The Risk-Taking Propensity of Construction Workers—An Application of Quasi-Expert Interview

Low, Banus Kam Leung; Man, Siu Shing; Chan, Alan Hoi Shou

Published in:
International Journal of Environmental Research and Public Health

Published: 01/10/2018

Document Version:
Final Published version, also known as Publisher's PDF, Publisher's Final version or Version of Record

License:
CC BY

Publication record in CityU Scholars:
Go to record

Published version (DOI):
10.3390/ijerph15102250

Publication details:
Low, B. K. L., Man, S. S., & Chan, A. H. S. (2018). The Risk-Taking Propensity of Construction Workers—An Application of Quasi-Expert Interview. International Journal of Environmental Research and Public Health, 15(10), 2250-2260. https://doi.org/10.3390/ijerph15102250

Citing this paper
Please note that where the full-text provided on CityU Scholars is the Post-print version (also known as Accepted Author Manuscript, Peer-reviewed or Author Final version), it may differ from the Final Published version. When citing, ensure that you check and use the publisher's definitive version for pagination and other details.

General rights
Copyright for the publications made accessible via the CityU Scholars portal is retained by the author(s) and/or other copyright owners and it is a condition of accessing these publications that users recognise and abide by the legal requirements associated with these rights. Users may not further distribute the material or use it for any profit-making activity or commercial gain.

Publisher permission
Permission for previously published items are in accordance with publisher's copyright policies sourced from the SHERPA RoMEO database. Links to full text versions (either Published or Post-print) are only available if corresponding publishers allow open access.

Take down policy
Contact lbscholars@cityu.edu.hk if you believe that this document breaches copyright and provide us with details. We will remove access to the work immediately and investigate your claim.
The Risk-Taking Propensity of Construction Workers—An Application of Quasi-Expert Interview

Banus Kam Leung Low, Siu Shing Man and Alan Hoi Shou Chan

Department of Systems Engineering and Engineering Management, City University of Hong Kong, Hong Kong, China; ssman6-c@my.cityu.edu.hk (S.S.M.); alan.chan@cityu.edu.hk (A.H.S.C.)

* Correspondence: kllow2-c@my.cityu.edu.hk; Tel.: +852-6772-5774

Received: 14 September 2018; Accepted: 12 October 2018; Published: 15 October 2018

Abstract: High accident rates have been a complicated and persistent problem in the Hong Kong construction industry. This situation has stimulated this investigation into factors that influence the risk-taking propensity of construction workers. However, interviewing workers who had a bad experience is problematic because changes in attitude and perception may occur as a result of such an experience. Using quasi-expert interviews can reduce this problem. The objective of this study was to identify factors that influence the risk-taking propensity of construction workers. Semi-structured interviews were conducted with 16 safety professionals all with accident inspection experience and six super-safe workers with no incident record for the past five years. Seven factors that affect the risk-taking propensity of construction workers were successfully identified. Each factor is thoughtfully discussed, and this study shows that quasi-expert interview is a pragmatic approach for deepening the understanding of risk-taking propensity among construction workers. Findings of this study will hopefully help and encourage further quantitative research on the risk-taking propensity of construction workers with different perspectives.

Keywords: construction safety; individual factor; organisational factor; quasi-expert interview; risk-taking propensity

1. Introduction

Despite the important contributions of the construction industry to developing and developed countries in terms of gross domestic product (GDP) [1] and employment opportunities, it has long been considered one of the most dangerous industries. High accident rates in the construction industry around the world are of great concern, particularly that in Hong Kong. Hong Kong’s construction industry has a fatality accident rate per thousand workers which is 2.23 times that of Japan [2] and 2.43 times that of Singapore in 2017 [3]. Human factors play an important role in accident occurrence and are closely associated with behaviour-based safety (BBS) among building workers [4,5]. Understanding the risk-taking propensity of workers is critical because it provides clues about the relationship between behavioural outcomes and accident proneness [6,7].

