Adoption of H&S Practices in Shipbreaking Operations: An empirical investigation of shipbreaking industry in Bangladesh

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Abstract

In many contexts where resources are finite, the recycling of different waste products has proved to be economically valuable. This is certainly true for the dismantling of large ocean-going ships at the end of their productive use with the disposal process referred to as 'shipbreaking'. Countries including India and Bangladesh have recently come to dominate the global shipbreaking industry in terms of the tonnage of scrapped and recycled ships. The work in this industry is hazardous, posing significant risks to employee health and safety (H&S). Much attention has focused on the occupational injuries and fatalities, typically portraying a bleak set of safety standards in shipbreaking in both countries. Rather than taking an industry-wide perspective common in prior research, this study investigates adoption of health and safety practices of shipbreaking firms in Bangladesh, to examine how such organisations adopt H&S practices overtime to ensure workplace safety, and their reasons for doing so.

The study employs a qualitative methodology using a case study approach. The case involved the integrative H&S interventions of seven firms in shipbreaking industry of Bangladesh. Semi-structured interviews along with observation and documentation were used for data collection. The research participants were 21 top management (strategic) and middle management (operational) decision makers in seven shipbreaking yards along. In addition, four governmental officials, six industry experts, and one NGO representative were interviewed. Secondary data from government documents and news reports complemented interview data. Data analysis techniques used included two cycles of coding, cross case comparisons among shipbreaking firms and category development through theoretical saturation.

The thesis identifies three approaches to adoption of H&S practices in shipbreaking operation: a) Continuous Adoption of H&S practices; b) Discontinuous Adoption of H&S practices; and, c) Random Adoption of H&S practices. Driven by safety related prioritization,

this study shows empirically that required level of accommodated and commissioned shipbreaking operations and ultimate H&S performance differ according to the approach used by firms to adopt H&S practices over time through forming varying alignment between H&S practices adopted. The results from this study provide policy makers, the media, and safety practitioners with the opportunity to showcase best practices, whilst also identifying how safety in shipbreaking can be improved for firms that are low in their safety performance along with addressing the H&S performance of the entire industry.

Keywords: Safety Prioritization, H&S Adoption, H&S Practices, Accommodating H&S practices, Commissioning H&S practices, Alignment of H&S Practices, Continuous Adoption, Discontinuous, Adoption, Random Adoption

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Chapter 1 Introduction

1.1 Introduction

Accidents and their tragic consequences are very common in shipbreaking industry throughout the world. Health and Safety (H&S) is multipronged and a variety of actions is needed to drive improvement. It is widely acknowledged that management of H&S in the workplace plays a key role in reducing accidents (Lingard & Rowlinson, 2005). H&S performance is dependent on the nature of the practices and the integrated management of a variety of practices at firm level (Oh et al., 2018; Robson et al., 2007). Shipbreaking industry has a poor reputation for employee safety in Bangladesh along with some other developing countries located in South Asia (Buerk, 2006); (Haque, 2016); (Sarraf et al., 2010); (Greenpeace, 2006). India and Bangladesh have recently come to dominate the global shipbreaking industry in terms of the tonnage of scrapped and recycled ships and the work is reportedly hazardous, posing significant practical risks to employee health and safety. This study aims to investigate how different shipbreaking firms prioritize and adopt workplace safety and what are the effects on safety outcome of the adopted H&S practices.

Shipbreaking is an industry that deals with the dismantling and subsequent recycling of ships including the furniture, wiring, fittings, steel, and other materials (Garmer et al., 2015). These ships are container and other ocean-going ships that have effectively come to the end of their productive usage and must be disposed of in some way. Shipbreaking occurs in many countries across the globe. Individual shipbreaking firms utilise different approaches, essentially linked to infrastructural design - including dismantling in a dry dock, at a pier, on a slipway or ramp, and on a beach (Yujuico, 2014). Beaching is the method of ship dismantling that is most common in Bangladesh as well as other South Asian countries such as India and Pakistan (Puthucherril, 2010).

In Bangladesh, dismantling is predominantly manual and labour-intensive process undertaken by unskilled workers rather than heavy machinery, such as cranes. The soft tidal surface of the beach often prohibits the use of such equipment. Shipbreaking can be arduous and hazardous work with the handling of, and exposure to, contaminated substances, the risk of toxic gas and boiler explosions, electric shocks, slippages and accidents from great height, and falling materials such as heavy steel plates either severely injuring or killing workers (Andersen, 2001; ILO, 2004). Employers in this industry have frequently been criticised for not doing enough to improve and enforce safety standards for those desperate for any job, regardless of the risks involved (Hussain, 2019b; Karim, 2009). The ostensible ambivalence by employers towards worker safety in this sector is exacerbated by low levels of regulatory enforcement (Derry, 2012) possibly attributed to the wider benefits to government of the supply of large quantities of cheap re-rolled and melted steel from recycled ships to meet the national demand for building construction. However, varying approaches to adoption of H&S practices are evident in shipbreaking firms in Bangladesh.

1.2 Background to the research problem

The disposal of waste can be done either legitimately or illegitimately and often crosses national borders from developed to other developed countries, or what appears more frequently, from developed to developing countries (Singh & Lakhan, 1989; Smith, 1991). In the case of the latter, what appears to be particularly problematic is the transfer or export of hazardous waste products and materials to developing nations (Baram, 2009). There are often economic and institutional forces to help explain this. Costs on waste management in developed countries are often prohibitive, while at the same time costs of disposal in developing countries are far cheaper. Similarly, legislative oversight is often more rigorously monitored in developed countries, while any relevant legislation in developing countries is not

always enforced, nor cases of wrongdoing successfully prosecuted (Boudier & Bensebaa, 2011).

It is important to note that there are certain hazardous wastes on many ships that simply cannot be recycled, such as heavy metals, sludge, and asbestos. These can be classified as waste *on* ships. This is different from ships *as* waste and how much of the constitutive waste components can be recycled. Nonetheless, dealing with either scenario may prove hazardous to the health and safety of those undertaking the recycling work. This is because many of the ships now being dismantled and scrapped in Bangladesh were built before the use of some of the hazardous materials used in their construction was globally banned. However, some have argued that most ship owners did very little to pre-clean some of the hazards from their end-of-life ships before they were sent to shipbreaking yards in developing countries (Haque, 2017).

Many of the H&S issues along with environmental and surrounding the ship recycling industry are well known (Garmer et al., 2015). Previous socio-legal work has extensively documented the different international agencies and standards that help shape the global shipbreaking regulatory framework and the application of various conventions alongside national laws designed to enhance environmental and labour standards. The Hong Kong International Convention for the Safe and Environmentally Sound Recycling of Ships in 2009 (typically referred to as the 'Hong Kong Convention') is aimed at ensuring that ships, when being dismantled after reaching the end of their operational activity, do not pose any unnecessary risk to peoples' health and safety or to the natural environment.

Bangladesh has also recently implemented new laws to comply with the Hong Kong Convention – Bangladesh Ship Breaking & Ship Recycling Rules, 2011 in 2011 and Bangladesh Ship Recycling Act, 2018 in 2018. A regulatory authority will monitor the industry inside the country. While this is encouraging with respect to the regulatory regime pertaining to hazardous ship waste and other hazards and risks while dismantling end-of-life ships, how

this is translated to enhance employee safety is uncertain in practice. This is because shipbreaking or recycling in Bangladesh is internationally known as an injury-prone industry with fatalities frequently reported (Hussain, 2019b). An average of 10–15 workers are reportedly killed and 150 injured every year in this industry (Andersen, 2001); (Sujauddin et al., 2015). This study examines the issue of firm level adoption of health & safety practices more broadly.

Most of the health & safety management studies are based on independent H&S practices and their impact on H&S performances (Manu, Mahamadu, Hadikusumo, et al., 2017; Saksvik et al., 2003; Subramaniam et al., 2016; Vinodkumar & Bhasi, 2010; Vredenburgh, 2002) but studies on firm level adoption approach toward various H&S practices are insufficient. Moreover, H&S practices are interdependent and therefore should be aligned (Griffin et al., 2014). Departing from the simplistic "independence" assumption (Aguilera et al., 2012), it can be contended that desirable H&S performance (in terms of no or low injury and death cases) of firms can be achieved by adopting various interdependent and aligned H&S practices.

Again, whilst there are few studies that large firms from developed world (mostly high-tech and capital-intensive) have applied H&S practices in order to minimize workplace accidents in different domains, studies on most academic writings on ship breaking industry preliminary focuses on insights into H&S management where challenges, prospects and recommendations have been provided. For example, Robson et al. (2007) in Canada; Luria et al. (2008) in USA; Breslin et al. (2010) in Canada; Hohnen and Hasle (2011) in Denmark; Greasley and Edwards (2015) in UK respectively. Only preliminary insight on few H&S practices of ship breaking firms in separate regions (South Asian developing countries) have been covered and scrutinized in the most notable studies, for example, Hossain et al. (2008), Neşer et al. (2008); Khan et al. (2012); Hiremath et al. (2015); Hossain et al. (2016); Andersen

(2001) ; Frey (2015). However, there is a dearth of research work, which offers a snapshot view of the adoption of H&S practices prevalent in ship breaking firms over time in these developing countries.

For this study, the rationale for selecting the shipbreaking industry of Bangladesh is firstly, the outlook of occupational H&S performance in the country; and secondly, the dearth of research on shipbreaking firms' management of H&S practices in the country. As empirical studies in health and safety management practices in the context of immature practices of developing countries have almost no reference in management academic literature, it is interesting to notice management of interdependent H&S practices in a low to medium-tech, labor-intensive (Garmer et al., 2015) and medium sized industrial sector such as shipbreaking industry of Bangladesh. Additionally, consideration was given to the availability of industry contacts known to the researcher in Bangladesh to facilitate data collection.

This study is grounded in the theoretical underpinnings of High Reliability Theory (Roberts, 1989, 1990; Roberts & Rousseau, 1989; Rochlin, 1996) and Institutional Theory (DiMaggio & Powell, 1983, 1991; Friedland, 1991; Friedland et al., 1991; Jepperson et al., 1991; Knoke, 1993; Meyer et al., 1991). A number of major hazards dealing organizations have been attempting to influence the organizational and safety culture at their sites to transform them into a high reliability organization (Andriulo et al., 2015; Hales & Chakravorty, 2016; Lèfstedt et al., 2011). High reliable organizations (HROs) are able to manage and sustain almost error-free performance despite operating in hazardous conditions where the consequences of errors could be catastrophic (Bourrier, 2011a; Christianson et al., 2011; Lèfstedt et al., 2011; Leveson et al., 2009). There is a rich body of literature on HROs, their characteristics, and the safety benefit for high-risk operations. However, several researchers have noted the dearth of prescriptive methods of transformation (Tolk et al., 2015), which means transformation from reliable to highly reliable operations and HROs from well-run

organizations that are not HROs (Benn et al., 2008; Bourrier, 2011b). On the other hand, Cantu et al. (2020) argued that the modern dynamic business environment with increasing international competition, need for speed of innovation, stringent H&S standards, etc. (features of open systems) mimics the tight coupling and interactive complexity similar to the technical design of a highly complex and risky operations operating in a closed system such as, nuclear power plant. Roberts and Bea (2001) clearly supported HRO principles for any organization, which is operating in a continuously changing institutional landscape (Cahaya et al., 2017; He et al., 2016; Kheni et al., 2010; Wijethilake et al., 2017), as did Vogus and Welbourne (2003). Therefore, mindful organizing is just as relevant to mainstream businesses as for high-risk ones (Cantu et al., 2021).

1.3 Purpose of the study and research questions

This study aims to address the under-researched area of perceived homogeneity regarding adoption of various H&S practices in shipbreaking industry. By examining firm level adoption approach to H&S practices, involving owners, management, workers of shipbreaking yard, government bodies, international legislative bodies and NGOs, this study aims to clarify a social phenomenon (Yin, 2014) 'Adoption of H&S Practices'. This phenomenon highlights how shipbreaking firms are adopting various interdependent H&S practices over time, leading to the H&S performance of the firms in terms of occurrence of injury and death cases. This study aims to contribute to broader safety literature and also provide guiding principles for safety researchers, academics, policy makers, and practitioners to implement a more effective management of H&S practices.

The inductive qualitative nature of this study was guided by the following research questions:

- What are the H&S practices adopted by the shipbreaking firms?
- How do shipbreaking firms adopt H&S practices?

- What are the effects of the adopted H&S practices on firm level H&S performance?

1.4 Overview of the research design

This study employs an inductive qualitative approach and investigates firm level adoption of H&S practices and H&S performance in the shipbreaking industry at two levels.

Primary data were collected predominantly from top and middle management of each case study firm through interviews and site observations and substantiated the primary data with safety performance data (injury rates and fatalities). Some workers from each firm were interviewed as well. The researcher visited in person seven shipbreaking yards and collected the data through interviews (senior managers, middle managers & officers), observations and secondary data secondary data were collected from industry reports, and from the NGO Shipbreaking Platform. Safety performance data (number of major injuries and deaths) were collected between 2014 - 2019 and verified from different source such as government records kept by Department of Inspection for Factory & Establishment (DIFE), Ministry of Labour and Employment, Government of Bangladesh.

The main point of departure in this study from previous literature that has adopted an industry-wide lens to shipbreaking and worker safety is to examine more thoroughly the adoption of occupational health and safety practices of different shipbreaking firms. It can be contended that a more nuanced firm-level analysis could reveal new insights into the different ways that companies in this sector are managing safety issues. Specifically, this study enquires into how ship-recycling firms prioritize safety of their workers, how firms develop infrastructure & equipment, how firms adopt formalization of systemic and operating practices, how firms develop safety skills and safety culture and with what effects.

This study makes three contributions: first, it makes a theoretical contribution to the area of workplace health and safety practices in shipbreaking by framing it as an important management issue and then distilling the important agentic influences at the organisational level. Second, an empirical contribution has been made on safety in shipbreaking by providing insights from relevant industry stakeholders including shipbreaking employers, industry experts, relevant government agencies, non-governmental organisations, and some employees who work on shipbreaking and recycling. Third, this study contrasts the common reputation that the entire industry is uniformly poor with respect to the processes and outcomes of employee safety in shipbreaking.

By using the concepts of adoption, accommodation, commission, interdependence, alignment, complementarity & fit, this study has examined how health & safety practices adopted by each firm have been approached and aligned over time (von Thiele Schwarz & Hasson, 2013). The variation in adoption of H&S practices has led firms to experience different H&S performance in terms of number of injury and death rates. Combination of various adopted H&S practices leading to effective outcomes is more important than the effectiveness of single H&S practice. This is justified by organizational researchers who have emphasized the need to understand the configuration of practices that lead to effective outcomes beyond the effectiveness of single practice or process (Delery & Doty, 1996).

In contrast to uniformly poor outcomes, the findings have shown better but uneven outcomes among shipbreaking firms of safe workplace practices, a phenomenon that is described as a variety of adoption approach toward H&S practices. Firms who have better H&S performance are adopting safety practices more in-depth to improve and update H&S practices and firms who have poor H&S performance are ceremonial in adoption of H&S practices. H&S practices such as setting high level of safety prioritization at strategic and operational management level, providing adequate personal protective equipment (PPE) and safety

training, formalizing process safety and behavioural safety management practices, developing safety skills and managing safety culture – all are more adopted in better performing firms.

Management agency or priorities towards strengthening workplace safety can positively influence safety performance outcomes in Bangladeshi shipbreaking firms. It is also contended that selecting and applying appropriate risk treatments using a hierarchy approach (e.g. elimination, substitution, engineering controls, administrative controls and personal protective equipment) to achieve and maintain a level of workplace risk that is as low as reasonably practicable while accomplishing the organization's objectives (Lyon & Popov, 2019). In this study, firm level adoption of H&S practices have been a combination of a variety of safety practices adopted in-depth or ceremonially, which is justified by Henrich et al. (1980) who advocated engineering controls, as well as non-engineering interventions (e.g. safety training, hiring on the basis of safety-related selection criteria, progressive disciplinary programs) to prevent or reduce unsafe behaviours and thus the risk of injuries.

This is a relatively novel perspective for health and safety research. The empirical insights emerged from this study challenge common assumptions that safety standards in the shipbreaking industry in developing nations like Bangladesh are homogenous and consistently bleak. This provides policy makers, the media, and safety practitioners with the opportunity to showcase best practices, whilst also identifying how safety in shipbreaking can be improved for firms that are low in their safety performance.

1.5 Structure of the thesis

This thesis comprises six chapters:

- Chapter 2 reviews the relevant safety management literature and literature on shipbreaking industry. It discusses H&S management practices and various theories

and concepts that that explain safety performance of firms. Second, it provides an overview of the main findings from the literature on shipbreaking.

- Chapter 3 presents the research methodology and methods used in the study. It begins with ontological and epistemological considerations, followed by a discussion of the research design and the selection of the cases for this study. The engagement strategies with the research participants and the data collection techniques are also discussed as well as the data analytical techniques and processes to organise and categorise participants' quotes and codes from the interview transcripts and other data. This chapter concludes with a discussion about the reliability and validity of the study.
- Chapter 4 is organised in two parts. First part provides an analysis across the key variables, namely, safety prioritization practices, infrastructure & equipment, formalization of systemic & operating practices, safety skills, safety culture, injury rate and death rate. Second part of this chapter identifies themes emerged from the findings where the key variables are linked with H&S performance.
- Chapter 5 discusses the study's results justified by theoretical grounds followed by the academic and practical contributions of this study. It also discusses the study's limitations and possible future research recommendations.
- Chapter 6 provides a conclusion to the study.

Chapter 2 Theoretical Underpinning of the Study

2.1 Introduction

This chapter reviews literature on health and safety (H&S) management practices in shipbreaking industry and identifies research gaps to address in this study. Holistically, H&S management in shipbreaking industry incorporates a wide range of disciplines and, therefore, it is multidisciplinary in nature. For example, the concept of "shipbreaking", itself, is multidisciplinary covering various perspectives such as engineering, ecology, sociology, legal, economic and organisational (Thomas, 2007; Frey, 2015; Kaiser and Mark,2008; Du et al.2017). Therefore, this chapter first presents the vital concepts related to H&S management, Shipbreaking, Workplace safety, H&S management practices, H&S management in Bangladesh, Interdependent nature of H&S practices. These concepts will provide a theoretical foundation to discuss the management of H&S practices and its key recent developments.

2.2 Shipbreaking

A ship is a large watercraft or marine vessel that travels the world's oceans and other sufficiently deep waterways, carrying goods or passengers, or in support of specialized missions, such as defence, research, and fishing (Wang et al., 2018). After being acknowledged as uneconomical to trade at sea, a ship is usually sold either in second-hand market or to a ship recycling yard for dismantling (Buxton, 1991). Usually, a ship reaches its End of Life (EOL) stage after expiry of its operational period of 25 to 30 years before corrosion, metal fatigue and a lack of parts render them uneconomical to operate (Ko & Gantner, 2016).

Shipbreaking (is also known as ship demolition, ship dismantling, ship cracking, or ship recycling) is a type of ship disposal involving the breaking up of ships for either a source of parts, which can be sold for re-use, or for the extraction of raw materials, chiefly scrap. The

International Maritime Organization (IMO), the regulatory body of maritime affairs, finds recycling to be the only option of reaching end of service life for ships (IMO, 2009). Ship recycling contributes to sustainable development and it is the most environmentally friendly way of disposing of ships with virtually every part of the hull and machinery capable of being re-used (Zuin et al., 2009). According to Yujuico (2014) and Jain et al. (2017), about 80% of a ship's LDT is mostly recyclable steel scrap. The ship recycling industry is primarily concerned with the reuse of the valuable materials from decommissioned vessels, such as machinery, equipment, and other fittings (Soner et al., 2021). The rationale behind shipyards interest in dismantling EOL ships relates to the materials they are carrying (Solakivi et al., 2019).

The number of ships to be scrapped would increase, particularly when old single-hulled tankers are gradually removed (Yujuico, 2014). The ship recycling industry has consequently seen a period of growth on a global scale, as it offers considerable economic benefits (Mikelis, 2019). This lowers the demand for mined iron ore and reduces energy use in the steelmaking process. Fixtures and other equipment on board of the vessels can also be reused. Lloyd's Register (2011) estimates that the recyclable materials account for 95% to even 98% of a ship's weight. Besides industry's labour intensity, ship's hull, machinery and other equipment offer valuable reusable materials, such as steel, non-ferrous metals and second-hand items (Sarraf et al., 2010), all of which are vital to local economies, especially in South Asia.

Dismantling of EOL ships is sustainable, it has both positive and negative impacts on the dismantling locations (Argüello Melo, 2016). It is also labour-intensive, and considered one of the world's most dangerous industries (Ahmed, 2020). At the same time, conditions of dismantling in terms of occupational health and safety as well as environmental aspects are often substandard (Abdullah et al., 2013; Andersen, 2001). Due to the fast growth in ship recycling industry worldwide, especially in Asian countries like India, Bangladesh, China and

Pakistan, it has become a major source of income for those countries (Hossain et al., 2008). However, there is a growing concern in the international maritime community regarding the conditions in which ships are dismantled. There is a necessity to develop stringent laws to guarantee the safety of individuals who are working in this industry and the surrounding environment is extremely important (Welaya et al., 2012). Tightening safety regulations along with environmental regulations resulted in increased dismantling costs in industrialised countries in the 1980s (such as UK, USA) causing the export of retired ships to lower-income areas, mainly in South Asia (Winchester, 1936). Currently, over 90% of the global fleet is dismantled in the shores of South Asia, dominated by Bangladesh, India and Pakistan (CRSL 2017). Asian shipyards are usually able to outbid their rivals for a number of reasons: high domestic demand for scrap steel; abundant supply of cheap labour; lax regulations in reference to environmental and safety aspects that entail low cost (Solakivi et al., 2021).

For the past decades, policymakers around the world have been developing international regulatory framework to address ship dismantling industry's negative impacts as a response to growing concerns among the general public (Argüello Melo, 2016). Many international attempts started since 1989. In 1989, United Nations' Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal (henceforth referred as Basel Convention) was signed, and it was followed by Ban Amendment in 1995 (Moen, 2008). International Labor Organization (Marine Environment Protection Committee (MEPC), 2003), the flag state obligations (SCIES and SEPA, 2008), Port State control rights (Breitling & Leader, 2010) were crowned by the effort of the MEPC from 1998 (Mikelis, 2006) which led to the signing of the Hong Kong International Convention in 2009. The International Maritime Organization (IMO) is responsible for the coordination between all such bodies to attain the safety aspects in ship scrapping industry (Mikelis, 2019). Hong Kong Convention on Ship Recycling (HKC) was introduced by IMO in 2009. The Hong Kong International

Convention for the Safe and Environmentally Sound Recycling of Ships in 2009 (typically referred to as the 'Hong Kong Convention') is aimed at ensuring that ships, when being dismantled after reaching the end of their operational activity, do not pose any unnecessary risk to peoples' health and safety or to the natural environment. Notwithstanding of the efforts, the results are not convincing due to interpretation differences, ineffective enforcement or pending ratification (Moncayo, 2016). The Convention was adopted in 2009, but has not entered into force. The European Union (EU) has taken active stance on ship dismantling by introducing the EU Ship Recycling Rules in 2013, which largely was inspired by the HKC. EU rules on ship recycling aim to make it greener and safer, and to reduce the negative environmental and social impacts of recycling ships. This EU Ship Recycling Rules implements the requirements of the Hong Kong Convention for the safe and environmentally sound recycling of ships into EU law, but includes also additional safety and environmental requirements. Consistent with the HKC terminology, and to illustrate sustainable and sound nature of the activity, EUSRR refers to ship recycling. The EU Rules contain a list of certificated shipyards (European List) that are allowed to recycle EU-flagged fleet (henceforth referred as EU fleet) (EUShipRecyclingRegulation, 2013). The decommissioning process is entirely different in developed countries than it is in developing countries (Vasani, 2018).

In developed and developing countries, ship-breakers bid for the ship and the highest bidder wins the contract (Barua et al., 2018). Usually, the ship-breaker then acquires the vessel from the international broker who deals in outdated ships (Breitling & Leader, 2010) and the price paid is around $400 per tonne and the poorer the environmental legislation the higher the price (Cairns, 2014; Hossain & Islam, 2006; Mishra, 2018; Zakaria et al., 2010).

2.3 Shipbreaking operations in Bangladesh

In Bangladesh, shipbreaking industry is mainly located in Sitakunda Thana, Chittagong. There are approximately 100 yards operating along the coastal areas in Sitakunda, mainly in Kumira, Bhatiary and Fouzdarhat (Hossain & Islam, 2006) by occupying around 4000 m2 of land, representing intense economic activity per square meter of land (Rahman and Mayer 2015). These shipbreaking yards provide a significant source of metal and steel to meet local demand due to the absence of virgin iron ore in the country. More than 70% of domestic steel demand is met by the shipbreaking yards along the coast (Saraf et al. 2010). The yards also provide employment for more than 50,000 people directly and more than 100,000 people indirectly (Hossain and Islam 2006; Saraf et al. 2010). This industry recycles and reuses metal scraps that contribute to the reduction of global environmental impacts, by reducing the need for the mining of virgin iron ores (Rahman et al. 2016).

In the shipbreaking yards, ships are driven ashore at high tide so that they can be accessed for disassembly (NGOshipbreakingPlatform, 2014). These ships are dismantled manually by workers who (in most cases) do not have basic safety equipment. As a result, it causes death of substantial number of workers each year. Generally, it takes few weeks for the ship to reach the ship breaker, for instance, it takes two weeks to get the ship sailed post haste to the demolition yards of Chittagong, Bangladesh (FIDH, 2002).

Shipbreaking is one of the most hazardous activities of maritime industry due to the structural complexity of the ships and due to the possible exposures to asbestos, polychlorinated biphenyls (PCBs), lead, hazardous materials and chemicals, as well as excess noise and fire and explosions (Neşer et al., 2008). As a testament to the dangers of ship breaking, itis estimated that over a 30 year span 1200 workers have died in the Chittagong ship breaking yards with 21 deaths in 2009 alone (Hossain et al., 2008; NGOShipbreakingPlatform, 2017; Sujauddin et al., 2015).

In shipbreaking operations, beaching plays a critical role on the final cost and dismantling time which could be doubled if the beaching operation is unsuccessful (Hossain and Islam (2006). After beaching, cutters and their helpers start cutting the vessel into parts. The breaking operation is undertaken on the basis of the ship's structural design (Ronning, 2000). Larger parts of the ship are dragged on shore by using motorized pulleys and a large number of workers are engaged in this task (Zakaria et al., 2010). A group of cutters' helpers and workers start cutting the dragged parts of the ship into truckable parts according to the specification provided by the buyers (NGOShipbreakingPlatform, 2016). Boilers, motors, capstan stocking etc. are heavy equipment recovered from old ships and generally are carried down to stack yards by crane (Sujauddin et al., 2012). Unskilled workers generally carry metal plates, bars or pipes in their heads or shoulders to a designated destination and pile up all the metal in stack yards or load them directly on trucks under no monitoring of supervisors in most cases (Hossain, 2010). There are also some valuable components like small motors, pumps, generators, navigation equipment, life-saving equipment, furniture, electrical cables, utensils etc. that are generally recovered and sold to the local second-hand market (Hossain et al., 2008). Approximately 3-4 months are needed to dismantle a typical old cargo ship (Hossain & Islam, 2006).

In shipbreaking industry in Bangladesh, on average, 10–15 workers are killed due to accident and 150 are injured every year (Andersen, 2001; Bailey, 2000; Sujauddin et al., 2015). The most frequent causes of death include gas explosions while using gas torches for cutting, suffocation from inhaling toxic gases, and sudden falls from steel beams and plates and common injuries include deep lacerations, broken bones, loss of limbs, and fainting/unconsciousness (DEWAN, 2020; Hossain et al., 2008; Rahman et al., 2018). In addition to these direct occupational harms, indirect harms result from exposure to hazardous chemicals and inhalation of toxic gases, causing health impacts that often appear years after

leaving shipbreaking work (Hossain et al., 2008; Rahman et al., 2018). Thousands of migrant workers who are mostly young, male and illiterate from poor rural areas of Bangladesh are employed in the shipbreaking yards (Mitra et al., 2020). Demaria (2010) and Puthucherril (2010) found that depending on the level of skills, workers are categorized where some workers use torches to cut up ships, some carry large iron plates, some are loaders, contractors, supervisors, winch operators, crane drivers, fitters, carpenters, asbestos workers and firemen. The daily wages of these workers range between US$2 to US$7 depending on the job (YPSA, 2012).

2.4 Health & Safety (H&S) management in shipbreaking industry of Bangladesh

Severe violation of workers' rights is now an open secret in shipbreaking industry of Bangladesh. Lack of compliance with the existing international and national rules and regulations as well as unethical practices of these shipbreaking firms in Bangladesh, India, Pakistan are exposed by the media (Hossain et al., 2016). For instance, labour exploitation of Bangladeshi ship breakers have been highlighted and criticized by local and international NGOs, special interest groups and activist groups (Rahman et al., 2018).

Shipbreaking industry in Bangladesh is not very worker-friendly industry (NGOshipbreakingPlatform, 2014). Until 2011, the government did not oversee this industry and there was no industry specific laws, rules and regulations until 2011. Migrant workers used to dominate the industry's workforce (YPSA, 2012). A significant portion of these workers come from the northern part of Bangladesh recognized as mostly poverty ridden, where there are limited employment opportunities (YPSA, 2014). Most of the shipbreaking firms do not follow any formal recruitment procedure. Most of their recruitments except few follow an informal approach to recruit employees. For example - workers usually are not given any appointment letter and there is no formal employment contract. In consequence, workers

cannot enforce their right to permanent and secured employment as they are unable to provide evidence of employment (Hossain et al., 2008). Their wages are dependent on several factors such as: the number of hours worked, type of work, skill level of the work etc. and workers have no entitlement to sick or annual leave (YPSA, 2012).

There are two main groups of hazards associated in breaking a ship: intoxication from dangerous substances (and injuries caused by explosions of leftover gas and fumes in the tanks) and injuries due to poor health and safety practices of shipbreaking firms and limited use of safety equipment. Hossain et al. (2008) identified that most of the ship scrapping activities are potentially risky when it comes to accidents and injuries, but no first aid facilities were found in most of the yards. They also mentioned that sudden fall of steel beam and plates, burning by gas flame, suffocation and inhaling CO2, etc. are the main causes of accidents and injuries in ship scrapping yards at Chittagong coast of Bangladesh and common injuries are cutting of muscles (50%), breaking and fracture of leg/hand/finger bones (25%), burning by gas flame (6%), loss of limbs (4%) and fainting/unconsciousness (3%). A research carried out by Mattorano et al. (2001) in a shipbreaking yard reported evidences of exposure to heavy metals (such as cadmium and lead) due to welding, torch cutting, grinding and abrasive blasting operations. Sawyer (2001) expressed the horrible condition in the following way - 'At Chittagong, the principal site of the Bangladeshi shipbreaking industry, 25000 laborers toil under horrendous conditions where proper fire-fighting equipment and safety equipment such as belts, gloves and eye protection are non-existent. He also mentioned that workers must carry dangerously heavy loads of scrap and work long hours without overtime and there are no restrooms, proper toilets, or fresh drinking water.'

Hossain (2010) categorized ship-breaking workers as supervisors, cutters, loaders-unloaders, carriers, helpers, labourers, suppliers etc. where cutters slice the ship, carriers carry the scrap iron to selected places and the loaders-unloaders are engaged in delivery via truck or

lorry. Most of the cutters have to work in very intense light of welding torches. However, they use goggles, but these are not enough for heavy-duty works like ship scrapping activities and thus they face the problem of eye redness, tearing, burning sensation, blurring of vision and conjunctivitis. Asbestos, smoke, dust, isocyanide gas, volatile chemicals may cause respiratory problems. Asbestos dust causes formation of scar-like tissues resulting in permanent breathing difficulties called asbestosis. Other respiratory problems as identified among the workers are asthma, pneumonia, chest pain, cough and sputum. Abdominal, urinary, muscle and skin problems as well as nutritional deficiency are also identified among the workers, which are mainly caused due to toxic metal, oil and chemical contaminations as well as excessive work load, long working hour, monotonous works, irregular eating, insufficient diet, unsafe drinking water, inadequate sanitation, and the likes. Most of the workers were found to suffer from multiple diseases and health hazards.

According to YPSA (2014), hardly workers wear protective gears and many work in barefooted condition; chemicals and toxic substances, small pieces of pointed and sharp iron splinters of the beach are also the causes of injuries; there is a very limited use of equipment such as cranes, lifting machinery or motorized pulley. According to NGOShipbreakingPlatform (2016), ship breaking yards tend to re-use ropes and chains recovered from the broken ships without testing and examining their strength and also there is no marking system of loading capacity of the chains of cranes and other lifting machineries and their capacity are not followed. Consequently, due to very poor occupational health and safety standards, workers suffer from several diseases including lung problems and skin disease, which can cause temporary loss of working capacity. Occupational and environmental exposure to the hazardous elements of ships while breaking ships and the attendant health consequences are not fully known but undoubtedly those who are exposed are at a high risk of death, disease, and injury because of their increased susceptibility to various site-specific

cancers, skin irritation, respiratory problems such as asbestosis, and neurobehavioral problems (Frey, 2013).

According to Cairns (2014), a number of researchers reported several harmful health effects in various international reports published by (Bank, 2010; FIDH, 2005; Greenpeace, 2002). There is a lack of availability to get reliable data on the number of accidental deaths and future deaths resulting from diseases with long latency periods such as asbestosis. NGO Ship Breaking Platform estimates indicates that one out of six workers may have asbestosis and workers are at inflated risk of lung and related forms of cancer (NGOShipbreakingPlatform, 2016). Greenpeace International and International Federation for Human Rights (2005) estimate that thousands of workers have died in the last several decades and thousands are at risk in the future (Frey, 2013, 2015). Maintaining occupational health and safety standards is not a priority for the yard owners as they experience over supply of the workers who desperately seek jobs to support their livelihood. Andersen (2001) first identified accidents causing injuries or deaths in ship breaking industry originated due to lack of: skills; appropriate plans and working procedures; precautions including the use of personal protective safety equipment; lack of facilities and safe working platforms and tools. Sawyer (2001) described Bangladesh is the second largest shipbreaker in the world and its specialty is large vessels, often oil tankers and oil tankers are the most dangerous vessels to dismantle because residual oil and trapped gases in their superstructures may ignite from the use of acetylene torches. The explosions and fires that ensue result in the suffocation of workers trapped inside the superstructure, and death from lacerations and burns to others (Cairns, 2014).

The exact statistics on accidents is not available even though various NGOs like NGO Shipbreaking platform, Bangladesh Environmental Lawyers Association (BELA) and Young Power in Social Action (YPSA) provide reports on accidents. Records on injury and death are kept by the Department of Inspection for Factory and Establishment (DIFE) - a wing of

Ministry of Labour and Employment, Government of Bangladesh as well. Most of the reports refer to various reasons of accidents such as death and injury from grasping cables, chemical spill over, fumes created by welding, falls from a great height, falling heavy and large objects, fires, and explosions (Demaria, 2010; Hossain & Islam, 2006; Puthucherril, 2010; Rousmaniere & Raj, 2007).

Given the backdrop of poor H&S scenario, Rahman et al. (2018) addressed a conflicting discourse regarding the impact of shipbreaking industry on Bangladesh held between two divergent groups of actors. They found a discourse on positive localized impacts forged by yard owners, yard workers, and local community members to encounter a discourse forged by national and international NGOs focusing on negative localized impacts. Rahman et al., (2018) found divergent discourses in their interview data. Their data revealed that one group (local and national NGOs-YPSA and BELA) denied any improvement had occurred and believed that shipbreaking was extremely hazardous to both workers and the environment whereas the second group, including yard officials and yard workers as well as representatives from government, articulated that shipbreaking practices were improving, with some issues remaining to be addressed.

On one hand, studies so far conducted on shipbreaking industry mostly provided preliminary insight into H&S management practices of shipbreaking firms in separate regions reporting only a few practices (Demaria, 2010; Du et al., 2017; Frey, 2015; Hiremath et al., 2016; Hiremath et al., 2015; McElroy-Brown, 2006; Neşer et al., 2008; Rousmaniere & Raj, 2007; Sarraf et al., 2010; Thomas, 2007; Wu et al., 2013). On the other hand, there are few research conducted on shipbreaking industry of Bangladesh which focused on the occupational health & safety of the industry (Alam & Faruque, 2014; Das & Ali Shahin, 2019; Hossain, 2010; Hossain & Islam, 2006; Hossain et al., 2008; Karim, 2009; Mitra et al., 2020; Patwary & Bartlett, 2019; Rahman et al., 2019; Rahman et al., 2018; Sujauddin et al., 2015; Zakaria et

al., 2010). So, there is a dearth of research that offers an overview of the current state of H&S management amongst shipbreaking firms and managerial adoption of H&S practices over time in Bangladesh.

2.5 Overview of Health & Safety Practices at Workplace

Health and safety problems are getting increasingly complicated in contemporary work places and thereby posing new challenges for preventive practices. The enforcement of health and safety regulations has only limited impact on the core occupational safety and health problems experienced by workers. Semmer (2006) argued that employers and employees do not always follow the advice of health and safety practitioners and researchers, and even when they do, the initiatives frequently fail to solve the complex safety problems. He also clarified the reasons for this failure attributed to the complexity of the problems, the structural embedding of local health and safety initiatives and organisations, and the strategies deployed by health and safety practitioners. Hohnen and Hasle (2011) argued that going beyond a traditional risk control approach is necessary where H&S practices must be based on a better-understood interplay between market forces, societal regulations, core business activities and company strategies. He also emphasized that it is necessary for the occupational safety and health practitioners be a reflective actor in this process and the initiative to undertake H&S practices needs to make sense in a broader context for all the actors involved. At the same time, Allvin and Aronsson (2003) found health and safety problems as becoming multidimensional and effective solutions are harder to find and solutions have to be identified frequently outside the normal sphere of health and safety. However, both the regulation strategy and the knowledge strategy identified by Allvin and Aronsson (2003) face serious constraints: political unwillingness to extend state regulation on more complex issues and organizational structure related problem. Structural

problem has been justified by (Cutler & James, 1997; Hasle & Jensen, 2006) where they found that in many organisations, health and safety activity assumes a sidecar position.

Decision-makers sometimes are hard to convince about the beneficial aspects of the application of the latest knowledge on preventive safety measures and managers (and employees) sometimes do not appreciate how health and safety adds value to the core business of the organization (Allvin & Aronsson, 2003). The tendency is to see it as concerned with more or less irrelevant questions about ambiguous health risks and juridical interpretations of legislation. The consequence is that health and safety practices often encounter serious problems when they are implemented (Kristensen, 2005). Sometimes they are only partly implemented because key stakeholders cannot see the point of the proposed practices. At other times, practitioners limit their intervention suggestions beforehand, because they believe that achieving agreement on the most effective H&S practice is unrealistic. Practitioners find it especially difficult to propose a strong initiative to undertake H&S practices when cause–effect relationships are multidimensional or hard to prove, or when the initiatives would interfere with management prerogatives or central organisational strategies. This can lead to the implementation of practices that have only a marginally positive effect. For instance, reviews of stress prevention indicate that individual initiative may be more effective than organisational prevention that works through intermediary mechanisms (Van der Klink et al., 2001).

The current safety literature reveals several gaps that are mostly associated with wide variations in practice among the common process elements and uncertainty about the influence of organizational and other external factors (Wirth & Sigurdsson, 2008). The difficulties of organisational interventions have to do with the complexity and changing character of the organisational setting, which is a challenge for traditional intervention approaches (Cox et al., 2007). Consequently, new strategies for health and safety adoptions are needed.

According to Luria et al. (2008), there are two main occupational health and safety approaches in order to reduce H&S costs and to improve H&S in organizations. The first approach is safety engineering, also known as process safety, is dominant in the safety field (Woodside & Kocurek, 1997). Safety engineering concentrates on safe physical environments including mechanical features for accident prevention and other features such as non-slip surfaces, railings, and barriers for dangerous mechanical parts, noise insulation, and so forth (Luria et al., 2008). They argued that under this approach dealing with safety issues is more of an engineering challenge than a managerial or behavioural concern. The second approach is the behavioural approach (Luria et al. (2008) that aims to improve safety through tools such as safety training (Cooper & Cotton, 2000; Cooper & Phillips, 2004; Goldenhar et al., 2001; Sinclair et al., 2003), compensation (Stetzer & Hofmann, 1996), and organizational safety behaviour interventions (Boyce & Geller, 2001; Geller, 1996, 2001; Williams & Geller, 2000). According to Choudhry (2014), Behavior-based safety (BBS) management technique can be applied to any country's culture, showing that it would be a good approach for improving the safety of front-line workers and that it has industry wide application for ongoing construction projects. Luria et al. (2008) clarified that using these approaches management tries to improve and change organizational safety level by influencing employee behavior rather than by changing the physical setting. For example, in the 'behavioral safety' approach (Geller, 2001; Krispin & Hantula, 1996; McAfee & Winn, 1989), management tries to modify behavior of workers by providing incentives (rewards). These managerial strategies provide an important organizational control mechanism that improves safety performance (Johnson & Gill, 1993; Reason, 1990, 1995; Reason et al., 1998).They are also important because most accidents in the workplace have a behavioral component (Zohar, 2002).

Most behavioural approaches rely upon dealing directly with the employees (training employees, compensating employees, etc.). However, one recent development of the

behavioural approach is the supervisory based safety intervention program for improving safety performance (Zohar, 2002; Zohar & Luria, 2003). Zohar and Luria (2003) demonstrated that intervening at the supervisory level eventually influences employees' behaviour as well as safety performance. The current study aims to integrate the engineering approach with the behavioral approach used by (Zohar, 2002; Zohar & Luria, 2003) to investigate the influences of physical environment (an engineering approach variable) on an organizational behavioural approach tool. It demonstrates that physical variables can be related to supervisory interactions with subordinates and therefore must be taken into account in safety management.

Size of the firms is another important factor for addressing workplace H&S issues. Unique occupational health and safety (OHS) challenges such as fewer resources, the economic precariousness, short life cycles, employing ‘‘vulnerable’’ workers etc. identified by Breslin et al. (2010) are likely to arise in small and medium-sized businesses. Shipbreaking firms in developing countries mostly are small and medium sized and less organized enterprises and so are in Bangladesh and they can apply these interventions in their industry. Mendeloff et al. (2006) justified that fewer resources may be devoted to safety compared to large firms as small businesses need to cope with many business limitations to survive. Lamm and Walters (2004) found that the economic precariousness of small firms may produce a climate where safety is less salient than firms’ viability and production efficiency and their short life cycles means that many of them are new and are not familiar with relevant safety regulations and practices. Garmer et al. (2015) argued that high-tech modern industrial sectors worldwide are engaged in implementation of strategies to minimize work place accidents and enhance occupational safety through periodic assessments of occupational risks. It will be interesting to notice such efforts in those low-tech labour-intensive and small and medium sized industrial sectors such as shipbreaking industry. Most shipbreaking firms are small/medium-sized firms. The

small/medium-sized firms often have limited resources for safety (Lamm, 1997). It is really challenging to intervene appropriately in H&S management with limited resources.

Breslin et al. (2010) in their systematic review tried to identify effective occupational health and safety practices for small businesses that can be applied for shipbreaking firms in developing countries mostly are small and medium sized enterprises. The types of practices identified in their study are a combination of training and safety audits; and a combination of engineering, plus training, safety audits, and motivational component. They argued that these practices were associated with positive changes in safety-related attitudes and beliefs and workplace H&S - concerned parties should be aware of them although their evidence synthesis overall found a moderate level of evidence for effectiveness of practices and found no evidence that any practice had adverse effects.

Little is known about the most effective OHS practices for small businesses despite the cost and range of initiatives implemented in the workplace. A comprehensive search found no review that had systematically explored H&S management practices and examined the effectiveness of interventions for reducing work injuries in small and medium sized product dismantling businesses. But still well-designed evaluations are possible with small businesses argued by (Breslin et al., 2010). Greasley and Edwards (2015) in their study looked specifically at managerial commitment to the Health and well-being interventions and at the organizational context in which they occur as Health and well-being interventions are increasingly assessed as complex processes rather than randomized controlled trials. Their two particular arguments need some explanation.

The degree of success of an intervention is shaped by wider organizational conditions. Cox et al. (2007) argued that variation in macro processes in the wider organisational, social and socioeconomic, and political contexts may explain why some interventions are successful while others are not. Yet little is known about the ways in which nominally similar work

practices are shaped by particular organisational conditions (Vallas, 2003). The extent to which large-scale socioeconomic or political factors prevent managers from keeping their promises is an important overall factor conditioning success (Uggen & Thompson, 2003).

This latter theme is central. Experimental studies necessarily control for the environment. They may find effects when other influences are absent, but in the reality of organizations managers need to know whether the effects will continue to exist when wider influences are taken into account. The reality of concurrent changes faced by organizations should therefore be considered the norm and be integrated into H&S management mechanism (Nielsen et al., 2010). Greasley and Edwards (2015) also specified the kinds of organizations who attempted initiatives in practice are not a random selection of all organizations. As Ichniowski and Shaw (2009) pointed out, workplace innovations are adopted by certain types of organizations, and interestingly what happens in them is not similar to average effects acrIchniowski and Shaw (2009)oss all organizations.

Initiating H&S practices are either mandatory or voluntary. According to Robson et al. (2007) mandatory initiatives arise from government legislation and their use is enforced through inspections, fines, etc. and voluntary initiatives arise through private enterprise, employer groups, government and its agencies, insurance carriers, professional organizations, standards associations and are not directly linked to regulatory requirements. Political and competitive forces sometimes play the role for firms to initiate interventions. For example, incentives are offered by governments or insurance carriers to organizations that voluntarily adopt particular interventions. Many voluntary H&S interventions, particularly those marketed through commercial industries are mostly observed in large companies. These are characterized by being more thoroughly specified but consequently, considered as too complex for the majority of smaller employers (Frick et al., 2000). Voluntary occupational H&S schemes marketed through public agencies, however, target not only large companies but also smaller

ones (Frick et al., 2000). These schemes either involve simpler H&S interventions or have a menu of options, including simple ones, for companies of different sizes or at different stages of occupational health & safety system (OH&S) development. Mandatory OHSMSs are simpler in terms of the demands placed on organizations as these are intended for all or most workplaces irrespective of size of the firm.

Hiremath et al. (2016) conducted their study in India developed the ship-specific recycling plan, what-if-analysis and wastes inventory strengthening the three-step risk assessment method that fulfil the legal obligations and eventually help in achieving the safe and environmentally sound ship recycling as desired by HKC and newly passed EU legislation. Indian ship breakers and other ship breaking firms, particularly, in South Asian Least Developed Countries (LDCs) can adopt as an intervention, which eventually contribute to the workplace health and safety as well. In Bangladesh, some shipbreaking firms adopted ISO 14000, ISO 18000 voluntarily as their intervention program due to increasing competitive and regulatory pressure worldwide.

2.6 Overview of Health & Safety Management at Workplace

Health & Safety (H&S) management relates to the actual practices, roles and functions associated to maintain a safe work environment (Kirwan, 1998). H&S management is considered as a sub-system of the total organizational management and is carried out through the organization's safety management system with the adoption of various safety management practices (Vinodkumar & Bhasi, 2010, 2011). Safety management systems are mechanisms that are designed and integrated within the organization to control the hazards that can affect workers' health and safety (Labodová, 2004).

Safety management practices are the policies, strategies, procedures and activities implemented by the management of an organization targeting safety of their employees

(Vinodkumar & Bhasi, 2010). They are the essential elements permitting an effective management of safety in firms and are designed to comply with the existing legislations applicable to the organization. The extents to which these practices are implemented in an organization are generally manifested through various management mechanism (actions and programs) and are clearly visible to an insider like an employee (Robson et al., 2010).

The occupational health and safety management system (OHSMS) is part of the overall management system that deals with the management of the occupational health and safety (OHS) risks associated with the business of the organization. This includes the organizational structure, planning activities, responsibilities, practices, procedures, processes, and resources for developing, implementing, achieving, reviewing, and maintaining the organization's OHS policy (Wilkinson & Dale, 1999). It was first prepared by the HSE's Accident Prevention Advisory Unit (APAU) in the UK in 1991 as a practical guide for directors, managers, health and safety professionals, and employee representatives who wanted to improve health and safety in their organization (Manu, Mahamadu, Ath, et al., 2017).

