

Potential and Challenges of Bangladesh Shipbuilding in Contest of Global

Commodore Khandakar Akhter Hossain, (E), NUP, ndc, psc, PhD, BN
Commodore Superintendent Dockyard and Chairman, BN Dockyard
Technical Institute, Chattogram, Bangladesh
Email: kahossain756@gmail.com

Abstract

There are ups and downs observed in shipbuilding growth. United Kingdom (UK) was the market leader in global shipbuilding before WWII. After that, Japan became the dominant shipbuilding nation in the 1960s and slowly lost its competitive advantage to the promising industrial nation South Korea, as they had the advantages of much cheaper wages, a suitable shipbuilding strategy, strong government support, and cheaper currency. South Korean shipbuilding overtook Japan's in 2003. In 2009, during and after the global financial crisis China became a global shipbuilding leader leaving behind South Korea and Japan by using the same strategy and technique of the two shipbuilding giants. China utilized the global financial crisis to develop its shipbuilding and they initially targeted the medium and small global market of containers, tankers, and cargo ships. Bangladesh is a maritime nation with a glorious shipping and shipbuilding history. However, the country has failed to keep pace with the global shipbuilding race due to a few reasons. We must utilize our potential and opportunities to meet the challenges for sustainable development of the shipbuilding industry. This analytical paper will describe the potentials and challenges of local shipbuilding in a contest of global and will suggest a suitable shipbuilding market for Bangladesh.

Key-word:

Shipbuilding, block, module, opportunity, challenge, 4IR,

Introduction

Shipbuilding is a primitive and labor-intensive industry. Conventional shipbuilding was a low-tech industry (Hossain et al. 2017). After the invention of arc welding technology, normal steel with insufficient fracture toughness was used in shipbuilding, and that resulted in some ships suffering catastrophic brittle fracture and structural failure. Since the 1950s, specialized high tensile strength and tough steel with good physical and chemical properties have been used in the shipbuilding industry (Hossain 2023g). Modern steel has eliminated brittle fractures in ships (Stopford M 2009). Distinct beautification and work excellence are found in modern shipbuilding. Today's shipbuilding needs a lot of automation and uses a line production manufacturing process, where a skilled workforce is essential. Ship design work, usually known as naval architecture, is finalized ship drawing after ship model testing either in towing tank/basin or CFD analysis. Modern shipbuilding makes considerable use of prefabricated blocks or modules, where entire multi-deck segments of the hull are built elsewhere in the yard, transported to the building dock/slipway, and then lifted into place and the fabrication process is done as per the guideline of naval architects. This is known as block or module construction.

So, modern shipyards pre-install machinery, equipment, pipes, electrical cables, and all other components within the blocks, to minimize the effort needed to assemble components within the hull, once it is welded together (Hossain 2018a). Again, incoming 4IR or Industry 4.0 will influence the whole maritime sector and new transformations will be taking place in the shipbuilding industry and that will be very decisive in nature (Noordstrand 2018). The main goal of shipbuilding 4.0 is an intelligent shipyard that is characterized not only by adaptability, resource efficiency, and ergonomics but also by close integration among ship owners, shipbuilders, suppliers, and other stakeholders both in industry and in value processes (Hossain 2023f).

Bangladesh with its vast and young population has immense opportunity to develop any labor-intensive heavy industry like shipbuilding. Local shipbuilding has adequate potential and prospects. However, Bangladesh has failed to keep pace with the continuous technological advancement in global shipbuilding. Moreover, a few typical problems and challenges have created obstacles to development

(Hossain et al. 2010, Hossain 2018b). It has been anticipated that, if local shipbuilding can utilize its potential can capture a tiny global market share, and meet the challenges, Bangladesh can develop a sustainable shipbuilding industry in the long run. Again, to become a sustainable ship-exporting nation after fulfilling local demand, we need to develop our shipbuilding with global standards. The study has been conducted with a combination of primary and secondary data including useful inputs from related stakeholders from home and abroad. The primary and secondary information about global and local shipbuilding have been collected from available sources like visits, interviews, books, publications, websites, journals, reports, financial reviews, etc. This is a specific study of the shipbuilding industry of Bangladesh to evaluate the suitable market. In this analytical paper, will be endeavor to depict the potential and challenges of local shipbuilding to achieve sustainability in a contest of global.

2. Evaluation of Global Shipbuilding Industry

Shipbuilding is a primitive and labor-intensive industry. Conventional shipbuilding was a low-tech industry. After the invention of arc welding technology, normal steel with insufficient fracture toughness was used in shipbuilding, and that resulted in some ships suffering catastrophic brittle fracture and structural failure. Since the 1950s, specialized high tensile strength and tough steel with good physical and chemical properties have been used in the shipbuilding industry (Hossain 2023lg). Modern shipbuilding makes considerable use of prefabricated blocks or modules, where entire multi-deck segments of the hull are usually built elsewhere in the yard, transported to the building dock/slipway, and then lifted into place and the fabrication process gets completed. This is well known as 'block or module construction'. The most modern shipyards pre-install equipment, pipes, electrical cables, and all other components within the blocks, to minimize the effort needed to assemble or install components within the hull, once it is welded together (Hossain 2023a&b). Ship design work, known as naval architecture, is usually conducted by using a ship model/towing tank or basin. Again, 4IR or Industry 4.0 will definitely influence the whole maritime sector and new transformations will come in the shipbuilding industry and that will be very crucial. The main goal of Shipbuilding 4.0 is an intelligent shipyard that is characterized not only by adaptability, resource efficiency, and ergonomics but also by close integration among ship owners, shipbuilders, suppliers, partners, and other stakeholder in the business and value processes.

If we evaluate the trend of the global shipbuilding industry, we find that, before and after World War I (WWI), Great Britain dominated the global shipbuilding market. However, during World War II (WWII) and one decade U.S. became the leader of the global shipbuilding industry. After World War II (WWII), from the 1950s to the 1960s, Japan used shipbuilding to rebuild its industrial structure (McCarthy M 2005). After that South Korea started to make shipbuilding a strategic industry in the 1970s and 1980s. Interestingly, China also followed the same path and repeated this same policy and strategy with large state-supported investments in shipbuilding in the 2010s (Michael D 2010, (Hossain 2023h). But few nations, like the Philippines, Vietnam, India, etc are privatizing its local shipbuilding. Today's global shipbuilding market was valued at USD 132.52 billion in 2021 and is anticipated to reach USD 175.98 billion by 2027, with considering average growth rate of 4.84 % (OECD, 2021). Usually, shipbuilding is a slow-moving industry experiencing challenges from unsteady market growth as well as economic and environmental changes. Again, the recent COVID-19 pandemic and the present geopolitical situation make shipbuilding more uncertain (Mordor Intelligence 2022 and Hossain 2023d).