Risk taking is common, yet the risk-taking propensity among construction workers is distinct. Many factors can affect the risk-taking propensity of workers, and they can generally be categorised as organisational [8] and individual factors [9]. Although many previous studies were conducted to test factors in the model of unsafe behaviour for construction workers, their findings heavily relied on statistical analyses. For instance, Fogarty and Shaw [10] investigated the prediction of unsafe behaviour with safety climate as a predictor. Jiang, et al. [11] employed system dynamics modelling to understand the causation of unsafety behaviours of construction workers. These studies are useful in examining statistical relationships between variables. However, they cannot explain why construction workers possess risk-taking propensity.
Certain attitudes are believed to be greatly affected by and vary according to circumstances. For instance, attitude towards risk is likely to change immediately after an incident has occurred due to the altered mental state of workers after accidents or negative experiences [12]. This change can occur even when workers witness a workplace accident [13] and can result in negative effects on survey results by not reflecting the true attitude of workers towards risk. Another factor that can affect study results is de-biasing effect which is the suppression of unrealistic optimism by having a negative experience [14]. Such changes in bias with regard to unrealistic optimism were reported for the effect of frequency of accidents on the attitude of children towards risk taking [15]. This adverse effect of negative experience on study results was recognised.

In this study, the risk-taking propensity of construction workers refers to their tendency to engage in benefit-seeking actions at work despite potential negative results. This study aimed to understand factors that influence their risk-taking propensity at work by conducting quasi-expert interviews. The findings of this study are expected to provide a theoretical insight into risk-taking propensity and offer practical recommendations to reduce the risk-taking propensity of construction workers.

2. Literature Review

How construction accidents happened and what type of these accidents are have long been investigated with different reporting systems and techniques [16]. For instance, Tixier, et al. [17] proposed a natural language processing system for extracting precursors and outcomes from unstructured injury reports. To understand why construction accidents occurred is important for the reduction of construction accidents. There are two domains of theories attracting attention of researchers, namely and theories of human error and the theories of accident causation. Heinrich Domino theory of accident causation is one of the well-known theories of accident causation and it is based on five sequential dominos; (1) ancestry and social environment; (2) fault of person (carelessness); (3) unsafe act and/or mechanical or physical condition; (4) accident; (5) injury [18]. The Heinrich Domino theory states that if the first domino (ancestry and social environment) falls, the following dominos will fall in sequence. This theory implies that the avoidance of construction accidents can be achieved if the chain of sequence is disturbed. For example, the unsafe act of construction workers can be eliminated to prevent the accidents and associated injuries. However, the Heinrich Domino theory was blamed for its simplifying the human behaviour control in accidents, leading to more emphasis to be put on the management role in accident prevention [19].

Different from Heinrich Domino theory, the theories of human error do not attribute accidents to unsafe human behaviour, but to the design of workplace tasks that do not consider the limitations of human [20]. Petersen [21] proposed a multiple causation model that focuses on management system rather than individuals. In the multiple causation model, unsafe acts and unsafe conditions were attributable to different sub-causes. By eliminating these sub-causes, unsafe act and unsafe condition can be prevented. The needs to improve training and inspection procedures, and to make better assignment of responsibilities, and pre-task planning by supervisors was stressed [21].

Fleming and Lardner [22] found that approximately 80% of accidents are caused by unsafe human behaviour. For improving construction safety, researchers have focused on understanding unsafe behaviour of construction workers. Choudhry and Fang [23] examined the reasons for construction worker unsafe behaviour and found that workers were involved in unsafe behaviour because of: to exhibit of being ‘tough guys’, a lack of safety awareness; co-workers’ attitudes; work pressure; and other organizational, economic and psychological factors. Also, Fang, et al. [24] proposed a cognitive model that adopted a five-stage form for explaining constriction worker unsafe behaviour. The five stages included obtaining information, understanding information, perceiving responses, selecting a response, and taking action, with obtaining information and selecting a response as the two key stages. Khosravi [25] conducted a quantitative study to test a new model for understanding the factors influencing unsafe behaviour in construction industry and found that physical condition had the highest correlation with the overall safety performance. However, there is a lack of
studies on the risk-taking propensity of construction workers in the relevant literature. This study
aimed to understand the factors that influence their risk-taking propensity at work by conducting
quasi-expert interviews.

3. Methodology

This study employed a qualitative approach to obtaining the thoughts of participants about the
risk-taking propensity of construction workers. The details of methodology design are discussed below.

