EFFECTS OF SAFETY-SPECIFIC TRANSFORMATIONAL LEADERSHIP, SAFETY MANAGEMENT PRACTICES AND HIGH-QUALITY RELATIONSHIPS ON MINDFUL SAFETY PRACTICES IN PETROLEUM INDUSTRY OF CHINA

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by

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LIST OF ABBREVIATIONS

GDP	Gross Domestic Product
CNPC	China National Petroleum Corporation
Sinopec Group	China Petroleum & Chemical *China National Petroleum Corporation*
Cnooc	China National Offshore Oil Corporation
SINOCHEM	Group Co., LTD China National Chemicals Import and Export Corporation
HSE	Health, Safety and Environment system
HRO Theory	High Reliability Organization Theory
SET Theory	Social Exchange Theory
LMX Theory	Leader Member Exchange Theory
HRM	Human Resource Management
USM	Universiti Sains Malaysia
SPSS	Statistical Package for Social Science
CB-SEM	Covariance-based Structural Equation Modeling
PLS-SEM	Partial Least Squares Structural Equation Modeling
AVE	Average Variance Extracted
HTMT	Heterotrait-monotrait Ratio of Correlations
VIF	Variance Inflation Factor
CR	Composite Reliability

LIST OF APPENDICES

KESAN TERHADAP KEPIMPINAN TRANSFORMASI BERSPESIFIKASI KESELAMATAN, AMALAN PENGURUSAN KESELAMATAN DAN HUBUNGAN BERKUALITI TINGGI KE ATAS AMALAN KESELAMATAN PEMIKIRAN (MINDFUL) DALAM INDUSTRI PETROLIUM DI CHINA

ABSTRAK

Objektif utama kajian ini adalah menyelidik kesan kepimpinan transformasi berspesifikasi keselamatan, amalan pengurusan keselamatan dan hubungan berkualiti tinggi ke atas amalan keselamatan pemikiran (mindful) pekerja di barisan hadapan, industri petroleum di China yang dimediasikan oleh motivasi keselamatan. Industri petroleum sebagai salah satu industri utama yang memberikan sumbangan besar kepada pertumbuhan dan pendapatan KDNK China. Walau bagaimanapun, industri petroleum ini tergolong dalam industri yang berisiko tinggi dari sudut keselamatan, kesihatan dan persekitaran pekerja. Amalan keselamatan yang diamalkan oleh pekerja barisan hadapan di industri petroleum di China yang menekankan aspek keselamatan di tempat kerja telah membuatkan tahap keselamatan pekerja berada ditahap yang baik. Akan tetapi, amalan ini dilihat masih terhad dan tidak mencukupi. Maka, dengan menggunakan dua teori iaitu teori *High Reliability Organisation* (HRO) dan *Leader Member Exchange* (LMX), kajian ini telah dibentuk dan seterusnya di kaji dalam konteks industri petroleum di China. Teori HRO telah digunakan sebagai teori pendukung utama dalam kajian ini. Untuk kutipan data, kajian ini mengaplikasikan kaedah pengambilan sampel secara persampelan bertujuan dan persampelan bukan-kebarangkalian untuk pengumpulan data daripada pekerja di barisan hadapan di sebuah perusahaan petroleum di China. Secara keseluruhannya terdapat 255

borang soal selidik diterima dengan kadar respons sebanyak 79.69%. PLS-SEM digunakan untuk menganalisa data dan hubungan hipotesis dianalisa dengan menggunakan perisian SmartPLS. Hasil kajian menunjukkan bahawa kepemimpinan transformasional berspesifikasi keselamatan berkait secara positif dengan motivasi keselamatan di kalangan pekerja barisan hadapan di industri petroleum di China. Dua dimensi amalan pengurusan keselamatan, iaitu latihan keselamatan dan komunikasi keselamatan dan maklum balas juga berkait secara positif dengan motivasi keselamatan di kalangan pekerja barisan hadapan. Motivasi keselamatan didapati berkait secara positif dengan amalan keselamatan yang diperhatikan pada tahap signifikan .01. Selanjutnya, implikasi dari sudut teori dan praktikal dibincangkan dengan teliti. Perbincangan berkaitan dengan batasan penyelidikan serta cadangan untuk penyelidikan dimasa hadapan juga dibincangkan secara teliti. Kesimpulannya, kajian ini menyumbang kepada pengetahuan yang berguna berkaitan dengan pemilihan jenis kepemimpinan dan pelaksanaan amalan pengurusan keselamatan dalam meningkatkan tahap motivasi keselamatan di kalangan pekerja barisan hadapan di industri petroleum di China.

EFFECTS OF SAFETY-SPECIFIC TRANSFORMATIONAL LEADERSHIP, SAFETY MANAGEMENT PRACTICES AND HIGH-QUALITY RELATIONSHIPS ON MINDFUL SAFETY PRACTICES IN PETROLEUM INDUSTRY OF CHINA

ABSTRACT

The main objective of this study is to investigate the impacts of safety-specific transformational leadership, safety management practices, and high-quality relationships on mindful safety practices of first line workers in the Chinese Petroleum Industry mediated by safety motivation. The Petroleum Industry as one of the traditional pillar industries has made great contributions to Chinese GDP growth and revenue. However, Petroleum Industry belongs to the high-risk industry, and potential hazards related to safety, health and environment exist. The conduction of mindful safety practices by first line workers in the Chinese Petroleum Industry facilitates safety promoting programs and excellent safety records in the workplace. In addition, two theories that are High Reliability Organization (HRO) theory and Leader Member Exchange (LMX) theory are adopted in this study. Among these two theories, HRO theory is regarded as the underpinning theory in this study. Moreover, in this study judgment sampling, which contains purposive sampling and non-probability sampling is applied for data collection of first line workers in a Chinese Petroleum Company. In total, 255 questionnaires are available with a response rate of 79.69%. PLS-SEM is adopted for data analysis and the examination of hypothesized relationships by SmartPLS software. The findings reveal that safety-specific transformational leadership is positively related to safety motivation

among first line workers in the Chinese Petroleum Industry. Two dimensions of safety management practices, which are safety training and safety communication and feedbacks are positively related to safety motivation among first line workers in the Chinese Petroleum Industry. Safety motivation is discovered to be positively related to mindful safety practices at a significant level of .01. Further, implications from theoretical and practical are discussed with the consideration of research limitation as well as the directions for future research. This study provides useful insights for leadership selection and implementation of safety management practices, which are safety training and safety communication and feedbacks to increase the level of safety motivation among first line workers in the Chinese Petroleum Industry.