Nowadays global shipbuilding market is suffering from inflation, over-capacities, depressed prices, low profit margins, trade distortions, widespread subsidization, financial and pandemic crises, volatile global politics, trade imbalance, and many more. There are ups and downs observed in shipbuilding growth. United Kingdom (UK) was the market leader of global shipbuilding before WW II (Banglapedia 2011). After that, Japan became the dominant shipbuilding nation in 1960s and slowly lost its competitive advantage to the promising industrial nation South Korea, as they had the advantages of much cheaper wages, a suitable shipbuilding strategy, strong government support and cheaper currency. South Korean shipbuilding overtook Japan's in 2003 (Lixing 2009). Again, from 2009, during and after global financial crisis China become the global shipbuilding leader leaving behind South Korea and Japan by using the same strategy and technique of that two shipbuilding giant ((Hossain, 2023i). China utilize global financial crisis to develop their shipbuilding and they initially target the medium and small global market of containers, tankers, and cargo ships.

High labor cost countries always have lost its global shipbuilding market share, during removal of state subsidies, even strong domestic policies failed to provide enough support. The British, USA, and European Countries' shipbuilding is the prime example of this (Stopford M 2009).

The market share of USA and European ship builders began to decline in the 1960s and their production is now primarily on military, and few special ships like cruise liners or pleasure Yacht. Today China is global shipbuilding leader with around 45% of global share. Their shipbuilding quality and technology has improved significantly, and they earn the confident of global customers. South Korea and Japan is following china securing second and third position in global market with 25% and 20% share respectively (Hossain, 2021, UNCTAD, 2021b). The trend of global shipbuilding leadership with probable causes and lessons for Bangladesh has been shown in table 1 below. Shipbuilding and shipping industries, responsible for the production and operation of merchant ships, and that has been considered as the heart of the international trade and economic system. But shipbuilding by its nature is a complex and diverse industry. So the analysis of the industry characteristics includes a generic analysis and some specifications for selected ships types. Relation of global trade and growth of active fleet or shipbuilding has been shown in figure 1 below (UNCTAD 2021a&b, Clarksons 2021a&b)). A concise summary of structural characteristics of the shipbuilding sector has been shown in table 2 below.

Table 1. Trend of market leadership of global shipbuilding

Duration of Shipbuilding Leadership	Country	Causes of Lost Leadership
1860's-1950's	UK(Great Britain)	Modernize of local shipbuilding not happened. Shipbuilding labor cost becomes high. Downsize own fleet. Lost global leadership by politically and economically
Mid1950's-mid1990's	Japan	High cost of shipbuilding with aging. High shipbuilding labor cost. Decrease shipyards R&D budget (less than 1%). Increase gap between demand and supply of steel. Increase steel price. Reduce government support.
Mid1990's to 2009	South Korea	High cost of shipbuilding labor. Increase gap between demand and supply of steel. Increase steel price. The appreciation of Korean local currency (won) has worsened the competitiveness of Korean shipbuilding. Reduce government support.
Since 2010' (it was earlier than Chinese planned)	China	Low human resources cost. Low shipbuilding labor cost. High shipbuilding labor cost. Ambitious government program for the shipbuilding development. Growing shipyards capacity. Favorable government policy and strategy. Increase governmental subsidies.

Table 2. Summary of structural characteristics of the shipbuilding Industry

SI No	Subjects or Characteristics	Situation of shipbuilding Industry
1	Production pattern	Unit production
2	Delivery time	Naturally long (2-3 years)
3	Production factor intensity	Labour-intensive for low value-added ships. Sometime high value-added ships (Yacht, liners, warships, etc)
4	Trade Ability	Very high. Large role of ship finance in ship exports.

		Multiplier of other business as connected with backword and foreword linkage.
5	Possible change areas	Offshore business, but involves high risks. Ship repair and maintenance. Steel construction and fabrication business.
6	Product heterogeneity	Very high as wide variation of ships types
7	Demand accelerate	Expansion of seaborne trade. Replacement of ships. Changes of regulations. Changes of owner requirement.
8	Challenges	Eco-system or environment friendly product. Automation and digitalization. Impose regulation. Design as unit production. Overcapacity. Trade fluctuation.
9	Uses	Versatile. EOL ships also have value.

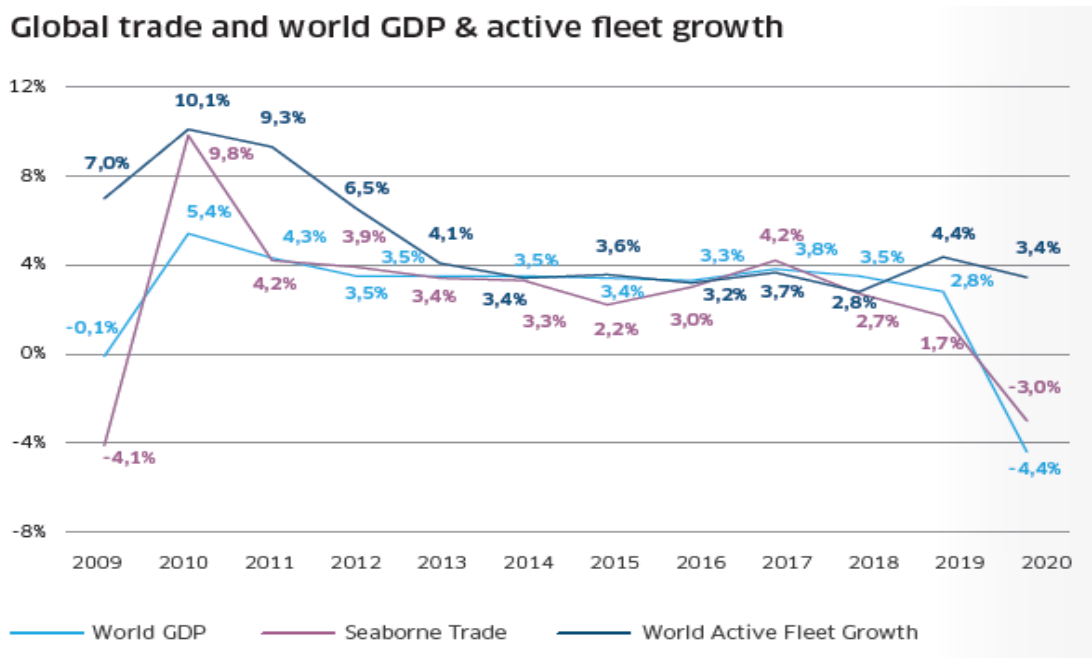


Figure 1. World GDP, Global Seaborne Trade and Global Active Fleet Growth (UNCTAD 2021a&b)

