UNIVERSITI PUTRA MALAYSIA

ASSOCIATION BETWEEN WORKING CONDITIONS, SAFETY BEHAVIOUR AND WORK-RELATED INJURIES AMONG FOREIGN CONSTRUCTION WORKERS IN THE KLANG VALLEY, MALAYSIA

HAROUN ZERGUINE

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By

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Thesis submitted to the School of Graduate Studies, Universiti Putra Malaysia, in Fulfilment of the Requirements for the Master of Science

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ASSOCIATION BETWEEN WORKING CONDITIONS, SAFETY BEHAVIOUR, AND WORK-RELATED INJURIES AMONG FOREIGN CONSTRUCTION WORKERS IN THE KLANG VALLEY, MALAYSIA

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May 2017

Chairman: Assoc. Prof. Juliana Binti Jalaludin, PhD
Faculty: Medicine and Health Sciences

Malaysian construction sector is one of the critical sectors represented by high accident and fatality rates over time (1st in fatality rate in the last 5 years). Construction workers come in contact with dangerous equipment and substances which can easily affect their physical and health conditions. Safety behaviour and working conditions-related risk factors combine to contribute in construction accidents which can result in work-related injuries. Therefore, to facilitate the expansion of current theoretical perspectives in this research area, this study attempts to determine the prevalence of work-related injuries and its association with safety behaviour, safety commitment, safety climate, physical operations and the overall working conditions' safety level among construction workers, and furthermore, this study intends to determine the predictors of work-related injuries in construction sites. A cross sectional study design was conducted in six (6) construction sites of large construction company in Klang Valley. Structured questionnaire to evaluate working conditions and work-related injuries was distributed to the workers in English and Malay languages. On-site observation was conducted using Behaviour Based Safety (BBS) checklist to assess the workers' safety behaviour. Data was collected from 1st July 2016 to 30th September 2016. The researcher ensured that all the questionnaires were answered (n=323 respondents). The results revealed that the majority of the construction workers were from Bangladesh and Indonesia; 48% and 39% respectively. The prevalence of work-related injuries in one year period is 22.6% where most of the injuries were moderate severity (39.7%) and falls from heights represented the major cause of work-related injuries with 31.5%. Majority of the workers have perceived between moderate and high safety commitment, safety climate and physical operations' safety level, all in which reflected good working conditions. The on-site observation recorded safe and unsafe behaviours from the workers; thus, the overall safety behaviour (percent safe) was at 51.62%. Independent t-test revealed a significant difference in the mean of safety behaviour between Yes/No work-related injuries ($p<0.001$). Chi square test showed also that

work-related injuries is significantly associated with safety commitment (χ^2=6.726, $p<0.05$), safety climate (χ^2=13.606, $p<0.001$), physical operations (χ^2=13.837, $p<0.001$) and the overall working conditions' safety level (χ^2=7.901, $p<0.05$). Safety behaviour was associated with safety climate ($p<0.05$), physical operations ($p<0.05$) and the overall working conditions' safety level ($p<0.001$). The predictive model of work-related injuries showed that safety behaviour ($p<0.001$), safety climate ($p<0.05$) and physical operations ($p<0.05$) are the predictors for work-related injuries, where high safety climate and high safety level of physical operations are reducing the occurrence of work-related injuries, and for any additional increase in safety behaviour, work-related injuries occurred less. Therefore, based on the findings, it is recommended to implement Behaviour Based Safety (BBS) program in the company in order to reduce the occurrence of accidents and work-related injuries in construction sites.

Keywords: Construction sector, working conditions, safety climate, safety behaviour, accidents, work-related injuries.

