

## **Enhancing Competencies of Shipbuilding Employees in Bangladesh: Effect of Training and Development**

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**Abstract:** Shipbuilding was once a flourishing trade along the coast of Bengal 400 years ago. Countries flocked to her shipyards to get the best wooden commercial and military ships available at the time. However, with the advent of the industrial revolution, the shipbuilders of Bengal lagged behind in the fabrication of the primary new construction material that was sweeping the world, namely steel. As a result of this lack of skill, Bengal rapidly lost her position amongst the great shipbuilders in the world. Today, Bangladesh has resumed the process of inheriting that lost heritage of shipbuilding. Being a young shipbuilding country of only 2 decades, Bangladesh has already started making ripples in the international shipbuilding market by fetching handsome orders from as far away as Europe and Africa. The prospects for future growth, based on industry analysis of the key forecasting variables, can only be labelled as positive. However, a lack of skilled shipbuilding personnel is hindering Bangladesh's chances in the global industry. This policy paper has presented numerous recommendations spanning the provision of 'specialised training to foster the development of local human resource' to 'recruitment of foreign skilled personnel' as means for supplying the local demand for skills. Additionally, joint industry action in areas such as training centres, university course development and labour supply forecasting has been promoted.

**Keywords:** Shipbuilding, Skill Development, Local Human Resource Development, Training, Joint Industry Action, Strategic Employee Plan.

### **INTRODUCTION**

Shipping in Bangladesh is a booming industry. Since the inception of the country's first modern shipyards in the late 1950s, and with new technology transfers since the early 2010s, the country's shipbuilding industry hasn't looked back. Today Bangladeshi shipbuilders have earned the reputation of being capable shipbuilders of up to 10,000 DWT ships. Internationally, Bangladesh enjoys the reputation of being a low-cost shipbuilder. When compared to Chinese, Korean or Japanese ships, Bangladeshi produced ships are between 10-30% cheaper when it comes to price. The benefits that Bangladeshi shipbuilders enjoy is from the fact that production in Bangladesh is cheaper, despite this phenomenon are perhaps the biggest advantage.

The developed world has recently started to favour the construction of very large ships over smaller vessels of less than 25,000 DWT. The reason for this lies in operational costs and overall profitability, with warships being an exception. As a result, there is a gap in the industry that has been made due to this trend. Bangladesh is in a prime position to exploit this opportunity. Bangladesh's huge, and more importantly active, young population is a major resource for the country. There are hundreds of thousands of people

involved in the trades such as welding, electronics, engineering, metal forging and other associated areas. This is a boon for any manufacturing industry.

However, Bangladesh lacks advanced engineering skills, such as advanced in-house designing capabilities, and advanced machining capabilities. These trends, despite being a long-standing problem for Bangladeshi shipbuilding, are yet to be addressed firmly through industry/government action. The problem arises for a number of reasons. Firstly, maritime subjects have not been a fashionable area of study for local college graduates. This is because the shipbuilding industry in Bangladesh has not been a viable career option for students, until now. As a result, the vast number of students in the last two decades preferred electronics and traditional mechanical engineering over maritime subjects such as naval engineering. Additionally, the vast majority of Bangladeshi universities have not opened up their classes to advanced technical oriented maritime subjects either, something they continue to do until this day. None of the major national universities, both private and public, have endorsed naval engineering as a viable study option for the country's college graduates through advertising and/or other means.

## LITERATURE REVIEW

Chakraborty [1] stated that shipbuilding is a complex engineering process due to the fact that the process is "a conglomeration of inputs by professionals spanning a wide range of specialization." It has been further stated that despite the advent of procedural technological aids, which have helped to make the process of designing and constructing ships easier, the key to effective shipbuilding still lay in the "adequacy in quantity and quality of skilled manpower."

According to Greene [2], the lack of skilled essential shipbuilding personnel is a phenomenon that might severely affect Australian shipbuilders in the near future. These comments were made with reference to Australia's new push for an overhaul for the Australian navy. Despite the commitment of more than AUD 1 billion worth of upgrades to Australia's dockyards in South Australia in preparation for the building of new ships, a government report has identified that essential shipping skills are missing and that thousands of foreign workers would be required to fill this gap. Greene [2] has reported that as part of the plan, foreign workers would be attracted through state-sponsored advertising.

