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# Critical Factors for Insurance Premium Computation in Construction

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## Abstract

Workers' compensation insurance is imperative for construction projects to safeguard the interests of workers and contractors. The commitment of insurers under this insurance is extremely broad. They must therefore accomplish rigorous risk and market assessments to decide optimal premiums. General insurers in Singapore have been experiencing detrimental loss-ratios in this business due to the lack of a proper framework that encompasses all the critical variables. The purpose of this study is to identify and explore the critical variables for premium-rating of construction workers' compensation insurance. An extensive literature review helped identify 17 variables that may influence premium rates. An interview questionnaire survey and subsequently a statistical analysis of the survey data were carried out to identify the critical variables. Eight variables were found significant for insurers for premium-rating including: wage roll, project hazards, project safety, contractor's claims history, insurer's overhead costs, insurer's corporate objectives, competition, and investment income from underwritten premiums. The findings of this study can be used by insurance companies in their risk assessment and premium-rating exercises.

**Keywords:** *Occupational injuries, Construction safety, Workers' compensation insurance, Premium, Singapore*

## Introduction

Construction is one of the most dangerous and risky occupations. Insurance is a keystone to eliminate most of the financial threats in construction business (Clough *et al.*, 2005). Bunni (2003) identified five types of insurance that are available for contractors for different risk nature: contractors' all risk insurance, general liability insurance, worker's compensation insurance, motor insurance, and marine transport insurance. Contractors' all risk insurance covers physical losses or damages to works, plant, equipment and materials during the course of construction that are resulted by crises such as natural disasters, fire/explosion or collapse. General liability insurance indemnifies the contractor in respect of legal liability for damages arising from death or injury to non-contracting entity or damage to non-contracting entity's property due to a project. For example, damage to adjacent property, injury to any third party due to an excavation work or damage to underground utilities may be indemnified under this insurance. According to the Workers' Compensation Act, cost of all the injuries/fatalities to workers resulting from construction activities should be borne by the contractor, irrespective of fault. Worker's compensation insurance (WCI) is purchased to transfer this financial risk to a professional insurer. Motor insurance provides liability coverage for over-the-road hazards for self-propelled motor vehicles used for the sole purpose of providing mobility to construction equipment such as pumps, cranes, air compressors, generators, etc. In international construction, marine transport insurance is required to protect from any losses resulting from ship crises when travelling by the sea.

Out of these five classes of insurance, the significance of the WCI in construction is overwhelming because the construction industry is well-known for poor safety performance globally. In Singapore, the construction industry accounted for 29% of the

total number of industrial workers but accounted for 40% of worksite accidents (Chua & Goh, 2004). Moreover, the latest analysis as of year 2006 on worksite accidents by the Ministry of Manpower, Singapore revealed that the construction industry recorded the highest accident frequency and injury severity rates among all the industries in Singapore (OSHD-MOM, 2006). Providing adequate WCI covers is therefore mandatory by the law of Singapore for employers to engage workers under a contract of service. It is enforced to safeguard the interests of occupational injury victims and to ease their employers' financial burden of compensating. On the other hand, insurance companies who issue the WCI for construction projects are forced to assume abundant financial risks. This implies that the construction WCI is a critical class of insurance in the whole portfolio of any insurer's business. Hence, the utilisation of an effective premium-rating technique is essential for insurers to perform rigorous risk assessments for construction WCI.

In the Singapore insurance industry, WCI premiums are traditionally computed by applying a rate on the wage roll of construction projects. There has been a collective agreement among general insurers that the preferable WCI premium rate for construction projects is 1% of the wage roll. This rate is merely a benchmark. Individual insurers set competitive rates around the benchmark considering other important variables. However, no strong theory supports this benchmark norm and therefore lacking of an effective framework for insurers to perform structured analyses on project risk and market factors. In the face of keen competition in Singapore's insurance market, underwriters tend to compromise the technical factors such as the risk profile of a project and the contractor's safety management system, due to the lack of a well-balanced framework. This brings about riskier projects that are being covered by insurers at lower premiums, which ultimately result in adverse loss ratios. Most of the

