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Exploring the Risk Perception and Work Environment Risk on Oil Refineries in Algeria

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ABSTRACT: The study aims to examine the strategic role of work environment satisfaction on performance of staff of oil refineries in Algeria. The study uses Protection Motivation Theory (PMT) to explain conceptual paradigms and risk perception and work environmental factors for understanding workplace risk behaviour. Literature review methodology is used to explore the area of research. The findings explore the literature in terms of Perceptions of risk as an integral portion of the policymaking process in oil and gas industries. The study shows risk perception in workplaces can influence employees' behaviour and, consequently, their exposure to some occupational risks. However, safety systems should be designed to reduce the amount of risk in different session of worksite. Expressing and evaluating the tolerable amount of risk is very difficult. This study provides rich insight of literatures that have been missing in relation to suitable conceptual framework on working conditions in oil sector especially in Algeria.

Keywords: Risk Perception, Work Environment Satisfaction, Employee Perceived Level of Performance, Protection Motivation Theory

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I. INTRODUCTION

Oil and gas industries are multifaceted and risky because of their active working environment. Algeria oil and gas industries have one of the largest established refineries (10Th) for natural gas around globe. In order to manage the industries Sonatrach Petroleum Corporation (SPC BVI) was established in 1989. Moreover, growing global energy demand has resulted to the need for risk assessment models for sustainable working environment and clear-cut policy development (Dehdasht, et. al., 2017).

Raziq, & Maulabakhsha (2015) further revealed that in modern settings, industries are encountering various issues due to the diversify nature of the environment. One of the many challenges for a business is to satisfy its employees in order to cope up with the ever changing and evolving environment and to achieve success and remain in competition. In order to increase efficiency, effectiveness, productivity and job commitment of employees, the business must satisfy the needs of its employees by providing good working conditions. Work environmental risks control and assessment become crucial in resolving environmental pollution measures when economy aims to pursue green environment and sustainable policies (Yang, et al., 2016). Algeria possesses 20 trillion cubic meters of technically recoverable shale gas and the third-largest quantity of untapped shale gas resources in the world and however the assessment of its work environmental risk has become very essential. Risk perception is a dynamic process that takes place majorly in oil and gas working environment and however the process are therefore too complicated to be studied by any approach mentioned previously alone (Yang, et al., 2016). This has given the reasons while this research is carried in order to contribute more on the risk mitigation in the sustainable working environment.

Risk perceptions can be described "as expected losses or potential adverse consequences caused by environmental contamination" (Aven & Renn, 2010). To measure risk perception, this research examined risk perceptions of the potential impacts of industrial activities on workers' health and well-being in Algeria. Perceptions of risk are an integral portion of the policymaking process in oil and gas industries. However, risk perception can be understood as an employees' assessment of risk, and the adequacy of any risk assessment is dependent on the suitability of the available risk information (Williams & Noyes, 2007). Ouddai, et al., (2012) revealed that continuous occurrence of several accidents in some of the oil refineries in Algeria has increased the insecurity feeling and decreasing the trust between employees and employers. These results mean that all these changes in safety policy and management commitment have not yet provided a positive attitude towards

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safety for all employees. As such a significant difference occurs amongst employees' perceptions, with the executives' having positive perceptions as they are more involved in safety issues.

Haridoss (2017) explains the hazards and safety issues and its management practices in Oil and gas industry. In Oil and gas industry, during the well drilling and other service activities involve the use and production of potential hazards. Oil and gas wells can release hydrogen sulfide and expose workers to hydrogen-sulfide gas. The three best practices to help prevent injury and death are: active monitoring for hydrogen-sulfide gas; good planning; and training programs for workers. Oil and gas workers exposed to chemicals produced and used in oil and gas industry may suffer occupational diseases of lungs, skin and other organs at levels relying on the amount and length of exposure time. Those exposed to hazardous noise levels may suffer noise-induced hearing loss (NIHL). Other hazards include confined spaces that may injury or threaten life of untrained workers. The aim of occupational safety and health risk management is to identify and assess safety and health hazards existing at the workplace and to define appropriate control and retrieval steps.

