A FRAMEWORK OF OCCUPATIONAL SAFETY AND HEALTH IN CONSTRUCTION INDUSTRIES FOR SAFETY PERFORMANCE IN IRAN

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DEDICATION

This thesis is dedicated to my father, who taught me that the best kind of knowledge to have is that which is learned for its own sake. It is also dedicated to my mother, who taught me that even the largest task can be accomplished if it is done one step at a time.

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ABSTRACT

Health and safety issues in the construction sector have always been a major concern. This sector is discovered to pose threats concerning health and safety standards particularly among developing countries. Iran, a developing nation is not spared from this. Accident rates are high in the Iran construction industry. Therefore, this study has proposed an occupational safety and health framework to address this. This framework combines employees, organizations and environmental factors that emphasize on workers' safety. The research objectives are aligned with the Iran's government plan and vision toward improving the country's economy and social wellbeing. A survey method was employed to collect the data from workers of both public and private sectors. The sample of 600 operative workers was chosen in achieving the five research objectives. The Confirmatory factor analysis (CFA) and Cronbach Alpha were employed to measure the validity and reliability of the instrument. Correlational analysis and Structural Equation Modeling (SEM) were used to examine the hypotheses and hypothesized model. The findings show that worker factors and organizational factors have positively and significantly influenced safety orientation as the mediator. In addition, there is no significant relationship between environmental factors and safety orientation. Worker factors and organizational factors have positive and significant influence on safety orientation. There is no significant relationship between environmental factors and safety performance and safety orientation partially mediates the relationship among worker factors and organizational factors and safety performance. Moreover, there is no significant relationship between environmental factors and safety performance. Therefore, the findings have addressed the gaps in factors of safety performance and an integrated framework for safety performance in the Iran construction industry has been proposed.

ABSTRAK

Masalah kesihatan dan keselamatan di sektor pembinaan sering menjadi perhatian utama. Sektor ini didapati menimbulkan ancaman mengenai standard kesihatan dan keselamatan terutama di negara-negara membangun. Iran, sebuah negara membangun juga tidak terlepas dari ini. Kadar kemalangan adalah tinggi dalam industri pembinaan Iran. Oleh itu, kajian ini telah mencadangkan kerangka kerja keselamatan dan kesihatan pekerjaan untuk mengatasi hal ini. Rangka kerja ini menggabungkan pekerja, organisasi dan faktor persekitaran yang menekankan keselamatan pekerja. Objektif penyelidikan yang ditetapkan selaras dengan rancangan dan visi pemerintah Iran untuk meningkatkan ekonomi dan kesejahteraan sosial negara. Kaedah tinjauan digunakan untuk mengumpulkan data dari pekerja sektor awam dan swasta. Sampel terdiri dari 600 pekerja operasi dipilih bagi mencapai lima objektif penyelidikan. Analisis faktor Pengesahan (CFA) dan Cronbach Alpha digunakan untuk mengukur kesahan dan kebolehpercayaan instrumen. Analisis korelasi dan Pemodelan Persamaan Struktural (SEM) digunakan untuk meneliti model hipotesis dan hipotesis. Hasil kajian menunjukkan bahawa faktor pekerja dan faktor organisasi telah mempengaruhi orientasi keselamatan secara positif dan signifikan sebagai pengantara. Di samping itu, tiada hubungan yang signifikan antara faktor persekitaran dan orientasi keselamatan. Faktor pekerja dan faktor organisasi mempunyai pengaruh positif dan signifikan terhadap orientasi keselamatan. Selain itu, tidak ada hubungan yang signifikan antara faktor persekitaran dan prestasi keselamatan dan orientasi keselamatan sebahagiannya mempengaruhi hubungan antara faktor pekerja dengan faktor organisasi dan prestasi keselamatan. Tidak ada hubungan yang signifikan antara faktor persekitaran dan prestasi keselamatan. Oleh itu, dapatan ini telah mengatasi kesenjangan dalam faktor prestasi keselamatan dan satu kerangka kerja bersepadu untuk prestasi keselamatan dalam industri pembinaan Iran telah dicadangkan.

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LIST OF ABBREVIATIONS

SP	-	Safety Performance
SO	-	Safety Orientation
MC	-	Management Commitment
HDR	-	Human Resource Department
OSHA	-	Occupational Safety and Health Administration
IPA	-	Importance Performance Analysis
ST	-	Safety Training
AFR	-	Accident Frequency Rate
ASR	-	Accident Severity Rate
FSI	-	Frequency Severity Indicator
ILO	-	International Labour Organization
IV	-	Independent Variable
DV	-	Dependent Variable
CSOS	-	Constriction Safety Orientation Course
PPE	-	Personal Protective Equipment
CFA	-	Confirmatory Factor Analysis
EFA	-	Exploratory Factor Analysis
UAVs	-	Unmanned Aerial Vehicle Systems
SI	-	Safety Inspection
SMT	-	Stress Management Training
ANSI	-	American National Standard Institution
RIR	-	Recordable Injury Rate
NSC	-	The National Safety Council
LMO	-	Iranian Legal Medicine Organization
OHSMS	-	Occupational Health and Safety Management System
EF	-	Environmental Factors
WHO	-	World Health Organization
SMS	-	Safety Management System

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CHAPTER 1

INTRODUCTION

1.1 Overview

Safety at work is a crucial factor in any construction site, hence attitudes on safety are important in determining the performance of a project. When construction projects involve employees, the risks of accidents to occur at sites are always there. So, to ensure that employees' safety are well taken care of, safety procedures are practiced. Safety at workplace is not only about preventing any injury or illness from occurring among employees at a working site (Mezlan, 2012). It is a more complex phenomenon, and consequently, it is about protecting the most valuable asset: the workers. By protecting employees or workers from any occurring accidents, the cost paid for employees' health and insurance benefits as well as the cost of hiring temporary workers to replace the injured workers can be reduced.

Occupational Safety and Health (OSH) is a domain that is concerned with protection among employees in terms of their health, safety and welfare in doing their assigned jobs (Abdollah, Tzuaan, & Sivaji, 2013). Occupational Safety and Health Act 1970 is officially authorized with the purpose to guarantee safe and healthy working conditions for working men and women; by authorizing enforcement of the standards developed under the Act; assisting and encouraging the governments in their efforts to assure safe and healthful working conditions, providing for research, information, training, and education, in the field of occupational safety and health; (Abdollah et al., 2013).

Despite having sophisticated safety and health regulations in many countries, high rates of accident and fatality still persist. The more thriving in economy a country is, the more construction projects that it has to cater the needs of development. This will lead to a wide array of workplace hazards which put employees at high risks of

getting injured or being sick at the working sites. Not only these hazards are physical factors, they can also be biological, chemicals, adverse ergonomic conditions, allergens, a complex network of safety risks and a wide variety of psychosocial and psychological factors (Johnson Cherian, Bazroy, Jacob Purty, Natesan, & kantilal Chavada, 2015).

Therefore, it can be said occupational safety plays a vital role in the productivity, efficiency and competitive advantages of many industries. Occupational injury, illness, and workplace fatalities on the other hand, are important public health concerns. Globally, two point three million deaths a year can be attributed to occupational accidents or work-related diseases, and many more suffer from non-fatal work-related injury and illness (Lay et al., 2016).

Occupational safety plays an important role in the construction industries (X. Lu and Davis, 2016) and safety is one of the most important issues in construction management. Scholars have looked into a variety of elements such as safety planning, safe work procedures, supervision, and safety training that are crucial in safety management (X. Lu & Davis, 2016). As reported by Phoya (2012) the construction industry is an important part of economy in many countries and is often seen as a driver of economy development especially in developing countries. Owing to its relatively labor-intensive nature, the construction industry provides opportunities for employment for a wide range of skilled, semi-skilled and unskilled workers. In the developed as well as developing parts of the world, the construction industry is considered as one of the most significant industries in term of contributing to GDP. Therefore, in point of the fact, the construction industry is both economically and socially important as mentioned by M. M. Hasan, Khanam, Zaman, and Ibrahim (2017).