3. Assessment of Bangladesh Shipbuilding Industry

Indigenous shipbuilding industry of Bangladesh has a glorious history. Shipbuilding consider as an early industry developed in Bengal based on its traditional boats building (Alam 2004). Ibne Batuta came to Bengal in 14th century and went back with a wooden ship that built in a shipyard located at Sonargoan, Dhaka. Interestingly, Ibne Batuta’s ships has conserved in European Museums. European Traveler Mr. Caesar Frederick viewed that, Chottogram was the centre of building ocean-going ships during middle of the 15th century (Hossain et al. 2010a). In 17th century, “a fleet of ships was built for Sultan of Turkey at Chottogram. In Mughal period, Chottogram has manufactured a large number of warships for their Naval Force. The British Navy used wooden hull warships, built at Chottogram and was successfully deployed in Battle of Trafalgar in 1805. The wooden hull frigate Deutschland (1000 DWT) was built in Chottogram for German Navy in 1818” (Hossain et al. 2017). Conventional shipbuilding was labor intensive low-tech industry (Mohiuddin and Hossain, 2023). Early welded steel ships used steels with insufficient fracture toughness and suffered brittle fracture and structural cracks. Since 1950, high tensile strength and tough steel with good physical and chemical properties has been used ship construction. So modern steel used in shipbuilding has eliminated brittle fracture in ships construction process (Stopford

M 2009). Distinct beautification and work fineness has also found in modern shipbuilding. Today's shipbuilding needs a lot of automation and use line production manufacturing process, where a skilled workforce is a must.

Local shipbuilding industry has adequate strength and potential. However, Bangladesh has failed to keep pace with the continuous technological advancement of global shipbuilding due not to depict the weakness and threat of the local shipbuilding industry. Moreover, a few typical problems and challenges have created obstacle for the development of this sector (Hossain 2018c, Hossain 2023e). It has been anticipated that, if local shipbuilding can choose the appropriate and optimum type and size of ships and can capture tiny global market share and handle meticulously the weaknesses and threats, nation can develop a sustainable shipbuilding industry. Again, to become a sustainable ship-exporting nation after fulfilling local demand, we need to develop our shipbuilding with global standard. There is hundred of indigenous private shipyards are located all over Bangladesh. Those local shipyards are capable to construct and repair almost all types of inland and coastal ships and crafts. Few local shipyards are well reputed and possess good shipbuilding history. As an example, Highspeed Shipyard has 70 years of shipbuilding history. Again, few private shipyards have achieved international standard and are getting international new building order, and constructing small and medium ships for foreign buyers. Recently few local shipyards have attained the capacity to construct 10000 dwt merchant ships.

Very recent past few local private shipyards (ASSL, WMSL, KSY Ltd, and KSSL) have received orders from the foreign ship owners like Germany, Japan, Denmark, Netherlands, EC, Mozambique, India, and Nigeria. Various types of merchant ships have built successfully and handed to foreign owners by local Shipyards. There are three public shipyards (DEW Ltd, KSY Ltd and CDDL) in Bangladesh with magnificent shipbuilding history. However, after independence all those shipyards have declared as sick industry and laid-off due to poor management and same inherent problems like other public industries. Finally, those are handed over to BN and presently those are running successfully by BN management with same civil workforce. Bangladesh has hundred indigenous dockyards/shipyards around different location. These shipyards are operating principally under individual management, except three public shipyards are run by BN. Most of the local private shipyards use materials, plate, fitting, engine, component and machinery of old merchant ship which collect from ship recycling industry in Chattogram. There are versatile types and size of ships built in local shipyards and dockyards. There are four local shipyards as mention above is capable to build ships around 10000 dwt. We need to find out suitable market for local shipbuilding. Local shipbuilding also needs to face the challenges with suitable strategy to become a sustainable industry.

4. Suitable Shipbuilding Market for Bangladesh

Productivity of local shipbuilding labor is very poor, but average hourly labor wage is the cheapest in the globe. As a result, relative labor wage is the lowest in the world. Present government has taken some step and drafts a shipbuilding policy to improve the shipping and shipbuilding sector as a whole. Before implementing the policy, it needs to consider proper evaluation and uniform priority, so that both public and private shipyards get benefit equally from the policy. Previously shipbuilding cost in China was cheaper. But at present, due to their improved living standard, labor wages have increased. It has been predicted that, at future, China will leave a portion of their small and medium shipbuilding market share and that is the niche market for our local shipbuilding. World middle class society of Asia and Africa is flourishing in 21st century. At the same time, shipbuilding labor price of China has increased manifold in recent years. As a result, china is going to reduce their small and medium container, cargo, tanker, and multi-purpose ships market share very soon (Mordor Intelligence 2022). Here the opportunity has created for small commercial shipbuilding nations like Vietnam, Philippines, India, Bangladesh, Myanmar, Australia, Turkey, etc. Tentative size of global shipbuilding market is USD 200 billion, where small ship building market size is USD 20 billion (Business Research Company 2021). There is a serious demand of container ships in all size. UNCTAD, WB, WTO, and OECD have detected the high demand of container ships in future.

