

THE ROLE OF HUMAN ERROR IN ACCIDENTS WITHIN OIL AND GAS INDUSTRY IN BAHRAIN

M. AlKhldi, C. Pathirage and U. Kulatunga

School of the Built Environment, University of Salford, Salford, M5 4WT, UK

Email: M.Alkhaldi1@edu.salford.ac.uk

Abstract: Through the last few decades, there is an increase in occupational accidents figures in different workplaces around the world. A number of causes contributes to these accidents but one of the main causes of these accidents is human error. Human error is an improper decision or behaviour of any worker in the workplace which leads to a negative impact on the workplace. In other words, it is an act which creates an emergency situation, causes loss of lives, damages property and environment, and hampers the economic activities of any workplace. In the case of Oil and Gas (O&G) industry, human error constitutes as the largest contributor of over 70% of all accidents. As O&G industry deals with a variety of risky chemicals and operations, the costs of these accidents are too high to the employees, workplace, economy and society. Few studies have paid attention to human error issue particularly within O&G industry. Therefore, considering human error related accidents within O&G industry is becoming an important global concern. Thus, the aim of this paper is to highlight the role of human error in accidents within O&G industry. This will be done through an extensive review of literature. Paper will provide a definition on human error in general and in O&G industry and discuss main causes that lead to human error related accidents. Study will consider Bahrain O&G industry as a case study and explore some recommendations that help in reducing the occurrence of human error related accidents.

Keywords: Accident, Human Error, Oil and Gas Industry, Safety.

1. INTRODUCTION

During the industrial history, there are several drastic industrial accidents that happened and resulted in loss in workers' life and workplaces. Piper Alpha disaster (1988), Bhopal Gas Plant disaster (1984), Chernobyl Nuclear Power Plant disaster (1986) and BP Deepwater Horizon Oil Spill disaster (2010) are examples of these accidents. As a result, safety revealed as a building block of any industrial policy to protect workers against sickness, disease and injury related to the working environment. Safety is reflected in numbers of believes or myths like 'safety first', 'safety comes first' and 'most accidents are caused by human error' (Besnard & Hollnagel, 2012). In simple expression, safety is the absence of an undesirable event that involves an unplanned and unacceptable loss; therefore, safety, risk, beliefs, perceptions of risk, causes of accidents and safety culture are fundamental prerequisites for effectively managing risks and designing preventive measures in workplaces (Edwards, Davey and Armstrong, 2013; Turtiainen and Vaananen, 2012; Nordlöf, Wiitavaara, Winblad, Wijk and Westerling, 2015). Thus, today more than ever, most types of industries have started to concern about ensuring safety, identifying, evaluating, and managing different risks and reducing accidents (Díaz-de-Mera-Sanchez, González-Gaya, Morales and Rosales, 2015; Zakaria, Mansor and Abdullah, 2012; Besnard & Hollnagel, 2012).

This concern is highly required in risky workplaces like O&G industry as the economic perspective of the accidents in this industry is an important issue (Bolu, 2011). Health and

Safety Executive (HSE) (1999) found that the costs of one accident in O&G industry like Piper Alpha disaster were over £2 billion including £76 million indirect insurance payments and 167 of people were killed while in comparison the cost of 7000 accidents occurring each year in motor vehicle repair industry was £250 million which equates to £5000 per garage. Moreover, the fatality rate of workers in the O&G industry was higher than the rate of other workplaces (Mason, Retzer, Hill & Lincoln, 2015). The accident rate of this industry in some countries is included in the accident rate of manufacturing sector as a whole. For example, in UK the accident rate for manufacturing sector that includes O&G industry was 23% in 2014 which was less than a quarter when United Kingdom was ranked as the 11th largest manufacturing nation around the world (Reporting of Injuries, Diseases and Dangerous Occurrences Regulations RIDDOR, 2014). However, in Malaysia, this rate was around 20% in 2015 and this rate declined in comparison to 35% in 2009 (Ministry of Human Resource MOHR, 2016). On the other hand, statistics of Ministry of Labor (MOL) in Bahrain showed that the number of occupational accidents in all industry types is high and human error plays a key role within these accidents (Alaradi, 2010). This rate in Bahrain is increasing in comparison to the declining trend in UK and Malaysia as it is shown in Table 1 (MOL, 2015).

