of a separate BG for B & D spares delivery. At times BG ends up blocking cash due non availability of the naval vessel or a dry dock slot. Advance Bank Guarantee and Performance Bond have been issued by the bank to shipyards against Margin Money of 10%. However, in testing times some banks have raised the Margin Money to 100%. It is a paradox that a shipyard undergoing severe cash crunch is required to deposit 100% Margin Money.

(c) **Aggressive Bidding and Poor Cost Estimation.** There is inadequate legacy data for cost estimation of Naval Ships particularly first in class. Further, there are no Benchmarking Norms / Standards for estimation of Shipbuilding effort which may be applied to the evaluation of bid price/cost by private players. Owing to their inadequate

exposure to the stringent requirements of naval shipbuilding, cost estimating by private shipyards may be flawed in focusing only on class requirements. Moreover, long gestation periods in RFP to signing of contract, design approvals, equipment delivery and ship construction result in cost escalation and cascading effects. The lure of being in race for high value warship construction contracts have led to aggressive costing by private players to win contracts, resulting in award of cash deficient naval vessel contracts.

(d) **Foreign Exchange Rate Variation (FERV).** FERV is not permitted in competitive Naval shipbuilding Contracts involving private shipyards. However, the same is accorded to DPSUs who build warships on nomination basis. Further Industry depends on import for a large content of material/components in shipbuilding due inadequate ancillaries. Such equipment import and procurement is vulnerable to severe currency fluctuations which have been volatile in the recent past.

(e) **Imposition of LD.** Levying LD penalty for the complete contract as soon as the contractual delivery date has elapsed and deducting the amount from the ensuing stage payments disrupts the financial cash flow in the project. Currently there exists no scope of incentives for delivery before time.

(f) **Adaptation to Concurrent Design and Approvals by IN agencies.** There are major deficiencies in design capability of Private Shipyards. In-house design expertise is essential to address nature and complexities of Warship Construction. There are shortfalls in adapting to concurrent design and construction with ability to factor in essential

change requests by IN towards enhanced equipment specifications and operational effectiveness. There have been delays in approval of contractual drawings / Key Plans by IN and difficulties in monitoring of receipt /dispatch which calls for effective technical and project management. IN tendency to deviate from Build Specifications and seeking modifications or new specifications midway through construction needs to be on unavoidable basis and brought within the scope of fixed price Contracts.

(g) **Planning and Project Management.** There is an absence of modern tools and techniques for Project Management and Monitoring. Shipbuilding plans/schedules are in comprehensive and unrealistic with disconnect between planning, production and procurement organization of the shipyard.

(h) **Approvals and Delegation of Authority.** Approval of Modifications and Delivery Period extension etc., are required to be taken up through CFA and deliberations on such cases are protracted and have large time penalties. Pending approvals lock vital working capital and delayed decision making have adverse cascading effects on time / cost schedule of Warship construction.

Key Gaps in Indian Warship Building Industry

During discussions with stakeholders in GoI, shipyards and experts in the field of warship building, large number of issues plaguing the sector emerged. Some of the key gaps in the Warship building industry have been summarised below: -

(a) **Long Gestation Period.** – Warship construction has a long gestation period of generally 07 to 08 years. Shipyards, therefore, resort to telescopic design & construction ie, construction and design progressing side by side, construction commence before freezing of design. The experience gained on the first ship is implemented on remaining vessels. However, since the batch size is small, each new class has its own learning curve.

(b) **Delay in finalizing the weapon package** by *IN* due to other procurement impediments, leading to late receipt of binding data, resulting in frequent design changes and in some cases even re-work.

(c) **Weapons/ Equipment at development stage** Nomination of weapons and sensors that are under various stages of development leading to a situation of risk of unproven systems. As in the case of Aakash Missiles for ships in the 1990's had to be replaced with Barak systems after prolonged delay.