3.1. Interview and Question Design

Face-to-face quasi-expert interviews were conducted because the relatively objective notions and
knowledge of experts were considered to avoid potential bias of the victims of accident cases [26,27].
All the interviewees voluntarily participated in the interviews in the presence of the research staff
only. They were assured the whole study was conducted by university staff with high level of data
anonymity, security and confidentiality. Two interview groups were used to obtain comprehensive
qualitative data about risk-taking propensity in this study, namely, accident and super-safe groups.
In the accident group, the accident cases which were construction accident reports were involved.
Safety frontline officers and related managerial safety professionals, who were experienced in handling
accident inspections in Hong Kong construction projects, possessed a certain understanding of these
accidents and knew the victims as colleagues before the occurrence of the accidents and as clients
after a detailed investigation of the accidents, were interviewed to obtain their relatively objective
comments on construction accidents. In the super-safe group, super-safe workers had no any official
accident records in the last five years and were front-line workers who could provide their experience
and opinions about not taking risks at work. Accident cases and super-safe workers were randomly
selected from 10 construction companies that are contracted for different types of construction projects
in Hong Kong that have certain representativeness in the industry. Specifically, a number was assigned
to all potential accident cases and super-safe workers and then a computer-based program was used
to generate a random number table to select accident cases and super-safe workers for the sample.
There were only two interviewers, the first author and a research staff member, who had more than
10 years of working experience in the construction field to ensure that they fully understand technical
terms and/or specific procedures referred to by the participants and the circumstance of the accident
or situation confronting the unfortunate person or persons involved in the accident.

A semi-structured interview guide was developed for interviewers wherein they ask
predetermined open questions to obtain comprehensive responses from participants. Questions
used for both the accident and super-safe groups were categorised in a three-layer sequence as follows:
Opening questions, follow-up questions and in-depth discussions. Opening questions introduced
the participants to the general purpose of the study, and follow-up questions covered contents of the
survey. In-depth discussions concentrated on uncovering and probing the underlying reasons for
risk-taking propensity.

In the accident group, the opening question was ‘Could you briefly describe the context of an
accident case you have encountered?’ This question provided basic information about the reported
accident case and general area of risk taking. Follow-up questions and in-depth discussions, however,
continued with an example to further investigate the underlying causes of the accident and provide
information and insight for the interviewer.

In the super-safe group, the opening question was designed to praise their performance over
the past five years, for example, ‘You have zero reported accidents over the past five years. How did
you do that?’ and ‘May I call you a super-safe worker?’ These techniques created an atmosphere
that helped the interviewees express themselves freely. As the two groups of participants were from
different backgrounds, follow-up questions used for the accident group were slightly different from
those used for the super-safe group. The super-safe group questions concentrated on the reasons
for not taking risks at work. In spite of this difference, the context of all the questions was related
to the factors that influence the risk-taking propensity of construction workers under examination. Table 1 shows the details of interview questions for the accident group and the super-safe group.

Table 1. Interview questions for the accident group and the super-safe group.

| Opening questions                                                                 | Super-Safe Group                                                                 |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Could you briefly describe the context of an accident case you have encountered? | You have zero reported accidents over the past five years. How did you do that? |
| May I call you a super-safe worker?                                               |                                                                                  |

| In-depth questions                                                                 |                                                                                  |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Could you explicitly describe the reasons for the worker to take risks at work during the incident period? | Could you explicitly describe the reasons for not taking risks at work?           |
| Could you further describe the safety supervision and inspection during the incident period? | Could you further describe the safety supervision and inspection during your servicing period? |
| Could you further describe the safety culture during the incident period?          | Could you further describe the safety culture during your servicing period?        |
| Could you further describe the workplace conditions during the incident period?    | Could you further describe the workplace conditions during your servicing period?  |
| Could you further describe the attitude of the worker towards risk during the incident period? Did s/he have any risky ideals at work? | Could you further describe the attitude of you towards risk during your servicing period? Did you have any risky ideals at work? |
| Could you further describe the risk perception of the worker during the incident period? | Could you further describe the risk perception of you during your servicing period?  |
| Could you further describe the perceived behavioural control of the worker during the incident period? Was s/he full of confidence or not? | Could you further describe the perceived behavioural control of you during your servicing period? Were you full of confidence or not? |

| Ending Question                                                                 |                                                                                  |
|----------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| Do you have anything to add?                                                      | Do you have anything to add?                                                     |

3.2. Participants

Thirty-one accident cases were used in the interviews with 16 safety professionals (accident group) and six construction workers without any incident records in the last five years (super-safe group). Table 2 shows the general demographic information of accident cases and super-safe workers in this study. In the accident group, the majority of victims were male (96.8%), aged above 30 years (93.6%), held an education level of primary school (62.1%) and had more than 1 year of working experience in the construction industry (96.8%). In the super-safe group, the number of male and female participants was equal. Most of them were aged over 51 years (83.3%), and all participants were married.