Table 3 Accident Rate in Manufacturing Sector in Bahrain (Source: MOL, 2015)

Year	Accident rate
2010	23.4%
2011	24.2%
2012	25%
2013	23%
2014	26.2%

Based on these statistics and the consequences of these accidents in O&G industry in Bahrain, the aim of this paper is to highlight the role of human error in accidents within O&G industry. This aim will be achieved through the following sections. This paper has seven main sections which are introduction, accidents and occupational health and safety (OHS), O&G industry background, methodology, human error specific accidents in O&G industry, discussion and conclusion.

2. ACCIDENTS AND OCCUPATIONAL HEALTH AND SAFETY

Through the last few decades, there is an increase in occupational accidents figures worldwide. In general, an accident is an undesired and unplanned event that leads to death, personal injuries, damage or loss to property, plant, materials or the environment and/or loss of business opportunity (Zakaria et al., 2012). According to International Labour Organization (ILO) (2014), occupational accidents and work-related diseases result in more than 2.3 million fatalities globally every year, of which over 350,000 result from occupational accidents and around to 2 million result from work-related diseases. The current increasing trend in these accidents has seen as an alarming sound to deflect attention to OHS to gain considerable economic benefits regarding the availability of work, level of morale, human resources usage, labor and management relations, key skills, insurance costs, medical expenditures and faulty products (Díaz-de-Mera-Sanchez et al., 2015; WBG, 2011). OHS is promoting and maintaining the highest degree of physical, mental and social well-being of

workers in all occupations, preventing departures from workers' health caused by their working conditions, protecting workers from risks resulting from factors adverse to health and placing and maintaining the worker in an occupational environment adapted to his physiological and psychological capabilities (WBG, 2011).

Walters, Wadsworth and Quinlan (2013) argued that introducing and managing OHS in a workplace are based on how this workplace operates and what types of risks it has. Besides, identifying the causes of any accident is also a fundamental requirement. Based on literatures, many causes of accidents were identified as it is shown in Figure 1. Human error is one of critical causes, which will be explained in the next section.