According to Hasle and Zwetsloot (2011), remarkable development of H&S management started from 1990. They also identified two main streams of this gradual development: firstly, the development of laws that required systematic H&S management, for example, EU framework directive and secondly, the introduction of some H&S management models, for example, BS OHSAS 18001 falls into this category (Hasle & Zwetsloot, 2011). In the arena of HSMS or models, HSE (1997, 2013), British Standard BS OHSAS 18001:2007 (BSI, 2007), and International Labour Organisation ILO-OSH (2001) are the most noticeable models (Manu, Mahamadu, Ath, et al., 2017).

HSE (1997)'s 'Successful Health and Safety Management Guidance (HSG65)' is widely known model of H&S management (Manu, Mahamadu, Ath, et al., 2017) and according to Pérezgonzález (2005) it has constituted the basis for other subsequent models.

Manu, Mahamadu, Ath, et al. (2017) identified six elements in this model. These are policy: A general statement and overall guiding principle regarding H&S of an organization; organisation: This covers the roles, responsibilities and provision of resources within an organisation to effectively control H&S issues; planning and implementing: This covers goal-setting and operating the system; measuring performance: This covers monitoring implementation to ensure that the set targets are being achieved; review performance: This covers procedures to ensure that the organisations learn from experiences at the measuring stage to improve performance; Auditing: This covers monitoring of the overall system to ensure its effective function to achieve continuous improvement (Manu, Mahamadu, Ath, et al., 2017). ILO-OSH (2001)'s guidelines on Occupational Safety and Health (OSH) management systems also consist of six elements like the HSE (1997) model and these are: policy; organizing; planning and implementation; evaluation; action for improvement and audit (Robertson, 2016) British Standards Institution BSI (2007)'s Occupational H&S Management System (BS OHSAS 18001:2007): BS 8800: 1996 (updated 2004) was the previous version of this British standard (Podgórski, 2015). Five elements of BS OHSAS 18001:2007: occupational health and safety policy; planning; implementation and operation; checking and corrective action; and management review, are almost similar to the HSE's (1997) model. The compatibility of the BS OHSAS 18001:2007 with the international standards ISO 9001 (for Quality Management) and ISO 14001 (Environmental Management) has been appreciated lot. Manu, Mahamadu, Ath, et al. (2017)) justified that such compatibility yields a conducive condition for organizations in integrating H&S management system with quality and environmental management systems in their daily operations. However, a new international standard for occupational H&S management systems titled as "ISO/DIS 45001" is coming soon and BS OHSAS 18001:2007 is expected to be replaced by this latest model (Robertson, 2016). He argued that HSE (2013)'s managing for H&S model is a revised form of the HSE (1997) model

where there is a structural shift of elements and sub-elements and it adopted Deming's Plan-Do-Check-Act (PDCA) structure. This shifting of elements and sub-elements attempts to make a balance between the behavioural and systems facets of management. It also considers H&S management as an integral part of general management. However, the sub-elements of the revised model however still reflect the components of the earlier HSE (1997) model like policy and planning for PLAN; risk profiling, organising, and implementing for DO; measuring performance and investigating accidents/incidents/near misses for CHECK; and reviewing performance and learning lessons for ACT (Manu, Mahamadu, Ath, et al., 2017). They also concluded that most of the other mentionable models have also taken adapted form of HSE (1997). Pérezgonzález (2005) (2005) criticized mentionable H&S management models firstly, by mentioning that these subsequent adapted versions are not management systems rather they are management procedures, secondly, lack of empirical validity of the existing models. He especially highlighted the lacking in terms of delivering H&S success. He criticized the H&S models by mentioning their very much exercise/dependence on exercises of theories and noted that existing models are good user guides.

Health & Safety models lack empirical validity and there is a common recognition that the implementation of H&S management practices is an effective way to mitigate occupational injuries and illnesses (Aksorn & Hadikusumo, 2008; Fewings, 2013; Lingard & Rowlinson, 2005). However, a study by Robson et al. (2007) on the effectiveness of H&S management (based on a systematic review and assessment of evidence by previous studies) concluded that the current body of evidence was insufficient to decide whether or not to support H&S management system. They suggest that benchmarks should be identified at the outset to assess the effectiveness of the management models. Recent study conducted by Yoon et al. (2013)Yoon et al. (2013) emphasized on H&S management system certification adopted by companies. Their study involved a comparison between two groups of companies: occupational

HSMS certified companies and non-certified companies, from 2006 to 2011, showed a significant improvement of H&S performance of the certified companies in comparison with non-certified companies. This lends support to the implementation of H&S management within organization. Implementation of H&S management practices within organizations are also potentially driven by several external factors such as legislation, competition etc. suggests that organizations are deriving some positive Health & Safety outcomes which may however be expensive and difficult to robustly empirically trace to specific H&S management interventions/practices (Shannon et al., 2001). Therefore, while inclination towards the view that H&S management is generally beneficial to eliminate the frequency of accidents, injuries and illnesses, it is also instructive to note that the model by HSE (1997) and its subsequent adaptations collectively offer a useful framework for diagnosing the implementation of H&S management (Manu, Mahamadu, Ath, et al., 2017) where H&S play the role of strategic expeditors in implementing H&S management practices.

Whilst there are studies that have inquired into the H&S management of firms, the domain of those studies were different (e.g. Whysall et al. (2006) in UK; Robson et al. (2007) in Canada; Luria et al. (2008) in USA; Breslin et al. (2010) in Canada; Hohnen and Hasle (2011) in Denmark; Greasley and Edwards (2015) in UK and Manu, Mahamadu, Ath, et al. (2017) in South East Asia). No study on firm level H&S management has been conducted in shipbreaking industry of South Asian developing countries such as Bangladesh, all studies were conducted either on processing industry or construction industry.

2.7 Safety related Prioritization

Prioritization is the activity that organize tasks/activities in order of importance relative to each other (definition of prioritization - The Free Dictionary. Retrieved 2020-12-09). In this study, safety related prioritization has been categorised into strategic and operational aspects.

Strategic prioritization of safety refers to the relative importance given to safety concerns while taking decisions by top management. Operational prioritization of safety refers to the relative importance given on safety concerns while taking actions by middle management. In shipbreaking industry, when firms decide to set reasonable production target instead of unreasonable production target by top management (i.e. strategic), it results into prioritized activities to give workers reasonable time for breaking ships instead of giving unreasonable time by middle management (i.e. operational). Here relative importance is given to safety versus production by top and middle management is critical, as safety leadership comes from them. High reliability theory provides a comprehensive description of how organizations maintain safety for long periods in complex and hazardous environments (Griffin et al., 2014) where strategic prioritization of safety has been identified as an important factor along with redundancy in safety systems, and a strong culture (Weick et al., 2008).

Clarke et al. (2017)Sharon assert that within organizations, decisions taken by senior management leadership have a direct effect on organizational safety. They also argue that how safety risks will be managed at an operational level is determined on the basis of top management decisions driven by its prioritization. Top management decisions range from broadly resource allocation for safety to specifically, development of infrastructure, formalization of safety management, investment in training, buying and maintenance machines and equipment, updating of equipment etc. (Zohar & Tenne-Gazit, 2008). In this regard, Reason (2000); Reason et al. (1998)argue that the majority of organizational accidents have their origins within the managerial sphere and the deleterious effects of poor safety leadership permeate throughout the organization, affecting attitudes and behaviours at every level.

The critical role that top management and middle management leaders play in setting the context in which individual workers evaluate and manage risks on a day-to-day basis is evident in many incidents (Kelloway et al., 2017). Kelloway et al. (2017) considered the major

accident occurred in 2010 at BP's Macondo offshore drilling rig in the Gulf of Mexico that caused the deaths of 11 oil worker. The investigation report produced by The National Commission on the BP Deepwater Horizon Oil Spill and Offshore Drilling (2011) concluded that most of the mistakes and oversights at Macondo can be linked to a single overarching failure which is nothing but a failure of management. Better management by BP, Halliburton, and Transocean could have prevented the blowout by improving the ability of individuals to identify the risks they faced, and properly evaluate, communicate, and address these risks to management) (Kelloway et al., 2017). Similar conclusions have been drawn from the analysis of earlier accidents in the oil and gas industry, such as the Texas City oil refinery explosion in (Hopkins, 2014), and the Piper Alpha disaster in 1988 (Flin, 2003), and across various other industrial sectors.

Another area highlighted by Zohar (2010); Zohar and Luria (2003) is the extent to which safety values are espoused is not necessarily aligned with the extent to which safety values are enacted during work operations. On one hand, safety can be proclaimed as a high priority through organizational policies, on the other hand, in the face of budget cut or production pressures safety procedures might be compromised (Sharon Clarke, Sara Guediri and Allan Lee, 2017). The true priority of safety emanates from the degree of congruence between the espoused and enacted values of safety (Zohar, 2010). Other studies (McPhail, 1989; Weick et al., 2008) have highlighted the relevance of social sense making in high-risk environments, where employees are typically confronted with multiple demands, such as ensuring safety while keeping a project on schedule and reducing cost simultaneously (Zohar, 2010; Zohar & Tenne-Gazit, 2008). In such cases, the priority of safety is not absolute, rather relative to other demands and targets (Shannon & Norman, 2009; Zohar, 2010; Zohar & Tenne-Gazit, 2008). Such relative prioritization of safety always deal with competing and contradicting goals such as safety and productivity.

Workers learn to concentrate on safety and assess the consequences of unsafe actions, rather than simply following safety procedures once the top management, apart from statutory regulations etc., defines these (Barling, 2001; Conchie & Donald, 2009; Kelloway et al., 2006; Zohar & Luria, 2004). A management that focuses on self-interest and continual learning from mistakes, ensures that employees from office managers to captain, purser or sailors understand the importance of following the safety procedures, until and unless it becomes their only choice and attitude (Clarke, 2013).

Finally, consistent prioritization of safety, which consequently lets followers feel safe to speak up about safety concerns and report errors, reflects the behavioural integrity of top management leaders and creates a predictable environment (Kelloway et al., 2017). Moreover, dangerous work contexts or crisis situations might place increased cognitive demands on the individuals who operate within them (Dóci et al., 2015). Therefore, aiding employees to make sense of the complexity and ambiguity that characterize their work environment has been considered as a core function of safety leadership (Baran & Scott, 2010; Mumford et al., 2007).

2.8 Accommodated Operations for Workplace Safety

History of workplace accommodation is not that old. The duty to accommodate refers to the obligation of an employer, service provider, or union to take steps to eliminate disadvantage to employees, prospective employees or clients resulting from a rule, practice, or physical barrier that has or may have an adverse impact on individuals or groups protected under the Ontario Human Rights Code (Hunter, 1972) . On one hand, accommodative practices are defined as those HRM practices aimed at meeting workers' needs for reduced workloads (Armstrong-Stassen & Ursel, 2009; Remery et al., 2003). On the other hand, Colella and Bruyère (2011) defined workplace accommodation as "modifications in the job, work environment, work process, or conditions of work that reduce physical and social barriers so that people with

disabilities experience equal opportunity in a competitive work environment" (p. 478). Man et al. (2020) argued that people with disabilities and without disabilities – all can be eligible for getting appropriate workplace accommodation for improving performance, although their study was based on creative performance.

The term Accommodative HRM practices predominantly studied psychological aspect of workers (e.g. engagement and commitment (Bal et al., 2013). Moreover, such practices in HRM have been inspired by disengagement theory (Adams, 1999; Cumming & Henry, 1961) by assuming that with increasing age, people gradually withdraw from their role in society when they prepare for retirement. Another inspiration for accommodative practices have come from SOC theory (Baltes et al., 1999), assuming that employees who experience losses in their capabilities will use a number of strategies to adapt to their environment, namely selection, optimization, and compensation (Wiese et al., 2000, 2002).

Employing ''vulnerable'' workers by small firms such as young, less experienced and/or low educated workers compared to large firms is another challenge (Belman & Levine, 2004) and such vulnerability should be accommodated well in order to reduce risk and hazards in highly risky and hazardous industry irrespective of the size of the firm.

However, as main aim of accommodative practice is to meet up workers' needs for reduced workloads, such practices can be used to meet up workers' needs for reduced risk of work as well by the employers who try to accommodate workers by equipping or mechanizing partially or completely to do the risky and hazardous work of shipbreaking. Shipbreaking firm owners cannot ignore their responsibility to make a risk, hazards free i.e. a safe working condition for workers, and it is one of the grounds of compliance nationally and internationally. By ensuring "Work-Health" balance of workers at shipbreaking yards, such practice has a large room for use in facilitating and enabling workers working hazardous and risky shipbreaking activities safely, such as, unloading hazardous cut parts from the ship, removing hazardous

materials from the yard, carrying gas cylinder, using welding machine, fitting parts of scraped machinery and equipment on board etc.

In the shipbreaking industry context, such needs for reduced workload is very critical due to the risky and hazardous nature of the activities. H&S management practices can meet up such needs by improving specific structural development specified in HKC and EU' structural requirements where use of mechanization and equipment is compulsory. For example, according Article 13(1)(g)(h)(i) under The EU Ship Recycling Regulation (EUSRR) (1257/2013), a shipbreaking yard must ensure safe and environmentally sound management and storage of hazardous materials and waste, including. It clearly mentioned there that the handling of hazardous materials, and of waste generated during the ship recycling process, must be conducted only on impermeable floors with effective drainage systems (EUShipRecyclingRegulation, 2013). It is also mentioned under Article 13(1)(h) and (d) that the yard establishes and maintains an emergency preparedness and response plan; ensures rapid access for emergency response equipment, such as fire-fighting equipment and vehicles, ambulances and cranes, to the ship and all areas of the ship recycling facility. Therefore, in this industry, machine-facilitated and equipped manual labour and built structures (lifting machines, crane, winch machines, fire-fighting equipment and vehicles, impermeable floors and so on) are not luxury rather necessity (EUShipRecyclingRegulation, 2013). Again, Horsley (1998) argued that escape routes from potentially dangerous areas must be unimpeded and manual trip devices easily accessible in the event of an emergency. Moreover, suitable alarmed detectors and escape masks/survival equipment should be available as appropriate when leakage of toxic or other harmful gases and so on may be encountered (Horsley, 1998).

Although national and international regulations have made accommodation mandatory for shipbreaking firms, study showed that organizations reactively adopt reasonable

accommodations mainly for disable workers or aged workers to fulfil the legal requirement and minimize the inferior status of employees with disabilities (Man et al., 2020).

Employees who are well accommodated will get more resources and support to help them complete creative job tasks successfully, which in turn will bring more enactive mastery experience to strengthen creative self-efficacy (Bandura, 2000). As a risky and hazardous working environment, shipbreaking firms need need to accommodate their yards with appropriate machineries and equipment and infrastructural facilities so that their workers can achieve competency in their performance. Moreover, proper workplace accommodation can improve safety culture as when employees feel well accommodated, they feel included and connected with the groups without losing their uniqueness and they will feel safer and less anxious (Man et al., 2020).

2.9 Commissioned Operations for Workplace Safety

The term ‘commissioning’ has been used predominantly in Construction Management. Commissioning is as much a management task as a technical task (John Horsley, 1998) where safe and orderly completion of a project by maintaining its operability in terms of performance, reliability, safety and information traceability is required where fulfilling safety requirements of the project is an essential factor along with costs and quality requirements (Bendiksen & Young, 2005). Ensuring safety is prerequisite while maintaining commissioning sequences in any processing project (Killcross, 2021). Again, Lawry and Pons (2013) recognized and considered occupational health & safety as a critical execution issue, appropriate to the project. Shipbreaking operation like many other processing projects, is highly commissioning driven where all the preceding activities of commissioning - that is, engineering, procurement and, indeed, construction itself -are directed not just towards the construction or mechanical completion of the plant, but also through the specific commissioning sequences required to

overall final acceptance (Horsley, 1998) and ensuring safety is prerequisite while maintaining such commissioning sequences in any processing project (Almasi, 2014) such as: shipbreaking. Occupational H&S is a critical execution issue (appropriate to the project) that should be recognized and considered (O'Connor et al., 2016). Complying safety requirements is considered as one of the main objectives of commissioning as highlighted by Bendiksen and Young (2005), who argued that, the main objective of commissioning is to affect the safe and orderly handover of the unit from the constructor to the owner, guaranteeing its operability in terms of performance, reliability, safety and information traceability where fulfilling safety requirements of the project is an essential factor along with costs and quality requirements.

On one hand, the emphasis placed on ensuring good scope definition and the establishment of clear responsibilities have been highly emphasized by Horsley (1998) as it helps to put in place the appropriate documentation and procedures. On the other hand, lack of definition in the split of work between contractors and owners, between commissioning and operating workers, within commissioning and operating workers –all- often causes misunderstanding and potential conflict between the various parties which needs greater attention (Horsley, 1998). Moreover, Popp and Scarborough (2016) highlighted six challenges to the transition from execution to operations for large capital projects people readiness, system readiness, legislative compliance, services and infrastructure readiness, procurement and supply chain readiness and equipment readiness. In order to cover up these challenges, Lawry and Pons (2013) emphasized on integrative approach while managing the interlocking elements of commissioning and identified several general commissioning issues and problem areas through their investigation of integrative plant commissioning, including a need for greater attention from management personnel, under-resourcing and difficulty in quantifying the value of commissioning. O'Connor and Mock (2019) identified eight indicators while defining success of commissioning and safety performance is one of the eight indicators of successful

commissioning along with product quality performance, product quantity performance, schedule performance, environmental performance, operations team performance, impact on on-going operations and level of effort required by the startup team (O'Connor et al., 2016). Procedure errors and off-design operations/errors in operation are important categories of problems recognized by Almasi (2014) that commonly occurred during industrial plant commissioning as part of his review of CSU for industrial plant machinery; along with design errors, material and fabrication defects; assembly errors and installation errors. Moreover, Cagno et al. (2016) identified four main areas that lead to errors during commissioning execution on process plants while addressing risk analysis for plant commissioning are event uncertainty, time pressure, managerial complexity and technological complexity.

All of these findings related to commissioning found by Horsley (1998) who briefly listed 20 typical problems encountered during process plant commissioning, include a lack of attention to detail, reluctance to plan ahead, inappropriate managerial controls, design changes and a reluctance to consult specialists. He also mentioned few underlying causes include the underestimation of CSU complexity, inexperience with/lack of confidence in planning and a lack of knowledge management (Horsley, 1998).

Another factor is legislation. Significant changes to legislation have come into force for shipbreaking industry across international and national levels. Examples of rules & regulations at international level are The Convention on the International Maritime Organisation (IMO), 1948; The MARPOL (Marine Pollution) Convention, 1973; The Basel Convention, 1989; The Hong Kong International Convention, 2009; The European Union (EU) Ship Recycling Regulation (No. 259 of 1993) 2013; The International Labour Organisation (ILO) Guidelines for Safety and Health in Ship Breaking, 2003; The Organisation for Economic Co-Operation and Development (OECD) Guidelines for Multinational Enterprises; The United Nations Guiding Principles on Business and Human Rights (UNGPs); The International Convention on

the Control of Harmful Anti-Fouling Systems on Ships, 2001; The London Convention, 1972; ISO 30000:2009 Standard for Safe and Environmentally Sound Ship Recycling are the rules and regulations respectively (Rahman et al., 2019). Examples of national level rules & regulations are The Shipbreaking and Recycling Rules, 2011; The Hazardous Wastes and Shipbreaking Waste Management Rules, 2011; The Bangladesh Ship Recycling Act, 2018 (Act No. 08 of 2018) and The Bangladesh Labour Act, 2006 (XLII of 2006) respectively. Such broad range of national and international rules and regulations clearly set out the obligations of employers, which require that the risks of commissioning must be taken into account throughout the operation. All these provisions are very much similar to the nature of commissioning as commissioning requires a comprehensive Safe System of Work to be set up to allow shipbreaking project to proceed safely (Kirsilä et al., 2007). Regulation 20 to 24 of the Hong Kong Convention, 2009 specifies that the Ship Recycling Facility Plan - one of the prerequisites of HKC - must ensure that facility is managed, company information is present, training programme is present, workers and records are managed according to the requirement for ensuring safety. Fulfilment of such requirements demands commissioning badly.

Keeping in mind several legal aspects, O'Connor et al. (2011) identified main ingredients of successful commissioning which are meticulous attention to safety and hazards; an ably led, well-balanced, well-trained and committed commissioning team who are capable of absorbing the physical and psychological stress; e adequate involvement in the design phase and safety studies, thorough planning, implementation and control of commissioning preparations; ready availability of help from supporting disciplines to deal with specific problems identified; an expeditious approval system for agreeing plant modifications; a web structured relationship at senior level with site construction management, and with future operational management backed up by ensuring the reliability and operability of the hard facilities (plant) during the commissioning phase. In addition, the proper recording of

modifications is a vital task, as is the preservation of performance tests as datum points for continuing operation (Cagno et al., 2016). Of even greater long term significance is a detailed post commissioning review, recording all that has been done to improve the reliability and operability of the plant during the commissioning phase(O'Connor & Mock, 2019).

Finally, commissioning is as much a management task as a technical task where the large quantity of documentation and records to be handled must be recognized, and an appropriate database is essential to manage the voluminous amount of commissioning records generated on all large projects (Horsley (1998). Commissioning imposes a specific approach to the management (Lawry & Pons, 2013). Therefore, shipbreaking operation demands a commissioning that imposes H&S management approach consisting of formalization of management system; management of safety skills of workers and management of safety culture which represent the interlocking elements of any commissioning such as people (commissioning and operating team workers) and process apart from the firm level accommodating work such as hard facilities.

2.10 Major H&S areas for highly risky and hazardous industry like Shipbreaking

2.10.1 Built structure and mechanization for shipbreaking yard

Firms can reduce work risk and work load by providing required level of accommodation (Bal et al., 2013). Managers should increase investment in production safety equipment, replace existing worn-out production equipment with more advanced technology to ensure that employees work in a safe and comfortable environment, which can greatly reduce the occurrence of safety accidents (Jiao et al., 2018). Moreover, proper built structure and mechanization and equipping shipbreaking operations are required by national and international level regulation. Required facilities for shipbreaking and facility management are mentioned for ship recycling in 2012 Guidelines for Safe and Environmentally Sound Ship

Recycling in HKC (HKC, MEPC 63/23 Annex 4, page 7). Facility management is one of the major components of Ship Recycling Facility Plan (SRFP) - required by HKC.

The required specifications of yard infrastructure for shipbreaking operation have been mentioned elaborately by EU Ship Recycling Regulation (EU SRR) in 2013. Although HKC was the first international mandatory instrument aimed specifically at ship-recycling adopted during the International Conference on the Safe and Environmentally Sound Recycling of Ships, under the auspices of the International Maritime Organization (IMO), it mainly focused on technical and procedural prerequisites (ROSSI, V. 2011).

EU specified the technical guidance note under EU Regulation No 1257/2013 on ship recycling through communication from the European Commission, which outlines the requirements and procedure for inclusion of facilities located in third countries in the European List of ship recycling facilities (EUShipRecyclingRegulation, 2013). EU has used the term 'built structures' as required ship-breaking facility. Article 13(1)(c) of Technical guidance note under Regulation (EU) No 1257/2013 on ship recycling specified that the ship recycling facility 'operates from built structures' (EUShipRecyclingRegulation, 2013). The purpose of built structures is to enable safe and environmentally sound ship recycling operations, ensuring worker safety, control leakage, containment of hazardous materials and impermeable support for hazardous materials and for waste generated during the ship recycling process.

The requirement to operate from built structures does not necessarily mean that a facility be completely built up, as long as compliance with the requirements of the Regulation is reached. Built structures may be complemented e.g. by 'machinery with tracked wheels or low ground pressure tyres' (Article 34, EU Regulation No. 1257/2013 on ship recycling), mobile settling tanks and floating cranes where the installation of fixed cranes is not possible. This applies in particular to temporary installations, where e.g. temporary fencing may be deemed as equivalent to walls provided that it achieves a similar level of protection. The Regulation does

not exclude temporary ship recycling installations whereby additional equipment is fitted to a base facility (e.g. to a port, quay or jetty), provided that the base facility itself complies with the design and construction requirements of the Regulation. In the context of the EU Regulation, examples of built structures in the ship recycling areas where primary cutting takes place may include — but are not limited to — the following: pontoons, slipways and access ramps, quays, docks, dry-docks, ship lifts, bridge-like structures (trestles), canals, canopies; floodgates.

Examples of built structures that provide support for 'fixed plants' is defined in the BCS 2013 guidelines (35) include (but are not limited to) the machines and equipment such as: 'Fixed cranes and other lifting devices used within their design limits (e.g. taking care not to exceed the gross weight that a crane can lift)'; 'Winching gear and cables for safely pulling a ship further away from the shore line while undergoing dismantling'; 'Pumps to transfer liquids to pump liquids from drainage catch pits' and 'Generators to provide electrical power for lighting to enable safer working under low light conditions' under Article 35, EU Regulation No. 1257/2013 on ship recycling) (EUShipRecyclingRegulation, 2013).

Examples of built structures applied to the health and safety-related requirements of the Regulation include (but are not limited to) the general yard infrastructure such as: 'Firm, level roadways (a simple road base can be constructed initially with e.g. crushed concrete)' or 'a compacted road base' making it possible for an ambulance and a fire truck to reach the ship and station next to it (41) or, in the case of a dry-dock, reach the escape way (e.g. lift), 'Fixed cranes and other lifting devices used within their design limits (e.g. taking care not to exceed the gross weight that a crane can lift)' (see above), stable exit gangways, additional elements referred to in the ILO guidelines (42), notably drinking water supply, location and conditions of operations of sanitary and washing facilities and cloakrooms as well as shelters and facilities for food and drink, additional elements referred to in the IMO guidelines for safe and

environmentally sound ship recycling (43): ‘washing facilities, showers, eating and recreation areas, toilet facilities and changing rooms to control exposure and avoid the spread of Hazardous Materials’; ‘Sanitary and washing facilities conveniently accessible and situated so that they are not at risk of contamination from the workplace’; ‘Separate and appropriate changing rooms and sanitary and washing facilities provided for exclusive use by workers handling asbestos’; ‘Separate and uncontaminated areas for workers to use for eating, drinking and other breaks’ (EUShipRecyclingRegulation, 2013).

2.10.2 Formalization of Management System

Formalization is the extent to which an organization’s policies, procedures, job descriptions, and rules are written and explicitly articulated (Sine et al., 2006). Formalized structures are those where rules and regulations are written to control employee behavior and in consequence employees have little autonomy to decide on a case-by-case basis (Schminke et al., 2000). An advantage of formalization is that it makes employee behavior more predictable (Chonko, 1982). Whenever a problem arises at work, employees know how to use a handbook or a procedure guideline to address the problem. This facilitates in developing a consistency throughout the organization in employees’ response to that particular problem (Covin & Slevin, 1988). In order to ensure worker’s safe working behaviour in highly hazardous and risky operations conducted in shipbreaking yards, improving predictability and consistency of behaviour are critical. The formal-deliberate approach uses rational decisions about fine grained planning and control steps developing detailed plans for budgets, schedules, and activities—formal practices (Appiah-Adu et al., 1996; Argouslidis & Baltas, 2007).

Formalization of Management System refers to the attempt of a firm to make structure of relationships more visible and explicit (Scott, 2002) that allows succession to be routinized and make personal abilities like charisma less critical to performance in a certain role (Bhowmick

& Agarwal, 2013). This definition of formalization is highly operational in this study and it has been used throughout the thesis.

Rand & Torm, (2012)Rand and Torm (2012) argue that informality constitutes a growing feature of many developing countries where they highlighted association of "limited or no social security for workers" with informal sector along with low profits and productivity, limited credit access and the absence of official employment contracts etc., notwithstanding its heterogeneity. Formalization is associated with an empowerment of workers (Scott, 2002). Firm level formalization and legal registration result in a decrease in the number of casual workers and an increase in workers with formal labor contracts. Rand and Torm (2012) argued that this contributes to firm level gross profits and investments and showed in their findings that firm's shift from using informal approach to a more formal approach tend to exhibit better compliance with regulations and/or more willing and able to invest on their workers to increase productivity and longer term stability of the business. This further helps in minimizing labour exploitation. However, their study fails to provide evidence on a better wage structure due to formalization. This may be related to the weakness of trade unions and the collective bargaining system among Vietnamese SMEs like other developing countries. Moreover, a case study on Sri Lanka (De Mel et al., 2013) found that modest increases in the perceived benefits of being formal might substantially increase rates of formalization.

Formalization is very much encouraged in High Reliability Organizations (HROs) as HROs have stringent procedures that they use to manage safety, because they function in a tightly coupled system, tightly coupled meaning that all their procedures and activities function simultaneously, and any error from one section will affect total system performance (Enya, Pillay, et al., 2018). However, Atalla and Awad (2020) argued that in the event of an uncertainty, there is a collapse in hierarchy and the most experienced personnel resolves the situation. In the presence of a formalized system, there is always room for getting operational

benefits such as developing a reasonable work plan and rules and regulations, making full use of modern technical means and methods, giving timely notice of changes to the work plan to employees, strengthening communication with employees for proper understanding of the work planning process, timely and accurate explaining the coordination and encouraging employees to put forward suggestions for rationalization (Jiao et al., 2018).

Finally, formalization is required by Hong Kong Convention 2009, for shipbreaking industries across the globe where the ship recycling facility plan SRFP should include facility management, company information, training programme, worker management, Records management even Housekeeping and illumination specifying procedures for work areas, such as aisles, passageways and temporary deck openings (MEPC 63/23, Annex 4, page 7, HKC, 2009). EU Ship Recycling Rules, 2013 also emphasized on formal management to ensure safety (Pastorelli, 2014).

2.10.3 Safety Skills

Safety skills of shipbreaking workers are very critical in order to achieve good H&S outcome in terms of injuries and death cases. In extant safety literature, attention has been focused on skills such as compliance, vigilance, and perseverance as determinants of individual safety behavior (Griffin & Neal, 2000). These behaviors, in turn, support overall safety of an organization, and contribute to improve organizational safety capability under routine operating conditions. However, there is also increasing awareness that individual safety behaviour does not ensure the overall safety of the system even in a fairly stable environment (Hayes & Maslen, 2015).

Generally, ‘skills and expertise’ includes cognitive abilities; interpersonal, communication, leadership, and coping skills, together with more specific role-related technical qualifications and competencies (Griffin & Neal, 2000). Safety skills and expertise

possessed by individuals within an organization formed human capital of that organization (Youndt & Snell, 2004). The personal skills and expertise that underlie individual safety performance in high risk industries have long been the focus of both researchers and organizations (Griffin et al., 2014). Expertise refers to an individual's accumulated knowledge, understanding, perceptions and cognitions derived from long-term exposure to particular roles, situations, and environments (Hayes, 2012). Such expertise is critically important in high-risk industries (e.g. exploration and production processes in the oil/gas industry).

Ericksen and Dyer (2005) describe a range of employee characteristics that drive effective performance in high reliability organizations such as ability to continuously anticipate and detect operational problems, to communicate extensively with co-workers; to respond rapidly and appropriately to problems and unexpected events, to switch tasks and roles flexibly to deal with changing situations; to respond to novel or complex problems with coordinated and effective actions; and the motivation to gain a better understanding of operating processes and procedures, and to share such information openly. These characteristics suggest that human capital is very useful not only under normal operating conditions but also in unexpected and rapidly changing situations (Griffin et al., 2014). Research has identified a range of safety-related attributes such as decision-making, coping with stress, and risk awareness that combine to create safety skills (Curcuruto et al., 2017). To increase education and training efforts in the area of enterprise safety production, firms must not only conduct pre-job skills training and emergency skills training, but also conduct manual training and rigorous training assessments to enhance staff proficiency in production to ensure that each staff proficiency in production operations (Jiao et al., 2018)

Curcuruto et al. (2017) categorizes safety skills as technical safety-skills and expertise and not-technical safety skills, which are important for sustained organizational operations (Griffin et al., 2014). Safety skills have been frequently investigated as proximal antecedents

of safe conducts in the workplace (Casey et al., 2017; Curcuruto et al., 2017; Griffin et al., 2014). Technical Safety skill includes technical qualifications, competencies, experience, and understanding of process safety risks (Griffin et al., 2014), whereas, non-technical safety skills refers to a range of personal and interpersonal qualities that promote safety capability (Griffin et al., 2014). Curcuruto et al. (2017) specified safety skills as working skills, working safely, process safety skills and emergency skills of workers where personal skills as personal attributes and interpersonal skills of workers. In many of the workplace injuries, poor hazard recognition skill among workers has played a central role (Haslam et al. 2005, Albert et al. 2013) along with other technical safety skills.

Decision-making & problem-Solving Skills, interpersonal communication skill with co-workers, communication skill, leadership skill, coping skill with operational change, situational awareness, effective communication skill with co-workers and so on are very critical non-technical safety skills (Curcuruto et al., 2017) as these can influence their technical safety skills. However, it is not practical to create an exhaustive list of personal attributes that support an organization's safety capability (Griffin et al., 2014). Moreover, the overall profile of demographic factors such as gender, age, and education of workers can identify systematic strengths or weaknesses in the level and diversity of workforce's safety skills (Hayes & Maslen, 2015). More generally, these skills and behaviors must enable personnel to respond effectively to complex and changing conditions, and to manage unexpected and volatile situations (Amir-Heidari et al., 2016). When an organization considers its capacity to adapt and change in response to internal and external pressures in order to maximize operational safety, other personal attributes are required. This broader set of attributes must necessarily encompass the ability to detect early signs of future system disturbances or malfunctions, and the knowledge and skills to forestall them before they escalate into operating emergencies (Griffin et al., 2016) (Griffin et al., 2014)

Process safety skill, emergency skill, hazard identification skill are important technical skills required for shipbreaking operation. Workers who have sound "process safety skill" know when to ask for external technical assistance in case of changes in the operating context. They understand risks when engaged in new activities/ changes, they have the breadth and depth of knowledge of major accident risks appropriate to the yard facility and they can manage the response to an incident such as a gas leak (Curcuruto et al., 2017). Even they know when to stop the operation. It is very important for yard owners to make sure that workers who plan and manage the operation of their facilities understand the factors that influence risk. These are some examples of process safety skills, which are desirable for ship breaking workers especially critical cutting and fitting job on board. Another important technical skill is the hazard identification skill which is particularly useful for highly hazardous industry. Therefore, it is important for workers in shipbreaking industry. For effective injury prevention, workers must be able to recognise and manage work-related safety hazards (Abdelhamid & Everett, 2000; Mitropoulos et al., 2005). If workers are unable to recognise safety hazards, they become more vulnerable to work-related injuries and accidents (Abdelhamid & Everett, 2000; Albert & Hallowel, 2013; Carter & Smith, 2006). Therefore, employers often encourage workers to adopt several field-level hazard recognition techniques (Pandit et al., 2020). Recent efforts highlighting the importance of hazard recognition skill among construction workers e.g. Abdelhamid and Everett (2000); Carter and Smith (2006); Jeelani et al. (2019); Namian et al. (2018); Perlman et al. (2014) emphasized on hazard recognition skill very much as technical skill and highly hazardous industry like shipbreaking industry where hazard recognition skill is considered as one of the most important technical safety skills. Albert and Hallowel (2013) argued that when workers fail to recognise relevant safety hazards, they are also more likely to experience hazard exposure and workplace injuries. Past research has also demonstrated that workers are more vulnerable to making human errors and adopting risk-taking behaviours

when workplace hazards or unsafe conditions remain unrecognised (Abdelhamid & Everett, 2000; Gibb et al., 2001; Mitropoulos et al., 2005; Perlman et al., 2014). Last but not the least important technical skill is “emergency skills” was described by key characteristics of workers like: knowing all the prescribed procedures for emergency situations, knowing how to handle emergency equipment and devices in emergency situations, knowing how to coordinate their efforts with other people and teams in real emergency situations etc.(Curcuruto et al., 2017) Where Neal et al. (2000) considered safety knowledge and safety motivation as determinants of safety performance, in another study, Pousette et al. (2008) measured safety motivation and safety knowledge as two individual attitudes to safety. Self-rated safety behaviour was measured by three safety behaviour measures. They were named as structural safety behaviour (concerning participation on organized safety activities), interactional safety behaviour (concerning safety activities in the daily work in interaction with co-workers and management) and personal safety behaviour (measuring behaviour promoting personal protection). The determinants of safety performance were measured by safety motivation and safety knowledge and components of safety performance were measured by safety compliance and safety participation in this study.

Competencies or skills of a ship-breaking worker have been explained in Article 3(3) of the EU Ship Recycling Regulation, 2013. According to Article 3(3), EU Ship Recycling Regulation, 2013, “a competent person may be a trained worker or a managerial employee capable of recognising and evaluating occupational hazards, risks, and employee exposure to potentially hazardous materials or unsafe conditions in a ship recycling facility, and who is capable of specifying the necessary protection and precautions to be taken to eliminate or reduce those hazards, risks or that exposure” (EUShipRecyclingRegulation, 2013). From this definition, it is evident that ship-breaking workers needs technical skills such as: hazard identification skill, process safety skill, situational awareness and emergency dealing etc. along

with non-technical skills which are predominantly personal attributes of workers. Such skills can also be improved through work experience.

In order to prevent injuries, it is necessary to have a proper understanding of workplace factors that can foster learning and the development of process safety skills, hazard recognition skill and emergency skills among the workforce is fundamental (Pandit et al., 2020). Therefore, safety skill management should consider design of safety training content accordingly along with recruitment of technically skilled workers.

2.10.4 Safety Culture

Safety culture has been repeatedly emphasized by major accident investigations as a significant contributing factor (Bills & Agostini, 2009; Group, 2011) and recognized as a key determinant of process safety and developing safety culture is promoted as an essential part of a risk based approach to process safety (CCPS, 2010). Safety culture is an aspect of organizational culture, and was firstly introduced in the frame of the investigation of the Chernobyl nuclear accident in 1986 (Karanikas et al., 2016) and numerous studies have attempted to define, and conceptualize safety culture, since then, thereby, leading "… to different ideas about the best means of developing a safety culture and thus also about the means of developing safety." (Reiman & Rollenhagen, 2014). Reason et al. (1998) defined safety culture as an organization's core values about the importance of safety and the underlying beliefs and assumptions that guide behaviour and decision making. Similarly, Guldenmund (2000) described safety culture generally through the values, beliefs and attitudes which are shared within the social context of an organization. Griffin et al. (2014) particularly mentioned the concept of safety culture as the most well articulated form that has been applied to high-hazard working environments. An organization's safety culture embodies the norms that shape how individuals interpret and

respond to safety events (Clarke, 2010; Quick & Considine, 2008) and motivates safety-related behaviours (Nahrgang et al., 2011).

Safety culture not only shapes the externally visible elements of an organization, but also the invisible element that are "not said" or reflected only in symbolic actions (Casey et al., 2017). For these reasons, safety culture is often described in terms of "deep" meaning i.e. the unrevealed part of the company's character. For example, Curcuruto et al. (2017) identified three sub-elements of safety culture: "error management culture", "just and fair culture" and "learning and flexible culture" while framing "The Fitness-To-Operate framework (FTO)" of the safety capability of an organization. The "error management culture" prevails when a worker can discuss his own errors in a "blame-free" atmosphere". Such non-blame culture is an approach that tries to see any problem from a view that is totally disconnected by any term of fear. Thus, this type of culture always encourage the workers working on board (inside EOL ship) and at the yard to report errors and every problem arising at workplace without any punishments. It also helps workers to handle the detected errors in a constructive way, to avoid the potential negative consequences of errors and so on (Curcuruto et al., 2017; Nahrgang et al., 2011). "Just and Fair culture" refers to an approach that shows zero tolerance to unsafe behaviour and some organizations draw a strict line that separates the acceptable incidents that may be opportunity for learning from unacceptable and totally unsafe behaviour that could lead to sever and catastrophic consequences (Weick et al., 2008). Final element of safety culture is "Learning and flexible culture" which is expected to prevail in firms when team members not only can discuss how potential problems (e.g. near-miss, errors…) might be managed but also when team members can discuss their committed errors and mistakes, and how they could have been prevented. In this culture, team can do things differently if they think it is necessary without waiting for the approval of higher authorities. Team can regroup and restructure its work if needed and can generate an effective team interactions while responding to unexpected

events. Lastly, when unusual events are used as sources for learning, it shows the learning and flexibility aspect of safety culture prevalent in firms as well. Combining these elements of safety culture can develop an organization of higher reliability where employees report their errors and all near misses events, whereas a line is drawn between acceptable and unacceptable behaviours. Moreover, the organization should always make the appropriate efforts to cultivate a safety culture among all members and use the arising problems as lessons to be learnt, in order to avoid errors in future (Guldenmund, 2000). The proverb "do mistake but do not repeat the same mistake" is very useful learning in safety culture. Studies in high-risk industries show that a positive safety culture leads to greater levels of safe behaviors among workers (Cooper & Phillips, 2004; Griffin & Neal, 2000) increased motivation to actively engage in safety behaviors rather than just comply with them (Griffin and Neal, 2000), and results in fewer occupational injuries (Barling, 2001).

Safety climate has emerged as a measure of workers' shared perceptions regarding the importance given to safety by management in comparison with other organizational priorities (Griffin & Neal, 2000; Neal et al., 2000; Sinclair et al., 2003; Zohar, 2010). According to Zohar (2010), safety climate perceptions are part of the injury cause-effect pathway, affecting proximal injury factors such as safety behaviours and subsequent safety outcomes. It is suggested that through this construct, workers interpret organizational safety policies, procedures and practices, and that this interpretation subsequently is reflected in their safety behaviour (Clarke, 2010).

In the last decades, safety climate has been suggested as a key factor for safety outcomes in different industries and environments (Beus et al., 2010; Christian et al., 2009). However, its relationship with injury occurrence is inconsistent in the empirical literature (Beus et al., 2010; Huang et al., 2006; Huang et al., 2012; Siu et al., 2004; Smith et al., 2006). Research has also explored safety climate ability to predict not only injury frequency, but also injury severity

in a variety of occupational settings. This relationship is also inconclusive and particularly presents significant discrepancies in defining the outcome. For instance, for a short period (less than 3 months), safety climate predicted severe incidents such as ones that meet OSHA recordability guidelines but not permanently disabling or deadly (Bergman et al., 2014). In addition, a relationship between perception of safety climate and injury severity (referred to as functional limitations) was identified among injured construction workers (Gillen et al., 2002; Gillen et al., 1997).

Safety climate emphasizes the perceptions held by employees regarding the importance of safety in their organization (DeJoy et al., 2004) while the implementation of specific management practices may be considered an actual manifestation of the management commitment to worker health and safety (Marín et al., 2017). Investigators vary in their operationalization of safety climate, but management commitment to, and involvement in safety is a consistent factor included in the majority of or all safety climate scales (Flin et al., 2000; Kines et al., 2011; O'Connor et al., 2011; Yule et al., 2006) as well as a recurring element reported in successful safety programs (Hale et al., 2010; Ismail et al., 2012; Lai et al., 2011; Swuste et al., 2012). Marín et al. (2017) argued that despite differences in the dimensional structure of safety climate, its adoption as a leaning or leading indicator of workplace safety performance is gaining momentum among researchers and practitioners. Safety climate as a whole or its dimensions can be used as a reliable and valid indicator across industries not only as a benchmarking tool, but also to proactively identify areas needing improvement within an organization (Schwatka et al., 2016).

Safety climate provides an assessment of how effectively various safety practices at different levels of an organization have been implemented, resulting in a shared sense of the overall value, priority, and importance placed on safety (Hofmann et al., 2003; Zohar, 1980, 2010). Safety climate implies the way safety is managed by the organization and how it is

transmitted and reflected at workers' behaviour. There are many factors that synthesize a safety climate in organizations with the safety management being the major by evaluating training programs, building and maintaining of team cohesiveness, assessing the risks and so on (Clarke, 2010). Safety culture is likely to be harder to change than safety climate because it reflects deeper and more pervasive assumptions (Casey et al., 2017). Beus et al. (2010) argue that safety climate, is more amenable to change through deliberate organizational actions such as safety training, strategic planning, and participative decision-making. Only way to reveal the deep rooted, unrevealed part of the company's character is through discussion with workers (Denison, 1996). Therefore, team process, driven by safety climate, is very important component of safety culture through ensuring effective team communication both within team and between team communications (Reiman & Rollenhagen, 2014). Safety culture, as it is a mental process, may be difficult to be described by the individuals, but through targeted questions, the main facts would come on the surface about what is safety for them and which are their own responsibilities related to safety. Therefore, team process is very important for ensuring effective team communication both with and team (Curcuruto et al., 2017). Organizations should invest on safety climate and always control and evaluate the safety performance bearing in mind that there are several things, visible and hidden, that contribute to positive safety outcomes, as also to the company's continual improvement (Casey et al., 2017).

Another important aspect of safety climate is safety leadership (Khalil, 2021) across top, middle and lower level management. Safety leadership has been considered as antecedent of safety climate and in turn safety culture (Clarke et al., 2017). Social exchange and social learning theories can explain the impact of leaders on employee safety attitudes and behaviour. For example, when a leader provides resources for safety and invests in safety training for employees, these create a sense of obligation amongst followers to reciprocate through

engagement in positive safety behaviour (Hofmann & Morgeson, 1999; Hofmann et al., 2003; Hofmann & Stetzer, 1998) is justified by social exchange principle. On the other hand, social learning theory has been utilized as a second theoretical foundation for investigating the role of leaders in employee safety behaviour. Social learning theory proposes that learning occurs in a social context through the observation of and interactions with others (Bandura, 2000). Within team communication and between team communication (Bosak et al., 2013; Espin et al., 2006) and in turn, team process (Curcuruto et al., 2017) prevalent in firms tend to be functional by using these principles while addressing safety communication. Applying a social learning perspective to safety leadership, it is suggested that as leaders interact with their employees, they transmit messages about what is expected with regard to safety (Bosak et al., 2013; Zohar & Tenne-Gazit, 2008). Consistent with a social learning perspective, numerous studies have shown that leaders influence their followers' safety behaviours through safety climate, as discussed previously (Shannon & Norman, 2009). Meta analytic evidence also shows that safety climate mediates the relationship between transformational-transactional leadership styles and individuals' safety behaviour (Clarke, 2013). Thus, employees learn the value of safety, as well as what behaviours are accepted and rewarded, through observing and interacting with their leader (Clarke et al., 2017).

Finally, enhancement of the safety culture of the enterprise by providing staff with a harmonious working team are needed to strengthen the supervision and coordination of management (Jiao et al., 2018). Moreover, studies in high-risk industries show that a positive safety culture leads to greater levels of safe behaviours (Cooper & Phillips, 2004; Griffin et al., 2014; Neal et al., 2000), increased motivation to actively engage in safety behaviours rather than just comply with them (Griffin & Neal, 2000) and fewer occupational injuries (Barling, 2001).

2.11 Theoretical Framework of the study

It is important to consider the theoretical frame used in occupational health and safety research. Common theories applied in highly risky, hazardous, and complex industry context is the High Reliability Organisations (HRO) Theory and Institutional Theory. Theoretical foundation of this study is based on High Reliability Organisations (HRO) Theory and Institutional Theory as dominant theoretical framework along with Dynamic Safety Capability Theory.

2.11.1 High Reliability Organisations (HRO) Theory

High reliability organisations (HROs) are known to operate nearly error-free in extremely challenging and uncertain environments, where complex procedures, technology, and guidelines are used to manage complex systems and conditions (Enya, Pillay, et al., 2018). Researchers argued that high reliability organisations are not error free, but rather remain obsessive about the potential causes of failure and are quick to respond to any errors that do occur (McCann et al., 2009; Vogus et al., 2014; Weick, 1999; Weick & Sutcliffe, 2001). The aim of early research on high reliability organisations (HROs) was to explore how principles of HROs appeared to violate the principles of normal accident theory (Perrow, 2011) – the commonly accepted theory of accidents at the time – and managed to maintain safe and reliable operations, while often operating under considerable time pressure in high-risk environments (Carroll & Rudolph, 2006; La Porte, 1996; Rijpma, 1997; Rochlin, 2011).