CHAPTER 1

INTRODUCTION

1.0 Introduction

This chapter provides the background and problem statement related to the special safety behavior-mindful safety practices in the Chinese Petroleum Industry. The research questions and objectives are prompted following the significance and scope of this study. In the end, the definition of key terms and organization of the chapter are explained further.

1.1 The Background of the Study

Empirical researchers focused on the common safety behavior including safety compliance and safety participation in the workplace (Griffin & Neal, 2000; Zacharatos et al., 2005; Vinodkumar & Bhasi, 2010; Shen et al., 2017). Kvalheim and Dahl (2016) examined the relationship between safety climate and one of the safety behavior-safety compliance in the oil and gas industry. Previous studies that are related to mindful safety practices are limited as mindful safety practices is a special component of common safety behavior, which comprises of safety compliance and safety participation. Several scholars have highlighted that mindful safety practices should be a highly valued and prioritized safety behavior in the gas and oil industry (Dahl & Kongsvik, 2018; Skjerve, 2008; Aase et al., 2005). For example, Dahl and Kongsvik (2018) focused on mindful safety practices in the oil and gas industry and Skjerve (2008) analyzed mindful safety practices at Norwegian petroleum installations. In addition, Aase et al. (2005) examined mindful safety practices in the offshore oil and gas drilling. Mindful safety practices belongs to the

special component of safety behavior and often applied in the high-risk organizations such as Petroleum Companies (Dahl & Kongsvik, 2018). However, mindful safety practices have gained limited attention and been defined as the ability to be aware of critical factors in the environment and to act appropriately when danger arises (Skjerve, 2008). Moreover, hazards which are involved in the mindful safety practices refer to the ones that cannot be explicitly expected during the work process or working environment such as unsafe tool handling and unsafe material storage. Safety-specific transformational leadership, which covers the characteristic of transformational leadership but specifies in the safety-specific point of view is identified as an independent variable for the prediction of mindful safety practices adoption in the Petroleum Industry in China. Safety management practices point out the policies, strategies, procedures and activities implemented and followed by the management, which targets the safety and well-being of the employees in the workplace. Previous studies connected the safety management practices with the common safety behavior, which includes safety compliance and safety participation such as Vinodkumar and Bhasi (2010) and Keffane (2015).In this study, six dimensions of safety management practices are identified as six independent variables to predict a special component of safety behavior, which is mindful safety practices in the Petroleum Industry in China. The purpose of identifying the six dimensions of safety management practices respectively is to understand which dimension has the most impact on safety motivation, which further affect the adoption of mindful safety practices in the Petroleum Industry in China. Moreover, high-quality relationships, which contains the positive regard and mutuality are explored to understand the conduction of mindful safety practices because of the 'hawk's eyes' and 'comrade check' concepts. Safety motivation, which is regarded as a mediator for the prediction of safety compliance and safety participation of the employees by

Griffin and Neal (2000) and Hedlund et al. (2016) is identified as the mediator in this study. Due to mindful safety practices are more like safety participation, which needs the employees to be aware of the current situation at hand and contribute more extra efforts to the emergency, safety motivation is identified as the mediator. The current study aims to understand the factors related to the mindful safety practices adoption in Petroleum Industry in China from individual, group and organizational levels to gain a comprehensive picture. Based on the conception of mindful safety practices, the current study adopts mindful safety practices as a dependent variable and identify the factors that could predict the mindful safety practices in the Chinese Petroleum Industry.

1.1.1 The Background of China

The full name of China is the People's Republic of China, which is located in the east of Asia and west coast of the Asian Pacific. China is a socialist country under the people's democratic dictatorship, and the capital is Beijing. The People's Republic of China was founded on 1st, October 1949. Han nationality accounts for the largest percent with 91.51% among the total 56 ethnic minority groups. The national territory area of China is 960 ten thousand square kilometers, which ranks the third position in the world. Now the president of the People's Republic of China is Xi Jinping. In addition, the State Council is the highest administrative organ and the highest authority executive organ. The official language in China is Chinese. China has 34 provincial administrative regions among them there are 23 provinces, 5 autonomous regions, 4 municipalities (Beijing, Shanghai, Tianjin, and Chongqing) and 2 special administrative regions (Hong Kong and Macao). China is one of the most populous countries in the world with many salutations such as one of the four great ancient civilizational countries, number one trading nation,

the world's second-largest economy, the world's largest foreign exchange reserves country, the world's largest steel producer country, super country, tourism country, the world's largest agricultural producer and the world's largest food producer country. The value of the Gross Domestic Product (GDP) of China in 2019 was USD 14.34 trillion, which ranked the third position in the world and 3.2% of the growth rate in 2020 (https://tradingeconomics.com, 2020).

From the 1980s, Chinese pillar industries are mainly considered as four main pillar industries. They are auto, construction, mechanical, electrical and petrochemical industries. Therefore, the Petroleum Industry belongs to one of the four traditional pillar industries in China. The Chinese government now expects to develop new four pillar industries, which belong to emerging sections such as energy conservation and environmental protection, new-generation information technology, the biotech industry, and high-end equipment manufacturing (http://www.china.org.cn,2012).