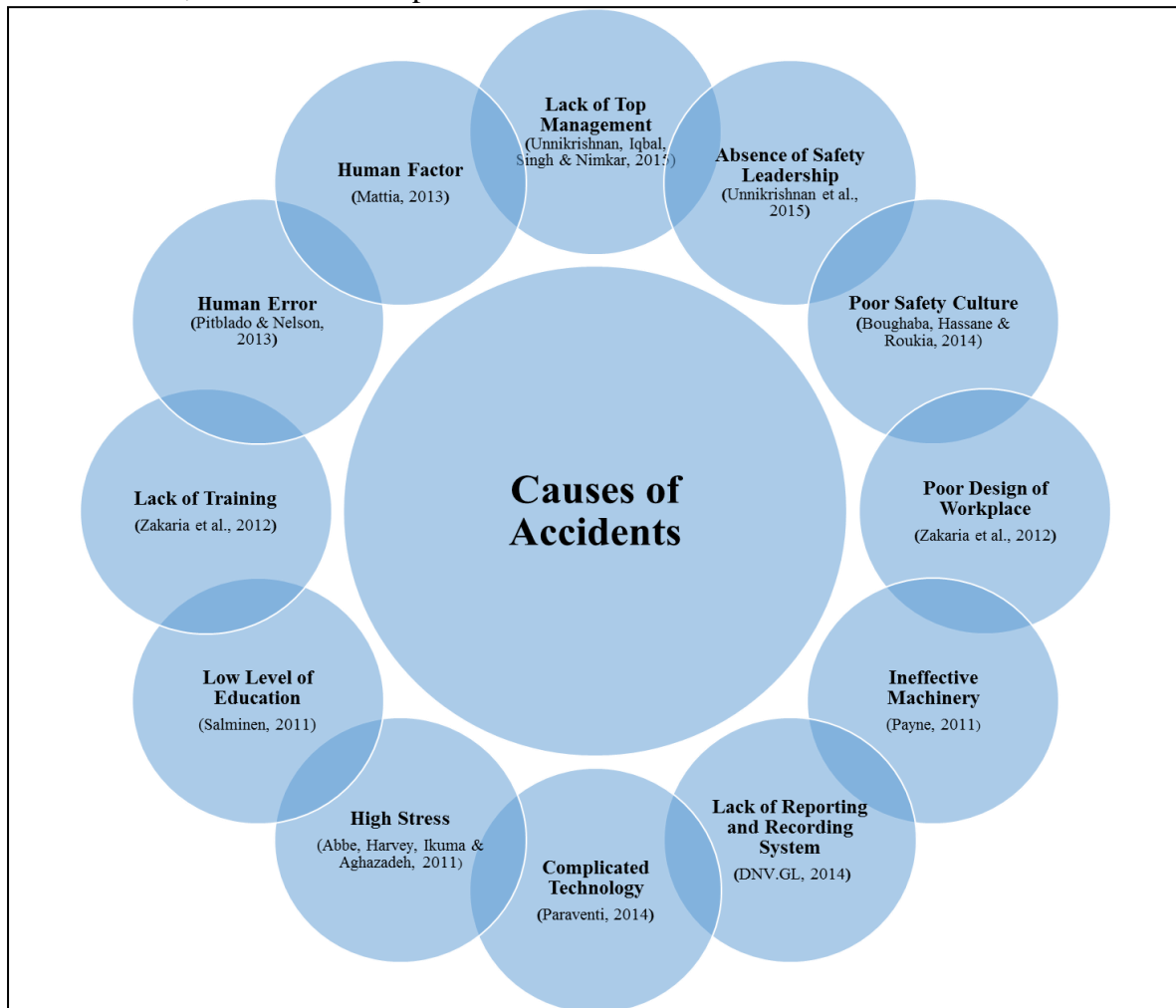


Figure 29: Causes of Accidents

2.1 Human Error

Human error constitutes as the largest cause of up to 80% of all workplace accidents and it was a root cause of all critical accidents in recent memory, including the Bhopal Gas Plant disaster, Hillsborough football stadium disaster, Paddington and Southall rail crashes, capsizing of the Herald of Free Enterprise, Chernobyl and Three-Mile Island incidents and the Challenger Shuttle disaster (Pitblado & Nelson, 2013; Manchi, Gowda & Hanspal, 2013; Zeng, Tam & Tam, 2008). Mattia (2013) and Patel, Sherratt and Farrell (2012) found that human error was and still is a concern of different researches and books since the Domino Theory of Heinrich. Heinrich is a leader of Industrial Safety Engineer (Mattia, 2013; Patel,

Sherratt and Farrell, 2012) and he described human error as a poor behaviour or an inadequate risk perception (Patel et al., 2012). In addition, Manchi et al. (2013) described it as a result of human nature. It is deemed as an improper decision or behavior of a worker which may have a negative impact on the effectiveness of safety performance system. However, Mattia (2013) interpreted human error as a natural consequence that is resulted from a break between human capacities (human) and the demands of processes and procedures (machine). He also found that human error is a result of lack of situation awareness, which is the perception of components in the process environment, the understanding of the meaning of these components and the projection of their situation in the future. However, earlier researches also had expressed human error. For example, Zhu and Xiao-ping (2009) found from the perspective of human mind that human error happens due to the artificial mistakes, whether intentional or unintentional. As well as, Zeng et al. (2008) claimed that human error that potentially causes an accident can be referred as an unsafe act that depart from hazard control or job procedures to which the person has been trained or informed and in turn this act leads to unnecessary exposure of a person to hazards.

Further, Reason (1990) and Kontogiannis and Embrey (1992) have introduced different classifications to illustrate this term as it is summarized in Table 2 and Table 3. According to Reason (1990), human failure is divided into two main categories which are human error and violation. Human error is by definition, an unintentional action or decision whereas violation is a deliberated intention to do the wrong thing or to depart from safe operating procedures, recommended practices, rules, standards or any noncompliant acts but not the bad consequences. Simply, human error is the failure of planned actions to reach the desired aim (Reason, 1990). Based on that, human error is divided into three main categories as slip, lapse and mistake. Slip and lapse are considered as failures in the execution time of routine and well-practiced tasks in a familiar environment. Within these two categories, the planned action does not go as planned or properly because something happened and prevented that. Slip occurs when actions were not carried out as intended or planned while lapse occurs when actions were missed. This scenario occurs due to confusing or poor labelling. On the other hand, mistakes occur in the planning phase. Mistakes are defined as actions that are executed entirely as planned, but the plan itself is inadequate to achieve the intended outcome. Mistakes occur due to a lack of knowledge or an inappropriate judgement. Reason (1990) also divided mistake into two categories based on the level of performance at which they occur as rule-based mistakes and knowledge-based mistakes. Indeed, rule based mistake describes a failure in the selection or application of problem solving rules. These problem solving rules are predefined rules that are known from experience and training. In contrast, knowledge-based mistake describes a failure of information processing capabilities of a worker while evaluating and solving a novel problem that does not have any pre-packaged rules. This form of mistake requires a solution from first principles.