Abstrak tesis yang dikemukakan kepada Senat Universiti Putra Malaysia sebagai memenuhi keperluan untuk ijazah Master Sains

HUBUNG KAIT ANTARA KEADAAN KERJA, TINGKAH LAKU SELAMAT DAN KECEDERAAN BERKAITAN PEKERJAAN DALAM KALANGAN PEKERJA ASING PEMBINAAN DI LEMBAH KLANG, MALAYSIA

Oleh

HAROUN ZERGUINE

Mei 2017

Pengerusi: Prof. Madya Juliana Jalaludin, PhD
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Sektor pembinaan merupakan salah satu sektor yang paling kritikal di Malaysia dengan peningkatan kadar kemalangan dan kematian yang tinggi. (pertama dalam kadar kematian untuk tempoh 5 tahun yang lalu).Pekerja pembinaan mengendalikan peralatan dan bahan-bahan berbahaya yang mudah memudaratkan kesihatan dan fizikal mereka. Tingkah-laku selamat dan faktor risiko yang berkaitan dengan persekitaran kerja boleh menyumbangkan kemalangan di tapak pembinaan sekaligus mengakibatkan kecederaan disebabkan pekerjaan. Justeru itu, kajian ini dijalankan untuk menentukan prevalens kecederaan disebabkan pekerjaan dan perkaitan dengan tingkah laku selamat, komitmen keselamatan, iklim keselamatan, operasi fizikal, dan keseluruhan tahap keselamatan persekitaran kerja untuk membantu pengembangan teori perspektif dalam bidang kajian ini. Di samping itu, kajian ini juga bertujuan untuk menentukan faktor yang menjurus kepada kecederaan disebabkan pekerjaan di tapak pembinaan. Sebuah kajian berbentuk rentas silang telah dijalankan ke atas enam (6) buah tapak pembinaan yang diusahakan oleh syarikat pembinaan terbesar di Lembah Klang. Borang soal selidik berstruktur dalam dwibahasa mengenai persekitaran kerja dan kecederaan disebabkan pekerjaan telah diedarkan kepada pekerja pembinaan. Pemerhatian lapangan telah dijalankan dengan menggunakan senarai semak Perilaku Berdasarkan Keselamatan 'Behaviour Based Safety (BBS)' bagi menilai tahap tingkah laku selamat pekerja. Pengumpulan data telah berlangsung bermula 1 Julai 2016 hingga 30 September 2016. Penyelidik telah memastikan semua item dalam borang soal selidik telah dijawab oleh pekerja (n=323 orang). Hasil kajian mendapati bahawa kebanyakan pekerja pembinaan adalah berasal dari negara Bangladesh dan Indonesia, yang mana masing-masing menunjukkan peratusan 48% dan juga 39%. Prevalens kecederaan disebabkan pekerjaan dalam tempoh setahun adalah sebanyak 22.6% dan kebanyakan kecederaan adalah dikategorikan sebagai sederhana teruk (39.7%). Jatuh dari tempat tinggi merupakan penyebab utama kecederaan dengan peratusan 31.5. Majoriti

pekerja didapati mempunyai komitmen keselamatan, keselamatan tapak bekerja dan kadar keselamatan operasi fizikal pada tahap sederhana dan tinggi. Justeru itu, ia jelas menunjukkan bahawa mereka mempunyai persekitaran kerja yang baik. Pemerhatian lapangan merekodkan tingkah-laku selamat dan tidak selamat, maka keseluruhan tingkah-laku selamat adalah mencapai 51.62%. Ujian T tidak bersandar menunjukkan hubungan yang signifikan antara perbezaan min tingkah laku selamat antara ya/tida berkaitan kecederaan ($p<0.001$), kecederaan disebabkan pekerjaan dan tingkah laku selamat ($p<0.001$). Ujian Chi-square mendapati kecederaan disebabkan pekerjaan mempunyai hubungan yang signifikan dengan komitmen keselamatan ($\chi^2=6.726$, $p<0.05$), iklim keselamatan ($\chi^2=13.606$, $p<0.001$), operasi fizikal ($\chi^2=13.837$, $p<0.001$) dan keseluruhan tahap keselamatan persekitaran kerja ($\chi^2=7.901$, $p<0.05$). Tingkah laku selamat berhubungkait dengan iklim keselamatan ($p<0.05$), operasi fizikal ($p<0.05$) dan keseluruhan keadaan tahap keselamatan pekerjaan ($p<0.001$). Model peramal untuk kecederaan disebabkan pekerjaan menunjukkan tingkah laku selamat ($p<0.001$), iklim keselamatan ($p <0.05$) dan operasi fizikan ($p <0.05$) adalah merupakan faktor peramal utama bagi kecederaan disebabkan pekerjaan, di mana iklim keselamatan yang tinggi dan aras keselamatan operasi fizikal yang tinggi mengurangkan berlakunya kecederaan disebabkan pekerjaan, dan peningkatan tambahan dalam tingkah laku selamat, kecederaan yang berkaitan pekerjaan kurang berlaku. Justeru itu, berdasarkan hasil dapatan kajian ini, adalah disarankan untuk pelaksanaan Program Perilaku Berdasarkan Keselamatan 'Behaviour Based Safety (BBS) Program' dalam syarikat pembinaan bagi mengurangkan kadar kemalangan dan kecederaan disebabkan pekerjaan di tapak pembinaan.