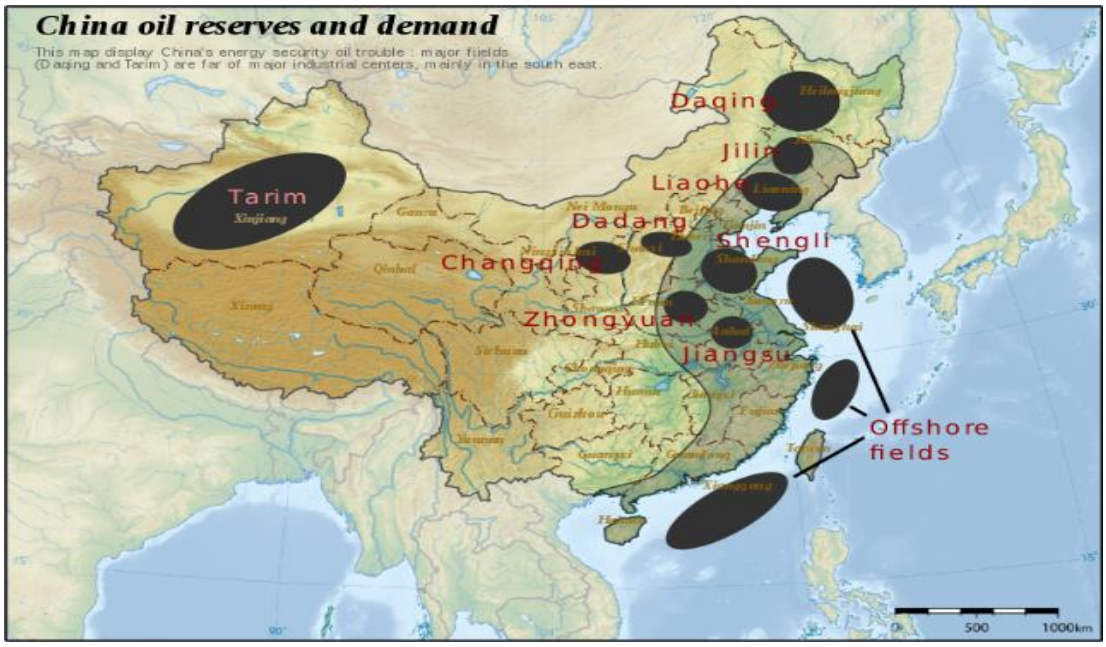
Source: https://baike.baidu.com

Above is the map of the People's Republic of China, which shows the location of China in the world. As can be seen, China is located in the east of Asia and west coast of the Asian Pacific and includes 34 provincial administrative regions. Among them there are 23 provinces, 5 autonomous regions, 4 municipalities (Beijing, Shanghai, Tianjin, and Chongqing) and 2 special administrative regions (Hong Kong and Macao).

1.1.2 The Background of Chinese Oil field

The petroleum resources in China are mainly concentrated on Bohai bay, Song Liao, Tarim, Ordos, Junggar, Pearl River Estuary, Qaidam and the East China Sea shelf with the recoverable resources of 17.2 billion tons, which accounts for 81.13% of the country total oil resources. In terms of geographic distribution, 76% of China's recoverable oil resources are distributed in the basins, plain, shallow sea, Gobi, and desert while 74 % of recoverable natural gas resources are distributed in the shallow sea, desert, mountain, plain and Gobi. Since the early 1950s, China has carried out oil and gas explosion and discovered more than 500 oilfields. Among them, the main and representative oilfields are Daqing Oilfield, Changqing Oilfield, Shengli Oilfield, Liaohe Oilfield, Karamay Oilfield, Sichuan Oilfield, Huabei Oilfield, Dagang Oilfield, Zhongyuan Oilfield, Jilin Oilfield, Henan Oilfield, Jianghan Oilfield, Jiangsu Oilfield, Qinghai Oilfield, Tarim Oilfield, Tuha Oilfield and Yumen Oilfield. In 2019, Changqing oilfield has exceeded Daqing oilfield, which ranked the first position with 57 million tons of oil and gas production in China (Zi & Meng, 2020). China has rich land oil, marine oil,

and gas resources, which is the fourth-largest oil producer and the sixth-largest natural gas producer in the world (http://www.360doc.com, 2018).



Source: http://www.360doc.com

Above the map indicates the distribution of Chinese petroleum resources, which are mainly concentrated on Bohai Bay, Song Liao plain, Tarim basin, Ordos, Junggar and East China Sea shelf.