Table 4: Reason's (1990) Classification of Human Error

Classification of human error based on Reason (1990)
<ul style="list-style-type: none"> ● Slips: Actions were not carried out as intended or planned. ● Lapses: Actions were missed. ● Mistakes: A plan was inadequate to achieve the intended outcome.

Apart from that, Kontogiannis and Embrey (1992) have formulated another classification structure of human error. They divided human errors into six types which are action, checking, retrieval, transmission, diagnostic and decision errors. First, action errors occur

when no action is taken or the wrong action is taken or the correct action is taken but on the wrong object. Second, checking errors occur when the checks are omitted, the wrong checks are made or the correct check is made on the wrong object. Third, retrieval errors occur when information that is required is not available, or the wrong information is received. Fourth, transmission errors occur when information has to be passed onto someone else, no information is sent, the wrong information is sent, or it is sent to the wrong place. Fifth, diagnostic errors occur when an abnormal event arises and the actual situation is misinterpreted. Last but not least, decision errors occur when the circumstances were considered but the wrong decision is made. In fact, action and checking errors are related to Reason's (1990) skill-based slips and lapses, retrieval and transmission errors are related to Reason's (1990) rule-based mistakes and diagnostic and 'decision' errors are related to Reason's (1990) knowledge-based mistakes.

Table 5: Kontogiannis and Embreys' (1992) Classification of Human Error

Classification of human error based on Kontogiannis and Embrey (1992)
<ul style="list-style-type: none"> • Action errors: No action was taken/ wrong action was taken. • Checking errors: Checks were omitted/ wrong checks were made. • Retrieval errors: Required information was not available/ wrong information was received. • Transmission errors: No information was sent/ wrong information was sent/ information was sent to the wrong place. • Diagnostic errors: Misinterpretation of an abnormal event. • Decision errors: Wrong decision was made.

As many definitions tried to define human error differently, human error is an unintended failure of achieving the planned outcomes in a form of action, checking, retrieval, transmission, diagnostic and decision errors. Thus, this definition has four main characteristics as:

1. there was no intention to commit an error,
2. the action was purposeful,
3. the action was action error, checking error, retrieval error, transmission error, diagnostic error or decision error,
4. the intended outcome was not achieved.

Having discussed accidents and human error in general, next section will discuss O&G industry and its current challenges from different angles.

3. O&G INDUSTRY BACKGROUND

O&G industry is an important part of the national economy and a backbone of the economy of most countries located in the Middle East like Bahrain and other regions worldwide (Mitchell et al., 2012). It is divided into three major units as upstream, midstream and downstream. The upstream unit embodies exploration, development, drilling and production of crude oil or natural gas. While the midstream unit focuses on processing and gathering the crude oil and gas and the downstream unit involves refining, storing, distributing and marketing petroleum products to domestic and industrial consumers. O&G industry has grown rapidly over the past 40 years and it is expected to grow more with a strong demand

(Mattia, 2013). Despite the fact that the recent rapid development projects in this industry have provided a wealth of new jobs and a burst of economic vitality for various countries, these benefits are at a cost (Paraventi, 2014).

The ageing O&G industry presents with numerous challenges that limit many developments. First of all, the price of oil is currently a great deal of uncertainty. As well as, O&G industry nowadays is confronting a sharpened focus on cost and an increased demands for uptime (Christ, 2015). Indeed, this industry is highly vulnerable to risks as many built-in health and safety risks may appear in most of the levels, operational conditions, production projects, facility operations, maintenance, construction, transport, storage, chemicals and end products which may spark serious health and safety problems and accidents (Awodele et al., 2014; Achaw & Boateng, 2012). Unfortunately, accidents are still relatively common in O&G industry (Christ, 2015; Pitblado and Nelson, 2013). Paraventi (2014) found that the rate of accidents in O&G industry is two and a half times higher than the construction industry and seven times higher than general industries.