(d) **Attempts to adopt State-of-the-Art Technology during the build process** - The need to have the latest technology available in the respective fields in equipment and material on a ship that would be in service for 25-30 yrs need no special mention. However the timeline for the Industry to develop and deliver the same has added to extended delivery schedules of warships.

(e) **Reliance on foreign OEMs for Weapon systems** – With the disintegration of former Soviet Union, the weapon systems and sensors from Russia is not forthcoming. India has shifted from Russia to Israel and now US for the reliance on critical weapon systems. This has led to multiple challenges in ensuring timely availability and integration of systems from the west and the east.

(f) **Delays in delivery of equipment - Cost and Time Overruns** Delay in delivery of equipment by both indigenous and foreign vendors has been a major cause of project delays. In addition, delays due to ab initio Indigenization efforts by R&D organization for development of certain weapons and sensors, also result in time over runs.

(g) **Obsolescence** - Considering the long gestation period of Warship construction and, despite concurrent design and construction, sometimes it becomes necessary at times to upgrade the weapons and sensors during advanced stages of construction of the platform which is likely to result in time and cost overruns.

(h) **Lack of Industrial Support Base** - In spite of national mission of make in India and such other efforts by the government towards indigenization, the ancillary industry is unable to produce the required components to support the shipyards. This is primarily due to non availability of advanced and latest

technology for manufacture of components, due to lack for strong R&D environment.

(j) **Lack of adoption of modern shipbuilding technologies** – The shipyards inability to augment the existing infrastructure to meet up to Industry 5.0, Robotics etc, are leading to delays and inefficiency of the workforce.

(k) **Delays in Contracting and Order placement for equipment/ systems** – In case of DPSUs elaborate contracting procedures in accordance with Defence Procurement Procedures (DPP) taking up to 12 – 36 months for placement of orders on OEMs.

(l) **Labour/ Labour Overheads** - The effect of periodic Wage Revisions and Labour Overheads cannot be overlooked. Influence of this factor has been on the rise with time and has sometimes been beyond the estimated escalation of 7% per annum (Bhera& Mishra, 2012). Even though this increase is anticipated, its actual magnitude can be unpredictable.

Opportunities in the Shipbuilding Sector

Shipbuilding capacity and capability in commercial and defence sectors have potential to significantly scale up the employment prospects for the burgeoning young population along with a massive multiplier effect on economy. Further, a shipbuilding industrial

base, catering to the naval vessel acquisition and freight carriage through domestically owned merchant ships is strategically significant for national security.

The shipbuilding industry in India has not succeeded in building competitiveness primarily due to inadequate policy support, lack of private participation and shipyard inefficiencies. Moreover, currently amidst an economic downturn and adverse shipbuilding cycle, most private shipyards are plagued with dwindling order books, excessive debt, non-existent credit, falling incomes and severe cash flow constraints. The financial stress at the private shipyards have also affected the warship construction projects recently embarked upon by the industry. In light of its strategic significance, economic potential and spinoffs, need of the hour is to shore up the private shipbuilding industry and prevent erosion of the national shipbuilding industrial base (NSIB). From the east Asian growth story, it is apparent that Government patronisation of shipbuilding industry and ancillaries through supportive policies, is fundamental to drive competitiveness in delivering quality ships on time. The incumbent central Govt. has initiated some key measures in support of the ailing shipbuilding industry and some more are desired.

While the government has a major role to play, Shipbuilding industry needs to rise up to the occasion and grab all avenues open to them to improve their competitiveness, productivity and profitability. It is incumbent on all stake holders during this lean period to focus on enhancing competitiveness of indigenous shipbuilding through resolution of gaps and issues afflicting the industry on all fronts viz. regulatory/ fiscal policy, modern

technology, design prowess, build strategy, HR skills, productivity and R & D. Simplification of bankruptcy norms and hastening of procedures towards competent ownership of shipyards would be strongly desirable, towards improved competitiveness, debt reduction and de-leveraging of the industry.

