# IDENTIFICATION OF CONSTRUCTION RISKS IN MALAYSIA CONSTRUCTION INDUSTRY (Case Study : Pulau Pinang Area)

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All construction projects are exposed to some risks. Three common types of risk management process are technical (or performance) risk, product cost risk and schedule risk (Carter, R. L. and Doherty, N., 1974). Failure to manage these risks properly will usually lead to a state of perpetual crisis that is characterized by the inability to decide what to do, when to do it and whether enough has been done to mitigate the risks.

This study identifies the construction risks in Malaysian construction industry scenario. For this purpose, a short questionnaire was designed and distributed to the randomly selected contractors in Penang area. The data collected were then analysed to determine the ranking of the construction risks. The sample consists of 60 contractors in Penang area The data was collected using self-administrated questionnaires. For the analysis of data, the SPSS version 13.0 Software and Total Weightage Method have been used to determine the ranking of the construction risks. The results indicated that the highest ranking of construction risk is increase in price of construction materials and the lowest ranking of construction risk is lack of construction materials. The interesting part of this study is that it determined the construction risk ranking due to the frequency of the risk. Construction risk is generally perceived as events that influence project objectives in terms of cost, time and quality. It is important to identify the risks faced by the contractors so that they can be better prepared for any problem or difficulty in a construction project. The findings of this research will also form a basis for extended investigation which aims to asses the risks factors that influence the construction industry.

**Keywords: Construction risks, Pulau Pinang, Contractors**

## 1.0 INTRODUCTION

There are several ways of which risks in construction can be identified. This includes economic risk, financial risk, legal risk, managerial risk, technical risk, political risk and environmental risk [Edwards PJ, Bowen PA, 199]. Risk identification is important as the first step of risk analysis. Construction projects contain many inherent risk factors which must be identified in this step.

Unless identified, it is impossible to manage a risk. In many cases, unfavourable outcomes resulted out of the events which had not been identified as risk factors. In order to eliminate such failures, the identification must be implemented in such a way as to minimize the number of unidentified risk factors. Questionnaire surveys and interviews by incorporating a brain-storming technique can be employed in the identification stage.

Ideally, risk identification should be implemented very thoroughly in accordance with the situation of individual projects. In other words, it should be implemented project by project. However, it is time and effort consuming, as well as being difficult to identify all the potential risks in projects one by one. Identification of common risks prior to project implementation at a rather general level can save such time and efforts, and can serve as a guidance or reference for individual projects.

## 2. RESEARCH QUESTIONS

It is the aim of this paper to study the construction risks faced by contractors in Malaysia so that risks among contractors can be identified and recommendations can be made with regard to the impacts of the problems as guidance to other researcher. Therefore, the objectives of this research are, firstly, to identify and to understand different types of risks faced by the Malaysian contractors in Pulau Pinang; and secondly, to rank the construction risks based on the experiences of the respondents.

## 3.0 LITERATURE REVIEW

It is also important to identify attributes of risk, i.e. whether general or specific, static or dynamic, and so on, because risk allocation needs to take account of the attributes of risks so as to allocate them to those who can treat them best. Risk classification can be made in accordance with those attributes. Williams[18] (1995)

found that the identification of each risk is an essential first step in risk management and is possibly the most difficult. The risks in a construction project may be derived from two sources. The first consists of the environmental impacts, which are called external risks. The second consists of the uncertainties existing in the project itself, which are called internal risks. Several types of broader definition of risks are defined below:

### 3.1.1 Economic Risk

This relates to materials supply, labour supply, increase in price of construction materials, equipment availability, inflations, tariffs, fiscal policies and exchange rates.

### 3.1.2 Financial Risk

This relates to interest rates, credit ratings, capital supply, cash flows, and rentals[14]. Local entities' reliability risk arises because projects involve local partners such as contractors, customers, suppliers and the success of these projects depends on their reliability and creditworthiness.

### 3.1.3 Legal Risk

This is associated with contract clauses, regulations and codes, and drawing issuance and approval are through contractual aspect of building procurement[14].

### 3.1.4 Managerial Risk

This relates to productivity, quality assurance, cost control, and human resource management[6]. The most important risks in construction
projects are those relating to safety, quality of work, defects, productivity
and competence.