The study of Arezes & Miguel (2008) which was carried out using 516 oil and gas workers argued that risk perception in workplaces can influence employees' behaviours and, consequently, their exposure to some occupational risks. However, only few literatures stressed the relationship between risk perception and occupational risk. The existing studies rarely include quantitative variables related to risk perception and occupational risk. Workers' opinion about the company's safety climate also seems to play an important role as predictor.

It is anticipated that the findings of the study will pave way for the Management of oil refineries and oil and Gas Industry in general to comprehend the effects of work environment and risk perceptions on the employees' performances and whether difference do occur in terms of levels of perception and how this invariable affects their respective performances in the oil refineries oil and Gas industry.

II. REVIEW OF ENVIRONMENTAL RISK FACTORS

2.1 Nature of Environmental Risk Factors

- *Perceived probability of Environmental Contamination*

Marquit (2008) focused on the risk perception and perceived impact on personal and community life using 289 returned surveys; the data were examined to determine the possible link between threat perception and the decision to engage in specific pro-environmental and avoidance behaviors. However, the result revealed that threat perception predicted some pro-environmental and avoidance behaviors.

Janmaimool & Watanabe (2014) carried out a study on the nature of environmental risk factors which a survey of 181 residents of communities experiencing different levels of hazardous gas contamination revealed rational risk judgments by inhabitants of high-risk and moderate-risk communities, based on their perceived probability of contamination, probability of receiving impacts, and perceived catastrophic consequences. However, risks assessed by people in low-risk communities could not be rationally explained and were influenced by their collective experiences.

Research on risk perception has been aimed, generally, at identifying and explaining the employees concerns associated with risk, explaining the context of risk situations, identifying the cultural meanings and associations linked to specific risk areas; helping articulate policy objectives in risk beyond risk minimization, such as improving equity and institutional trust and reducing inequality and vulnerability, designing programs for participation and joint decision making and designing programs for the evaluation of risk management and organizational structures to identify, monitor and control risks (Oltra & Sala, 2014). Risk perception is prejudiced by potential catastrophic consequences and likelihood of an occurrence (Yang, et al., 2016).

- *Perceived Probability of Receiving Impacts*

Janmaimool & Watanabe (2014) showed that the potential predictor variables were perceived probability of environmental contamination and perceived benefits from industrial development

Janmaimool, P. (2016) conducted research of 193 employees using one-way analysis of variance (ANOVA) which was performed to justify the effect of individual threat appraisal and coping appraisal on the engagement in sustainable work environment behaviour. The results demonstrated that the perceived probability of being impacted from pollutants influenced all of the sustainable environment and however, the perceived severity of adverse consequences caused by pollutants highly influenced reuse and recycle behaviors. It could be suggested that PMT is well suited for investigating low-cost and simple sustainable environment.

- *Perceived Severity of Catastrophic Consequences*

Risk judgments involve judgments of probability, severity of catastrophic consequences, and perceived control (Slovic, 1987). This result is supported by Janmaimool & Watanabe (2014) that the significance of employees' variables in predicting risk perception scores found that the variables significantly predicting risk perceptions were statistically significant: perceived probability of environmental contamination and perceived benefits from industrial development. However, the perception score in moderate-risk was significantly predicted by the variables of perceived probability of receiving impacts and perceived severity of catastrophic consequences.