Table 2. General demographic information of accident cases and super-safe workers.

| Demographic Information | Accident Group (n = 31) | Super-Safe Group (n = 6) |
|-------------------------|-------------------------|-------------------------|
| Gender                  |                         |                         |
| Male                    | 96.8%                   | 50.0%                   |
| Female                  | 3.2%                    | 50.0%                   |
| Age                     |                         |                         |
| 18–30 years old         | 6.5%                    |                         |
| 31–40 years old         | 19.4%                   |                         |
| 41–50 years old         | 32.3%                   | 16.7%                   |
| Over 51 years old       | 41.9%                   | 83.3%                   |
3.3. Investigating Factors

Voice recording was used during interviews. Qualitative data were obtained from transcriptions of the recordings to provide quotes, which help in understanding the factors that affect risk-taking propensity. Constant comparative approach was specifically adopted for data analysis to generate in-depth meanings [28]. For example, a response from the accident group ‘... they noticed no safety officer doing safety inspections during that period’ was coded as a ‘Safety Supervision and Inspection’ theme because a lack of safety supervision and inspection may result in taking risks. A response from another participant ‘There was not enough site supervision. There were some problems on the site, but nobody cared about them ... ’ was examined and compared to determine whether it was similar to the previously identified themes. If so, the response was coded as a ‘Safety Supervision and Inspection’ theme. Otherwise, the response was coded as a new theme. Related pieces of conversation were identified and stated.

4. Research Findings and Discussions

Qualitative data were analysed systematically through constant comparative approach to extract in-depth understanding of each participant’s viewpoint on risk-taking propensity. Risk-taking propensity was found to be a combination of various contributing factors. Generally, two domains of factors that affect risk-taking propensity of construction worker were organisational and individual factors. Organisational factors involved safety supervision and inspection, safety culture, social influence and workplace condition. Individual factors included attitude towards risk, risk perception and perceived behavioural control. These factors are discussed in depth below. A list of sample responses from the accident group and the super-safe group is shown in Table 3. Also, the results of coding for accident group and super-safe group are shown in Table 4.
Table 3. A list of sample responses from the accident group and the super-safe group.