### 3.1.5 Technical Risk

This includes design failure, equipment and systems failure, health and safety and estimation error[7]. Other risks in this category are site location and access and new technology failure. For local-foreign joint ventures, a technical risk that can arise is the partners' different practices and working procedures

### 3.1.6 Political Risk

This is defined as foreign government interference with the normal conduct of business. It includes civil disorder and industrial relations actions that affect the progress of the project[8]. Political risks include delay in approvals, corruption and change in law.

### 3.1.7 Environmental Risk

Include weather, soil conditions and environmental impacts risk. Environmental risks are the naturally occurring and artificial elements, organisms, and products that impact the current environment.

### 3.2 The importance of Managing Risks

The important to manage risk is to reduce potential losses and to increase potential gains [10]. But to make risk management a daily reality for an organisation, more concrete operational goals are need. Risk management is an important part of the decision-making process of all construction companies. Risk and uncertainty can potentially have damaging consequences for some construction projects. Risk can affect productivity, performance, quality, and the budget of a project. Risk can not be eliminated, but it can be minimised, transferred or retained. Four good reasons for an organisation to manage risk are (i) to minimize losses, (ii) to seize opportunities, (iii) to reduce uncertainty, and (iv) for legislative compliance

### 3.3 Typical Construction Risks

Typical construction risks that may impact the project cost or schedule are categorized as (i) risks on project site, (ii) risks due to owner and design/construction team relationships, (iii) materials and labor, and (iv) some other external factors

## 4.0 RESEARCH METHODOLOGY

### 4.1 First Stage *(Research design)*

The first stage involved studying and understanding of the topic area and to identify scope and objective of research proposal. This study used a cross-sectional study design. The cross-sectional design involves the collection of data from any given sample of population elements only once (Malhotra, 1996).

This study also employed the survey method by using questionnaire. Self-administered questionnaire was selected as the means to data collection. The unit of analysis for this study was single contractor companies in Pulau Pinang area. The questionnaires were distributed by the researcher to the contractor companies in Pulau Pinang area.

### 4.2 Second Stage *(Data Collection Procedure)*

This stage is to identify project data and to conduct study for further details of the research. The sources of data are classified into prime sources and secondary sources. Prime sources provide original data and latest information for the research. A total number of 50 questionnaires were distributed to the respondents. The respondents consist of personnel in management level such as CEO, owner, managing director, engineer, supervisor, quantity surveyor and others. The secondary sources are magazine and newspaper cuttings, printed sources such as books, journals, internet, worksheet, theses and case studies.

### 4.3 Third Stage *(Study Population and Sample)*

The population for this study was the contractors in Pulau Pinang area. The sampling frame was obtained from the directory of Pusat Khidmat Kontraktor Malaysia, (PKK) and the Construction Industry Development Board Malaysia (CIDB) directory (2005-2006). The directory contained the list of Bumiputera contractors in Pulau Pinang area which is divided into 6 classes based on the project limit. The classes were A Class, B Class, C Class and D Class, E Class, and F Class. The sampling design method used in this study was stratified random sampling. This sampling design, which is the most efficient, is a good choice when differentiated information is needed regarding various strata within the population which are known to differ in their parameters (Cavana *et.al*, 2001).

### 4.4 Fourth Stage (Pilot Test)

The questionnaire was tested with 10 contractors from each class of C class, E class and F class in Pulau Pinang to ensure the reliability and validity of the questionnaire. According to Burns and Bush (1998), a pre-test of 5 to 10 representative participants is usually sufficient to validate the questionnaire. The participants were asked to evaluate the questionnaire to clarify any ambiguous questions. Then, from the feedback of the pilot test, the questionnaire was later redesigned.

### 4.5 Fifth Stage (Data Analysis)

Data was analyzed using ***SPSS version 12.0*** and several statistical tools were employed. These include reliability analysis and descriptive analysis.

### 4.6 Six Stage (Descriptive Analysis)

Descriptive analysis was conducted to describe and to interprete the data. The descriptive analysis used in this study was the frequency analysis to examine the respondents' demographic factors, central tendency and dispersion.

## 5.0 DATA ANALYSIS AND RESULTS

### 4.1 Background of Respondents

In this study, interviews and questionnaires are conducted and distributed to 70 contractors in the construction industry. A total of 60 responses were returned back and analysed.

#### 4.1.1 The Position of Respondents in the Company

Figure 4.1 shows the distributions of respondents position in the construction companies.