Kata kunci: Sektor pembinaan, persekitaran kerja, iklim keselamatan, tingkah laku selamat, kemalangan, kecederaan disebabkan pekerjaan.

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I certify that a Thesis Examination Committee has met on 9 May 2017 to conduct the final examination of Haroun Zerguine on his thesis entitled "Association between Working Conditions, Safety Behaviour and Work-Related Injuries among Foreign Construction Workers in the Klang Valley, Malaysia" in accordance with the Universities and University Colleges Act 1971 and the Constitution of the Universiti Putra Malaysia [P.U.(A) 106] 15 March 1998. The Committee recommends that the student be awarded the Master of Science.

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This thesis was submitted to the Senate of Universiti Putra Malaysia and has been accepted as fulfilment of the requirement for the degree of Master of Science. The members of the Supervisory Committee were as follows:

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

LIST OF ABBREVIATIONS

BBS	Behaviour Based Safety
BLS	Bureau of Labor Statistics
DOSH	Department of Occupational Safety and Health
FGD	Focus Group Discussion
HSE	Health and Safety Executive
ILO	International Labour Organization
NOHSAC	National Occupational Health and Safety Advisory Committee
OSHA	Occupational Health and Safety Administration
OSHMS	Occupational Safety and Health Management System
SOCSO	Social Security Organisation
WMSD	Work-related Musculoskeletal Disorder

CHAPTER 1

INTRODUCTION

1.1 Background of the study

Construction plays a big role in the development of a country, where successful infrastructure development contributes to economic growth and generates additional demands (Abdullah & Wern, 2011). Malaysia is regarded as one of the non-western countries that successfully and smoothly transitioned to modern economic growth at the end of the 20th century. Malaysia, in accordance with the vision 2020 development plan, aims to transform the country into a prosperous, competitive, dynamic, robust, and resilient country by the year 2020 (Khan, Liew, & Ghazali, 2014). As such, the construction sector is essential in order to achieve these objectives because of its dynamic nature and its ability to foster an industrialised economy. All socio-economic infrastructures for the country are dependent on the construction sector as it provides all residential and commercial spaces, recreational spaces, healthcare units, and transport channels and hubs, all of which that improve the society's standard of living.

The vast contributions of the construction sector to Malaysia's economy have made it a very important sector, where researches based on statistics have shown a strong association between the construction sector and the economic growth of Malaysia (Khan et al., 2014). However, the full potential of economic growth that can be achieved by the construction industry is inhibited by occupational risks and poor working conditions. At worldwide level, construction work is one of the most hazardous works as evidenced by the high work-related mortality, injury, and fatality rates, where accidents occur at a substantially higher rate than in construction sector rather than in other industries (Pinto, Nunes, & Ribeiro, 2011). Construction workers are three times more likely to die, and two times more likely to suffer injuries at work as compared to workers involved in other industries (Worksafe, 2004), this is due to the nature of the construction work; work is done outside under the hot sun or in the rain. Workers are required to climb to high places such as roofs, ladders, and scaffolding. The usage of dangerous tools, heavy materials, hazardous machinery and dangerous equipment also increase the risk to their health.