According to Bhole (2016) efficient health and safety at the workplace would not only ensure that workers are contented and productive but also help to reduce costs of treatments for injuries and unnecessary lawsuits. By making health and safety their priority, construction companies are effectively ensuring that employees are valued and acknowledged. Additionally, quality health and safety standards support

companies to be more effective to complete projects on time and build good reputation among clients.

Based on previous studies, it has been discovered that regulations and policies are insufficient to achieve zero accident and incident at construction sites. Lay et al. (2016) state that the consequences of work-related injury and illness go beyond employees, in fact these are extended to their families, businesses and economy in general. It is understood that construction industry posts high risks of causing serious health hazards to workers, users of construction facilities and the public. This is supported by the risk of fatality that is two times higher in this industry compared to the manufacturing industry (Ventura, Getuli, Capone, & Ciribini, 2016).

It is discovered that, even, in some developed countries, construction industry is still considered as one of the most dangerous industries in term of the accident rate. For instance, in 2014, over 73,000 non-fatal injuries were reported in the Unites States of America's construction industry (Hatami, Khanjani, Alavinia, & Ravandi, 2017). In addition, in New Zealand, over 12 per cent of non-fatal injuries (155,566 injuries) have occurred in the construction industry between 2003 and 2010, while only seven point eight per cent of workers were working in the construction industry during that specific period (Ghodrati, Yiu, Wilkinson, & Shahbazpour, 2018). Therefore, it is important to have a national strategic plan to improve safety at workplace and to reduce injury and fatality in the construction industry.

In order to enhance safety performance and minimize potential hazards and accidents from happening, it is crucial to identify factors and elements that can affect safety. Several studies have examined safety performance and its improvement and it has been discovered that major factors of accidents are related to the unique nature of the industry, human behavior, poor safety management and difficult worksite conditions, which result in unsafe work methods, equipment and procedures (Bamfo-Agyei & Atepor, 2017). Analyzers and policymakers need to explore the most important factors that can positively affect safety performance onto safety development. Based on the occupational safety literatures the most important factors discovered are: individual factors such as age, gender, accident experiences (Yuting

Chen, McCabe, & Hyatt, 2017), environmental factors such as working condition or nature of project (Khosravi, Asilian-Mahabadi, Hajizadeh, Hassanzadeh-Rangi, Bastani, et al., 2014; Sawacha, Naoum, & Fong, 1999) and organizational factors like management practice on-site, inspections, safety meetings (Guo, Yiu, & González, 2016; Jitwasinkul, Hadikusumo, & Memon, 2016). Investigation and analysis on these factors are essential due to the significance of the construction industry considering the huge impacts that it has on a nation's economy and social well-being. Although dramatic improvement has taken place in recent decades, the safety record in the construction industry still continues to be one of the poorest (Mir & Mahto, 2015).

The same scenario can be seen for the construction industry in Iran. Data showed from 2009 to 2013, there were 9625 human-life losses due to occupational accidents. According to Iran Social Security Statistics (ISSS), approximately 37 per cent of all industrial accidents (including fatalities and lost time accidents) occur in the construction industry (Amiri, Ardeshir, & Zarandi, 2014; Ghanbari, Ashtarian, & Yarmohammadi, 2017). In addition, the Labour Relations Department at the Ministry of Labour reported 1518 construction accidents between 2009 and 2013, that 16 per cent of these accidents led to death, and 70 per cent led to injury and damages. Indeed, although less than 12 per cent of Iranian workers are active in constructions, the severity of injuries is very high.

Thus, it can be said that safety at construction sites has become a major issue in Iran (Oostakhan, Vosoughi, & Khandan, 2012). Apart from the high rate of the accident, the unreported accident cases is another obstacle that the industry has to face. Non-reported accident cases could influence safety performance measurement. Safety outcomes are a form of objective criteria that represent critical safety incidents such as the number of injuries or accidents that occurred within a particular period. As stated by Drew (2014) there are several subjects with this form of criteria including 1) incident or accident underreporting; 2) reporting system failures (Risk Management System); and; 3) measurement deficiency.

Work-related accidents and injuries are often not recorded because workers fear that they will be punished and the management fears that it will be answerable for

such accident or injury to happen (Probst & Estrada, 2010). When accidents or injuries are not reported, employees often feel the burden in which they may have to bear the treatment cost themselves or they might suffer from ailments without having to receive the right treatments or having access to proper healthcare that should be provided by employers. Statistics have shown that in the area of health care industry, 64 per cent of unreported minor injuries among workers actually needed proper medical treatments. There are many reasons for employees not to report accidents or injuries at workplace. One of them is that the management discourages employees to lodge a report.

On the other hand, according to the Occupational Safety and Health Act of 1970, employers need to control, monitor and maintain records of occupational injuries and illnesses. In general, the construction industry needs to have a proper risk management system to keep the critical accident and injury reports. On the contrary, Drew (2014) mentions that various organizations do not have strong, orderly and necessary reporting system and standard of accidents or injuries at workplace.

Lastly, data and statistics on accident and injury rates cannot provide significant information about employees' behavior preceding accidents. Using safety outcomes as a measurement criteria serves can only provide incomplete or unauthentic information on safety performance. Indeed, safety performance cannot be defined only by lacking of accidents. However, many studies that have been conducted consider accident rates and fatalities as the safety performance indicators. SchulTz (2012) states that if occupational injuries can be predicted, it will lead to the decrease and prevention of accidents. The ability to predict safety outcomes plays a vital role in designing a realistic and effective plan for improving overall occupational health and safety in the construction industry. Focusing on behavioral aspects of safety help managers and policymakers to predict employees' behavior in risky condition. Based on evidences, unsafe behaviors cannot consistently cause accidents, but consecutive unsafe behavior increases the probability of an accident at the workplace. Thus, all unsafe behaviors are dangerous, despite the nature of its consequences.

Human is not free from making errors and errors at workplace can mean disaster and thus they should be avoided. Safety behaviors are still not fully comprehended, predicted and improved by industrial or organizational psychologists and there is a lack of studies in this area. It is important to note that accusing employees of being the main cause of accidents at workplace without investigating all psychological and behavioral angles provides an imperfect information on safety performance. To precisely measure safety performance, it is important to consider all aspects of safety behaviors rather than only looking at mere instances in which specific behaviors would result in an accident or cause an injury. For instance, it can be more beneficial for policymakers and practitioners to investigate the factors that can affect employees' orientation toward safety. Finally, control of human errors requires the identification of two important issues. First, the types of errors that occur and second reasons for workers to break safety rules.

Efforts have been made by scholars and researchers in adopting a framework that is suitable not only within the perimeter of work culture, but also suitable in looking at different aspects of safety performance. Nonetheless, successful implementation of the safety performance in construction industries is challenging, particularly in developing countries due to lack of policies and limited factors measured at construction sites. In other words, although some of the current models provide valuable information in terms of safety outcomes at the organizational level, they are not effective in national context and for strategic planning (macro-level).

In addition to that, the key factors influencing safety performance have not previously been the focus of research, and to date, there is no integrated safety performance framework that acts as a benchmark for construction industry in developing countries (Priyadarshani, Karunasena, & Jayasuriya, 2013). Iran as a developing country is also not spared from this issue. Accidents at construction sites in Iran have resulted in great resource and socioeconomic losses (Soltanzadeh, Mohammadfam, Moghimbeigi, Akbarzadeh, & Ghiasvand, 2016). Therefore, to address this gap, this study attempts to identify the factors affecting the construction safety performance in Iran construction industry. The identification of these factors can contribute to the awareness of the importance of safety performance, which in turn

can lead to the improvement of overall quality of health and safety at workplace in Iran's construction industry.