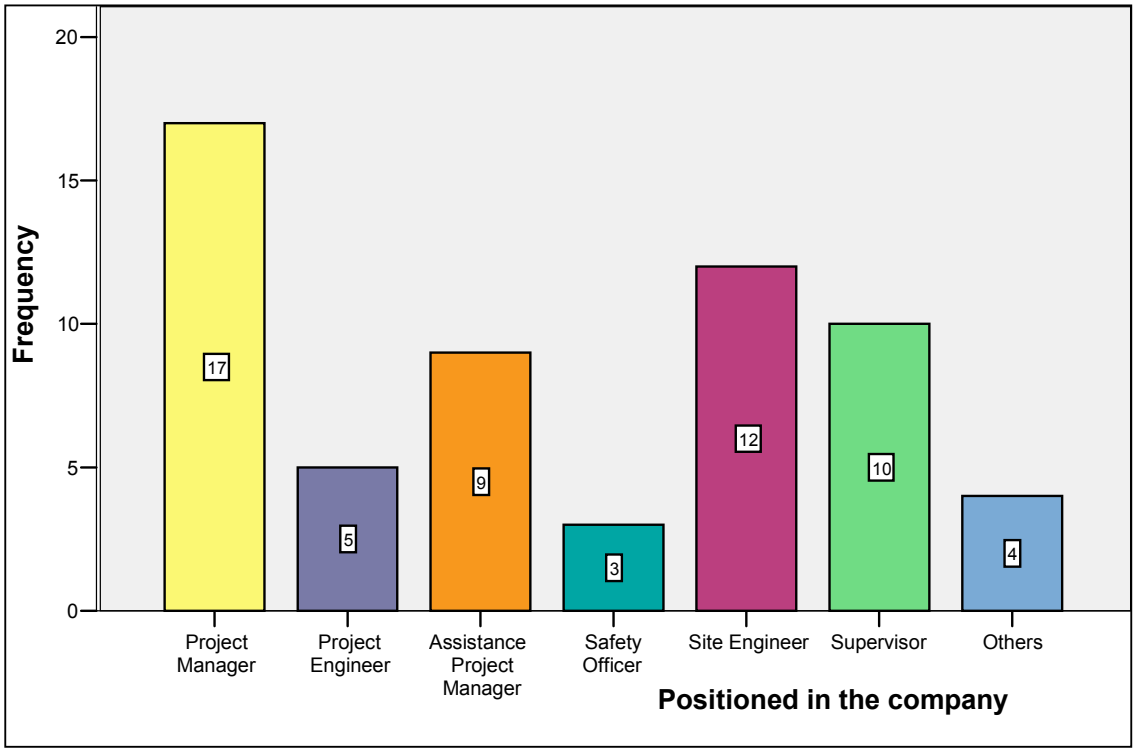


**Figure 4.1: Respondent Position in Company**

#### 4.2.3 The Position and Experiences of Respondents in the Construction Industry

Figure 4.2 shows the distributions of respondents experiences in the in the construction industry.