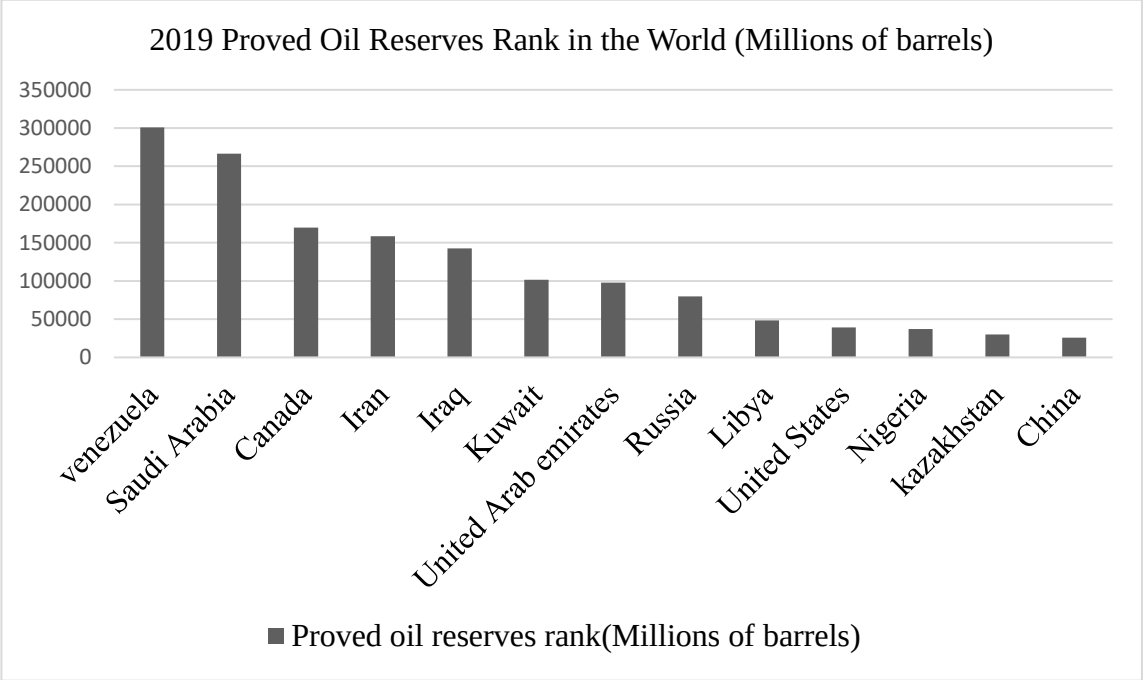


Figure1.1 Proved Oil Reserves Rank in the World

Source: http://www.sohu.com

As can be seen from the above figure 1.1, China ranked the 13th position for the proved oil reserves in the world in 2019 based on the estimated value of the oil stock in the ground, which owns 2562 million barrels of proved oil reserves. There are four types of Chinese petroleum companies such as central government-led enterprise, state-owned company, private company, and foreign-owned company. Central government-led enterprise is a type of stated-owned enterprises under direct center government control while there are also other types of stated-owned enterprises such as provincial, municipal and township state-owned enterprises. However, four central government-led enterprises dominate the Petroleum Industry in China as they are large-scale backbone central government enterprises. They are CNPC (China National Petroleum Corporation),

Sinopec Group (China Petroleum & Chemical Corporation), Cnooc (China National Offshore Oil Corporation) and SINOCHEM Group Co., LTD (China National Chemicals Import and Export Corporation).

According to the data released by the 3 major Chinese oil companies, which are CNPC, Sinopec Group, and Cnooc in 2015 the amount of taxes and fees separately accounts for 2.22%, 2.34%, and 0.54% of the total national fiscal revenue. Petroleum Companies in China are paying various types of taxes such as revenue windfall levy, resource tax, mineral resource compensation fee, and environmental protection tax, which play an important role in contributing to the country's tax revenue (https://www.ey.com/Publication/vwLUAssets/ey-global-oil-and-gas-tax guide/$FILE/ey-global-oil-and-gas-tax-guide.pdf, 2018). Statista.com estimated the world 10 largest companies in 2018 based on profits, revenues, market cap and brand value, which are Walmart, State Grid Corporation of China, Sinopec Group, China National Petroleum Corporation, Toyota Motor, Volkswagen, Royal Dutch Shell, Berkshire Hathway, Apple Inc., and Exxon Mobil. Among them, two central government-led enterprises Chinese Petroleum Companies were included in the top ten largest companies in the world in 2018, which were CNPC and Sinopec Group. In 2019, Sinopec Group ranked the second position in the Fortune 500 list, which owned the largest revenue of more than $414 billion among other oil companies in the world while CNPC ranked the fourth position with more than $ 392 billion consolidated revenue in the Fortune 500 list (Carpenter, 2020). CNPC was established in 1988 and headquarter is based in Beijing, which has rich experience for oil reserves exploration and production. Now CNPC is extending its business to renewable energy except gas and oil. Moreover,

it extends its explosions and production in other countries as well such as Canada, Thailand, Iran, and Venezuela. Due to the large scale of Chinese central government-led petroleum enterprises, the scale of employment is also large. In 2019, Sinopec Group employed about 582,648 people while CNPC absorbed around 1344,410 employees as the Chinese biggest oil producer (statista, 2020). CNPC ranked the second position while Sinopec ranked the ninth position among the world largest companies based on the number of employees. Chinese petroleum companies, especially central government-led enterprises play a vital role in easing the employment pressure in China and reduce unemployment burden.

As oil enterprises have generally become the market mechanism, which are integrated with the market economy, fair competition and diverse market participation of companies are encouraged. Moreover, remarkable achievements have been made in the market mechanism as resource allocation and prices set are determined by the market. However, the four central government-led petroleum enterprises still dominate the oil and gas market in China and account for the majority of oil market shares in China (http://www.pinlue.com, 2018).

Oil Consumption in China (Unit: Barrel/Day)

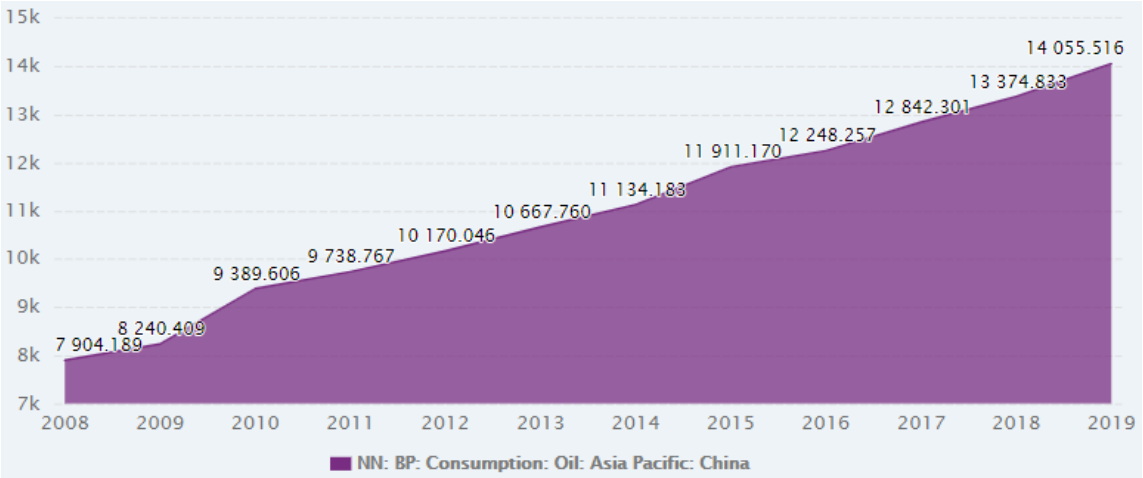


Figure 1.2 Oil Consumption in China (Unit: Barrel/Day)

Source: https://www.ceicdata.com/en/indicator/china/oil-consumption

As can be seen from the above figure 1.2, the oil consumption in China increased year by year from 2008 to 2019, which implies the huge demands of oil in China. In 2019, the oil consumption in China reached around 14,055.516 barrels daily due to the country growing economic and political conditions (Statista, 2020). In 2019, the Chinese cumulative domestic crude oil production has exceeded 4 billion tons, which plays an important role in people's daily life (China Petroleum News Center, 2020).