1.2 Background of the Study

For many years, writers worldwide, particularly in the developed and industrialized societies, have struggled in understanding the 'accident' or 'safety' phenomenon (Sawacha, 1993). Since the beginning of the century till 1916, works were under "the common laws", which made employees responsible for themselves and the risks of their works. At that time, industrial accidents were common in many countries. Furthermore, legislation and public opinions all favored the management and there were only few protections in term of employees' safety. "Before this most employers passed the blame and responsibility to their workers for workplace incidents using what was called "the common laws" which stated that firstly, the management/employer was not responsible when a fellow worker was injured due to the worker's negligence. Second, the employer/management was not responsible if workers were injured due to the management's negligence."

"The history of safety and health at workplace can be considered as long and winding since exploitation of laborers is always there. The first and second World War tremendously contributed in getting employers to consider various hazards at workplace. Consequently, governments in many counties established Boards and Research Bodies to investigate "Fatigue" and health in the industry (Turk, 2018). After 1916, workers compensation law was deemed by governments which enforced managers or employers to be responsible for their workplaces' safety and health. Subsequently, employers were required to provide and pay for medical care and lost wages due to on-the-job accidents. This was a moral responsibility before it was a duty (Reese 2003). Indeed, the high rate of occupational accidents made policymakers and employers to establish occupational health and safety laws to protect employees at workplace. Employers also found it more cost-effective to keep workplace safe from any harm or hazard as this would save them from having to fork out additional cost for treatment or other medical bill due to accidents at workplace."

Eliminating the hazards that exist at workplace is the first step in ensuring safety at workplace and more importantly, the implementation of it should be a cause for concern. During the first 20 years of the safety movement, death cases decreased significantly. In April 1971, the Occupational Safety and Health Act became effective and applied to more than five million businesses including 60 million workers in the USA (Zekri, 2013). Occupational health and safety (OHS) management protects the safety, health and welfare of employees at workplace. The International Labour Organization (ILO) and the World Health Organization (WHO) have shared a common definition of occupational health.

Efforts have been taken by many quarters in preventing and reducing accidents at workplace. Many variables that are related to safety at workplace have been studied and explored. Among these variables are classification of accidents, influence of age, race, culture, stress, safety management system; ergonomic factors, safety motivation and many other areas. Moreover, research studies on construction safety have focused on preventing accident occurrences and alleviating severity.

Post the second World War, construction industry gained significance due to massive development that needed to be carried out due to the massive destruction of infra-structures and this had resulted in attracting more people to work in this industry. These people have been skilled, semi-skilled and non-skilled employees. When employees are made of mixed abilities and coupled with other issues pertaining to work environment, the chances of accidents to occur at workplace would be high. (S. Dekker, 2014; Swuste, Frijters, & Guldenmund, 2012). "Compared to other labor-intensive industries, the construction industry has historically experienced high rate of disabling injuries and fatalities for its nature (Hinze, 1997)."

Safety performance may also be influenced by different safety factors at different construction sites. However, it is sad to note that several studies have shown that the construction industry has poor safety performance record (Michaud, 2017) and at the same time, this industry is also recognized to be one of the most hazardous. Even though dramatic measure have been taken to improve the poor record, it continues and

more effective solutions should be developed to overcome this (Recarte Suazo & Jaselskis, 1993).

Socially, construction industry is also significant in contributing to the gross domestic product (GDP) of a nation especially among the developing ones. In developing countries, the construction of infra structures to meet the high demands of development is extensive and many employees are working in the industry to meet the high demands. These infra structures include houses, hospitals, schools, worship places, business premises and other premises that are needed in a progressive society. In fact, in many developing countries the increase in population has led to critical demand for housing. Thus, based on the importance of this sector, it is clear that there is a direct connection between construction output and national output (R. A. Khan, Liew, & Ghazali, 2014). The construction industry is frequently considered the catalyst to the growth of economy among developing nations; yet the factors of safety have not being fully attended to and there are still high number of accident cases in this industry which leads to losses not only among developers or contractors but to the country as well.

"Due to the use of extensive use of sophisticated plants, modern methods of construction, equipment and multitasked aspects of its project workforce, construction industry can pose risks of accidents among its workforce (Teo, Ling, & Chong, 2005)." Indeed, safety concerns have been intensified because of rising costs of premium compensation of workers, an increase in the number of liability lawsuits, the intensification that has been made to safety regulations and obligations enacted by owners to address workers' injuries and accidents. Although great improvements have been made in health and safety performance in some countries, the construction industry continues to lag behind most other industries. (Torghabeh & Hosseinian, 2012). This is true among developing countries that have high rates of accidents due to poor safety at work sites (Babiker, 2015). According to Priyadarshani et al. (2013), although it is difficult to quantify labor accidents on a global scale, it was estimated that approximately 350,000 workers died every year due to accidents at workplace.

Accidents at workplace can be avoided should proper preventive measures be taken by contractors or developers (Adane, Gelaye, Beyera, Sharma, & Yalew, 2013). Many countries are affected by this, and these countries are both developed and developing nations. According to United States' OSHA, "construction safety in developing countries is still at its infancy (Bust and Gibb, 2006; Koehn and Reddy, 1999; Aires et al., 2010). Poor safety performance in these countries can be attributed to unsuitable enforcement of regulations or insufficient work procedures (Awwad, El Souki, & Jabbour, 2016)." Comparisons between developed and developing countries have proved that there are three times as many fatalities in construction industries in developing countries than in industrialized ones. They attributed this difference somewhat to the weak regulatory systems in most developing countries. This viewpoint was further supported by Suazo and Jaselskis (1993) through their in-depth comparison of construction health and safety codes in the developed and developing countries.

Therefore, developing countries can learn from developed countries their experiences, procedures and management systems so that number of accidents at workplace can be reduced in developing countries. "Although the field of occupational health and safety has always been a major issue in academic research, only a few researchers have investigated and compared the safety performance between developing and developed countries (King and Hudson 1985; Suazo and Jaselskis 1993; Koehn et al. 1995; Hamalainen et al. 2006). As shown in Table 1.1, the disparity in occupational accident rates between different regions is remarkable. Regions in Table 1.1 are divided by using the World Bank divisions. For example, as indicated in Table 1.1, both the accident and the fatality rates in South Africa (19.2 and 14626 per 100 000 workers respectively) are significantly higher than those of Singapore (9.8 and 7452 per 100 000 workers respectively).

Table 1.1 Fatality & Accident Rates at Regions

	Region	Fatality rate (per 100 000 workers)	Accident rate (per 100 000 workers)
1	EME	4.2	3240
2	FSE	12.9	9864
3	OIA	21.5	16434
4	SSA	21.0	16012
5	LAC	17.2	13192
6	MEC	18.6	14218
7	Singapore	9.8	7452
8	South Africa	19.2	14626

(EME): Established Market Economics (e.g. US, Hong Kong); (FSE): Former Socialistic Economy (e.g., Norway, Ireland, New Zealand ,Belgium); (OIA): Other Asia and Islands (excluding China and India); (SSA): Sub-Saharan Africa (Including South Africa); (LAC): Latin America and the Caribbean; (MEC): Middle Eastern Crescent. ***Source:*** *(Bank, 2014)*

Table 1.2 describes the fatality rates in developed and developing countries. For instance, there is a huge gap between the UK and Zimbabwe which is a developing country.