In many parts of the world, construction work is one of the most hazardous works as evidenced by the high work-related mortality, injury, and fatality rates (Pinto et al., 2011). Statistics of the Department of Occupational Safety and Health in Malaysia (2015) has shown that the construction sector has a high number of accidents, where it contributes to highest death cases (88 cases) and the second highest rate of non-permanent disability (138 cases) as compared to other sectors (Figure 1.1). Safe Work Australia (2015) has revealed that a proportion of 5.9% of construction workers are injured each day where 30% of the injuries that require hospitalisation are for fractures and 98% of these cases are recorded by male workers. Health and Safety Executive in Great Britain reported that around 3% of workers in the

construction industry suffer from work-related injuries (HSE, 2014). In conclusion, in all over the world, the construction sector is registering a high number of accidents and injuries.

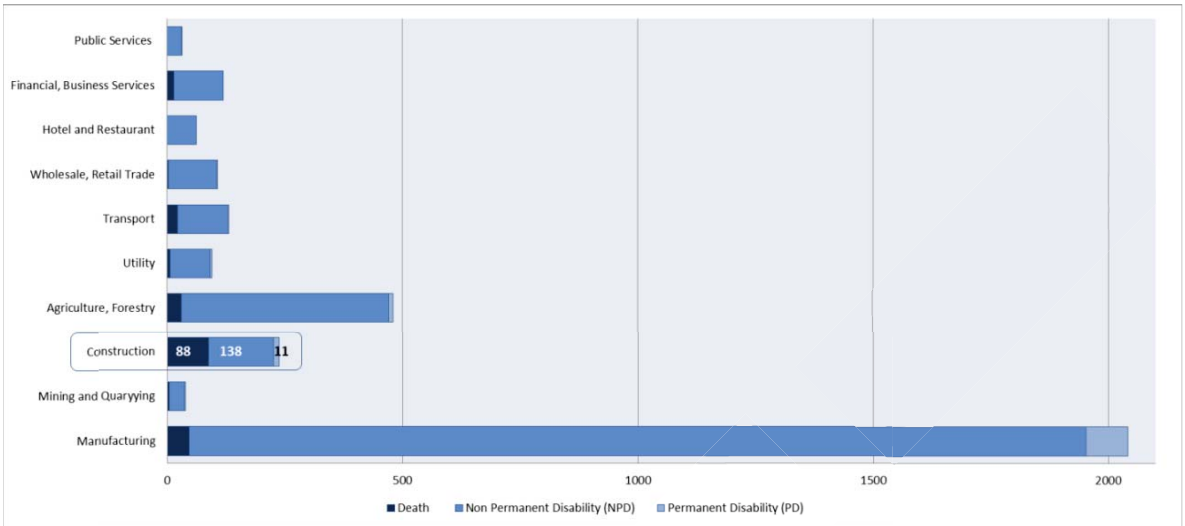

Figure 1.1: Occupational accidents statistics by sector for the year 2015
(Department of Occupational Safety & Health, 2015)

The mechanism of an accident describes the action, exposure or event directly causing an injury (Suraji, Duff, & Peckitt, 2001).Researchers and professionals from construction engineering or other fields have given broad attention to the factors contributing to accidents and injuries in the construction industry. Accidents could happen due to a variety of reasons where it can be attributed to multiple factors including the multi-stage, multi-process nature of construction projects, the usage of a variety of heavy machinery and dangerous equipment, poor working conditions, health hazards such as the exposure of high levels of noise, exposure to the elements, irritation by dust or vibrations as well as handling heavy or dangerous materials. The Health and Safety Executive divided the main causes of construction-site related accidents into three main categories; where the first category is the failure to identify the safe working conditions before, during, or after starting work; the second category involved workers who decided to continue working even after identifying unsafe conditions; and the final category involved unsafe performance of the workers regardless of the initial work conditions (Fleming & Lardner, 2002a).