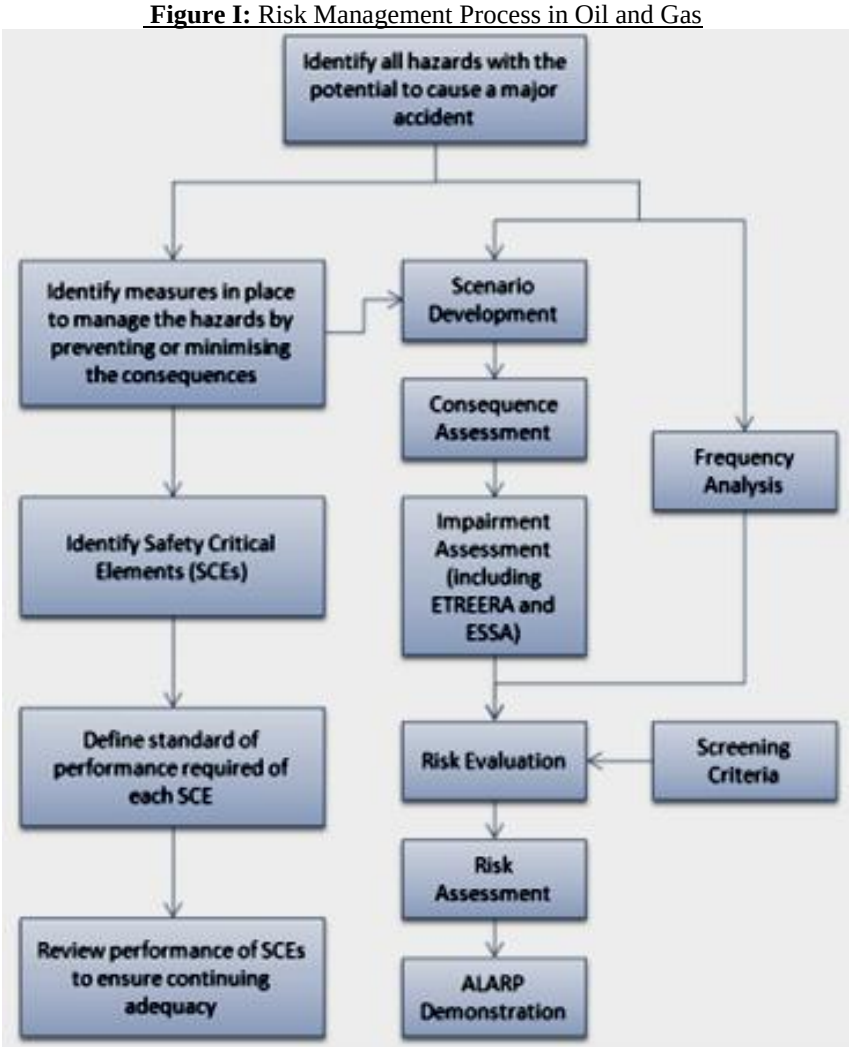
2.2 Psychological & Cognitive Factors

- *Perceived Ability to Control the Risk*

This is done through the control of risks resulting from major work accident hazards, which have the possibility of affecting a major part of the offshore workforce and the integrity of the oil and gas installation itself; risk resulting from the industries day to day operational activities and industrial health risks linking to the operational environment (Thapa, 2016).

Sjöberg, (2004) argued that safety systems should be designed to reduce the amount of risk in different areas. Expressing and evaluating the tolerable amount of risk is very difficult. It will also vary among employees and nature of work. Why should risk be so important? In related work, we found that people are more easily sensitized to risk than to safety. Mood states have been found to be more influenced by negative expectations than by positive ones. People seem to be more eager to avoid risks than to pursue chances

Figure I: Risk Management Process in Oil and Gas



Source: Adapted from Thapa, 2016

- *Concerns About Family member*

The environment, broadly defined, plays a significant role in shaping human health. Understanding how environmental health risks are perceived by different people, in different places, and at different times is critical to their management (Sjöberg, et al., 2004).

- *Previous Experiences in facing Polluted Air*

Although there is huge employees concern about the environmental impacts of oil pollution, however, Nriagu et al. (2016) conducted a study with 600 participants where oil pollution is rampant. The findings revealed that *m*ost of the participants suffered direct exposure to oil in their environment. The result further revealed that risk perception in the study area was mediated, to a large extent, by dreaded hazards (catastrophic fears of pipeline explosions and oil spill fire), visual cues (gas flares and smoke stacks) and chemosensory cues (off-flavor in

drinking water). The exposure metrics were found to be significant predictors of the health effects and influencing factors (emotional reactions).

Chakraborty, et al. (2017) uses multivariate estimation model to extend environmental risk perception research by exploring how potential health risk from exposure to industrial and vehicular air pollutants, as well as other contextual and socio-demographic factors, influence racial/ethnic differences in air pollution health risk perception. The findings revealed significantly higher risk perceptions and those exposed to greater cancer risk from industrial pollutants, and also indicate that gender influences the relationship between race/ethnicity and air pollution risk perception. These findings highlight the need to incorporate measures of environmental health risk exposure in future analysis of social disparities in risk perception in which this study is taken cognizance of.

- *Perceived Benefits from Industrial Development*

Perceived benefits from industrial development comprise one of the psychological factors that have been widely investigated, whether it is associated with perceived risks (Janmaimool & Watanabe, 2014).