Moreover, evolving research acknowledged the open systems of HROs, subject to the pressures of "aggressive knowledge watchers" (La Porte, 1996, p. 64) such as regulators and the wider public (Sanders et al., 2016). Such acknowledgement contrasted significantly with HROs' early assumptions of closed systems immune from external influences and with the total elimination of errors as the overriding organisational goal (Sanders et al., 2016). Therefore, researchers have widened the application of high reliability theory to several other

highly complex and consequential operational environments - for instance: healthcare (Chassin & Loeb, 2013; Ruchlin et al., 2004); power generation (Roe & Schulman, 2008); oil and gas industry (Mannarelli et al., 1996); fire-fighting (Barton et al., 2015; Thomas et al., 2015; Vidal & Roberts, 2014); the military (Bierly III & Spender, 1995; Demchak, 1996) and construction (Busby & Iszatt-White, 2014; Olde Scholtenhuis & Doree, 2013). However, there are very few studies that have explored large-scale projects through the lens of high reliability theory and those that have are limited to either IT (Denyer et al., 2011; Sullivan & Beach, 2009) or construction projects (Brady & Davies, 2010; Olde Scholtenhuis & Doree, 2013).

A variety of recognised safety approaches, developed and improved over the past decades, evident in the safety literature, are personnel selection, safety campaign, risk assessment, behaviour-based safety programs, safety regulations, safety climate, prevention through design, near miss accident reporting and so on. These safety approaches have been implemented and assessed with most of the outcomes such as, reducing lost time injuries and accidents on site (Enya, Dempsey, et al., 2018). However, most of the approaches considered by the authors did not keep up with emerging theory on accident causation and safety management (Pillay, 2014) as they were developed and implemented over twenty years ago (Yassin & Martonik, 2004). More advanced approaches and methods are required to address the advancement of operations-based safety such as shipbreaking, and one such method is high reliability organisational (HRO) theory.

Shipbreaking industry also operates in an uncertain environment due to changes in the work environment, unfavourable weather conditions, subcontractors, unskilled workers, management issues, and logistics. However, shipbreaking activities are rarely error- or accident-free due to the strategies and procedures implemented in managing safety. HROs are able to attain high safety standards because they apply the principles of collective mindfulness

in their daily operations. HRO principles have been mostly applied and investigated in the healthcare sector, but nothing has been done in shipbreaking operations. Therefore, it is important to investigate the opportunities of applying the HRO principles as a safety management strategy in construction. A systematic review was carried out to summarise and critically analyse the body of evidence on HRO theory and its applicability as a safety management strategy in shipbreaking industry.

Shipbreaking industry functions in environments that can be compared to HROs. However, due to the complex organisational setup in shipbreaking operations (very common in construction, chemical processing industry and so on) consisting of multiple contractors, changing work environments, cost cutting, and project deadlines (Harvey et al., 2019), some of the HROs principles can be implemented, whereas others may be difficult to fully implement. According to HROs principles, operations management category such as, preoccupation with failure, reluctance to simplify , and sensitivity to operations have attributes that can be linked to risk assessment, incident and near miss reporting, permit-to-work, job safety analysis (JSA), and safe work method statements (SWMS) (Borys, 2012) which are prevalent in shipbreaking safety management tools and procedures. On the other hand, management resilience category of HROs principles such as commitment to resilience and deference to expertise are linked to management responsibility, as it deals with maintaining the overall safety performance of an organisation, ability to recover from unexpected events, and training of personnel to be competent in all aspects of their jobs (Enya, Dempsey, et al., 2018). This study has attempted to empirically investigate how these categories can be used to empirically investigate how these principles can be integrated and implemented as safety management strategies in shipbreaking, justified in industries with complex organizational setup (Enya, Pillay, et al., 2018) .

2.11.2 Institutional Theory

In addition to HRO Theory, adoption of workplace safety practices can also be explained through the 'Institutional Theory'. Institutional theory assumes that the ways people think and act are heavily influenced by social relationships and shared cognitive understandings that are culturally-embedded, give meaning to events, and (may) limit possible actions (Dacin, 1997). Institutional theory is very much aligned with the open systems of HROs subject to pressures of "aggressive knowledge watchers" (La Porte, 1996) such as regulators and the wider public (Sanders et al., 2016). Therefore, Institutional theory provides a suitable framework - based on the regulatory, the normative, and the cultural-cognitive pillars (Scott, 2013) - which is specific to particular countries, cultures, or industries (Poetz, 2016). Frameworks in developing countries often differ from developed country environments, which is the reason that institutional theory has become a dominant approach for studying the behaviour of organizations operating in these environments (Bruton et al., 2010). Moreover, institutional theorising has also been influential in strategic responses of business organizations revealed by Oliver (1991) which indicated that organisations may strategically respond ethically with low resistance, and the lowest in resistance to institutional pressure is acquiescence , which can also be termed simply 'conformity'; may take a slightly higher resistance to institutional pressure and compromise which is the most likely response when there are multiple conflicting priorities from the institutional environment and a desire to promote self-interest, but there is still intent to conform to institutional rules, norms and values (Oliver, 1991); The mid-range of resistance is defined as avoidance and can comprise attempts to conceal undesirable parts of organisational activities from institutional pressures to conform. Defiance is higher in resistance than avoidance as it involves an overt response that is more likely to occur if the nature of the pressure differs from the normative and cultural-cognitive goals of the organisation (Scott, 2005). The most resistive of strategies, manipulation, can be defined as a

purposive attempt to control the pressures from the environment and is the most highly resistant response to institutional pressure (Oliver, 1991).

Variety of safety practices across firms prevalent in shipbreaking industry of Bangladesh can be explored through Institutional Theory as a suitable theoretical lens as well, which is aligned with the HROs Theory - dominant theory for this study.

2.12 Overview of Firm level Adoption of Health and Safety Practices in Shipbreaking Industry of Bangladesh

A theoretical study or explanation is based on (or uses) ideas and abstract principles that relate to a particular subject, rather than the practical aspects or uses of it (Duberley et al., 2012). In light of this, the theoretical underpinning addressed so far for this study has justified this fact, which has been depicted as an overview of the firm level adoption of Health and Safety Practices in Shipbreaking Industry of Bangladesh.

Organizations do not necessarily blindly conform to institutional pressures but rather, may actively assess the extent to which conformity allows them to enhance technical concerns, such as efficiency or the acquisition of resources (Covaleski & Dirsmith, 1988; Powell & DiMaggio, 2012; Scott, 2005). In the case of the ship recycling companies, if labour laws designed to safeguard worker safety are not sufficiently enforced by regulatory agencies (Alam & Faruque, 2014), then some firms might not insist on necessary employee training, equipment, or the replacement of poor equipment in a timely fashion, for example, all features that might make the work much safer. Therefore, the question of responsibility for workplace health and safety is more than the simplistic one of shifting this burden onto employees (risk framing of shipbreaking workers, their unsafe behaviour); employers and managers are very much involved and can potentially be highly instrumental in helping to regulate and enact safer workplaces. Indeed, there is a very long history of employer responsibility for ensuring

workplace safety (Hearns et al., 2014) along with a long history of conformity and non-conformity with coercive, mimetic and normative institutional norms identified by DiMaggio and Powell in 1983 (Zhang et al., 2020). New institutionalism theory have been used largely to investigate the institutional factors that drive companies, working in risky and hazardous industries, to be health and safety conscious, responsible, (Anku-Tsede, 2016) and the response of the companies towards such pressures (Abdalla & Siti-Nabiha, 2015).

Adoption of H&S practices is organizational choice and shipbreaking firms approach adoption of H&S practices, over time, in a variety of ways because firms can respond to institutional pressures in a variety of modes ranging from passive compliance with coercive, mimetic and normative institutional norms to direct and active defiance of an institutional environment Oliver's (1991). Therefore, when shipbreaking firms appoint safety officer in order to comply with Bangladesh Shipbreaking and Recycling Rules, 2011 and Bangladesh Shipbreaking and Recycling Act, 2018; they try to comply with coercive type institutional norm as national laws and regulations compel organisations to adopt and formulate certain policies and structures (Abdalla & Siti-Nabiha, 2015; Hussain & Hoque, 2002).

On the other hand, when firms tend to adopt HKC Statement of Compliance (SOC) to get compliance with Hong Kong Convention, 2009 are assumed to comply with mimetic type institutional norms. Mimetic isomorphism results from the environmental uncertainties in which an organisation operates and the pressure exerted by competition (Beckert, 2010). Firms want to adopt HKC SOC as it is the trend in shipbreaking industry for achieving international competiveness along with national one and attempt to duplicate the practices of other successful organisations (Arezes & Carvalho, 2014). In this way, firms that are uncertain of certain practices seek to emulate other successful reference groups (Hassan, 2005). Khalil (2021) argued that mimetic type institutional pressure entails the process of reconfiguring leading organisations to gain status and legitimacy whereas, new or poorly performing

organisations follow the lead of more successful ones; this saves them the time and cost of searching for their own solutions to respond to changing circumstances (Braunscheidel et al., 2011).

In addition, when firms try to comply with the social expectations demanded by NGOs for social sustainability, are assumed to try to conform normative institutional norms as the normative isomorphism mechanism arises when norms and rules of society and other professional bodies and agencies influence the practices of organisations (Arezes & Carvalho, 2014). The reason behind this is the association of normative isomorphism with professionalization (Lipincka & Verhoeven, 2014). Special interest groups such as NGOs, professional networks usually create a common set of practices that are considered to be favourable to increase the legitimacy of an entity once implemented (Khalil, 2021).

Differences in firm level adoption of H&S practices as firm level response is justified as Goodstein (1994) argued that different responses depends on factors, such as, the characteristics of institutional constituencies and the congruence of institutional norms and organizational goals etc. Corporate compliance with institutional pressures creates an isomorphic process that ultimately makes the behavior of enterprises more similar to that of its stakeholders (Teo et al., 2003). However, the institutional isomorphic process does not always occur under any condition.

Building on this, the role of safety theory, and the link between firm level safety practices and accidents (including injuries and fatalities), is also relevant. There are two main schools of thought with respect to workplace accidents: normal accident theory which asserts that accidents are inevitable in organisations due to their complex, and tightly coupled systems (Kim et al., 2016) (Shrivastava et al., 2009). In other words, accidents are attributable to system aspects rather than human behaviour (Le Coze, 2015). Consequently, accidents and injuries will occur regardless of the provision of suitable equipment and the level of training around

safety. The pursuit of employee safety is but one organisational objective and is largely assumed to be an impossibility (Tidwell, 2000). In practice, normal accident theory, by believing in inevitability of risks, abandons any real sense of managerial commitment and responsibility for safety and this can be exacerbated when regulations are not enforced by government agencies. In contrast, high reliability theory, by believing in manageability of risks, posits a role for managerial agency such that organisations can substantially contribute to the prevention and reduction of workplace accidents (Rijpma, 1997; Sagan, 2020). Training, learning from mistakes, and establishing a safety culture throughout the firm (Hajmohammad & Vachon, 2014; Sinclair & Haines, 1993) are important means to enhancing workplace safety. Accident reduction and safety are essential management priorities and remain highly aspirational for high reliability theory (Tidwell, 2000), pp.165-166. Both theories are important in understanding the association between ethics and workplace safety especially as they pertain to the role of managerial commitment and responsibility. Understood in this way, it is at least possible that the assumptions of normal accident theory and high reliability theory may be found among different managers and their organisations even in the same industry.

As noted earlier, the shipbreaking industry is an important source of national steel production as well as source of employment in Chittagong and surrounding areas. However, questions have emerged both inside Bangladesh and internationally, with respect to both environmental and safety standards (Gunbeyaz et al., 2019). While there are indications that the practice of beaching ships for subsequent dismantling and recycling of materials can lead to the significant contamination of the natural environment (Choi et al., 2016), the focus of this study examines the impact of this activity on the health and safety of shipbreaking workers. It has been claimed that the majority of shipbreaking workers lack sufficient awareness of hazards and basic safety requirements, precipitating a need for better training of workers in this industry with respect to such features including job hazard awareness, the provision and wearing of

personal protective equipment (PPE), working in enclosed spaces, and first aid awareness (Gunbeyaz et al., 2019). There have been reports of unskilled employees who work bare footed, with no helmets and those who work as gas cutters using no protective eye equipment (Haque, 2017). Many of those who work in the industry are young and illiterate males which might mean their ability to comprehend safe work instructions, use personal protective equipment (PPE) when required, and appreciate emergency preparedness could all be impacted (Choi et al., 2016). In addition, managers have the power to manage the business and employees are the people to be managed and the reasonable work arrangements will allow employees at work not be too tired and always maintain a full state of mind (Jiao et al., 2018).

These issues pose considerable challenges for the shipbreaking industry in Bangladesh. As there are roles for different regulatory approaches as well as different levels of firm level responses (e.g. adoption of &S practices) are prevalent along with corresponding safety performance. Moreover, organizations do not passively obey institutional pressures, but exercise discretion through a series of positive strategic actions in response to institutional pressures (Heugens & Lander, 2009). Some scholars have pointed out that internal factors of enterprises may regulate the isomorphic process of enterprises' compliance to institutional pressures (Gupta et al., 2014; Liu et al., 2010).

This extends from the provision of communication to assess risk through to the vigorous pursuit of accident reduction. Typically grounded in safety theory, much of the literature notes the important obligations or duties on employers towards managing workplace hazards. Drawing from this work but also seeking to integrate safety theory to highlight how different shipbreaking firms manage workplace safety. Doing so can reveal more fine-grained insights into employee safety in this industry rather than the reputation that all shipbreaking firms in Bangladesh have poor employee safety practices and records.

2.13 Chapter summary

H&S practices are required for shipbreaking firms in order to comply national and international rules and regulations and to become highly reliable organization from reliable organization, all of these lead to preventing accidents and improving H&S performance by reducing injuries and death cases. This chapter has reviewed the extensive literature on shipbreaking, shipbreaking operation and Bangladesh, safety related prioritization, understanding safety at workplace, accommodating and commissioning H&S practices for better workplaces, H&S management, H&S management practices in ship breaking industry of Bangladesh, infrastructural development and mechanization for shipbreaking yard, formalization of management system, management of safety skills , safety culture and finally, justification of High Reliability Organizations (HRO) Theory and Institutional Theory in preventability of accidents followed by an overview of understanding health and safety at workplace and shipbreaking industry. To add to this body of knowledge, this research investigates firm-level adoption approach of interdependent H&S practices prevalent in shipbreaking industry. The next chapter discusses the methodology, research design, study context, and the participant selection strategies and techniques to collect data for this study.

Chapter 3 Research Methodology

3.1 Introduction

This chapter outlines the research methods used in this study. It explains the reasons for the selected methodology, the research design, the data collection process. It also outlines the approach to analysis of data by specifying analytical tools and at the end discusses the steps to ensure quality through rigor and ethical considerations.

3.2 Research methods in business research

In order to plan a research project in business, researchers need to identify whether they will employ a qualitative, quantitative, or mixed methods approach. According to Creswell (1996), this approach is based on bringing together a worldview or assumptions about research, a specific design, and research methods. Decisions about choice of an approach are further influenced by the research problem or issue being studied, the personal experiences of the researcher, and the readers for whom the researcher writes. Cavana et al. (2001) argued that typically, quantitative research methods are used within the positivist research paradigm and qualitative methods are used within the interpretivist paradigm. Often the distinction between qualitative research and quantitative research is framed in terms of using words (qualitative) rather than numbers (quantitative) or using closed-ended questions (quantitative hypotheses) rather than open-ended questions (qualitative interview questions). According to Creswell (1996), the differences lie in the basic philosophical assumptions researchers bring to the study, the types of research strategies used in the research (e.g. quantitative experiments or qualitative

case studies), and the specific methods employed in conducting three strategies (e.g. collecting data quantitatively on instruments versus collecting qualitative data through observing a setting).

This research has employed a qualitative approach. Specifically, a comparative case study has been conducted followed by the inductive theory-building approach (Eisenhardt, 1989; Yin, 2003). Aim of this research is to investigate how different shipbreaking firms prioritize and adopt workplace safety and what are the effects on safety outcome of the adopted H&S practices. Since the concept of 'Variety of Safety' (encapsulated by the variation of adoption of H&S practices) has not been well researched, the inductive case study approach has helped a lot to gain valuable insights (Sue et al., 2014). Data have been collected from semi-structured interviews of top management and middle management from seven shipbreaking case study firms. In addition to the interviews, data also collected from site observations and secondary sources like: firm-level documents, photos, publicly available NGO-level documents, Government-level documents and records. Eleven industry experts were also interviewed from various stakeholder groups (e.g. government, industry experts, health & safety agency, NGO officials). Data were analysed using standard approaches used in qualitative research methods according to "Qualitative Data Analysis" outlined in Miles et al. (2018).

3.3 Qualitative approach

A qualitative research method with a case study design has been chosen as the most appropriate way to investigate the integrated management of interdependent H&S practices of shipbreaking firms. Polkinghorne (2005) summarized the importance of this particular methodology by asserting: 'Experience has a vertical depth, and methods of data gathering, such as short answer questionnaires with Likert scales that only gather surface information, are inadequate to capture

the richness and fullness of an experience'. This study uncovers some of the complexities of a phenomenon like adoption of H&S practices using case studies.

Maxwell (2013) explained that case studies are selected in response to a study's goals, existing theory, and research. He noted that although not a requirement, cases could be selected based on their representativeness of what is being studied. Creswell (2007) argued that if the cases in a multiple study are selected properly it could allow for broader generalization of the findings. Creswell also noted that the case study approach has a "long, distinguished history across many disciplines" and can take the form of a single instrumental case, a collection of cases, or as an intrinsic case study where the focus is on the case itself rather than the case as a window into what is being studied (Creswell, 2007).

As noted by Yin (2017), researchers use a case study design when they "want to understand a real-world case and assume that such an understanding is likely to involve important contextual conditions pertinent to your case". Context is important for this study because it significantly affects firms' H&S management practices (Ospina et al., 2004). In addition, by using case studies, beneficiaries of the research can easily determine how the context is relevant to them. For example, a firm who is planning to adopt H&S practices should understand the context first and then proceed with its context specific applications. Then the lessons learnt become more meaningful due to the relevance of the context. For all these reasons, a qualitative method using a multiple case study design has been chosen for this study.

According to Creswell (2007), "Case studies are a design of inquiry found in many fields, especially evaluation, in which the researcher develops an in-depth analysis of a case, often a program, event, activity, process, or one or more individuals". Cases are bounded by time and activity and researchers collect detailed information using a variety of data collection procedures over a sustained period of time (Stake, 1995; Yin, 2009, 2017). Unlike other research methods, however, there is no standard design for case studies (Yin, 2017). Although

a standard design has not been developed, best practices for case studies have been developed as a result of their extensive use in the social sciences (Miles et al., 1994; Yin, 2017). This study has referred to those best practices, particularly as outlined by.

3.4 Pilot study - Interviews with industry experts

As the shipbreaking industry of Bangladesh is not yet very organized and structured industry and as this industry is very new (got recognition as an industry in 2011) compared to other industries existing in Bangladesh, interviews with industry experts were crucial in order to get insights on H&S management practices in this industry. An expert, is a person with extensive knowledge or ability based on research, experience, or occupation and in a particular area of study (Chi et al., 1981; Dreyfus & Dreyfus, 2005) who is widely recognized as a reliable source of technique or skill whose faculty for judging or deciding rightly, justly, or wisely is accorded authority and status by peers or the public in a specific well-distinguished domain. According to Ericsson (2006), experts are called in for advice on their respective subject, but they do not always agree on the particulars of a field of study.

Six industry experts and four government officials and one NGO representative were interviewed as part of the build-up to the main study for gaining a holistic perspective on H&S management practices in shipbreaking industry of Bangladesh. These experts include advisor of Bangladesh Shipbreaking & Recycling Association (BSBRA), H&S management experts, government officials, and NGO officials. The purpose of this study was explained to these experts prior to the interview. The conversation started with a general question “How do you view H&S management practices of ship-breaking industry in Bangladesh?” The insights gained from one interview formed some an understanding that was used in subsequent interviews.

All respondents from the industry expert panel made it clear that shipbreaking firms have to maintain their social sustainability credentials and H&S management practices can provide that. They also discussed representative firms and gave useful insights into some important areas. These areas were taking into account later when the researcher designed the data collection protocol. A clear understanding of the necessity of firm-level H&S practice and their positive impacts on H&S outcome were also evident in their responses. In particular, the industry experts raised an apparent conflicting interest among stakeholders of this industry across national and international level. Industry collective action was also pronounced by the experts that is very influential to convince government regarding building some infrastructural facilities for shipbreaking industry, tax exemptions, lobbying with international bodies, raising voice in international forums etc.

Overall, the insights from expert interviews gave a set of context-specific observations that were helpful to understand firm-level management of H&S practices of a developing country and general issues in this industry. Table 3.1 provides the key insights gained from the expert interviews.

Table 3.1 Key insights retrieved from the expert interviews

Type of Participants	**Position held by Participants**	**Number of participants**	**Summary of Interviews**
Industry Experts	President, Ship Building & Ship Recycling Board (SBSRB) of Bangladesh	1	In order to assess the H&S performance of the shipbreaking yards, three categories can be used on the basis of their currently used infrastructure and mechanization:
	Advisor, Ship Building & Ship Recycling Board (SBSRB) of Bangladesh	2	High performing firm: yards that are having 61%-100% of the required infrastructure of HKC; yards that are using 61%-100% of work mechanically done
	H&S Consultant, Health & Safety Agency, Bangladesh	2	Medium performing firm: yards that are having 41%-60% of the required infrastructure of HKC; yards that are using 41%-60% of work mechanically done
	General Secretary, Ship Building & Ship Recycling	1	Low performing firm: yards that are having 21%-40% of the required infrastructure of

Type of Participants	Position held by Participants	Number of participants	Summary of Interviews
	Board (SBSRB) of Bangladesh		HKC; yards that are using 21%-40% of work mechanically done; Yards have been improving gradually. Some yards are international standards and some are making them ready for international competition; Accidents are insignificant compared to other industries; The industry needs high level of patronization from government The industry needs international investment to enhance capacity building. Workers are both happy to work and realize the work is risky and they want this industry and do not want it to stop; This industry is a job opportunity for many; International lobbying is badly needed; All the concerned international parties involved in this industry should be responsible
Government officials	Joint Secretary, Ministry of Industry, Government of Bangladesh; Deputy Secretary, Ministry of Industry, Government of Bangladesh; Director General, Bangladesh Shipping Corporation,, Government of Bangladesh; Director General, Department of Inspection for Factory & Establishments (DIFE), Ministry of Labour & Employment, Government of Bangladesh	1 1 1 1	There is a need to assess the feasibility of this industry; Proper data are needed to explore the issues for building capacity appropriate for this industry; The first phase of the Safe and Environmentally Sound Ship Recycling in Bangladesh project (SENSREC Phase I) was successfully implemented from January 2015 to March 2017. It resulted in economic and environmental studies on ship recycling in Bangladesh, the development of training materials and capacity building plans and a preliminary design for infrastructure including facilities for treatment, storage and disposing of hazardous wastes generated from recycling operations. Major source of fund for SENSREC project has come from Norwegian Agency for Development Cooperation (NORAD) for ship recycling in Bangladesh; The industry is improving, some yards are international standards and some are not; Building HKC and EU compliant yard is very expensive This industry needs international investment to enhance capacity building;

Type of Participants	Position held by Participants	Number of participants	Summary of Interviews
			Bangladesh should get ship recycling fund as a leading shipbreaking country; Ship owners, cash buyers and all the concerned parties involved in this industry should be responsible
NGO Official	CEO, YPSA (Young Power in Social Action) – the local agent of NGO Shipbreaking Platform	1	Shipbreaking operations are conducting in an unsafe manner making this industry as a death trap for workers; Workers are getting exploited psychologically and financially; Shipbreaking firms are disinterested to improve H&S practices;. Shipbreaking firms are highly profit motivated; Concerned Government offices are not adequate about this industry unlike Garments.

3.5 Justification of case study method for this study instead of grounded theory

Generally, both grounded theory and case study research approaches are important in qualitative research as each is useful in a particular situation for investigation of a certain problem where one thing is common in terms of the general process of research, which is both begins with research problem and proceeds to the questions, the data collection, the data analysis and interpretations and the research report, however, they differ as well (Mfinanga et al., 2019). Tavory and Timmermans (2009) argued that grounded theory and the case study method are two epistemologically competing perspectives, where the case method uses theoretical narratives as a denouement of the case; the grounded theory employs theory to construct a grammar of social life drawn upon largely in sociological ethnography with a different conceptualization of sociological case-construction and theory.

Case study approach to research is a way of conducting mainly qualitative inquiry, commonly used when it is impossible to control all of the variables that are of interest to the researcher (Laws & McLeod, 2004). Merriam (1988) pointed out that case study's unique strength is its ability to deal with a full variety of evidence, including documents, artefacts, interviews and observations. Yin (1992) offers a more technical definition by equating a case study with an empirical enquiry that investigates a contemporary within its real-life context when the boundaries between phenomenon and context are not clearly evident and in which multiple sources of evidence are used. Therefore, How and why questions are the most suitable for a case study because the approach draws attention to what can be specifically learned from the single case (Denzin & Lincoln, 2002). In light of this argument, the research questions used for this study, RQ1 'What are the H&S practices adopted by the shipbreaking firms?'; RQ2 'How do shipbreaking firms adopt H&S practices?' and RQ3 'What are the effects of the adopted H&S practices on firm level H&S performance?' justified the choice of case study method.

Contrasting Characteristics of Case Study & Grounded Theory Approaches (Creswell, 2007) are very detail where he argued that focus of case study approach is to develop an in-depth description and analysis of a case or multiple cases and research problem is addressed by providing an in-depth understanding of a case or cases and unit of analysis are multiple sources, such as interviews, observations, documents, artefacts and data analysis strategies are analysing data through description of the case and themes of the case as well as cross-case themes - and all these features lead to developing a detailed analysis of one or more cases. On the contrary, focus of Grounded theory is to develop a theory grounded in data from the field where research problem is addressed by Grounding a theory in the views of participants, unit of analysis: Using primarily interviews with 20 – 60 individuals and data analysis strategies are analysing data through open coding, axial coding, selective coding and all these features lead to generating a theory illustrated in a figure (Creswell, 2007).

This study was aimed to explore pattern of H&S adoption which is a new idea prevalent in H&S practices across the shipbreaking industry and in broader workplace safety literature and such exploratory type study can be best served by using case study method by helping to generate new ideas (that might be tested by other methods). It is supported by Mfinanga et al. (2019) who argued that a case study may offer larger details about a particular phenomenon. For instance, it may include narrative and a specific description about a particular activity, personal relationship or a group interpretation, which is highly applicable in this study.

Moreover, where grounded theory tries to grasp the narrative character of the field and is thus said to neglect the invisible macro-forces that shape it, Case method focuses mainly on how larger structures affect the situational context, and is said to risk substituting the normativity of social life with knowledge (Tavory & Timmermans, 2009). In this study, Institutional pressures play a key role while analysing how firms adopt H&S practices i.e., the

pattern of H&S adoption and therefore case study method best suited to analyse the firm-level adoption of H&S practices over time within widespread geo-political scale (larger structure).

Under the circumstances stated above, it can be concluded that case study method is the well-suited method for this study where mobilization of case knowledge has been done through accumulating case knowledge, comparing and contrasting cases, and in doing so, producing new knowledge (Khan & VanWynsberghe, 2008) by using cross-case analysis.

3.6 Securing access to case study firms

Purposive sampling strategy has been used in this study (Gugiu & Rodríguez-Campos, 2007) following the pilot study with the experts. The experts have indicated that in order to include case, (representative of the industry) selected firms should demonstrate variations in infrastructural settings, adoption of technologies and H&S management systems. Such approach thus has increased the generalizability of the study and the variation across the firms (representative of the industry) has ensured variation in the management of H&S practices across the firms, which has helped to assess the construct of this study (Wauters et al., 2003). Firms that have Hong Kong Convention's Statement of Compliance (HKC SOC) along with required amount of infrastructure, use of technology and formal H&S management system were considered as 'high' performing firms. Firms that do not have HKC SOC but have reasonable amount of infrastructure, use of technology and formal H&S management system are called 'medium' performing firms and 'low' performing firms are those who have only rudimentary infrastructure and use of technology and do not have formal H&S management system. The pilot study experts have recommended to use this high, medium and low categorization to identify the firms and the firms to be approached. Support was also sought from Ministry of Industry, Government of Bangladesh, Department of Inspection for Factory and Establishment, Ministry of Labour & Employment, Government of Bangladesh, BSBRB

and industry experts. In order to secure the access to participants, officials of Ministry of Industry and one joint secretary and one deputy secretary have been approached who are working in shipbreaking project SENSREC funded by Norwegian Agency for Development Cooperation (NORAD) to get the permission for access in the firms operating in the industry. To solicit their participation, a recommendation letter from the PhD supervisor of the researcher was used in his official letterhead (enclosed) while lodging a written application seeking permission to visit shipbreaking yards and conduct interviews. Ministry of Industry, Government of Bangladesh issued the researcher a letter of permission and informed formally the Bangladesh Ship breakers and Recyclers Association (BSBRA) to cooperate the researcher to visit yards. It also informed Department of Inspection for Factories and Establishment, Ministry of Labour and Department of Shipping to cooperate the researcher. The researcher took interviews with the president, advisor and secretary of BSBRB to let them know the need of this research for H&S performance-based classification. The Association took five (5) days to notify researcher the name of firm in each category. The secretary informed the researcher and arranged the visits in the yard as well as at the head offices of all the firms.

In this study, the access was guaranteed to seven firms. Based on the prior categorization of firms by experts during the pilot study, firms were grouped into three categories (see Table 3.2). Out of the seven firms, one firm was placed in “high” performing category, three firms were placed in “medium” performing category and three firms were placed in “low” performing category respectively. Table 3.2 provides an overview (demographic composition) of the firms.

Table 3.2 Overview of case study firms

Case study Firms	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Year established	1982	1978	2000	2000	2005	2002	2011

Case study Firms	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Existence of the firm as a sister concern of a group of companies	Yes	Yes	Yes	Yes	No	No	No
Type of ships processed*	BC, CPS, CS	OT, BC, CPS, CS	BC, CPS, CS	OT, BC, CPS, CS	OT, BC, CPS, CS	OT, BC, CPS, CS	OT, BC, CPS, CS
Average monthly Scrap Production (in Metric tonnes)	3000 MT	4000 MT	3000 MT	4000 MT	1500 MT	2000 MT	3000 MT
Average Time for breaking of a ship (in months)	3 months	2.5 months	2.5 months	2.5 months	1 month	1.5 months	2 months
Night shift	No	Yes (2/3 times weekly)	No	Yes (2/3 times weekly)	Yes (3/4 times weekly)	Yes (3/4 times weekly)	Yes (2/3 times weekly)
Overtime	No	Yes (2/3 times weekly)	Yes (1 time weekly)	Yes (2/3 times weekly)	Yes (3/4 times weekly)	Yes (3/4 times weekly)	Yes (2/3 times weekly)
Category of firm's H&S performance based on experts opinion	High	Medium	Medium	Medium	Low	Low	Low

*Note: BC = Bulk Career; CPS = Cargo passenger ship; CS = Cruise ship; OT = Oil tanker

There is a strong argument regarding selecting only one firm as 'high' category at the initial stage based on expert opinion.

In order to address the question how scholars can select cases from a large universe for in-depth case study analysis, Seawright and Gerring (2008) argued that random sampling is not typically a viable approach when the total number of cases to be selected is small. Therefore, attention to purposive modes of sampling is needed. Yet, while the existing qualitative literature on case selection offers a wide range of suggestions for case selection, most techniques discussed require in-depth familiarity of each case.

Out of seven case selection strategies identified by Seawright and Gerring (2008), this study used 'Diverse' case selection strategy. Primary objective of 'Diverse' case selection strategy is to achieve maximum variance along relevant dimensions and encompassing a full

range of variation is likely to enhance the representativeness of the sample of cases chosen by the researcher (Collier, 2008; Elman, 2005). However, if there are more high cases than low cases in a population, and the researcher chooses only one high case and one low case, the resulting sample of two is not perfectly representative (Seawright & Gerring, 2008).

In this study, during case selection process, only one case was selected as 'high', but three cases were as 'low', based on expert opinion, which maintained representativeness. The reasons behind selecting one case as 'high' was the international recognition of the firm (only HKC compliant firm) operating in Bangladesh, which was absent in any other firm across the shipbreaking industry. International nature of shipbreaking industry demands scrutiny of this industry at a global level (Tanha et al., 2021) and therefore, shipbreaking industry of Bangladesh, which is currently having one international standard shipbreaking yard, should be considered in a high regard. All these grounds have justified such inclusion of only one firm in 'high' category in this study.

3.7 Data Collection

Data were collected through interviews, documents, photographs and observational field notes. One-to-one interviews were conducted with each participant.

The interview questions for both top management and middle management were semi-structured i.e. a mixture of structured and unstructured opened ended questions). It was structured in an interview protocol – understood as "a written questioning protocol…in which maximum researcher control is imposed on the content and sequencing of questions" (DePoy & Gilson, 2011). However, it was unstructured in a sense that probing and follow up questions were used to gather more information from respondents, and none of the questions were changed into close-ended responses in an attempt to fit any predetermined set of answers (DePoy & Gilson, 2011). This interview approach encouraged the interviewee to stay on topic

while also allowing the conversation to explore additional, emerging information (Carruthers, 1990; Newcomer et al., 2015; Schmidt, 2004). It allowed the researcher to "gain understanding by probing respondents to clarify their meaning" (Harvey-Jordan & Long, 2001). The main interviews with senior management (one respondent from each case study firm) and representatives from middle management (two respondents from each case study firm) lasted between two to three hours during an in-person site visit of each shipbreaking firm.

Interview protocol was developed for owner / top management and middle management (See Appendix 3C). Some workers were also interviewed in order to cross check some data provided by top & middle management. During the interviews, participants started responding to initial questions focused on demographic composition of firm and general discussion (name of the firm, location, year of establishment, scrapping volume (monthly), type of work undertaken by the firm, certification adopted by the firm, role of the participant, and existence of the firm as a sister concern of a parent company etc.).

The participants then expanded on questions regarding the concurrent problems with H&S practices prevalent in the industry, what has been the situation at his place, how safety has been prioritized, how is he showing safety commitment and describing his firm's H&S performance over time, etc. Afterwards, participant was asked to identify a significant intervention that have been used to improve the H&S friendly practices, how did he decide to implement the intervention, what was the driving force behind etc. Participants from top management level were asked mainly to address safety related strategic and operational priorities, recollection of experiences while managing interdependent H&S practices and expectations for future improvement. Participants from middle management level were asked mainly to address practices for process safety management, behavioural safety management, developing safety skills of workers and managing safety culture etc. prevalent in their firms.

Participants described their motivation for managing H&S issues and related their experiences to their adopted practices (e.g., why & how they adopted). The interview time ranged from 60 to 120 minutes with an average of about 90 minutes per participant and each participant was interviewed twice. Note taking was done rigorously during the interviews.

Formal Ethical approval (University of Canterbury's Human Ethics Committee) was secured prior to conducting the interviews. Following (Creswell, 2007) recommendations, participants in interviews were assigned a number to protect their identity. For example, first interview of first Participant from Firm 1 was denoted as F1_P1_I1. In addition, care was taken to explain the purpose and nature of the study so that there was informed consent by participants. They were all informed that the discussion would be audio recorded for transcription and possible presentation purposes. An informed consent document was given to them read in English & Bengali (first language of Bangladesh) both and informants were asked to give their consent before the interviews by signing the consent form. The informed consent of individuals was not culturally required because the researcher had the permission of the Ministry of Industry, Government of Bangladesh; nevertheless, it was sought as a matter of best practice.

Following (Yin, 2009) recommendations, a research protocol was developed prior to the field research and it was followed during the data collection process (see Appendix 3C for Research Protocol). Interview questions were developed to address the study's research questions and to explore whether aspects of several theories affecting adoption were present in the firms' adoption of H&S practices. Inclusion of questions that address theory was important for the quality of the research because it helped ensure that the right data were collected and that it was analysed in a way that increases the rigor of the study (Yin, 2009).

Additionally, data were collected through field observations and records and documents kept by firms, government bodies and NGO Shipbreaking Platform from 2014 to 2019.

Photographs were taken to capture evidence of relevant infrastructure development and various workplace practices. The interview data was collected from January to February of 2018. In particular, the researcher sought to observe any informal interactions between the safety manager, supervisors and the front-line workers in the study along with their formal interactions and the researcher noted the physical characteristics of the firm's infrastructure, adopted technology and surroundings. These observations can provide new dimensions for 'understanding either the context or the phenomenon being studied' (Yin, 2014), p. 78. This approach of interviewing and observing to collect data was the appropriate way for the researcher to discover "behavioural norms and their meanings" (DePoy & Gilson, 2011), p. 131. Making field observations was appropriate for the research question because it provided a fuller understanding of the context where firm-level management of H&S practices have been taking place.

In this study, 21 initial interviews and 42 follow-up interviews were conducted across different levels of management of shipbreaking firms. One (1) participant from top management level and two (2) participants from top management level and three (3) participants from front-line worker level were interviewed from each firm. Table 3.3 provides the number of participants and interviews conducted across different levels of management of Seven (7) shipbreaking firms.

Table 3.3 Number of participants and interviews conducted across different levels of management of Seven (7) shipbreaking firms

Firms	Firm level Participants	Number of Participants	Number of initial interviews conducted	Number follow up interviews conducted
F1	Top Management (Managing Director)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
F2	Top Management (Managing Director)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
F3	Top Management (Chairman)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
F4	Top Management (Managing Director)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
F5	Top Management (Chairman)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
F6	Top Management (Managing Director)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
F7	Top Management (Chairman)	1	1	2
	Middle Management (Manger & H&S Officer)	2	1	2+2=4
	Frontline workers (Cutter, Fitter and Loader)	3	1	0
	Total Number	**42**	**21**	**42**

Apart from 63 (21+42) semi-structured in-depth interviews, different triangulating materials were used during data collection for this study, such as, photographic evidence of infrastructure and mechanization & equipment; documents kept by shipbreaking firms; documents kept by Department of Inspection for Factories and Establishments, Government of Bangladesh and NGO. For example, interviews with frontline workers were conducted, site visit and observation and taking photos (photographic evidence) of infrastructure (impermeable

yard floor, yard floor under construction, muddy floor; yard medical facilities, PPE storage, hanging and visible safety instructions); mechanization & equipment (winch, incinerator, heavy-duty crane, magnetic loaders); hazardous material handling facilities (HAZMAT handling & storage facilities, fire-fighting facility, LPG cylinder handling); photos of formal systemic practices (certification, H&S policy manuals, use of PPE, management of PPE) and formal operating practices (safety meeting minutes, reporting accidents, accident analysis, risk assessment, housekeeping practices) and Government and NGO records on injury and deaths occurred at the case shipbreaking firms kept by Government and NGO.

3.8 A description of the cultural context where the research was conducted

The shipbreaking industry of Bangladesh has received international attention for poor safety practices toward workers (Rahman et al., 2018). In most cases, these issues have been framed without considering the involving of all actors (stakeholders) within the industry and their associated motives. For example, on the one hand, national and international NGOs and media collaborate to enforce a discourse focused on negative localized impacts. One of the NGO (Mr. Shahin, YPSA) interviewed for this study mentioned about the poor health and safety practice within the industry in the following way:

> "*Those who are working in this industry do not use PPE or helmet. When they dismantle a steel plate from a ship, they have no idea on what to wear. They work in bare body with a traditional dress "lungi" and a "towel". Even the yard owners or contractors do not know what to wear……..Here new workers are coming on a regular basis and yard owner never check their background or expertise*."

He further highlighted the failure of the government to enforce health and safety practice due to its lack of resources and capabilities. He mentions the followings:

> "*In this industry, technical tasks are basically performed by non-technical workers. As we are raising this concern, we are told that we are working to close this industry. Reality is government or inspection department are completely failed to perform their duties properly. For example, inspection department have neither skills nor resources. Those who are working here and those who are inspecting here should have proper*

knowledge on how to dismantle ships so that it helps in reducing the number of accidents. Inspector or government has failed to provide that guideline to take care of workers. What an inspector is doing is to go a yard and try to find a non-compliance issue which he did not like. Later send a letter to yard owner and fines that yard. No guidance on how to fix the problem".

"*Ministry of Labour cannot handle even the worker's issue properly. They do not have any additional knowledge and training on ship and we do not expect that. Ministry of Environment does not have manpower, resources and technologies to conduct 'Environmental Impact Assessment' of the waste discharge by the ships. Clearly each department has lack of resources regarding health and safety related issues*".

On the other hand, workers, yard owners, locals, government, industry expert forge a counter discourse, by focusing on positive localized impacts and raising doubts about the origin of the occupational standards setting. They have stated in their interviews that no media discourse at international and national level has ever conducted so far to show the developments, changes, new rules, injury figures happening in this industry. For example – one of the industry experts (Captain Anam Chowdhury) provided his view in the following way:

"*If you search shipbreaking in internet, the images, videos or documentaries that will be coming through one after another are nothing but the horrific scenarios of working condition almost which is almost 15 years old. National Geographic broadcasted their documentary where one NGO staff described the inhuman condition in 2014. It was total false allegation at that time. The Horrific showdown created by the documentary broadcasted in National Geographic on the title "Death Trap" of this industry implies the intention of the media and NGOs to frame this industry. They are implementing the agenda of European Union*".

Another industry expert (Captain Habibur Rahman) echoed a similar view:

"*If you go to the website of Green Peace, YPSA, BELA, you will always find who is dying in this industry in India and Bangladesh. I have conducted literature review on this topic for the last one year but never find in these websites that they have mentioned about the compliance of HKK Convention of PHP group or how many firms so far*

received ISO certificate. European shipbreaking yards are influencing EU and thereby NGOs to redirect this industry to EU recycling facilities."

These two different views are raising doubt in setting the occupational H&S standards. The consequence is the amplified overall exposure to extreme events as proper attention is not paid to "Strategic Deployment of Geo-Political Scale" by the actors involved (Cairns, 2014; Rhodes, 2016). Industry Experts and consultants mentioned that NGO and international media are implementing European shipbreakers' agenda (Rahman et al, 2018). These local and national NGOs maintain strong international network to create knowledge that are desirable to the international stakeholders (Rahman et al., 2018). The core purpose of such practices is their funding dependency on international organizations (Cairns, 2007; Rahman et al., 2018).

NGO people and media intend to establish that workers are either incapable of understanding tasks allocated to them or unable to pursue their own interests to employer (Cairns, 2014; Rahman et al., 2018) which are not completely true. By conducting interviews of the yard workers, it is clear that they are aware of the risk of working in this industry and ready to take the risks intentionally by mentioning that risk is everywhere, and they do not want to starve. They are desperate to get the job and earn money for their livelihood.

Industry experts and consultants (Captain Anam (expert & advisor), Captain Habibur Rahman (advisor), Captain Mawla (consultant), Bozlur Rahman (EX DG, Bangladesh Shipping Corporation), Dr Sujauddin-consultant)) also raise the questionable role of ship owners and cash buyers responsibility in terms of waste disposal (i.e. pre-cleaning of ships). Their views are given below:

"*Everyone is after shipbreakers. Everyone is pointing fingers toward shipbreakers. Shipbreakers get the custody of the EOL ship only for few months but are expected to perform many responsibilities whereas ship-owners who have used the ship more than 30 years are free from many responsibilities. Ship owners cannot avoid their extended responsibilities related to the waste disposal part. No one is pointing out ship owners.*

They are from developed countries who are having green and clean image. Ship owners are those who are selling even their wastage at profit. Earning profit for more than 30 years is not enough for them. They are trying to make profit by selling their (EU countries) obsolete ship by changing flag which is clearly circumvention of EU rules. Again, ship owners are not doing "Pre-Cleaning" ship before selling (which is one of the prerequisites while selling ship) or not properly doing Pre Cleaning task who are doing this…….." (Captain Anam Chowdhury)

"*Cash buyers are also taking chance of being middlemen between ship owners and ship breakers. Cash buyers also cannot avoid their responsibilities while dealing with the trading. Government of Bangladesh has to take very effective lobbying with international actors. In fact, every party should come forward for a collaborative approach to address the improvement of standard of H&S practices in shipbreaking yards. It is not justified to blame only the shipbreakers……..*" (Bozlur Rahman, EX Director General, Bangladesh Shipping Corporation).

"*National and international actors have so far missed the conflicting perspective of workers, yard owners, locals, government and NGOs and media……*" (Captain Mawla).

From socio-economic point of view, workers in this industry have poor educational background and low social status (Hossain et al., 2008; Hossain et al., 2016; Sujauddin et al., 2015). Rahman et al. (2018) argued that this industry evolves over time by creating job opportunity for this group of people who would otherwise struggle to get any industry jobs and as a result, they are desperate to get these jobs which reflect their "risk taking" behaviour. These workers also illustrate their risk calculation behaviour by discussing money, carefulness, and opportunity for temporary leave. This is aligned with Douglas and Wildavsky's (Douglas & Wildavsky, 1983) 'state of society assumptions' notion. It implies that workers often have calculative assumptions and the discourse that excludes such assumptions carries only "trivial information or hilarious inconsequentialities" (p. 81).

In Bangladesh, the workers' position can be described in terms of their framing of risk consisted of their perception and consideration regarding 'risk nature', 'risk contexts' and risk

calculation (Rahman et al., 2018). By the term ‘Risk Nature’, shipbreaking workers invoked ideas such as hard work (e.g. hard work for days in a row, along with opportunities for relaxation (e.g. break from work for days in a row) and injury proneness as essentially communicating the dangerous nature of working environment; by the term ‘Risk Context’, workers mentioned the tropical climate of Bangladesh and risk of work as a phenomenon prevalent everywhere in Bangladesh and they invoked the idea of ‘Self-management of safety equipment’ which illustrates the reliance on available information shaping their choice (Cairns, 2017; Rahman et al., 2018).

The term “Tropical Climate” (that inhibits the use of safety clothes) and the statement “risk as being everywhere” are referring to ‘Risk Context’, which is known to workers as well. It is the tropical climate that inhibits the use of safety clothes and the lack of willingness to spend money on safety equipment must be understood from the “embodied capacities in the performances of tasks in social context” (Adger, 2001). Regarding safety clothes, a yard manager said that

> *“…….They have all of the clothes available but the workers cannot work long hours wearing them because they are heavy and make them tired”.*

Discourse driven by NGOs is rarely understood by their [workers] own terms and serves western style bio-imperialism” (Escobar, 2011). Arguably, the emphasis on workers’ rights is driven by the empathy of first world institutions (and in this case, third world NGOs sharing a first world view) and thus is viewed as a false cultural affirmation (Escobar, 2011). This does not mean that the workers are immune from sorrow and frustrations, but rather that the priority of the workers is misrepresented and they are intentionally uninformed argued by (Leach & Mearns, 1996; Peluso et al., 1994). The difficulty of understanding such a paradoxical stance of workers and their representation of sufferings needs to be studied from

multifarious angles such as these should be studied against the exploitation of and domination over the conditions of local, regional, national and global political discourses" (Escobar, 2011).

In general, workers value their employment in shipbreaking (Cairns, 2007). This contradiction is reminiscent that peasants have their own culture, needs preferences and demands that are most often determined by the access to available opportunities (Buerk, 2006; Peluso et al., 1994). Ethnography authored by Buerk (2006) on the shipbreaking industry in Bangladesh captured how workers recalled their helplessness—potentially exhibiting risk takers behaviours over the abysmal economic plights their families experienced. Therefore, the perspective of workers on the risks and benefits of shipbreaking work are influenced by the choices of survival and necessities rather than life style and choice (Cairns, 2014; Rahman et al., 2018) which reflects the position of risk framing of workers where workers are desperate for money and employment which can be contrasted with the other discourses that have different risk framing such as sanctity and pricelessness of life (Rahman et al., 2018).