Unsafe behaviour of workers, such as human error or inappropriate operation, has been identified as one of the major risk factors that occur across construction projects. Heinrich (1941) indicated that 88% of the construction accidents were due to the unsafe acts of workers in addition to the unsafe working conditions onsite**.** Whereby, accidents are attributed to the lack of prompt action by construction workers (Garrett & Teizer, 2009; Hinze, Huang, & Terry, 2005). Human error can be inappropriate human decisions or behaviours that affect safety during operations and that leads to the occurrence of an accident or any related injuries (Aksorn & Hadikusumo, 2008; Teo, Ling, & Chong, 2005). Safety climate is also seen as a

crucial predictor for behaviour and accidents in the workplace (Kanten & Ülker, 2013). Safety climate is represented by the perception of employees on the esteem and the significance of safety within the company, regularly reflected in approaches, techniques and practices (Huang et al., 2013). Researchers considered it as a main component of the overall safety culture (Choudhry, Fang, & Lingard, 2009; Cooper & Phillips, 2004; Neal, Griffin, & Hart, 2000) and a reflection of actual safety culture in a company (Flin et al., 2000; Guldenmund, 2010; Lee & Harrison, 2000). Furthermore, another factor that provides a best fit for safety is the management commitment and the workers' involvement in safety (Dedobbeleer & Béland, 1998), where researchers believe that management commitment has great influence on the overall safety level of the company (Choudhry et al., 2009).

This study was performed to investigate the working conditions and safety behaviour as the two main factors contribute to work-related injuries, where it is believed that safety climate, safety commitment and the safety level of physical operations perceptions give the correct picture on the working conditions and its influence on safety behaviour in construction sites. Furthermore, the influence of safety climate, safety commitment and safety behaviour on work-related injuries was evaluated.

1.2 Problem Statement

The construction sector is one of the largest sectors in many parts of the world due to the various types of activities taking place onsite as well as the nature of construction work. This particular sector is also regarded as the most dangerous and hazardous workplace. Construction workers are constantly in contact with dangerous equipment and substances which often affect their physical and mental health.

Recent statistics on the worldwide construction fatalities recommends that at least 60,000 fatal incidents occur annually at construction projects; which represent a proportion of six deaths every one hour (International Labor Organization, 2005). One from every six fatal accidents occurs at a construction site. In industrialised nations, construction project's fatalities represent 25–40% of the total workplace fatal accidents. In the United Kingdom, the construction industry reported 42 fatal injuries, accounting for 31% of fatal injuries at the industrial sector from 2013-2014. There were 1900 major injury cases reported during the same period, as compared to an average of 2457 cases over the previous five years. Construction and agriculture sectors had the highest rate of fatalities in the 2011–2012 fiscal years. That year, 42 workers in the construction sector died on the job (HSE, 2014). Although the number of cases decreased when compared to the previous years, it is still considered to be very high as compared to other industries. In 2015, the United States of America (U.S.A) reported a total of 937 fatal injuries in the construction sector. This has made the construction industry as the most dangerous and potentially fatal industry followed by the transportation sector. This number rose 4% from 2014, and considered the highest since 2008, though the rate for construction injuries remained statistically unchanged and could be attributed to the recession and the slump of the construction work instead of improved working conditions or practices (BLS, 2015).

In 2015, the Department of Occupational Safety and Health (DOSH) in Malaysia reported that the construction sector has the highest fatality rate as compared to other sectors (88 deaths from a total of 214 deaths) that is equivalent to 41.12 % of the overall industry deaths reported. Recent accidents have been reported by newspapers; on 25th August 2016, a fatal crane accident occurred in Jalan Raja Chulan where a tower crane hook fell and crushed a car passing by the construction site and killed the driver (Farhana, 2016). After that, on 4th November 2016, a couple was crushed to death by a piling crane that toppled onto their car at Persiaran Astana, Bandar Baru Bukit, Klang (Andria & Choong, 2016). The number of fatalities reported proved that safety on construction sites still remains a leading cause of death in the workplace, and safety practices requires an overhaul. Malaysian construction sector is an important sector for the socio-economic growth of a country, and construction projects are one of the key tenets that will pave the way to achieving Vision 2020. As construction projects increase, the amount of accidents is expected to increase as well. Thus, there is a need for more research to improve working conditions, educate workers, promote safety, and decrease the rate of accidents.