general insurance companies in Singapore have been encountering undesirable loss-ratios in the construction WCI due to inadequate premiums; some have given up issuing the WCI altogether and a few other companies have bankrupted (Imriyas *et al.*, 2006). The industry statistics for year 2006 of the General Insurance Association of Singapore reinforced that the WCI is the third largest class of insurance in Singapore. It continued to struggle in 2005 with an underwriting loss of S\$7 million in the first half of 2005 compared to the same period in 2004, when it lost S\$1 million. The incurred loss-ratio has climbed from 72% to 80%. The WCI business has sustained poor underwriting results over the years. This is mainly due to unrealistic pricing, under declaration of wages by some companies as well as aggravated and fraudulent injury claims by some foreign workers (GIA, 2006). Hence, there is an intense need for developing a new methodology for WCI premium-rating of construction projects. The prime task towards developing a new model is to identify the critical variables that influence WCI premiums for construction projects. Hence, the aim of this paper is to explore and critically analyse the variables pertinent to WCI premium-rating.

The paper is presented in various parts. Firstly, a general view of workers' compensation insurance is given followed by an account on the literature review findings on variables pertinent to WCI premium-rating. Then, the research method and the findings are described followed by a conclusion.

### Background of WCI

During the industrial revolution, injured workers had to prove employers' negligence to recover medical expenses, lost wages and other damages caused by accidents. Employers had three primary defences for them to avoid liabilities for injuries. The first was the concept of *contributory negligence*, which prevented the employee from recovering any damage if he/she contributed to even in a small way to the cause of the

accident. Another defence was the *fellow-servant doctrine*. If the injury resulted from contributory actions of fellow employees, the employer was not considered liable. The third defence was the *assumption of risk doctrine*. It could limit a worker's recovery of damages if he/she knew of the workplace hazard and assumed those risks by going to work (Clayton, 2004).

Besides overcoming common law defences, injured workers faced other problems in filing lawsuits against the employer: (1) filing lawsuits often resulted in injured workers losing their jobs, (2) the lawsuits were expensive and time-consuming thus workers had difficulty finding lawyers to represent them, and (3) there was no guarantee that the employee would win the suit and collect damages (Newman & Hancher, 1991). Thus, injured workers received no compensation, lost the current job or faced difficulty finding other jobs due to disability. To overcome this unfair situation, the workers' compensation system was designed as a trade-off between employers and employees. The underlying principle behind the system is that the cost of on-the-job injuries, regardless of fault, should be borne by employers. In exchange, the injured workers forfeit the right to sue employers. The basic objectives of the workers' compensation are to: (1) provide sure, prompt and reasonable benefits to work accident victims or their dependents, (2) provide a single remedy and eliminate time-consuming and costly trials, (3) encourage maximum employer interest in safety and rehabilitation, and (4) promote frank study of accidents' causes and reducing preventable accidents (Everett & Thompson, 1995).

According to Singapore's Workers' Compensation Act, the compensation to a victim can be as high as S\$147, 000. Thus, all contractors are required by law to procure the WCI for all their projects to eliminate such financial burden in the event of any worksite injuries/fatalities. Failure to do so is an offence punishable with a fine of

up to S\$10,000, a jail term of up to 1 year or both (MOM, 2005). Hence, the WCI is an integral part of the insurance business.

### Premium-rating variables for construction WCI

In insurance, unlike other industries, the cost of the production is unknown when the contract is sold, and it will be unknown until the policy expires. Therefore, the pricing for insurance must be based on predictions of losses, expenses and incomes in future. Under the WCI, the commitment of an insurer is extremely broad; there are no exclusions, and there is no maximum limit on the insurer's liability (Vaughan & Vaughan, 1996). Setting an appropriate cost for some future contingency of unpredictable timing, frequency and size requires the estimates of future claims, investment income, administrative expenses, profit and tax. In addition, the price can profoundly influence the volume of the business attracted (Booth *et al.*, 1999). Hence, WCI premium-rating is a critical management function for any insurer, which should decide premiums that are high enough to cover all the future costs, yet low enough to meet the market competition. The premium-rating is regarded as a two-stage process (Booth *et al.*, 1999):

1. The costing exercise – this is a scientific method that calculates the cost of future claims from the insured risks and all associated expenses.
2. The pricing exercise – this is a commercial adjustment to technical costs that considers broader corporate and market factors.