The small niche shipbuilding market is suitable for local shipbuilders. In near future, the world will need few thousand of merchant ships, where mostly are small to medium. Moreover, the existing single hall oil tanker fleet is going to be replaced soon as per IMO requirement. The niche market of small size containers, tanker, cargo, multipurpose and special types of ships with 3000-10000 dwt is suitable for local shipyards. Global renowned and bigger shipyards have less interest on this niche market. Bangladesh has all potential and capacity to capture this market with competitive price. Again, we need to develop our own merchant fleet to maintain export and import of cargo, oil, energy and passengers.

So, it is another niche market for us. The sea area of Bangladesh has enormous importance because it is the only way of direct connectivity to the rest of the world during the crisis with any of our neighbors. The constant presence of BN and BCG are imperative for keeping the sea lanes of communication secured and maintaining the sovereign rights over 118813 sq-km sea areas and economic benefit of the country. To avert any threat to national security by 'traditional' and 'non-traditional' means both the organizations remain vigilant by deploying naval ships and craft at sea. So, a good number of military ships are required for operational tasks both in peace and wartime. This is another suitable niche market for BN operated three public shipyards.

5. Potential and Strength of Local Shipbuilding

Bangladesh has all the necessary facilities to become an emerging shipbuilding nation in the globe by exploiting her glorious shipbuilding tradition and cheap labor in the maritime industry. The presence of indigenous shipyards and long shipbuilding practices with a large pool of young workforce is the main strength of local shipbuilding. The potential and strengths of Bangladesh shipbuilding have been described below.

- a. Cheap shipbuilding labor is the major strength of local shipbuilding. Bangladesh possesses the cheapest workforce in the world. Manual welding quality and local welders are better than those of China, Vietnam and the Philippine.
- b. Presently, local shipyards enjoyed sufficient support from backup industries or backward linkage with competitive prices. At the same time, local re-rolling factories produce various accessories for shipbuilders by using scraped, which come from Bhatiary break-yards. So, presence of various supporting industries is contributing as backward, and Forward Linkage Industries.
- c. Bangladesh being a maritime nation has magnificent shipbuilding history and that encourages local and foreign entrepreneurs to invest in this sector. Again, coastal area and river side of Bangladesh are geographically convenient for shipbuilding and other maritime activities (Hossain 2023j).
- d. There is a availability of white color semi skilled manpower like naval architect, marine engineer, electronics and IT engineer, management professional, in maritime field. A little training and skill development program will convert them human resource (Hossain 2023j).
- e. Availability of cost-effective human resources of whom a good number of skilled manpower are now working overseas. And Bangladeshi maritime workforces have proved themselves as disciplined, diligent, hard working, obedient and quick learner in international arena (in Japan, Korea, Middle East, Malaysia, etc). There are opportunities to have more employment in this sector. Country has abundance of easily trainable work-force. A little training can elevate the quality and competency of workforce into international standard. There is huge number of white color semi-skilled manpower is also available for any industry.
- f. Now huge number of technical institutes and vocational training centers are producing skilled manpower for heavy industries. Presently KSY, BN Dockyard, WMSL, KSSL, and ASSL are producing few thousand of skilled labours per year in different trade courses like, welders, cutters, painters, carpenter, blacksmith, foremen, mechanics, electrician, etc (Hossain 2021).
- g. There are huge numbers of SMEs are functioning and contributing distinctly to heavy industries like shipbuilding as backward and Forward Linkage Industries.
- h. The classification society is extending their support to guiding to develop quality of class certified shipbuilding and also certifying the material lists for export oriented shipbuilding. Germanischer Lloyd (GL), BV, and NKK are contributing and supporting to develop export shipbuilding.
- i. Present shipbuilding cost in China has increased further due to their improved standard of living. Careful comparison of prices of China and Bangladesh has been made and the price of Bangladesh has been found to be better and competitive. And this need continuous improvement, otherwise many cancellation of order may occur in recent recession. It has been predicted that, China will leave a portion of their small and medium shipbuilding market share in near future.
- j. Tax free activities for export oriented shipyards, ease of rules for shipbuilding, imposed tax on import ship, declare some development strategy for the local industry, dredging of rivers, and negotiating with related other sectors will definitely improve the local shipbuilding (Hossain 2021).
- k. The emerging shipbuilding industry will strengthen the export diversification strategy. Present government has taken some step and drafts a shipbuilding policy to improve the shipping and shipbuilding sector as a whole (Hossain 2023j).

l. Local shipbuilding has enough potential to capture a portion of the global market share and can earn mentionable foreign currency by building and exporting quality ships. Existing local shipyards of Bangladesh can manufacture quality ships at competitive prices. Moreover, there is a golden opportunity to flourish backup industries to support local shipbuilding. There is also a chance to grow back up and foreword linkage industries with foreign collaboration.

m. Present geopolitical situation and financial crisis may increase demand for low cost ships. This is an opportunity and is favorable for local shipbuilding. Shipbuilding may be a dominant foreign currency-earning sector within next few years and that is suitable for Bangladesh. Bangladesh has export-import imbalance and export deficiency. We need to explore potential sectors to balance deficiency. Shipbuilding may be the new opportunity. Because, there is an opportunity for access duty free market of ships, into developed countries (Hossain 20231).

n. There is an opportunity of FDI in shipbuilding sector. Country like China, Turkey, Netherlands are showing their keen interest in this sector. The foreign buyers especially in Western Countries (Europe and North America) have exhausted to China due to present geopolitical situation. They are searching new market and are imposing few mandatory requirements to using their own equipment in the ordered ships. It creates hope for LDC and developing countries like Bangladesh.

o. During the discussion with a focus group, few experts stated that Bangladesh is suitable for small and medium size shipbuilding. They viewed that Bangladesh have the opportunity to capture a handsome share of 3000-20000 dwt multipurpose, container, tanker, and cargo ships market. Those small and medium niche markets will be alive in the coming years (Hossain 2021).

p. The government, investors, shipbuilders, ship owners and related stakeholders are mostly understand that shipbuilding is a promising sector and that may be one of the alternative sector in replace of RGM in the near future (Hossain 20231).