3.1 O&G Industry in Bahrain

O&G industry is a pillar of Bahrain's economy. It covers the exploration, production, refining, marketing, and distribution of Bahraini oil for both domestic use and the international market such as Middle East, India, the Far East, South East Asia and Africa (Economic, 2013; EIA, 2011). O&G industry reserves more than 80% of total government revenues and more than 60% of total exports (EIA, 2011). Several new investments and competing projects are being planned or have recently been completed in O&G industry in Bahrain. For example, the current government policy in this industry is to consolidate the oil industry through further development in petroleum resources, improvement in seismographic surveys and enhancement in developmental drilling which all lead to explore new sources of O&G (WTO, 2014) and to double output from O&G fields (Economic, 2016). On the other hand, several challenges are facing O&G industry in Bahrain which will be illustrated in the next sub-sections.

Challenges as a Developing Country

Bahrain as a developing country that operates in today globalized market is enforced to operate among several regions and countries. As a result, a new challenge is initiated to propose more sophisticated accident prevention programs and OHS management systems taking into account cultural differences (Hassanzadeh, 2013). Furthermore, the complexity of the required instrumentation, regulatory regime, expertise and technology in O&G industry, the nature of the impact of the products, by-products and waste products on human health and the environment are main questions in this industry especially with the global trend for a safe and friend environment (Achaw & Boateng, 2012). Besides, Marcella et al. (2011) have indicated that this industry within these countries requires better OHS regulations, greater consistency, better safety standards and better enforcement due to lack of openness and sharing across management, robust safety assessment, agreement on competence measurement techniques and accurate training program. After explaining these challenges, the next section will explain challenges of petroleum countries.

Challenges as a Petroleum Country

Bahrain as a petroleum country is confronting also with several health and safety related problems regarding their economy and nature. For example, there are limited integrated researches on the region's long-term institutional and sectoral development and hence its long-term geoeconomic significance is missed (AlBanna, 2002; Matooq & Suliman, 2013). Further, ports and oil terminals in Bahrain are at high risk of major oil spills and accidents (Naser, 2011). Besides, details and statistics of occupational accidents in Bahrain are seldom recorded and this may be explained by likelihood of recording bias (Matooq & Suliman, 2013). Additionally, these statistics do not contain a lot of data about the root causes of the accidents (Matooq and Sulima, 2013; Bahrain News Agency BNA, 2013; AlBanna, 2002); thereby, Matooq and Suliman (2013) indicated that OHS framework in Bahrain is not suitable now to depend on. However, National Examination Board of Occupational Safety and Health (NEBOSH) in 2007 and Matooq and Suliman (2013) have confirmed that safety framework in Bahrain needs strongly more redesigning and development plans with more fairness and transparency in enforcement decisions. On top of that, there are no ongoing dedicated regulations for the processes in O&G industry. This poses a question to Bahrain, especially as it concerns on generating revenue instead of improving OHS standards while other industrialized countries are contemplating the importance of OHS laws within this industry (Neave, 2010).

4. METHODOLOGY

An extensive literature review of existing published relevant materials is carried out to explain human error, O&G industry and human error specific accidents in O&G industry in general and in Bahrain in specific. These relevant materials include textbooks, journals, conference papers, and Internet information that assist in capturing the background of accident and human error specific accidents in O&G industry in general and in Bahrain in specific. Some Bahrain's Governmental publications from the Ministry of Labor were also used to show some critical statistics related to the aim of this paper. The main purpose behind reviewing all these materials is to address human error related accidents in O&G industry in Bahrain by explaining the real setting of this issue and developing clear insights regarding it in order to provide some recommendations and solutions that help in reducing the occurrence of this type of accidents in this industry.

5. HUMAN ERROR SPECIFIC ACCIDENTS IN O&G INDUSTRY

Different causes were identified in literatures that focused on why an accident has occurred in O&G industry as they are shown in Table 4. The most common contributor with over 70% of all O&G industry accidents is human error (Bhavsar, Srinivasan and Srinivasan, 2015). Pitblado and Nelson (2013) and Mattia (2013) pointed out that the recent ongoing series of major accidents showed that current safety management programmes and improvement are not sufficiently effective in treating human element appropriately in O&G industry. However, Bhavsar et al. (2015) indicated that the cognitive challenges faced by operational workers during their interactions with the process and decision making in this industry were behind this high rate. To sum up, Lawyers and Settlements (2011) argued that accidents in O&G industry typically occur due to worker's carelessness or recklessness, workers postpone the

equipment's maintenance or repair and worker's misunderstanding. Next sub-section will explain human error in O&G industry in Bahrain.