### Predicting future claims in construction WCI

The scientific approach to determine the cost of future claims of a WCI policy entails an assessment of project and contractor related variables. Under the project-related variables, the following were identified by various authors:

- Worrall & Buttler (1988) noted that the wage roll, project duration and the expected workers' compensation liability per wage roll unit need to be accounted for predicting claims.
- The Canadian Wood Council (2005) reported that base rates are influenced by the:  
(1) location of the project, (2) type of construction, and (3) general industry experience on loss history for projects of similar type and location.
- Lott (2005) added that an assessment of the workers' risk management programme will lead to an effective prediction of the costs to be incurred. This assessment should scrutinise the following aspects:
  1. Management commitment and employees participation in workers' risk control;
  2. Workplace hazards, population demographics and previous incident rates;
  3. Implementation of a pertinent risk/safety programmes; and
  4. Training of supervisors and workers.

As for the contractor-related variables, Groth (1996) commented that WCI premium-rating must consider contractors' past claim history. Coble *et al.*, (1998) noticed that the contractor's size has a bearing on premium rates. The Canadian Wood Council (2005) suggested that insurers must consider the following variables:

1. Contractors' knowledge, experience and safety-consciousness;
2. Compliance with loss control and underwriting recommendations by the insurer;
3. Acceptance of deductible, that is, a retention of part of the claims cost by the contractor;
4. Potential future business; and
5. Placement of multiple policies with the same insurer.



## **Determining the mark-up for construction WCI**

The adjustment of the technical costs of risks for commercial interests necessitates the consideration of insurers' corporate factors and market factors. The variables, pertinent to insurers, were recognised by many authors in the literature, viz:

- Vaughan & Vaughan (1996) identified three variables that influence the mark-up:
  1. The expenses of acquiring and administering the business (overhead costs);
  2. The profit required by the insurer; and
  3. The return from the investment of premiums by the insurer.
- Young (1997) quoted that premium-rates are adjusted on account of the profit/loss experience of the insurer in the past, and the outstanding claims to the insurer from all projects. The competition and the volume of business in the market also influence the mark-up.
- Booth *et al.* (1999) reported that corporate objectives of insurers will have a significant bearing on mark-ups.
- Phifer (1996) observed that the reinsurance premium, which insurance companies pay for risk sharing with re-insurers do influence the pricing.

## **Research method**

From the literature review above, 17 variables pertinent to WCI premium-rating of construction projects were identified and classified into four categories as shown in Table 1. Subsequently, a questionnaire was designed with the objective of determining the most significant variables. The questions in the questionnaire assessed the significance of the 17 variables for deriving the optimal premium rate on a 10-point Likert scale, whereby 1= "Low important" and 10= "High important".

The field survey was conducted during November and December 2005 in the Singapore insurance industry, which encompasses a population of 23 general insurers.

An interview questionnaire survey was conducted to collect data because having a questionnaire administered face-to-face by an interviewer rather than a mail survey has the following advantages (Babbie, 1992):

1. Interview surveys attain higher response rates than mail surveys;
2. If the respondent misunderstands questions or indicates that he/she does not understand, the interviewer can clarify matters, thereby obtaining relevant and accurate responses;
3. The presence of an interviewer generally reduces unanswered questions; and
4. The interviewer can observe and ask questions for additional explanations.

All the 23 companies were covered in the survey. At every interview session, the questionnaire was presented to the interviewee for his/her response. Additional explanations were rendered when needed. Moreover, interviewees were invited to elaborate on the rationale for their answers.