However, it has also been stated according to the Naval Shipbuilding Plan published in 2017 by the Australian Department of Defence that over time the need for foreign workers skilled operating for Australian shipyards will be reduced as Australian workers become more skilled and learn the construction techniques and specialised skills. According to Dunk [3], the Australian government has decided to spend AUD 89 billion to overhaul the navy's capability, with new ships. The author stated that the Australian government has prioritised the development of sovereign shipbuilding capability as a national priority through this project. Hence, it may be seen that despite the requirement for foreign workers to fill temporary

gaps, the end goal is the development of sovereign shipbuilding capability.

Additionally, the Australian Defence Teaming Centre chief executive Margot Forster has stated that the on/off nature of the shipbuilding industry in Australia has meant that skilled persons have left the industry once projects were completed. According to Foster, "...we have suffered from is (*skilled workers*) coming into these programs, learning the skills, delivering quality products and then having to dismantle the workforce because there isn't a follow-on project," Greene [2].

Davies [4] reported on the issue of continuous project turnover to keep skilled shipbuilding crews employed with the industry. According to the author, the 'Valley of Death' is a term used to define a situation when there is no shipbuilding workaround to keep employees on the company's payroll, resulting in employees being sacked offseason. The author also stated, referring to statistics presented by the RAND Corporation, that there is a link between the productivity of shipbuilding crews and their years of experience on the dockyard. According to Davies [4], "...a brand new worker is less than one-third as productive as a ten-year veteran." Additionally, this also means that firing experienced employees when contracts are fulfilled and rehiring new employees when new contracts are signed means that productivity will suffer. To make an example of this, Davies [4] pointed to the case of the shipyards in Australia who performed exceptionally well during the construction of the Anzac class frigates in the 1990s, however, due to manpower limitations suffered delays in the construction of the latest generation of ships. This goes to show that once trained, employees need to be kept within the company, or even industry, as skilled employees once lost can lead to direct, or more likely, indirect project cost overruns at a later date.

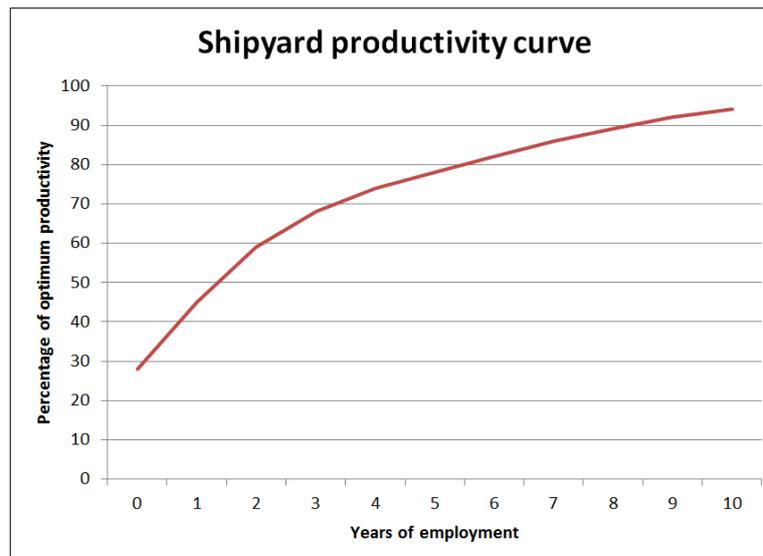


Fig-1: Shipyard productivity curve, presented by RAND Corporation, source: Davies [4]

Ergas [5] also commented on the same topic in a report for the Australian National Strategic Institute. The author stated that any initiative to bridge production gaps to maintain workforce continuity should be assessed through cost-benefit analyses. The author suggested that maintaining essential shipbuilding crews on the company's employee roster may be pursued using a range of options. For example, it has been suggested that in order to retain experienced shipbuilders, the company could make a capacity payment to this crews to keep them intact with the company. Additionally, it has also been suggested that those employees with experience and skills could be given certifications, with the net result being that those employees with certification being paid higher wages/salaries on subsequent shipbuilding projects in that company.

### Research Gap

This study has been developed to highlight policies, strategies and tactics that might be utilised to address the shortfall of skilled shipbuilding employees in Bangladesh. The study has presented a qualitative solution to the problem and has sought to introduce industry collaboration on training and development as an essential process for addressing the needs to the Bangladeshi shipbuilding industry. Previously, no major academic solution has been attempted on this matter from this perspective, i.e. joint action from industry members.