Table 1.2 Fatality & Accident Rates at Regions (Developing & Developed Countries)

	Country (Country Code)	Total Employment	Fatal Accidents	Fatality Rate
1	United Kingdom (GBR)	28225400	236	0.83612632593
2	Sweden (SWE)	4239000	63	1.4861995754
3	Norway (NOR)	2278000	42	1.8437225637
4	Switzerland (CHE)	4156000	81	1.9489894129
5	Germany (DEU)	36816000	1107	3.0068448501
6	India (IND)	402510000	40133	9.9706839582
7	Bangladesh (BGD)	51764000	11768	22.733946372
8	Tajikistan (TJK)	1143000	116	10.148731409
9	Kuwait (KWT)	1243126	138	11.101046877
10	United Arab Emirates (UAE)	1779000	224	12.591343451
11	Saudi Arabia (SAU)	5808617	829	14.271899834
12	Zimbabwe (ZWE)	4665449	1097	23.513278143

(Sources: Fatality Rate in Different Countries Horiuchi (2013)

As mentioned above, accidents at workplace happen in both developed and developing countries. However, the rate of occurrence of these accidents is more dominant in the developing countries. In the United States of America (USA), it was reported that the construction industry accounted for 20 per cent of all occupational fatalities when they made up only six per cent of the USA's workforce (Enshass &

Aqaad, 2011). In Kuwait, the construction industry accounts for 42 per cent of all occupational fatalities and in Hong Kong, the industry accounts for more than one-third of all industrial accidents over the last 10 years (El-zain, 2014). In Singapore, the construction industry takes up 29 per cent of the total number of industrial workers, but the industry accounted for an un-proportionate 40% of the industrial accidents (El-zain, 2014).

Table 1.2 depicts the fatality rates among different nations. It can be said that alongside having a lower productivity level and more socio-economical problems compared to developed nations, workers in developing nations have higher risk of meeting accidents at workplace (Ofori, 2015). In adopting different approaches to health and safety in developing and developed countries, two major differences have recognized. The first is the existence of proper legislation and its effective implementation; the second is hazard awareness and consciousness. Indeed, in developed countries, many safety acts and policies exist and are implemented effectively (Alhajeri, 2011). Based on the above-described about construction safety in different regions, it is easy to understand that in developing countries, however, safety rules hardly being adhered to; and when they are, often these rules are incomprehensive or they are unsuitable, or out of date.

Since it is apparent that accident rates are more dominant in developing countries than among developed nations, it is notable to identify the factors that affect safety performance. Many studies have been conducted about these factors. Based on the findings, there are many factors identified and this study will take into account these factors. For instance, Petersen (1971) has summarized that people or employees are the main factor behind accidents and this is known as worker factor and management is also causing many accidents to occur and this is known as organizational factor. Petersen too emphasized that root causes must be identified on order to have permanent improvement. He specified that root causes often related to the management system and may be owing to management policies, procedures, supervision, effectiveness and training plus several other related matters. Other researchers have increasingly acknowledged that management factors in addition to human factors have also played an important role in workplace safety (Enshass,

Choudhry, & Aqaad, 2013). Indeed, to reduce the number of accidents, injuries, and fatalities in the workplace, safety and identifying the factor affecting safety performance should be a top priority in order to avoid huge loses of human resource and financial resource (Amiri et al., 2014).

Since this study is focused on Iran, then the study shall identify workplace safety scenario within the context of this country. From identified and relevant literatures, a similar narrative can be found in Iran's construction industry as a developing country. It is stated in the history of Iran that the eight years of devastating war with Iraq (1980 – 1988), has left the country with an urgent need for development and rebuilding ranging from housing to other public amenities and commercial premises. Iran needs large construction works and huge number of employees in order to rebuild its infrastructures post war.

Thus, construction, as one of the biggest sectors in the Iranian economy with more than 15 per cent share of GNP and employing more than 10 per cent of the total workforce. It is identified as having the highest potential for elevating the country's economy recovery (Chileshe, Hosseini, & Jepson, 2016). Iran's construction industry is a major contributor to gross domestic product (GDP), which is around five per cent, and finally is a pillar of the national economy (Oostakhan, Vosoughi, and Khandan, 2012). At present, 2000 units are being built every day even though this needs to increase to 2740 units (P. Manu, Emuze, Saurin, & Hadikusumo, 2019). Iran's construction market expanded to $154.4 billion in 2016 from $88.7 billion in 2013. According to all aforementioned reasons, the role of the construction industry is evident in Iran. On the other hand, Iran has also recorded many accidents at construction sites which resulted in great human and socioeconomic losses (Soltanzadeh, Mohammadfam, Moghimbeigi, Akbarzadeh, et al., 2016). Even though less than 12 per cent of Iranian workers are active in construction, the intensity of injuries is very high (Moradinazar et al, 2013). Therefore, this study is very significant because it is aimed at identifying the key factors affecting construction safety performance by emphasizing on behavioral aspects of safety in Iran. The identification of these factors can contribute to policymakers to establish a suitable framework to predict future accident and improve safety performance in the construction industry.

1.3 Problem Statement

Iran is a developing country that is currently enjoying relatively strong growth in construction activities. The high rate of urbanization which results in high demands for housing and amenities in Iran has increased the number of construction activities (Aghajanian & Thompson, 2013; Bahrampour, Nodoushan, & Shoaa, 2009). Therefore, this has provided employment opportunities both skilled and unskilled employees (Well and Hawkins, 2007). Additionally, the construction industry is often regarded as a driving force for economic growth, especially in developing countries. However, the prosperity of construction industry also comes with its disadvantages. In this industry, occupational accidents have been the cause of more than 350,000 mortalities and 300 million injuries around the world each year; this considerable number of cases has led to serious human and financial impact in many countries (Amiri, Ardeshir, Fazel Zarandi, & Soltanaghaei, 2016; Hatami et al., 2017). Previous studies have revealed that workers in different industries are exposed to occupational accidents in different ways (Dudarev, Karnachev, & Odland, 2013). The construction industry is known to be one of the most hazardous industries all over the world (Cheng, Leu, Lin, & Fan, 2010). Alhajeri (2011) indicated that in the majority of developing countries, safety rules usually do not exist, and if it exists the regulatory authority is usually very weak in implementing the rules effectively. Therefore, this study will consider the gaps exist in the implementation of safety rules in the construction industry in Iran.

In Iran, based on the statistics provided by the Ministry of Labour and Social Affairs, 45 per cent of the total incidents are related to the occupational accidents. Unfortunately, among this percentage, 50 per cent of the fatality incidents are related to the construction industry (Hatami et al., 2017). Additionally, based on the Iranian Legal Medicine Organization (LMO)' report in 2016, 45 per cent of the total work-related accidents have been accumulated in the construction industry (Khanzadi, Sheikhkhoshkar, & Banihashemi, 2018). Although statistics has shown that the fatality and accident rates are high in this industry, there is not much knowledge has been discovered on the safety factors in the Iran construction industry. A more

comprehensive study is needed to gain more insights into safety factors at construction sites in Iran (Amiri et al., 2014).

Therefore, to analyze the problem of safety at workplace in the Iran construction industry, this study will address identified gaps and challenges into two different categories. First, identified gaps and issues in previous safety studies and frameworks will be explained. Second, the relevant issues in this industry will be explored. In other words, this study will be identifying factors associated with construction accidents that may help to reduce its consequences. Besides, it will cover as many factors as possible that is identified in accident reports, to establish its relation to safety performance.

To date, many of the studies conducted on occupational health and safety at construction sites in Iran have focused on small regions, small scale construction activities and covered limited causes or factors of accidents. In addition, many of these studies were conducted among private contractors or developers and this translated into limited data. At one point, all these information or data cannot be generalized to construction sites or activities that are located in huge cities and operated on a larger scale (Bahrampour, Jafari Nodoushan, & Vatani Shoaa, 2015; Halvani, Jafarinodoushan, Mirmohammadi, & Mehrparvar, 2012; P. Manu et al., 2019). In addition, in the previous studies, there has been lack of attention given to the behavioral aspects of the safety.

Analyzing the behavioral and psychological reasons for employees' unsafe behaviors will help to predict and prevent accidents at workplace. However, this has not been sufficiently addressed in research works of safety at construction sites in Iran. Thus, this study will explore the key factors extensively in three large industrial cities in Iran. As mentioned before, construction industries are one of the important sectors that create the most job opportunities in Iran. Regardless of significant of these industries, the rate of work-related accidents is on the rise and the severity of the injuries caused by these incidents has also increased (Bakhtiyari et al., 2012; Hatami et al., 2017; Mehrdad, Seifmanesh, Chavoshi, Aminian, & Izadi, 2014).