Naval shipbuilding at the private shipyard is in its infancies and facing considerable challenges. It is imperative that proactive measures are adopted to plug the existing loop holes in warship contracts and enhance the effectiveness of warship acquisition through competitive bidding. The shipbuilding industrial base upon survival and maturity, along with economic benefits shall also bring quality and efficiency in construction and repair of warships. The expansion of the Navy and the Coastguard, the growth in the manufacturing sector in synergy with the "Make in India" campaign can offer unprecedented opportunities to all the stake holders. The private shipbuilding industry needs to rise to the occasion with enhanced competitiveness and graduate towards a reliable and resilient pillar in nation building.

Chapter 6

Findings and Recommendation

The analysis of various facets of the global and Indian shipbuilding industry clearly shows that India needs to look at multiple interventions including in the areas of Regulatory framework, Investment policies, Trade policies, Fiscal policies, Infrastructure, R&D, Skill, Financing, Process, Collaboration and Technology. Given that the share of Indian made ships that carry India's overseas cargo has fallen sharply and Indian warship building is limited presently to PSU Shipyards, there is an urgent need to take proactive steps to ensure revival of the domestic shipbuilding sector. This also brings to focus the importance of India's shipbuilding industry which has the capacity and expertise but is presently functioning below capacity. Global Shipbuilding industry is presently in the cusp of a rebound after having hit a nadir in 2008 and timely action with effective government support is essential to revitalise the indigenous shipbuilding industry.

Mitigation Strategies for Revival of Indigenous Warship Building Industry

There is a clear need to revive the indigenous ship building industry with some robustness to meet the *IN's* requirements of vessels as outlined in the Maritime Capacity Perspective Plan for a 200 ship fleet. Additionally, with global cues of a rebound of the economic growth, thereby the shipping business and Shipbuilding industry, broad

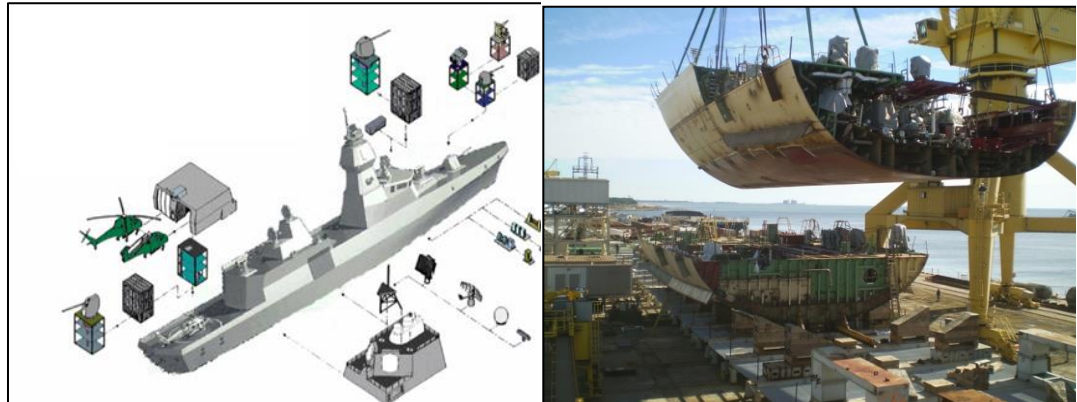
strategy and recommendations to improve the health of the indigenous Naval Shipbuilding industry could include, among others: -

(a) **Multiple Shipyard Modular Build Strategy.** Several shipbuilding nations across the globe are resorting to Modular Parallel construction of Mega Blocks with certain degree of outfitting to facilitate concurrent construction of vessels. This can drastically reduce time lines as parallel production could progress at different locations or in different shipyards and the final assembly of blocks could rest with the integrator who is responsible for performance of platform.

(b) **Building more in the same class.** Building more number of a particular Class would have significant time and cost advantages. This can ensure better learning curve effect ensuring benefits of design and production processes. It can also reduce the procurement cost of material in bulk for a larger group of ships.