### Enhancing Critical Skills and Competencies

Bangladesh lacks sophisticated personnel in areas such as in-house ship designing and machining, such as advanced manufacturing computer numeric control (CNC). Today Bangladesh does not fully employ the standard set of shipbuilding personnel classifications that other shipbuilding industries in

foreign countries employ. Instead Bangladesh employs a modified system of employee classifications based on convenience. Engineers not traditionally trained in shipbuilding have taken up the task of naval engineers. Usually, naval engineers will perform industry-specific tasks starting from the beginning of the project to the very end. Initial tasks will involve conducting studies about hydrostatics and hydrodynamics, flotation and stability, safety values, and lifecycle of the entire structure or the onboard systems and installations.

Chakraborty [1] laid out the different types of skilled personnel required at shipyards. The following lists these key skills and personnel:

**(a) Welders:** Welders are at the forefront of ship construction, as they are directly responsible for welding together the various pieces of metals that eventually become part of the ship's hull plates, frames, girders, tanks, foundations, pipes, etc. The welder's skill directly has an influence on the cycle time of the project as well, with good welders completing projects in record time. For this purpose, various shipyards will have training cells within their premises to train welders in this most essential skill. Maritime welding is completely different to welding in other industries, as the quality of the weld could make or break a ship. Various welding methods such as MIG welding, TIG welding, Arc Welding, etc. are used in the shipping industry. Certified welders are very sought after in the industry, as their welds are very high quality and long-lasting.

**(b) Structural Fabricators and Structural Fitters:** These are essential skills in the shipyard as well. The structural fabricator is responsible for fabricating ship components from the engineering drawings and designs produced by designers. The key here is to successfully

read and understand engineering drawings in order to accurately convert them into metal components, each of which may be huge in size. The structural fabricator must be capable of fabricating with a wide range of metal plates, sheets, pipes and rods in order to render accurate reproductions. Additionally, tolerances must be carefully integrated and respected in all stages of production, otherwise, the ship components will not match each other's specifications and fail to fit into each other. The Structural Fitter is another cadre of the skilled technician at the shipyard who is responsible for fitting machined components into the body of the ship, which is a more technologically complicated task.

**(c) Plumbing Technicians:** Plumbing is an exceedingly important aspect of a ship. The skilled plumbing technician at the shipyard will need to possess detailed knowledge on how to read and interpret isometric piping drawings. For this, plumbers will require the working knowledge of Plumbing and Instrumentation Drawings or P&IDs. The different components of plumbing also require detailed knowledge of items such as valves, flanges, pressure gauges, etc. At professional shipyards, plumbing is taken very seriously, and only board certified, and course passed plumbers will be allowed to work on ships.

**(d) Electrical Technicians:** The electrical technician is another indispensable skilled worker at the shipyard, as they are tasked with installing all electrical and electronic equipment on board the ship. As with the other cadres of workers thus identified, the electricians also need to be able to read complex technical drawings produced as part of the ship's designs. On top of laying cables, the electrician will also install "all the electrical and electronic equipment, navigational equipment in the bridge and radar, lighting, control panels, main electrical control room panels, etc.," Chakraborty [1]. Additionally, the electricians will be very active as part of the maintenance crews of already built and running ships.

**(e) Riggers:** Riggers carry out very crucial tasks at the shipyards. They are tasked with a movement of heavy structures to and from positions within the shipyard. They are also involved in scaffolding activities as well as lifting and shifting of weight structures. The riggers are experts in working cranes to move things. They are also trained in using hand signals to communicate within themselves during complex lifting operations, in high noise environments.

**(f) Quality Control Inspectors:** This is a very technical cadre of shipbuilding crew. Quality control inspectors are responsible for ensuring that ship components are as per specification, or design drawings. The quality control inspector, therefore, requires a sound knowledge of reading complex engineering drawings, as the task requires comparison

of produced components with engineering designs. The quality control inspector also checks all the welds on the ship to ensure their integrity. Because of this important task, quality control inspectors are highly trained, highly skilled and highly experienced individuals who are usually veteran shipbuilders themselves. They also require very high level of industry certification.

**(g) Supervisors:** The shipbuilding yard will usually employ multiple individuals as supervisors. The supervisors are chosen from amongst the most skilled and experienced people from each department. Rigging, plumbing, fabricating, fitting, etc. will all have their individual supervisors. Additionally, if the ship is a large one, and the parts of the ship are being produced in separate pieces, then each part will have separate supervisors for each of the above-mentioned departments mentioned.