6. Challenges and Limitations of Local Shipbuilding

Local shipbuilding has enormous potential to expand and capture a tiny global share, with few distinct weaknesses, and those need to be considered and converted into strengths to flourish this sector. The shipbuilding industry of Bangladesh failed to keep pace and consistency due to a lack of proper government, stakeholder, and private initiatives (Hossain 2021). This has ultimately caused of slow progress and failure to penetrate the international shipbuilding market. Existing and suspected weaknesses and future challenges have been described below:

a. Even with inheritance, Bangladesh shipbuilding found sluggish to keep pace and consistency with technological development. Due to the abundance of cheap labor, shipyard owners are reluctant to accept advance technology. Moreover, there is a distinct gap between industrial needs and the curriculum or syllabus of mass education system. The nation should concentrate more on technical education.

b. Policy planners, bureaucrats, bankers, and other stakeholders are generally less aware of local shipbuilding potential. To progress the shipbuilding, the country need to nurture this sector same as RGM. At the same time, local bank interest and service charges are still high. Again, shipbuilding requires bank guarantees as per the choice of foreign buyers. So, local commercial banks need counter guarantees from foreign banks. This incurs additional costs in local shipbuilding (Hossain 20231).

c. Private shipyards lack of corporate culture as those are managed by family members. They capture all the key and top appointments and create an unhealthy business environment. Local shipyards are operated by their desire and aspirations. As a result, employees don't feel belong to the organization. Again, the key weakness of the local industry is the dishonesty and fraud character of our people. We are usually tried to cheat and earn illegal profit in an unethical way.

d. Most of the local shipyards are located in and around Dhaka, which is far away from the coastal area and that restrict size of ships production. Again, weak infrastructure, deficiency in energy supply, insufficient land, poor EODB, and other facilities are a few hindrances for rapid development of local shipbuilding.

e. Prime raw materials like, class plate, machinery, equipment and accessory of local shipbuilding industry are import-based. So, local shipbuilding is highly dependent on foreign countries and that incur additional cost. For example, Bangladesh is not producing class approved MS plate, frame, girder, stiffener, longitudinal, etc; which are essential for export-oriented shipbuilding.

f. Local shipbuilding lacks of technical expertise on modern technology and government financial support to meet incoming 4IR and that will be the main hindrance for sustainable development. The

technology used in local shipbuilding is still rudimentary. There is distinct lacks in efficiency, technological, managerial and labour skill. Most of the local shipyards lack of modern shipbuilding tools and machineries. Moreover, there is a shortage of expert machine and digital/AI operators. Still, Bangladesh has lack of ship design expertise and we are depending on foreign support (Hossain 2023j).

g. Shipbuilding requires guarantees to be issued by banks acceptable to foreign buyers. But local commercial banks have to obtain counter guarantees from foreign banks. This incurs additional cost in local shipbuilding. For example, commission for opening import LC, counter bank guarantee and other mark up in local shipbuilding incur additional costs and fail to make export-oriented shipbuilding more competitive with its competitors like China, Korea, Japan, Vietnam, Philippines, India, Australia, etc. Moreover, productivity expansion and export promotion are being impeded due to lack of required capital and sound investment (Hossain 2023i).

h. Poor management practices observed in most of the local shipyards. Family member are running local shipyards as per their desire and aspiration. They hold all the key and top appointments and treated employees a primitive mentality. As a result, there are distinct gap between shipyard owners and employees, which creates an unfriendly business environment in local shipyards. So, due to poor management culture employees have poor job satisfaction and not motivated to organization. As a result, lack of discipline, huge absenteeism, and poor turnover of skilled manpower are common phenomena in local shipyards.

i. Shipbuilding industry is not well understood by local investor and policymaker; as a result the usual responses to such investment proposal are lukewarm and not treated as booming sector. Thus banking support that the shipbuilding sector enjoys in the current policy is not sufficient. Again, there is a risk of shipbuilding business both for the entrepreneurs and for bankers. Moreover, local commercial banks are shy to deal with big investment individually; but that is essential for shipbuilding (Hossain 2023j).

j. The technology used in local shipbuilding is still rudimentary. There is distinct lacks in efficiency, technological, managerial and labor skill. Most of the local shipyards lack of modern shipbuilding tools and machineries. At the same time, there is a shortage of expert machine and digital/AI operators. Moreover, at present Bangladesh is not working in the field of ship design and that create dependency to foreign support (Hossain 2021).

k. Many countries like Vietnam, Philippine, Indonesia, India, Brazil, etc are also trying to capture the surplus and niche shipbuilding market and that is a viable threat for local shipbuilding. As per market analysis, today new ship demand or Compound Annual Growth Rate (CAGR) is increasing at a rate of around 4%. Theoretically there is formidable threat and risk for the newcomers and investors in this sector.

l. There are lack of information, motivation and business promotion for prospective foreign buyers. Little image crisis and obstacle in EODB discourage FDI in shipbuilding and local export oriented shipyards performance need to improve. Bangladesh ambassadors in different foreign mission need to do more in this matter. We may have little wrong attitude and have little integrity problem. At the same time, we have unfriendly and negative attitude to expansion on heavy industry like shipbuilding (Hossain 2021).

m. The world is passing through economic recession due to post COVID-19 situation and severe geopolitical crisis (Russian and Ukraine crisis). Shipping and shipbuilding of the world are affected from present recession and that result cancellation of orders and slow down the global business (Hossain 2023i).

n. The draught restricted in rivers (maximum 4m) limit the size of ship built in local shipyards. It is very difficult to maintain navigable draft in the river/channel for navigability of ships due to huge siltation. Again bridges and overhead cables also induce additional restriction to the ship size built in shipyards. A minimum 22 meters air draft over high water (monsoon) needs to be maintained for major rivers.

o. Shipbuilding industry needs a lot of machinery, equipment, components, spare-parts, and accessories and that lead to emergency import during the construction period. Present existing roles and facilities are not so adequate for emergency import requirements. Under the present global situation, import policy and foreign currency regulation, create unwanted complicacy and delay the delivery of import of ships items (Hossain 2023i). Finally whole export/import process delays the production and that demoralize foreign buyers.

p. Poor training facilities of the technical personnel observed in almost all local shipyards. Most of the local shipyards' owner considers that, every human resource development programmed as money drain not gains (Hossain 2023j). At the same time, there is a lack of mechanism for proper formulation, implementation, monitoring and updating export oriented local shipbuilding policy and strategy.