### **Profile of the respondents**

As shown in Figure 1, the designations of the interviewees were top management (48%) and middle management (52%). The top management interviewees comprised of managing directors, general managers, senior managers and managers. The middle management interviewees were assistant general managers, deputy managers and assistant managers. The mean working experience of the interviewees was 21 years. The minimum and maximum working experiences were 8 and 35 years, respectively. Also, more than 75% of the interviewees had experience of above 10 years. From the interviewees' profile, it is understood that all of them are well-qualified and well-experienced in the subject matter. Hence, the data collection is perceived to be reliable.

## Data analysis and discussion

A statistical analysis was accomplished to identify the most important variables according to the Pareto's 80/20 rule for WCI premium-rating. Descriptive statistics were computed for each category of variables as shown in Table 2. The 17 variables were re-organised, as illustrated in Table 3, into 3 groups namely, important variables, less important variables and unimportant variables, based on their mean importance ratings. Unimportant variables have mean importance ratings  $< 4.00$ , important variables possess mean importance ratings  $> 7.00$ , and the rest are less important variables. The above grouping notion was adapted from the medical industry of Singapore where Goh (2004) proposed a pain scale, as shown in Figure 2a, to measure cancer pain intensity in patients. Based on that scale, the 9 equal intervals in the 10-point Likert scale were re-arranged into 3 equal intervals as illustrated in Figure 2b.

### **Important variables for premium-rating**

Eight important variables for premium-rating were identified out of the 17 variables (See Table 3). A brief discussion on each variable is provided below, based on the qualitative explanation rendered by the interviewees.

#### ***1. Wage roll:***

In the Singapore insurance industry, WCI premiums are traditionally computed by applying a rate on wage rolls of construction projects. There has been a collective agreement among the insurers that the preferable WCI premium rate for construction projects is 1% of the wage roll. This rate, however, is merely a benchmark. Individual insurers set competitive rates around the benchmark heuristically considering other important variables. The wage roll is also considered as a representation of the project duration since both are positively correlated.

On another perspective, when the wage roll is high, the premium amount is high though the premium rate is low. But, claims and administrative costs will be proportionately less, making it possible for insurers to earn more money by insuring bigger projects. Thus, large projects drive keen competition.

### ***2. Project hazard level:***

The project hazard is directly correlated with the frequency and severity accidents and thereby the amount of compensation to be paid by the insurer. Therefore, the higher the project hazard, the higher the premium rate. The project hazard has to be assessed in line with project's scope. The assessment should peruse if the project involves demolition works, explosive works, excavation works, works at heights, works involving lifting and cranes and/or confined space works. The hazard in each type of work has to be assessed via a rigorous analysis of relevant attributes. For example, the hazard in works at heights can be deduced by the total height of the building. Moreover, the characteristics of the project location/vicinity should also be assessed. Among the attributes to be scrutinized for project locality are: soil condition, site congestion level, and/or presence of any chemical/manufacturing factory or combustible source.

### ***3. Effectiveness of the safety management system on site:***

Presence of an effective safety management system on site is significant in reducing claims; thus, the better the safety management system, the lower the premium rate. All the insurers recognised that inspecting the safety management system of the project is essential in inferring potential claims. However, they encountered two constraints, viz:

- Lack of guidelines to assess the effectiveness of the safety management system; and

- Although a contractor can produce a well-documented safety plan for a project, its implementation on site is still uncertain as it is inherent to the attitude of the site management team.

#### ***4. Contractor's claims history:***

Insurers examine a contractor's claims records for the past five years to deduce the contractor's safety performance as an alternative to assessing the safety management system. From the survey, it would appear that records with low severity and high frequency infuse higher premiums than records with high severity and low frequency.

#### ***5. Competition:***

Triumphing competition is crucial in any business. A well-thought out strategy is necessary to assess the competition level by considering the number of competitors, regional economic condition, prestige in the project and the project size. This can subsequently be used to adjust the mark-up that the higher the competition the lower the mark-up.