The emphasis on workers' H&S rights is driven by the empathy of first world institutions and in this case, third world NGOs are sharing a first world view. This does not mean that the workers are immune from sorrow and frustrations, but rather that the priority of the workers is misrepresented and intentionally uninformed (Rahman et al., 2018) which is reflected in statement of one of the industry experts in shipbreaking industry of Bangladesh (Captain Anam Chowdhury) who shares a similar view:

> "*Human benefit is more important than loss of environment in the context of Bangladesh. The people who came here (from outside of Bangladesh), they all observed this industry through a coloured glass. I told them not to do so because you are coming from a country, which is very green. Therefore, your way of observing this industry and our observations are completely different. These people have to know this (i.e. Bangladesh) country, know from where to start, know what is our existing logistics support and know what we have achieved so far. This industry is currently giving jobs*

to workers who have poor educational background. With the help of Government support, we are now improving but pace of this improvement is like snail. It could have been faster"

All stakeholders involved in this industry agree the importance of the adoption of H&S practice considering significant risks involved in this industry by accommodating and commissioning shipbreaking operations. But how to improve this existing H&S practice across the industry to achieve an acceptable standard is the point where conflicting arguments have raised. Therefore, arguments hinge mainly on the 'process' of improving this existing system. When NGO s are portraying the health and environmental risks to international community, they are ignoring the other side of the story. They rarely highlight this 'process' aspect of improvement. In consequences, their recommendations/suggestions are mainly focused on "what" to do rather than "how" to do the H&S improvement.

Finally, in the case of shipbreaking in Bangladesh, there is a moral hazard. In economics, moral hazard occurs when there is an incentive to take, and even increase, the exposure to risk knowing that the risk-taker will not bear the full cost of the risk; indeed, others will bear at least some cost. In the case of the ship recycling companies, if labour laws designed to safeguard worker safety are not sufficiently enforced by regulatory agencies (Alam & Faruque, 2014), then some firms might not insist, for example, on necessary employee training, personal protective equipment, or the replacement of poor equipment in a timely fashion, all features that might make the work safer. It is necessary to mention here that in the Ship Breaking and Recycling Rule 2011, the protocols for worker's safety compliance are clearly state.

Therefore, the question of responsibility for workplace health and safety is more than the simplistic one of shifting this burden onto employees; employers and managers are very much involved and can potentially be highly instrumental in helping to regulate and enact safer

workplaces. Indeed, there is a very long history of employer responsibility for ensuring workplace safety (Henshaw et al., 2007). Nonetheless, it is uncommon for behavioural safety management to focus on employers as opposed to employee behaviours [for an exception, see (Smallman & John, 2001)]. A further drawback of behavioural safety management is that it runs the risk of assuming that unsafe behaviours are the only cause of workplace injuries worth focusing on (Hopkins, 2006). This can ignore important broader contextual issues such as the nature of the work organisation, work and equipment design, other social and organisational factors, as well as external economic, political and regulatory considerations, all of which might contribute to unsafe workplace conditions.

3.9 Unique experience of the researcher while conducting data collection

Key motivational drivers for the researcher to conduct this study were firstly, to challenge the worldwide perceived negative image about the poor health and safety practices prevailing across the shipbreaking industry in Bangladesh and secondly, to conduct a follow up action against the National Geography Documentary broadcasted in 2014 prepared by Shipbreaking Platform (with the collaboration of YPSA (Young Power in Social Action) – the local agent of NGO Shipbreaking Platform in Chittagong, Bangladesh). Additionally, consideration was given to the availability of industry contacts known to the researcher in Bangladesh to facilitate data collection.

The researcher faced questions like: what are the main reasons behind conducting research on such a sensitive industry, which is under international and national level scrutiny and where local, national and international NGOs are far more active in comparison to the activeness in other industries where injuries and deaths are occurring more than the shipbreaking industry. Interviewing frontline workers such as cutters, fitters, loaders, needed

for triangulation purpose, was challenging as well, because the researcher wanted to interview them in private.

Conducting research on shipbreaking industry was not easy for the researcher being a women researcher. This is the industry where women and children are not allowed to enter the yards, let alone work there. The CEO of an NGO named BELA (Bangladesh Environmental Lawyers' Association), who was a lady, visited yards for research purposes and reported all the loopholes of Bangladeshi shipbreaking firms to international NGOs and bodies working on global shipbreaking industry. Her report influenced Government of Bangladesh to close this industry for two years. Shipbreakers can never forget such a betrayal action taken by a researcher since 2008 and therefore shipbreaking firms do not want to welcome any researchers warmly. The researcher had faced those cold welcome gestures in many cases. It was researcher's personal network and contacts along with the well intention of her research, which helped her to convince them in order to collect in-depth firm level data relevant for my study apart from my 'case study protocol' i.e. formal application to the ministry of Industry, Government of Bangladesh; Bangladesh Shipping Corporation and Department of Inspection for Factory and Establishment, Ministry of labour and Employment, Government of Bangladesh for securing permission to visit shipbreaking yards and collect data followed by expert interviews.

In general, Bangladeshi shipbreaking firms want to cooperate and have cooperated the researcher wholeheartedly. Unique experience faced by the researcher (cold welcome and raising questions about why this research) was due to the bitter experience that they have had due to the NGO's intervention to close the industry. The researcher can't help mentioning the fact that, she was offered a full range of breakfast, morning tea with snacks, lunch and evening tea with snacks every day at every yard as she used to spend whole day for conducting interview

sessions with different participants (9 am to 5 pm) at each yard. Such hospitability is a typical Bangladeshi culture.

3.10 Approach to Data Analysis

This section begins by discussing the analytical techniques used, the processes to organise and categorise participants' quotes and development of a coding scheme. The initial (or open) coding of the interview data led to numerous open codes. This has been followed by two levels of focused coding.

3.10.1 Data analysis techniques

In order to design this study, the guidance was taken from ontological, epistemological and axiological stances. In this study, the perspectives of participants in a complicated economic, social and situational real world (Liamputtong & Ezzy, 2005; Mills et al., 2010) were explored through a deliberate approach. However, an informed choice was made by selecting grounded theory tools as the most suitable data analysis tools to conduct this interpretive study. Grounded theory tools, commonly referred to as qualitative research tools, include coding, memoing, constant comparisons and theoretical saturation (Charmaz, 2008). It is worthy to mention that these tools are instrumental in the study to generate theory from the data in participants' original environment (Charmaz, 2014; Glaser & Strauss, 2017) in terms of usefulness and practicability of the study. One of the most effective ways to explore emerging phenomena (Charmaz, 2008; Eisenhardt & Graebner, 2007) is collecting data from interviews. Charmaz (2014), for instance, highlights that the quality and credibility of empirical study begins with the data. In order to select the number of cases, "saturation" principle has been used for this study. According to Saunders et al. (2017), saturation principle has attained widespread acceptance as a methodological principle in qualitative research that is used in qualitative research as a criterion for discontinuing data collection and/or analysis. Although its origin is

found in grounded theory (Glaser & Strauss, 1967) it now commands acceptance across a range of approaches to qualitative research in one way or another. Saunders et al. (2017) also proposed saturation often as an essential methodological element within such work. Fusch and Ness (2015): p. 1408, claimed categorically that 'failure to reach saturation has an impact on the quality of the research conducted'; whereas Morse (1995, 2015): p. 587, notes that saturation is 'the most frequently touted guarantee of qualitative rigor offered by authors'; and Guest et al. (2006), p. 60, referred to it as having become 'the gold standard by which purposive sample sizes are determined in health science research'. A number of authors refer to saturation as a 'rule' (Sparkes et al., 2012; Vrandečić, 2009) or an 'edict' (Morse, 1995) of qualitative research, and it features in a number of generic quality criteria for qualitative methods (Leininger, 1994; Morse et al., 2002). Saunders et al. (2017) argued that it is commonly taken to indicate that, on the basis of the data that have been collected or analysed hitherto, further data collection and/or analysis are unnecessary.

Development of the research questions led the subsequent processes of building theoretical sampling and saturation clearly, and attention to constant comparative method. Such clarification helped the researcher to use grounded theory tools to construct theory embedded in data collected from the interviews (Charmaz, 2014; Tweed & Charmaz, 2012).

Data analysis begins with data collection in an on-going cycle that is instrumental to construct proposition or theory grounded in data. Qualitative research tools are sensitive and suitable for theoretical explanations with an emphasis on the development of events (Corbin & Strauss, 2008) and are particularly useful for research with characteristics of 'uncharted, contingent or dynamic phenomena' (Charmaz, 2008). Using qualitative research tools also enables the addition of new data even if it comes later in the analysis (Charmaz, 2011, 2014).

Qualitative coding and reflective memo writing were used to organise, sort and synthesise the data collected through semi-structured interviews. All interviews were recorded

using a recorder and were transcribed all data verbatim. Interviews were conducted in Bengali (the first language of Bangladesh) instead of English and therefore it was required to translate all the transcripts as well. The transcriptions and field memos were stored and sorted in NVivo. Pseudonyms were assigned to each participant. All the files of raw interview data, transcriptions, field memos and NVivo files were backed up in a portable disk and used an encrypted password for its protection. Additionally, locker was used in the researcher's office at the university premise to lock all these files.

Preliminary analysis started immediately after taking the initial interviews. Interview transcripts, field memos and secondary data (e.g., news and NGO & government documents) were compared and analysed simultaneously with subsequent data collection. Very useful cues were found within the data that was crucial for subsequent interviews (Eisenhardt, 1989) through immediate and systematic analysis of the collected data and writing reflective field memos after each interview. Two excerpts from the reflective field memos written in different days and how the earlier field memo helped to prepare for the next interview by asking more direct and critical questions are in Appendix 3F.

In order to codify the data, two major methods of coding were used: initial coding (or open coding) and focused coding (Charmaz, 2008). Initial or open coding began with reviewing transcripts line-by-line where larger chunks of works were coded instead of specific lines of interview transcripts. Throughout the coding process, it was kept in mind that only the essential parts were aimed to be coded. Categorising codes, comparing data and looking for possibilities of specific patterns, and identifying properties and dimensions (Charmaz, 2008, 2011; Miles et al., 2018; Saldaña, 2016) - all of these were included in analysing data under qualitative approach. Glaser and Holton (2007) argues that as coding progresses, patterns emerge. For example, varying organisational management of H&S practices effectively depicted in the codes ranged from variation in facilities & infrastructural development,

variation in use of PPE to variation in HRM practices, variation in adoption and maintenance of formal management certification and variation in improving safety skills and managing safety culture. These codes led to the discovery of an emerging theme (in focused code form) and informed larger stories beyond the meaning of individual themes and dimensions (Charmaz, 2014). The focused codes showed a theme that organisations had taken varied H&S practices they perceived essential for effective management of H&S issues without having a common understanding of approaches and objectives to attain an, effective and a coherent H&S management approach.

Participants' motives, views and actions were distinguished to explain their adoption of H&S practices (Charmaz, 2008) by organising and realigning codes. Charmaz (2014) metaphorically described codes as 'the bones of the analysis' and, when all relevant codes are integrated, 'skeleton of the analysis' is formed. Examples of open coding showed that codes such as: Variation in general yard infrastructure, variation in yard mechanization and equipment and variation in hazardous materials handling facilities which led to the identification of a focused code: variation in infrastructural development of yard. This focused code explicitly represented the varied infrastructure and facilities developed by shipbreaking firms. Using active codes and gerunds (a verb that functions as a noun ending in 'ing') are very common in analysis of qualitative data research (Charmaz, 2014) such as practicing and coordinating (Charmaz, 2014). By nature, coding is non-linear. It moved back and forth between data and analysis iteratively (Charmaz, 2008). Tabular forms were used throughout the analysis to illustrate categories, properties and variables identified in the analysis. All of these ultimately formed the basis of the final theory.

Focused coding followed initial coding to shift, sort and synthesise large data sets in order to identify the nature of relationships between and within categories (Charmaz, 2008). Subsequently, first-level and second-level focused codes were produced by conducting two

iterations of focused coding. For example, 'Formal management certificates adopted', 'Renewal and updating of certificates' and 'Credibility of certifiers' were identified as first-level focused codes that led to a salient second-level focused code with a higher level of message 'Formal management certification'. Comparing data and codes and defining links between them throughout the analysis generated categories. Subsequently, technique of comparing 'data and data, data and codes, codes of data and other codes, codes and category, and category and concept' (Charmaz, 2014). Common themes and patterns in several codes were compared constantly that led to conjecture and generalisation (Charmaz, 2011, 2014). Finally, triangulation (Liamputtong, 2013; Liamputtong & Ezzy, 2005; Stake, 1995) was done among the primary data from the in-depth interviews and the secondary data.

3.10.2 Organising the data

The verbatim transcriptions comprised of 150,645 words. Individual interview transcripts were computer composed, stored, organised and catalogued with computer-assisted qualitative data analysis software - NVivo version 11. Documentation and organisational reports were stored and sorted manually as printed copies. All the participants' signed consent forms for the interviews, field notes, audio records, and interview transcripts are maintained in locked cabinets in the university and all electronic data are protected with encrypted passwords.

3.10.3 Reflective field memorandum

Reflective, analytical memos were drafted immediately after conducting each interview. Memo was written quickly while memories were still fresh. These field memos were written in various places. This memo writing provided a space to reflect on what had been communicated, observed and explored between interviewer and interviewee. Writing memos and field analytical memos is a useful act to prepare a researcher for the next interview (Miles et al., 2018). Memo writing helped the researcher to correct otherwise unnoticed errors in the

previous interview. Through learning from previous interviews, the researcher became proactive and asked important questions earlier, listened without interrupting, and attentively observed the body language of interviewee (See Appendix 3Fi & 3Fii).

3.10.4 First cycle coding

Two phases of coding data, as mentioned earlier, were conducted where initial coding was followed by focused coding (Charmaz, 2014). Coding scheme has been discussed in the next section. The first cycle coding began with initial or open coding where Charmaz (2008)'s terms "close reading and interrogation of data" (p.163) were used. Guided by these techniques, retrieving the stories, flows, hidden messages and anomalies depicted in the interview transcripts were looked for. Frequently used words, essential sentences or paragraphs of interview transcripts with similar patterns categorised as open codes were actively identified throughout the initial coding phase. This phase was interactive and comparative. In order to search for emerging prominent leads during the initial coding, the researcher applied process coding, descriptive coding and NVivo coding where process coding method uses gerunds

("-ing" words) exclusively to connote observable and conceptual action in the data; a descriptive code assigns labels to data to summarize in a word or short phrase (mostly a noun) - the basic topic of a passage of qualitative data and NVivo coding uses words or short phrases from the participant's own language in the data record as codes (Miles et al., 2018). Illustrative examples of process coding, descriptive coding and NVivo coding are given below in table 3.3.

Table 3.4: Examples of process coding, descriptive coding and In Vivo coding

Types of Coding	**Participant's Quotes**	**Open Code**
Examples of Process Coding		
Giving pressure for more production	*"Well, here, work pressure is not same always. Sometimes pressure is high to retain the customers otherwise, we will*	Compromising safety to produce more

Types of Coding	Participant's Quotes	Open Code
	lose business. Other yards will snatch our customers ……."	Compromising safety to earn profit more
Running over time for more production	*"Sometimes we have 2/3 ships, and we need to run overtime to finish work……*	Running overtime
Running night shifts for more production	*"We often compelled to run night shifts particularly when we face huge pressure of production from the customer side"*	Running night shift
<u>Examples of Descriptive Coding</u> Non-salary benefits Financial compensation	*We usually provide salary to an injured worker during his recovery from the injury period. It's our responsibility not to deprive the injured worker* *It is our duty to bear all the medical expenses for treating the injury and we are always doing that* *Our yard is H&S friendly yard. We have safety friendly gears and workload. We provide salary along with other benefits regularly, such as: bearing all medical expenses, compensation etc.*	Bearing medical expenses during the injury & recovery period
Salary (Financial rewards)	*We are giving the highest salary to our highly experienced workers. No yard is giving this much salary…..* *We do not believe in providing abnormally high salary to our highly experienced workers. We make sure that worker is in safe hand. We care our workers in their bad times as well. Workers who work here know very well what they are getting. Reward is not solely based on salary……..*	Providing higher than mandatory salary Providing mandatory salary justified by other benefits Providing mandatory salary not justified by other benefits
<u>Examples of In Vivo Coding</u> We have used international certifier International certifiers are credible	*We have used international certifiers for all of our certification for getting competitive advantage* *International certifiers are credible than Local certifier as it involves credibility of the certifier*	Use of reputed international certifier for all certification

3.10.5 Categorisation of open codes, and first-level and second-level focused codes

A detailed account of arriving at the first- and second-level focused codes from the open codes is discussed in the next section with examples to illustrate the process in a structured manner. Table 3.4 provides a partial overview of the categorisation of open codes, and first-level and second-level focused codes (for details, see Appendix 3A).

Table 3.5: Partial Overview of the categorisation of open codes, and first-level and second-level focused codes

Open Codes	**First-level focused codes**	**Second-level focused codes**
• Experienced Workers	Firm wise different levels of "Experienced Workers" • Medium (41% – 60%) • High (61% – 80%)	**Human Resources Management Practices**
• Permanent Workers	Firm wise different levels of "Permanent Workers" • Very Low (01% – 20%) • Low (21% – 40%) • Medium (41% – 60%)	
• Local Workers	Different levels of presence of "Local Workers" • Low (21% – 40%) • Medium (41% – 60%)	
• Regularly provided formal Safety Training for workers	Different levels of "Safety Training for workers" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Providing salary higher than the mandatory amount	Firm wise different levels of "Providing salary higher than the mandatory amount" • Very Low (01% – 20%) • Very High (81% – 100%)	
• Providing Attendance Bonus	Firm wise different levels of "Providing Attendance Bonus" • Very Low (01% – 20%) • Very High (81% – 100%)	
• Fully & Regularly providing Medical Expenses for injured workers	Firm wise different levels of Fully & Regularly provided Medical Expenses for injured workers • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Fully & Regularly providing mandatory Compensation amount	Firm wise different levels of Fully & Regularly providing mandatory Compensation amount for dead & injured (major) workers	

for dead & injured (major) workers	• Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	

3.10.6 Second cycle coding process

Second cycle coding followed the first cycle coding. The second cycle led to the discovery of focused codes where open codes were reorganised into specific categories, prioritised to form anchor categories, and synthesised to develop a central category (Saldaña, 2016). Using Charmaz (2008)'s coding techniques, **246 open codes** were determined during the initial analysis. The selected open codes were coded a second time since Saldaña (2016) contends it is necessary "…to develop a sense of categorical, thematic, conceptual, and/or theoretical organization from your array of first cycle codes" (p. 234). As a result, **207 first-level focused codes** and **16 second level focused codes** were identified - examples provided in Table 3.4.

For illustrative purposes, the following describes the process to identify first-level focused codes from the selected open codes. For instance, the first-level focused codes, such as, "very low level of recruitment of experienced workers", "low level of recruitment of experienced workers", "medium level of recruitment of experienced workers", "high level of recruitment of experienced workers" and "very high level of recruitment of experienced workers". "Setting selective recruitment criteria for main cutter-man & helper" highlights the varying perceptions, plans and practices of firms during different types of H&S intervention. It was an integrated result of the following three open codes supported by various participants' quotes.

- Presence of 60% workers with practical working experience: For example,

  "……*In my opinion, number of years of experience (5+) in this industry is critical while recruiting workers if we want to ensure safety. 60% workers here are*

experienced. Experienced workers know how to work safely. They can lead other workers…….." (MD of Firm 6).

"……*If we can hire highly experienced workers, we do not need to take tension as they can complete the whole job done. Therefore, we prefer highly experienced workers with minimum 5 years of experience. We offer higher salary for them. They can negotiate for higher than market rate of salary. At present 60% workers are experienced with minimum 5 years……..*" (MD of Firm 5).

"……*approximately 60% workers are experienced with 5 – 10 years of practical working experience.* We *are dependent on experienced workers. We are trapped by experienced workers' over demanding salary. They always negotiate for higher than market rate of salary. It is not always possible to hire all experienced workers. Around 60% workers are experienced here ……..*" (MD of Firm 2).

"……*hiring highly experienced workers is very costly. We prefer highly experienced workers but we need to reduce our cost as well. 60% of our workers are experienced. We offer government mandated salary for them which is reasonable.. But they always are over demanding. They switch from yard to yard as soon as they get offers of higher salary and some substandard yards are taking unfair advantage of it……..*" (MD of Firm 4).

- Presence of 70% workers with practical working experience: For example,

"*We always give weight to the experienced workers. Many activities in shipbreaking need highly experienced workers. Only experienced workers know how to deal with risk. Right now around 70% workers are experienced and 30% are inexperienced who deal the less technical tasks. Experienced workers are highly demanding and every yard wants them…….. "* (Manager of Firm 3).

"*We try to hire experienced workers as much as we can. But competition among local firms do not allow us to get 100% of our workers as experienced workers. Approximately our 70% workers are experienced……."* (MD of Firm 7).

- Presence of 80% workers with practical working experience: For example,

  "……*we prefer workers practical working experience. The more experienced the better. A worker with long practical experience usually know how to deal with risk and hazards. Moreover, they usually got either BSBA or any local training over their long time working in this industry……..*" (Manager of Firm 1).

  " ……..*80% of our recruited workers are experienced. We try to recruit experienced workers as much as we can. However, we still are not in a position to recruit experienced worker 100%. Experienced workers are highly demanding in this industry. They have high yard switching tendency. Main reason of switching is higher salary. Some firms just offer far higher salary than us to attract workers that are more experienced and no other benefits. As workers prefer salary (financial rewards) mostly, they switch whoever offers highest salary*……." (MD of Firm 1).

In addition to the above discussed **3 first-level focused codes**: "Experienced workers recruited in 60% practices", "Experienced workers recruited in 70% practices" and "Experienced workers recruited in 60% practices", another **20 first-level focused codes** detected were respectively:

- "0% presence of permanent workers", "30% presence of permanent workers", "50% presence of permanent workers" ;
- "0% presence of local workers", "30% presence of local workers", "50% presence of local workers";
- "Regularly provided Formal Safety Training for workers in 40% practices", "Regularly provided formal Safety Training for workers in 50% practices", "Regularly provided formal Safety Training for workers in 60% practices", "Regularly provided formal Safety Training for workers in 80% practices", "Regularly provided formal Safety Training for workers in 100% practices";

- "Providing salary higher than the mandatory amount in 0% practices", "Providing salary higher than the mandatory amount in 100% practices";
- "Providing Attendance Bonus in 0% practices", "Providing Attendance Bonus in 100% practices";
- "Fully & Regularly providing Medical Expenses for injured workers in 60% practices", "Fully & Regularly providing Medical Expenses for injured workers in 80% practices", "Fully & Regularly providing Medical Expenses for injured workers in 100% practices" and
- "Fully & Regularly providing mandatory Compensation amount for dead & injured workers in 60% practices", "Fully & Regularly providing mandatory Compensation amount for dead & injured workers in 80% practices", "Fully & Regularly providing mandatory Compensation amount for dead & injured workers in 100% practices"

Altogether, these above-mentioned **23 first level focused codes have** formed the second level focused code titled as 'Human Resources Management Practices'.

Eventually, fifteen (15) second-level focused codes were detected from the whole data set (derived from **207 first-level focused codes derived from 246 Open codes**). These second-level focused codes have been merged into **Eight (8) final focused codes that have formed Eight (8) variables for this study**. Table 3.5 summarises the discussion in the preceding sections on identifying Fifteen (15) second level focused codes from 64 first level focused codes derived from the 120 (Hundred and Twenty) open codes derived from participants' quotes as documented in the interview transcripts, on-site inspection, photographs and documentation.

Table 3.6: Categorisation of the second-level focused codes

Number	Second-Level Focused Code	Final Focused Code (Variables)
1.	Safety related Strategic Priorities of Firms	Safety prioritization practices
2.	Safety related Operational Priorities of Firms	
3.	Yard Infrastructure	Infrastructure & Equipment

4.	Hazardous Material Handling Facilities	
5.	Mechanization & Equipment	
6.	Formal Management Certification	Formalization of Systemic Practices
7.	Human Resources Management Practices	
8.	Management of PPE Issues	
9.	Management of Housekeeping Issues	Formalization of Operating Practices
10.	Process Safety Management (PSM) practices	
11.	Behaviour-based Safety Management (BSM) practices	
12.	Technical Safety Skills of workers	Safety Skills
13.	Non-Technical Safety Skills of workers	
14.	Safety Climate	Safety Culture
15.	Team Process	

3.10.7 Temporal analysis of firm level adoption of H&S practices

In this study, a temporal analysis has also been done along with the coding of data. Over time, shipbreaking firms started adopting H&S practices, under different approaches, triggered by several institutional pressures such as, ILO concerns, IMO concerns, NGO pressures, Hong Kong Convention compliance, closure of industry by Government of Bangladesh's embargo, recognition as an industry by Government of Bangladesh, Bangladesh Shipbreaking and Recycling Rules, 2011, EU Rules for Ship Recycling Rules, Bangladesh Shipbreaking and Recycling Act, 2018 etc. All the H&S practices adopted at firm level over time (between 2006 & 2019) have been listed with trigger points that activated firms to adopt H&S practices (See Appendix 3B for the Temporal Analysis). This study analyses firm level data (derived from coding) along with temporal dimension.

3.11 Identification and Explanation of variables

Finally, six (6) variables (derived from the final focused codes) used in the study are listed in Table 3.6. The other two variables (rate of injury and rate of death) used in this study have been

collected from records of injury and death kept by NGO Shipbreaking Platform and Department of Inspection for Factory and Establishment (DIFE), Ministry of Labour & Employment, Government of Bangladesh.

Table 3.7 List of Variables

Serial number	Variables	Sub Variables
1	Safety prioritization practices	Strategic Prioritization of Safety
		Operational Prioritization of Safety
2	Infrastructure & Equipment	Overall level of Yard Infrastructure
		Overall level of Hazardous Material Handling Facilities
		Overall level of Mechanisation & Equipment
3	Formalization of Systemic Practices	Overall level of elements of Formal Management Certification
		Human Resources Management Practices
		Management of PPE Issues
4	Formalization of Operating Practices	Process Safety Management (PSM) practices
		Behaviour-based Safety Management (BSM) Practices
		Management of Housekeeping Issues
5	Safety Skills	Overall level of elements of Technical Safety skills of workers
		Overall level of elements of Non-Technical Safety skills of workers
6	Safety Culture	Safety Climate
		Team processes
7	Rate of Injuries	Number of injuries (major)
8	Rate of Deaths	Number of deaths

3.11.1 Safety Prioritization Practices

Safety Prioritization Practices refer to safety related priorities undertaken at strategic level and operational level. Strategic prioritization of safety refers to safety related strategic priorities set at top management level. In this study, four key elements of strategic prioritization are considered and these are avoiding highly risky ships, setting reasonable production target, percentage of use of mechanization and addressing future uncertainties and long-term considerations along with present certainties and short-term considerations. (See Table 3.7).

Table 3.8 Key elements - Strategic Prioritization of Safety (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Avoiding highly risky ships	To ensure less hazardous & risky operations	Data provided by senior managers	Accept or avoid highly risky ships
Setting reasonable production targets	To ensure safe speed of operations	Data provided by senior managers	Assessment of reasonable production target set by each firm
Use of mechanization	To ensure less manually done risky operations	Data provided by senior managers	Assessment of production target set by each firm
Addressing future uncertainties and long term considerations along with present certainties and short term considerations	To ensure exploration instead of exploitation for building dynamic safety capability	Data provided by senior & middle managers	Assessment of future uncertainties and long-term considerations along with present certainties and short term considerations addressed by each firm

Operational prioritization of safety refers to safety related operational priorities set at middle management level. In this study, four key elements of operational prioritization are considered and these are giving reasonable breaking time for shipbreaking, Avoiding night shifts and overtime and compromising production & profit to ensure safety. (See Table 3.8).

Table 3.9 Key elements - Operational Prioritization of Safety (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Giving reasonable breaking time for shipbreaking	To ensure safe speed of operations	Data provided by middle managers	Assessment of reasonable breaking time given by each firm
Avoiding night shift	To ensure less hazardous & risky operations	Data provided by middle managers	Assessment of night shift avoided by each firm
Avoiding Overtime	To ensure safe speed of operations	Data provided by middle managers	Assessment of overtime avoided by each firm
Compromising production & profit to ensure safety	To ensure safety friendly operations	Data provided by senior managers	Assessment of production & profit compromised by each firm

3.11.2 Infrastructure & Equipment

Infrastructure & Equipment refer to the to all the built structures and physical facilities appropriate for safe ship recycling yard such as general yard infrastructure, hazardous material handling facilities and mechanization & equipment prevalent in firm. (See Table 3.9).

Table 3.10 Key elements - Infrastructural Development of Yards (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Overall level of Yard Infrastructure (i.e. dry dock facility, impermeable floor, security gates, medical facility, PPE storage, fire-fighting facility, toilets etc.)	To ensure less hazardous & risky yard	Observation	Averaging scores of critical elements of General Yard Infrastructure in each firm
Overall level of Hazardous Material Handling Facilities (i.e. incinerator, fire alarm, hazardous waste storage and removal system, classified collection of wastes etc.)	To ensure less hazardous & risky yard	Observation	Averaging scores of critical elements of Hazardous Material Handling Facilities in each firm
Overall level of Mechanisation & Equipment (i.e. magnetic crane, lifter, tractors, generators etc.)	To ensure less manually done risky operations	Observation	Averaging scores of critical elements of Mechanisation & Equipment in each firm

3.11.3 Formalization of Systemic Practices

Formalizations of systemic practices refer to enablers that facilitate workers to perform their tasks and help to design structure of operations to coerce compliance (Adler & Borys, 1996). The underlying factors under this variable are adoption of formal management certification, human resources management practices and PPE management practices (See Table 3.10).

Table 3.11 Key elements - Formalization of System Practices (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation

Overall level of elements of Formal Management Certification	To ensure less hazardous & risky yard	Data provided by senior & middle managers	Averaging scores of elements of Formal Management System in each firm
Human Resources Management Practices	To ensure capable workforce	Data provided by senior & middle managers	Averaging scores of elements of Human Resources Management Practices in each firm
Management of PPE Issues	To ensure safe work and behaviour	Data provided by senior & middle managers	Averaging scores of elements of Management of PPE Issues in each firm
Management of Housekeeping Issues	To ensure less hazardous & risky yard	Data provided by senior & middle managers	Averaging scores of elements of Management of Housekeeping Issues in each firm
Process Safety Management (PSM) practices	To ensure less hazardous & risky PSM activities	Data provided by senior & middle managers	Averaging scores of elements of Process Safety Management (PSM) practices in each firm
Behaviour-based Safety Management (BSM) Practices	To ensure safe work and behaviour	Data provided by senior & middle managers	Averaging scores of elements of Behaviour-based Safety Management (BSM) Practices in each firm

3.11.4 Formalization of Operating Practices

Formalization of Operating Practices refers to the formal approach to make structure of working relationships more visible and explicit that allows routinized performance for H&S practices. The underlying factors under this variable are process safety management (PSM) practices, behaviour-based safety management (BSM) practices and management of housekeeping practices (See Table 3.11).

Table 3.12 Key elements - Formalization of Operating Practices (See Appendix 3A for detail list of elements)

Key elements	**Importance**	**Data Collection**	**Data interpretation**
Process Safety Management (PSM) practices	To ensure less hazardous & risky PSM activities	Data provided by senior & middle managers	Averaging scores of elements of Process Safety Management (PSM) practices in each firm
Behaviour-based Safety Management (BSM) Practices	To ensure safe work and behaviour	Data provided by senior & middle managers	Averaging scores of elements of Behaviour-based Safety

			Management (BSM) Practices in each firm
Management of Housekeeping Issues	To ensure less hazardous & risky yard	Data provided by senior & middle managers	Averaging scores of elements of Management of Housekeeping Issues in each firm

3.11.5 Safety Skills

Safety Skills refer to the practices to develop the technical and non- technical safety skills of workers such as technical qualifications, experience, competencies and understanding of process safety risks of workers along with their personal attributes and interpersonal communication skills. (See Table 3.12).

Table 3.13 Key elements - Safety Skills (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Overall level of elements of Technical Safety skills of workers	To ensure safe work and behaviour	Data provided by senior & middle managers	Averaging scores of elements of Safety Skills of workers
Overall level of elements of Non-Technical Safety skills of workers	To ensure safe work and behaviour	Data provided by senior & middle managers	Averaging scores of presence of elements of Personal attributes of workers related to safety

3.11.6 Safety Culture

Safety Culture refers to the safety climate and the team process prevalent in the firm. (See Table 3.13).

Table 3.14 Key elements - Safety Culture (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Safety Climate	To ensure safety values across the yard	Data provided by senior & middle managers	Averaging scores of presence of elements of Safety skills of workers
Team processes	To ensure safe work and behaviour	Data provided by senior & middle managers	Averaging scores of presence of elements of Personal attributes of workers related to safety

3.11.7 Rate of Injuries

Rate of Injuries refers to the number of major injuries occurred in the yard from 2014 – 2019. (See Table 3.13).

Table 3.15 Key elements - Injury Rates (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Number of injuries (major)	To improve H&S performance	Data provided by NGO Shipbreaking Platform & records of GOB	Data collected between 2014 - 2019

3.11.8 Rate of Deaths

Rate of Deaths refers to the number of deaths occurred in the yard from 2014 – 2019. (See Table 3.15).

Table 3.16 Key elements - Death Rates (See Appendix 3A for detail list of elements)

Key elements	Importance	Data Collection	Data interpretation
Number of deaths	To improve H&S performance	Data provided by NGO Shipbreaking Platform & records of GOB	Data collected between 2014 - 2019

3.12 Ensuring Quality in Research

As Yin (2014) noted, there are four common tests for judging the quality of social science research: Construct validity, internal validity, external validity, and reliability. This section discusses how those tests have been applied to a multiple case study design and outlines the steps this study took to meet the thresholds of the four tests.

3.12.1 Construct Validity

Construct validity is defined as "the extent to which variables accurately measure the constructs of interest…Do the operations really get at the things we are trying to measure?" (Vogt &

Johnson, 2011), p.70. Yin (2014) explained that there are three tactics to use with case studies to increase construct validity: multiple sources of evidence, established chain of evidence, and key informants review of report draft. Yin mentioned six options for the first tactic and this study incorporated three of them: documents (the records and documents kept by shipbreaking firms, Department of Inspection for Factories and Establishments (DIFE) under Ministry of Labour, Government of Bangladesh and NGO Shipbreaking Platform), interviews, and direct observations. The other three options (archival records, participant-observation, and physical artefacts) were not pertinent to this study. The second tactic was accomplished by securing the data in such a way that only the researcher has access to it and by taking careful field notes about who made what statements. The third tactic was accomplished by having draft reviewed by the study's participants.

3.12.2 Internal Validity

Internal validity is defined as "the degree to which one can draw valid conclusions about the causal effects of one variable on another" (Vogt & Johnson, 2011), p.80. According to Yin (2014), internal validity concerns for case studies stem from the inferences that researchers have to make when they cannot observe an event. Yin (2014) argued that case study researchers have four tactics at their disposal to increase internal validity: pattern-matching, explanation building, addressing rival explanations, and using logic models. This study has used explanatory case studies as it has explained the phenomena "Adoption of H&S practices". Explanation building is concerned with finding a robust explanation of why a particular state of affairs exists, often contrary to expectations (Wittgenstein & Rhees, 1968). This study has an accurate description of the facts of the cases (firms), considerations of alternative explanations, and a conclusion based on credible explanations that are congruent with the facts (Yin, 1992).

3.12.3 External Validity

Vogt and Johnson (2011) defined external validity as "the extent to which the findings of a single research study apply beyond the study. It's another term for generalizability" (p. 134). Yin (2014) provided two tactics for increasing external validity in case studies. They were using theory in single-case studies and replication logic in multiple-case studies. Although this is a multiple-case study, it will use both theory and replication logic. Case studies focus on analytic generalization rather than statistical generalization that is concerned about samples and populations. He said that case studies aim to expand and generalize theory. Case studies, such as this one, that ask "how" or "why" questions are more likely to generate an analytic generalization (Yin, 2014). Miles et al. (1994) explained the issue of generalizability as, "We are generalizing from one case to the next on the basis of a match to the underlying theory, not to a larger universe, the multiple-case sampling gives us confidence that our emerging theory is generic, because we have seen it work out-and not work out-in predictable ways" (p. 30). They added that multi-case studies increase confidence of the finding and that the strategy is one of replication. They also said that "if a finding holds in one setting and, given its profile, also holds in a comparable setting but does not in a contrasting case, the finding is more robust" (Miles et al., 1994), p. 29.

Purposeful selection used in this study is another dimension of ensuring external validity. According to Maxwell (2013), the quality of qualitative research is increased through what he termed the "purposeful selection" (p. 97) of people and settings that can best provide information relevant to the study's purpose and questions. He noted that the goal should be to achieve "representativeness or typicality of the…activities selected" and this purposeful selection of cases that "are known to be typical provides far more confidence that the conclusions adequately represent the average members of the population…" (p. 98). As this study selected case firms based on the criteria set by industry experts, it can reasonably be

assumed that the top management, middle management are representatives of H&S adopters in this denomination.

3.12.4 Reliability

Reliability is defined as "the consistency or stability of a measure or test or observation internally or from one use to the next" (Vogt & Johnson, 2011, p. 335). In other words, if the same study is conducted by other researchers in the same way then those researchers should get similar results. Reliability can be increased in case studies by using a case study protocol and developing a case study database. A case study database is an electronic collection of data files and other electronic documents that could be subject to a separate analysis by someone other than the original researcher (Yin, 2014). Both tactics have been incorporated in this study.

3.13 Ethical Considerations

Permission was secured for taking interviews from Ministry of Industry, Government of Bangladesh and approval was also secured from University of Canterbury's Human Ethics Committee in order to conduct this research among the shipbreaking firms of high, medium and poor performance in terms of health & safety performance. Each participant was provided an Information Sheet (See Appendix 3D for Information Sheet Template) and a Consent form (See Appendix 3E for Consent Form Template) for making him/her assured that all the information given during interview would be kept confidential

All the audio records of the interviews were stored in researcher's personal mobile phone and then transferred to her personal laptop protected by password. The most important part is that the researcher transcribed and translated every interview by herself, and therefore, the confidentiality of the files has been protected well. Data collected by the researcher were stored in her university office and personal laptop where only she has access, and it will not be

made available to any third party. The researcher discussed data and findings only with PhD supervisors.

3.14 Conclusion

This chapter presents the research design, the selection of participants and research methods used in the study. It began with a Pilot study conducted on industry experts of shipbreaking industry of Bangladesh in order to retrieve a set of context-specific observations based on their insights. It is helpful to understand firm-level management of H&S practices of a developing country like Bangladesh and general issues in this industry.

Afterwards, a discussion of the rationale for employing inductive qualitative approaches to examine the dynamics of cross-case comparison among firms in shipbreaking industry of Bangladesh. In selecting this approach, a case study method has been used as the most suitable strategy to investigate a unique phenomenon. Due consideration to ontological and epistemological beliefs was given reflexively on how the chosen research method on collecting data to generate research findings.

Finally, a discussion on the participants has been done, who are the key informants for this study, and participant selection and engagement strategies. The challenges in balancing theoretical sampling and theoretical saturation were also discussed. Finally, the data collection techniques were presented: how to design an interview protocol and interview questions, and how to apply qualitative research tools to collect data for a case study. The evaluative criteria of validity and reliability of qualitative research inquiries were illustrated to provide evidence about how this study addressed various challenges to generate novel theory.

The next chapter discusses the analysis of data based on cross-case comparisons and identification of themes.

Chapter 4 Analysis of Data

4.1 Introduction

This chapter is divided into two parts. First part provides an analysis across the variables (previously outlined in Chapter 3); namely, safety related strategic prioritization, safety related operational prioritization, infrastructure, mechanization & equipment, hazardous material handling facilities, formalization of safety practices, safety skills and safety culture, rate of injury and rate of death. Second part of this chapter discusses the emerging themes from the findings. In this section, the variables are linked with H&S performance and the analysis concludes with a set of propositions.

4.2 Safety Prioritization Practices

In shipbreaking industry, safety prioritization practices adopted in strategic and operational levels of the firm are the precursors for adoption of other H&S practices. Strategic prioritization of safety is considered as one of the important factors in High Reliability Theoretical approach where collective mindfulness embodied in systematic preparedness for and response to unexpected events (Weick et al., 2008) are done with operational prioritization of safety. Such approach provides a comprehensive description of how organizations maintain safety for long periods in complex and hazardous environments (Griffin et al., 2014). The following discussion provides strategic and operational priorities for safety set at top management and middle management levels.

4.2.1 Strategic Prioritization for Safety

An important part of H&S management in firms is the alignment of H&S with the general strategy of a firm. Typically, such reconciliation emerges at top management level. The decisions at this level set the strategic priorities, which in turn affect the management of everyday practices. Managers must often address interdependent and often, contradicting trade-offs such as, balancing productivity and safety (Leveson et al., 2009). Table 4.1 provides an overview of strategic prioritization for safety across the case firms. Data showed that firms approach strategic prioritization differently. The differences are manifested through different approaches to, for instance, avoiding highly risky ship, setting reasonable production target, level of use of mechanization and addressing future uncertainties & long-term considerations along with present certainties and short-term considerations.

Table 4.1 Overview of Strategic Prioritization for Safety

Components	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Avoiding highly risky ship	Very High	Very Low	Very High	Very Low	Very Low	Very Low	Very Low

Components	F1	F2	F3	F4	F5	F6	F7
	(100%)	(0%)	(100%)	(0%)	(0%)	(0%)	(0%)
Setting reasonable production target	Very High (90%)	Medium (50%)	High (70%)	Medium (50%)	Medium (50%)	Medium (50%)	Medium (50%)
Use of mechanization	High (80%)	Medium (50%)	High (70%)	Medium (50%)	Low (30%)	Low (30%)	Medium (50%)
Addressing future uncertainties & long term considerations	Very High (90%)	Medium (50%)	High (70%)	Medium (50%)	Very Low (20%)	Very Low (20%)	Medium (50%)
Overall Assessment of Strategic Prioritization for Safety	Very High (90%)	Low (38%)	High (78%)	Low (38%)	Low (25%)	Low (25%)	Low (38%)

Note: See Appendix 4Ai for calculation of percentages

F1 & F3 use 3 months for shipbreaking activities in order to produce 3000 MT respectively by using 20% manual labour and 80% mechanization. On the other hand, F5, F6 uses almost half time span (1 - 1.5 moths) for producing half or little less amount of production of F1 by using 70% manual labour and 30% mechanization. Particularly, by using 70% manual labour, F5 takes 1 month for producing 1500 MT and F6 takes 1.5 months for producing 2000 MT of scrapped metal. F7 takes 2 months for producing 3000 MT by using 50% manual labour and 50% mechanization. The amount produced by F7 is as similar amount as that of F1 & F3 whereas F1 & F3 gives more time (3 months & 2.5 months) and uses less manual labour (20% & 30%) and more mechanization (80% & 70%). On the contrary, F2 & F4 use 2.5 months just like F3 for shipbreaking activities in order to produce more than production of F3 i.e. 4000 MT by using 50% - manual labour and 50% mechanization which is 30% manual and 70% mechanical in case of F3. In order to reduce the operating cost and earn more profit, F5 & F6 uses least time (1-1.5 months) for breaking with little use mechanization (lesser than the time

and mechanization used by F2, F3 & F4) and F2, F4 &F7 use lesser (2.5, 2.5 & 2 months) than the time and mechanization used by F3 let alone F1.

Safety related priorities given by top management across the case firms vary largely. By accepting risky ships (e.g. oil tankers); by setting reasonable production targets observed in only 50% cases; by using various levels of mechanization only in only 30% cases and by proactively addressing future uncertainties & long term considerations in only 20% cases, F5 & F6 are showing that they have not prioritized safety and are driven by production and profit goals rather than by safety goals. For example, MD of F5 pointed out:

> *"……Yeah we have mechanised activities, I think it is 30%.....But we set reasonable production target in 50% cases. It is not possible to set reasonable target always. We always face problems and challenges. It's not easy to make everything ideal…….....We always run overtime and sometimes night shifts because we need to finish our work timely and cost effectively. It is profitable for workers as well. They can earn extra money. They are happy to do overtime and sometimes nightshifts. Otherwise, how can we earn profit? We cannot bear loss after investing a huge amount ……..* . Again, MD of F6 for instance mentioned:
>
> *"……..We prefer oil tankers as these are heavy weight ships and huge amount of metal scraps can be recovered by breaking these ships than cargo or passenger ships…."* (MD, F6)

This clearly indicates that firms are profit driven, not safety driven. F2, F4 & F7's approach to prioritization is more considered right than that of F5 & F6 only in terms of using slightly more mechanization more in 50% cases than F5 & F6 and in terms of addressing future uncertainties and long-term considerations more in 50% cases than F5 & F6. However, overall assessment is low level of strategic prioritization on safety from their top management level.

Consequences are quite evident. All of their prioritizations are contributing to "relative prioritization of safety". In F5 & F6, and F2, F4 & F7 where employees are typically

confronted with multiple demands, such as ensuring safety while keeping activities on schedule and reducing cost simultaneously, priority on safety is not 'absolute', rather 'relative' to other demands and targets (Shannon & Norman, 2009; Zohar, 2010; Zohar & Tenne-Gazit, 2008). For example, in F5 & F6, and F2, F4 & F7, setting reasonable production target only in 50% cases set by top management level results into prioritized activity i.e. giving workers reasonable time for shipbreaking only in 50% cases given by middle management level.

On the contrary, F1 & F3 are discouraging unsafe speed of work and ensuring safe speed of production by avoiding highly risky ships, setting reasonable production target, using mechanization and addressing future uncertainties & long-term considerations. Here, priority on safety is 'absolute', rather 'relative' to other demands and targets. Prioritization of safety is very high in F1 & high in F3 while dealing with competing and contradicting goals of safety and productivity. Here, workers are not confronted with multiple demands (such as ensuring safety while keeping activities on schedule and reducing cost simultaneously) at least in 90% and 78% cases.

The following quotes from MD of F3 & F1 demonstrate how managers describe their prioritization of safety:

> *"……. We never buy risky ships such as oil tankers as these are highly risky to break. Fatal accidents might occur due to a little mistake in breaking such ship as highly hazardous elements are there inside the ship. Highest level of rigorousness should be followed in each and every step of shipbreaking operations along with sophisticated infrastructure and equipment to prevent any single accident ……."* (MD, F3)

> *"…….Due to the highly risky and hazardous nature of shipbreaking activities, we have installed a significant amount of machine and equipment. Almost 80% of our activities are conducted mechanically……."* (MD, F1).

4.2.2 Operational Prioritization for Safety

Operational priorities are determined, typically at middle management level and once safety related top management sets strategic priorities. It is important to know the operational priorities as well. Table 4.2 provides an overview of operational priorities for Safety across the firms in terms of giving reasonable breaking time for shipbreaking, avoiding night shifts, avoiding overtime and compromising production and profit to ensure safety.

Table 4.2 Overview of Operational Prioritization for Safety

Components of Safety related Operational Prioritization	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Reasonable level of breaking time	High (80%)	Medium (50%)	High (80%)	Medium (50%)	Low (40%)	Low (40%)	Medium (50%)
Avoiding night shifts	Very High (100%)	Very Low (0%)	Very High (100%)	Very Low (0%)	Very Low (0%)	Very Low (0%)	Very Low (0%)
Avoiding Overtime	Very High (100%)	Very Low (0%)	Very Low (0%)	Very Low (0%)	Very Low (0%)	Very Low (0%)	Very Low (0%)
Compromising production & profit to ensure safety	High (80%)	Low (40%)	Medium (60%)	Low (40%)	Low (40%)	Low (40%)	Low (40%)

Overall Assessment of Operational Prioritization for Safety	Very High (90%)	Low 23%	High (62%)	Low (23%)	Very Low (20%)	Very Low (20%)	Low 23%

Note: See Appendix 4Aii for calculation of percentages

Except F1 & F3, all firms are putting workers under pressure by giving unreasonable breaking time. F2 & F4 are the highest scrapped metal producers among seven firms but giving reasonable breaking time only in 50% cases whereas and F1 & F3 are giving reasonable breaking time in 80% cases.