Research has shown that unsafe behaviours of workers are generally the cause of injuries and deaths in construction sites. However, the management should also be responsible of providing good and safe working conditions in order to prevent accidents or incidents from occurring (Abdelhamid & Everett., 2000). Construction Industries Development Board (CIDB) in Malaysia showed that accidents and injuries are influenced by various causes, these causes can be related to the workers by performing unsafe behaviour or to the working conditions that do not major factors unsafe acts of the workers or unsafe conditions. This study intends to assess the relation between working conditions, safety behaviour, and work-related injuries on construction sites. By addressing the root problems surrounding these factors, it is possible to reduce unsafe behaviour and work-related injuries. Through exploring safety climate, safety commitment, physical operations and the overall safety level of working conditions, and investigating the workers' safety behaviour when performing their job; it is possible to prevent, reduce, and control the recurrence of workplace accidents and, in turn, achieve a safer future.

1.3 Study Justification

Construction industry is closely related to other sectors as well as the economic development of the country; however, this sector requires extensive and intensive labour to accomplish work goals. As a fast growing sector in Malaysia, the number of workers hired in construction projects has increased over the years. The Department of Statistics in Malaysia, (2013) has shown that the construction industry directly employed approximately 1,214,000 - 12,116,600 workers, thereby taking up 10% of the country's total employment, where around 70% - 80% are occupied by foreigners. Moreover, the statistics as was shown before indicate that this sector has a high number of accidents and work-related injuries (Hamid, Majid, & Singh, 2008). This shows the importance of this sector and the need of more research to improve safety and decrease the accident and injury rates; as the problem is expected to grow

in the coming years with more establishment of construction projects as Malaysia is becoming a developed country.

Constant exposures to health hazards put construction workers at risk of accidents and work-related injuries, thus making them a high-risk group. This study intends to explore safety commitment, safety climate and physical operations on construction sites to determine the overall working conditions' safety level, while the workers' safety behaviour is also evaluated during work. By investigating these factors, it is possible to obtain a clearer picture of current safety issues and the factors influence accidents and injuries rates in the construction industry. Furthermore, this study will determine the prevalence and causes of work-related injuries and how these relate to working conditions as well as to safety behaviour on site.

The results obtained can be used by researchers, occupational Safety and Health practitioners and consultants in future studies. The construction company management can also use the information to improve safety measures and take preventive steps in order to reduce the accident rates. The results can be used to increase the job satisfaction of workers and improve the workplace environment as well.

1.4 Conceptual framework

Work-related injuries that result from accidents on construction sites have been known to be multi factorial in origin. This study has conceptualised work-related injuries as the dependant variable. Many studies have shown that a combination of safety behaviour and working condition-related risk factors contribute to accidents in the construction industry (Chi, Han, & Kim, 2012). Thus, this study has conceptualised safety behaviour and working conditions including safety climate, safety commitment and physical operations as independent variables. The association between the variables was examined in this study, and furthermore, this research has demined the predictors of work-related injuries in construction. Figure 1.2 shows the conceptual framework for this study; the socio-demographic characteristics of the respondents were explored. Safety commitment, safety climate and physical operations were the three elements reflecting the overall safety level of working conditions through the perception of workers. The safety behaviour was measured by Behaviour Based Safety "BBS observation", where wearing personal protective equipment (PPE), housekeeping, access to heights, plants and equipment are the four components observed (Choudhry, 2014).