China has a large demand for oil consumption as the high-speed economic development. On 17th, January 2019, Petro China (CNPC) announced that the investment in domestic oil explosion and development would be increased by 25% year-on-year, which indicates the trend of exploration and development in the Chinese major oilfields in 2019. Petro China (CNPC) emphasizes increasing investment in the upstream

exploration. Moreover, among them, the investment for risk exploration plan will increase by four times and the investment scale is going to increase from 1 billion yuan to 5 billion yuan to satisfy the demands of oil for the Chinese high-speed economy (http://dy.163.com, 2019).

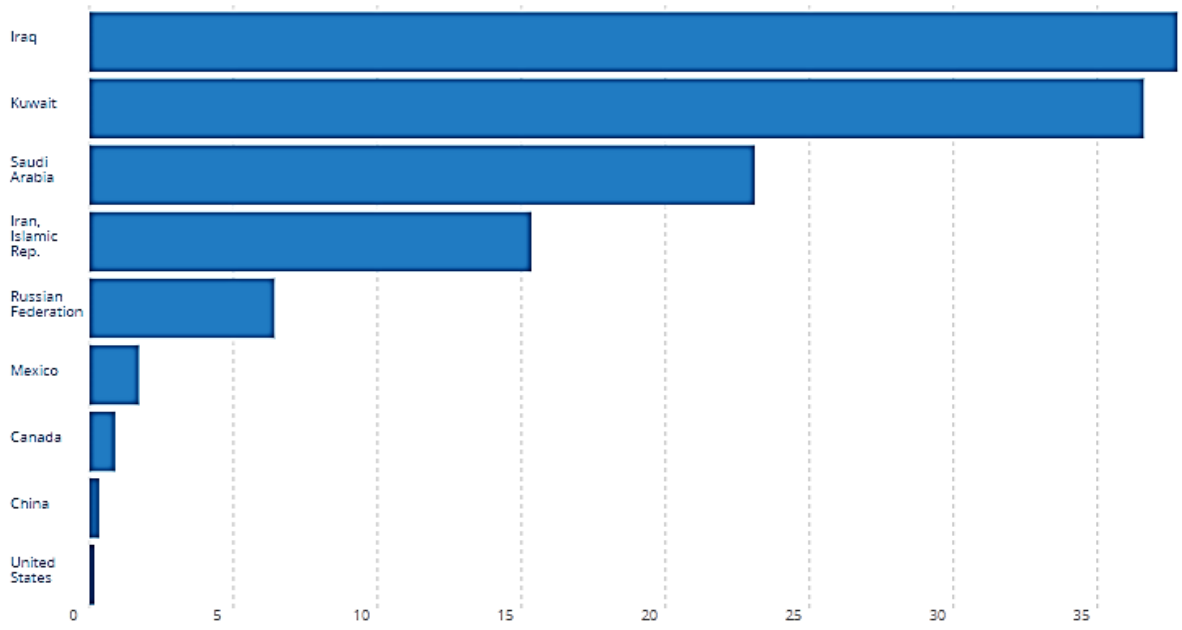


Figure 1.3 Oil Rent Contribution to GDP

Source: World Bank

As can be seen from the above figure 1.3, Chinese oil rent contribution to GDP only accounts for 0.335%. It is showed that the country with the highest oil contribution to GDP is Iraq, which accounts for 37.782%. China and the United States have the low oil rent contribution to GDP compared to other Middle East countries. The reasons lay on the economy of Middle East countries largely rely on the oil. However, considering the size of the Chinese population and the structure of the economy, 0.335% of oil rent contribution to GDP is quite a large proportion in China as there are many industries

(https://data.worldbank.org, 2019). Therefore, Chinese Petroleum Industry plays an extraordinary role in the Chinese economy.

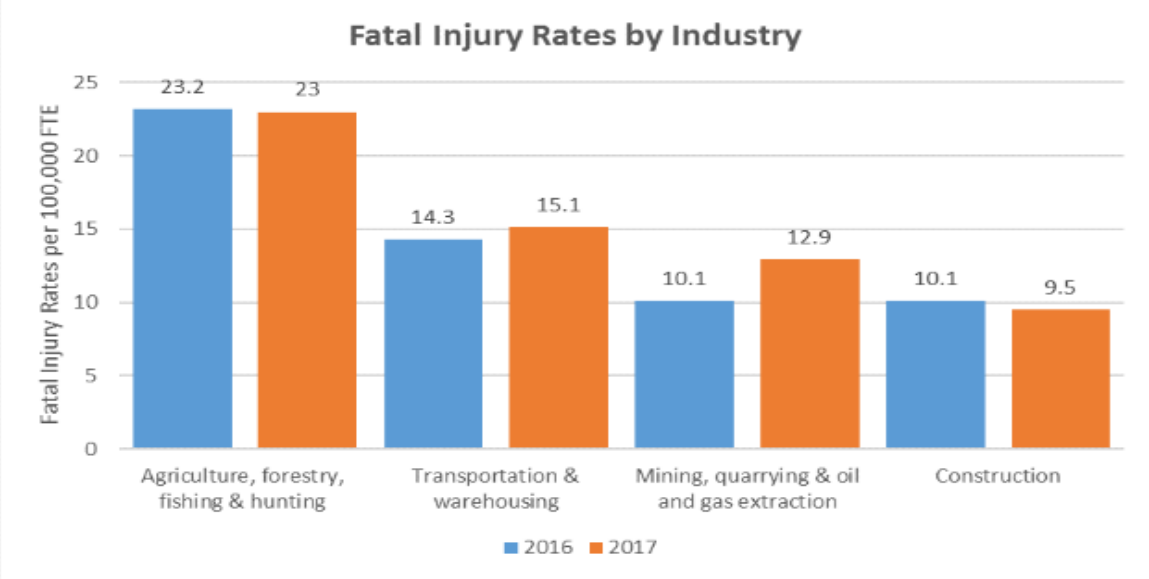


Figure 1.4 Fatal Injury Rates Rank by Industry

Source: Bureau of Labor Statistics (BLS)