| Factor                          | Group                  | Example Quotes                                                                                                                                 |
|---------------------------------|------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| Safety Supervision and Inspection | Accident Group        | ‘... they noticed no safety officer doing safety inspections during that period’  
‘... there was not enough site supervision. There were some problems on the site but nobody cared about them’  
‘... they noticed that the foreman or the consultant’s representative was not present’  
‘... sometimes, we face a shortage of personnel to supervise safety in the workplace’  
‘... the site actually was operated without the supervisor’s involvement’  |
|                                 | Super-safe Group       | ‘The safety officers patrolled the work site frequently’  
‘We were discouraged from engaging in unsafe work practices when our supervisors were inspecting. Therefore, a regular inspection by our supervisors is very important. It may not be a proactive way to improve our safety performance, but at least it worked’  
‘I know that the equipment has been well inspected by the relevant safety officers’  |
| Safety Culture                  | Accident Group        | ‘The safety culture of the team was poor ... For instance, no person in the team was assigned to clean up debris and or pick up cables that were left lying on the floor for few days. Many workers replied that cleaning debris was not their responsibility’  
‘... the team had a poor safety culture’  
‘... there was no empathy in the team and this situation is getting worse’  
‘they didn’t want to be isolated or blamed by others for asking for extra safety measures’  |
|                                 | Super-safe Group       | ‘... I feel my team was concerned about being considerate and responsible for coworkers’  
‘My group had a team spirit in safety ... I feel more comfortable to work safely if the group has a team spirit ...’  
‘My groupmates understood my safe work practices and did not blame me for working slow ...’  |
| Social Influence                | Accident Group        | ‘they think they were not the only one who did that (unsafe behaviour) ... there were other people (workers) who did the same ...  
‘... they just followed the practice (unsafe practice) of the group ...’  |
|                                 | Super-safe Group       | ‘I followed safety practices because co-workers did so too ...’  
‘If I work unsafely, other workers blame me ...’  
‘I did not want to get others angry because of my unsafe behaviour ...’  |
| Workplace Condition            | Accident Group        | ‘the site area was pretty dark and I usually couldn’t see the floor clearly ...’  
‘... the workplace space was insufficient for us to work properly’  
‘The workplace was located 30 m above ground, the working platform was small and its loading capacity was just enough to support the drilling rig’  |
|                                 | Super-safe Group       | ‘The workplace was tidy and had sufficient lighting ...’  
‘I can see the access points to many locations in the site ...’  |
| Attitude towards Risk          | Accident Group        | ‘... they knew about the consequences of engaging in risky behaviour. These workers think risks are accompanied with certain benefits, thereby taking risks at work ...’  
‘... they think taking risks is not a bad idea’  
‘... they like taking risks at work ...’  |
|                                 | Super-safe Group       | ‘... I think risks at work are harmful to our safety and health so I did not take risks at work  
‘... I think working unsafely is unwise ...’  |
| Risk Perception                | Accident Group        | ‘... workers did not follow safety procedures because they did not think doing so is dangerous ...’  
‘... they think they did it before, so doing it again would not be risky ... However, an accident did happen ...’  
‘... he did not perceive any risks in what he is about to do ...’  |
|                                 | Super-safe Group       | ‘... I did not take risks, such as not using safety helmets because I believe not using safety helmet can lead to serious injuries ...’  
‘... I think taking risks is very likely to result in accidents ...’  
‘... I worry about the accidents which are caused by taking risks ...’  |
| Perceived Behavioural Control  | Accident Group        | ‘... workers did not use a safety harness to work at height because they think it is easy to complete the task without safety measures ...’  
‘... they always felt confident in taking risks ...’  |
|                                 | Super-safe Group       | ‘... I think it is difficult to take risks at work ...’  
‘... I have no ability to take risks ...’  |
Table 4. Results of coding for the accident group and the super-safe group.

| Groups               | Categories                          | Subcategories                        | Codes                        | Frequency |
|----------------------|-------------------------------------|--------------------------------------|------------------------------|-----------|
| Super-safe Group     | Organizational Factors              | Safety Supervision and Inspection    | Infrequent Safety Inspection | 35        |
|                      |                                     |                                      | No Close Safety Supervision  | 30        |
|                      | Social Influence                    | Safety Culture                       | Bad Safety Culture           | 32        |
|                      |                                     |                                      | Blaming Culture about       | 26        |
|                      |                                     |                                      | Using Safety Measures       |           |
|                      | Workplace Condition                 |                                     | Poor House Keeping          | 21        |
|                      |                                     |                                      | Limited Workspace           | 18        |
|                      |                                     |                                      | Insufficient Lighting       | 15        |
| Individual Factors   | Attitude towards Risk               |                                     | Preference for Risks        | 35        |
|                      | Risk Perception                     |                                     | Low Risk                    | 23        |
|                      |                                     |                                      | No Danger                   | 10        |
|                      | Perceived Behavioural Control       |                                     | Feeling of Ease             | 25        |
|                      |                                      | Safety Supervision and Inspection    | Frequent Safety Inspection  | 13        |
|                      |                                      |                                      | Close Safety Supervision    | 11        |
|                      | Social Influence                    | Safety Culture                       | Good Safety Culture         | 11        |
|                      |                                      |                                      | Encouragement to Use        | 9         |
|                      |                                      |                                      | Safety Measures             |           |
|                      | Workplace Condition                 |                                     | Good House Keeping          | 6         |
|                      |                                      |                                      | Sufficient Work Space       | 4         |
|                      |                                      |                                      | Sufficient Lighting         | 3         |
| Individual Factors   | Attitude towards Risk               |                                      | No Preference for Risks     | 11        |
|                      | Risk Perception                     |                                      | High Risk                   | 6         |
|                      |                                      |                                      | Danger                      | 4         |
|                      | Perceived Behavioural Control       |                                      | Feeling of Difficulty       | 6         |