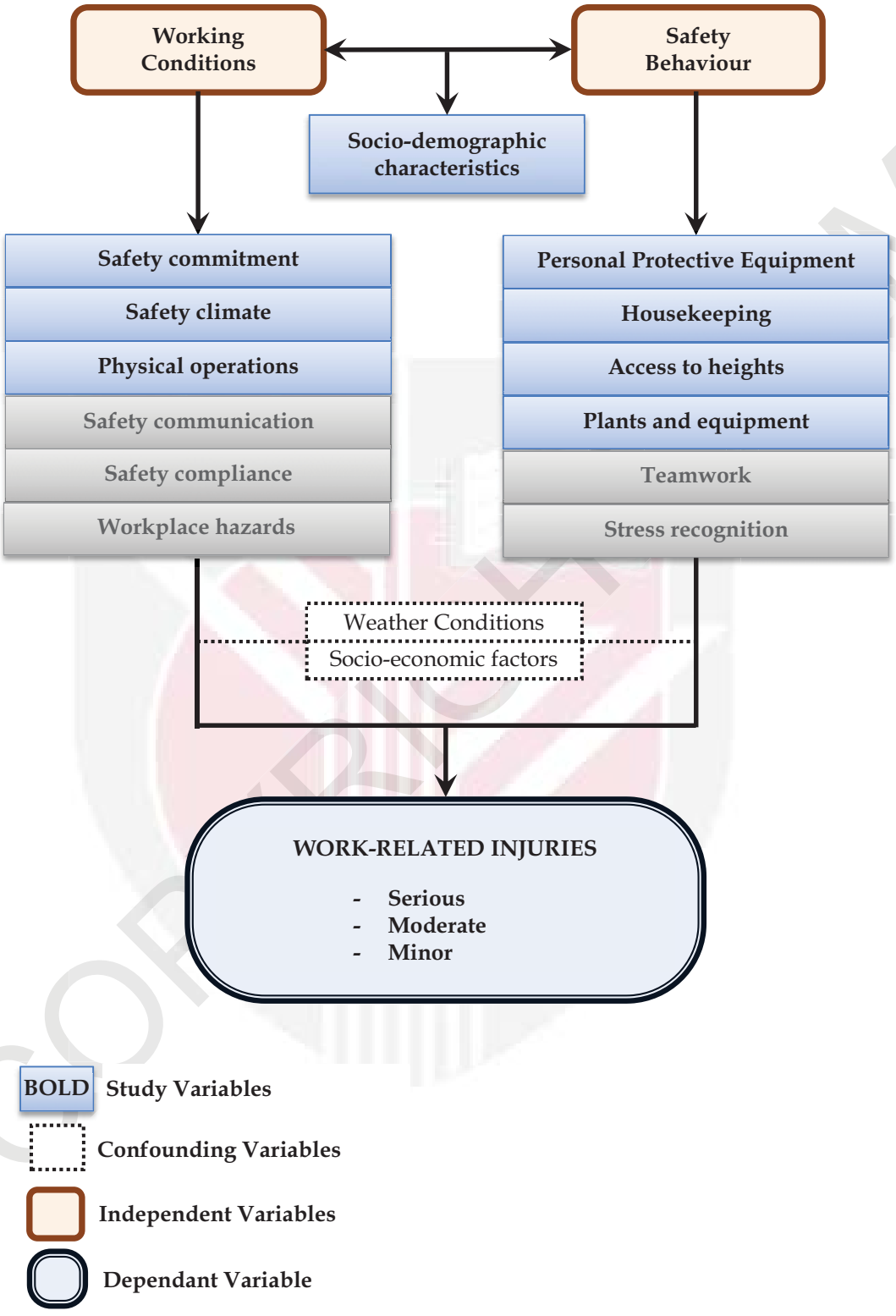

Figure 1.2: Conceptual framework

1.5 Research Objectives

1.5.1 General objective

To determine the prevalence of work-related injuries and its association with safety commitment, safety climate, physical operations, working conditions' safety level and safety behaviour among construction workers in Klang Valley.

1.5.2 Specific objectives

i. To determine the prevalence of work-related injuries among the respondents.
ii. To determine the causes and severity of work-related injuries among the respondents.
iii. To determine the association between safety commitment, safety climate, physical operations and working conditions' safety level with work-related injuries in construction sites.
iv. To determine the association between safety behaviour and work-related injuries in construction sites.
v. To determine the association between safety commitment, safety climate, physical operations and working conditions' safety level with safety behaviour in construction sites.
vi. To determine the predictors of work-related injuries in construction sites.