**(h) Marine Surveyors:** Multinational shipbuilding giant IDC Consorzio Engineering lists these nine essential services required of naval architects from the shipbuilding industry, 9 essential services (n.d.):

1. *Development of concept Design and Feed:* determining among other things- ship type, deadweight, type of propulsion, service speed and minimising service life cost.
2. *Development of basic Design:* defining compartment configuration, preliminary body plan, stability, carrying capacity, piping systems, propulsion power, and most importantly cost.
3. *Generation of Detailed Designs:* determining and development of 3D Drawings, blueprints and list of materials. Elements included in the detailed designs are information pertaining to the structure, machinery, electrical, and workshop drawings.
4. *Performing of Static Analysis:* ensuring survivability in steady-rate loading conditions
5. *Performing of Dynamic Analysis:* ensuring survivability when exposed to varying loads over time, and countering vibrations
6. *Performing of Thermal Analysis:* evaluating heat flux, and assessing thermal risk in structures
7. *Performing of Fatigue Analysis:* ensuring product durability when exposed to repeated stresses and loads
8. *Performing of Hydrodynamic Diffraction Analysis:* studying motion and efficiency under wave forces
9. *Performing of Computational Dynamics:* evaluating interaction of fluids and heat, whilst also accounting for possible chemical reactions

## DISCUSSIONS ON EMPLOYEE STRATEGIC PLAN

The shipbuilding industry must create a strategic plan for the secure supply of skilled shipbuilding labour. The industry must come together as a whole to utilise the combined financial and logistical benefits of joint strategic planning. This is

true for a number of reasons. Chiefly, the shipbuilding industry in Bangladesh lacks significant financial clout. The industry, as it is, is unable to attract huge financial investment due to a number of reasons. The government, despite allowing shipbuilding raw materials to be brought in using Green Channel facility, are yet to commit significant funding to the shipbuilding industry. This means that despite having administrative clout in Bangladesh, the shipbuilding industry is yet to receive all-round cooperation needed to develop individual company capabilities to flourish. As a result, the wisest way forward for local shipbuilders, at least over the next 5 years, is the development of sound policies for inter-organisation cooperation.

The companies must create a joint plan for training of employees and sourcing of foreign skilled employees. The first step in achieving such a status is the development of forecasts for the next 5 years. These forecasts should include parameters such as upcoming contracts, overall global demand, upcoming government regulations, economic condition in Bangladesh, new and upcoming trade laws in Europe and America, including laws related to import of manufactured goods, and export of shipbuilding raw materials to Bangladesh.

After these conditions have been studied, and a master forecast developed, the objective should be to develop a recruitment plan to reflect this new forecasted demand. The selection of appropriate recruitment strategies should be based on the actual number of ships forecasted to be built over the next 5 years or more.

## **CONCLUSION**

Based on the above discussion, it may be concluded that shipbuilding is an industry that requires a host of skilled personnel, from skilled to highly skilled. It has also been highlighted that the industry finds the process of retaining skilled employees a challenging process, due to lack of continuous projects and costs involved with retention. The industry relies on a set of skilled persons who have to be promised good job guarantee in order to retain them, and also to inspire a new generation of students to take up the shipbuilding trade and enrol in special programs. As with all expensive commodities, the skilled shipbuilder's contribution must be measured against the costs of retaining his/her service; a process that will eventually dictate the decision of choosing between the alternatives of foreign recruitment and locally developed/trained employees.

The Bangladeshi shipbuilding industry must assess the manpower requirements needed in her shipyards as part of the operational demands for future production orders. As part of this, there needs to be a strategic layout for long-term skilled manpower

development and training. Only through a long-term development program will the country's shipyards acquire the special expertise required to produce high-quality ships in her yards.

## **RECOMMENDATIONS**

The following recommendations have been produced for this study. These recommendations are designed to help the shipbuilding industry:

### **Training and Development**

The training and development of existing employees may serve to strengthen the manpower capability of companies. Local companies may utilise a wide range of methods for training of local employees. Firstly, foreign trainers may be brought in for medium to long courses, e.g. 12 -24 weeks, and may teach local shipbuilders on the job for that duration. These training sessions may include between 15-30 crews in areas such as engineering, electrical, electronic or other areas as needed by the company. The company may hire and invite a foreign trainer to come in on a need basis to train their employees in Bangladesh. Companies might cooperate and have their employees trained by one trainer, whilst jointly providing funding for the trainer, and his or her costs. Secondly, employees may be sent abroad for long courses to foreign training academies or dockyards for hands-on training. This may be more expensive, but might be practical when advanced equipment is required for training. Alternatively, training videos and materials may be distributed to employees and local experienced university faculties/engineers may assist in their assimilation through lectures and hands-on training.