7. Analysis of Present and Future Challenges of Local Shipbuilding

Local private shipyards are very reluctant to introduce corporate management culture. Family members occupy the important managerial appointment. Such family management culture is one of the hindrances for development of shipbuilding. For example ASSL, has failed to continue their success in ship export business due to family management culture (Hossain, 2023j). Local shipyards have negative attitude and are very reluctant to improve quality, health, safety, and environmental (QHSE) aspects. Government pressure, foreign buyers' demand, together with awareness and training program on QHSE aspects may develop local shipyards to international standard. People need to change the attitude as 'get rich quickest way possible'. We need focus on sustainable development and happiness (Hossain, 2023l).

For example, WMSL has failed to continue their success in ship export due to their investment in other business aside shipbuilding, where they don't have enough expertise. Additional financial cost of local Shipbuilding is about 10 to 20% and that is higher than the other competing nations (China, Korea, Japan, India, and Vietnam). High price and uneven electricity and gas supply with other poor infrastructure are major obstruction for smooth development of shipbuilding industry. Relatively poor state diplomacy, country image and insufficient activities to promote local shipbuilding are creating obstacle to growth export shipbuilding. Local shipbuilding is still at a vulnerable stage; need so many things to do, to sustainable development and achieve international standard. If this sector get same facilities as given to RMG, the net benefit will be better than that of RMG.

Ocean and shipping is the livelihood of global trade, where technology has placed at core of the strategy since the inception of ship and shipping, which observed the previous three industrial revolutions. Likewise, there will be huge impact on the maritime industry during incoming 4th IR (4IR) or Industry 4.0 and future ships will be controlled by Artificial Intelligence (AI), IoT, or automated systems. Modern technology will steadily reduce seafarers in shipping due to unmanned ship and AI. "The 4IR is anticipated to reach at the peak around the middle of the 21st century and bring disruptive changes by exploring and implementing new technology in all spheres of trade and shipping to create safer, efficient, greener, and viable solution. The technologies like Robotics, AI, Machine Learning, IoT, Blockchain, Drones, and Augmented Reality (AR) are going to change the equation of the job sectors and give a new dimension of maritime industry" (Hossain, 2023k).

To overcome the present situation and future complexity few measures need may be adopted by government, maritime administration, shipyards, ship-owners, MET and technical institutes. We need to take necessary preparation to fulfill the demands of 4IR. The policy, strategy, context and learning process in the mass and technical/MET education need to be formulated accordingly to develop the skills and knowledge for new generation. There may be skill development program for seafarers and shipbuilding workforce to meet the future challenges. Such program are: communication and coordination, QHSE, adaptability and cognitive flexibility, automation and AI, digital proficiency, innovation and creativity, critical thinking, emotional intelligence, technical skills, self learning (on-line), data-based decision, people management and negotiation, complex problem-solving skill, service orientation, etc, (WTO, 2021). we have the strategic vision to adapt with disruptive changes in 4IR but the main obstacle in this transformation is poor motivation of employees due to fear of losing jobs, unawareness and rigidity in old style of work (Hossain 2023m).

In the recent time, the impact of 4IR or Industry 4.0 has been discussed everywhere. The first industrial revolution introduced water and steam-powered mechanical manufacturing. "The second industrial revolution brought electrically powered mass production system and the third industrial revolution introduced electronic and information technology (IT) for achieving automation in manufacturing process" (Wikipedia 2022). On the other hand, "the incoming 4IR leads to the complex use of digitization, combining the cyber world with the physical world by including AI, IoT, big data analytics, cloud computing, virtual and augmented reality, simulation, human-machine interaction, 3D printing, advanced materials technology, etc" (Hossain, 2023k and Kobylinski 2018). The main goal of 4IR is intelligent shipyard which is characterized not only by adaptability, resource efficiency and ergonomics but also close integration among all stakeholders (Andi Reni et al 2020 and Hossain, 2023m).

8. Conclusion

High labor cost countries always have lost its global shipbuilding market share, during the removal of state subsidies, even strong domestic policies failed to provide enough support. The British, USA and European Countries' shipbuilding is the prime example of this (Stopford M 2009). The market share of USA and European shipbuilders began to decline in the 1960s and their production is now primarily on military, and few special ships like, cruise liners or pleasure Yacht. Today China is a global shipbuilding leader with around 45% of global share. Their shipbuilding quality and technology have improved significantly and they have earned the confidence of global customers. South Korea and Japan is following China securing second and third position in the global market with 25% and 20% share respectively (Hossain K 2021, UNCTAD 2021). Cheap labor alone cannot be the only factor for the sustainable development of shipbuilding. Nowadays advanced technology can save costs and there is a chance to lose our competitiveness, if we rely only on labor costs. Bangladesh can make huge economic progress by properly nourishing and utilizing our export-oriented shipbuilding industry. Entrepreneurs are also confident about the good prospects of the local shipbuilding industry. Bangladesh is taking advantage of its long history of maritime activity, favorable geographical location, and availability of cheap workforce. 'Export-oriented shipbuilding is truly a global industry.

Bangladeshi-made ships of international standard are roughly 10%-30% less costly than ships made in Japan, Korea, China even Vietnam or India'. Recently the opportunity of FDI has been created in the shipbuilding sector. A country like China, Turkey, Netherlands are showing their keen interest in this sector. So the creation of an export shipyard zone or air-marking a special zone for export shipbuilding can positively help to develop healthy growth of shipbuilding industry in Bangladesh. Small and medium-sized containers, tankers, cargo, and multipurpose ships with around 3000-10000 DWT are suitable for Bangladesh. There is a serious demand for container ships of all sizes. The old single-hall tanker fleet will be replaced immediately as per IMO requirements. Bangladesh has all the potential and capacity to capture this niche market at a competitive price. Previously shipbuilding cost in China was cheaper. But at present, their standard of living has improved and their labor wages have also been increased. So, Bangladesh remains in an advantageous position in this aspect. It has been predicted that, at the future, China will leave a portion of its small and medium shipbuilding market share. Bangladesh has all the potential and capacity to get 2% of global market share within 2030 and the worth value will be USD 4 billion.