The next important question is why a study on occupational health and safety is crucial in Iran's construction sectors? The answer is very clear: Accidents resulting in death, total disability, and partial disability impose a huge cost burden on employers, families, and society; significant amounts of the cost of construction accidents involve production disturbance costs, human capital costs, medical costs, administrative costs, transfer costs, and other costs (Feng, Zhang, & Wu, 2015; Vatani et al., 2016). Thus, due to the dangerous nature of construction industries, safety has become a major issue, as indicated in Figure 1.1; the highest accident rate is in the steel industry followed by the construction sector as the second hazardous industry in Iran (Oostakhan et al., 2012). Extensive endeavors have been conducted to identify construction accidents and distinguish factors, but most of the studies are not comprehensive in this matter (Soltanzadeh, Mohammadfam, Moghimbeigi, Akbarzadeh, et al., 2016).

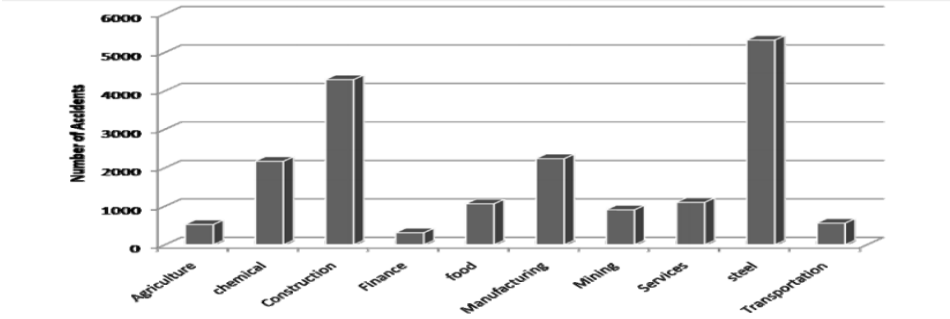

Figure 1.1 Distribution of occupational accidents by separation of different industries (Oostakhan et al., 2012)

Iran's construction industry has many challenges and issues at managerial, individual and organizational levels. Amiri et al. (2014) showed the effect of historical factors such as age, work experience on safety performance in Iran. They explained the frequency of accidents among young workers (15 to 24 years old) that is dramatically higher than the other age groups. This is probably because younger workers are less educated and experienced and more venturesome. Other studies characterized that the majority of laborers, which are also mostly untrained for safety, are included in this group (Amiri et al., 2014; Mohamdfam & Zamanpzrvar, 2003; Soori, Rahimi, & Mohseni, 2006).

As mentioned before construction industries provide job opportunities for a wide range of people who are semi-skilled or even non-skilled. Thus, it would not be far from reality to say that, in Iran, the majority of the construction workers have not enough competence to perform their duties at the worksite. Untrained and non-skilled workers are exposed to hazards that can lead to major injuries (Ebrahimi, Fazlali, & Hosseini, 2012). Another trouble that construction sectors are involved with is the lack of equipment that is used for the specific task to work safely on sites such as safe ladders, personal protective equipment (PPE) and tools (Ardeshir, Mohajeri, & Amiri, 2014). Moradinazar, Kurd, Farhadi, Amee, and Najafi (2013) specified that there are some shortcomings in the provision of PPE in Iran's construction site; they explained that PPE should be provided at a construction site to prevent and even reduce the severity of accidents.

There is also strong evidence that shows the construction industry is suffering from poor and unsafe site conditions. Khosravi et al. (2013) Have confirmed that operating of site conditions is not taken is designed to work safely. They showed that the majority of construction sites are not well planned and designed which can result in a major accident in Iran's construction industry. There is sufficient evidence that shows Iran's construction industry is affected by unorganized site and there is no systematic Layout Planning with the quick material flow and the lowest hazards (Kaveh & Vazirinia, 2019). Worksite conditions influence the risk perception among employees and lastly influence accidents at workplace. In addition to that, safety training is the next area, which is critical in the construction industry. Other studies have revealed that a lack of proper safety training plays a significant role in an accident under Iran's constriction industries. They have claimed that establishing the safety training to increase the worker safety knowledge is not the top priority for managers in construction industries; in result, it is not far from the expectation that accident and incident rate is constantly growing (Firoozi Chahak, Beheshti, & Poursadeghiyan, 2015; Halvani et al., 2012).

Likewise, Ardeshir, Mohajeri, and Amiri (2016) have stated that almost all construction workers in Iran are untrained for safety. This is the reason why construction workers are not able to manage the risky condition. Lack of adequate

safety knowledge and awareness that stem from a failure to provide safety training, is significantly associated with accident severity rate in a construction site (Goh & Chua, 2016). Thus, low levels of safety knowledge and lack of proper awareness about the risky condition have been known as one of the important reasons for accident and fatality in Iran's construction industries (Darvishi, Maleki, Dehestaniathar, & Ebrahemzadih, 2015; Jahangiri et al., 2016; Khodabandeh, Kabir-Mokamelkhah, & Kahani, 2016).

The construction industry is like a double-edged sword, in fact, one edge helps the countries to develop their economy and other edges lead them to pay the cost of disability or death. This issue is more obvious in developing countries, especially in Iran, that apply massive pressure on workers to increase production or finish the project on time, regardless of safety training and education for workers. Safety training can be a strong mechanism that increases workers' attitudes toward safety. Other studies described further gaps and problems in Iran's construction industries. For example, Seifi Azad Mard, Estiri, Hadadi, and Seifi Azad Mard (2017) highlighted that lack of safety inspection and safety supervision that is related to an accident in the construction industry; they revealed that the frequency of accidents on the first day of the week is the maximum comparing to other weekdays. This might be because of a lack of safety inspection at the workplace.

On the other hand, Kalatpour and Khavaji (2016) demonstrated that there is a lack of management commitment and awareness of senior managers toward safety in the construction industry. Indeed, one of the main challenges for the implementation of OHSMS (Occupational Health and Safety Management System) is the lack of management commitment toward safety in Iran's construction. The level of OHSMS effectiveness depends on the commitment of all levels of an organization, especially the top management and management promises and support. Mohammadfam et al. (2017) specified the importance of poor management commitment to safety and its impacts on accidents in the construction industry. His result shows a lack of proper management's attitude towards worker's safety and welfare. Baran, Shanock, and Miller (2012) have shown that Management rarely praises site employees for working safely that comes from lack of their commitment towards safety. As said by

Mahmoudi, Ghasemi, Mohammadfam, and Soleimani (2014) lack of management commitment as well as inadequate policy and strategic goals is the most important element affecting OH&S at the organizational level in Iran. Actually, management commitment has the highest values in policy element; additionally provides sufficient support and resources to safety, helps to create a safe environment, participate in meetings and injury investigation committees, communicates the importance of safety and so on (Mohammadfam et al., 2017; T. -C. Wu, Lin, & Shiau, 2010).

Thus, based on mentioned above, there are complicated challenges at different levels in the construction industry in Iran; some of these problems are related to organizational levels and others are related to individual and environmental aspects. The poor safety performance of the construction industry and lack of comprehensive framework give warning to the safety researchers that this area still needs to study well in Iran (Shahin, Arabzad, & Ghorbani, 2010). Consequently, the study attempted to explore the gaps and challenges to improve the safety performance in Iran's construction industry. The main purpose of this study is to develop an integrated framework that can be used as an effective tool to predict the worker unsafe behavior and improve safety performance at construction sites in Iran.

1.4 Research Objectives

The objectives of this research are to:

1. Measure the level of safety performance in construction industries in Iran.
2. Determine the factors that affect the safety performance of construction industries in Iran
3. Measure the impact of these factors on safety performance
4. Determine the safety orientation as a possible mediator on the relationship between independent factors and safety performance
5. Develop a framework that can be used as an effective tool for improving safety performance in construction industries in Iran.

1.5 Research Question

1. What is the level of safety performance in construction industries in Iran?
2. What are the factors that affect the safety performance of construction industries in Iran?
3. Is there any relationship between these factors and safety performance?
4. Does dose safety orientation have a possible mediating effect on the relationship between factors and safety performance?
5. How to develop an integrated framework that can be used as an effective tool for improving safety performance in construction industries in Iran?