F5 & F6 put workers under stress as they are producing scraps (compared to F2, F4 & F7) by using 70% manual labour and only 30% mechanization but giving reasonable breaking time only in 40% cases.

Driven by unreasonable production targets set by top management, middle management of F5 & F6 are enforcing unreasonable breaking time in 60% production cases followed by middle management of F2, F4 & F7 who are enforcing unreasonable breaking time in 50% production cases. Moreover, these firms are not compromising production & profit for the sake of safety in 60% cases whereas F1 & F3 are compromising in 80% & 60% cases respectively. Here, compromising production and safety means expedient acceptance of production and profit that are lower than is desirable in order to ensure safety set by management. For example, Manager of F7 & F3 explained:

> *"……We sometimes say in 40% cases, we just reject orders from customers if we feel that workers are not safe to do the extra workload…yeah we just are not making profit sometimes…..*(Manager, F7*)*

> *"…….Safety is our priority. It is very common in our yard to reject orders from customer when our workers are already loaded with work. We cannot put our workers*

at risk. If any fatal accident occurs, it will take away my money more than what I will earn by putting their life at risk with work pressure……" (Manager, F3)

Unreasonable breaking time compels workers to work more than the reasonable hours appropriate for such heavy duty and physically exhausting work. The workers even work overtime. All firms run overtime except F1. Another potentially harmful operational decision made by management is running night shifts. During night, insufficient lighting, insufficient support workers and so on can cause fatal accidents. Workers tend to be exhausted during night shifts as well. Only F1 & F3 do not run night shifts. F3 runs overtime occasionally and comparatively less frequently (once a week only). On the contrary, F2, F4 & F7 are using night shifts and overtime weekly 2/3 times. F5 & F6 are using night shifts and overtime most (weekly 3/4 days & nights) most. However, night shift work even for a single night is dangerous for this type of work. Firms are driven by profit, not safety orientation, as they compromise safety by running night shifts and overtime frequently (weekly 3/4 days & nights). These rationales are evident in the following interview quotes from middle management of F2, F4, F5 & F6.

"……Well, work pressure is always high during cutting time. We have to run overtime and night shifts to reduce cost and meet up demand of customers and retain the customers, and otherwise, we will lose business. No one wants to lose a single customer. Why should we? Other yards will snatch our customers….." (Manager, F5)

"……We cannot avoid overtime and night shifts because we are operating on our own money and we have to reduce cost. No one is helping us. Government is not helping us. And you are talking about workers safety. Our workers don't care. They know accidents can happen anywhere anytime. But they need money for their families……. …." (Manager, F6)

"We are often compelled to run night shifts particularly when we face huge pressure from the customer ……." (Manager, F4)

4.3 Infrastructure & Equipment

In making decisions about the establishment, maintenance, alteration, upgrading, and expansion of infrastructure within the shipbreaking industry, infrastructure & equipment for shipbreaking yard, play a very important role in establishing safe working conditions for workers, which ensures the required accommodated operations. In addition to the administrative controls, highly effective safety measures are needed to further reduce the number of injuries and fatalities in the industry (Nnaji et al., 2019). Due to the potential to enhance workplace safety conditions and prevent injuries and fatalities, use of technology in terms of machineries and equipment have increasingly gained momentum recently (Hollnagel, 2018). Safety performance in high-tech industries has been substantially improved which is evident in multiple studies (Gill & Shergill, 2004) and one of the salient reasons is increased technology use in these industries (Nnaji et al., 2019). Different stakeholders such as, International Maritime Organization (IMO), International Labour Organization (ILO), European Union (EU), Non-Governmental Organizations (NGOs) (particularly NGO Shipbreaking Platform, Greenpeace) are promoting adoption and improvement of infrastructure, mechanization and equipment in the shipbreaking industry in order to enhance safety performance in this industry like construction and other project based industries.

In this study, infrastructure & equipment refer to all the built structures and physical facilities appropriate for safe ship recycling yard such as general yard infrastructure, hazardous material handling facilities and mechanization & equipment. International regulations such as, The Hong Kong International Convention for the safe and environmentally sound recycling of ships, 2009 & EU Ship Recycling Regulation, 2013 require that shipbreaking operations should

be conducted from built structures, hazardous material handling facilities and use necessary mechanization & equipment. These standards require physical changes to shipbreaking yards, for example, installation of an impermeable surface to the dismantling areas with appropriate drainage systems is required. Additionally, a completely traceable downstream waste disposal system and heavy duty cranes to lift entire blocks directly from the ship to the impermeable floor; metal slag collectors to catch materials falling within the inter-tidal zone while dismantling side shells; wearing PPE while working - all are required built structure, facilities, mechanization and equipment for shipbreaking yards to meet international standards.

EU specification of built structure for shipbreaking yards is more detail than HKC. For example, Article 13(1)(c) of Technical guidance note under EU Regulation (EU) No 1257/2013 on ship recycling specified that the ship recycling facility 'operates from built structures'. The purpose of built structures is to enable safe and environmentally sound ship recycling operations, ensuring worker safety, control of leakage, containment of hazardous materials and impermeable support for hazardous materials and for waste generated during the ship recycling process (EUShipRecyclingRegulation, 2013). The requirement to operate from built structures does not necessarily mean that a facility be completely built up, as long as compliance with the requirements of the Regulation is reached. Built structures may be complemented e.g. by 'machinery with tracked wheels or low ground pressure tyres' (Article 34, EU Rules, 2013), mobile settling tanks and floating cranes, where the installation of fixed cranes is not possible. This applies in particular to temporary installations, where e.g. temporary fencing may be deemed as equivalent to walls, provided that, it achieves a similar level of protection. The EU Rules, 2013 do not exclude temporary ship recycling installations whereby additional equipment is fitted to a base facility (e.g. to a port, quay or jetty), provided that the base facility itself complies with the design and construction requirements of the regulation. Article 13(1)(g)(i)(ii) of EU Ship Recycling Regulation, 2013 also mentioned that ship recycling yard

ensures safe and environmentally sound management and storage of hazardous materials and waste including the containment of all hazardous materials present on board during the entire ship recycling process so as to prevent any release of those materials into the environment; and in addition, the handling of hazardous materials, and of waste generated during the ship recycling process, only on impermeable floors with effective drainage systems. It is also mentioned that all waste generated from the ship recycling activity and their quantities are documented and are only transferred to waste management facilities, including waste recycling facilities, authorised to deal with their treatment without endangering human health and in an environmentally sound manner (EUShipRecyclingRegulation, 2013). Moreover, Article 13 (h) specified that recycling yards establish and maintain an emergency preparedness and response plan; ensures rapid access for emergency response equipment, such as fire-fighting equipment and vehicles, ambulances and cranes, to the ship and all areas of the ship recycling facility (EUShipRecyclingRegulation, 2013).

Hazards and risks of manually conducted shipbreaking have been studied inspired by the occurrence of frequent number of major injury and death cases of workers in the South Asian shipbreaking yards. For example, Andersen (2001) identified two main groups of hazards in shipbreaking. First, intoxication from dangerous substances and injuries caused by explosions of trapped gas or oil in fuel tanks, and second, the limited use of safety equipment. Accidents can occur such as falling from the ship – which may be up to 70 metres since many workers do not use safety harnesses – as well as workers being crushed by falling steel beams and plates and electric shocks. Again, according to NGO Shipbreaking Platform, the most frequent reasons of major injuries and death cases occurred in shipbreaking industry of Bangladesh are falling / hit by iron plates/pieces, falling from a great height, explosion, fire broke, cylinder blast, and leakage of toxic gas (NGOshipbreakingPlatform, 2014). However, these fatal accidents are preventable through proper use of mechanization and equipment and

improving infrastructural and hazardous material handling facilities for making safe workplace. For example, when workers are provided with a winch machine, workers do not need to pull manually rope or cable or wire cable for pulling the large ship, winch designed for the most challenging job onshore and offshore (Mark et al., 1999) hence preventing accidents. Instead of using muscle power, loading and unloading of scraps metal can be performed by cranes and lifting tools, which can help to prevent accidents due to falling of scraped metal plates etc.

Shipbreaking yards in Bangladesh have started developing the required built structures gradually since 2005 in terms of infrastructural improvement, mechanization & equipment and hazardous material handling facilities improvement. Bangladeshi yards started improving general infrastructure by installing large security gates, PPE stores, medical facilities, sanitary facilities, fire-fighting facilities, impermeable floor etc. Firms also started improving mechanisation and equipment such as crane, magnetic crane, loader, multipurpose lifter, tractor, generator, personal protective equipment (PPE) etc. and hazardous material handling facilities such as, incinerator, hazardous waste storage and removal area, classified collection of ship wastes etc. Data from the case firms showed that there is a large variation in terms of infrastructure, mechanization & equipment and hazardous material handling facilities across the case firms. Table 4.3 provides an overview of results from case firms (more details are provided in Appendix: 4Bi, 4Bii, 4Biii).

Table 4.3 Overview of Infrastructure & Equipment

Components	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
General Yard Infrastructure (Dry dock facility, impermeable floor, security gates, medical facility, PPE storage, fire-fighting facility, toilets etc.)	Very High (96%)	High (70%)	Very High (92%)	High (70%)	Low (40%)	Low (40%)	Medium (50%)
Hazardous Material Handling Facilities	Very High	High (70%)	Very High	High (70%)	Low (40%)	Low (40%)	High (70%)

(Incinerator, fire alarm, hazardous waste storage and removal system, classified collection of wastes etc.)	100%		100%				
Yard Mechanization & Equipment (Crane, lifter, tractors, generators, PPE, magnetic crane etc.)	Very High 100%	High (70%)	Very High 90%	High (70%)	Low (40%)	Low (40%)	Medium (50%)
Overall Assessment of Infrastructure & Equipment	Very High (99%)	High (70%)	Very High (94%)	High (70%)	Low (40%)	Low (40%)	Medium (57%)

Data revealed that, F1 has arguably set an example in the whole industry by initiating the decision to take Hong Kong Convention (HKC) certification through a very high level of built structures in terms of very high level of yard infrastructure, mechanization & equipment and hazardous material handling facilities required for an international standard yard. Worldwide, HKC SOC is the highest level of internationally recognised certification in shipbreaking industry. Only full-fledged Dry Dock facility (required for EU enlistment) is missing in F1's infrastructural development.

F3 has all the facilities except the impermeable floor (yard infrastructure) and Woki Toki (mechanisation & equipment) and therefore is having very high level of infrastructural and mechanization & development. F3 is planning to adopt HKC SOC for face off international competition. As the Managing Director (MD) of F3 noted:

> *"……We are planning to adopt the HKC certificate but just waited so far to see whether the return on the investment made by Firm 1 is evident or not in order to invest such a huge amount……."* (MD, F3).

Impermeable floor is one of the prerequisites in terms of getting the HKC SOC. Out of all the seven firms, only F1 has invested in building the impermeable floor. It costs 4 million US$ for developing the required infrastructure for getting HKC SOC whereas they have sufficient facilities before getting HKC certificate. For instance, MD of F1 excitedly mentioned:

"We invested 4 million USD for making us ready to get the HKC certificate. I struggled a lot to implement this project. But you know if want to be competitive you have no way but to keep the pace with competition. We have applied for EU enlistment only after we got HKC certificate……" (MD, F1).

A variety of 'General Yard Infrastructure' is evident in photos taken by the researcher during yard visits across the firms exhibited in Figure 4.1, 4.2, 4.3 & 4.4.

Figure 4.1 Photographic evidence of High, Medium & Low level of Yard Floor

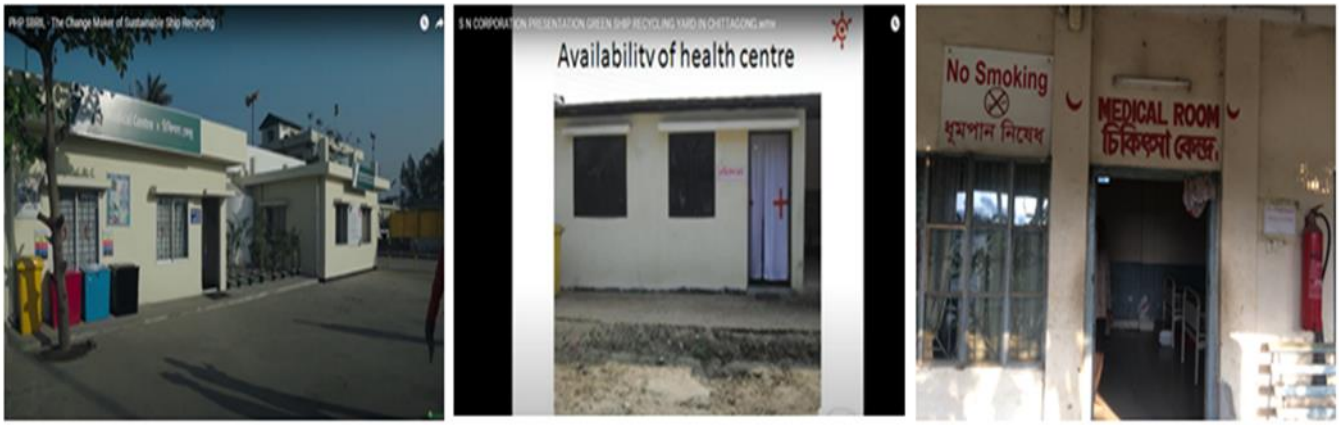

Figure 4.2 Photographic evidence of High, Medium & Low level of Medical Centre

Figure 4.3 Photographic evidence of High, Medium & Low level of PPE Storage

Figure 4.4 Photographic evidence of High, Medium & Low level of Hanging and Visible Safety Instructions

F2 & F4 have improved their infrastructure but not as much as F3, let alone F1. However, their high level of components of built structures are the result of their high level of yard Infrastructure, mechanisation & equipment and hazardous material handling facilities. Managing Directors of Firm 2 & 4 are thinking almost in the same way. They are against huge investment on impermeable floor and other HKC required facilities. For example, the MD of F2 pointed out:

> *"We are waiting to see the return F1 can realize against its huge investment. We cannot take the risk of such a big investment unless and until we get the assurance that it is going to be worth it. We cannot ignore the uncertainty of this industry in Bangladesh as well ……."* (MD, F2).

MD of F4 also mentioned their risk averse tendency toward huge investment on impermeable floor and other HKC required facilities.

F7 is having medium level of yard infrastructure, medium level of mechanisation & equipment and high level of hazardous material handling facilities and operating in medium level of facilities. F7 also adopts risk averse strategy for huge investment into more mechanization and infrastructural development. For instance, Managing Director of F7 pointed out:

"We are doing business here. We cannot take the risk of such a big investment unless and until we get the assurance that it is going to be worth it. ……In Bangladesh, this industry might be totally closed within 20 years if HKC and EU regulations are enforced……"

F5 & F6 who have low levels of yard infrastructure, low levels of hazardous material handling facilities and low levels of mechanisation & equipment and operating with a very rudimentary infrastructure. They are the firms where only 30% shipbreaking activities are conducted mechanically and 70% shipbreaking activities are conducted manually with their low levels of infrastructure and mechanization & equipment. These firms do not have security gate, medical facility inside the yard, fire-fighting facility, hanging signboard with major H&S guidelines, proper large gate, security guard & reception centre, security checking, hanging layout of the yard, truck way indicator, precautionary guideline for movement in the yard, training centre for workers, pond (water body), emergency exit, dormitory for living, recreation room, safety officer's room etc. They do not have adequate lifters, adequate PPE (prerequisite for such activities), let alone magnetic crane. Workers there work only with a toolbox and winch machine and aim to continue operating with basic safety facilities for as long as possible. MD of F5 & F6 shared mostly similar views regarding infrastructural and hazardous material handling facilities. For instance, MD of F5 mentioned:

"……we are running our yards on our own money. We are not getting any support from government and ship owners. It is not easy to develop the required infrastructure. A lot of funds are required. We will run our yards as long as we can. When regulations will prohibit us to run without international standard facilities, we will quit this industry……."(MD, F5).

A variety of 'Mechanization & Equipment' is evident in photos as well taken by the researcher during yard visits across the firms exhibited in Figure 4.5, 4.6 & 4.7.

Figure 4.5 Photographic evidence of High, Medium & Low level of Heavy-Duty Crane and Magnetic Loader

Figure 4.6 Photographic evidence of High, Medium & Low level of Winch

Figure 4.7 Photographic evidence of High, Medium & Low level of Incinerator

Finally, a variety of ‘Hazardous Material Handling Facilities’ are evident as well in photos taken by the researcher during yard visits exhibited in Figure 4.8, 4.9, 4.10 & 4.11.

Figure 4.8 Photographic evidence of High, Medium & Low level of HAZMAT handling

Figure 4.9 Photographic evidence of High, Medium & Low level of LPG Cylinder Handling

Figure 4.10 Photographic evidence of High, Medium & Low level of Hazardous Waste Storage

Figure 4.11 Photographic evidence of High, Medium & Low level of Firefighting Facilities

4.4 Formalization of Systemic Practices

Researchers identified that on one hand, formalizations facilitates workers to perform their tasks and on the other hand, helps to design structure of operations to coerce compliance (Adler & Borys, 1996). On one hand formalization works through imposition of rules and policies on organization members (by using traditional control models) which focuses on monitoring adherence to previously established objectives and standards and on the other hand, formalization allows employees to effectively deal with unavoidable contingencies (by taking into account intelligence of the workers) and specifies characteristics that formal systems must have to foster efficiency and flexibility (Ahrens & Chapman, 2004; Jørgensen & Messner, 2009). In order to streamline shipbreaking operations, formalization of various practices is inevitable for the sake of safety. An advantage of formalization is that it makes employee behaviour more predictable (Michaels et al., 1988), which is very critical to ensure safety in highly risky and hazardous nature of shipbreaking industry . In general, well-designed rules and procedures reduce role conflict, ambiguity, and increases coordination (Organ & Greene, 1981; Podsakoff et al., 1986). Different researchers have also proposed that formalization must be aligned with the characteristics of the firm to achieve appropriate levels of coordination,

control and organizational performance (Gulati & Singh, 1998) and therefore, large variation exists in firm level adoption of formalization across the shipbreaking industry of Bangladesh due to different characteristics of firms. Table 4.4 provides an overview of formalization of systemic practices across seven firms in terms of adoption of formal management certification, human resources management practices and PPE management practices (more details are provided in Appendix: 4C).

Table 4.4 Overview of Formalization of Systemic Practices

Components	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Formal Management Certification	Very High (92%)	Medium (50%)	Very High (83%)	Medium (50%)	Very Low (8%)	Very Low (8%)	Very Low (8%)
Human Resources Management Practices	High (70%)	Medium (52%)	High (64%)	Medium (52%)	Low (40%)	Low (40%)	Medium (58%)
PPE Management Practices	Very High (100%)	Medium (50%)	Very High (83%)	Medium (50%)	Low (40%)	Low (40%)	Medium (55%)
Overall Assessment of Systemic Practices	Very High (87%)	Medium (51%)	High (77%)	Medium (51%)	Low (29%)	Low (29%)	Low (40%)

This study has found that firms vary considerably in terms of level of formal management certification. In addition to the variation in adopting formal certificates, firms vary greatly in terms of credibility of certifiers through accreditation of the certifiers and country of origin of the certifying firm (international/local) and regularity of renewal and updating of adopted certificates. F1 is having a very high level by adopting a variety of formal management

certificates such as: HKC SOC, ISO 9001, ISO 14001, OHSAS 18001, ISO 30000 & applied for EU enlistment along with using of highly accredited international certifiers and regular renewal and updating of all adopted certificates. The most significant formal certificate that F1 adopted was HKC (Hong Kong) SOC (Statement of Compliance). MD of F1's statement during interview regarding HKC and EU is worthy to mention:

> *"……we have no alternative, we have to have HKC SOC and we should have EU enlistment if we want to sustain our business in this industry and to attain competitive advantage. Our firm is the pioneer in this industry. We have set example by adopting HKC SOC and we are going further step by getting EU enlistment……."* (MD, F1).

On the other hand, a low level of formal management certification is evident in F5, F6 & F7 and medium level of formal management certification is evident in F2, F3 & F4 respectively. Data showed that F2, F3 & F4 have all certificates (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000) except HKC SOC and EU enlistment, whereas F5, F6 & F7 have only ISO 9000. Moreover, F5, F6 & F7 have used local certifiers (non-accredited and dubious) for their certificates. These firms neither renewed their certificates nor updated their adopted certificates since the date of adoption. Data revealed an interesting variation aiming F3 and F2 & F4 in spite of having same number of certificates which is F3 has used accredited international certifiers and regularly renewed and updated all its adopted certificates whereas F2 & F4 have used local certifiers who are considered to be dubious. Moreover, F2 & F4 have renewed and updated certificates irregularly since their adoption of certificates.

A Variety of 'Formal Management Certification' are evident in photos taken by the researcher during yard visits across the firms and are exhibited in Figure 4.12 & 4.13.

Figure 4.12 Photographic evidence of High, Medium & Low level of Formal Management Certification

Figure 4.13 Photographic evidence of High, Medium & Low level of Formal H&S Policy

Management of human resources issues is one of the critical areas for conducting shipbreaking operations. This study has also found a broad range of human resources management (HRM) practices evident in data. Variation of firm level HRM exists predominantly in terms of presence of experienced workers (5+ years); permanent workers; local workers; presence of formal and regular safety training for workers; providing higher salary (higher than the mandatory amount set by government); providing attendance bonus; bearing regular and full medical expenses for injured workers; providing mandatory

compensation for injured and dead workers fully and regularly and level of retention of experienced workers. Data revealed that all firms prefer experienced workers who have at least 5 years of practical working experience as the nature of cutting job, fitting job demands safety skills highly, and practical working experience is a major source of safety skills. However, not all firms can afford experienced workers. Presence of experienced workers in F1 & F3 is high whereas F2, F4 & F7 are having a medium level and F5 & F6 are having a low level of experienced workers out of their total workforce. As one manager from F7 commented:

> *"In my opinion, number of years of experience in this industry is critical while recruiting workers if we want to ensure safety. Minimum 5 years practical working experience is good for such work. Experienced workers know how to work safely. 60% workers at our yard are experienced……. "* (MD of F7). Again, MD from F6 pointed out:
>
> "……*Experienced workers are highly demanding in this industry. Highly experienced workers can negotiate for higher than market rate of salary. We cannot afford experienced workers always. I can say 40% workers are highly experienced at our yard……."* (MD of F6).

Data also showed that no worker is permanently employed in F5, F6 & F7 (i.e. all workers are temporary recruited). Only 30% workers permanent and 70% temporary in case of F2 & F4 whereas 50% workers are permanent and 50% temporary in case of F1 and F3. In this industry, firms are least interested to employ all/most of their workers permanently. Reduction of operating cost is the main reason for recruiting temporary workers is to reduce operating cost. Temporary and permanent employment both are very common. All firms has temporary employment practice. For instance, MD of F6 pointed out:

> *"……we do not recruit worker permanently as we do not need them throughout the year. Only we need them when we have ship to break. Moreover, monsoon season is not suitable for shipbreaking and it lasts almost 2/3 months. So why we will increase our operating cost by having permanent workers? ……."* (MD of F6).

This argument behind temporary recruitment is reflected in interviews with MD of F5 & F7. On the other hand, MD of F3 pointed out argument in favour of having some permanent employment along with temporary one:

> *"……we need some worker permanently particularly who are very qualified, experienced and competent. We do not want to lose them. In this industry, we struggle with attracting experienced workers always. Switching tendency is very high among experienced workers here. We are ready to bear costs for permanent employment for some workers. I can say 50% workers here are permanently employed. These workers also share the safety values we want to uphold which is very important I think……. ....."* (MD of F3).

MD of F1 mentioned the importance of permanent employment in the following way:

> *"…….We have invested a lot in developing the safety skills of our workers as well. Our head of operations, manager and safety officer are National Examination Board in Occupational Safety and Health (NIBOSH), UK, certificate holders. Our Head of Operations has International certification diploma on occupational H&S who in fact are now invaluable assets for our firm. They are the building block of our existing safety culture. We need them permanently. Moreover, some workers who have been trained and groomed according to our safety culture, how can we not make them permanent in exchange of their loyalty and dedication……."* (MD of F3).

Data also showed that all firms appoint both local workers and migrant workers. Local workers are the workers located in the region and area where the shipbreaking industry is located (Chittagong coastal areas – southern part of Bangladesh) whereas migrant workers are mainly come from Rajshahi division and its districts, which is located at Northern part of Bangladesh. However, employing local workers do not differ across firms that much as it ranges from 40% to 50%. The reasons behind recruiting local workers are predominantly the familiarity with the industry, comfortable communication with the other workers being the same regional people etc. On the other hand, firms prefer migrant workers, as they are easily available and in high supply- utilize the local ones. Additionally, firms can deprive them easily

as most of the migrant workers are inexperienced and recruited temporarily. Migrant workers are not even getting medical expenses and compensation in case of injury and death due to their temporary employment. Data showed that 50% workers are local and 50% are migrant in F1, F3 & F7 whereas 40% workers are local and 60% are migrant in F2, F4, F5 & F6. F1 provides external (BSBA) and in-house safety training formally and regularly while firms 2,3, & 4 conduct formal both types of training irregularly and firms 5, 6 & 7 do not conduct training neither formally nor regularly. In case of F1 & F3, safety training programs are highly formal & regular, cover both theoretical & practical aspects and participation is compulsory for all workers whereas the worst scenario is present in Firm 5 & 6 where training is conducted in less formal manner. Mostly informal training program prevails and no external professional trainer is present here. It is reflected in the following statement:

> *"……..Our experienced workers are the trainers. They train whenever any worker or some workers need them. We do not think it has to be very formal. They can get training and give training at their common convenient time……..."* (Manager, F6).

F1 send their workers to not only to national safety training program but also to the international level safety program. It has internationally certified safety personnel such as head of operations, manager and safety officers with NIBOSH certificate, Head of Operations has International certification diploma on occupational H&S. F1 always send their key workers to international safety training programs. F3's manger is also a NIBOSH certificate holder. Additionally, F1 and F3 conducts formal safety training by hiring external safety agency twice a year. It is evident in the following statement of Head of Operations of F1:

> "……*It is a matter of pride that we send our mangers and safety officers for international training sometimes……*" (Head of Operations, F1).

F2, F4 & F7 are having moderately formal training program attended by most of the workers, which covers both theoretical & practical aspects. However, formal training is

irregularly conducted in F2 & F4 whereas regularly conducted in F7. For instance, manager of F2 mentioned,

> *"……we do not think there is any need for formal training always. As training is part of everyday work here, it can be effective even if it is informally done. Workers can get training whenever they want depending on the common convenient time of the trainer. Our experienced workers are the experienced trainers as well. If we need, we hire external trainer as well. We called on safety agency sometimes for giving our workers theoretical training along with practical one……"* (Manager, F2).

There is no significant difference between the firms in case of paying main salary and providing lunch for yard workers. All firms pay the government-mandated rate (market rate). However, F5, F6 & F7 tend to pay higher than the government-mandated rate to attract highly experienced workers. Their salary is about 2 times higher than the government mandated rate. However, F1, F2, F3 & F4 do not provide higher than mandated salary. These firms provide attendance bonus to retain their workers as yard switching tendency of workers is very high in this industry. F1, F2, F3 & F4 provide accommodation (though quality varies) and firm 5, 6 & 7 do not provide any accommodation. Again, firms differ largely in terms of fully & regularly providing medical expenses for injured workers as well. Data revealed that in F1 & F3, total medical expenses covered fully and regularly whereas in F2, F4 & F7 total expenses covered fully but irregularly. In F5 & F6, medical expenses are covered partially and irregularly. For example, MD of F3 pointed out:

> *"……we always bear all the medical expenses of our injured worker. ……."* (MD, F3)

Firms differ largely in case of providing government mandated compensation in case of injury and death as well. Data showed that F1 & F3 regularly provide the mandatory compensation amount one (1) lac taka (NZ$ 2000) fully to the dead and injured (major injury) workers. On the contrary, F2, F4, & F7 do not provide full amount of mandatory compensation

although provide regularly and therefore their level is 80%. In F5, F6, mandatory amount of compensation is covered partially and irregularly (60%). While F1 assumes responsibility toward injured workers and dead workers, F5 ignores their responsibility. The following statement is the reflection of responsible attitude of F1:

> *"We cannot avoid our responsibility toward injured workers even dead worker due to the accident while working at our yard……"* (MD F1).

MD of F5, in contrast, shifts the blame to workers for accidents:

> *"……It is not always possible to provide compensation all the time. We try to give whatever we can afford. Government is not helping us in any way. We have to compensate highly in case of injury from our money. Accidents are common here. Workers are responsible for accidents. Their carelessness is the main reason for accidents. Why should we care them always if they do not care themselves*……" (MD F5).

Data also showed that F1 & F3 are regular users of H&S management consultants, technical consultants and industry experts in order to make sure the safety. F1 has permanent H&S management consultants, technical consultants and industry experts who work part time and F3 has temporarily appointed H&S management consultants, technical consultants and industry experts who work part time basis. F2, F3, F4, F5, F6 & F7 are not users of H&S management consultants, technical consultants and industry experts like F1 & F3. For instance the following statements of MD from F1 & F3 are important to note regarding this issue:

> "…….*We have Captain X as an industry expert. He is an advisor of BSBRB. He has 30 years of experience in this industry. He is working here part time…….. ….. "Y" H&S Consultancy firm is working part-time for our yard as well……"* (MD, F1).

> *" ……..We sometimes need to take advice and assistance from technical consultants and industry experts especially when we face problems. We appoint them sometimes temporarily….."* (MD, F3).

Another component is management of personal protective equipment (PPE) designed to minimise exposure to, and decrease the likelihood of, injuries, accidents, and other hazards in the workplace. However, adequate training on proper usage of PPE is needed to effectively decrease the risk of accidents from occurring. A large variation of availability and use of PPE among the firms exists. F1, for instance, has made mandatory use of all kind of PPE for cutting and fitter work; mandatory use of safety boots and helmets for all employees. This firm conducts adequate training for the proper use of PPE has adequate storage of PPE and availability of PPE, good quality of the PPE, and daily monitoring of employees receiving and returning PPE. All these PPE issues have led a very high level of management of PPE issues for F1. For example, manager of Firm 1 pointed out:

> *"……..You won't find anyone here without a helmet and boot. Even visitors are bound to wear a helmet and boots. Our cutter men and fitter men wear all kinds of PPE as they do the most risky work……'* (Manager, F1).

F3 has a high level of management of PPE issues (83%), however, some aspects of PPE management are missing , such as, no formal and regular training for PPE use and maintenance, 80% workers use helmet and boot, quality of PPE are medium and very wear and tear prone etc. F2, F4 & F7 are having medium level of management of PPE issues as these firms have only the use of helmets and safety boots for cutting and fitting work. Almost half of the workers (60%) do not use any PPE in Firm 2, 4 & 7. These firms have policy for PPE issues but do not have any formal and regular training for PPE use and maintenance. These firms do not have all kind of PPE for critical work and adequate PPE for all workers. Additionally, due to medium quality of PPE, their PPE are very wear and tear prone, creating room for all time inadequacy of PPE. On the other hand, 80% of workers in case of Firms 5 & 6 are not using any PPE. They only provide a helmet and boots for cutter men and fitter men. PPE management is low in F5 & F6.

A Variety of ‘Use and Management of PPE’ are evident in photos as well taken by the researcher during yard visits across the firms and are exhibited in Figure 4.14, 4.15 & 4.16.

Figure 4.14 Photographic evidence of High, Medium & Low level of Use of PPE - in individual setting

Figure 4.15 Photographic evidence of High, Medium & Low level of Use of PPE - in Group setting

Figure 4.16 Photographic evidence of High, Medium & Low level of Management of PPE

4.5 Formalization of Operating Practices

Researchers argue that formalization facilitates organizational performance, and it is a key aspect for organizational survival (Fréchet & Goy, 2017; Wouters & Wilderom, 2008) by promoting deliberations, acts as an integrating framework, provides a clear understanding of control mechanisms, and codifies best practices, allowing employees to receive feedback Chams Anturi et al. (2018). Chams Anturi et al. (2018) found in their study that operational performance fully mediates the relationship between formalization and business performance.

For each phase of shipbreaking operations, there is standard operating procedure. For example, safe-for-entry; safe-for-hot work; welding, cutting, grinding and heating; prevention of falling from heights and accidents caused by falling objects; housekeeping and illumination; maintenance and decontamination of tools and equipment; health and sanitation; personal protective equipment; worker exposure and medical monitoring; emergency preparedness and response plan; fire and explosion prevention, detection and response; environmental monitoring etc. Additionally, for management of hazardous materials including asbestos, PCBs, ODSs, TBTs, paints, oil, bilge and ballast water and heavy metals; spill prevention, control and countermeasures; storm-water pollution prevention; debris prevention and control; and incident and spills reporting, standard operating procedures are also in place.

Moreover, each HKC-compliant yard has a dedicated firefighting, first aid, oil spill control and emergency response team. As the aim of standard operating procedure is to achieve worker safety and health compliance along with environmental compliance, such procedures are useful to prevent adverse effects on human health and safety. On the other hand, plethora of records that needs to be maintained by the yards are required for supporting standard operating procedures. These records are being audited from time to time by the classification society that certifies the yard.

Table 4.5 provides an overview of formalization of operating practices across seven firms in terms of process safety management (PSM) practices, behaviour-based safety management (BSM) Practices and Management of Housekeeping management practices (more details are provided in Appendix: 4D).

Table 4.5 Overview of Formalization of Operating Practices

Components	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Process Safety Management (PSM) practices	Very High (100%)	High (71%)	Very High (90%)	High (71%)	Medium (49%)	Medium (49%)	High (71%)
Behaviour-based Safety Management (BSM) Practices	Very High (90%)	Medium (60%)	High (80%)	Medium (60%)	Low (40%)	Low (40%)	High (60%)
Management of Housekeeping issues	Very High (100%)	Medium (60%)	High (80%)	Medium (60%)	Low (40%)	Low (40%)	High (80%)
Overall Assessment of Safety Operating Practices	Very High (97%)	High (64%)	Very High (83%)	High (64%)	Medium (43%)	Medium (43%)	High (70%)

Management of Process safety practices, the main framework of shipbreaking activities, is influenced by many factors such as level of formality, rigour, regularity, consistency leading to competency (Einolf & Menghini, 1999). Organisational and operating procedures for management of process safety practices need to be managed formally, rigorously and regularly in shipbreaking operations. All the elements of process safety management such as, ensuring employee participation, keeping and providing process safety information, conducting process hazard analysis, following operating procedures, conducting training, managing contractors, pre-start up safety review, ensuring mechanical integrity, taking hot work permit, management of change, incident investigation, emergency planning and response, compliance audits and trade secrets (Klein & Vaughen, 2017) need to be

managed formally, rigorously and regularly in shipbreaking operation to reduce the risk. Moreover, adherence to formal and rigorous approaches leads to more compliance with national and international safety requirements.

Data revealed that only F1 has maintained 100% quality followed by F3 who has maintained a very high level (90%) in all areas of PSM. By having SRFP (Ship Recycling Facility Plan) and SRP (Ship Recycling Plan) which are the required documents of HKC, F1 has manifested its high level of quality of PSM. F3 is also developing SRFP. Managing director of F3 claimed,

> *"……our target is zero accidents and we would strive to meet this target always as long as our firm is in operation. We are developing our SRFP (ship recycling facilities plan)……'.*

On the contrary, by maintaining a high level (80%) in some critical PSM activities (such as, in keeping and providing of process safety information, conducting of process hazard analysis, following of operating procedures, ensuring of mechanical integrity and taking of hot work permit), F2, F4 & F7 have showed high level (not very high) of required formality and rigorousness and regularity of process safety management practices. However, F2, F4 & F7 are moderately rigorous, regular and consistent in other PSM activities (more details are provided in Appendix: 4D). For instance, MD of F 2 noted:

> " …..*We want to reduce accidents. We are trying to secure our workers' safety by following most critical parts of PSM though we do not have any formal SRFP (ship recycling facilities plan)……."* ; whereas, F1 is more likely to meet the required PSM practices 100%. For instance, MD of F1 pointed out: *"……no compromise with quality of PSM activities……" (*MD, F1)

On the contrary, where all firms have taken initiatives to ensure high level of PSM activities as much possible as they can, only F5 & F6 do not pursue such initiatives. They are

having medium level in terms of formality, rigorousness and regularity in only some critical PSM practices (e.g. keeping and providing of process safety information, conducting of process hazard analysis, following of operating procedures, ensuring of mechanical integrity and taking of hot work permit) and low level in other PSM practices. For example, manager of F5 mentioned:

> *"……..We are very careful about the important steps of PSM and try to maintain our level best. We do not think it has to be very formal. Our experienced workers know how to do these very well……" (Manager, F5).*

A variety of 'Formal Operating Practices' are evident in photos taken by the researcher during yard visits in terms of elements of Process Safety Management (PSM) practices, Behaviour-based Safety Management (BSM) Practices and Management of Housekeeping issues. Different levels of Formal Operating Practices across the firms across firms are exhibited in Figure in 4.17, 4.18, 4.19, 4.20 & 4.21.

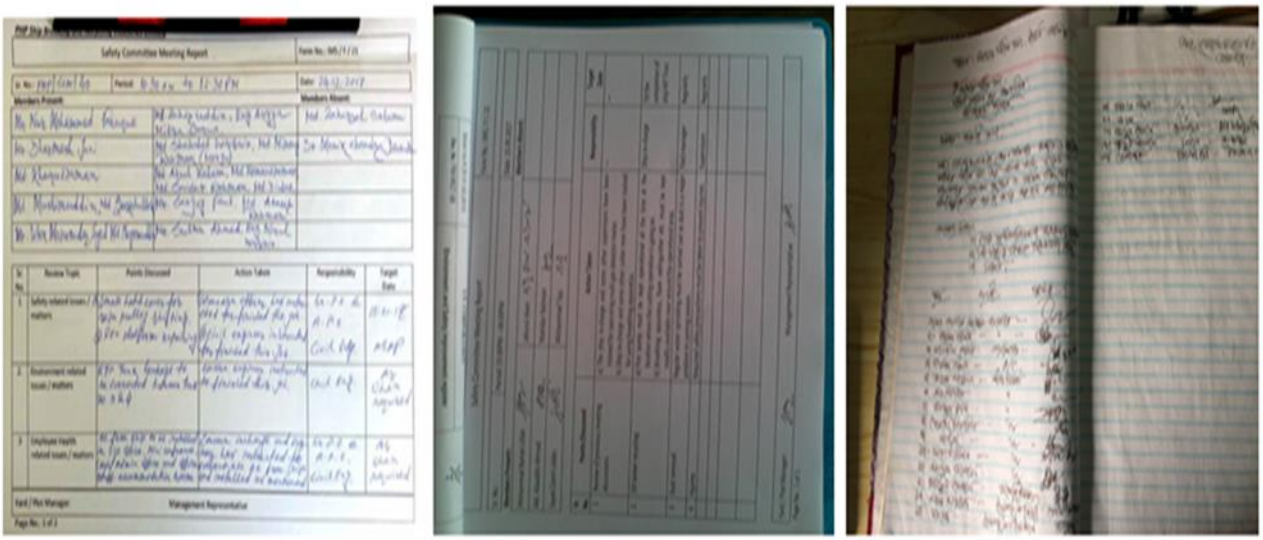

Figure 4.17 Photographic evidence of High, Medium & Low level of Safety Meeting Report

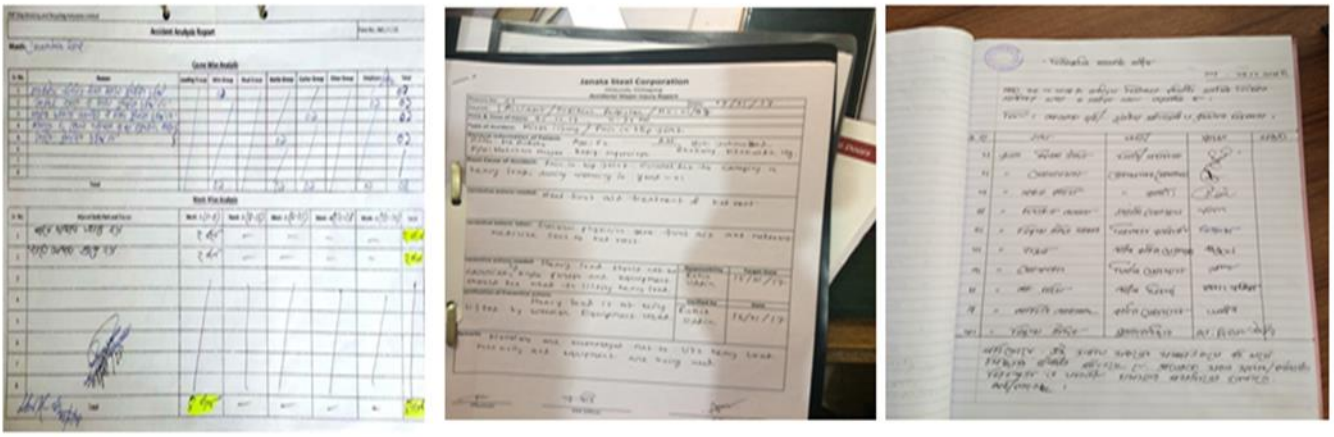

Figure 4.18 Photographic evidence of High, Medium & Low level of Accident Analysis

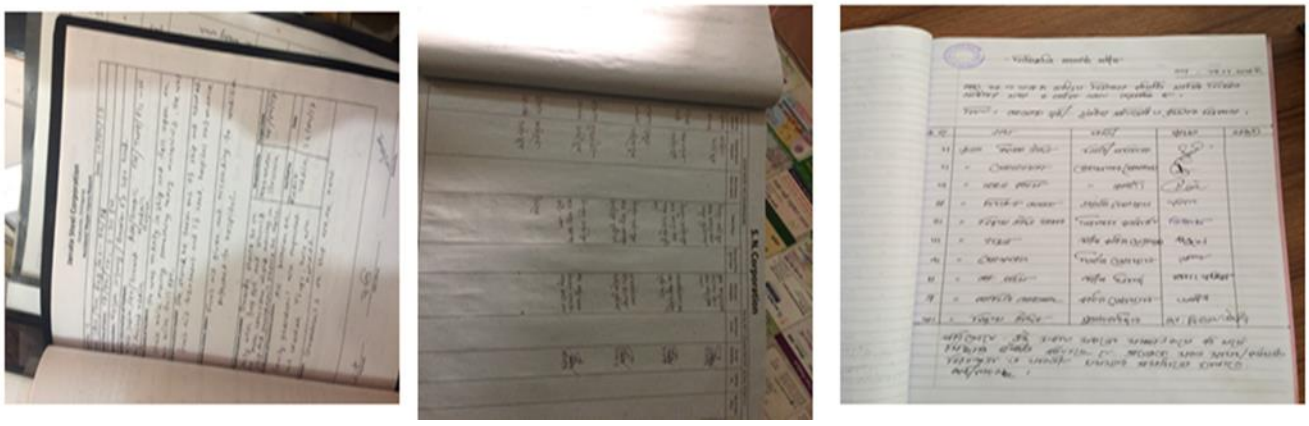

Figure 4.19 Photographic evidence of High, Medium & Low level of Formal Accident Reporting

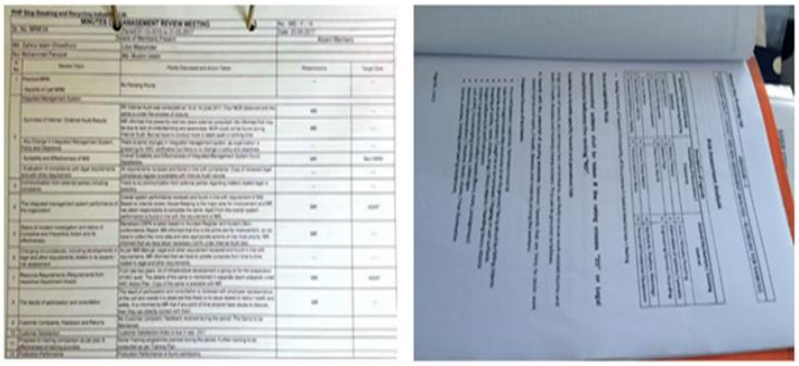

Figure 4.20 Photographic evidence of High, Medium & Low level of Risk Analysis

Figure 4.21 Photographic evidence of High, Medium & Low level of Housekeeping Practices

Along with process-safety management practices, management of behaviour-based safety management practices is equally important. Firms vary largely in such practices as well. Differences across the seven firms regarding adherence to behaviour-based safety management practices are evident in all respective areas such as risk analysis and pinpointing, goal setting, training and prompting, observation and measurement, performance feedback, and rewards and incentives (Wirth & Sigurdsson, 2008). These behaviour-based safety management practices are conducted through very high level of formal means in F1. F3 closely follows F1 and interestingly, F7 follows F3 whose formality means for BSM practices are medium. The following statement of safety office of F1 is reflection of F1's management of behaviour-based practices:

> *"……..our safety committee with the help of experts always conduct risk analysis and set goals for minimizing risk and safe work. Continuous training, observation and feedback are the key of our safety program. We have "worker of safety" award for employee every year to encourage them to work safely……."* (Safety Officer, F1).

On the contrary, F2 & F4 demonstrate a medium level where all areas of management of behaviour-based safety practices were conducted medium level of formal means in risk analysis, goal setting, observation, training and feedback. F5 & F6 have shown low in BSM

even lower than F2 & F4, as they have low level of formal means for ensuring behavioural safety. Informal approaches (e.g. informal verbal exchange between employees and supervisors regarding important safety issues) are the predominant means of BSM in F5 & F6 followed by F2, F4 & F7.

Finally, management of housekeeping issues is another important component. Housekeeping is key daily activity in shipbreaking industry. It is mandatory for all yards to keep the proper storage of materials and equipment, removal of scraps, waste and debris at appropriate intervals (BSBRA, 2011). In F1, work areas are maintained appropriately where trash and scrap are always picked up and no spills. Here, walkways are kept unobstructed and materials and tools are kept organized. Even monitoring of housekeeping activities are present as well. All these factors made F1 the best performer. F1's very high level of housekeeping management is reflected in the following statement of F1' manager:

> *"……Many people just wonder how come a shipbreaking yard which deals scraps, wastes can be so much neat and tidy. Credit goes to housekeeping skills of our workers which is part of our safety values. Housekeeping sounds simple but in fact, it is not. In this industry housekeeping matters significantly. You will not find obstructed walkways or unorganized tools or materials. Housekeeping is part of their job responsibility……."* (Manager, F1)

Management of housekeeping issues prevalent in F3 & F7 (high level) follows F1 closely. On the contrary, F2 (60%) & F4 (60%) are moderately managing housekeeping issues followed by F5 (40%) & F6 (40%) who are the low performers. For instance, the researcher found scrapped metals scattered in many areas of the yards of F5 & F6, even in F2 & F4. In F5 & F6, walkways are not kept unobstructed and materials and tools are not organized. Poor Housekeeping management practice is one of the major reasons for accidents in F5, F6, F2 & F4.

4.6 Safety Skills

According to Youndt and Snell (2004), safety skills possessed by individual worker within a particular organization include technical qualifications, competencies, experiences, and understanding of process safety risks, along with a range of personal and interpersonal qualities that promote safety capability. Griffin et al. (2014) that the personal skills and expertise, that underlie individual worker's safety performance in high-risk industries, have long been the focus of both researchers and organizations. In terms of technical and non-technical safety skills, firms vary considerably. Table 4.6 provides overview of safety skills of workers across seven firms (more details are provided in Appendix: 4E).