Perceived Benefits from Industrial Development could lead to economic incentives such as more employment opportunities and tax benefits due to the localization of such oil and gas industries in such area (Dawson & Johnson, 2014). However, the urbanization of such installation could increase CO2 emissions and damage eco-systems, which may increase the likelihood of climate change, species extinction, and biodiversity loss.

2.3 Theoretical Framework

2.3.1 Protection Motivation Theory (PMT)

Of the many theories related to explaining risk perceptions and risk tolerance, protection motivation theory (PMT) is one of the most cited (Inouye, 2014). According to this theory, people are more likely to protect themselves when they anticipate negative consequences, have the desire to avoid them and feel they have the ability to take preventive measures. Some may recognize PMT as having similarities to the health belief model (Sun, Wang, Guo, & Peng, 2013), which argues that people weigh factors such as the severity of the threat, their personal vulnerability, and the possible benefits of protective actions before choosing whether or not to take a risk.

Overall, PMT postulates that there is a relationship between risk perception and injuries and incidents, and that people take protective action when they are motivated and have the agency to do so. The decision to take protective actions in the workplace is a process(Lindell & Perry, 2012). As such Workers weigh their response efficacy and self-efficacy (i.e. sense of agency) against the possible costs incurred. Use of personal protective equipment and other protective actions tend to increase as these behaviors become normalized and habituated, and also as workers realize that they can take action to put safety in their own hands.

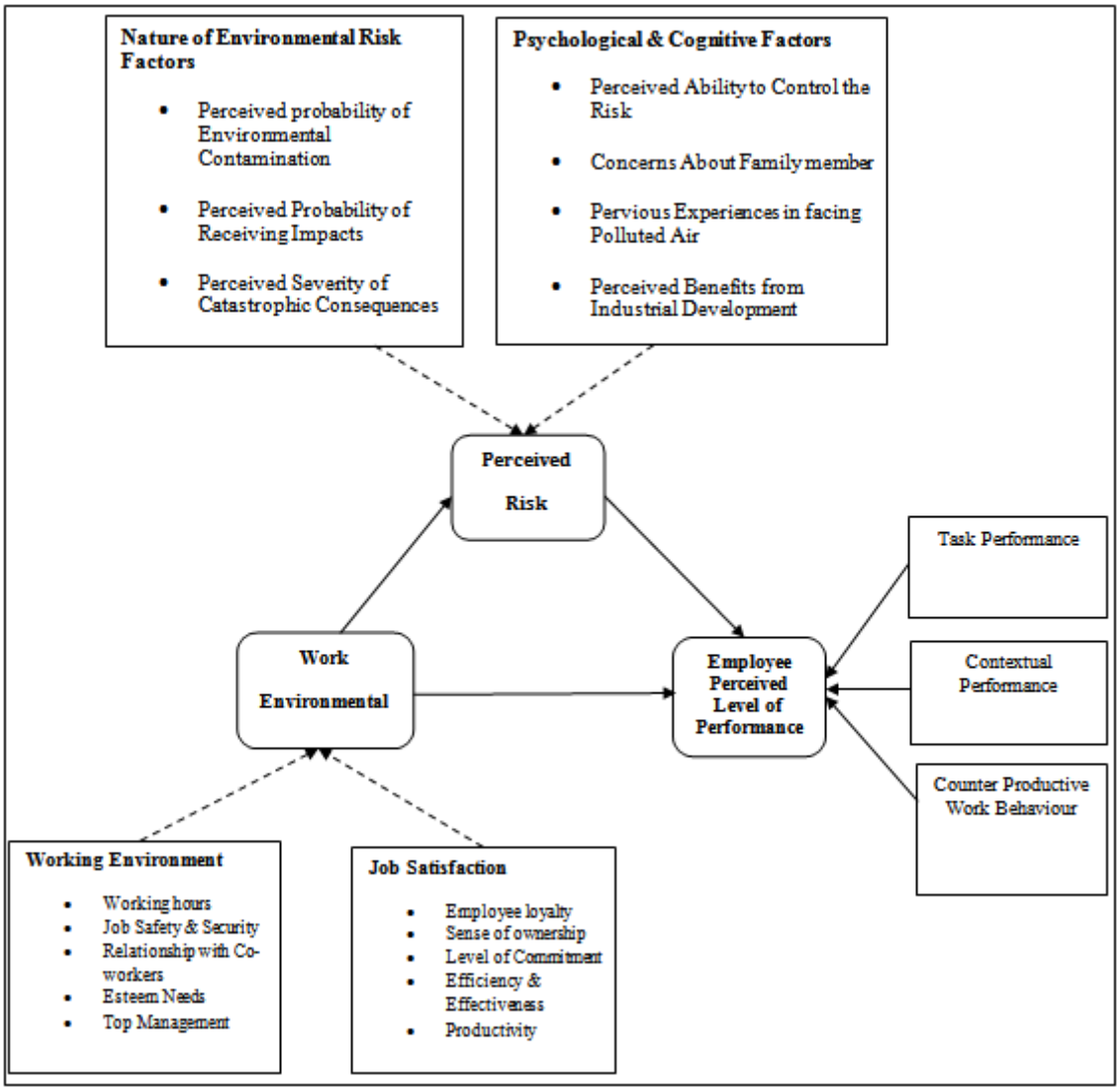
According to protection motivation theory, risk perception and use of personal protective equipment increase when workers have reason for concern, oftentimes due to a previous incident. Kiefer et al. (2016) found that workers were more likely to express concern about hazardous materials and workplace air quality if they had previously experienced an occupational injury. In both these cases, workers' concerns and motivations to protect themselves were heightened because of first-hand experiences of incidents or injuries.