1.6 Research Hypothesis

i. There is a significant association between safety commitment, safety climate, physical operations and the overall working conditions' safety level with work-related injuries in construction sites.
ii. There is a significant association between safety behaviour and work-related injuries in constructions sites.
iii. There is a significant association between safety commitment, safety climate, physical operations and the overall working conditions' safety level with safety behaviour in construction sites.

1.7 Conceptual and Operational definitions of variables

1.7.1 Work-related injuries

Conceptual definition: Work-related injuries have been defined as any harm to the body produced by an energy exchange and an acute exposure that takes place in the workplace during work time (Clarke, 2011). The Occupational Health and Safety Administration (OSHA) relate the injury to an accident which is defined as an unplanned event that results in personal injury or property damage (Haviland et al., 2010).

Operational definition: Work-related injuries were identified using questionnaire. The respondents were asked with "Yes" or "No" question on whether they had experienced any accident when performing their work that had caused injury or harm to their body. The injury was classified into serious (received hospital treatment), moderate (involving at least a day's work lost) or minor (needed immediate treatment but did not influence work).

1.7.2 Safety behaviour

Conceptual definition: Safety behaviour refers to the way in which the workers' respond to specific circumstances or situations in the workplace and unsafe behaviour can be related to human error. Researchers have defined the human error as an inappropriate human decision or as behaviour that reduces either quality or safety (or both) during operations and thus results in accidents, injuries and deterioration of the project schedule (Abreu Saurin et al., 2005).

Operational definition: Safety behaviour was measured through an on-site observation. The observation was conducted to identify the safe or unsafe behaviour of workers when performing their job. Four categories were measured; wearing PPE, housekeeping, access to heights and plan and equipment, where these elements were the component of the observation checklist (Choudhry, 2007).

1.7.3 Working conditions

Conceptual definition: The working conditions refer to the working environment within which employees perform their tasks, taking into account of the physical aspects and all existing circumstances affecting labour in the workplace that could directly permit the occurrence of an accident (Hoonakker & VanDuivenbooden, 2010). To maintain high working conditions' safety level, employers are required to provide and to enforce the same safety standards that are applicable to the line of work (Friberg, 2010).

Operational definition: The working conditions' safety level was measured using a self-constructed questionnaire. The workers gave their perceptions on safety commitment, safety climate and physical operations taking place in construction sites. These three elements reflect the current safety level of working conditions where workers perform their job (Chi, Yang, & Chen, 2009).

1.7.4 Safety commitment

Conceptual definition: Safety commitment can be defined as the formulation, communication, and enforcement of safety programs by the management. The Health and Safety Executive team in UK has defined the management commitment to safety as the delivered practice, mainly through showing patience and interest to safety, establishing safety policy, providing resources and trainings and creating a safe work environment (HSE, 2013).

Operational definition: The respondents were asked questions on the participation and interest of the company's management in safety and health, and whether or not they are provided with the necessary safety equipment, tools and machinery and trainings to accomplish their work safely (Marsh et al., 1998).

1.7.5 Safety climate

Conceptual definition: Safety climate can be defined as a summary of perceptions that employees share about their work environment (Zohar, 1980) and it highlights the perceptions held by workers regarding the significance of safety in their job-site (DeJoy, Gershon, & Schaffer, 2004). The most frequent definition of safety climate from previous research was that it reflected employee perceptions of safety in the workplace (Schwatka, Hecker, & Goldenhar, 2016).

Operational definition: Workers were asked to give their perception on the potential hazards, the compliance to safety rules, instructions and procedures, wearing PPE and furthermore on their satisfaction about working environment, facilities and housekeeping in the construction site. The workers' satisfaction or dissatisfaction about the working environment is the reflexion of safety climate and working condition in the construction site (Pousette, Larsson, & Törner, 2008).

1.7.6 Construction physical operations

Conceptual definition: Construction operations include physical activities that take place during the construction process. These physical operations are used and performed by workers during repairing, building or any related construction work (Illingworth, 2002).

Operational definition: Respondents were asked to answer questions on some construction physical operations, whether they are performed safely or no. Scaffolding, trenching and excavations, use of ladders, stairways treads and walkways, crane and forklift operations were the critical operations used in this part (Illingworth, 2002).

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