Table 6: Causes of Accidents in O&G Industry

Causes of accidents in O&G industry	Authors
<ul style="list-style-type: none"> • Human error 	(Mattia, 2013) and (Bhavsar, Srinivasan and Srinivasan, 2015)
<ul style="list-style-type: none"> • Ineffective safety management programs 	(Pitblado and Nelson, 2013)
<ul style="list-style-type: none"> • High numbers of active drillings • Inexperienced workers 	(Christ, 2015), (Paraventi, 2014), (NIOSH, 2014) and (Lawyers and Settlements, 2011)
<ul style="list-style-type: none"> • Continuous increasing demand 	(Christ, 2015), (Paraventi, 2014), (NIOSH, 2014) and (Lawyers and Settlements, 2011)
<ul style="list-style-type: none"> • Risk inherent to the production activity • Level of training of workers 	(Díaz-de-Mera-Sanchez et al., 2015)
<ul style="list-style-type: none"> • High numbers of people employed • Nature of drilling process 	(Lawyers and Settlements, 2011)
<ul style="list-style-type: none"> • Reoccurring disruptions during daily operations • Pre-warning signals 	(Korvers & Sonnemans, 2008)
<ul style="list-style-type: none"> • Unique job requirements • Labor-intensive • Work overtime • Hard activities 	(Roth, 2006)
<ul style="list-style-type: none"> • Inadequate training strategies • Poor maintenance priorities • Inadequate supervision • Failure of effective hazard identification • Inadequate auditing 	(Anderson, 2005)

5.1 Human Error issues in O&G Industry in Bahrain

As many projects have been undertaken recently in O&G industry in Bahrain and notable improvements have presented currently, these projects have appeared with several shortcomings. For instance, the evaluation of impacts of these projects on workers, workplace and environment is not sufficiently adequate as the cumulative and long-term impacts are neglected in addition to the fail in addressing the monitoring measures effectively in this industry (Naser, 2011). These shortcoming are putting Bahrain nowadays under a permanent threat from O&G industry especially as Bahraini ports and O&G terminals are at high risk. Further, from nineteen different researchers, like Madany, Jaffar and Al-Shirbini (1998), De Mora, Tolosa, Fowler, Villeneuve, Cassi and Cattini (2010), Naser (2011) and Freije (2013) have remarked that some mistakes during several operations and maintenance activities done by workers in O&G industry in the coastal areas of Bahrain were the primary causes of accidents in this area. In 2000, this industry in Bahrain had recorded six oil spills, including leakages in pipelines, over flooding of containers, weathered oil and tarballs, and incidents during loading of tankers in the terminals.

Though, these accidents led to oil spillages which have a strategic effects on people, workplace and environment. For instance, this kind of human error in this industry were behind the increase of hydrocarbon concentrations in this place (De Mora et al., 2010; Naser, 2011; Freije, 2013). Additionally, all these researches confirmed that the highest pollution concentrations in GCC countries were particularly in the places that have continuous human interventions to transport oil and clean oil tankers. This indicates that workers in these places did some errors while they are proceeding their job and this have created cumulatively in this highest pollution. Besides, Sheppard, Al-Husiani, Al-Jamali, Al-Yamani, Baldwin, Bishop, Benzoni, Dutrieux, Dulvy, Durvasula and Jones (2010) and Naser (2011) have noticed an escalating in human activities in the area of O&G industry in Bahrain which have several negative effect on human, workplace and environment in Bahrain. On top of that, Salminen (2011) expressed that the foreign employees were mostly behind the most of occupational accidents in Bahrain. Further, Alaradi (2010) found that workers' mistakes are behind the delay in daily procedures which indeed hinders several improvement in this industry. Therefore, Naser (2011) has indicated the importance of improving worker's understanding regarding the negative impacts of their mistakes.