(c) **Integrated Construction and outfitting (80% targeted pre-outfitting).** Integrated construction philosophy, consisting of advanced pre-outfitting of blocks prior launch would enable construction of vessels with reduced build periods. This methodology is being adopted for P – 17A, Stealth Frigates under construction at M/s MDL wherein build period of 66/ 60 months for each vessel is being targeted vis-à-vis approximately 84 months for conventional construction of Frigates/ Destroyers.

Figure 10: Modular construction with pre-outfitted blocks.



[Source: Modular Build of Warships, RAND Report, 2011]

(d) **Achieving Early Maturity in Ship Design.** Timely availability of Binding Data of all sub assemblies and systems with freezing of ship design prior commencement of construction is critical for progressing Integrated Construction resulting in reduced build periods for warships.

(e) **Minimise and Manage Changes in Design.** It can be seen that large changes in design based on weapons and sensors sourced from other countries occur much later in the production phase in the military contracts. Resulting in rework, time and cost overruns. Whereas in commercial contracts the design is frozen post all changes in the design phase prior start of production. A mechanism to ensure effective Change Management during the build period is essential to ensure timely delivery of ships.

(f) **Availability of dedicated Trial Platforms** Most new equipment developed for new construction ships when installed onboard for the first time, develop technical

problems which need finer tweaking of technical specifications or reinforcements. This lead to delay in availability of equipment resulting in time and cost overrun of the warship building project. Therefore having a dedicated platform for trials of new equipment prior installation on ships under construction would aid in reducing the time lines of construction.

(g) **Encourage competitive bidding amongst Public & Pvt. Shipyards** – Deviating from the current practice of awarding Naval shipbuilding contracts through nomination to Defence PSU Shipyards, encouraging competitive bidding for new projects between Public & Pvt Shipyards (with MoUs with other major Shipbuilding Yards across the world, if necessary) would go a long way in enabling price discovery and on time delivery of projects.

(h) **Reduction of time lines for contract conclusion** Though the time line for contract conclusion from RFI is stipulated in the DPP, in actual scenario it takes four to five years, on an average. There is a need to revisit the process and analyse the reason for delay to conclude the contract within 18 months. The RFI stage and stage of benchmarking of cost could be avoided in case of competitive bidding amongst shipyards.

Policy Recommendations for Reviving Indian Shipbuilding Industry

With the support extended by the government, India had achieved the 5th position in 2009 among the global shipbuilding nations. However, the period thereafter had witnessed

decline in India's global ranking. With the potential India possesses as a shipbuilding nation and economic benefits of a robust shipbuilding industry, conducive policy framework and institutional support systems would go a long way in our endeavours to emerge as a vibrant shipbuilding nation.

(a) **Policy Statement.** A policy statement in clear terms should be pronounced conveying the commitment of the Government to undertake various priority measures in the sector. Such policies need to be adhered to scrupulously and not changed with change in Government. In 2002, the Government introduced a Shipbuilding Subsidy Scheme that provided 30% subsidy applicable to ocean going vessels, for shipyards both in public and private sector. The scheme came to an end after five years in August 2007. Some form of adequate financial / fiscal incentive would need to be considered in order to facilitate the industries to achieve critical mass.

(b) **Strategic Industry Status.** As the shipbuilding industry in a mother industry which can clearly drive the GDP of the country with affects on large number of ancillary industries and various sectors of the economy, this need to be give a special status as a strategic Industry.

(c) **Technology Upgradation through Joint Ventures.** An important measure to upgrade technology in the shipbuilding industry could be joint ventures with major shipbuilding companies/ shipyards. For instance, the collaboration between M/s MDL &

M/s Fincantieri, Italy (Know How Partner) for the Integrated Construction of P – 17A ships is an incremental step in this direction.

(d) **Exploring Potential Demand from Overseas Markets.** An important strategy to provide a boost to India's shipbuilding activities as also India's exports could be matching India's export capability with demand existing for ships in emerging markets. A case in point would be exploring specific markets in Africa, which are major importers.