Table 4.6 Overview of Safety Skills

Components of Management of Safety Skills	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Technical Safety skills of workers	High (70%)	Medium (60%)	High (70%)	Medium (60%)	Low (40%)	Low (40%)	Medium (60%)
Non-Technical Safety skills of workers	High (70%)	Medium (60%)	High (70%)	Medium (60%)	Low (40%)	Low (40%)	Medium (60%)
Overall Assessment of Safety Skills	High (70%)	Medium (60%)	High (70%)	Medium (60%)	Low (40%)	Low (40%)	Medium (60%)

Technical Safety skills of workers can be considered as life-blood of shipbreaking operations. There is no formal educational degree for developing these skills. In Bangladesh, this industry is dependent on the experience and safety training of workers (Platform, 2016) and therefore, having a skilled workforce is the main strength of a shipbreaking yard. Safety Skills consists of technical qualification, working experience, competency, process safety skill and emergency skill of workers (Griffin & Neal, 2000). Shipbreaking firms need not only technically qualified workers (having demonstrated skills and knowledge related to the

shipbreaking operation and has received safety training to identify and avoid the hazards involved) but also competent workers (having sufficient experience for ensuring efficiency) (EUShipRecyclingRegulation, 2013). A competent worker is an worker who can meet all the requirements of a technically qualified worker and, in addition, he is responsible for all work activities or safety procedures related to special equipment and has detailed knowledge regarding the exposure to all kinds of hazards, appropriate control methods to reduce the risk associated with those hazards, and implementation of those methods (Tudor et al., 2014). Demand of workers with very high level of safety skills is very high in this industry.

Data revealed that F1 (where 'very high' level prevails always) is having only 'high' level (not very high) followed by F3. Rest of the firms are having either a medium level or a low level. As there is no formal education on shipbreaking operation, it is firms' safety commitment with the help of other concerned parties to improve the level of safety skills of workers in terms of not only technical qualification and working experience but also competency. It is reflected in the quote from the interview taken with Manager of F1. He was very excited while talking about the safety skills of the workers of their firm:

> *"…… there is no formal education on shipbreaking operation. It is us, along with concerned parties, who are working for last 3 decades, creating experienced workers who over 3 decades. Currently, 70% of our workers are having high level of safety skills in terms of all these feature you mentioned like: technical qualification, working experience, competency, process safety skill and emergency skill. Here, you are not in a position to get 100% workers with high level of safety skill. Rather you have to make their level high by your effort……..What are we doing? For example, our workers are going through several rounds of training always on weekly and monthly basis. Monthly meeting is very rigorous. We provide weekly training and rigorous monthly training and BSBA is mandatory training for all. But we are doing more than that. We hire external H&S management consultants and experts. Even we hire foreign experts to improve safety skills of our workforce ……."*

Regarding safety skills of workers, quotes of MD of F1 & MD of F3 are very much worthy to mention as well such as:

> *……Our manager, Head of Operations, safety officers –all are NIBOSH certified experts. We invested lot to train our staffs to be H&S experts as we are after the best H&S friendly international standard yard of the world. ……..” MD of F1*

> *“……..I can say 70% workers of our yard know how to work efficiently and safely. Our target is to make this number 100%. It is not possible to hire 100% skilled workers here. We try our level best to make them highly skilled. Ii is very likely that anytime any emergency can occur in this type of work and our workers are always getting training to manage these……”* (MD of F3).

Comparatively weaker position holders are F2, F4 & F7 have less experienced workers and F5 & F6 could not hire workers with high level of safety skills. Only 60% workers of F2, F4 & F7 are qualified, experienced with required process safety skill and emergency skill and in F5 & F6, only 40% workers are having required safety skills. For example, Manager from F6 pointed out that:

> *“……..Getting experienced workers is always a challenging issue here. On one hand, we struggle to get experience workers even by offering higher salary, on the other hand, a large number of experienced workers always keep switching yards. On an average, 40% of our workers are available always who are qualified and experienced. These experienced workers used to work in this industry over decade. They have already sufficient safety training along with the related process safety skill and emergency skill. Other workers of our firm are getting training from these experienced workers whenever they want. These experienced workers are the ones who manage everything like, how to work efficiently but also how to work safely from our experienced workers. However, regretting part is that yard-switching tendency of these experienced workers is very common in this industry. We always struggle to retain our experienced workers. Every time one experienced worker leaves, our workforce falls into trouble……..” (*Manager, F6).

In addition to technical skills, non-technical safety skills of workers are equally important for working in shipbreaking operations. Firms vary by personal attributes and interpersonal communication skill as well. Shipbreaking workers need these skills badly as these skills allow the skills of worker to adapt to operational changes, to maintain situational awareness, to communicate effectively with co-workers, and to make timely and appropriate decisions, not only under normal operating conditions but also in unexpected and rapidly changing situations (Dyer & Ericksen, 2006). The favourable personal attributes & interpersonal communication skills can drive effective performance in high reliability organizations (Ericksen & Dyer, 2005) and needed badly for such risky and hazardous industry. Unfortunately, poor socio-economic and cultural background of shipbreaking workers cannot contribute to form these favourable personal attributes.

F1 & F3 are having again a high level but not a very high level. Rest of the firms are having a medium and a low level ranging from 40% (F5 & F6) to 60% (F2, F4 & F7). The relationship between safety skills of workers and personal attributes of workers is interdependent - the workers who have high level of personal attributes, they usually have high level of safety skills and vice versa.

Presence of low level of safety skills and personal attributes of workers is impacted by the recruitment practices in these firms, which are predominantly “temporary-migrant-inexperienced” workers. Consequently, recruited workers have low level of decision-making and problem solving skills, coping poorly with stress and process risk etc.

4.7 Safety Culture

Multiple collective properties of safety culture have been empirically associated with team safety performances (Curcuruto et al., 2017) such as, safety climate and team processes. Safety culture refers to an organization’s core values about the importance of safety and the underlying

beliefs and assumptions that guide behavior and decision making (Reason, 2000). It not only shapes the externally visible elements of an organization, but also the invisible element that are "not said" or reflected only in symbolic actions (Casey et al., 2017). Moreover, Reason (2000) identified positive features of learning, fairness and flexibility as the constituents of a good safety culture. Burns et al. (2006); Griffin et al. (2014) and Curcuruto et al. (2017), have considered these positive features later as well. For instance, Griffin et al. (2014) raised the need to communicate the intrinsic value of safety and for individuals across the organization to share common safety values, a common feature of different approaches associated with building a safety culture, which depends on the degree of learning and trust expressed throughout an organization (Burns et al., 2006). In addition, Curcuruto et al. (2017) identified error management culture, just and fairness and flexibility and learning culture as the sub elements of dimension "safety culture' while assessing tools to evaluate the fitness-to-operate in high-risk industrial environments.

Where teams are the main group structures implicated in all processes of safety information (Hofmann & Stetzer, 1996, 1998), Griffin et al. (2014) used the term 'team processes' as the communication and coordination activities through which teams achieve their safety goals. Griffin et al. (2014) tried to use the term team broadly to capture the variety of interpersonal processes that occur through the work activity of individuals (Hackman, 1990). Research has identified activities that support task achievement and maintain group commitment across different phases of activity (Marks et al., 2001), such as, encouraging vigilance, supporting others to report hazards and threats, and discouraging team behaviours that threaten personal and process safety (Griffin et al., 2014) through elements such as , team communication, team leadership & motivation for safety (Curcuruto et al., 2017). In order to assess the safety culture of shipbreaking firm, this study has assessed externally visible elements along with the invisible elements that are reflected through symbolic actions and

therefore, safety climate and team process have been considered. Data revealed that there is a considerable variation in safety culture prevalent among firms in terms of presence of supportive safety climate and effective team process. Table 4.7 provides an overview of safety culture across seven firms (more details are provided in appendix 4F).

Table 4.7 Overview of Safety Culture

Components	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Safety Climate	Very High (90%)	Medium (60%)	High (70%)	Medium (60%)	Low (40%)	Low (40%)	High (70%)
Team Processes	Very High (87%)	Medium (60%)	High (70%)	Medium (60%)	Low (40%)	Low (40%)	Medium (60%)
Overall Assessment of Safety Culture	Very High (89%)	Medium (60%)	High (70%)	Medium (60%)	Low (40%)	Low (40%)	High (65%)

A very high level of safety climate is prevalent in F1 in terms of elements reflected in symbolic actions such as, just & fair culture, error management culture and a flexibility & learning culture. F1's attempts to maintain a positive safety climate where workers can feel the justice and fairness in 90% practices and they can discuss their own errors in a blame-free atmosphere as well (error management culture) in 90% cases. Moreover, these positive aspects of F1's safety climate have helped workers to adapt with changes, for example, by changing role playing (flexible culture) in 80% cases.

For instance, manager of F1 pointed out:

"……unlike other yards, 90% of our workers can speak up openly about their wrongdoings"……. (Manager, F1).

"…….Main cutter man always work with one or two cutter helper. These helpers not only helping the main cutter man but also know over time the cutting techniques over time become main cutter man. Sometimes, main cutter man take test of the cutter helper who is going to be a main cutter. However, making mistakes is common. Here workers

try maintain the just and fairness and error management mind-set always say in 90% cases. Here workers are driven by our safety value. Trial and error is a common practice used in this industry……..

……..Again, cutter man, fitter man also know how to respond in an emergency for example, firing apart from their main job……. (Manager, F1).

F3 follows F1 who is maintaining a high level of safety culture where level of 'Justice & Fairness' is 70%, level of "Error Management Culture" is 70% and level of "Flexibility" is 70%. For example,

"……safety concerns and safety rules are changing and getting stricter. Our workers can adapt with safety related changes most of the time (say, in 70% cases) as they hold our positive safety values……" (Manager, F3). He also mentioned,

"…….Here, workers can speak up freely most of the time…… (Manager, F3)

Like F1, F3 has intervened as well by building and maintaining a high level of positive safety climate where commissioning and operating workers can share their problems in 70% cases, which is crucial in order to ensure high level of safety culture.

F3, F2, F4 & F7 have medium level of safety culture in terms of their prevalent medium level of safety climate and team process through safety leadership as level ranges between 50% and 60%. For example, manager of F7 mentioned:

"…….Our experienced teams can do things differently if they think it is necessary without waiting for the instant approval of higher authorities at least 60% cases, not always, as we can depend on many of our operating workers and commissioning workers……." (Manager, F7)

On the contrary, level of presence of these features of safety climate is medium in case of F2 (50%), F4 (50%) & F7 (60%) where level of "Justice & Fairness" is medium (50%, 50%

& 60%) and level of "Error Management Culture" is medium (50%, 50% & 60%) as well. Even, in these 3 firms, level of "Flexibility" is medium (50%, 50% & 60%). All the MDs, managers responded almost in the same way.

MD of F2 mentioned while discussing the issue of Error Management Culture of their firm:

> *"……Yeah. Our workers discuss and share their mistakes. To be specific almost 60% mistakes are dealt with discussion. But you know there is internal conflict among workers particularly who are migrant and temporary workers (mainly from Northern part of Bangladesh) they cannot or take long time to adjust with the existing permanent and local (Chittagong based) workers. They sometimes do not feel to share and discuss their mistakes. They consider it as one time job like one time use……"*

In F5 & F6, 'Just & Fair Culture' is low (40%) and level of 'Error Management Culture' is low (40%) and level of 'Flexibility' is low as well (40%). All the MDs, managers of F5 & F6 responded almost in the same way. All of them thought it is 40% in terms of justice, fairness, error management and flexibility. For example, Manager of F5 pointed out while discussing the issue of 'Just & Fair Culture' of their firm:

> *"……..We are confident that here we make sure error management positively in more than 40% practices*……." (Manager, F5).

Workers enjoy flexibility most in F1 & F3 followed by F7, F2 & F4 and least in F5 & F6.

Flexibility prevails when workers can change the role playing and get training to play the changed role (Griffin et., al., 2014). In terms of flexibility culture, F2, F4 & F7 are having medium level. For instance, manager of F2 mentioned:

> *".....No, we don't prefer regrouping and restructuring team's work. We use these but not always. I would say, we use these practices in 60% cases, as we cannot depend on*

all of our operating workers and commissioning workers, only few are dependable ……." (Manager F2).

Finally, along with the prevalence of positive and supportive safety climate, effective team process is another critical component of safety culture where firms have shown variation as well. Data revealed that firms have attempted to create a functionally effective team process. Teamwork between commissioning team and operating team members, firms try to conduct successful shipbreaking operation. Therefore, effectiveness of the process of functionality of team is critical in this industry.

Data revealed that a very high (90%) level of effective team process is prevalent in F1 where not only team communications (within team & between team) are very effective (90%), but also is team leadership (90%). In F1, 90% workers are motivated to engage actively in safety behaviours and work safely as well. For example, manager of F1 mentioned:

> *"…….Teamwork and team level discussion is the life blood of shipbreaking operation. I would not say 100%, but in our yard, team communication is effective in case of 90% practices where leaders are effectively leading and workers are motivated to work safely in 90% practices. It is evident in our no death and no major injury record for last 5 years.*
>
> *Apart from monthly compulsory general safety meeting, team specific safety meeting always held daily and weekly basis. There are cutting team, fitting team, loading team, housekeeping team etc. In each daily meeting, task specific risks are identified and the safe working behaviour is discussed, for instance how to identify risks, manage errors, near- miss etc. headed by supervisors as leader of particular team and team members. Safety Officer always attends all daily meetings of all different teams. Weekly meeting is conducted among the specific team and the Manager and H&S expert who lead the meeting. Root Cause Analysis, Performance monitoring report, Performance feedback are discussed. In addition to these formal meeting and discussions, informal interactions regarding safety issues are continuously happening within team and between team levels……."* (Manager, F1).

In F1, team composition ranges from ‘duet’ setting such as cutter man & cutter-helper, fitter man & fitter-helper etc. to ‘trio’ setting such as: Cutting team with Cutting Supervisors and Safety officer to ‘multiple-performer’ setting such as: Cutting team, Cutting Supervisors, Safety Officer with manager and H&S expert.

A high level of team process prevails in F3 (70%) in terms of effective team communications, effective team leadership and motivated workers to work safely. For instance, Manager of F3 pointed out:

> *“……..This industry is one of the highest example of team work. And teamwork run by our experienced workers. Several rounds of team communications happen throughout the shipbreaking operation. Cutter man leads cutter-helper, fitter man leads fitter-helper, Safety Officer and supervisors communicate with Fitting team, Cutting Team, Loading team, etc., even sometimes with manager.*
>
> *Usually, Supervisor and Safety officer are the leaders in daily meeting; cutter man is the leader in their duet performance such as: cutter man with cutter helper, and manager and expert play the leading role in weekly meeting. However, their leader role rotates according to the demand of situation…….”* (Manager, F3).

Team discussions always are conducted regularly and both formally and informally in F1 & F3 on different safety issues such as, how to manage potential safety problems (e.g. near-miss, errors…), how to handle the detected errors in a constructive way, how to avoid successfully the potential negative consequences of errors etc. However, a very high level (87%) of team process prevails in F1which where F3 is lagging behind F1 with its high level (not very high) of team process (70%).

Team leadership, in F1 & F3 has become effective by encouraging and ensuring discussion of errors and mistakes among team members and how these could have been prevented regularly. Even regrouping and restructuring team’s work are conducted, if needed.

On the contrary, a medium level of safety climate is evident in F2 (60%), F4 (60%), & F7 (60%) and a low level of safety climate is evident in F5 (40%) & F6 (40%) in terms of medium and low level of effective team communications, effective team leadership and motivated workers respectively. Low level of safety climate of F5 & F6 is not motivating most of their workers to open up regarding their safety related problems. In their low 'fair and just culture', 'error management culture' and 'flexible culture', it very likely that many workers of these firms do not come forward to discuss freely and open up. For example, manager of F5 mentioned:

> *"……In case of 40% practices, our team communication, team leadership are effective. Our 60% workers are not experienced and migrant and temporarily appointed and that is why they struggle to communicate. Their motivation is not that high. Here, workers are also motivated almost in 40% work… They want to work safely by continuously communicating with their peers, supervisors and safety officer whenever they need….."* (Manager, F5).

Team leadership and motivation of team members in F2 (50%), F4 (50%) & F7 (60%), have become moderately effective as well. Discussion of errors and mistakes among team members are mostly conducted informally which is not effective enough to encourage all workers to open up regarding their errors and mistakes who are migrant, inexperienced and temporarily recruited. F2, F4 & F7 are mediocre in terms of leadership and motivation of team members by having 60% effective team leadership and motivated workers to work safely in 60% activities. Here, team leaders try to encourage team members to work safely and freely discuss errors and how these could have been prevented. However, such encouragements are done irregularly. Even regrouping and restructuring team's work are not conducted frequently. The following quotes from F4 and F7 are reflective of these issues:

> *"……Our supervisors, safety officers try to make our workers comfortably discuss all of their safety related issues comfortably with each other and with them not most of the time. I can say, in 60% cases they do. You know we always struggle with*

new migrant workers with no experience or least experience Making effective teamwork is always challenging for us……(Manager, F4)

"……unlike other yards, 60% of our workers discuss how to correct the mistake they already made. But I can say that we face problems with our migrant, inexperienced and temporarily appointed who are reluctant to share their mistakes, rather they hide their mistakes just to pass the working period. Retention of experienced workers is always a challenge in this industry……" (Manager, F7)

However, these dynamics of team leadership is medium in F2, F4 & F7 and is low in F5 & F6. For instance, manager of F7 commented on team interaction in the following way:

"…….This industry is one of the highest example of team work. Team composition ranges from double- setting such as: Cutter man & cutter-helper, Fitter man & fitter-helper etc. to triple-setting such as: Cutting team with Cutting Supervisors and Safety officer to multiple-performer-setting such as: Cutting team, Cutting Supervisors, Safety Officer with manager.. Usually, Supervisor and Safety officer are the leaders in daily meeting; Cutter man is the leader in their duet performance such as Cutter man with Cutter helper, and manager and expert play the leading role in weekly meeting. However, their leader role rotates according to the demand of situation. Informal communications are way more than formal communication, all of our formal and Informal communications are effective here almost in 60% cases ……" (Manager, F7).

Again, manager of F5 pointed out while discussing the issue of "Effective Team Process" of their firm:

"We have some highly experienced cutters and fitters. They are the boss. We can completely rely on them. Their performance is proven. They take the lead to train and guide other workers. Whenever work starts, interactions among these highly experienced workers and others are conducted continuously. These all-time interactions are the key to successful operations. Not necessarily, it has to be always formal. Sometimes as heads, they formally meet team wise workers such As; cutting team, fitting team. All our workers do the housekeeping things whenever they find

something problematic. Inexperienced workers are turned into experienced workers gradually. Trial and error is a common learning technique in this industry… …." (Manager, F5).

Low level of formal and regular communication and training and induction have made their team communication less effective.

4.8 Rate of Injury and Death

Injury and death are direct occupational harms. Shipbreaking industry of Bangladesh, along with other South Asian shipbreaking countries, has raised concerns regarding human rights for workers who confront serious occupational accidents and injuries. This serious issue is particularly salient for NGOs across local, national and international scale and international regulatory bodies. For example, local NGO, such as, Youth Power in Social Action (YPSA); national NGO, such as, Bangladesh Environmental Lawyers Association (BELA) and international NGOs, such as, Greenpeace, NGO shipbreaking platform, and International Federation for Human Rights (FIDH) as well as International Labour Organization (ILO) (Rahman et al., 2018). The portrayal of barefooted labourers and toxic spills from ships in the Western press is part of a broader genre of reporting on the race-to-the-bottom of capitalism that distributes exposure to toxic waste to the Global South (Akese & Little, 2018).

In the Bangladeshi shipbreaking industry, on average, 10–15 workers are killed and 150 are injured every year (Andersen, 2001; Bailey, 2000; Sujauddin et al., 2015). Media images of shipbreaking tend to focus on the spectacular violence of the industry, where workers lose their lives through falling from heights, being crushed under tonnes of steel or being ripped apart in explosions (DEWAN, 2020). The most frequent causes of death include gas explosions while using gas torches for cutting, suffocation from inhaling toxic gases, and sudden falls from steel beams and plates (Rahman et al., 2018). Common injuries include deep lacerations, broken bones, loss of limbs, and fainting/unconsciousness (Hossain et al., 2008).

In this study, injury refers to major injuries only. This study has considered major injuries according to the Bangladesh Labour Act, 2006, which are compound fractures, other than to fingers, thumbs and toes; amputation; dislocation of the shoulder, hip, knee or spine; loss of sight (temporary or permanent); chemical or hot metal burn to the eye or any penetrating injury to the eye; injury resulting from an electric shock or electrical burn leading to unconsciousness, or requiring resuscitation or admittance to hospital for more than 24 hours; any other injury leading to hypothermia, heat-induced illness or unconsciousness, or requiring resuscitation, or requiring admittance to hospital for more than 24 hours; unconsciousness caused by asphyxia or exposure to a harmful substance or biological agent; acute illness requiring medical treatment, or loss of consciousness arising from absorption of any substance by inhalation, ingestion or through the skin; acute illness requiring medical treatment where there is reason to believe that this resulted from exposure to a biological agent or its toxins or infected material (BangladeshLaborLaw, 2006).

Data on major injury and death cases have been collected from NGO Shipbreaking Platform and Department of Inspections for Factories and Establishment (DIFE), Ministry of Labour and Employment, Government of Bangladesh from 2014 to 2019. The causes of major injuries and deaths found for seven case firms of this study from 2014 to 2019 are aligned with the previous studies. For example, in 2014, one worker died and one worker injured from fire broke in F2; two workers died by severe fire broke in F5; one worker died in F6 due to cylinder explosion and one worker died in F7 by falling from height respectively. In 2015, one worker died by struck by a falling steel plate and two workers got injured due to a severe explosion and fire in F4; two workers got injured in F5 due to sudden falls from steel beams and plates and one worker died in F6 due to gas explosions while using gas torches for cutting. In 2016, one worker died by struck by a falling steel plate and two workers got injures due to a severe explosion and fire; one worker died in F7 by explosion of gas; two workers got injured and

one worker died in F6 by fire broke; one got injured in F5 by fire broke; 1 died in F4; 1 worker died and I injured in F7; one worker died and one got injured in F2 by falling from height. In 2017, one worker died by struck by a falling steel plate and two workers got injured due to a severe explosion and fire in F2; one worker died in F4 by falling of heavy metal objects; one worker got injured due to being crushed by falling of large metal beams in F5; one worker got injured in F6 by cylinder blast; two workers injured; one worker died in F7 by falling of steel plates. In 2018, two workers got injured due to falling from height and one worker died by sudden falls from steel plates in F7 and the cause of death was suffocation from inhaling toxic gases; three workers were severely injured due to fire broke in F6; one worker died due to cylinder blast in F5; two workers injured run over by truck carrying scrapped metal plates in F4 ; one worker died by falling from a height in F3 and two workers died by being crushed by several pieces of iron pieces, nuts & bolts in F2 respectively. Finally, in 2019, four workers were severely injured and two workers died due to a severe explosion in F5 and one worker was died due to fall of steel beams in F6.The table 4.8 shows an overview of Injury and Death across seven firms from 2014 to 2019.

Table 4.8 Overview of Injury and Death

Components of Safety Prioritization	F1	F2	F3	F4	F5	F6	F7
Injury Rate	0	3 1(2014) 1(2016), 1(2017)	2 [1(2016) 1(2018)]	4 [2(2015), 2(2018)]	8 [2 (2015), 1 (2016), 1(2017), 4(2019)]	6 2(2016) 1(2017) 3(2018)	4 [2(2017), 2(2018)]
Death Rate	0	4 [1(2014), 1(2016), 2(2018)]	2 [1(2016), 1(2018)]	3 [1(2015), 1(2016) 1(2017)]	5 [2(2014), 1(2018) 2(2019)]	4 [1(2014), 1(2015) 1(2016), 1(2019)]	4 [1(2014), 1(2016), 1(2017), 1(2018)]

4.9 Identification of Themes

After the discussion of the individual variables, the analysis now turn its focus toward the analysis of key themes. These themes emerge from a cross analysis between the variables and are linked to H&S performance in firms. This analysis is firstly organised around H&S performance of firms. Namely, firms are categorized as high, medium and low performers. Accordingly, their approaches to adoption of H&S practices are discussed. The overview of this approach is outlined in Table 4.9. The subsequent chapters discuss the results in more detail.

Table 4.9 Overview of Approaches to Adoption of H&S Practices

Category of H&S Performers	Approach	Characterized by
High Performers	Continuous Approach	Adoption of H&S practices at regular intervals
		Upgrading and continuously improving
		Proactive, responding to both mandatory & voluntary H&S practices
		Prevalence of high level in all H&S practices
		High Alignment between H&S practices
Average Performers	Discontinuous Approach	Adoption H&S practices at irregular intervals
		Responding to leaders in industry
		Responding more to mandatory H&S practices (legislative) & less to voluntary H&S practices
		Prevalence of medium level in all H&S practices
		Moderate Alignment between H&S practices
Low Performers	Random Approach	Highly opportunists
		No pattern of adoption (random)
		Responding to mandatory H&S practices (legislative) at the basic compliance level
		Prevalence of low level in all H&S practices
		Low Alignment between H&S practices

4.9.1 First Theme: Continuous Adoption of H&S practices of High Performers

This study has revealed a continuous pattern of adoption of H&S practices that occurs in firms who tend to adopt H&S practices continuously without interruption to improve H&S practices. Firms do adopt not only for mandatory safety practices but also for voluntary safety practices. In this study, F1 and F3 are examples of continuous adoption of H&S practices, who are currently having a high combination consisted of high-level H&S practices through continuous adoption in all the identified H&S practicing areas. The reason behind continuous adoption is the need for continuous improvement and updating of H&S practices. Data revealed that, F1 is having a very strong combination of H&S practices and F3 is having a strong combination of H&S practices, which is the outcome of their continuous adoption.

To a certain extent, mandatory H&S practices at national level required by governments of Least Developed Country (LDC) like Bangladesh may function as a major driving force to advance H&S practices in shipbreaking industry. However, the desired H&S practices may not always happen because of the opportunistic tendency of some firms to maintain "Symbolic Compliance" (Huq et al., 2016; Oliver, 1991) and go on profitably. Most importantly, adherence to the international requirement to meet up the H&S rules and regulations provided by Hong Kong Convention and EU Ship Recycling Rules gradually have become the prerequisite for survival of the shipbreaking firms of Bangladesh. Firms are facing "Do or Die" and "Survival for the Fittest" situation. Voluntary adoption of H&S practices matter most while competing internationally.

Data revealed that F1 & F3 have started adoption of H&S practices since 2006 and over time, these firms have kept developing their H&S practices properly and continuously in order to adhere the national and international requirements. Main trigger point was ILO and IMO concerns for labour rights violation of this industry and firm level social responsibility.

H&S practices of F1 & F3 are the consequence of continuous adoption of H&S practices. For example, F1 & F3 started developing infrastructure, mechanization and adopted ISO 9001 to improve workplace safety in 2006 & in 2007 respectively. F1 & F3 started using adequate winch machines, toolboxes, tractors, conducting formal safety training, hazardous waste storage and removal system, fire-fighting facility, first aid centre, mess room with cooking facilities since 2006 & 2007. At that time, government intervention was absent. All of their adoption of H&S practices was voluntary. F1 & F3 continued to adopt H&S practices to improve and update their existing H&S practices, such as, F1 in 2007 and F3 in 2008 started using magnetic crane, multipurpose lifter, generators. Adoption was not prevalent during industry wide closure for two years (2009 -2010). After two years of closure, this industry got recognition from Government of Bangladesh as an industry and got Bangladesh Shipbreaking

and Recycling Rules in 2011 and F1 & F3 started adopting H&S practices continuously to comply with all the mandatory requirements for H&S issues along with their voluntary initiatives. Notable mandatory practices were such as, appointment of safety officers, mandatory use of PPE for all workers, conducting regular formal safety training, taking clearance and No Objection Certificate (NOC) from the concerned authorities etc.

In 2012, F1 & F3 started building medical facility inside yard and PPE storage, hanging signboards with major H&S guidelines, proper large gate, security guard & reception centre. security checking, hanging layout of the yard, truck way indicator, formal housekeeping etc. In 2012, F1 started recruiting experienced workers for cutting and fitting job as well whereas F3 started this practice in 2013. In 2013, F1 & F3 adopted ISO 14001, OHSAS 18001, ISO 30000) voluntarily to ensure work place safety. Both firms adopted all series of ISO certifications certified by reputable and international accredited certifier.

In 2014, F1 & F3 started formalizing process safety and behavioural safety management practices. F1 also built worker training centre, emergency exit, and dormitory for living in 2014. In 2015, F1 made hospital access, safety Officer's room recreation room available. F1 & F3 added magnetic cranes and introduced heavy-duty cranes and barges in 2015 as well. F3 made worker training centre, emergency exit, and dormitory available for workers in 2016 and made hospital access, safety Officer's room recreation room available in 2017.

In 2014, F1 took a drastic step for adopting Hong Kong Convention Statement of Compliance HKC SOC as in 2009 Hong Kong International Convention formulated (on behalf of International Maritime Organization (IMO) rules for safe ship recycling and started certify yards. It was important to compete internationally. F1's relentless technical and managerial effort to get HKC SOC lasted four years and was achieved in 2017. F1 used leading classification society ClassNK who issued this HKC statement of compliance to the facility of F1 upon completion of rigorous technical verifications. For example, F1 started developing

Ship Recycling Facility Plan and Ship Recycling Plan, Impermeable floor (critical requirement of HKC SOC) since 2014 and completed at the beginning of 2017. Still it is not the end of the story of F1. In 2018, F1 is planning to get EU enlistment, which is more demanding than HKC SOC. F1 has started preparing accordingly in 2019.

Like F1, F3 never stopped its adoption of H&S practices although F3 is lagging behind F1 in terms of only HKC SOC. Currently F3 is not HKC certified yard. However, F3 started preparing for adopting HKC SOC since 2017 and hopeful to get it in the near future.

F1 & F3 kept adopting, improving and maintaining the improved level in all the adopted H&S practicing areas almost every year and therefore their adoption pattern is continuous. Therefore, a high level of all of their H&S practices has created the required accommodated and commissioned shipbreaking operations. Ultimately, F1 has experienced no injuries and death cases and F3 has experienced low injuries and death cases since 2014 (NGO Shipbreaking Platform & Department of Inspections for Factories & Establishments (DIFE). Table 4.10 shows H&S outcome of continuous adoption of H&S practices of F1 & F3 through their regular adoption and the consequent required accommodated & well commissioned shipbreaking operations and finally no and low injury and death cases as ultimate H&S outcome.

Table 4.10 H&S outcome of Continuous Adoption of H&S practices

H&S Practices	F1	F3
Safety Prioritization Practices	Very High (90%)	High (69%)
Infrastructure & Equipment	Very High (99%)	Very High (94%)
Formalization of Systemic Practices	Very High (87%)	High (77%)
Formalization of Operational Practices	Very High (97%)	Very High (83%)
Safety Skills	High (70%)	High (70%)
Safety Culture	Very High (89%)	High (70%)
Vertical & Horizontal Fit	High	High
Injury Rate	0	2 [1(2016), 1(2018)]
Death Rate	0	2 [1(2016), 1(2018)]

From the tabulated data (Table 4.10), a very high level and a high level of safety prioritization practices are prevalent in F1 and F3 respectively. Reasons are evident in their high level of safety related strategic and operational priorities for safety that are precursors of creating the required accommodated & commissioned shipbreaking operations. Moreover, a very high level of infrastructure, mechanization & equipment and hazardous material handling facilities evident in F1 & F3 has led them to have a very high level of infrastructure & equipment for the required accommodated & commissioned shipbreaking operations. F1 & F3 are not only having very high level of infrastructure & equipment, but also high level of formalization of systemic practices, formalization of operational practices, safety skills and safety culture. Here, workers know all areas of process safety management, such as, how to classify hazardous wastes; how to use PPE, how to do housekeeping, how to use welding machine, firefighting equipment etc., how to handle gas cylinder, how to operate crane, generator etc., how to do housekeeping and so on. Reason behind this is regularly conducted formal and rigorous training along with high level of team communication among workers prevalent in F1 & F3. Again, a good number of permanently employed skilled workers (50%) and a high level of safety skills of the workforce (70% workers are skilled) prevalent in F1 &

F3, in turn, have helped them to build a more supportive safety culture. Here, workers are better able to speak up and learn from incidents, they can communicate effectively; safety leadership exists in team leadership along with motivated workers to work safely in most of the cases. Eventually, better team safety practices have become embedded in the firm wide processes and

On the other way around, by having a very high level and a high level of supportive safety culture, visible in terms of showing just and fair culture, blame free culture and flexibility prevalent in F1 & F3, workers working in F1 & F3 can express any of their safety concerns easily in most of the cases. Positive safety culture prevalent in F1 & F3 has boosted up their workers' confidence, as they know they are not to be blamed if they make any mistake in most cases and they will get just and fair treatment from the firm in most of the cases. In this way, novice workers start to learn the process from the experienced ones. For example, new comers can gain knowledge on how to anticipate and detect operational problems, how to communicate extensively with co-workers, how to respond rapidly and appropriately to problems and unexpected events and so on and once they get experienced, they teach other novices along with continuing his own learning. Additionally, workers get training to switch tasks and roles flexibly to deal with changing situations. For example, cutter helper who mainly helps the main cutter gradually becomes the main cutter and hire a novice or other worker to go through the process. In case of emergency, a cutter helper can support the workflow and prevent disruption. Moreover, by recruiting comparatively less temporary and less migrant workers, the quality of the workforce of F1 & F3 has been improved which in turn is contributing to their team process. Consequences are effective team communication and team work of operating workers (e.g. cutter man, fitter man etc.) and those of commissioning workers (e.g. manager, consultants, safety officers, supervisor, foreman etc.) in terms of both within and between team work and team communication. All of these group dynamics contributes to build a positive and

supportive safety culture in F1 & F3 and over time, this process improves the capacity of the firm to understand system-level safety (Leveson et al., 2009).

F1's exemplary decision to adopt HKC SOC has proved its very high level of top management and strategic level prioritization on safety related concerns. It is worthy to mention that F1 is not losing its production being a highly safety concerned firm. F1 has started leveraging continuous adoption of H&S practices. F1 believes safety should not be an afterthought and it also doesn't have to be associated with productivity loss. The positive effect on H&S performance is evident. F1 is the only firm in the industry that has no death and injury case consistently since 2014. F3's approach is similar to F1 and it is evident in their initiatives for continuous development of H&S practices to ensure work place safety.

The findings also show that continuous adoption is prevalent in F1 & F3 who run as a sister concern of a group of companies and their size of business in terms of production quantity is large. F1 & F3 use shipbreaking yards as economy source of supply of important raw material for their other business units such as steel mills, rerolling steel mills etc.

Due to the prevalence of continuous adoption of H&S practices, F1 & F3 are having a high level in all their H&S practices. In F1, level is very high. Therefore, strength prevalent in all or most of the areas of H&S practices have complemented each other strongly and thereby making strong alignment among the practices, which has led to a good 'Vertical Fit' (Ericksen & Dyer, 2005) among all the H&S practices.

4.9.2 Second Theme: Discontinuous Adoption of H&S practices of Average Performers

Discontinuous approach to adoption of H&S practices occurs in firms who tend to adopt H&S practices at irregular intervals. Their irregularity is applicable predominantly for voluntary H&S practices such as adopting ISO certification, HKC SOC use of reputed international certifier etc. These firms are comparatively more regular while adopting mandatory H&S

practices such as, ensuring use of PPE (although low), appointing safety officer (low level), providing safety training (although low) etc.

These firms tend to adopt discontinuously because they follow 'wait and see" approach. Their motivation for adoption is highly influenced by the development of H&S practices of industry leaders. These firms are mainly followers of industry leaders, as they do not want to take risk only want to sustain their shipbreaking businesses profitably.

In this study, F2, F4 & F7 are examples of discontinuous adoption. Irregular improving and updating of existing H&S practices have led F2, F4 & F7 to experience high rate of injuries and deaths. Table 4.11 shows the H&S outcome of discontinuous adoption of H&S practices of F2, F4 & F7.

Table 4.11 H&S outcome of Discontinuous Adoption of H&S practices

H&S Practices	**F2**	**F4**	**F7**
Safety Prioritization Practices	Low (31%)	Low (31%)	Low (31%)
Infrastructure & Equipment	High (70%)	High (70%)	Medium (57%)
Formalization of Systemic Practices	Medium (55%)	Medium (55%)	Low (38%)
Formalization of Operational Practices	High (64%)	High (64%)	High (72%)
Safety Skills	Medium (60%)	Medium (60%)	Medium (60%)
Safety Culture	Medium (60%)	Medium (60%)	High (65%)
Vertical Fit	Medium	Medium	Medium
Injury Rate	3 [1(2014),1(2016), 1(2017)]	4 [2(2015), 2(2018)]	4 [2(2017), 2(2018)]
Death Rate	4 [1(2014),1(2016), 2(2018)]	3 [1(2015),1(2016),1(2017)]	4 [1(2014),1(2016), 1(2017), 1(2018)]

Data revealed that F2 & F4 started mechanization in 2006 & in 2007 respectively. Other practices such as formalization of systemic and operating practices were absent. High level of

infrastructure & equipment is evident in F2 & F4. However, adoption of their infrastructure & equipment development was halted until 2013. It indicates that F2 & F4 operated their yards with their 2006's & 2007's H&S adoption until 2013. Without any initiative for improving or updating, F2 & F4's adopted H&S practices remained same until 2013. Moreover, they made delay in formalization of systemic practices and operating practices by adopting ISO 9001 in 2013 compared to their infrastructural and mechanization development practices and compared to F1 & F3. They made further delay in formalization of H&S practices by adopting other formal certification such as, ISO 14001, OHSAS 18001, ISO 30000 in 2016 & 2017 respectively. Interestingly, F2 & F4 do not have any plan for HKC SOC still now. They are waiting to see the returns realized by the firms who have adopted HKC SOC. They do not want to take risk. Such irregular intervals in adopting H&S practices have made their adoption approach of H&S practices discontinuous.

F7's story is slightly different from F2 & F4 despite F7's discontinuous adoption of H&S practices. Data revealed that F7 started its operation in 2011 with medium level of infrastructural and mechanization and no further improvement or updating in this area until 2018. Other practices such as formalization of systemic and operating practices started in 2016. It indicates that F7 operated its yard with its 2011's H&S approaches until 2016, without any initiative to improve its H&S practices. F7 delayed its decision to adopt ISO 9000 in 2016 compared to F2 & F4 let alone F1 & F3. Moreover, F7 does not have other ISO certifications, like F1, F3, F2 & F4. Like F2 & F4, F7 does not have any plan for HKC SOC still now and waiting to see the returns realized by the firms who have adopted HKC SOC. This indicates F7's risk averse tendency similar to F2 & F4. Such irregular intervals in adopting H&S practices have made F7's adoption of H&S practices discontinuous.

Discontinuous adoption of H&S practices (from a temporal perspective) is not the only feature of average performers, a moderate combination of H&S practices is prevalent in F2, F4

& F7 as well. Moderate combination of H&S practices occurs when most of the H&S practices prevalent in these firms also vary in their maturity (high, medium & low). Most of the H&S practices are high and medium levels and there are H&S practices at low level. In particular, F2, F4 & F7 are having high level of operating practices and medium level of safety skills. However, F2 & F4 are having a high level of infrastructure & equipment, medium level of formalization of systemic practices and a medium level safety culture whereas F7 is having a medium level of infrastructure & equipment and low level of formalization of systemic practices but a high level of safety culture. These firms tried to improve formalization of operational practices with their medium level safety skill which is obviously better. However, high level infrastructure & equipment of F2 & F4 could not stand out due to their medium level of safety culture and on the other hand, high level operational practices of F7 could not stand out due to its low level formal systemic practices. H&S performance of F2, F4 & F7 in terms of rate of injury and death cases are almost similar despite some notable differences. Notable difference is also prevalent in terms of safety culture. F7 is the only firm in this subset with high level and uses its superior safety culture to overcome the low level of formal systemic practices.

In F2 & F4, knowledge of workers regarding all areas of process safety management, such as, how to classify hazardous wastes; how to use PPE, how to do housekeeping, how to use welding machine, firefighting equipment etc., how to handle gas cylinder, how to operate crane, generator etc., how to do housekeeping and so on is medium. Reason behind this is absence of regularly conducted formal and rigorous training along with absence of high level of team communication among workers of F2 & F4, whereas these are present in F7 due to their high safety culture.

Again, a low level of permanently employed skilled workers and medium level of experienced workforce prevalent in F2, F4 & F7, in turn, have not helped them to build a more

supportive safety culture. Here, workers cannot communicate effectively in many cases; safety leadership does not exist in team leadership in many cases as well due to their medium level of just & fair culture, blame free culture and flexible culture. Even motivated workers to work safely is absent in almost half of the cases. Eventually, better team safety practices embedded in the firm wide processes and routines is moderate not high.

Interestingly, this study also revealed that by having a high level of infrastructure, mechanization and equipment, F2 & F4 have not achieved a good H&S performance rather experienced similar performance of F7 who has medium level of infrastructure, mechanization and equipment as data showed that F2, F4 & F7 have been experiencing very similar number of injury and death cases. Comparatively young firm F7 has stood out in the same line with comparatively old firm F2 & F4.

F2 & F4 are apparently having safety friendly yards due to their high level of machineries & equipment and infrastructure whereas F7 is apparently not safety friendly due to its medium (comparatively less) infrastructure and machineries & equipment compared to F2 & F4. Medium level of supportive safety culture, effective team process and medium level composition of safety skills of F7 are not complementing F7's high level of infrastructure, mechanization & equipment and systematic operating practices. F2 & F4 are experiencing death and injury cases every year as the consequences of such lack of a high level of safety skills, safety culture and formalization of systemic practices.

The findings also showed that discontinuous adoption prevalent in F2 & F4 who run as a sister concern of a group of companies and their size of business in terms of production quantity is large. F2 & F4 use shipbreaking yards as a source of supply of important raw materials for their other business units such as steel mills, rerolling steel mills etc. However, F7 is running as a single unit and not a part of a group of companies unlike F1, F2, F3 & F4.

Due to the discontinuous adoption of H&S practices prevalent in F2, F4 & F7, strength of all the high-level H&S practices has complemented the weakness of their medium level and low-level practices moderately. Such medium level of complementing effect and alignment has led to a medium 'Vertical Fit' (Ericksen & Dyer, 2005) among all the H&S practices of F2, F4 & F7 and the consequent moderately accommodated and commissioned shipbreaking operations through moderate combination of H&S practices for F2, F4 & F7 where high rate of injury and death cases are the ultimate H&S outcome from 2014 to 2019.

4.9.3 Third Theme: Random Adoption of H&S practices of low performers

Random approach of adoption of H&S practices is associated with firms where there is almost no pattern found in firm level adoption of H&S practices. These firms try to adopt their current H&S practices at the late hour to comply with the mandatory practices and without any plan to form an improved and updated (voluntary practices). These firms randomly adopt H&S practices only in response to legislation; their initiative to improve or update the H&S practices is hardly voluntary. They try to be the last compliant firm (compliance only with national level requirements), let alone to adapt principles of continuous improvement. These firms just want to operate their businesses as long as they can. Moreover, they are not focused on competing internationally and therefore least interested to comply with international regulations. They prefer to act opportunistically with their weak combination of H&S practices where improvement and updating practices are absent due to their random adoption approach.

Low level of maturity of H&S practices is prevalent in most of their H&S practices. Therefore, safety related management prioritization practices, infrastructure & equipment, formalization of systemic practices, formalization of operating practices, safety skills and safety culture – all safety-practicing areas are at low level. Unsurprisingly, this is the least desirable combination of H&S practices in order to create safe environment for workers.

In F5 & F6 a low level of H&S practices is prevalent in all of their adopted H&S practices except formalization of operating practices. Data showed that F6 & F7 have failed to balance safety and productivity related competing goals due to low level of safety prioritization practices at both strategic and operational management level. Participants of F5 & F6 frequently mentioned that adoption of H&S practices is costly and time consuming. Such attitude has been identified by Sinclair and Cunningham (2014) and Kotey and Folker (2007) who found that due to the uncertain effects non-compliance on profit, small businesses are less likely to engage in OSH activities, which are often perceived as costly and time consuming. Formalization of operating practices is their only practicing area where medium level is prevalent. Such weaknesses prevalent in all areas of the H&S practices have not complemented each other and alignment is low, which suggests poor a bad 'Vertical Fit' (Ericksen & Dyer, 2005) and the consequent highest rate of injury and death cases. Such poor H&S performance is not only creating a death trap for workers but also tainting the image of this industry nationally and most importantly, internationally, which is already negative.

These firms have not initiated any H&S practice voluntarily as they want to stick to only mandatory H&S practices required by government at national level such as, appointment of safety officer, use of PPE, safety training although not formal, adequate and rigorous in 2012 (after the formulation of Bangladesh Shipbreaking and Recycling Rules, 2011).

F5 & F6 started shipbreaking operations since 2005 & 2002 respectively. However, their adoption of the required H&S practices was absent until 2012 (after 2011). Since 2012, F5 & F6 are operating with the same combination of H&S practices that they were having in 2012, whereas other firms in this study started adopting more advanced H&S practices since 2006. These firms currently have a strong or a moderate combination of H&S practices through either continuous or discontinuous adoption. Table: 4.12 shows the H&S outcome of random adoption of H&S practices of F5 & F6. Notable as well, F5 & F6 run as a single business unit

(not part of a group of companies like F1, F2, F3 & F4) and their size of business in terms of production quantity is small compared to the other five firms.

Table 4.12 H&S outcome of Random Adoption of H&S practices

H&S Practices	**F5**	**F6**
Safety Prioritization Practices	Low (23%)	Low (23%)
Infrastructure & Equipment	Low (40%)	Low (40%)
Formalization of Systemic Practices	Low (29%)	Low (29%)
Formalization of Operational Practices	Medium (43%)	Medium (43%)
Safety Skills	Low (40%)	Low (40%)
Safety Culture	Low (40%)	Low (40%)
Vertical Fit	Poor	Poor
Injury Rate	8 [2 (2015), 1 (2016), 1(2017), 4(2019)]	6 [2(2016), 1(2017), 3(2018)]
Death Rate	5 [2(2014), 1(2018), 2(2019)]	4 [1(2014), 1(2015), 1(2016), 1(2019)]

4.10 Summary of the overall findings

Collectively, analysis of the second-order concepts in connection with the temporal analysis provide explanation on how firms have approached adoption of H&S practices over time. This study reveals that high performing firms (F1 & F3) have kept improving infrastructure and equipment, formalization of systemic and operating practices, improving safety skills and safety culture through continuous adoption approach and a high level is prevalent in all the adopted H&S practices there. As a matter of consequences of continuous adoption, high performing firms have been experiencing high H&S performance in terms of zero/low number of injuries and deaths consistently since 2014. This study also reveals that a low level is prevalent in all these H&S practices in low performing firms (F5 & F6) as these firms have been adopting neither continuous nor discontinuous, rather randomly and have been

experiencing low H&S performance in terms of highest number of injuries and deaths consistently since 2014. In between these two-extreme performers, there are average performers (F2, F4 & F7), evident in this study, where high, medium & low - all three levels are prevalent in one or two H&S practices adopted in these firms due to their discontinuous adoption approach and have been experiencing medium H&S performance in terms of high number of injuries and deaths consistently since 2014. This study also points at the interdependent nature of H&S practices. Table: 4.13 shows the summary of the findings.

Table 4.13 Approach to Adoption of H&S practices and H&S Outcomes

H&S Practices	**F1**	**F3**	**F2**	**F4**	**F7**	**F5**	**F6**
Approach to Adoption of H&S practices	Continuous Adoption		Discontinuous Adoption			Random Adoption	
Safety Prioritization Practices	Very High	High	Low	Low	Low	Low	Low
Infrastructure & Equipment	Very High	Very High	High	High	Medium	Low	Low
Formalization of Systemic Practices	Very High	High	Medium	Medium	Low	Low	Low
Formalization of Operational Practices	Very High	Very High	High	High	High	Medium	Medium
Safety Skills	High	High	Medium	Medium	Medium	Low	Low
Safety Culture	Very High	High	Medium	Medium	High	Low	Low
Vertical Fit	Good		Medium			Poor	
Major Injury	0	2 [1(2016), 1(2018)]	3 [1(2014), 1(2016), 1(2017)]	4 [2(2015), 2(2018)]	4 [2(2017), 2(2018)]	8 [2 (2015), 1(2016), 1(2017), 4(2019)]	6 [2(2016) 1(2017) 3(2018)]
Death	0	2 [1(2016), 1(2018)]	4 [1(2014), 1(2016), 2(2018)]	3 [1(2015), 1(2016), 1 (2017)]	4 [1(2014), 1(2016), 1(2017), 1(2018)]	5 [2(2014), 1(2018) 2(2019)]	4 [1(2014), 1(2015) 1(2016), 1(2019)]

Three main adoption approaches to adoption of H&S practices were identified in this study and associated with different types of Vertical Fit. Ultimately, each adoption approach leads to varying levels of H&S performance in terms of injury and death cases.