4.1. Safety Supervision and Inspection

In this study, safety supervision and inspection refer to frequency, breadth, and depth of safety supervisions and inspections on site. Improper safety supervision and inspection, like ‘No close safety supervision’, might lead to more risk-taking behaviours such that they may subsequently result in construction accidents. The following statement from the accident group was reported: ‘... they noticed no safety officer doing safety inspections during that period’. This finding is consistent with that of Fung, et al. [29] who found that safety supervision is highly negatively correlated with risk-taking behaviour among Hong Kong construction workers. Safety professionals agreed that ‘... sometimes, we face a shortage of personnel to supervise safety in the workplace ...’, indicating a manpower-shortage problem in the Hong Kong construction industry. One super-safe worker reported that ‘We were discouraged from engaging in unsafe work practices when our supervisors were inspecting. Therefore, a regular inspection by our supervisors is very important. It may not be a proactive way to improve our safety performance, but at least it worked’. Such a response indicates that super-safe workers behave passively during an inspection. A previous study of Hola, et al. [30] proposed a methodology of classifying the causes of occupational accidents involving construction scaffolding using Pareto-Lorenz analysis and found that in the group of organizational causes, first and foremost, is a lack of direct supervision by a construction manager or executive manager during the performance of work. Therefore, the construction industry and concerned authorities should be aware of the problems related to safety supervision and inspection. They should also employ additional human resources to ensure adequate safety supervision and inspection for construction workers, thereby reducing their risk-taking propensity.
4.2. Safety Culture

Safety culture constitutes values and beliefs that involve interaction between organisations and individuals [31]. The present study found that safety culture might affect risk-taking propensity of construction workers. One safety professional echoed the responses of the construction workers as follows: ‘The safety culture of the team was poor. . . . For instance, no person in the team was assigned to clean up debris and or pick up cables that were left lying on the floor for few days. Many workers replied that cleaning debris was not their responsibility . . . ’ By contrast, a super-safe worker stated the following about the safety culture of his working team: ‘. . . I feel my team was concerned about being considerate and responsible for coworkers . . . ’ This statement reflects the important effects that safety culture can exert on the attitudes and actions of Hong Kong construction workers. For example, a negative safety culture can influence a worker to take risks through social pressure. This social pressure is likely to be heightened in closely bonded work communities. To provide a positive safety culture for construction workers, construction safety weeks are advised to be organised for them, and activities may include safety carnivals, conferences and safety award presentations.

4.3. Social Influence

In this study, social influence refers to subjective norms of the participants in the safety aspect. It was also found as a factor that affects risk-taking propensity of construction workers, similar to the findings of Zohar and Luria [32] that social influence can influence the safety performance of individuals. The accident group demonstrated much tendency to take risks. The following statements were from a safety officer in the accident group ‘. . . they just followed the practice (unsafe practice) of the group . . . ’ and ‘they think they were not the only one who did that (unsafe behaviour) . . . there were other people (workers) who did the same . . . ’ These quotes are victim responses during accident investigations and are typical examples of how workers complied with unsafe norms prevailing in the workplace. Construction projects in Hong Kong are generally extensive, called ‘mega’, and involve a large work force for each project. Intensive work under time and cost pressure is likely to result in negative social norms regarding unsafe practices within an organisation [33]. The present study revealed the influence of social influence and norms on the risk-taking propensity of construction workers, but not much research has been done on the formation of such unacceptable norms in Hong Kong’s construction industry.

4.4. Workplace Condition

In this study, workplace condition is defined as the housekeeping of a construction site. Complaints about insufficient lighting, limited space and debris problems were reported to safety officers in the accident group. Statements like ‘the site area was pretty dark and I usually couldn’t see the floor clearly . . . ’ indicate that insufficient lighting may cause workers to work in a risky environment. Moreover, many workers argued that cleaning debris was not their responsibility. They continued to work under unclean conditions, which may cause accidents. Other workers identify limited space in their workplace as another driver of risk-taking behaviour. One respondent reported that ‘The workplace was located 30 m above ground, the working platform was small and its loading capacity was just enough to support the drilling rig’. These findings are consistent with that of Ghosh, et al. [34] who found that poor workplace conditions are related to the risk-taking tendency and occupational injuries of workers. In addition, these findings imply that providing a clean and safe workplace for construction workers can reduce their risk-taking propensity.