References

- Alam Commodore M K., Bangladesh Maritime Challenges in the 21st Century, Dhaka Pathak Shamabesh Publication, 2004, accessed on 31 Jul 2023
- Allied Market Research, (2022), Shipbuilding market by types and end-use, available at: <https://www.alliedmarketresearch.com/shipbuilding-market>, (Accessed on 29 Jun 2022), accessed on 31 Jul 2023
- Andi Reni et al, (2020), Maritime Technology and the Industrial Revolution. Journal of Environmental Treatment Techniques, pp 210-213, Volume 8, Issue 1, Feb 2020, accessed on 30 Jul 2023
- Bizvibe Blog, (2022), Top ten Shipbuilding Company, Mar 2022, available at: <https://blog.bizvibe.com/blog/top-shipbuilding-companies-world>, accessed on 30 Jul 2023
- Bearingpoint, (2022), Industry 4.0 and IoT Insight, Jan 2022, available at: <https://www.bearingpoint.com/en/insights-events/insights/industry-4-0-and-iot-insight>, accessed on 30 Jul 2023
- Blacksmith International, (2022), Global supply chain, available at: <https://blacksmithint.com>, accessed on 30 Jul 2023
- Business Research Company, (2021), Shipbuilding global market report 2021, Jan 2021, available at: <https://menafn.com/1102455116/The-Shipbuilding-Industry-Takes-On-3D-Printing-Technology-As-A-Latest-Trend>, accessed on 30 Jul 2023
- Banglapedia, (2011), Ship Building Industry, The National Encyclopedia in English, Banglapedia Trust, available at: https://en.banglapedia.org/index.php?title=Ship_Building_Industry, accessed on 28 Jul 2023
- Clarksons Research, (2015), World Shipyard Monitor, July 2015 accessed on 30 Jul 2023
- Clarksons Research, (2021a), Container Intelligence Monthly, Volume-23, No-6, June 2021.
- Clarksons Research, (2021b), Shipping Review Outlook, June 2021, accessed on 30 Jul 2023

- IMF, (2021), Equity and defeating the pandemic, 1 June 2021, available at: <https://www.imf.org/en/Home> (Accessed on 26 Jul 2022), accessed on 30 Jul 2023
- Global Maritimehub, (2020), Future changes in the shipbuilding market, Jan 2021, available at: <https://globalmaritimehub.com/report-presentation/future-changes-in-the-shipbuildingmarket>, accessed on 31 Jul 2023
- Hossain et al, (2010), SWOT analysis of shipbuilding industries in Bangladesh and its challenges to become a potential ship exporting nation, *Journal of Ship Technology India*, Volume 6, Issue 2, July 2010, accessed on 31 Jul 2023
- Hossain K A, (2015), Leadership qualities for 21st century leaders, *Journal of Management, Social Science and Humanities*, Published on 19 May 2015, available at: <http://pearlresearchjournals.org/journals/pjmssh/archive.html>, accessed on 31 Jul 2023
- Hossain et al, (2017), A Study of global shipbuilding growth trend and future forecast, *Procedia Engineering*, Elsevier, Jul 2017, available at: <https://www.sciencedirect.com/science/article/pii/S1877705817332927>, accessed on 31 Jul 2023
- Hossain K A, (2018a), SWOT analysis of China shipbuilding industry in the third eyes, *Journal of Recent Advancement of Petrochemical Science*, Volume 4, Issue 2, 22 Jan 2018, available at: <https://juniperpublishers.com/rapsci/pdf/RAPSCI.MS.ID.555632.pdf>, accessed on 31 Jul 2023
- Hossain K A, (2018b), Analysis of important steering factors which give success to global shipbuilding leaders, *Journal of Recent Advancement of Petrochemical Science*, Volume 4, Issue 5, 10 Apr 2018, available at: <https://juniperpublishers.com/rapsci/pdf>, accessed on 31 Jul 2023
- Hossain K A, (2018c), Proposed viable ship recycling process for South East Asian recycling yards specially for Bangladesh, *Procedia Engineering*, Elsevier, Published on 27-07-2018, available at: https://www.mtc-utm.my/wp-content/uploads/MARTEC_2018_Paper/I2.pdf, accessed on 29 Jul 2023
- Hossain K A, (2021) Strength Weakness Opportunity, Threat (SWOT) analysis of Bangladesh shipbuilding industry, Technical Paper: NAME, MIST, 16 Dec 2021, available at: <https://www.mist.ac.bd/storage/files/name/TECHNICAL>, accessed on 31 Jul 2023
- Hossain K A, (2023a), Tale of LNG and LPG Ships, *Global Scientific Journals (GSJ)*, Vol 11, Issue 6, June 2023, ISSN 2320-9186, accessed on 31 Jul 2023
- Hossain K A, (2023b), Tale of Buik Ships, *Global Scientific Journals (GSJ)*, Vol11, Issue 6, June 2023, ISSN 2320-9186, accessed on 31 Jul 2023
- Hossain K A, (2023c), Tale of Container Ship, *Journal of Software Engineering and Simulation*, *Quest Journals* 9 (7), page: 48-61, accessed on 13 Aug 2023
- Hossain K A, (2023d), Evaluation of global and local ship designing software trend and way forward, *Global Scientific Journals (GSJ)*, Vol 11, Issue 5, May 2023, ISSN 2320-9186, accessed on 13 Aug 2023
- Hossain K A, (2023e), Analysis of present global ship recycling status and challenges for Bangladesh, *Global Scientific Journals (GSJ)*, Vol 11, Issue 4, April 2023, ISSN 2320-9186. accessed on 13 Aug 2023
- Hossain K A, (2023f), Technological advancement and future of warship building, *International Journal of Research and Development (IJNRD)*, Vol 8, Issue 5, May 2023, ISSN 2456-4184, accessed on 13 Aug 2023
- Hossain K A, (2023g), An overview of merchant ships, *International Journal of Research and Development (IJNRD)*, Vol 8, Issue 6, June 2023, ISSN 2456-4184, accessed on 13 Aug 2023
- Hossain K A, (2023h), An Overview of Naval Ships, *Scientific Research Journal (SCIRJ)* 11 (6), ISSN: 2201-2796, June 2023, accessed on 15 Aug 2023
- Hossain K A, (2023i), Analysis of development trend of ship designing software and future of ship design, *American Journal of Engineering Research (AJER)*, Vol 12, Issue 6, June 2023, ISSN 2120-0847, accessed on 13 Aug 2023
- Hossain K A, (2023j), Evaluation of local industry of Bangladesh including shipbuilding, *Global Scientific Journals (GSJ)*, Vol 11, Issue 6, June 2023, ISSN 2320-9186, accessed on 31 Jul 2023
- Hossain K A, (2023k), Evaluation of Influence of Internet of Things (IOT) Technologies and Devices in 21 Century, *Scientific Research Journal* 11 (7), accessed on 14 Aug 2023
- Hossain K A, (2023l), SWOT Analysis of Shipbuilding Industry of Bangladesh, *Science Publication Group (Science PG)* 4 (3), accessed on 14 Aug 2023
- Hossain K A, (2023m), Evaluation of Influence of Artificial Intelligence (AI) on Technologies in 21st Century, *Journal of Electronics and Communication Engineering Research*, *Quest Journal*, accessed on 15 Aug 2023