(e) **Purchase Preference for Indian built ships.** Purchase preference for Indian built, Indian flagged vessels from Indian Shipyards in Government / defence purchase. Globally, countries have aggressively promoted the use of locally built vessels by domestic shipping companies. The National Manufacturing Competitiveness Council (NMCC) has also recommended facilitating greater carriage of Indian trade by Indian built ships, and consequently developing domestic shipbuilding capabilities.

(f) **Need for State Maritime Policies.** In order for the efforts to boost Indian shipbuilding to be successful, the industry also needs to get adequate support from the maritime states of the country. It is the states that would have to help implement these policies to support and develop the industry. The states could also invest in the inland waterways which can also provide ample opportunities for the small ship builders. In this context, development of state maritime policies and state maritime boards is extremely important. Gujarat Maritime Board (GMB) has come up with its own shipbuilding policy

(Shipbuilding Policy 2010). The policy aims to develop Marine Shipbuilding Parks (MSP) and clusters.

(g) **Foreign Investments.** Measures & Policy initiatives to attract Foreign Direct Investment (FDI) in the Shipbuilding Sector by reducing corporate taxes, eliminating red-tapism and providing tax incentive packages as available in other East Asian countries should be provided to the domestic shipbuilding industry. In India though, present requirement to obtain multiple clearances covering land acquisition, environmental clearance, power and water etc., from various departments for new projects in shipbuilding acts as a deterrent to attracting investment into this sector.

(h) **Skill Development, Innovation and R & D.** For overall growth of the industry, there is a need to create a strong R&D base along with developing in-house design capability, infusing new technology, developing skilled workforce, adopting appropriate fiscal measures and industry-friendly regulations, so that Indian shipbuilding can achieve credibility for delivering quality ships on time. The budget for R& D needs to increase multi fold with MoUs with academia and specialists.

(i) **Labour Productivity.** Labour productivity for India's shipbuilding sector is less than one-tenth of Japan & Korea. This gap in labour productivity is due to several reasons viz. acute shortage of basic skills, small scale of operations etc. With enhanced government fiscal and policy support (as available in China and South Korea) and

adoption of Skill India initiative of GoI by the Shipbuilding industry, tangible gains are expected.

(j) **Lower Interest Rates.** A shipyard typically requires a working capital of around 25-35% of the cost of the ship during the entire construction period. The interest rates on working capital in India are in the average range of 10-10.5% depending upon the negotiation power of the shipyard. In contrast, the interest rates presently offered to shipbuilding yards overseas are significantly lower. They stand at 5-6% in Korea and around 4-8% in China.

(k) **Developing Ancillary Industries.** Development of ancillary industries is critical for increasing cost competitiveness of shipbuilding and repairs. The ancillary industries need to invest in strong R&D and develop equipment and sub assemblies with world class quality. By merely making a product in India would not suffice, rather it needs to be designed and manufactured in India.

Conclusion

The shipbuilding sector in comparison to other industries / sectors have its own distinctive features. It is unique in a way that it sells the ship first and then commences construction later, unlike the auto industry or others, where one manufactures first and sells later. Further shipyards get orders only if they are credible (deliver quality ships on time) and it can be credible only after successfully executing consistently under

international competition. Further, it has to be globally competitive against the best yards in the world. Unfortunately, the shipyards are faced with very stiff taxes, tariff, duties, and financing charges as compared to foreign yards. Unlike other manufacturing industries the product takes years to deliver and requires high cost finances over a long period. This weakens the competitiveness of the industry. The shipbuilding industry can improve the economy of a nation, only with a high volume of shipbuilding output along with sourcing the raw material indigenously. Towards this, a favourable economic ecosystem is essential with strong R&D backbone. In addition, the shipyards need to perform to the best of their ability, so that they can deliver quality ships on time which will bring in more orders. The recommendations deliberated above will go a long way in providing the required boost to Indian Shipbuilding industry.

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