4.5. Attitude towards Risk

Attitude towards risk refers to a person’s positive or negative evaluation of risks at work. In the accident group, safety professionals mentioned that ‘. . . they knew about the consequences of engaging in risky behaviour. These workers think risks are accompanied with certain benefits, thereby taking risks at
work’. Such response clearly indicates a positive risk attitude of workers who have accidents. In the super-safe group, respondents reported that ‘… I think risks at work are harmful to our safety and health so I did not take risks at work …’ This response shows super-safe workers hold a negative risk attitude. These findings imply that attitude towards risk is a factor of the risk-taking propensity of construction workers. Previously, Wang and Yuan [35] identified factors affecting risk attitudes of construction project contractors. However, no studies have been conducted to identify factors that influence attitude towards risk among construction workers. Future research may focus on this issue.

4.6. Risk Perception

Risk perception refers to subjective judgement about a risk. In the accident group, one interviewee reported that ‘… workers did not follow safety procedure because they did not think doing so is dangerous …’ This statement implies that low risk perception may lead to risk-taking propensity of construction workers. By contrast, in the super-safe group, a worker reported that ‘… I did not take risks, such as not using safety helmets because I believe not using safety helmet can lead to serious injuries …’ This claim indicates workers who have a high level of risk perception tend to avoid risks at work. These findings are in agreement with that of Arezes and Miguel [36] who found that worker risk perception is a significant predictor of using hearing protection devices. Risk perception has received increasing attention from safety searchers. For instance, Bohm and Harris [37] explored risk perception of dumpers and its relationship to their risk-taking behaviour using a paired comparison technique. They found that risk perception was negatively related with risk-taking behaviour. The present study advocated that risk perception is one factor influencing the risk-taking propensity of construction workers. Safety training should be given to construction workers to increase their risk perception so that their risk-taking propensity can be reduced.

4.7. Perceived Behavioural Control

Perceived behavioural control refers to the extent to which workers perceive the ease or difficulty of taking risks at work. In this study, perceived behavioural control affects risk-taking propensity. In the accident group, one respondent reported that ‘… workers did not use a safety harness to work at height because they think it is easy to complete the task without safety measures …’. For the super-safe group, a response ‘… I think it is difficult to take risks at work …’ was obtained. These statements indicate that workers with a high level of perceived behavioural control tend to take risks at work. According to the theory of planned behaviour [38], the intention of performing a behaviour is determined by perceived behavioural control over that behaviour. This study supported this theory in the context of construction safety.

5. Conclusions

In this qualitative study, seven factors associated with construction worker risk-taking propensity were identified using quasi-expert interviews. Specifically, organization factors (including safety supervision and inspection, safety culture, social influence, and workplace condition) and individual factors (including attitude towards risk, risk perception, perceived behavioural control) were found to influence construction worker risk-taking propensity. The findings of this study help explain the risk-taking propensity of construction workers. The identification of factors affecting risk-propensity of construction workers may help industry stakeholders to allocate resources properly for improving safety performance of construction workers.
Author Contributions: Conceptualisation, B.K.L.L. and A.H.S.C.; Methodology, B.K.L.L.; Formal analysis, B.K.L.L.; Investigation, B.K.L.L.; Data curation, B.K.L.L.; Writing—original draft preparation, B.K.L.L.; Writing—review and editing, S.S.M.; Supervision, A.H.S.C.

Funding: This research received no external funding.

Acknowledgments: The authors wish to thank Kenneth W. M. Szeto, a senior safety officer of Build King Construction Company Limited, for his contribution in safety professional communications.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. Gunduz, M.; Birgonul, M.T.; Ozdemir, M. Development of a safety performance index assessment tool by using a fuzzy structural equation model for construction sites. *Autom. Constr.* 2018, 85, 124–134. [CrossRef]

2. Japan Industrial Safety and Health Association. Industrial Accidents in CY2016 in Japan. Available online: http://www.mhlw.go.jp/bunya/roudoukijun/anzeneisei11/rousai-hassei/xls/16_kakutei.xls (accessed on 3 October 2018).

3. Workplace Safety and Health Institute. *Workplace Safety and Health Report 2016—National Statistic*; Ministry of Manpower Services Centre: Singapore, 2016.