### **Foreign Recruiting**

At the rate things are going, it will be difficult for Bangladesh to completely account for skilled shipbuilder shortages by local training in the short term. Bangladesh needs skilled engineers and designers to compete in the global market. This is because the price is not the only competitive factor; technology and quality are of paramount importance for buyers of Bangladeshi ships. If Bangladeshi shipbuilders are unable to make up for differences in technology and quality with Chinese or other shipbuilders of similar classes, then the price margin advantage that Bangladesh enjoys will be rejected by foreign buyers in favour of Chinese or Korean ships, as they will be better performing in these criteria.

Bangladeshi shipbuilders may decide to hire foreign skilled shipbuilders from countries such as China, Russia and Korea in order to boost their capabilities in areas such as advanced design engineering, construction engineering, and post-construction testing in the meantime. Even a small injection of foreign talent may drastically improve the lack of skilled engineers in Bangladesh. The foreigners

may be brought in for 2-4 year contracts with attractive pay and job guarantee. Additionally, housing in foreign villages or good neighbourhoods with proper security may be a good investment for the shipping companies. The government may decide to provide improved security to the foreign shipbuilders, along with easy visa entry into Bangladesh. Additionally, the government could allow easy repatriation of money earned by the foreigners to their native countries.

### **Local Human Resource Development**

Despite the need for foreign recruiting in the short to medium time frame, the government and shipbuilding companies in Bangladesh must aim for maximum self-sufficiency in the shipbuilding sector. The self-sufficiency must emanate from local shipbuilding know-how and technology. There are close to one hundred universities in Bangladesh, however, the majority of these universities are teaching shipbuilding at an advanced level. This is true for several reasons. Firstly, there is low demand amongst students to study maritime subjects, as the industry has not proliferated financially until now, and most people look upon the shipping industry in Bangladesh as mostly manufacturing small boats and small fishing trawlers. Secondly, shipping jobs are mostly located in coastal areas in Bangladesh, away from the shiny capital city Dhaka. Graduates are not willing to relocate their city and move away from their families to the coastal city. They would rather prefer to get a job in a white-collar office in the capital city Dhaka.

Thirdly, the shipping industry is not an industry that has gathered pace for a few decades, unlike the garment industry, who have their own university, along with other universities teaching textile engineering. The garments industry benefits from students receiving hands-on experience with machinery and equipment. The industry also has on offer veteran engineers and experienced former and current top management who can lecture students about the structure, operations, and methods of the industry. There is ready and available knowledge on the global market expectations from Bangladesh, quality control methods, established supply chains and good knowledge on accurate forecasting techniques. The shipping industry does not have this benefit. However, this must be the target. There must be two-way communication and knowledge transfer between the academic circles and the shipping industry. The objectives when training local students should be quality graduates who will be able to produce export quality shipping products for the global shipping market and stay up to date with the latest technology in competing countries such as China and Korea.

The industry must make a plan to universities to open new advanced courses in shipbuilding here in Bangladesh. The course curriculum must be in sync with the requirements of the Bangladeshi shipbuilders.

Universities could divert brilliant students to study shipbuilding subjects. This form of skimming could allow the shipbuilding industry to benefit from the capability of good students. There could be provision for scholarships provided by the shipping companies, and also promise of guaranteed work for 5-10 years based on successful completion of studies.

### **Cost-Benefit Analysis**

The issue of costs and benefits is of paramount importance when it comes to training and development. The industry must ensure that the monies spent training and developments are recouped through actual gain in productivity and shipyard capacity. The major issue here is the costs related to training and retention thereafter, and the benefits derived from that particular employee in terms of value creation at the dockyard. The cost of hiring the employee, providing training with pay, compensating the employee on a regular basis, and paying for other costs associated with retaining an employee must all provide for greater dividends in terms of productivity than these aforementioned costs. Training and development must result in improved quality as well for the products manufactured by the shipyard.

### **Combined training centre/facility**

An integral part of developing skilled human resource is training and development. As things stand, there is no advanced dedicated training facility for the shipbuilding industry in Bangladesh. The main reasons for the lack of such facilities is primarily cost and lack of initiative. This must be overcome by the industry. The industry may decide to pool resources and funds to establish centralised training facilities where expensive training equipment and machinery might be shared amongst the different shipbuilding companies. The establishment of a centralised recognised training facility will mean that there will be an excellent opportunity to jointly establish training standards. Additionally, this would also mean worker certification and recognition for their training efforts.

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