1.6 Research Hypothesis

H1: There is a significant relationship between worker factors and safety performance.
H2: There is a significant relationship between environmental factors and safety performance.
H3: There is a significant relationship between organizational factors and safety performance.
H4: Safety orientation mediates the relationship between worker factor and safety performance.
H5: Safety orientation mediates the relationship between environmental factors and safety performance.
H6: Safety orientation mediates the relationship between organizational factors and safety performance.
H7: There is a significant relationship between safety orientation and safety performance

1.7 Significance of The Study

Apart from the intrinsically dangerous nature of construction work, there are unpromising accident statistics that show and refer to a high rate of accidents and fatalities in the construction industry in Iran. “Construction accidents have been causing many human tragedies, economic and social costs, and loss of life, productivity, and delay projects (Al-Kilani, 2011). The significant of the research stems from the need to develop an understanding and investigate the problem of health and safety in the construction industry in Iran and contributes to an existing body of

knowledge in this area where very little information is available. Although some efforts have been made to remedy this, the incident statistics are still so tragic and disastrous that the who have given it a similar status as an epidemic in the field of public health, and consider it major health, a social and economic risk factor in Iran.

As safety is concerned with reducing rates of accidents and controlling or eliminating hazards at the worksite, preventing accidents must be the first significant step towards safety improvement. There is a need to increase awareness and to exert pressure on companies for safety. Thus, identification and understanding of accident causes is a prerequisite in improving safety. To avoid accidents, it is required to identify and eliminate unsafe acts and unsafe conditions.

On the other hand, the significance of this research derives from the fact that there is indifference in the previous safety research concerning the behavioral and psychological aspects of safety. It is very important to find out why some workers tend to have unsafe behavior in the workplace? Additionally, what factors can affect the orientation of the worker towards safety. Knowing all these answers gives the management the necessary ability to understand and predict worker behavior when they face risky conditions. Furthermore, emphasizing the behavioral and psychological aspects of the safety can open a new window to the personnel selection, those who are qualified enough to perform the job. Unfortunately, this topic has been ignored in construction industries. It cannot be ignored that an unqualified worker can make many disasters at the workplace that impose massive costs on management, society or even government. Accordingly, due to the existence of inappropriate and insufficient frameworks, this study aims to assess the level of safety performance and recognize the key factors affecting safety in Iran's construction industry.

1.8 Theoretical Framework

Incidents and accidents are the most current troubles that construction site encounters. They lead to unwanted expenses and downtime resulting in non-productivity or entrammels. one approach believes that accidents happen while the workers behave unsafely or offer unsafe acts and the management ignores the presence

of unsafe conditions coming to arise. Therefore, unsafe acts and unsafe conditions as the immediate (direct) causes of accidents are the central factors to cause an accident. Other physical and mental conditions of a worker as well as environmental forces and the lack of proper supervision on safety performance are the contributory factors of the unsafe act and unsafe conditions leading to accidents. Thus, it can be said that all the construction accident causation theories and models developed have considerably increased the understanding of accidents and how they happen (Hosseinian & Torghabeh, 2012).

Accidents happen because of failure in one or more than one factor. Academic researchers developed construction accident causation models as early as 1960. Since then, many different accident causation models appear in books and journals. When we take a closer look at the changes in the accident causation model over the years from 1961, we can see an interesting phenomenon: the models are getting more and more complicated (R. Li & Poon, 2010). Accident causation models before the mid-'80s were a lot simpler than model developed, later on, i.e. complicated model "survive" in natural selection. The researchers developed several theories to justify the processes of accidents or incidents and presented ways to eliminate the causes of losses or injuries. The learning and understanding about accident causation engendered by an awareness of the evolution in thinking about causation and with these models lead to the establishment of effective preventive methods and systemic defenses and the ability to effectively respond to those which do occur (Toft, Dell, Klockner, & Hutton, 2012). One model cannot be applied to all accidents. Thus, the main purpose of this study is to examine the factors that can affect safety performance to improve safety and finally reduce the rate of accidents."

Professor James Reason of the University of Manchester has developed a theory of accident. Reason (1997) Model classifies factors contributing to accidents into three domains: local workplace, organizational/systems, and unsafe acts. In doing so, the model moves the blame from a human error to the environment in which humans work. In other words, as said by Elliott, Page, and Worrall-Carter (2012) the model promotes a focus on the conditions or situation in which the person is trying to perform, conditions which might be designed to create an incident or error. In other

words, Reason, like Heinrich (1931) and Bird and Germain (1985) before him, accepted that accidents were not solely due to individual operator error (active errors) but lay in the wider systemic organizational factors (latent conditions Reason) in the upper levels of the organization (Toft et al., 2012). The strength of the reason theory is its main focus on the system or environment in which the event occurred.

The reason proposed that there are two types of accidents, those that happen to individuals and those that happen to organizations (J Reason, 1997). Reason defines organization accidents as “situations in which latent conditions (arising from such aspects as management decision practices, or cultural influences) combine adversely with local triggering events (such as weather, location, etc.) and with active failures (errors and/or procedural violation) committed by individuals or teams at the sharp end of an organization, to produce the accident (J Reason, 1997).

The fact is that numerous health and safety interventions aim at the level of the general operative e.g. programs to encourage the wearing of hard hats or instituting health check campaigns. However, there are an infinite number of unsafe acts that can precipitate accidents on a construction site "the vast majority of them are unforeseeable and occasionally quite bizarre" (James Reason, 1990). Attempts to reduce the number of unsafe acts can only have limited value. It would be more beneficial to aim at the level of latent errors/failures. Latent errors/failures correspond to errors at the head office and site management levels. In another word, they arise from decisions made by designers, builders, policymakers, procedure writers, and top-level management. They are "actions or decisions, the damaging consequences of which may lie dormant for a long time, and only becoming evident when they combine with local triggering factor. The example of these failures is poor design, a shortfall in training, poor safety inspection and lack of provision of the safety equipment. Unlike active errors, whose specific forms are often hard to predict, latent conditions can be identified and improved before an adverse event occurs.

Second, multiple causation model was presented by Petersen in 1971 that has a different concept with the domino theory that influenced many researchers during Heinrich time (Hamid, Majid, & Singh, 2008). The Heinrich domino theory is

structured on the theory that an accident is caused by a single cause. The theory of multi causation is that the contributing causes (e.g. Behavioral, Environmental) combine randomly to result in an accident. This model was inspired by his believed that many contributing factors, causes, and sub-causes are the main culprits in an accident scenario. During accident investigations, there is a need to identify as many of these causes as possible. Petersen believed that there are two major features of the events, which lead to an accident, namely an unsafe act and an unsafe condition; under this concept, there are more than the single cause which contributes or lead to both unsafe act and unsafe condition and finally occurrence of an accident. (Jha, 2011; Taylor, Easter, & Hegney, 2004). By using multiple causation models, the surrounding factors to the accident would be revealed (Abdelhamid & Everett, 2000).

In conclusion, one model cannot be applied to all accidents and one model cannot cover all causes and factors of accidents as explained in Figure 1.2. Therefore, the researcher has selected two accident causation theories to enhance the understanding of accidents and how they happen.