#### ***6. Corporate objectives of the insurer:***

The mark-up in a premium coheres with an insurer's corporate objective(s). The corporate objective of a Singapore's insurer at any given time can be one or more of the following:

- i) Ensuring the survival of the company;
- ii) To write a given premium volume;
- iii) Achieving an overall operating ratio across the whole portfolio;
- iv) Achieving an adequate level of profitability or return on equity; and
- v) Achieving a target premium growth rate.

For objectives i to iii, an insurer may intentionally quote a low premium while for objectives iv and v, the same insurer may wish to quote an average premium.

### ***7. Overhead costs of insurance:***

Overhead costs are key components of a mark-up; the higher the overhead costs, the higher the mark-up. Overhead costs for the WCI includes brokerage fees and administrative costs for underwriting and claims management. The brokerage fee is a fixed percentage in the Singapore's market; 10% of the premium. Administrative costs vary from company to company, which are estimated to be in the range of 15% to 35 % of the underwritten premium. In total, overhead costs amount to 25% to 45% of the premium in Singapore.

### ***8. Investment income from underwritten premiums:***

The underwritten premium can be invested by the insurer on shares, subsidiary companies, real estate, etc. The returns on these investments influence the premium significantly. If the investment returns are high, the insurer can quote attractive premiums as the insurer's reserve is stable.

## **Less important variables for premium-rating**

Seven variables seem less important for WCI premium-rating of construction projects.

### ***1. Profit/loss experience in WCI business:***

When an insurer experiences a remarkable profit/loss over a period of time, it is acceptable to adjust the premium rate for new undertakings. If there is a profit growth, the insurer may wish to reduce the premium so as to win more projects, as there is a buffer to assume the risk and to develop the business. In contrast, if the experience is bad, premiums for new projects could be increased with consideration of market trends

because losing business is preferred to suffering from loss. However, such adjustments in the WCI's context are not encouraged by most of the Singapore insurers because profitable years will have to be balanced with less profitable years.

## **2. *Reinsurance cost:***

Reinsurance is the principal mechanism that insurance companies use to transfer part or all of the risks assumed through their own underwriting activities. The reasons for reinsuring are as follows:

- For balance sheet protection – reinsurance is purchased to protect the solvency of the insurance company.
- To increase the capacity – the risk exposure that an insurer can reasonably accept is restricted by the size of its capital base. Reinsurance allows taking larger risks, which makes the company more attractive to insurance brokers and their clients.

Risk of an insurer can be ceded to a re-insurer via facultative reinsurance and treaty reinsurance. Under the facultative arrangement, each risk is underwritten by the re-insurer on its own merits with a separate reinsurance contract. Under the treaty system, reinsurance is underwritten for a class of insurance, annually. The treaty reinsurance is further categorised into proportionate treaty and non-proportionate treaty. The subsets of the proportionate treaty are quota share reinsurance and surplus reinsurance while the subsets of the non-proportionate reinsurance are excess-of-loss (XOL) reinsurance and stop-loss reinsurance. The WCI in Singapore adopts the XOL treaty reinsurance.

A re-insurer decides the XOL treaty premium for an insurer based on the estimated premium income, loss-ratio, risk profile of the business covered and the excess point of the treaty. Insurers can decide upon attractive premiums for their policies, depending on their treaty premiums. However, reinsurance cost is usually less

than 10% of the premium. Hence, it is not a major concern for premium-rating. Most of the companies incorporate the reinsurance cost into the overhead costs.

### ***3. Amount of outstanding claims to the insurer:***

When a particular class of insurance, like the WCI, experiences too many claims, the insurer prefers to increase the premium for new projects so as to recover losses. Nevertheless, market competition restrains such adjustments. On the other hand, decreasing the premium rate to attract more business for cash flow purposes is also unfeasible because the WCI is the riskiest insurance class in Singapore.