Campaign messages derived from PMT were based on raising awareness of speeding's consequences and increasing young drivers' sense of vulnerability and self-efficacy (e.g. being able to respond to peer pressure by driving within the speed limit). People may be less tolerant of risks imposed on them by others than those risks they choose to take for themselves, which implies that helping people recognize the consequences their actions could impose on others is one way to lead them away from high-risk behavior and be motivated to protect themselves and others. In general, PMT states that being motivated to protect one requires not only adequate risk perception, but also the tools and skills to take preventive action.

2.4 Research Framework

In this study, research framework is the organization of concepts derived from the reviewed theories. More so, considering the importance of risk perception in oil and gas industries, the protection motivation theory (PMT) being one of the most cited (Inouye, 2014) theory of risk perception, this study adopted in the development of its conceptual model. According to this theory, people are more likely to protect themselves when they anticipate negative consequences, have the desire to avoid them and feel they have the ability to take preventive measures. However this study adopted the framework of Janmaimool & Watanabe (2014) that coined the protection motivation theory in assessing the determinant of risk perception in oil and gas sectors. Based on this, the researcher attempt to show the interconnectivity between concepts of work environment and employee performance based on the previous literature in order to offer a clear understanding of the relationship. The Figure 2 illustrates the relationship between the dependent variable (Employee job performance), the independent variable (work environment satisfaction) and mediating variables for the study (Risk perception).

Figure 2 Research Framework



III. CONCLUSION

In summary, this study provides information about the global overview of the oil and gas development, Algeria's oil and gas industry and its challenges. Other aspect such as the work environment, employee perceived level of performance as well as the concept of risk perception. Empirical literatures were reviewed and also the theoretical framework.

It is vital to measure each work environment from the perspective of realistic knowledge of the responsibilities to be carried out, the instruments to be used and the required skills. Therefore, it is essential that such risk assessments are examined by skilled persons who have required knowledge of the environments that prevail, at a specified work environment during operational activities. By appraising the work environment, the risk that could result in an accident can be identified, as well as the safeguards necessary to control or mitigate the risk for each stage of the work. However, stringent assessment of environmental impacts and safety system requires industry to identify hazards, assess the risks and follow best practice to manage them; and comprehensive emergency response framework. At the same time, there should be a review panel highlighting the importance of continuous improvement and the scope for raising standards through: assure implementation of safety and environmental management systems; improve the learning culture and processes for spreading best practice; greater integration between the regulatory authorities; a clearer command and control structure in the event of a spill; robust arrangements to ensure operators' level of liability and ability to pay in the event of a spill; and intensified R&D to develop improved avoidance, capping, containment, clean-up and impact monitoring of major offshore oil spill incidents.

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