4. Chen, D.; Tian, H. Behavior based safety for accidents prevention and positive study in China construction project. *Procedia Eng.* 2012, 43, 528–534. [CrossRef]

5. Li, H.; Lu, M.; Hsu, S.C.; Gray, M.; Huang, T. Proactive behavior-based safety management for construction safety improvement. *Saf. Sci.* 2015, 75, 107–117. [CrossRef]

6. Tixier, A.J.P.; Hallowell, M.R.; Rajagopalan, B.; Bowman, D. Automated content analysis for construction safety: A natural language processing system to extract precursors and outcomes from unstructured injury reports. *Autom. Constr.* 2016, 62, 45–56. [CrossRef]
21. Petersen, D. Techniques of Safety Management; McGraw-Hill Companies: New York, NY, USA, 1978.
22. Fleming, M.; Lardner, R. Strategies to Promote Safe Behaviour as Part of a Health and Safety Management System; HSE Books: London, UK, 2002.
23. Choudhry, R.M.; Fang, D. Why operatives engage in unsafe work behavior: Investigating factors on construction sites. Saf. Sci. 2008, 46, 566–584. [CrossRef]
24. Fang, D.; Zhao, C.; Zhang, M. A cognitive model of construction workers’ unsafe behaviors. J. Constr. Eng. Manag. 2016, 142. [CrossRef]
25. Khosravi, Y.; Asilian-Mahabadi, H.; Hassanazadeh-Rangi, N.; Hajizadeh, E.; Gharibi, V. Why construction workers involve in unsafe behavior? Development and cross-validation of a structural model. Iran Occup. Health 2015, 12, 27–37.
26. Littig, B.; Pöchhacker, F. Socio-translational collaboration in qualitative inquiry: The case of expert interviews. Qual. Inq. 2014, 20, 1085–1095. [CrossRef]
27. Bogner, A.; Menz, W. The theory-generating expert interview: Epistemological interest, forms of knowledge, interaction. In Interviewing Experts; Springer: Heidelberg, Germany, 2009; pp. 43–80.
28. Hewitt-Taylor, J. Use of constant comparative analysis in qualitative research. Nurs. Stand. 2001, 15, 39–42. [CrossRef] [PubMed]
29. Fung, I.W.; Tam, C.; Tung, K.C.; Man, A.S. Safety cultural divergences among management, supervisory and worker groups in Hong Kong construction industry. Int. J. Proj. Manag. 2005, 23, 504–512. [CrossRef]
30. Hoła, A.; Sawicki, M.; Szóstak, M. Methodology of classifying the causes of occupational accidents involving construction scaffolding using pareto-lorenz analysis. Appl. Sci. 2018, 8, 48–58. [CrossRef]
31. Machfudiyanto, R.A.; Latief, Y.; Arifuddin, R.; Yogiswara, Y. Identification of safety culture dimensions based on the implementation of OSH management system in construction company. Procedia Eng. 2017, 171, 405–412. [CrossRef]
32. Zohar, D.; Luria, G. A multilevel model of safety climate: Cross-level relationships between organization and group-level climates. J. Appl. Psychol. 2005, 90, 616–628. [CrossRef] [PubMed]
33. Akomah, B.; Boakye, A.N.; Fugar, F. Safety on Ghanaian Construction Sites: The Role of the Employer and the Employee. In Proceedings of the West Africa Built Environment Research (WABER) Conference, Accra, Ghana, 27–28 July 2010.
34. Ghosh, A.K.; Bhattacharjee, A.; Chau, N. Relationships of working conditions and individual characteristics to occupational injuries: A case-control study in coal miners. J. Occup. Health 2004, 46, 470–480. [CrossRef] [PubMed]
35. Wang, J.; Yuan, H. Factors affecting contractors’ risk attitudes in construction projects: Case study from China. Int. J. Proj. Manag. 2011, 29, 209–219. [CrossRef]
36. Arezes, P.M.; Miguel, A.S. Risk perception and safety behaviour: A study in an occupational environment. Saf. Sci. 2008, 46, 900–907. [CrossRef]
37. Bohm, J.; Harris, D. Risk perception and risk-taking behavior of construction site dumper drivers. Int. J. Occup. Saf. Ergon. 2010, 16, 55–67. [CrossRef] [PubMed]
38. Ajzen, I. From intentions to actions: A theory of planned behavior. In Action-Control: From Cognition to Behavior; Kuhl, J., Beckman, J., Eds.; Springer: Heidelberg, Germany, 1985; pp. 11–39.