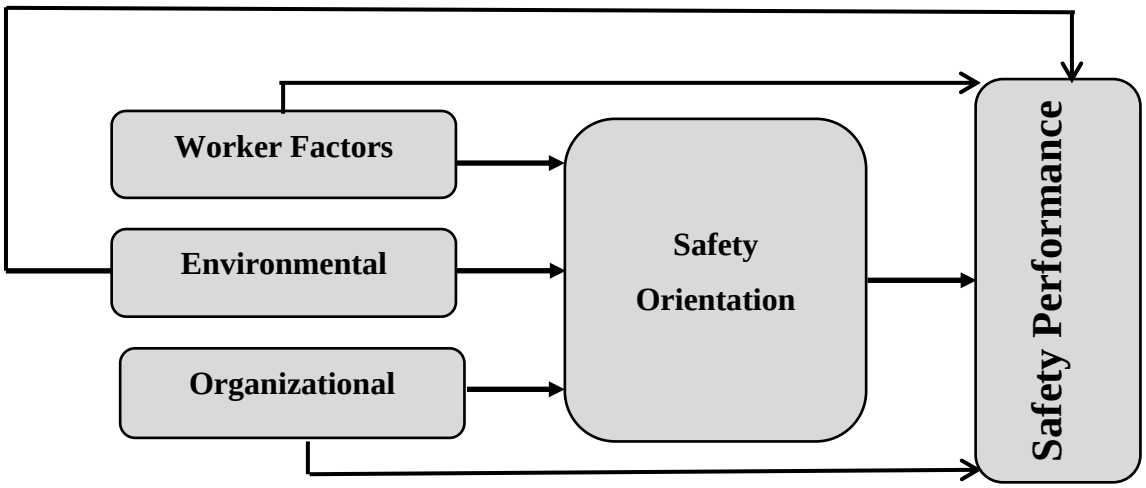

Figure 1.2 The Theoretical Framework

1.8.1 Worker Factors (WF)

The human side of safety is seen as a key factor to improve safety performance in the construction industry. A worker may commit unsafe acts regardless of the initial

conditions of the work (i.e., whether the condition was safe or unsafe). Examples of worker unsafe acts include the decision to proceed with work in unsafe conditions, disregarding standard safety procedures such as not wearing a hard hat or safety glasses, working with insufficient sleep, working while intoxicated, etc. Therefore, it is needed to investigate and analyze the impact of worker factors on safety performance. Consequently, many studies have been done in this area, such as attitudes, behavior, motivation, teamwork, leadership and so on (M. D. Cooper & Phillips, 2004; Hopkins, 2005; Helen Lingard & Rowlinson, 1994; Sunindijo & Zou, 2012).

1.8.1.1 Historical Factors (HF)

According to Sawacha et al. (1999), this aspect is included operative age, operative job and accident experience, operative background safety training.

1.8.1.2 Worker Competence (WCF)

Competence can be seen as the ability of an individual to do a job properly. A competency is a set of defined behaviors that provide a structured guide enabling the identification, evaluation, and development of the behaviors in individual workers (Sant, 2016). Workers' adequate skill, knowledge, and ability to works, especially toward risks and dangers in their work, may diminish accidents. The competences can be enhanced through training and appropriate workers' selection. Especially concerning the establishment of the personnel selection procedure, the researcher has tried to focus and investigate worker competence among Iran's construction industry. Based on the reviewing of the safety literature, there is a strong belief that the lack of systematic personnel selection is one of the major weaknesses in the construction industry.

1.8.1.3 Psychological factors (PS)

The psychological climate has been shown to directly affect the safety performance of individual workers. Current safety approaches proved that psychological aspects of safety play an important role in accident reduction strategies. New safety studies and approaches try to identify and highlight the impacts of psychological factors on accident occurrence at the workplace. This psychological climate includes the workers' relationship with or the behavior toward fellow crewmembers, the supervisor, and the employing firm. The safer workers worked in smaller crews and they also had a more cordial or friendly relation among themselves. Safer workers also had supervisors who openly showed them respect and gratitude by integrating or considering their suggestions and by praising them for work well done (El-Nagar, Hosny2 and Askar 2015).

1.8.1.4 Safety Orientation

Safety orientation is defined as the inclination to act safely at the workplace as demonstrated through worker behavior. A worker with high safety orientation would use required safety equipment, follow established safety rules, read and/or listen to safety warnings, and avoid on-the-job accidents. As such, if an individual has shown a tendency to act safely in the past, it can be inferred that they will likely behave safely in the future. Effectively, safety orientation operates on the basic hiring principle that past behavior is the best predictor of future behavior. The impacts and roles of safety orientation on safety improvement programs are the important subjects that the researcher aimed to investigate in this study. Examination of the factors that can affect safety orientation and furthermore the effect of this factor on safety performance is a neglected subject especially in Iran's safety literature.

1.8.2 Environmental Factors (EF)

As mentioned before previous safety theories and literature normally have focused on an individual, managerial or organizational level. there are a few studies that seriously have perused the role of the environmental factors in construction's safety performance. The construction site is a complex system with a lot of stakeholders working together to complete the construction project. thus, This study considers existing signs and symbols at the workplace, tools, and equipment as well as the nature of the project as factors in the work environment system (Häkkinen, 1995; Khosravi, Asilian-Mahabadi, Hajizadeh, Hassanzadeh-Rangi, Bastani, et al., 2014).

1.8.2.1 Equipment and Apparatus

Findings from literatures have proved that existing tools and equipment at workplace have the potential to increase or decrease the probability of accidents. This is an important aspect that has been neglected in Iranian safety literatures. Existence of unsafe ladders and tools, existence of suitable cranes and lifting equipment with licensed operators and rate of repair and maintenance of equipment in good condition are only some examples that should be taken into consideration (Leung, Chan, & Cooper, 2015).

1.8.2.2 Sign, Symbol and Signal (Safety Sign)

Warnings in the forms of signs and symbols have been recognized as one of the effective tools to influence behavior and improve the risk perception of recipients. The researcher will find out how the existence of appropriate safety signs can affect safety performance.

1.8.2.3 Project Nature

In this study, project nature is investigated to find out how the tidiness of construction can affect safety performance. Previous research shows that tidy and well-planned sites are more likely to provide a high level of safety performance (Pritchard, 2014). Indeed, the nature of the project is supposed to have a strong effect on safety performance in construction sites.

1.8.3 Organizational Factors (OF)

Numerous studies have examined and developed safety management theories in attempts to understand causes of accidents and ways to avoid or minimize them. Safety literatures have shown that people are the main reason for such problems (Vredenburgh, 2002; Mullen, 2004). Besides people who are acknowledged as a contributing factor, organizational factors also contribute to risky work behaviors and human error to happen at workplace. The role of organizational factors in safety improvement is overwhelming (Jitwasinkul et al., 2016). Several safety studies have demonstrated the role of organizational factors are able to improve employees' behaviors. Any improvement in organizational factors can directly affect workers' safety behaviors at workplace(Hua, 2013).Therefore, organizational factors are significant in developing and implementing of policies in term of safety at workplace. Companies can adapt or adopt various approaches to develop and implement safety programs. These programs may involve top management or operational group and they can be conducted as part of training and education, campaigns, safety inspection, policies and standard procedures. In this study, organizational factors are classified into several aspects and each is explained in the following subsections.

1.8.3.1 Economic Investment

This study explores the effect of economic investment on safety and its influence on safety performance. Economic investment is often known as payment or

reward system like critical allowance (incentive for working under dangerous condition), safety incentive, productivity bonus, etc. This factor is one of the most disputed elements especially in the construction industry in developing countries. There is often an inadequate economic investment in safety in many projects (Bayram, Ünğan, & Ardıç, 2017).

1.8.3.2 Construction Welfare Facilities (WFF)

Construction workers need adequate facilities at their workplace because good facilities can positively benefit their health and well-being and most importantly, help to prevent illness at workplace (Harris & McCaffer, 2013). The management/contractor must provide adequate welfare facilities for employees, before starting the construction activities. The current safety studies have proved that the provision of the safety facilities psychologically and physically can affect worker behavior at the workplace. Although, some of these factors consider as basic facilities that should be provided at the workplace still construction companies are facing with lack of safety facilities. The contractors must meet the following requirements to prevent construction site accidents such as smoking area, first aid facilities, food and drinking water, toilets, ambulance, etc. (Permana, 2007).

1.8.3.3 Safety Inspection, Record and Audits (IR)

This study explores the significance of safety inspection in the improvement of health and safety at the workplace. A safety inspection is a factor of safety management system with early detection and correction to control hazards. The use of safety inspections has shown to have positive effect on companies' loss control initiative. Companies who perform safety inspections have fewer accidents incidents than companies that do not perform inspections (El-nagar, Hosny, & Askar, 2015).