From figure 1.4, Mining, quarrying, oil, and gas exaction industry ranked the third position among the other fatal injury industries on fatal injury rates perspectives. Chinese Petroleum Industry as one of the traditional pillar industries and still plays an important role in the Chinese economic growth as an extraordinary contribution to the Chinese tax revenue. Moreover, as the central government-led enterprises and state-owned petroleum companies in China have large-scale and huge market demands, the employment amount is also large, which could help ease the pressure of the huge employment demands in China. However, petroleum companies belong to the high-risk organizations and potential hazards often exist related to health, safety, and environment.

The motivation for conducting this study is that the Chinese Petroleum Industry contributes largely to the Chinese economic growth and help the Chinese government burden high employment stress. Nevertheless, the potential risks and hazards exist, which triggers the need for the researchers to understand how the Chinese petroleum companies could operate safely with efficient productivity and achieve balance between safety requirements and production targets. Once the accidents happen, both the economic cost and law punishments would occur. The most important thing is that the public reputation and trust of the company could be ruined. Unfortunately, the rebuild of public image and trust would be extremely difficult to achieve again.

1.2 Preliminary Study

A preliminary study was conducted by the researchers to gain a clear and complete picture of safety behavior by the first line workers in the Chinese Petroleum Industry for the research interest. The respondents in this preliminary study are the four first line workers from four different Chinese petroleum companies. Respondents were invited to answer the five questions related to their safety conduction in these four Chinese petroleum companies, which includes potential hazards, challenges, accidents, resource constraints, and safety training perspectives. The purpose of this preliminary study conduction is to get the reality that once the accidents happen, the biggest challenges and constraints faced by the first line workers in the petroleum companies. Moreover, through the preliminary study, the meaning and significance of prompting mindful safety practices among the first line workers in the petroleum companies could be ensured. The researchers firstly got the permission for the preliminary study conduction from the four petroleum companies' HR departments by sending the five questions through the email. The email

address of these four respondents were provided by these four petroleum companies. The five questions are prompted as below:

i.Do you receive enough safety training in the workplace?

ii.What kinds of potential hazards do you face during your daily operation?

iii. What challenges do you face once the accident happens?

iv. Do you remember the latest accidents happen in your workplace?

v.What resources constraints do you face in your workplace?

1.2.1 Findings of Preliminary Study

The findings of the preliminary study reveal that the attitudes of first line workers on potential hazards, challenges, accidents, resource constraints, and safety training in these four Chinese petroleum companies related to these five questions. The feedbacks were collected from these four first line workers from four different petroleum companies in China.

Petroleum Company 'A'

The first line worker in the Petroleum Company A stated that safety training in the workplace was enough. However, during the daily operation, the air in the workplace is not fresh with poor ventilation. The latest accident happened a half year ago, which is a gas leak accident. The challenges faced once the accident happens is the difficulty to

control within a short time. Resources constraints lay on insufficient protective equipments.

Petroleum Company 'B'

The first line worker in the Petroleum Company B remembered the latest accident happened three months ago, which an operational staff fell down from the stairs during the operation because of fatigue. The potential hazards he faced during the daily operation is dirty drilling well and cold weather. Harsh operation environment, especially in winter, makes him feel resource constraints. The biggest challenge he faced once the accident happens is the replacement of components and the speed of bouncing back. Safety training is enough for him in his job position.

Petroleum Company 'C'

The first line worker in the Petroleum Company C told that the latest accident he could remember is around one year ago, which was a gas blowout. In addition, the potential hazards in the workplace faced by him is also the harsh work environment sometimes with toxic gas. The challenges he faced once the accidents happen is the spread of accidents cannot be controlled immediately. Resource constraints he faced is sometimes there is not enough personnel for the oil drilling and production operation.

Petroleum Company 'D'

The first line worker in the Petroleum Company D remembered the latest accident happen one month ago, which the equipment was broken suddenly. In his daily operation,

high-temperature rotating machines are the potential hazards. Moreover, the aging machine is the resource constraints in his workplace. Safety training is enough for him from his perspective. The challenge he faced once the accidents happen is the stop of operation with not achievement of production tasks.

1.2.2 Implication of Preliminary Study

The findings of the preliminary study indicate that some potential hazards exist for the first line workers' daily operation in the Chinese Petroleum Industry such as harsh working environment, poor ventilation, toxic gas and high-temperature rotating machines. Once the accident happens the challenges they face are the control of the accident spread speed, replacement of the components, quick bounce back and production targets delay. Moreover, although the safety training in these four petroleum companies is enough sometimes the accidents could still happen without expectations and preparations. Furthermore, once the accident happens the control power is weak, which needs to gain more awareness and identification for the accidents prevention. Through preliminary study, the challenges that first line workers faced during the daily oil operation are identified. More strategies need to be taken for the prevention and control of the accidents. Petroleum companies should have a comprehensive safety management system to guide the employees to handle the workplace accidents and overcome the harsh working environment. Employees should be aware of the current situation at hand during their daily oil operation, which needs the employee especially first line workers to adopt mindful safety practices. Further, the management should play certain roles in facilitating the adoption of mindful safety practices. By preliminary study, some factors that are

related to the adoption of mindful safety practices are identified such as comprehensive safety management system and management commitment to safety. This will provide some insights for the practical significance of mindful safety practices adoption in the petroleum companies and consider the factors that are related to the facilitation of mindful safety practices from a practical perspective. The proposed research aims to facilitate the adoption of mindful safety practices by the first line workers in the Chinese Petroleum Industry to improve safety records and reduce accident rates in the workplace.