- IMO, (2021), Report of the Maritime Safety Committee on its 103rd session, MSC 103/21, London, 25 May 2021, accessed on 30 Jul 2023
- IMO, (2021), Guidelines on maritime cyber risk management, MSC-FAL 1/Circ.3/Rev 1, London, 14 June 2021, accessed on 30 Jul 2023
- IHS Markit, (2022), Maritime and trade research and analysis, Feb 2022, available at: <https://ihsmarkit.com/research-analysis/shipbuilding>, accessed on 30 Jul 2023
- IHS Fairplay, (2022), largest maritime database in the world, evolved from the Lloyd's Register of Ships, available at: <http://www.acml-egypt.com/Fairplay.html>, accessed on 30 Jul 2023
- Lixing Z, (2009), Development oriented finance and economy in China: A historical review and prognostic assessment, Printed in Bloomington, Indiana, USA, July 2009, accessed on 30 Jul 2023
- MSc Thesis, (2010), Evaluation of potential prospect and challenge of Bangladeshi shipbuilding in light of global contest by khandakar Akhter Hossain, Dept of NAME, BUET, 10 Jan 2010, available at: <https://docplayer.net/64761793-Khandakar-akhter-hossain.html>, accessed on 30 Jul 2023
- Michael D, (2010), China: A modern history, I B Tauris and Co Ltd, London, UK, May 2010, accessed on 30 Jul 2023
- Mordor Intelligence, (2022), Shipbuilding market growth, trends, COVID-19 impact, and forecasts 2022-2027, available at: <https://www.mordorintelligence.com/industry-reports/ship-building-market>, accessed on 30 Jul 2023
- Mohiuddin G, and Hossain K A, (2023), Evaluation of present ship recycling scenario and opportunity for Bangladesh, Journal of Environment and Analytical Toxicology (JEAT), Vol 13, Issue 4, April 2023, ISSN 2161-0525, accessed on 16 Aug 2023
- Noordstrand A, (2018), Experience with robotic underwater hull cleaning in Dutch Ports, Hull PIC 18 (pp 4-9), Redworth, 3rd Hull Performance and Insight Conference, Jun 2018, accessed on 17 Aug 2023
- OECD, (2011), International trade and capital movements in OECD, 11 Mar 2011, available at: <http://www.theworldeconomy.org/advances>, accessed on 17 Aug 2023
- OECD, (2021), Shipbuilding market development, May 2021, available at: <http://www.oecd.org/sti/ind/shipbuilding-market-developments>, accessed on 17 Aug 2023
- Researchgate, (2022), Comparison of shipbuilding productivity, Feb 2022, available at: https://www.researchgate.net/figure/Comparison-of-Japanes-shipbuilding-productivity-and-labor-costs-2-Slika-1-Usporedba_fig1_277843837, accessed on 17 Aug 2023
- Strotmann H, (2007), Entrepreneurial survival, Small Bus Econ, Vol 28, 12 Apr 2007, accessed on 17 Aug 2023
- Stopford M, (2009), Maritime Economics, Routledge, New York, USA, Nov 2009, accessed on 17 Aug 2023
- Seaweb ships, (2022), The ultimate maritime reference tools, available at: <https://maritime.ihs.com/EntitlementPortal/Home/Information/Seaweb>, accessed on 17 Aug 2023
- UNCTAD, (2020), The COVID-19 Crisis: Accentuating the need to bridge digital divides, Digital Economy Update, UNCTAD/DTL/INF/2020/1, Apr 2020, available at: <https://unctad.org/system/files/official-document>, accessed on 17 Aug 2023
- UNCTAD, (2021a), Ship recycling by countries annual, available at: <http://stats.unctad.org/shiprecycling>, accessed on 17 Aug 2023
- UNCTAD, (2021b), Trade and Development Report 2021, available at: <https://unctad.org/webflyer/trade-and-development-report-2021>, accessed on 17 Aug 2023
- WTO, (2021), World trade primed for strong but uneven recovery after COVID-19 pandemic shock, World Trade Organization Press/876, 31 March 2021, accessed on 17 Aug 2023
- Wikipedia, (2022), 4th Industrial Revolution, 4IR or Industry 4.0, Feb 2022, available at: https://en.wikipedia.org/wiki/Fourth_Industrial_Revolution, accessed on 17 Aug 2023
- Zakaria N M G et al, (2012), Underlying problem of ship recycling industries of Bangladesh, Journal of Naval Architecture and Marine Engineering, Published on 13 Nov 2012, accessed on 17 Aug 2023

Author Biography: Commodore Khandakar Akhter Hossain, (E), NUP, ndc, psc, PhD, BN, join BN as cadet in 1988 and got commission in engineering branch and is working last 35 years with excellent reputation in home and abroad. He did his B Sc and M Sc Engineering in naval architecture and marine engineering with distinct result (1st Class 1st) from Bangladesh University of Engineering and Technology (BUET). He did his PhD both from California, USA (on advanced technology and engineering management) and from BUET (on ship recycling assessment model). He successfully works as Managing

Director (MD) in all three shipyards/dockyards run by BN (Khulna Shipyard Ltd, Dockyard and Engineering Works Ltd, Chittagong Dry Dock Ltd) and has contributed national shipbuilding industry. He has served as Head and Dean of NAME/ME Dept in MIST. He is a fellow of three prestigious institutes named as IEB (BD), RINA (UK) and IAMSP (USA). He has around hundred international publications/papers in different national and international technical journals. Presently he is serving as Commodore Superintendent Dockyard and chairman BN Dockyard Technical Institute at Chattogram.