6. DISCUSSION

As recent industrial statistics in O&G industry have revealed a high rate of occupational accidents that were caused by human error and have a great toll on workers, workplace and environments, attention should be diverted to investigate human error extensively even if some research have started to do so because still various perspectives remain question till yet. Serious attention should be paid currently because most of the expletory attentions to improve OHS performance were allocated to Nuclear and Aviation industry (Mattia, 2013) and to construction industry (Patel et al., 2012) but not O&G industry. On top of that, as currently this industry has a rapid pace of growth in demand along with an uncertain price of oil, this industry should shed lights on reducing costs and accidents by controlling risks across all different levels. Thus, O&G industry should give safety a top priority and continually build upon this record. In other words, this industry should press ahead to ensure that safety issues meet international standards and best practices that are needed to build and maintain safety with the lightest environmental footprint possible (API, 2016).

Nevertheless, as human error seems as a failure in the interactions between workers and other factors in the workplace, understanding the real setting of a human error specific accident is not just a seldom concept, rather, it is an integrated one that embeds factors like individuals, workplace components and environment. Hence, if there is a gap in one or more of these factors then errors will be common and accidents will be more probable. However, as the relationships among these factors and safety practices are complex, safety issues cannot be adequately addressed in any workplace using technical analysis solely instead a broader strategy that outlines the strategic direction of workplaces is required increasingly (Johnson, Whittington, Scholes, Angwin, & RegnŽr, 2013) especially to enable OHS at work widely. It is important to note here, as there is no best strategy and even if any strategy built a success it will not stand as a best without any alterations; therefore, radical changes in this strategy are required to remain effective and relevant.

Apart from that, driving a safety culture in the industry is a significant contributor. This can be achieved by creating a multidisciplinary team that directs this culture. This team indeed understands the needs of the industry and the gaps in skills clearly. Therefore, this team

should invest in the human capital of the industry and especially in the talented one to address the shortage in any required personnel capabilities and skills. This team also should be responsible for creating an open channel for new ideas and encouraging innovative ways of working. Nevertheless, adapting Information Communication Technologies (ICT) in this industry is a valuable point that should be added to the strategic agendas of the industry in order to take advantage from the current trend of digital transformation which is described by an extensive use of ICT and automation systems. Aligning with the benefits of these technologies, companies in this industry should develop collaborative partnerships and invest together through these technologies in order to generate, innovate, share, analyze, store data quickly. This point is an important enabler for this industry if the current concerns over data privacy and usage, security and interoperability are addressed and balanced.

On the other hand, O&G industry is thirsting for any extensive studies on a continuous basis to improve its performance and reduce accident rate as the mainstream of research tends to reflect the priorities of political and economic elites. Therefore, governments in petrochemical countries in specific should reform this stream to safety aspects and applications through shaping, for example, shared safety information systems, research donations and partnerships. In addition, these governments should increase the awareness of carrying out this nation widely in the nearest future in contrast with the status quo of silence. Moreover, governments should establish an authorized agency or authority that works as a coordinator or regulator. This coordinator tends to oversight and coordinate O&G industry and other essential industries to ensure that these industries survive within safe workplace conditions. Besides, this party is responsible of issuing annual risk assessment reports and evaluating all comments. It is important to mention that having this authority will not neglect the importance of having a safety committee in each industry also.

Finally, these recommendations need first to be sponsored from the top and then to set a clear vision, commit funding and resources and actively coordinate the associated management changes in order to ensure that these recommendations are fully integrated into the industry's core business. On top of that, O&G industry, governments and other related parties will not maximize the benefits of these recommendations to reduce human error accidents if they each act separately. Instead, addressing human error accidents with all these parties stands to reap potential gains that have never been greater.

7. CONCLUSION

From the overall review of the literature, O&G industry in general and in Bahrain in specific has a strategic importance in the national and local economy and safety is a core value in this industry. Unfortunately, accidents are common in this industry in general and the main cause of most of these accidents is referred to human error. In Bahrain, human error specific accidents in O&G industry are also high. This problem is increasing recently during the pressure of high demand. Many negative consequences and costs on workers, workplace and environment were recorded. As a result, this industry in general have started to adopt different safety-related programmes and systems to reduce this high rate of human error specific accidents. In conclusion, addressing human error effectively can be a challenging, but necessary, endeavour. Clearly, focusing on the real scheme of these accidents in this industry and committing to safety requirements in all operations may assist in overcoming this problem and identifying various solutions. Further empirical studies of this problem in Bahrain are needed as it has not been sufficiently researched to date. These studies should

place particular emphasis on not only OHS implementation and legislations in the overall industry in Bahrain but also on improving the employees in term of their safety awareness.

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