1.8.3.4 Safety Training and Educations (TR)

Training and education are defined as a process that enables people to acquire new knowledge, learn new skills, and perform behaviors in a new way (El-nagar et al., 2015). Thus, based on this definition, safety literatures define safety training as the knowledge that needs to be given to employees to work safely. Employers are required to provide safety training when employees are or could be exposed to hazards on site.

1.8.3.5 Management Commitment (MC)

Organizations or companies that have effective safety committees are more likely to improve safety performance than those companies without. Top management should consider safety as equally as important as other aspects of the organization like productivity and profit. There is also a need for the top management to respond immediately when a safety problem is raised. Additionally, employees should be reprimanded to adhere to all safety procedures and take their own initiatives and take up initiatives of others to improve their safety performance (El-nagar, Hosny and Askar, 2015). It can be said that to demonstrate their commitment toward safety, top management needs to provide necessary resources such as tools, money, policy and equipment for employees to safely work as well as to monitor safety.

1.8.3.6 Safety Meeting

Regular safety meetings are necessary for communicating safety information to all parties (El-zain, 2014). A well-planned safety meeting is an excellent morale builder. When a worker is convinced that his employer is concerned about his on the job safety, through holding a safety meeting, the employee will obey the safety rules and perform his work safely and effectively (Alnunu & Maliha, 2015). In addition, a safety meeting enables workers to share safety issues and thus, managers are able to make decisions to solve the issues. In conclusion, the researcher has identified the key

factors affecting safety performance after reviewing the safety literature. Figure 1.3 presents the most critical factors.

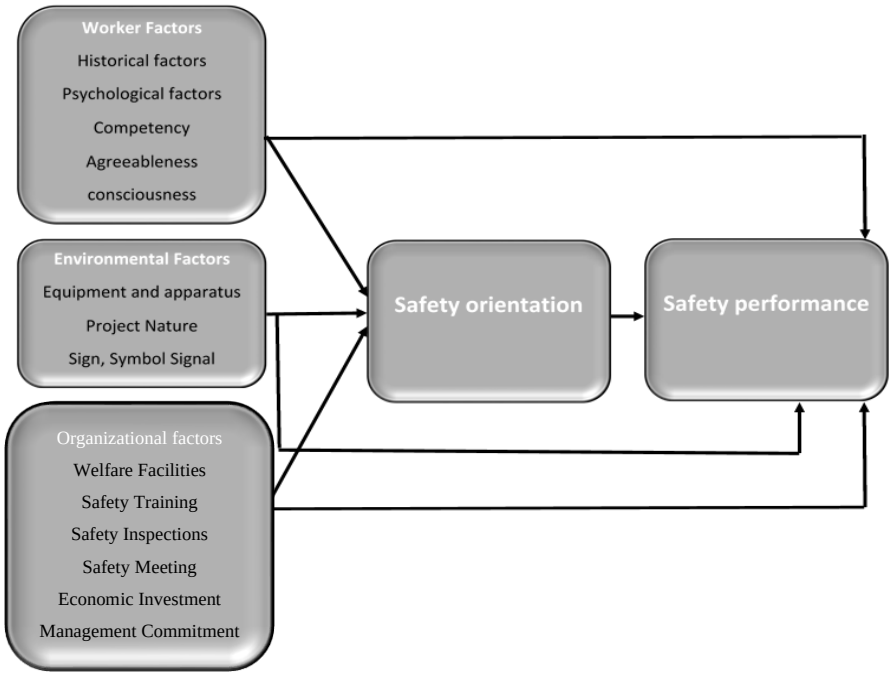

Figure 1.3 Conceptual Framework: Factors and Components Affecting Safety Performance

1.9 Operational Definition

This section provides the definitions of terms and jargons used in the study. These terms and definitions are presented in the following subsections.

Occupational Injury- is any physical injury resulting from an accident in the workplace (especially constriction industry).

Health- is the general condition of a person in mind, body, and spirit, usually meaning to be free from illness, injury or pain. The World Health Organization (WHO) defined health in its broader sense in 1946 as "a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity" (WHO, 2006). In this study, health means being free from illness, injury or pain which can be caused by construction activities.

Safety- is related to external threats, and the perception of being sheltered from threats. Based on the business dictionary, safety is defined as relative freedom from danger, risk, injury, or threat of harm, or loss of personnel and/or property, whether caused purposely or by accident (Phoya, 2012). In this study, safety means freedom from danger, harm, and injury to the person involved in construction activities.

Psychology- Psychology is the study of the mind, how it works, and how it affects behavior.

Hazard- is the potential for harm. In practical terms, a hazard is often associated with an activity or condition that, if left uncontrolled, can result in an injury or illness (Afosah, 2015). HSE (2004) defines a hazard as any source of potential damage, harm or adverse health effects on something or someone under certain conditions at work. A hazard can cause harm or adverse effects (to individuals as health effects or organizations as loss of property or equipment). In this study, hazard means anything which has the potential to cause harm to people on construction sites.

Risk- "has been traditionally defined as a measure of the probability and severity of adverse effects (Andretta, 2014). Risk is related to hazard whereby risk becomes the hazard level (hazard severity) combined with the likelihood of the hazard resulting to hazard consequence."

Accident- The definition of an accident provided by Heinrich in the 1930s is often cited. Heinrich defines an accident as an uncontrolled and unplanned event in which the action or reaction of an object, substance, person or radiation results in personal injury or the possibility thereof.in this study, an accident means any uncontrolled event that is related to construction industries (Asan & Akasah, 2015).

Construction- is the process of constructing a building or infrastructure. It refers to the branch of manufacture and trade based on the building, maintaining, and repairing structures. "Wells (1985) defined construction as 'the activity of the creation of physical infrastructure, superstructure, and related facilities."

Occupational health and safety (OHS)- is an area concerned with the health, safety, and welfare of people engaged in work or employment. The aims of occupational safety and health programs include fostering a safe and healthy work environment. OSH may also protect co-workers, employers, family members, customers, and many others who might be affected by the workplace environment (Khan, Mustaq, & Tabassum, 2014; Nanthini & Karunagari, 2016).

Safety management system (SMS)- is the formal, top-down business approach to managing safety risk, which includes a systemic approach to managing safety, including the necessary organizational structures, policies, accountabilities, and procedures. This study tries to focus on systematic approaches that can manage safety in the construction industry in Iran (Song, Guo, Lee, & Jiang, 2016).

1.10 Scope of Study

This section provides the scope of this research. This research focuses on issues or problems in health and safety in the construction industry in Iran. By having such focus, these issues or problems can be addressed, minimized or solved. The findings would help other countries to focus on similar attributes that are affecting the health and safety of workplace in their countries.

Table 1.3 Construction Industry In Three Major Cities Of Iran

City	Governmental sector	Private sector	Number of Workers
Esfahan	6	4	5890
Tehran	8	4	10282
Khorasan Razavi	6	2	8284
TOTAL	20	10	24456

This study will only cover several selected private and governmental companies in which it only examines the operative employees of the construction industry in three large cities which are Tehran, Esfahan and Khorasan Razavi. The proper sampling process will represent the population and it will be discussed in

Chapter 3. This is a cross-sectional study in which the data will be taken from one point in time.

1.11 Summary

This chapter represents the introduction of this research as well as the overview and background of the problem to provide readers with a preliminary understanding of this study. The problem statement, the research objectives and research questions have been explained and the hypotheses have been set. The significance and contribution of the research are also explained. Finally, the scope of this research is described in this chapter.

recommended for future research to investigate in greater depth the personnel selection system and its potential in safety development.

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LIST OF PUBLICATIONS

1. Determination of Factor Affecting Safety Performance in Iran Construction Industry**.**
2. The Role of The Big Five Personality Factors on Accident: A Case of Accidents In Construction Industries.