In this study, continuous adoption of H&S practices has led F1 & F3 to experience a good vertical fit (Ericksen & Dyer, 2005) between H&S practices and within H&S practices in F1 & F3 due their strongly aligned H&S practices. Reason behind such high alignment is the consistency and high level of all H&S practices. A positive outcome of continuous adoption of H&S practices is evident especially in F1 who has experienced no injury and death cases. F3 has experienced low injury and death cases between 2014 and 2019.

On the contrary, random adoption of H&S practices has led F5 & F6 to experience a poor vertical fit. Their poorly aligned H&S practices do not complement each other. H&S outcome of random adoption of H&S practices is evident in the highest number of injury and death cases between 2014 to 2019.

Finally, discontinuous adoption of H&S practices led to medium vertical fit due to moderately aligned H&S practices in F2, F4 & F7. Reason behind such high alignment is that strength prevalent in some (two) H&S practices of F2, F4 & F7 and weakness prevalent in other (four) H&S practices of F2, F4 & F7 have complemented neither strongly nor poorly and therefore, complemented each other moderately. However, their aligned combination of H&S practices are not symmetrical. F7 has a combination of H&S practices different from that of F4 & F7. F7's high level of formalization of operational practices and safety culture (strength) have overcome its medium level of infrastructure & equipment and low level of formalization of systemic practices. On the other hand, F2 & F4's high level of infrastructure & equipment (strength) has overcome its medium level of safety culture. H&S outcome of discontinuous adoption of H&S practices leads to medium number of injury and death cases between 2014 and 2019.

Chapter 5 Discussion

5.1 Introduction

This chapter discusses the findings and its relation to literature. The findings are discussed from the perspective of absolute or relative prioritization of safety, alignment of adopted H&S and the commissioning and accommodating perspectives. Subsequently, the theoretical contributions and implications of this study are discussed as well as practical contributions for policy makers, academics and practitioners. This chapter also includes a discussion on limitations of this study and future research.

5.2 Continuous, Discontinuous and Random Adoption of H&S and its consequences

5.2.1. Overview of the Approaches

The study has identified three approaches to adoption of H&S practices. Prior to the discussion, these approaches are summarized below:

- ***Continuous Approach to Adoption of H&S practices:*** an approach where firms are driven by their choice (organizational response) to comply actively with institutional requirements and expectations (coercive, mimetic and normative); have kept adopting H&S practices continuously in order to improve and update their H&S practices; their pursuit of H&S is strategic and considerate.
- ***Discontinuous Approach to Adoption of H&S practices:*** an approach where firms are driven by their choice (organizational response) to comply passively with institutional requirements and expectations through discontinuous adoption of H&S practices. These firms tend to improve and update their H&S practices in an irregular manner

and tend to adopt H&S practices as and when they are either coerced to do so or pulled into doing so because of the revenue implications.

- ***Random Approach to Adoption of H&S practices*:** an approach where avoiding is the primarily choice (organizational response) and where firms, while avoiding institutional pressures, attempt to response symbolically and tend to adopt H&S as and when coerced in doing so.

5.2.2. Absolute and Relative safety prioritization of shipbreaking firms

Prioritizing safety relatively or prioritizing safety absolutely is a firm's choice. By deliberately making a strategic choice, firm often responds to institutional pressures (Goodstein, 1994). This study critically refined firm level relative prioritization and absolute prioritization of safety, identified by (Shannon & Norman, 2009; Shannon et al., 2001; Zohar, 2010; Zohar & Luria, 2003; Zohar & Tenne-Gazit, 2008; Zohar et al., 2008), which has been under researched in the context of risky and hazardous operations in safety research. It is evident in this study that on one hand, safety can be proclaimed as a high priority through organizational policies, on the other hand, in the face of budget cut or production pressures safety procedures might be compromised (Clarke, 2010; Clarke et al., 2017). For example, driven by a very low level of strategic and operational prioritization for safety, F5 & F6 use low mechanization and run night shifts and overtime regularly (3 or 4 times weekly). Again, F2, F4 & F5, driven by their low level of strategic and operational prioritization for safety, use a medium level of mechanization and run night shifts and overtime regularly (2 or 3 times weekly). Interestingly, all these firms have shown their safety concerns during their interview. Even F2 & F4 are having written safety policies. Therefore, although these firms proclaim safety as their high priority, they compromise safety by running night shifts considered as one of the most dangerous decisions (illegal as well) for conducting risky shipbreaking operations. The true priority of safety

emanates from the degree of congruence between the espoused and enacted values of safety (Zohar, 2010). In such cases, the priority of safety is not absolute, rather relative to other demands and targets (Shannon & Norman, 2009; Zohar, 2010; Zohar & Luria, 2003; Zohar & Tenne-Gazit, 2008; Zohar et al., 2008). Their relative prioritization cannot encourage safe pace of workers. It is evident in their tendency to give less reasonable breaking time and compromise less with producing more & earning profit more to ensure safety. Such relative prioritization of safety always deals with competing and contradicting goals such as safety and productivity.

Firm level variation in pursuing competing and contradicting 'safety-productivity' goals indicate their 'exploration-exploitation' orientation (March, 1991). Griffin et al. (2016) has described these goals as short-term versus long-term consideration and addressing future uncertainties versus present certainties. Organizations are advised to strike a balance between explorations by allocating resources to experimentation and exploitation by focusing on execution and doing known things better (Chanda & Miller, 2019). F1 & F3 give more priorities to address future uncertainties and long-term considerations, using mechanization, setting reasonable production target and avoiding risky ships for breaking in most cases. Therefore, F1 & F3 can be characterized as 'exploration-orientated'. For example, F1 & F3 have mechanized most of their shipbreaking activities instead of traditional fully manually conducted shipbreaking operations means these firms have facilitated manually conducted activities and replaced risky manual labour by use of machines and equipment.

Again, F1 has developed their H&S practices to an internationally compliant yard (like European yards) instead of just a nationally compliant yard. F3 is planning to do so as well. This indicates that these firms have allocated their resources to explore and utilize new opportunities and have gone beyond the 'traditional' practices. It is also worthy to mention that, F1 & F3 are also engaged in formal scanning of the environment, market research, industry

analysis, feasibility analysis, active formal communication with stakeholders in order to explore new areas and opportunities driven by its proactive and exploration orientated strategy.

On the contrary, F5 & F6 are mostly 'exploitation-oriented' firms, and so are F2, F4 & F7. These firms put less emphasis on addressing future uncertainties and long-term considerations. They only pursue short-term operational goals and aim to stay ahead of their competition with a minimal attention paid to H&S practices. Their exploitation orientation is underscored by lack of resources available for exploring new opportunities and areas. Neither any formal scanning of external environment, market research, industry analysis, and feasibility analysis are present, nor any continuous active formal communication with stakeholders are present in F5 & F6. F2, F4 & F7 have some of this formal setup. They prefer traditionally conducted shipbreaking operations as they pursue traditional practices (e.g. only minimum national level compliance) instead of facing future uncertainties for example, frequently changing international challenges such as HKC compliance, EU compliance etc.

Operational priorities of F2, F4, F5, F6 & F7, just like top strategic priorities, are tilted more toward "exploitation orientation" instead of "exploration orientation" as these firms are motivated to produce more and earn more profit or reduce costs, which indicate their priorities based on only nationally competing priorities. Either these firms have not allocated resources for addressing long term considerations (Chanda & Miller, 2019) or do not have available resources that prohibits them to pursue full application of both exploratory and exploitative approaches. On the contrary, operational priorities set by F1 & F3 are tilted more toward 'exploration orientation' just like their strategic priorities. Consequences of these contrasting approaches are quite evident. By deliberately giving workers unreasonable breaking time, by not avoiding night shifts and overtime, for example. F5, F6, F2, F4 & F7 are predominantly encouraging unsafe speed of production and making workers at risk. Like strategic

prioritization, all of their operational prioritizations are contributing to the 'Relative Prioritization of Safety'. Their safety priority is relative to other demands and targets.

Only exceptions are F1 & F3 who are providing all the safety friendly operational priorities that are contributing to the 'Absolute Prioritization of Safety' means in case of F1 & F3, just like their strategic priorities their operational priorities of safety is absolute as well. Their safety priority is not relative to other demands and targets. 'Relative' or 'Absolute' importance given on safety versus production by top and middle management is critical while pursuing 'safety-productivity' goals (Luria et al., 2008; Shannon & Norman, 2009; Zohar, 2010; Zohar & Luria, 2003; Zohar & Tenne-Gazit, 2008).

5.2.3. Accommodated and Commissioned Shipbreaking Operations

The term Accommodative HRM practices predominantly studied psychological aspect of workers (e.g. engagement and commitment (Bal et al., 2013). Moreover, such practices in HRM have been inspired by disengagement theory (Adams, 1999; Cumming & Henry, 1961) by assuming that with increasing age, people gradually withdraw from their role in society when they prepare for retirement. Another inspiration for accommodative practices have come from SOC theory (Baltes et al., 1999), assuming that employees who experience losses in their capabilities will use a number of strategies to adapt to their environment, namely selection, optimization, and compensation (Wiese et al., 2000, 2002). The duty to accommodate refers to the obligation of an employer, service provider, or union to take steps to eliminate disadvantage to employees, prospective employees or clients resulting from a rule, practice, or physical barrier that has or may have an adverse impact on individuals or groups protected under the Ontario Human Rights Code (Hunter, 1972). On one hand, accommodative practices are defined as those HRM practices aimed at meeting workers' needs for reduced workloads (Armstrong-Stassen & Ursel, 2009; Remery et al., 2003). On the other hand, Colella and

Bruyère (2011) defined workplace accommodation as "modifications in the job, work environment, work process, or conditions of work that reduce physical and social barriers so that people with disabilities experience equal opportunity in a competitive work environment" (Colella & Bruyère, 2011), p. 478. Man et al. (2020) argued that people with disabilities and without disabilities –all can be eligible for getting appropriate workplace accommodation for improving performance, although their study was based on creative performance.

The term 'commissioning', predominantly in Construction Management, is as much a management task as a technical task (Horsley, 1998) where, safe and orderly completion of a project by maintaining its operability, in terms of performance, reliability, safety and information traceability, is required (O'Connor & Mock, 2020). Moreover, fulfilling safety requirements of the project is an essential factor along with costs and quality requirements (Bendiksen & Young, 2005). By emphasizing on safety in commissioning project, Killcross (2021) considered ensuring safety as prerequisite while maintaining commissioning sequences in any processing project and Aloini et al. (2012) recognized and considered occupational health & safety as a critical execution issue, appropriate to the project. Shipbreaking operations like many other processing projects, is highly commissioning driven where all the preceding activities of commissioning -that is, engineering, procurement and, indeed, construction itself -are directed not just towards the construction or mechanical completion of the plant, but also through the specific commissioning sequences required to overall final acceptance. Ensuring safety is prerequisite while maintaining such commissioning sequences in any processing project such as shipbreaking (Almasi, 2014; Bendiksen & Young, 2005; Horsley, 1998; Lawry & Pons, 2013; O'Connor & Mock, 2020).

Shipbreaking operations demand reduced workloads and work risks due to the risky and hazardous nature of operations. Additionally, shipbreaking operations demand a management approach where complying with national and international safety requirements is

considered as one of the main objectives. These two-folded demands of shipbreaking operations have made yard owners responsible to accommodate and commission shipbreaking operations in order to make a work-health balance of the shipbreaking workers. H&S practices adopted through continuous adoption can realize the required level of accommodated and commissioned shipbreaking operations, which is evident in firms such as F1 & F3. On the contrary, moderately aligned combination of H&S practices adopted through discontinuous adoption can realize less accommodated and commissioned shipbreaking operations, which is evident in F2, F4 & F7.

Accommodating workers by equipping and mechanizing risky and hazardous work of shipbreaking, partially or completely, is now demanded by coercive, mimetic and normative institutional norms (DiMaggio & Powell, 1983). Shipbreaking firm owners cannot ignore their responsibility to make a safe working condition for workers either by making the shipbreaking operations risk and hazards free or reducing the risks and hazards of operations. Hazards and risks of manually conducted shipbreaking have been triggered by the occurrence of frequent number of major injury and death cases of workers in the South Asian shipbreaking yards. For example, two main groups of hazards in shipbreaking, first, intoxication from dangerous substances and injuries caused by explosions of trapped gas or oil in fuel tanks, and second, the limited use of safety equipment identified by Andersen (2001) badly need adequate infrastructure, hazardous material handling facilities, mechanization and equipment.

Accidents can occur such as falling from the ship – which may be up to 70 metres where workers do not use adequate safety gears or workers being crushed by falling steel beams and plates and electric shock where movement does not happen in indicated safe pathway or absence of use of crane or lifter etc. The most frequent causes of major injuries and death cases occurred in shipbreaking industry of Bangladesh are falling / hit by iron plates/pieces, falling from a great height, explosion, fire broke, cylinder blast, and leakage of toxic gas (DEWAN,

2020; NGOshipbreakingPlatform, 2014; Rahman et al., 2018). However, these fatal accidents are preventable through use of required accommodation. For example, when workers are provided with a winch machine, a large number of workers do not need to be involved in moving parts of the ship and its equipment. The winch is designed for the most challenging job onshore and offshore (Mark et al., 1999), and can prevent accidents. Loading and unloading of scraps metal can also be done by using crane and lifting tools, which can help workers to prevent accidents due to falling of scraped metal plates etc.

Shipbreaking operation has a large room for accommodation through facilitating and enabling workers working hazardous and risky shipbreaking activities safely. Need for reduced workloads and work risks is also very critical for shipbreaking industry from legislative perspective. Shipbreaking firms can meet up such needs by improving specific structural requirements specified in HKC and EU' where use of proper infrastructure, mechanization and equipment are compulsory. For example, according to under Article 13(1)(g)(h)(i) The EU Ship Recycling Regulation (EUSRR) (1257/2013), a shipbreaking yard must ensure safe and environmentally sound management and storage of hazardous materials and waste, including. It clearly mentioned there that the handling of hazardous materials, and of waste generated during the ship recycling process, must be conducted only on impermeable floors with effective drainage systems which is mentioned in Article 13(1)(g)(i) of EU Ship Recycling Regulation, 2013 (EUShipRecyclingRegulation, 2013). It is also mentioned under Article 13(1)(h) and (d) of EU Ship Recycling Regulation, 2013, that the ship recycling yard establishes and maintains an emergency preparedness and response plan; ensures rapid access for emergency response equipment, such as fire-fighting equipment and vehicles, ambulances and cranes, to the ship and all areas of the ship recycling facility Article 13(1)(h) and (d) of (EUShipRecyclingRegulation, 2013). Therefore, in this industry, machine-facilitated and equipped manual labour and built structures (lifting machines, crane, winch machines, fire-

fighting equipment and vehicles, impermeable floors and so on) are not luxury rather necessity. Firms such as F1 & F3 have been adopting infrastructural and equipment development continuously since 2006 since the serious concerns raised by NGOs, ILO and IMO. However, the remaining firms have not adopted infrastructural and equipment development to the same level.

Such accommodating aspect of shipbreaking operations can work only when complemented by proper commissioning of all the shipbreaking activities. Formalized systemic practices and operational practices, for example, regular safety training on how to use and check machine, equipment, or PPE etc.; prevalence of sufficient safety skills of workers on the interconnected processes; and a supportive safety culture for effective communication within team members and between team members etc. can enable commissioning of shipbreaking operations.

In addition, commissioning is as much a management task as a technical task (Horsley, 1998). Technical and management aspects of shipbreaking operations have created the ground for commissioning of shipbreaking operations through adoption of H&S practices such as, formalization of systemic practices and operating practices, improving safety skills and safety culture.

Therefore, continuous adoption of H&S practices can enable firms to achieve the required accommodated and commissioned shipbreaking operations leading to safety performance, which is evident in this study. This study has found that firms who have not adopted H&S practices continuously over time, rather discontinuously or randomly, have not achieved the required accommodated and commissioned shipbreaking operations compliant with national and international regulations and requirements.

5.3. Understanding Adoption of H&S practices from a Theoretical Perspective

The extent to which various H&S practices have been adopted by firms show very symmetrical pattern. The more continuously firms adopt H&S practices to improve and update their combination of H&S practices, the more their H&S practices show a good vertical fit. On the other hand, the less continuous adoption of H&S practices, the more their H&S practices show poor vertical fit. Therefore, continuous adoption of H&S practices can achieve better H&S performance in terms of low/no injury and death cases by accommodating and commissioning shipbreaking operations. On the contrary, discontinuous and random adoption of H&S practices results in poor H&S performance.

From a theoretical perspective, the assumptions of new institutionalism theory, normal accident theory and high reliability theory are relevant to justify firm level adoption of H&S practices, categories of H&S practitioners and the corresponding H&S performance prevalent in the seven firms examined.

Organizational responsiveness to institutional pressures is a strategic choice and organizations do not respond uniformly to institutional pressures, rather, adopt strategies that depend on the nature of the institutional pressures on them and the congruence between the institutional goals and organizational goals (Oliver, 1991). Absence of uniform approach to adopt H&S practices compliant with institutional requirements is evident in the seven case study firms. A number of theorists have argued that broad emphasis on processes of conformity to institutional pressures has led to a downplaying of the role of interest and agency in organizational adaptation to institutional environments (Covaleski & Dirsmith, 1988; DiMaggio & Powell, 1983; Elsbach & Sutton, 1992; Goodstein, 1994; Khalil, 2021; Mezias, 1990; Oliver, 1991; Phillips et al., 2004; Powell & DiMaggio, 2012).

Firm level adoption of H&S practices is dependent on the nature of the institutional pressures. For example, F5 & F6 want to conduct business only at national level i.e. at the level of compliance with Government of Bangladesh's Shipbreaking Rules and Act. In this institutional environment, there is room for symbolic compliance, manipulation and concealing nonconformity for avoiding institutional pressures (Oliver, 1991) combined with a poor enforcement of law in Bangladesh (Alam & Faruque, 2014; Hossain et al., 2016; Khan et al., 2012).

These firms are mainly concerned with complying with minimum compliance and broadly diffused institutional practices in this industry such as ensuring use of PPE (although low), appointing safety officer (low level) , providing safety training (although low) etc. It is justified in literature that the more broadly diffused an institutional practice, the higher likelihood that an organization will adopt it (Fligstein, 2002; Tolbert & Zucker, 1983; Zucker, 1987). However, firms are largely taking the chance of symbolic compliance while complying with these minimum H&S practices and want to continue with the business as usual. They are not at all interested to compete internationally. Further, either conformity or resistance to institutional pressures is likely to reflect both institutional and technical concerns (Goodstein, 1994). F5 & F6 have assessed that conformity allows them to get clearance for running operations (technical concerns) and therefore they maintain the minimum compliance. These firms know how much they need to comply and how much should do to avoid the institutional requirements exploiting the weaknesses of the institutional norms such as, symbolic compliance, poor enforcement of law and so on.

F2, F4 & F7 deliberately have chosen to comply passively with institutional requirements through discontinuous adoption approach. These firms also have assessed the extent to which conformity allows them to get clearance to run operations (acquisition of resources). These three firms are very concerned with complying with the most diffused

practices while less concerned with the less diffused practices (ISO certification, use of reputed international certifier, HKC SOC etc.) across the industry.

In addition, comparatively small size and less visibility and less resources (as F5 or F6 are not a part of any group of companies), force them to avoid institutional pressures in most cases and to stick with the most diffused (and ultimately the most required) H&S practices across the industry. On the other hand, due to the large size and high visibility (as F1, F2, F3, F4 are not a sister concern of different group of companies), F1, F2, F3 & F4 are under greater pressure to maintain their social legitimacy by responding institutional demands (Goodstein, 1994; Khalil, 2021).

The more safety-focused firms have clearly conceptualised employee health and safety in line with high reliability theory and their exploration is consistent with dynamic safety capability theory whereby management agency is critical in reducing yard accidents and deaths. Their high level of safety prioritization and the continuous adoption of H&S practices are even more manifested in their required level of accommodated and commissioned shipbreaking operations through highly aligned H&S practices. However, least safety conscious shipbreaking yards (F5 & F6) are treating major injuries and fatalities as largely 'inevitable', or more consistent with normal accident theory. Their exploitation orientation is not complying with dynamic capability theory at all. There is opportunism to continue to expose their employees to workplace hazards and risk and workplace safety was largely characterised by informality. F5 & F6 are smaller firms compared to the other five firms and F5 & F6 offer higher remuneration to its employees to compensate them for higher workplace risks. However, paying higher wages does not discharge employer obligations towards worker safety (Hughes, 2019). Their low level of safety prioritization and the provisions of low level of H&S practices adopted through random approach and the consequent poorly aligned H&S practices are

reflected in their less than the required level of accommodated and commissioned shipbreaking operations that made them incapable in terms of building dynamic safety capability.

F2, F4 & F7 are the firms in between the discussed two extremes and reveal interesting findings as well. Due to their discontinuous adoption of H&S practices, these three firms have low safety related strategic and operational priorities. Interestingly, these three firms have almost similar production of scrapped metal and H&S performance pursued by two opposite combination of adopted H&S practices. Where F2 & F4 are having comparatively more accommodated but less commissioned operations, there, F7 is having comparatively less accommodated but more commissioned operations. Eventually their H&S practices are moderately aligned due to a combination of high, medium and low level of H&S practices.

Low performing firms treat major injuries and fatalities as 'inevitable' and consistent with normal accident theory. Their more exploitation orientations and less exploration orientations are consistent with passive compliance with intuitional norms (Oliver, 1991) under institutional theory as well. They also acted opportunistically by exposing their employees to workplace hazards and risks.

Manageability of accidents is evident in F1 followed by F3, which is aligned with High Reliability Theory that holds the contrasting opinions with Normal Accident theory on manageability of system accidents instead of inevitability of system accidents (Cooke & Rohleder, 2006; Hofmann et al., 1995; Roberts, 1990; Vogus & Welbourne, 2003). It is argued that high-risk, high-hazard organizations can function safely despite the hazards of complex systems (Madsen et al., 2006) and serious accidents can be prevented through a combination of organizational design, culture, management, and human choice (Rochlin, 1996), in high risk, hazardous operations. Although such arguments are considered as more optimistic view of High Reliability Organizations proponents.

There is direct and indirect evidence of informing workers (Arnold 2010) about the inherent risks and hazards associated with shipbreaking in F1 and F3, and especially in the former. For example, F1 & F3 provide detailed information on the general workforce and job functions and on training procedures to ensure the appropriate level of worker safety protection which is compliant with Regulation 22 of the Hong Kong Convention. Training programme prevalent in F1 & F3 enable workers to safely undertake all operations that they are tasked to do and ensure that all workers at the Ship Recycling Facility have been provided with the appropriate training prior to performing any shipbreaking operation. On the contrary, F5 & F6 are least complaint in such training related compliance and F2, F4 & F7 are less complaint compared to F1 & F3.

Low performing firms were characterised by less systematic practices and formal operating practices towards employee safety and it can be said with less confidence that all employees were made fully aware. As Boatright (2000) contends, the lack of safer employment alternatives does not excuse employers from exposing their employees to unnecessary risks in this industry. And neither was there evidence in any of the seven firms of an employee's right to refuse dangerous work (Faden & Beauchamp, 1990; Sass, 1986). Nonetheless, F1, and to a lesser extent F3, had vastly improved safety records compared with the intervention type undertaken by F5 & F6 and with the intervention type undertaken by F2, F4 & F7. Rather than exercising the right to refuse hazardous work, F1 and F3 have sought to actively prevent major injuries and deaths. These shipbreaking firms have developed infrastructure, mechanization and hazardous material handling facilities.

Shipbreaking firms' approaches toward employee H&S practices vary considerably and accordingly, they experience different levels of major injuries and death among workers. The high performing firms on safety had no or low major injury or death (no in F1 and low in F3)

from 2014 to 2019 whereas the medium (F7, F2 & F4) and low performing firms (F5 & F6) experienced moderate and higher levels of major injury and workplace deaths.

Interestingly, safety culture is the practicing area where F7 has strength and has overcome its weaknesses in infrastructure & equipment area and has realized similar H&S performance level F2 & F4 in terms of number of injuries and deaths. It indicates the power of safety culture that is inevitable for achieving required level of commissioned operations and safety culture is recognized as a key determinant of process safety and developing safety culture is promoted as an essential part of a risk based approach to process safety (CCPS, 2007). Moreover, safety culture is a significant contributing factor that has been repeatedly emphasized by major accident investigations (Bills & Agostini, 2009; Group, 2011). Occupational injuries and fatalities can be preventable as shown by F1. Prevention of workplace deaths depends on the understanding that worker safety is not only the responsibility of the worker but is the primary responsibility of the employer (Tidwell, 2000). To do well, employers must train all employees in the appropriate safety procedures and maintain a safe working environment. Major injuries and fatalities at shipbreaking yard are not the fault of the worker; rather, they are the combination of unsafe yard due to low infrastructure & equipment, insufficient safety skills, recruiting inexperienced, migrant workers and temporary workers, inadequate safety training, low process safety management and behavioural safety management practices, absence of positive safety culture and effective team communication. These can all be mitigated by management agency and care for employees (Hughes, 2019) by accommodating and commissioning shipbreaking operations through continuous adoption of H&S practices.

5.4. Contributions and Implications

This study contributes to both the theory and practice of safety literature. By addressing the research questions: ‘How do shipbreaking firms prioritize safety’; ‘How do shipbreaking firms adopt safety’ and ‘What are the impact of adopted H&S practices on firm level H&S performance’, this study has addressed the gap in the existing safety literature predominantly by identifying three approaches to adoption of H&S practices in developing economy in what is otherwise considered a homogeneous context.

5.4.1. Theoretical contributions

This study has been grounded in the theoretical underpinnings of of HRO Theory and Institutional Theory. The HRO's ontogenesis is grounded in behavioural science and proposes that the actions of individuals-as-organizations were addressed from the perspective of the potential for, and mitigations towards preventing or minimizing, internal human and systemic errors or failures (Cantu et al., 2020). On the other hand, Institutional Theory's ontogenesis is derived from the assumption that the ways people think and act are heavily influenced by social relationships and shared cognitive understandings that are culturally-embedded, give meaning to events, and (may) limit possible actions (Dacin, 1997) as organizational responses. Institutions normalize behavior and shape the nature of much economic activity (DiMaggio & Powell, 1983, 1991; North, 1993), thus regulating the potential and constraints for action of different economic actors in a given environment (Scott, 2010, 2013). Institutional theory is very much aligned with HROs operating in open systems subject to pressures of aggressive knowledge watchers (La Porte, 1996) such as regulators and the wider public (Nee, 1998). In an open system, organizations must see themselves as part of dynamic environments that they affect and that affect them through rapid feedback as well as emergent, longer-term, and unexpected consequences (Hurth, 2017) as because it is becoming impossible for organizations

to sustain an isolationist view and many are arguing that we need to completely revise how we see organizations in order to maximize their performance (Wheatley, 1994). H&S research, focused on End-of-Life Product dismantling, has not referenced any HRO work. This study posits, however, that these two bodies of research (and corresponding HRO and Institutional theories) are compatible, and that their integration adds to the theoretical development of the role of H&S practices on firms' H&S performance. High Reliability Organizations theory and institutional theory, through combining, can offer integrated and aligned approaches that organizations can address to transform themselves while adopting H&S practices.

High Reliability Organization (HRO) perspective and this study

In a complex industrial setting, the theory of High Reliability Organisations (HROs) may help leaders to achieve better outcomes in critical areas such as health and safety, environmental management, and social performance (Meyer Jr et al., 2020). The vast majority of all the subsequent research is focused on the health care sector (Carnes, 2020; Hendrich & Haydar, 2017; Jahn et al., 2020; Morrow, 2016; Young et al., 2010). Again, Weick and Roberts (1993) in their first study, drew a distinction between productivity and reliability where they argued that without implementing HRO principles (organisational mindfulness), it would be possible to be productive, at least for a time, but not be reliable. This initial work was followed in 2001 by Weick and Sutcliffe (2011) where they argued that the essence of resilient – or reliable – performance can be achieved where an organisation 'creates a mindful infrastructure that continually does all of the HRO principles.

More than twenty years have passed, and several thousand HRO-related research papers have been released since the publication of Managing the Unexpected (Bisbey et al., 2021). It is reasonable to describe the implementation of HRO principles and linking that implementation to demonstrable outcomes in this given context.

'H&S Adoption' is a firm-level strategic response to prevent accidents and consequent injuries and deaths at workplace as part of manageability approach of accidents and 'Categories of H&S Adoption' divide firms into categories based on their willingness to adopt a H&S practice in course of time as a firm level strategic response (e.g., continuous adoption, discontinuous adoption or random adoption) under different institutional pressures ranging from coercive to mimetic to normative pressure.

In this study, firm level H&S Adoption can be described as part of implementation challenges of HRO principles as this study has revealed heterogeneous H&S adoption patterns. Demonstrable outcomes of such revealed heterogeneous H&S adoption patterns are H&S Performance in terms of injury and death at workplaces across the firms.

Research suggests it is time to reset the dial on HROs and HRO principles. (Johnston, S., 2021). Rather than asking people to action a three-letter acronym (i.e., HRO) as expeditiously as possible, a deeper review of these implementation challenges of HRO principles is actually necessary for achieving meaningful and sustainable change.

Institutional perspective and this study

Understanding the institutional landscape within which firm level safety practices are happening is an important first step to considering how firms can better address adoption of safety practices (Lingard et al., 2019). The concept of institutional logics, derived from Institutional Theory, has been used to understand changes to institutional forms and practices driven by social and political processes (Friedland, 1991, 2012, 2017; Friedland et al., 1991). Thornton and Ocasio (2008) observed a link between institutions and actions because actors engage in rational mindful behaviour that is shaped by the central value systems with which they identify. Therefore, there is a need to better understand how different institutional arrangements can shape the implementation and functioning of firm-level safety practices

(Lingard, H., Oswald, D., & Le, T. (2019). Because it is likely that different institutional environments transform national and international standards in different ways, it is necessary to understand not only its functioning, but also how the safety practices itself is shaped by the institutional context.

Due to the legal requirement of Bangladesh Shipbreaking and Ship Recycling Rules, 2011, firms are bound to comply with mandatory national requirements under coercive institutional pressure, not bound to comply with all the international requirements (e.g. HKC,2009 and EU Ship Recycling Rules, 2013) which are voluntary for operating in Bangladesh and considered under mimetic and normative instructional pressures along with coercive pressures. Therefore, different geo-political scalar influences are prevalent in shipbreaking industry and so are the adoption of H&S practices (as responses of firms) across the industry.

Intersection of the theoretical perspectives

In this study, empirically evident 'Heterogeneity of H&S practices' has been contrasted with the perceived homogeneity of H&S practices. The term 'Heterogeneity' (degree to which a system diverges from a state of perfect internal similarity) gains substantial conceptual power only when discussed with specific reference to the space of features being deemed heterogeneous, where a central emphasis of this argument, overall, is that understanding heterogeneity requires separation of the understanding of it as a quantity from the conditions and features that we deem to be heterogeneous, and the causes thereof (Nunes et al., 2020).

However, we have yet to develop a consistent operational framework as part of meeting up the challenges of HRO implementation within which heterogeneity can be measured at least qualitatively (e.g. different paaterns of H&S adoption across firms) and communicated. Developing such a framework clarifies different levels of analysis at which heterogeneity manifests.

The formulation of heterogeneity makes it clear that the "causes" of heterogeneity will depend on the system whose heterogeneity is being measured (Nunes et al., 2020) (Nunes, A., Trappenberg, T., & Alda, M. (2020) and in this study, this system has been created by the variety of adoption pattern of H&S practices influenced by institutional pressures.

On one hand, 'Categories of H&S Adoption', as a term, is related to the HRO Theory due to its manageability aspect of preventing workplace injuries and deaths; on the other hand, it is related to the Institutional Theory due to its varying levels of responsiveness (H&S adoption) toward workplace safety under pressures for preventing workplace injuries and deaths.

Therefore, there is a need to better understand how different institutional arrangements can shape the implementation and functioning of workplace safety. Because it is likely that different institutional environments transform national and international standards for workplace safety practices in different ways, it is necessary to understand not only its functioning, but also how the safety practices itself is shaped by the institutional context.

Empirical evidence is needed for determining the predictive validity of HRO-based qualitative measures in terms of safety performance or other relevant indicators (Shrivastava, S., Sonpar, K., & Pazzaglia, F. (2009). Although, emerging literature can guide implementing and evaluating HRO journey (Weick & Sutcliffe, 2015), there is still limitation in understanding of available frameworks, metrics, and initiatives and their use in terms of their complexity and wide variability of their key characteristics, their target participants, their foundation, their structure, which of the HRO principles they address, and operational system setting type (Veazie et al., 2019). Understanding the quality and applicability of existing HRO resources is important to developing best practices, identifying barriers and facilitators to implementation, spreading implementation initiatives to other systems, measuring progress, and identifying knowledge gaps.

In light of such lacking, findings of this study has contributed to improve the comprehensiveness of HRO theoretical framework by explaining how HROs in shipbreaking industry under institutional pressures of open system have been experiencing High H&S performance in terms of no/low number of injuries and deaths where other firms have been experiencing Low and medium H&S performance in terms of low and medium number of injuries and deaths. With a particular focus on understanding different levels of aligned accommodating H&S practices (infrastructure & mechanization) and commissioning H&S practices (formalization of systemic practices, formalization of operational practices, safety skills of workers and safety culture) that affects the varying development of HRO processes through a variety of categories of H&S adoption.

Another important finding 'Equifinality of two different configurations of adopted H&S practices within 'Discontinuous H&S Adoption' revealed in this study also has enriched existing H&S theories by integrating HRO Theory and Institutional Theory. Such equifinality implies that two differently configured H&S Adoption pathways can lead to similar H&S performance (medium) by adopting two differently configured accommodating and commissioning H&S practices. In this study such equifinality is evident in case of the 'Discontinuous H&S Adoption' category where adoption of comparatively more accommodating (high level of infrastructure & mechanization) and less commissioning H&S practices (medium level of safety culture) is experiencing similar H&S performance (medium number of major injuries and deaths) just like the adoption of comparatively less accommodating (medium level of infrastructure & mechanization) and more commissioning H&S practices (high level of safety culture).

This equifinality indicates that the H&S research from each perspective can and should be integrated to formulate a more comprehensive approach to errors, failures or attacks to any organizational asset (Cantu et al., 2020), particularly to reduce injuries and deaths of workers

while working at workplaces. This equifinality revealed in this study embracing complexity theory which can be addressed in future research by embracing complexity theory as such perspective was not employed in previous studies.

The concept of 'H&S Adoption Categories' that was described in this study can serve as future platform for research in other domains, such as sustainability or corporate social responsibility, For example, adopter categories are especially relevant to social sustainability analysis. Studies, e.g. (Manu, Mahamadu, Ath, et al., 2017; Manu, Mahamadu, Hadikusumo, et al., 2017; Vinodkumar & Bhasi, 2010, 2011) regard implementation of health and safety practice as being uniform across the industry without considering that different organizational choices may exist across firms reflected in safety prioritization and corresponding adoption approaches. It is empirically evident in this study that not every firm possesses the same safety prioritization to adopt H&S practices continuously.

When comparing these H&S adoption categories, the progression of adoption is gradual and logical. Bridging the gap between continuous and random adoption is the most vexing part of ensuring social sustainability across the shipbreaking industry. It represents a fundamental change in organizational orientation (exploitation Vs exploration orientation) while setting safety prioritization to adopt a H&S practices where, some firms adopt some H&S practices just because these are legally mandatory across national level, whereas, some firms progress to adopting some H&S practices voluntarily because it is socially responsible and some firms want to be socially sustainable not only in national context abut also in international context. This study has revealed that in the case of the random adopters of H&S practices, social sustainability is out of their agenda.

Exploration oriented firms are more likely to be held accountable by public stakeholders for the health, safety and environmental performance of projects, might experience institutional pressure to engage in "voluntary" OHS activities conflicting with

business goals (e.g. productivity and profitability). Ju et al. (2018). Therefore, categories of H&S adoption is the manifestation of exploration or exploitation orientation of the firm where continuous H&S adoption is the pattern of Exploration oriented firms and random H&S adoption is the pattern of Exploitation oriented firms and 'Discontinuous H&S adoption' is the pattern of more exploitation and less exploration oriented firms.

5.4.2. Practical contributions

The empirical insights from this study challenge common assumptions that safety standards in the shipbreaking industry in developing nations like Bangladesh are homogenous and consistently bleak. The results from this study provide policy makers, the media, and safety practitioners with the opportunity to showcase best practices, whilst also identifying how safety in shipbreaking can be improved for firms that are low in their safety performance. The three approaches to safety might serve as a blueprint of what is typically achieved at various levels of the industry and why. This will be in particularly important for policy makers who want to address the H&S performance of the entire industry. Notably, the poor H&S performance of firms is mainly observed in local, small firms that operate as single units. Whilst their overlooking of safety problems is disappointing, it should be also recognised that these firms are under resourced and allowed to operate due to established norms in the industry. It is also important to recognise the role of informal safety culture and the positive role of experienced workers in achieving better H&S results – even in absence of substantial infrastructure. As it was mentioned at the outset of this section, the results of this study can be also used to showcase the true nature of H&S in the industry and pinpoint both positive and negative sides of H&S performance in the industry – for the benefit of safety of workers.

Applicability of Findings in other Industries

Shipbreaking is one of the most hazardous activities of maritime industry (International Labour Organization (ILO), 2003). This is due to the structural complexity of the ships and due to the possible exposures to asbestos, polychlorinated biphenyls (PCBs), lead, hazardous materials and chemicals, as well as excess noise and fire and explosions (Neşer et al., 2008). Shipbreaking operations begin with the draining of fuel, hydraulic fluid, coolant, lubricating oils and firefighting liquid, which is sold to the trade (Andersen 2001). Any re-usable items—wiring, furniture and machinery—are sent to local markets or the trade and unwanted materials become inputs to their relevant waste streams (Sujauddin et al., 2015). The combined effects of several concomitant exposures, e.g., chemicals, noise, and vibration along with fire hazards are prevalent in shipbreaking operations, which are very common in chemical processing industry that may influence the individual susceptibility to occupational exposures (Mihić, 2020). Recognition of the actual presence of multiple exposures, on the one hand, and data gathered from experimental toxicology, on the other, have resulted in some degree of concern over potential aggravation of health problems caused by multiple exposures that may be synergistic in terms of additive or potentiating (Bahadori, 2013).

Findings of this study should enable not only other End-of-Life (EOL) product dismantling operations but also a variety of industrial operations to improve H&S performance because shipbreaking operations cover almost every possible area of occupational hazards identified by OSHA which are chemical hazards, biological hazards, physical hazards, Ergonomics, Psychological hazards (OSHA, 1970) by offering transformative guidance of adoption of accommodating and commissioning H&S practices. It is recognized that the assessment and management of risks from exposure to all types of hazards is among the highest priorities in pursuing the principles of sustainable development (Swaminathan, 2011).

Therefore, continuous, discontinuous and random categories of H&S adoption of accommodating H&S practices i.e. building and maintaining infrastructure, mechanization and

equipment and commissioning H&S practices, i.e. formalization of systemic practices, formalization of operational practices, safety skills management and safety culture management has offered a comprehensive set of prescriptive H&S practices resulting in reduced injury and fatality rates in highly hazardous industry.

Finally, findings of this study provide manager with an important way to leverage sustainable development and improve CSR practices in their respective organizations.

5.5. Research limitations and future research recommendations

The current study has a number of potential limitations that provide opportunities for future research in H&S interventions. This study has looked at the direct and the most immediate risks to employee safety in shipbreaking. There may exist indirect harms resulting from regular exposure to hazardous chemicals such as asbestos and lead paint, and the inhalation of toxic gases, causing long-term illnesses. This could be addressed by future research. This study also treated ships as waste and waste on ships that might be harmful for employees; it has not examined how such waste and recycling initiatives also impact the health of local communities (non-employees). While considering worker safety at the level of individual shipbreaking yards, this study has also excluded accountability of shipping companies/owners and their part in the final destination for, and dismantling of, their end-of-life ships (Alcaidea et al., 2016).

Further research could scrutinise these actors as well as the accountability and processes of the intermediaries (brokers) or those who operate between the ship owners and shipbreaking firms. Such work might contribute to more appropriate responses in building an aid-based approach by developed nations to enable shipbreaking firms in developing countries – such as those like F2, F4 & F7 – to invest in the relevant infrastructure & equipment and training of employees to ensure better worker safety (Yujuico, 2014).

By taking a firm level analysis and focusing on shipbreaking yards and employees' safety, this study has also excluded the downstream supply chain. Future research might investigate the social and economic impact of shipbreaking on downstream firms and communities. Reusable items, such furniture, electrical wiring and other materials and recovered objects from ships contribute to the economic well-being of a large population in Bangladesh. For instance, using a Social Life Cycle Assessment (Strazza et al., 2015) might bring more complex (but more balanced) perspectives on the shipbreaking industry. Finally, this study has noted that the industry has been under increased media and NGO scrutiny for more than a decade (Hussain, 2019a)(Greenpeace 2005; Hussain 2019). Several participants in this study highlighted that the tenor of ongoing media coverage does not always reflect the current reality of all firms in the industry and their progress in improving employee health and safety. Future research could scrutinise national and international media coverage of the shipbreaking industry to determine the extent to which the publically circulated stories project an accurate picture of firm-level adoption of H&S practices towards employee safety in developing countries such as Bangladesh.

Chapter 6 Conclusion

This thesis work has focused on investigation of H&S practices in shipbreaking firms. Originating from a premise that H&S practices are uniform in the context of shipbreaking in developing countries, the study has identified that the practices in the industry are far from being homogeneous. Moreover, the resulting H&S performance is also far from being homogeneous. The findings are embedded in the broader context of occupational health and safety management literature. This research has both scholarly and practical implications for the pursuit of H&S in the developing world.

In order to address the research question - to investigate how shipbreaking firms prioritize and adopt workplace safety and what are the effects on safety outcomes - this study firstly develop a more nuanced understating about the different approaches to adoption of H&S practices. The distinction has been made between the continuous approach to adoption, discontinuous approach to adoption and random approach to adoption of H&S practices along with three categories of adopters (high, medium and low performers). These three approaches to adoption of H&S practices suggest that firms are either ambitious, casual or apathetic while prioritizing safety, developing infrastructure & equipment, formalizing systemic practices and operating practices and managing safety skills and safety culture in order to accommodate and commission their shipbreaking operations for reducing injury and death cases. Based on the adoption approaches and category of adopters, some firms have highly aligned H&S practices and having required level of accommodated and commissioned operations – whilst some firms have moderately aligned H&S practices and therefore having less than the required level of H&S practices (and consequently H&S outcomes).

The increasing frequency and intensity of fatal accidents in shipbreaking industry combined with the rapidly changing geo-political, economic, legal and sociocultural contexts,

have increased the complexity of occupational health & safety management and demand for new ways of adopting H&S practices. Relying on a 'domestic' approach to H&S management seems to be inadequate and as it was demonstrated, the impact of international regulations and push for more advanced practices provided an institutional platform for high performing firms to develop more advanced H&S practices. The impact of international regulations will need further scrutiny. On the one hand, the impact can lead for more in-depth adoption of H&S practices. On the other hand, if more firms are required to comply, smaller and less resourceful firm may be essentially driven out of business. Therefore the socio-economic consequences of such institutional process need further scrutiny. There seems to be one more possible pathway for improvement. The middle performers showed a large variation of their H&S practices and firms that rely of experienced workers often overcome the poor infrastructural and procedural environment with similar H&S outcomes. This finding shows a great promise to address H&S and can be adopted immediately. Policy makers and practitioners should take the results of this study while formulating and implementing policies in occupational H&S management of highly risk and hazardous industry. It is a hope of the author that this study will lead to more focus on H&S at individual firms as well as to more accurate portrait of the industry in the media: shipbreaking is far from being a homogenous industry. The practices and performance vary and should be objectively communicated.