1.3 Problem Statement

In 2019, the annual tax and fees contribution from the Chinese Petroleum Industry increased from 30.11 billion yuan in 1998 to 348.68 billion yuan by 10.58 times increase. Moreover, the annual profit in the Chinese Petroleum Industry increased from 6.48 billion yuan in 1998 to 120.36 billion yuan by 17.57 times increase (China Petroleum News Center, 2020). That indicates that the Petroleum Industry contributes to the Chinese tax revenue and economic development in China. Moreover, as discussed above the number of employment recruited by the Chinese petroleum companies is large such as CNPC and Sinopec, which could also help the whole Chinese society relieve the pressure of employment. Therefore, Chinese Petroleum Industry is an important Industry with the contribution for Chinese tax revenue, economic development and employment releasement.

However, petroleum companies have an interactively complex and tightly-coupled social-technical system with potential hazards existing (Dahl & Kongsvik, 2018). Skjerve (2008) stated that petroleum production and installations contain several major hazards related to health, safety, and the environment. As an oil extraction and production

company, there are some potential hazards during the daily operation such as flammable, explosive and toxic environment, explosion, gas leak, and the rotating machine broken, which have threatens for the first line workers' well-being and organizational safety operation (Dahl & Kongsvik, 2018). In addition, Aase et al. (2005) stated that the petroleum production environment belongs to the hostile environment, which includes a large number of hydrocarbons under the pressure and poor evacuation possibilities. Therefore, more attention should be paid to the critical thinking of safety operation within the organization. Safety operations and processes are very vital in the petroleum companies for the achievement of both the safety production and production targets. The probability of accidents in the petroleum companies is high due to the petroleum companies belong to the high-risk organizations and the potential hazards exist (Kulkarni, 2017).

In order to prevent certain potential hazards and ensure safety operation, HSE (Health, Safety, and Environment) system is widely adopted by the worldwide petroleum companies to make sure that a complete safety operational management system functions. HSE management system is a common set of management system for the oil and gas exploration and development industry, construction industry, health and safety, and environmental management, which is generally recognized by the international petroleum and Petrochemical companies currently. The characteristics of HSE are systemized in the ways of scientism, normalization, and institutionalization.

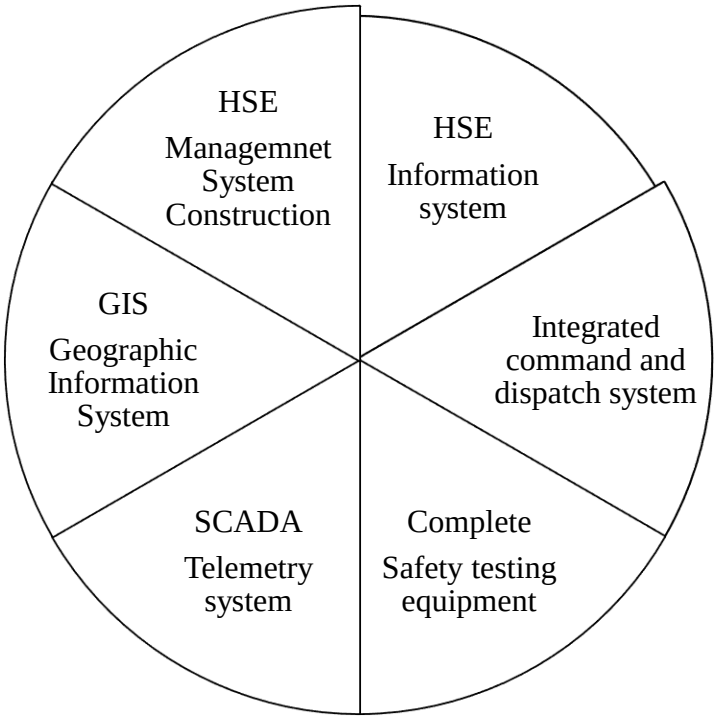


Figure 1.5 HSE System
Source: Yu et al. (2012)

From figure 1.5, the elements in the HSE system such as information system, management system construction, geographic information system, telemetry system, safety testing equipment, integrated command and dispatch system are included to constitute a complete safety operation management system to ensure the safety operation, accident prevention and accident handle in the petroleum companies.

In this system, training is highly focused and the training time for the different job positions is strictly specified insides this system. Every staff must accept the relevant trainings related to the involving work species and only competent staff, who pass the

relevant examination could begin to take part in the production process and operational process. Moreover, all the staff must go through re-training of HSE and reexamination on regular time base and must get the relevant certificate (Yu et al., 2012).

Table 1.1 Training Time for Different Job Positions in HSE System

Job position	Training time
Principal person in charge	Fist training time should be not less than 32 learning hours and every year re-training should not be less than 12 hours.
Safety management personnel	Fist training time should be not less than 48 learning hours and every year re-training should not be less than 16 hours.
Special operation personnel	After passing the relevant examination and get relevant certification, they must accept regular review base on regulations.
New employees	Must go through factory and accept safety production education training and the time should not be less than 72 learning hours and every year the re-training time should be no less than 20 hours.