### ***4. Project duration:***

When the project duration is longer, the risk exposure of an insurer is longer and the earned premium, along with the net profit for the year, is reduced. Project duration is therefore a moderate consideration for some insurers in Singapore. However, the other insurers perceive that the duration is built into the wage roll; thus, it can be negligible for premium-rating.

### ***5. Placement of multiple policies by the contractor:***

When contractors take multiple policies for projects, discounts may be considered as the risks can be spread among policies. Contractor's all risk (CAR) insurance and the WCI are the main construction insurances. The WCI is ranked as the worse policy by insurers, which earns small premiums but large claims. Meanwhile, the CAR insurance has been contrary in this aspect. Mostly, the loss in the WCI is covered by the total premium from both policies. Most of the insurers prefer selling insurance packages rather than individual policies. Hence, the placement of multiple policies is more of a prerequisite than a discounting factor in Singapore.



#### ***6. Co-operation by the contractor:***

The Singapore's construction industry is heavily reliant on foreign workers from neighbouring developing nations such as India, China, Bangladesh, Thailand and the Philippines. The objective of these workers is to earn money as fast as possible to return to their home countries for a comfortable life. There were incidents in Singapore whereby: (1) some of the injured workers chose to claim by common law to reap greater compensation and (2) some workers injured themselves or acted recklessly in order to claim compensation (Kyodo, 1991). It is therefore important for insurers to scrutinise the root cause(s) of accident(s) and any fraudulent action(s) of workers to diminish their risks. Contractors' support is paramount in such situations, which could be a consideration in premium-rating. Nonetheless, it is a weak factor because there could still be claims although the contractor is supportive.

#### ***7. Volume of business in the market:***

It is acceptable to increase premium rates when the construction industry undergoes an economic boom. Nonetheless, more insurers enter the market when the demand is high. This makes the Singapore's market constantly competitive.

#### **Unimportant variables for premium-rating**

Two insignificant variables for premium-rating are identified below.

##### ***1. Expectation of potential business from the contractor:***

The expectation of potential business from contractors are irrelevant for premium-rating because construction projects are secured through competitive-bidding, thus the prediction of potential projects for contractors is difficult

## **2. Contractor's size:**

Large contractors with good safety records demonstrate their capacity to use sophisticated and less hazardous construction methods. It is therefore beneficial for insurers to favour large contractors. However, all main contractors employ subcontractors. Thus, subcontractors' experience, operation methods and records become key factors. As per insurers' experience, reported accidents mostly involved subcontractors' workers whereby the main contractor provided the WCI.

## **Conclusion**

Providing an adequate WCI is mandatory for a Singapore contractor to employ workers in construction projects. It is enforced to safeguard the interests of occupational injury victims and to ease contractors' financial burden of compensating. Under the WCI, the commitment of an insurer is extremely broad unlike other classes of insurance; there are no exclusions and there is no maximum limit on the insurer's liability. Hence, WCI premium-rating is a critical management function for any insurer who should decide premiums that are high enough to cover all the future costs, yet low enough to meet the market competition. Nevertheless, general insurers in Singapore seem to be reluctant to issue the WCI for construction projects as they have been experiencing undesirable loss-ratios. These losses occurred mainly due to underestimating of potential risks in construction projects. This is, in turn, the result of the ineffectiveness of the premium-rating framework as used by the general insurance industry in Singapore. Hence, an effective WCI premium-rating framework is imperative for Singapore insurers to address this dilemma. Identification of the critical variables for such a framework is crucial and fundamental.

Seventeen variables pertinent to WCI premium-rating for construction projects were identified in a literature review. An interview questionnaire survey was conducted

in the Singapore general insurance industry to identify the most significant variables that fit in the Pareto's 80/20 rule. Statistical analyses results of the survey data indicate that eight variables are important for WCI premium-rating: (1) wage roll, (2) project hazard level, (3) effectiveness of the safety management system on site, (4) contractor's claims history, (5) overhead costs of insurance, (6) competition, (7) corporate objectives of the insurer, and (8) investment income from underwritten premiums. The finding may be utilised by insurance companies in Singapore to re-engineer their premium-rating approach. The study may be extended to develop a premium-rating model for workers' compensation insurance incorporating these significant variables.