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Appendices

Appendix: 3A

Detail table on the categorisation of open codes, and first-level and second-level focused codes

Firm wise level of presence of elements under each variable has been measured based on the following classification scheme:

- Very Low (01% – 20%)
- Low (21% – 40%)
- Medium (41% – 60%)
- High (61% – 80%)
- Very High (81% – 100%)

Overview of the categorisation of open codes, and first-level and second-level focused codes

Open Codes	First-Level Focused Codes	Second-Level Focused Codes
Presence of key elements of "Safety related Strategic Prioritization of Firms" • Presence of Avoiding highly risky ship (e.g. Oil Tanker) in 100% & 0% cases • Presence of Setting reasonable production target in 90%, 70% & 50% cases • Presence of Use of mechanization in 80%, 70%, 50% & 30% cases • 90%, 70%, 50% & 20% presence of Addressing future uncertainties and long term considerations along with along with present certainties and long term considerations in 90%, 70%, 50% & 20% cases •	Firm wise level of presence of key elements of "Safety related strategic prioritization of Firms" • Very Low (01% – 20%) • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	Strategic & Operational Prioritization Practices for Safety
Presence of key elements of "Safety related Operational Prioritization of Firms" • Presence of Giving reasonable breaking time for shipbreaking in 80%, 70% & 40% cases • Presence of Avoiding night shifts in 100% & 0% cases • 100% & 0% presence of Avoiding Overtime in 100% & 0% cases • Presence of Compromising production & profit to ensure safety in 80%, 60% & 40% cases	Firm wise level of presence of key elements of "Safety related operational prioritization of Firms" • Very Low (01% – 20%) • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	

Table 3.3 Continued

Open Codes	**First-Level Focused Codes**	**Second-Level Focused Codes**
Presence of key elements of Yard infrastructure • presence of impermeable floor, security gates, medical facility, PPE storage, fire-fighting facility, toilets etc.	Firm wise level of "Presence of key elements of Yard infrastructure" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	**General Yard infrastructure**
Presence of key elements of hazardous material handling facilities • presence of incinerator, fire alarm, hazardous waste storage and removal system, classified collection of wastes etc.	Firm wise level of "Presence of key elements of hazardous material handling facilities" • Low (21% – 40%) • High (61% – 80%) • Very High (81% – 100%)	**Hazardous Material Handling Facilities**

Presence of key elements of mechanization & equipment 100%, 90%, 80%, 70% & 50% presence of magnetic crane, lifter, tractors, generators etc.	Firm wise level of "Presence of key elements of mechanization & equipment " • Medium (41% – 60%) • High (61% – 80%) Very High (81% – 100%)	**Mechanization & Equipment**

Table 3.3 Continued

Open Codes	First-Level Focused Codes	Second-Level Focused Codes
• 90%, 70% & 50% presence of "Formal management certificates (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000, HKC SOC, EU enlistment)	Firm wise different levels of "Adoption of Formal Management Certificates" • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	Different levels of Formal Management Certification
• 100%, 70% & 50% presence of quality of certifiers through Accredited certifier, International certifier & Local certifier	Firm wise different levels of quality of certifiers • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• 100%, 70% & 50% presence of regular Renewal and Updating of certificates	Different levels of regularity of Renewal and updating of certificates • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• 80%, 70% & 60% presence of "Experienced Workers"	Firm wise different levels of "Experienced Workers" • Medium (41% – 60%) • High (61% – 80%)	
• 50%, 30% & 0% presence of "Permanent Workers"	Firm wise different levels of "Permanent Workers" • Very Low (01% – 20%) • Low (21% – 40%)	

	• Medium (41% – 60%)	
• 50% & 40% presence of "Local Workers"	Different levels of presence of "Local Workers" • Low (21% – 40%) • Medium (41% – 60%)	Different levels of Human Resources Management Practices
• Presence of "Regularly provided formal Safety Training for workers " in 100%, 80%, 60%, 50% & 40% cases	Different levels of provided Safety Training for workers • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Providing salary higher than the mandatory amount" in 100% & 0% cases	Firm wise different levels of "Providing salary higher than the mandatory amount" • Very Low (01% – 20%) • Very High (81% – 100%)	
• Presence of "Providing Attendance Bonus " in 100% & 0% cases	Firm wise different levels of "Providing Attendance Bonus" • Very Low (01% – 20%) • Very High (81% – 100%)	
• Presence of Fully & Regularly providing Medical Expenses for injured workers in 100%, 80% & 60% cases	Firm wise different levels of Fully & Regularly provided Medical Expenses for injured workers • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of Fully & Regularly providing mandatory Compensation amount for dead & injured (major) workers in 100%, 80% & 60% cases	Firm wise different levels of Fully & Regularly providing mandatory Compensation amount for dead & injured (major) workers • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Retention of Experienced Workers" in 50% & 30% cases	Firm wise different levels of presence of "Retention of experienced workers" • Low (21% – 40%) • Medium (41% – 60%)	
• Presence of "Formal & Written Policies related to PPE" in 100%, 80% & 60% cases	Firm wise different levels of presence of "Formal & Written Policies related to PPE" • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Use & Users of PPE " in 100%, 80%, 60% & 40% cases	Firm wise different levels of Use & Users of PPE • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	

• Presence of "Adequacy of PPE" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Adequacy of PPE" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	Different levels of PPE Management Practices
• Presence of "Proper Storage of PPE" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Proper Storage of PPE" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Quality of PPE" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Quality of PPE" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Regular Training for PPE" in 100%, 60% & 40% cases	Firm wise different levels of "Formal & Regular Training for PPE " • Low (21% – 40%) • Medium (41% – 60%) • Very High (81% – 100%)	
• Presence of "Formal & Regular Documentation of PPE issue" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Regular Documentation of PPE issue" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Appropriate Maintenance of work area (e.g. trash and scrap picked up, no spills) 100%, 80%, 60% & 40% cases	Firm wise different levels of "Appropriate Maintenance of work area (e.g. trash and scrap picked up, no spills) • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	Different levels of Housekeeping Management issues
• 100%, 80%, 60% & 40% presence of "Unobstructed Walkways" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Unobstructed Walkways" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Organized materials and tools" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Organized materials and tools" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Monitoring of housekeeping activities" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Monitoring of housekeeping activities" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	

• 100%, 80%, 60% & 40% presence of "Formal & Rigorous Ensuring of Employee Participation " in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Ensuring of Employee Participation" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	Different levels of Process Safety Management (PSM) practices
• Presence of "Formal & Rigorous Keeping and Providing of Process Safety Information" 100%, 80% & 60% cases	Firm wise different levels of "Formal & Rigorous Keeping and Providing of Process Safety Information" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) Very High (81% – 100%)	
• Presence of "Formal & Rigorous Conducting of Process Hazard Analysis" in 100%, 80% & 60% cases	Firm wise different levels of "Formal & Rigorous Conducting of Process Hazard Analysis" • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• 100%, 80% & 60% presence of "Formal & Rigorous Following of Operating Procedures" in 100%, 80% & 60% cases	Firm wise different levels of "Formal & Rigorous Following of Operating Procedures" • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Managing of Contractors" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Managing of Contractors" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Conducting of Pre-Start up Safety Review" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Conducting of Pre-Start up Safety Review" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Ensuring of Mechanical Integrity" in 100%, 80% & 60% cases	Firm wise different levels of "Formal & Rigorous "Ensuring of Mechanical Integrity" • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Taking of Hot Work Permit"	Firm wise different levels of "Formal & Rigorous Taking of Hot Work Permit" • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Management of Change" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Management of Change" • Low (21% – 40%) • Medium (41% – 60%)	

	• High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Incident Investigation" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Incident Investigation" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Emergency Planning and Response" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Emergency Planning and Response" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Compliance Audits" in 100%, 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Compliance Audits" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Formal & Rigorous Conducting of Risk analysis and pinpointing" in 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Conducting of Risk analysis and pinpointing" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	Different levels of Behaviour-based Safety Management (BSM) Practices
• Presence of "Formal & Rigorous Setting of Goals" in 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Setting of Goals" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Formal & Rigorous Providing of Training and prompting" in 80%, 60% & 40% cases	Firm wise different levels of "Formal & Rigorous Providing of Training and prompting" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	
• 80%, 60% & 40% presence of "Formal & Rigorous Conducting of Observation and Measurement"	Firm wise different levels of "Formal & Rigorous Conducting of Observation and Measurement" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Formal & Rigorous Providing of Performance feedback"	Firm wise different levels of "Formal & Rigorous Providing of Performance feedback" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Formal & Rigorous Providing of Rewards and Incentives"	Firm wise different levels of "Formal & Rigorous Providing of Rewards and Incentives" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	

Table 3.3 Continued

Open Codes	First-Level Focused Codes	Second-Level Focused Codes
• Presence of Technical Qualification of workers in 70%, 60% & 50% cases	Firm wise different levels of Technical Qualification of workers • Medium (41% – 60%) • High (61% – 80%)	**Different levels of Technical Safety Skills of workers**
• Presence of Practical working experience of workers in 70%, 60% & 50% cases	Firm wise different levels of Practical working experience of workers • Medium (41% – 60%) • High (61% – 80%)	
• Presence of Process safety skills of workers in 70%, 60% & 50% cases	Firm wise different levels of Process safety skills of workers • Medium (41% – 60%) • High (61% – 80%)	
• Presence of Safety Competency of workers in 70%, 60% & 50% cases	Firm wise different levels of Safety Competency of workers • Medium (41% – 60%) • High (61% – 80%)	
• Presence of Emergency skills of workers in 70%, 60% & 50% cases	Firm wise different levels of Emergency skills of workers • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Decision-making & Problem-Solving Skills of workers" in 70%, 60% & 50% cases	Firm wise different levels of "Decision-making & Problem-Solving Skills of workers" • Medium (41% – 60%) • High (61% – 80%)	**Different levels of Non-Technical Skills of workers**
• Presence of "Coping skill with Operational Change & stress of workers" in 70%, 60% & 50% cases	Firm wise different levels of "Coping skill with Operational Change & stress of workers" • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Situational & Risk awareness of workers" in 70%, 60% & 50% cases	Firm wise different levels of "Situational & Risk awareness of workers" • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Effective communication skill with co-	Firm wise different levels of "Effective communication skill with co-workers" • Medium (41% – 60%)	

workers" in 70%, 60% & 50% cases	• High (61% – 80%)	

Table 3.3 Continued

Open Codes	First-Level Focused Codes	Second-Level Focused Codes
• Presence of "Just & fair culture" in 90%, 70% & 40% cases	Firm wise different levels of "Just & fair culture" • Low (21% – 40%) • High (61% – 80%) • Very High (81% – 100%)	**Different levels of Safety Climate**
• Presence of "Error management culture" in 90%, 70% & 40% cases	Firm wise different levels of "Error management culture" • Low (21% – 40%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Flexible culture" in 80%, 70%, 50% & 40% cases	Firm wise different levels of "Flexible culture" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%)	
• Presence of "Effective Team communication" in 90%, 70%, 50% & 40% cases	Firm wise different levels of "Team communication" • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	**Different levels of Team Process**
• Presence of "Effective Team leadership" in 90%, 70%, 50% & 40% cases	Firm wise different levels of Team leadership • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	
• Presence of "Motivation of average workers to work safely" in 90%, 70%, 50% & 40% cases	Firm wise different levels of Motivation of workers for work safely • Low (21% – 40%) • Medium (41% – 60%) • High (61% – 80%) • Very High (81% – 100%)	

Table 3.3 Continued

Open Codes	First-Level Focused Codes	Second-Level Focused Codes

• Number of major injuries (0,1,2,3,4,5,6,7,8……) from 2014 to 2019	Firm wise different numbers of major injury cases	**Different levels of H&S performance in terms of injuries and deaths**
• Number of deaths (0,1,2,3,4,5,6,7,8……) from 2014 to 2019	Firm wise different numbers of death cases	

Appendix: 3B Temporal Analysis of H&S Practices

Year 2005	Trigger Point 1 ILO concerns IMO concerns NGO Pressure						
Year	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
2006	Mechanization & Equipment Winch machines, Toolboxes, tractors, Infrastructural Development hazardous waste storage and removal system, fire-fighting facility, first aid centre, mess room with cooking facilities Formalization of systemic practices formal safety training, ISO 9000	Mechanization & Equipment Winch machine, Toolboxes, tractor	Mechanization & Equipment Winch machine, Toolboxes, tractor	Mechanization & Equipment Winch machine, Toolboxes, tractor			
2007	Mechanization & Equipment Magnetic crane Multipurpose lifter, Generators. More Winch machines, more Toolboxes, tractors,	ISO 9000 Magnetic crane	Mechanization & Equipment More Winch machines, more Toolboxes, tractors, Infrastructural development hazardous waste storage and removal system, fire-fighting facility, first aid centre, mess room with cooking facilities Formalization of systemic practices formal safety training, ISO 9000	ISO 9000 Magnetic crane			
2008			Mechanization & Equipment Magnetic crane Multipurpose lifter, Generators.	ISO 9000			

2009 2010	**Trigger Point 2** **NGO Pressure** **Hong Kong Convention** **Closure of industry by Government of Bangladesh's Embargo (due to Court verdict)**						
2011	**Trigger Point 3** **NGO Pressure** **Recognition as an Industry by Government of Bangladesh** **Bangladesh Shipbreaking and Recycling Rules, 2011**						
2011 (BSBR Rules)	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Formal Structure for H&S practices	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Formal Structure for H&S practices	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Formal Structure for H&S practices	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Formal Structure For H&S practices	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Low Infrastructural Development	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Low Infrastructural Development	Mandatory H&S Practices Appointment of Safety Officer; Use of PPE; Safety Training Moderate Infrastructural Development Moderate Mechanization
2012	Infrastructural Development PPE storage, hanging signboards with major H&S guidelines, proper large gate, security guard & reception centre. security checking, hanging layout of the yard, truck way indicator, Formalization of systemic practices Recruiting experienced workers Formalization of operating practices formal housekeeping		Infrastructural Development PPE storage, hanging signboards with major H&S guidelines, proper large gate, security guard & reception centre. security checking, hanging layout of the yard, truck way indicator, Formalization of operating practices Formal housekeeping		ISO 9000	ISO 9000	
2013	**Trigger Point 4** **NGO Pressure** **EU Rules for Ship Recycling Rules**						
2013	Formalization of systemic practices ISO 14001, OHSAS 18001, ISO 30000); International certifier	Magnetic crane Infrastructural Development ISO 9000	Formalization of systemic practices Recruiting experienced workers; ISO 14001, OHSAS 18001, ISO 30000); International certifier	Magnetic crane Infrastructural Development ISO 9000	Low Infrastructural Development	Low Infrastructural Development	
2014	Formalization of operating practices formalizing process safety and behavioural safety management practices Infrastructural Development worker training centre, emergency exit, and dormitory for living Preparation for HKC SOC		Formalization of operating practices formalizing process safety and behavioural safety management practices	Major Infrastructural Development	Low Infrastructural Development	Low Infrastructural Development	

2015	Infrastructural Development hospital access, safety Officer's room recreation room Mechanization & Equipment magnetic cranes and heavy-duty cranes and barges	Magnetic crane	Mechanization & Equipment magnetic cranes and heavy-duty cranes and barges	Magnetic crane			
2016		ISO 14001, OHSAS 18001, ISO 30000	worker training centre, emergency exit, and dormitory	ISO 14001, OHSAS 18001, ISO 30000			ISO 9000
2017	Got HKC SOC leading classification society ClassNK	ISO 14001, OHSAS 18001, ISO 30000	hospital access, safety Officer's room, recreation room; Preparation for HKC	ISO 14001, OHSAS 18001, ISO 30000			
2018	**Trigger Point 5** **NGO Pressure** **Bangladesh Ship Breaking and Ship Recycling Act, 2018**						
2018	Preparation for EU enlistment		Preparation for HKC				Moderate Infrastructural Development Moderate Mechanization
2019	Preparation for EU enlistment		Preparation for HKC				

Appendix 3C Interview protocol and interview questions

Interview Protocol

Instructions: I am a PhD student. I am conducting this interview to determine why and how the ship breaking firms manage health and safety practices in their ship breaking operations over the years. All information will be kept confidential.

1. **Demographic composition of ship breaking firm**

1.1 Name of the firm:

1.2 Location:

1.3 Number of employees:

1.4 Year of establishment

1.5 Scrapping volume (monthly):

1.6 Type of work undertaken by the firm:

1.6 Certification adopted by the firm:

ISO 9000/ISO 14000/Others

1.7 Role of the participant:

Owner/Director/Manager/Yard Manager/Health & Safety supervisor/Yard Engineer/Worker/Other role

1.8 Existence as a sister concern of a parent company

2. Protocol for owner / top management

- When was the firm established and what is its standing in the industry? How this standing evolved over time? What is the performance of the company (revenue)? How many employees?
- Supply chain management: how do you source the ships? Are you focusing on a particular ship type/size or do you accept any ship? How are your customers/supply chain partners? What is the relationship with your customers? Are they involved in the ship breaking process?
- The industry is known for its problems with health and safety. What has been the situation at your place? How are you showing your Safety Commitment? Can you describe your H&S performance over time?
- Can you identify a significant management of H&S practices that you have used to improve the H&S performance?
- How did you decide to implement the management of H&S practices? What was the driving force behind your decision?
- What was the situation PRIOR to the management of H&S practices? What issues did you address first? Why? How did you go about the implementation? How did you involve your staff? What sort of training were they given?

2.1 Describe your firm's health & safety policy. Discuss about the safety related strategic priorities exercised in your firm that you exercise for ensuring safety.

(e.g. When did you start making policy? When first introduced? Why did you start making policy? Tell me your current H&S policy (formal/informal). How they evolved? Do you have a formal company health and safety policy statement? Do you have a company director with overall responsibility for health and safety? Do you have a written safety policy, safety program and OHS manual or Safety Management System? Do you avoid highly risky ship (e.g. Oil Tanker)? Do you set reasonable production target? Do you use mechanization/ manual labour? How much? Do you compromise production & profit to ensure safety, how much? How much do you address future uncertainties along with present certainties? How much do you address long-term consideration along with short-term consideration for improving safety performance?

2.2 What have you done for developing yard infrastructure, mechanization and hazardous material handling facilities? What have been the major health & safety initiatives/programs that were implemented in the last 10 years (e.g. ISO 9000, ISO 14000 etc.)? When were these programs/initiatives implemented? Show years on event map. Do you practice formalization of management system for H&S practices? Please describe in detail. Do you have H&S focused Human Resources Management Practices? Please describe in detail. Do you have Management of PPE Issues? Please describe in detail. Do you have Management of Housekeeping issues? Please describe in detail.

2.3 What is the effectiveness of the initiatives and programs? How do you measure it? Do you have any data on accidents, injuries that would show quantitatively the level of health & safety outcome over the past 10 years?

2.4 Pre-management of H&S practices: What was the situation prior to the intervention? Were people getting injured? Why? Is there any underlying reason for the previous injuries?

2.5 How was the management of H&S practices communicated to you? How were you involved? What was the most memorable learning from the intervention process? Can you identify a manager that helped you most during the process? Why was it helpful?

2.6 Post-management of H&S practices: What was the situation after the implementation of management of H&S practices? What has improved?

3. Protocol for middle management

- Discuss about the operational priorities exercised in your firm that you exercise for ensuring safety.
- What was the situation prior to the intervention? Were people getting injured? Why? In there any underlying reason for the previous injuries?
- How was the intervention communicated to you? How were you involved? What was the most memorable learning from the intervention process? Can you identify a manager that you helped you most during the process? Why was it helpful?
- POST: what was the situation after the implementation? What has improved?
- Do you give reasonable breaking time for shipbreaking? How much?
- Do you avoid night shifts? How much?
- Do you avoid Overtime? How much?
- Do you compromise production & profit to ensure safety? How much?

3.1 Describe your firm's practices for process safety management (e.g. How much formally, rigorously and regularly your firm practices the PSM activities: Ensuring Employee Participation, Keeping and Providing Process Safety Information, Conducting Process Hazard Analysis, Following Operating Procedures, Conducting Safety Training, Managing Contractors, Pre-Start up Safety Review, Ensuring Mechanical Integrity, Taking Hot Work Permit, Management of Change, Incident Investigation, Emergency Planning and Response, Compliance Audits etc.).

3.2 Describe your firm's practices for behaviour-based safety management (e.g. How much formally, rigorously and regularly your firm practice the following activities: Risk analysis and pinpointing, Root Cause analyses of injuries, Goal setting, Training and prompting, observation and measurement, Performance feedback, Rewards and Incentives etc.)

3.3 Describe your firm's practices for developing safety skills of workers (e.g. technical skills & non-technical skills of workers)

3.4 Describe your firm's practices for managing safety culture in your firm (e.g. safety climate & team process)

4. Protocol for supervisors and front line workers

4.1 Safety Communication

- Does the firm have a Safety Committee/Safety Representatives?

If yes, please provide details (positions) of the Committee Member /safety

Representatives.

Committee Chairperson Name & Job Title

Committee Member/Safety Representatives Name & Job Title

- Does the firm hold regular site safety meeting?
- In what frequency are meetings held?
- Please attach a copy of a recent field supervisor's safety meeting record/minutes
- Does the firm hold regular "toolbox" safety meetings?
- In what frequency are meetings held?

Please attach a copy of a recent "Toolbox" safety meeting record/minutes

- Do you engage with on health and safety issues e.g. participating in health and safety meetings and suggestion schemes?
- Do you get health and safety supervisors on sites?
- Do you get the communication regarding health and safety information (through newsletters, leaflets, posters, etc.)?
- Do you get open display of company health and safety policy on ship breaking yards, company website, and head/branch offices? Do you get training related to H&S)
- Do you get amended and corrected health and safety plans (if necessary) during ship breaking?
- Do you get sanitation and welfare facilities on sites (e.g. toilets, canteens, drinking water)?

4.2 Training

- Does the induction program cover the following?
  Please attach a copy of the training agenda/topics covered in inductions.
- Does the induction program cover the following?

Areas of H & S	Yes/No/NA	Comments
Personal Protective Equipment (PPE)		
Foot protection		
Eye protection		
Hand protection		
Hearing protection		
Respiratory protection		
Scaffolding		
Housekeeping		
Fire protection		
First aid facilities		
Emergency procedures		
Hazardous substances		
Excavation and Trenching		
Confined spaces		
Working at heights		
Signs, barricades, flagging		
Electrical safety		

Rigging and crane safety		
Incident/injury Reporting		
Consultation process		

- Does the company have a system for recording training, qualifications, competencies and licences of its employees?
- If yes, please attach a copy of an employee's training records.
- Does the company have a program for newly hired or promoted supervisors?
- If yes, does training include instruction on the following?

Areas of H & S	Yes/No	Comments
OHS Legislation & Duty of Care		
Safe work practices		
Safety supervision		
Toolbox meetings		
Emergency procedures		
First aid procedures		
Equipment inspection procedures		
Injury/incident investigation		
Fire protection and prevention		
Lock out/tag out procedures		

4.3 Personal Protective Equipment

- What PPE do you provide for your employees and sub-contractors?

Type of PPE	Employees (Yes/No/NA)	Sub-contractors(Yes/No/NA)
Foot protection		
Eye protection		
Hand protection		
Hearing protection		
Respiratory protection		
Fall protection		
Safety Harnesses		
Others (specify)		

- How is the issue and use of PPE controlled?

4.4 Hazard Identification and Risk Assessment

- Does the company have a system for conducting risk assessments?

If yes, please attach a copy of 2 recent risk assessments.

- Does the company have a system to manage hazardous substances?
- Does the company keep a register of hazardous substances?

If yes, please attach a copy of the register

- Are Material Safety Data Sheets (MSDS) available where hazardous substances are stored/used?

4.5 Disciplinary Policy

- Does the firm have a Disciplinary Policy in place?

If yes, please attach a copy of the policy in place.

- Do you get reward for safe work behaviour and penalty for unsafe work behaviour? Do you attend training programmes?)

4.6 Alcohol and Other Drugs Policy

- Does the firm have an Alcohol and Other Drugs Policy?

If yes, please attach a copy of the policy in place.

4.7 Accidents, Injuries, deaths & diseases

Have you experienced any injury/diseases?

If yes, please describe the nature and cause of the injury/disease

4.8 Compensation & Rehabilitation

- Does the firm have an injury management/rehabilitation policy/program for employees who suffer work related injury/illness?

If yes, please attach a copy of the policy/program.

- Does the firm have a company doctor?
- Do you have a Work Cover accredited Rehabilitation Coordinator?

Appendix 3D Information Sheet Template

Information Sheet Template

This template is the starting point for constructing an Information Sheet.
Researchers – please ensure you use everyday language, avoid jargon and due consideration is given before excluding any items from the template.

Department of Management, Marketing and Entrepreneurship
University of Canterbury
Telephone: +64 21 02742727
Email: moutushi.tanha@pg.canterbury.ac.nz

Title of PhD research

Investigating management of firm level Health and Safety (H&S) practices in product dismantling industry: An empirical analysis of the ship breaking industry of the Developing Countries like Bangladesh.

Information Sheet for Participation in Research Project

I am a doctoral student in the Department of Management, Marketing and Entrepreneurship, University of Canterbury, New Zealand. My proposed study aims at investigating the motivational drivers behind occupational health and safety management interventions, managerial interventions adopted over time and their effect on health and Safety Performance: An empirical analysis of the ship breaking industry in Bangladesh.

Particularly, this research attempts to understand;

- Why do firms intervene in health & safety management practices over time?

- What are the health & safety management interventions adopted by the firms over time?
- What are the effects of the interventions by determining the relationships between Health and Safety interventions, management practices and H&S outcome?

I have a pleasure to invite you to participate in this study and to share your knowledge of the industry and its practices. The research aims to understand best practices in health and safety in the industry and to enable the industry to improve its health and safety performance by understanding and describing these practices. Your involvement will be through an interview - the expected duration of an interview will be about 90 minutes and it will be organised at the time of your convenience.

This project has been reviewed and approved by the University of Canterbury Human Ethics Committee, University of Canterbury, New Zealand ensuring the confidentiality and professionalism in handling of the project. Participation in this study is voluntary and you have the right to withdraw at any stage without penalty. If you withdraw, I will remove information provided by you provided this request is made prior to compilation of the project output. An interview transcript will be provided to you before the information is used for analysis. You will have the opportunity to make any changes to the interview data at that time. If no amendments are made, original transcripts will be used for further analysis.
There are no known risks involved in participating in this study.

You may receive a copy of the project results by contacting the researcher at the conclusion of the project.

The results of the project will be published, but you may be assured of the complete confidentiality of data gathered in this investigation: your identity will not be made public under no circumstances. To ensure anonymity and confidentiality, data will be placed in secure facilities and/or in encrypted electronic form. The data will be accessible only by the research team listed in the consent form. Raw data (such as consent forms, audio recording and transcripts) will be destroyed after 10 years. In addition to PhD thesis, the output of this project may also include conference papers and journal articles. A PhD thesis is a public document and will be available through the University of Canterbury Library.

The project is being carried out as a requirement of Doctor of Philosophy (PhD) by Moutushi Tanha under the supervision of Dr. Pavel Castka, who can be contacted at pavel.castka@canterbury.ac.nz. He will be pleased to discuss any concerns you may have about participation in the project. In case of any ethical concerns, participants should address any complaints to The Chair, Human Ethics Committee, University of Canterbury, Private Bag: 4800, Christchurch (human-ethics@canterbury.ac.nz).

If you agree to participate in the study, please complete the consent form and return by email to moutushi.tanha@pg.canterbury.ac.nz.

Regards

Moutushi Tanha
PhD student
Student ID: 94826243
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E-mail address: moutushi.tanha@pg.canterbury.ac.nz,
Contact number: + 64 21 027 42727

Appendix 3E Consent form (for participants) template

Consent Form Template

This template is the starting point for constructing a Consent Form.
Researchers – please ensure you use everyday language, avoid jargon and due consideration is given before excluding any items from the template.

Department of Management, Marketing and Entrepreneurship
University of Canterbury
Telephone: +64 21 027 42727
Email:
moutushi.tanha@pg.canterbury.ac.nz

Title of the PhD Research Project

Investigating management of firm level Health and Safety (H&S) practices in product dismantling industry: An empirical analysis of the ship breaking industry of the Developing Countries like Bangladesh.

Consent Form

Include a statement regarding each of the following:

- ☐ I have been given a full explanation of this project and have had the opportunity to ask questions.
- ☐ I understand what is required of me if I agree to take part in the research.
- ☐ I understand that participation is voluntary and I may withdraw at any time without penalty. Withdrawal of participation will also include the withdrawal of any information I have provided should this remain practically achievable.
- ☐ I understand that any information on individual firm or opinions I provide will be kept confidential to the researcher and the supervisors that any published or reported results will not identify the participants. I understand that a thesis is a public document and will be available through the UC Library.
- ☐ I understand that all data collected for the study will be kept in locked and secure facilities and/or in

password protected electronic form and will be destroyed after 10 years.

- ☐ I understand the risks associated with taking part and how they will be managed.
- ☐ I understand that I can contact the researcher **[** Moutushi Tanha, PhD student, Department of Management, Marketing and Entrepreneurship, University of Canterbury, E-mail address: moutushi.tanha@pg.canterbury.ac.nz, Contact number: + 64 21 027 42727] or supervisor [Associate Professor Pavel Castka, Department of Management, Marketing and Entrepreneurship, University of Canterbury, E-mail address: pavel.castka@canterbury.ac.nz, Contact number: +64 3 364 2987 ext. 93761] for further information.
- ☐ If I have any complaints, I can contact the Chair of the University of Canterbury Human Ethics Committee, Private Bag 4800, Christchurch (human-ethics@canterbury.ac.nz)

- ☐ I would like a summary of the results of the project.
- ☐ By signing below, I agree to participate in this research project.

Name:_____ Signed:_____ Date:_____

Email address *(for report of findings):*

_____

Please return this completed consent form by email to moutushi.tanha@pg.canterbury.ac.nz or in printed form at the time of interview.

Regards

Moutushi Tanha
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Student ID: 94826243
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Appendix 3F: Two excerpts from reflective field memos

The first memo was written on 05 January 2018 and the second was written the next day immediately after the interview. This excerpt summarises a more detailed reflective memo with the following indicators:

- What were your personal feelings and reflections as you were interviewing? How did you personally relate to your participant?
- What questions were useful?
- Were there any other questions that you should have asked?
- How satisfied are you with the interview?
- What codes/ concepts stand out for you from the interview?

3Fi). The first example of a reflective field memo:

Interview date	Analytic and reflective field memo
05 January, 2018	It was my second time meeting with Mr X (P1-I2-F1), though it was the first time face-to-face interview with him. The first time interview was in September 2017 where I took his interview through video call from New Zealand. The interview with Mr X is the longest so far, probably about 90 minutes, and he is passionate to share his insights with me. He started with showing me a documentary video on their firm's current H&S state with background history. He acknowledges there are strategic and operational challenges since the implementation of management of H&S practices. Among other are developing template on how top management has shown high level of safety commitment, how all the formal management certifications were secured, how can a safe workplace be developed and how can workers be managed to work safely in order to build a safety driven culture in his firm. Additionally, collecting and collating information from multiple national and international authorities, and providing a synchronised and timely audit report to the board of directors and chairperson for further decision making. Mr X's 15-years' experience in his present position (the details of job descriptions and names of organisation are omitted to keep his identity anonymous) made him always prefer to look at bigger picture and yet meticulous in managing H&S practices.

The interview with Mr X was among the early batch after the six pilot interviews and the first face-to-face interview were conducted. This reflective memo was drafted almost immediately after the interview. In the memo, pressing strategic and some operational issues confronting X's organisation were highlighted as the participant uttered, analysed and illustrated during the interview. I listened to his stories and deliberately not to take notes so he has no pressure to express himself freely. Nonetheless, Ahmad is an expert corporate figure who prefer to analyse problems from micro-macro and strategic-tactical-operational perspectives with relatively medium level experience (15 years) in management of H&S practices in shipbreaking industry. At time, I am reserved if his concern are valid and realistic as management of H&S practices is dynamic and volatile, different from his previous experience in economic planning. This reflective field memo technique is particularly useful for novice

qualitative researchers because the drafting of such a memo helped reorganise the interviewer's thoughts, review interview technique and questions, and better manage the time of future interviews.

3Fii). The second example of a reflective field memo:

Interview date	Analytic and reflective field memo
06 January, 2018	Mr X's views from the other shipbreaking firm's perspective on disaster management is important. His organisation is officially part of the SENSREC project affiliated under Ministry of Industry, Government of Bangladesh are currently under the supervision of the Industry Minister. Mr X's current role is to maintain lobbying with government officials and international bodies to secure a socially sustainable shipbreaking industry for Bangladesh. Mr X's analysis on his organisation's leadership role in the areas of management of H&S practices is informative and useful. Mr X is very generous with his time and sharing of his 5 years long effort to make a safe shipbreaking, from December 2011 to January 2016. I am very glad to have his support.

The second interview, the next day, with another participant from a different organisation was better conducted. Mr X is an experienced corporate figure in managing H&S issues in shipbreaking industry. His stories of the 5 years long effort to make a safe shipbreaking yard (2011-2016), which he led, was full of rigour and information. I made comparison his stories in response operation to Ahmad's stories of H&S management strategic planning, and attempted to give myself a more realistic perspective of the managing mechanism in responding to highly demanding H&S practices in Bangladesh. A more satisfactory insight was attained as a result of learning from the previous field memo where critical and specific questions on firm level response and management were given priority during the interview.

Appendix 4A: Different Levels of Strategic & Operational Prioritization for Safety

Averaging technique has been used for calculation of percentages of practices found in each firm. Calculation is given below:

i) Different Levels of Strategic Prioritization for Safety across 7 firms.

Here, calculation is shown only for F1 and same technique applies for rest of the firms.

In F1, avoiding highly risky ship' has been found in 100% practices, setting reasonable production target has been found in 90% practices ; use of mechanization has been found in 80% practices and addressing future uncertainties & long term considerations has been found in 100% practic

Number of components under Strategic Prioritization for Safety = 4

Average % of practices under Strategic Prioritization for Safety: (100+90+80+90)/4 = 360/4 = 90% for F1

ii) i) Different Levels of Operational Prioritization for Safety

In F1, reasonable level of breaking time has been found in 80% practices; avoiding night shifts has been found in 100% practices; avoiding overtime has been found in 100% practices and compromising production & profit to ensure safety has been found in 80% practices

Number of components under Strategic Prioritization for Safety = 4

Average % of practices under Strategic Prioritization for Safety: (80+100+100+80)/4 = 360/4 = 90% for F1

Appendix 4B: Different Levels of General Yard Infrastructure & Equipment across 7 firms

i) <u>Yard Infrastructure across 7 firms</u>

Presence of General Yard Infrastructure	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Impermeable floor	Yes	No	No	No	No	No	No
Berge	Yes	No	Yes	No	No	No	No
Full-fledged Dry Doc facility	No	No	No	No	No	No	No
security gates	Yes	Yes	Yes	Yes	Yes	Yes	Yes
medical facility inside yard	Yes	Yes	Yes	Yes	No	No	Yes
PPE storage	Yes	Yes	Yes	Yes	Yes	Yes	Yes
fire-fighting facility	Yes	Yes	Yes	Yes	No	No	Yes
Toilets	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Drinking water facility	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Hanging signboards with major H&S guidelines	Yes	No	Yes	No	No	No	No
Proper large gate	Yes	Yes	Yes	Yes	No	No	No
Security guard & reception centre	Yes	Yes	Yes	Yes	No	No	No
Security checking	Yes	Yes	Yes	Yes	No	No	No
Hanging layout of the yard	Yes	Yes	Yes	Yes	No	No	No
Emergency contact numbers of all concerned authorities	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Truck way indicator	Yes	No	Yes	No	No	No	No
Precautionary guidelines for movement in yard	Yes	Yes	Yes	Yes	No	No	Yes
Worker training centre	Yes	Yes	Yes	Yes	No	No	No
First aid centre	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pond (water body)	Yes	Yes	Yes	Yes	No	No	No
Emergency exit	Yes	No	Yes	No	No	No	No
Dormitory for living	Yes	Yes	Yes	Yes	No	No	No
Mess room with cooking facilities	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Recreation room	Yes	Yes	Yes	Yes	No	No	No
Hospital access	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Safety Officer's room	Yes	Yes	Yes	Yes	No	No	No
Level of Yard Infrastructure	**Very High (96%)**	**High (70%)**	**Very High (92%)**	**High (70%)**	**Low (40%)**	**Low (40%)**	**Medium (50%)**

ii) Hazardous Material Handling Facilities across 7 firms

Hazardous material handling facilities (MC)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
hazardous waste storage and removal system	Yes	Yes	Yes	Yes	Yes	Yes	Yes
classified collection of wastes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
hazardous waste storage area	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Asbestos removal and storage area	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Glass wool, thermocal and insulating material area	Yes	Yes	Yes	Yes	No	No	Yes
Paint chips and metal waste removal system	Yes	No	Yes	No	No	No	No
Plastic and rubber waste removal system	Yes	Yes	Yes	Yes	No	No	Yes
Empty chemical container and pressurized container removal system	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Electronic waste and material containing PCB removal system	Yes	Yes	Yes	Yes	No	No	Yes
Oily sludge & oily sand removal system	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Broken lights and lighting materials removal system	Yes	No	No	No	No	No	No
Bio medical waste removal system	Yes	Yes	Yes	Yes	No	No	Yes
Oily water separator	Yes	No	Yes	No	No	No	No
Platform for oil containers	Yes	No	Yes	No	No	No	No
Incinerator	Yes	Yes	Yes	Yes	Yes	Yes	Yes
fire alarm	Yes	Yes	Yes	Yes	No	No	Yes
Fire extinguisher	Yes	Yes	Yes	Yes	No	No	Yes
Workers change and rest room	Yes	No	Yes	No	No	No	No
Level of Hazardous Material Handling Facilities	**Very High (100%)**	**High (70%)**	**Very High (100%)**	**High (70%)**	**Low (40%)**	**Low (40%)**	**High (70%)**

ii) Table: Level of Yard Mechanisation & Equipment across 7 firms

Yard Mechanisation & Equipment (MC)	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Winch machine	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Crane	Yes	Yes	Yes	Yes	No	No	No
magnetic crane	Yes	Yes	Yes	Yes	No	No	No
lifter	Yes	Yes	Yes	Yes	No	No	Yes
tractors	Yes	No	Yes	No	No	No	No
generators	Yes	Yes	Yes	Yes	No	No	No
Tool Box	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Woki Toki	Yes	No	No	No	No	No	No
Level of Yard Mechanisation & Equipment	**Very High (100%)**	**High (70%)**	**Very High (90%)**	**High (70%)**	**Low (40%)**	**Low (40%)**	**Medium (50%)**

Appendix 4C: Different levels of Formalization of Systemic Practices across 7 firms

Components of Formalization of Systemic Practices	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Formal Management Certification							
Number of adopted formal management certificates (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000, HKC SOC, EU enlistment)	75% (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000, HKC SOC, applied	50% (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000)	50% (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000)	50% (ISO 9001, ISO 14001, OHSAS 18001, ISO 30000)	25% (ISO 9001)	25% (ISO 9001)	25% (ISO 9001)

	for EU enlistment)						
Quality of certifiers (Accreditation of certifiers, Local/ Foreign certifiers)	100% (Certified by accredited foreign certification body)	50% (Certified by non-accredited local certification body)	100% (Certified by accredited foreign certification body)	50% (Certified by non-accredited local certification body)	0% (Certified by non-accredited local certification body)	0% (Certified by non-accredited local certification body)	0% (Certified by non-accredited local certification body)
Regularly Renewal and Updating of certificates	100% Regularly renewed and updated since the first adoption	50% (Irregularly renewed and updated since the first adoption)	100% (Regularly renewed and updated since the first adoption)	50% (Irregularly renewed and updated since the first adoption)	0% (Never renewed since the first adoption)	0% (Never renewed since the first adoption)	0% (Never renewed since the first adoption)
level of Formal Management Certification	**92%**	**50%**	**83%**	**50%**	**8%**	**8%**	**8%**
Human Resources Management Practices	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Presence of experienced workers (5+ years)	70%	60%	70%	60%	40%	40%	60%
Presence of permanent workers (Out of total number of workers)	50% permanent	30% permanent	50% permanent	30% permanent	0% permanent	0% permanent	0% permanent
Presence of local workers	50% Local	40% Local	50% Local	40% Local	40% Local	40% Local	40% Local
Presence of regularly provided formal Safety Training for workers	100% (Very Highly formal & regular)	50% (Moderately formal & irregular	80% (Highly formal & regular)	50% (Moderately formal & regular)	40% (least Formal & irregular)	40% (least Formal & irregular)	60% (Moderately formal & regular)
Providing salary higher than the mandatory amount	0 (Only mandatory amount set by government)	0% (Only mandatory amount set by government)	0 (Only mandatory amount set by government)	0% (Only mandatory amount set by government)	100% (Very High than mandatory amount set by government)	100% (Very High than mandatory amount set by government)	100% (Very High than mandatory amount set by government)
Providing Attendance Bonus	100%	100%	100%	100%	0	0	0

					(No bonus for attendance)	(No bonus for attendance)	(No bonus for attendance)
Fully & Regularly providing Medical Expenses for injured workers	100% (Total expense covered & Regularly covered)	80% (Total expense covered & irregularly covered)	100% (Total expense covered & Regularly covered)	80% (Total expense covered & irregularly covered)	60% (Partial expense covered & irregularly covered)	60% (Partial expense covered & irregularly covered)	100% (Total expense covered & regularly covered)
Fully & Regularly providing mandatory Compensation amount for dead & injured (major) workers	100% (Full amount covered & regularly covered)	60% (Partial amount covered & regularly covered)	100% (Full amount covered & regularly covered)	60% (Partial amount covered & regularly covered)	60% (Partial amount covered & irregularly covered)	60% (Partial amount covered & irregularly covered)	100% (Partial amount covered & regularly covered)
Level of Human Resources Management Practices	**High (70%)**	**Medium (52%)**	**High (64%)**	**Medium (52%)**	**Low (40%)**	**Low (40%)**	**Medium (58%)**
Management of PPE Issues	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
1.Formal & Written Policies related to PPE	100% (Formal, written, visual, available to all workers)	40% (Informal, available to all workers)	100% (Informal, visual, available to all workers)	40% (Informal, available to all workers)	40% (Informal, unavailable to all workers)	40% (Informal, unavailable to all workers)	40% (Informal, visual, available to all workers)
2.Use & Users of PPE (all gear/some gear)	100% (All PPE compulsory for cutters and fitters; all other workers use only safety boots and helmets)	60% (Safety boots and helmets compulsory only for cutters & fitters; 60% of the total workers use safety boots and helmets)	80% (All PPE compulsory for cutters and fitters; & 80% of workers use safety boots and helmets)	60% (Safety boots and helmets compulsory only for cutters & fitters; 60% of the total workers use safety boots and helmets)	40% (Safety boots and helmets compulsory only for cutters & fitters; 80% of the total workers do not use even safety boots and helmets)	40% (Safety boots and helmets compulsory only for cutters & fitters; 80% of the total workers do not use even safety boots and helmets)	60% (Safety boots and helmets compulsory only for cutters & fitters; 60% of the total workers use safety boots and helmets)
3.Adequacy of PPE	100% (Very Adequate)	50% (Moderatel y Adequate)	80% (Adequate)	50% (Moderately Adequate)	40% (Inadequate)	40% (Inadequate)	60% (Moderately Adequate)
4.Quality of PPE	100%	50%	80%	50%	40%	40%	60%

	(Good, Imported)	(Medium, local)	(Medium, local)	(Medium, local)	(Medium, local)	(Medium, local)	(Medium, local)
5.Formal & Regular Training for PPE	100% (Formal & Regular)	50% (Informal & Regular)	60% (Informal & Regular)	50% (Informal & Regular)	40% (Informal & Irregular)	40% (Informal & Irregular)	60% (Informal & Regular)
6.Formal & Regular Documentation of PPE issue	100% (Formal, regular)	50% (Formal, irregular)	100% (Formal, regular)	50% (Formal, irregular)	40% (Informal, irregular)	40% (Informal, irregular)	50% (Informal, regular)
Level of Management of PPE Practices	**Very Well-Integrated (100%)**	**Moderately Integrated (50%)**	**Well-Integrated (83%)**	**Moderately Integrated (50%)**	**Ill-Integrated (40%)**	**Ill-Integrated (40%)**	**Well-Integrated (55%)**
Overall Assessment of Formalization of Systemic Practices	**Very High (87%)**	**Medium (51%)**	**High (77%)**	**Medium (51%)**	**Low (29%)**	**Low (29%)**	**Low (40%)**

Appendix 4D: Different levels of Formalization of Operating Practices across 7 firms

Management of Housekeeping issues	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Work area maintained appropriately (e.g. trash and scrap picked up, no spills)	100% Present	60% Present	80% Present	60% Present	40% Present	40% Present	80% Present
Walkways unobstructed	100% Present	60% Present	80% Present	60% Present	40% Present	40% Present	80% Present
Materials and tools organized	100% Present	60% Present	80% Present	60% Present	40% Present	40% Present	80% Present

Monitoring of housekeeping activities	100% Present	60% Present	80% Present	60% Present	40% Present	40% Present	80% Present
<u>Level of Management of Housekeeping issues</u>	**Very High (100%)**	**Medium (60%)**	**High (80%)**	**Medium (60%)**	**Low (40%)**	**Low (40%)**	**High (80%)**
Process Safety Management (PSM) practices	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
1. Formal, rigorous & regular ensuring of Employee Participation	100% (Highly Formal & highly rigorous)	60% (Moderately formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
2. Formal rigorous & regular keeping and providing of process safety Information	100% (Highly Formal & highly rigorous)	80% (Highly formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	80% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Highly formal & moderately rigorous)
3. Formal rigorous & regular Conducting of Process Hazard Analysis	100% (Highly Formal & highly rigorous)	80% (Highly formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	80% (Highly formal & moderately rigorous)	60% (Lowly formal & Lowly rigorous)	60% (Lowly formal & Lowly rigorous)	80% (Highly formal & moderately rigorous)
4. Formal rigorous & regular Conducting of Process Hazard Analysis	100% (Highly Formal & highly rigorous)	80% (Highly formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	80% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Highly formal & moderately rigorous)
5. Formal rigorous & regular Following of Operating Procedures	100% (Highly Formal & highly rigorous)	80% (Highly formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	80% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Highly formal & moderately rigorous)
6. Formal rigorous & regular Managing of Contractors	100% (Highly Formal & highly rigorous)	60% (Moderately formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
7. Formal rigorous & regular Conducting of Pre-Start up Safety Review	100% (Highly Formal & highly rigorous)	60% (Moderately formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
8. Formal rigorous & regular Ensuring of Mechanical Integrity	100% (Highly Formal &	80% (Highly formal &	90% (Highly formal &	80% (Highly formal &	60% (Moderately formal &	60% (Moderately formal &	80% (Highly formal &

	highly rigorous)	moderately rigorous)	moderately rigorous)	moderately rigorous)	moderately rigorous)	moderately rigorous)	moderately rigorous)
9. Formal rigorous & regular Taking of Hot Work Permit	100% (Highly Formal & highly rigorous)	80% (Highly formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	80% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Highly formal & moderately rigorous)
10. Formal rigorous & regular Management of Change	100% (Highly Formal & highly rigorous)	60% (Moderatel y formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
11. Formal rigorous & regular Incident Investigation	100% (Highly Formal & highly rigorous)	60% (Moderatel y formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
12. Formal rigorous & regular Emergency Planning and Response	100% (Highly Formal & highly rigorous)	60% (Moderatel y formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
13. Formal rigorous & regular Compliance Audits	100% (Highly Formal & highly rigorous)	60% (Moderatel y formal & moderately rigorous)	90% (Highly formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
Level of Process Safety Management (PSM) practices	**Very High (100%)**	**High (71%)**	**Very High (90%)**	**High (71%)**	**Medium (49%)**	**Medium (49%)**	**High (71%)**
Behaviour-based Safety Management (BSM) Practices	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
1.Formal rigorous & regular Conducting of Risk analysis and pinpointing	90% (Highly Formal & moderately rigorous)	60% (Moderatel y formal & moderately rigorous)	80% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
2.Formal rigorous & regular Setting of Goals	90% (Highly Formal & moderately rigorous)	60% (Moderatel y formal & moderately rigorous)	80% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
3,Formal rigorous & regular Providing of Training and prompting	90% (Highly Formal &	60% (Moderatel y formal &	80% (Moderately formal &	60% (Moderately formal &	40% (Lowly formal &	40% (Lowly formal &	60% (Moderately formal &

	moderately rigorous)	moderately rigorous)	moderately rigorous)	moderately rigorous)	Lowly rigorous)	Lowly rigorous)	moderately rigorous)
4,Formal rigorous & regular Conducting of Observation and measurement	90% (Highly Formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
5.Formal rigorous & regular Providing of Performance feedback	90% (Highly Formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
6.Formal & Rigorous Providing of Rewards and Incentives	90% (Highly Formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	80% (Moderately formal & moderately rigorous)	60% (Moderately formal & moderately rigorous)	40% (Lowly formal & Lowly rigorous)	40% (Lowly formal & Lowly rigorous)	60% (Moderately formal & moderately rigorous)
Level of Behaviour-based Safety Management (BSM) Practices	**Very High (90%)**	**(60%) Moderately Integrated**	**(80%)**	**(60%)**	**(40%)**	**(40%)**	**(60%)**
Overall Assessment of Safety Operating Practices	**Very High (97%)**	**High (64%)**	**Very High (83%)**	**High (64%)**	**Medium (43%)**	**Medium (43%)**	**High (70%)**

Appendix 4E: Different levels of Safety Skills across 7 firms.

Components of Safety Skills	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Technical Safety Skills							
Level of Technical Qualification of workers (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Practical working experience of workers (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Process safety skills of workers (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%

Level of Competency of workers (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Emergency skills of workers (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Technical Safety skills of workers	**Very High (70%)**	**Medium (60%)**	**High (70%)**	**Medium (60%)**	**Low (40%)**	**Low (40%)**	**High (60%)**
Non-Technical Safety Skills							
Level of Decision-making & problem-Solving Skills (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Coping skill with Operational Change (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Situational Awareness (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of interpersonal communication skill (Out of total number of workers)	70%	60%	70%	60%	40%	40%	60%
Level of Non-Technical Safety Skills	**Medium (70%)**	**Low (60%)**	**Medium (70%)**	**Low (60%)**	**Low (40%)**	**Low (40%)**	**Low (60%)**
Overall Assessment of Safety Skills	**High (70%)**	**Medium (60%)**	**High (70%)**	**Medium (60%)**	**Low (40%)**	**Low (40%)**	**Medium (60%)**

Appendix 4F: Different levels of components of Safety Culture across 7 firms.

Components of Safety Culture	**F1**	**F2**	**F3**	**F4**	**F5**	**F6**	**F7**
Safety Climate							
Level of Just & fair culture	90%	60%	70%	60%	40%	40%	70%
Level of Error management culture	90%	60%	70%	60%	40%	40%	70%
Level of Flexible culture	90%	60%	70%	60%	40%	40%	70%
Level of Safety Climate	**Very High (90%)**	**Medium (60%)**	**High (70%)**	**Medium (60%)**	**Low (40%)**	**Low (40%)**	**High (70%)**
Team processes							

Level of Effective Team Communication (Out of total number of practices)	90%	60%	70%	60%	40%	40%	60%
Level of Effective Team Leadership (Out of total number of practices)	90%	60%	70%	60%	40%	40%	60%
Level of Motivation of Workers to work safely (Out of total number of practices)	80%	60%	70%	60%	40%	40%	60%
Level of Team processes	**Very High (87%)**	**Medium (60%)**	**High (70%)**	**Medium (60%)**	**Low (40%)**	**Low (40%)**	**Medium (60%)**
Overall Assessment of Safety Culture	**Very High (89%)**	**Medium (60%)**	**High (70%)**	**Medium (60%)**	**Low (40%)**	**Low (40%)**	**High (65%)**