Source: (Yu et al., 2012)

Further, three representative accident cases from the Petroleum Industry in China are selected as below to help gain a brief understanding of the possibility of accidents and the cost of accidents:

Table 1.2 Three Accidents Cases Summarized in Chinese Petroleum Industry

Accident	Place	Accident Description	Lost	Direct Reason
Accident 1	Company A	Serious and strong gas blowout	243 death, 2142 hospitalization and 65,000 evacuation with the direct economic loss 6423.31 ten thousand yuan.	1.Technology problems 2. Fail to make a quick and correct decision in time to control the situation.
Source: China Daily				
Accident 2	Company B	Gas leak and explosion occurred in organ canteen	Canteen collapsed and 3 externally-hired personnel dead	Lack of regular inspections.
Source: CCTV.com				
Accident 3	Company C	Mixed gas flew into the gap of the water pump and met the high welding temperature suddenly explosion happened	One external temporary contracted male worker dead	1. Onsite supervisors are not fully responsible. 2. Safety testing is not strictly followed and observed.
Source: Sohu News				

Source: Author's database

From Table 1.2, the lessons of accidents could be learned and the loss involves both personnel death or injuries and a large economic loss, which have an adverse effect on company public reputation, inner worker psychological safety, and environment protection (Wang, 2011). From these three accidents, it could be concluded that because of lack of certain technical supports, timely correction decision, regular inspections, lack of responsibility or poor coordination the accidents happened. Moreover, from the analysis of these three accidents, the mainly direct reason is human factor, which lack of timely handling capacity when emergency happen and enough safety awareness during the safety operation. The lessons of the accidents require the first line workers to have the ability to identify potential hazards and prevent accidents, which emphasizes the importance of mindful safety practices adoption in the Petroleum Industry.

Once the accident happens, both the direct and indirect losses are high. The direct loss involves monetary compensation while the indirect loss contains company public trust and reputation (2011). The reason why a successful and responsible company always regard safety as equal as productivity or even the higher priority as they know the cost of failing to obey safety procedures is far higher than safety production. Moreover, the cost of maintaining auxiliary units and equipment such as underground and above ground boreholes, drilling machines, transportation fees, new equipment purchase fees and power offers are also included in the maintenance costs (Sokolov & Giniatullin, 2015). Therefore, production should never be at the cost of people's lives and must have the red line awareness of safety and environmental protection. Safety production regulation and the responsibility system for safe operation in the high-risk organizations are extremely essential (Shen et al., 2017).

In addition, the punishment of the law of the People's Republic of China on Work Safety is very strict. This not only harms the involved employees but also bring seriously negative influence on both inside company staff and the public reputation. According to the regulations of the law of the People's Republic of China on Work Safety, the main responsible person in charge of the unit will get the punishment such as 40%-80% of one-year salary as a penalty while civil servants would be punished according to the relevant law. If the case constitutes a criminal responsibility, the relevant personnel shall be investigated further based on the law (https://baike.baidu.com, 2019).

Although HSE system is comprehensive with sufficient training time in the petroleum companies, sometimes the accidents happen suddenly without any expectation especially under the social-technical system. Safety hazards under the mindful safety practices need the individuals to evaluate the current situation based on their own subjective judgments and knowledge. In addition, once the accidents happen, it will cause a series of the system broken. The well-being and public reputation of petroleum companies will be largely damaged even with strict law punishment. Therefore, the prevention of the accidents become extremely significant. Mindful safety practices belong to a special component of the common safety behavior, which focus on the ability of the employees to be aware of critical factors in the environment and act appropriately when danger arises (Dahl & Kongsvik, 2018). Nevertheless, limited attention has been paid in the area of mindful safety practices that is a special employee safety behavior. In order to facilitate the first-line workers to conduct mindful safety practices in the petroleum companies, factors that are related to common safety behavior are identified, which are safety-specific transformational leadership and six dimensions of safety management

practices from both the group and organizational perspectives to examine if these factors could also be adopted to predict the special safety behavior-mindful safety practices. High-quality relationships contain capacities, which include emotional carrying capacity, tensility, and connectivity while subjective experience contains vitality experience, positive regard, and mutuality (Carmeli et al., 2009). Mindful safety practices require the employees to warn and stop their colleagues when danger arises, which means a high-quality interpersonal relationship with colleagues could facilitate the employees to gain more motivation to warn and pay attention to their colleagues' operation by cultivating a mutual safety environment. In this study, the subjective experience of high-quality relationships including positive regard and mutuality is adopted as these two components of the subjective experience of high-quality relationships comply with the concepts of mindful safety practices such as warning colleagues. Common safety behavior contains safety compliance and safety participation, which includes the basic safety rules compliance and safety improvement in the workplace (Griffin & Hu, 2013). It is argued that the mindful safety practices are more like the safety participation, which needs more willingness and voluntary efforts (Dahl & Kongsvik, 2018). Skjerve (2008) found that petroleum companies operate under the tightly coupled and interactively complex social technical system, which belong to the high-risk industry and potential hazards exist. Therefore, HRO (High Reliability Organization) theory is adopted as the underpinning theory, which provides the theoretical understanding that through the comprehensive safety management, high reliability operation could still be achieved in the high-risk organizations. Another theory, which is LMX (Leader-member Exchange) gives the theoretical support for the relationship between safety-specific transformational

leadership (relationship-oriented) and the mindful safety practices conduction as a reciprocity by the first line workers because of the management commitment and effective exchange.

Thus, this study aims to examine the six dimensions of safety management practices, safety-specific transformational leadership, and high-quality relationships from the individual, group and organizational levels to understand whether the level of safety motivation of first-line workers to conduct mindful safety practices in the Chinese Petroleum Industry could be increased. Hereby, safety motivation is identified as a mediator in this study. Two theories, which are HRO and LMX provides the theoretical backgrounds and supports for the current research. The purpose of this study is to provide an innovative insight for understanding a special component safety behavior-mindful safety practices in the Chinese Petroleum Industry from the individual, group and organizational levels.

1.4 Research Objectives

This study considers the association of safety-specific transformational leadership, dimensions of safety management practices, high-quality relationships, and safety motivation with mindful safety practices in the Chinese Petroleum Industry. The research objectives of this study are presented as below:

1) To investigate the effect of safety-specific transformational leadership on safety motivation.
2) To investigate the effect of the six dimensions of safety management practices (management commitment, workers' involvement, safety training, safety