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## Tables

Table 1: Premium-rating variables

<b>Variable category</b>	<b>Pertinent variable</b>
1. Project factor	<ul style="list-style-type: none"> <li>• Wage roll</li> <li>• Project duration</li> <li>• Project hazard level</li> <li>• Effectiveness of the safety management system on site</li> </ul>
2. Contractor factor	<ul style="list-style-type: none"> <li>• Contractor's claims history</li> <li>• Placement of multiple policies by the contractor</li> <li>• Expectation of potential business from the contractor</li> <li>• Co-operation by the contractor</li> <li>• Contractor's size</li> </ul>
3. Insurer factor	<ul style="list-style-type: none"> <li>• Corporate objectives of the insurer</li> <li>• Investment income from underwritten premiums</li> <li>• Overhead costs of insurance</li> <li>• Amount of outstanding claims to the insurer</li> <li>• Profit/loss experience in WCI business</li> <li>• Reinsurance cost</li> </ul>
4. Market factor	<ul style="list-style-type: none"> <li>• Competition</li> <li>• Volume of business in the market</li> </ul>

Table 2: Descriptive statistics of industry survey findings

Variables	Descriptive statistics							
	Mean	Standard deviation	Median	Mode	Kurtosis	Skewness	X <sub>Min.</sub>	X <sub>Max</sub>
<b>Project factor</b>								
• Wage roll	8.33	1.32	9	9	0.41	-0.81	5	10
• Project duration	5.10	3.10	6	3	-1.30	-0.12	0	10
• Project hazard level	9.33	0.71	9	10	-0.76	-0.63	8	10
• Effectiveness of the safety management system on site	7.67	2.17	8	8	3.67	-1.74	1	10
<b>Contractor factor</b>								
• Contractor's claims history	8.33	1.21	9	9	-1.18	-0.19	6	10
• Placement of multiple policies by the contractor	5.00	2.56	5	8	-0.66	-0.66	0	8
• Expectation of potential business from the contractor	3.76	2.60	4	0	-1.09	0.00	0	8
• Co-operation by the contractor	4.90	3.15	5	2	-1.34	0.01	0	10
• Contractor's size	3.38	2.92	3	0	-1.26	0.37	0	9
<b>Insurer factor</b>								
• Corporate objectives of the insurer	8.05	1.13	8	7	-0.80	0.32	6	10
• Investment income from underwritten premiums	7.24	1.23	7	8	-0.34	0.33	5	10
• Overhead costs of insurance	7.10	1.34	7	8	-1.22	-0.06	5	9
• Amount of outstanding claims to the insurer	6.62	2.15	7	7	0.14	-0.92	2	9
• Profit/loss experience in WCI business	6.76	2.51	7	10	-1.10	-0.34	2	10
• Reinsurance cost	6.71	1.91	7	9	0.05	-0.67	2	9
<b>Market factor</b>								
• Competition	7.38	1.68	7	7	-1.23	-0.14	5	10
• Volume of business in the market	4.52	2.52	5	6	-0.72	0.09	0	9

Table 3: Re-organisation of variables

<b>Variables group</b>	<b>Pertinent variable</b>
1. Important variables	<ul style="list-style-type: none"> <li>• Wage roll</li> <li>• Project hazard level</li> <li>• Effectiveness of the safety management system on site</li> <li>• Contractor's claims history</li> <li>• Competition</li> <li>• Corporate objectives of the insurer</li> <li>• Overhead costs of insurance</li> <li>• Investment income from underwritten premiums</li> </ul>
2. Less important variables	<ul style="list-style-type: none"> <li>• Profit/loss experience in WCI business</li> <li>• Reinsurance cost</li> <li>• Amount of outstanding claims to the insurer</li> <li>• Project duration</li> <li>• Placement of multiple policies by the contractor</li> <li>• Co-operation by the contractor</li> <li>• Volume of business in the market</li> </ul>
3. Unimportant variables	<ul style="list-style-type: none"> <li>• Expectation of potential business from the contractor</li> <li>• Contractor's size</li> </ul>



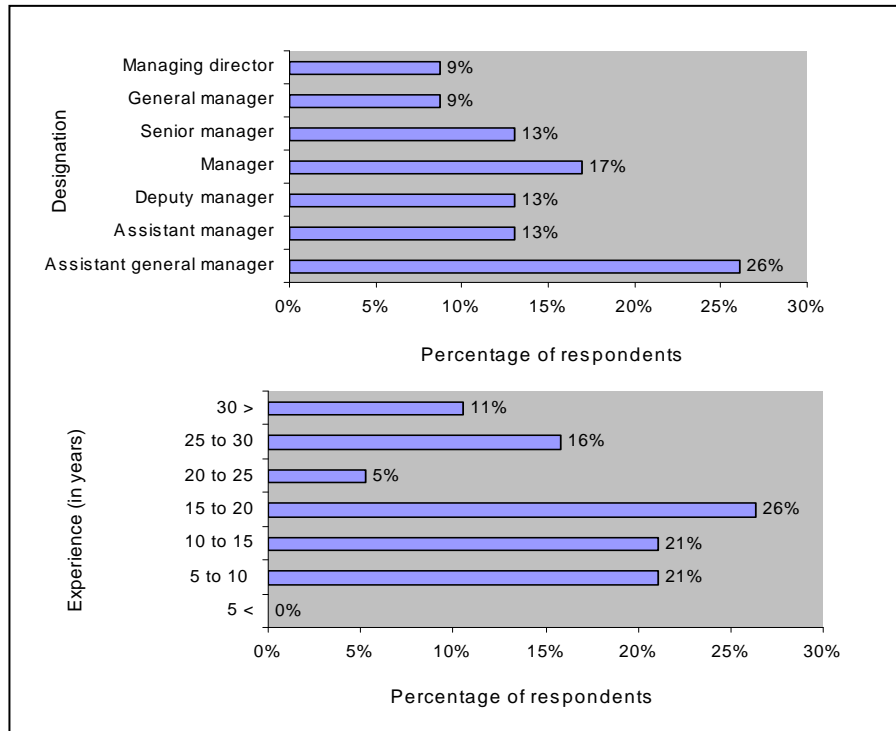
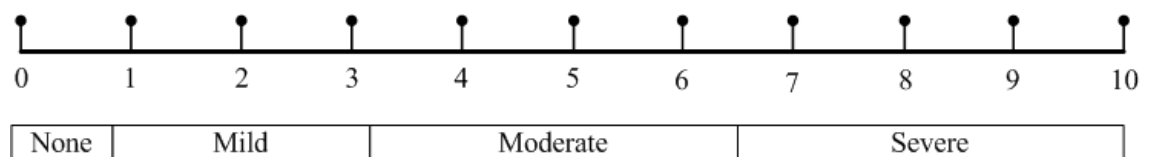
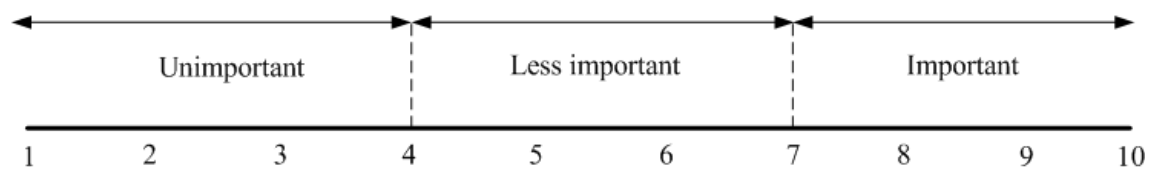
**Figures**

Figure 1. Profile of the respondents



(a)



(b)

Figure 2: (a) Pain scale (Goh, 2004); (b) Intervals of rating