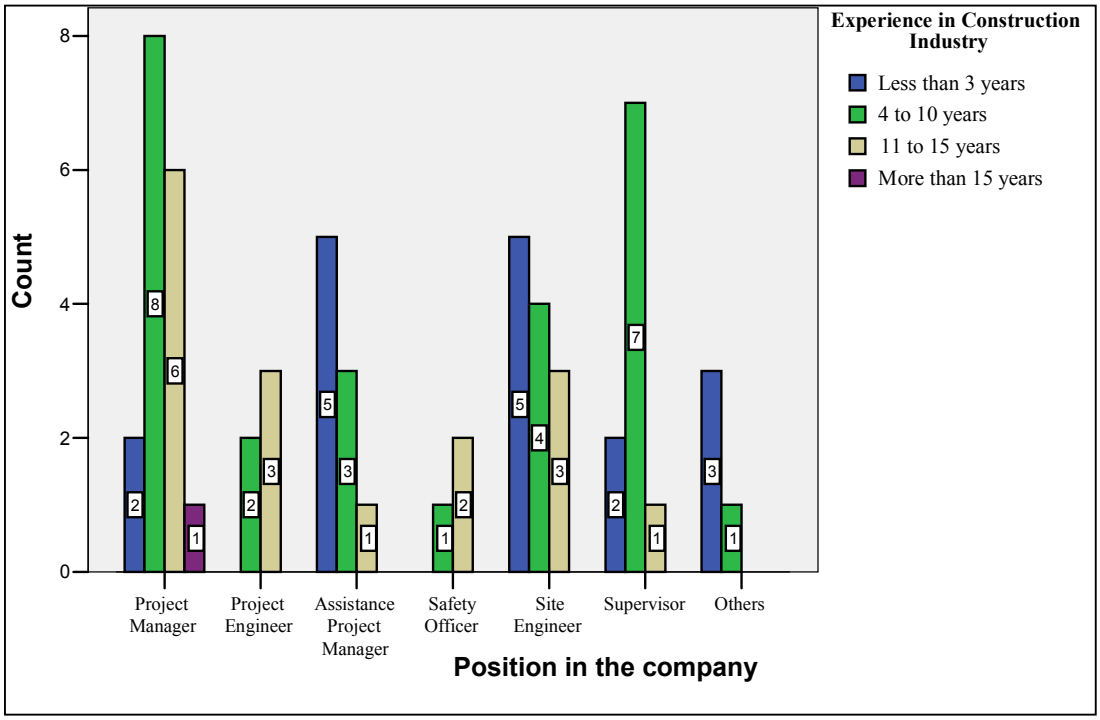


**Figure 4.2: Position and Experiences in Construction Industry**

### 4.2.4 Status of the Company

Figure 4.3 shows the distribution of company status

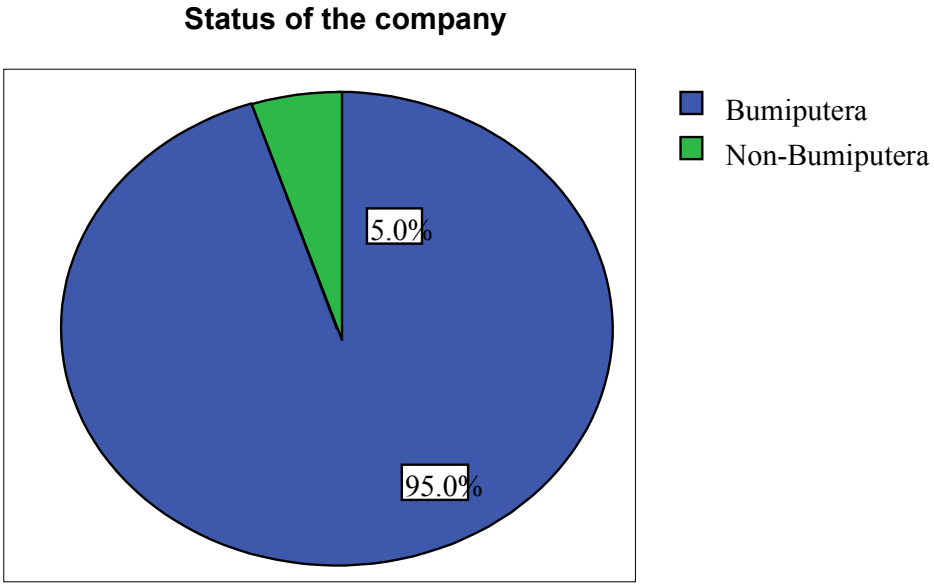


**Figure 4.3: Status of the Company**

### 4.2.5 Class of the Contractor (Registered with PKK)

There are 6 classes of contractor in the PKK (Persatuan Khidmat Kontraktor) that are classes A, B, C, D, E and F. In this study, the researcher had classified the class into 3 groups such as Group 1 for Class A and B, Group 2 for Class B and C and Group 3 for Class E and F. It is shown that the entire 3 group (Group1, Group2 and Group3) is registered with PKK.

#### 4.2.6 Grade of the Contractor (Registered with CIDB)

There are 7 grades of contractor in the CIDB (Construction Industrial Development Board) that are Grades 1, 2, 3, 4, 5, 6 and 7. In this study, the researcher has classified the Grade into 3 groups such as Group 1 for Grade 7 and 6, Group 2 for Grade 5 and 4 and Group 3 for Grade 3, 2 and 1. It is shown from the study that the entire 3 group (Group1, Group2 and Group3) is 33.33% respectively registered with CIDB.

#### 4.2.7 Grade of Contractor and Company Involvement in Construction

Figure 4.4 shows the involvement of the company in construction industry for Group 1 (Grade 7 and 6) is more than 15 years. Then, the involvement of the company in construction industry for Group 2 (Grade 5 and 4) and Group 3 (Grade 3, 2 and 1) is between 4-10 years.

### 4.2 Data Analysis for Construction Risks

The questionnaires listed the probability of the risks to occur in construction industry. Respondents were requested to mark the risks based on the Likert Scale 1 to 5, where Scale 5 represented strongly agree for the risk, Scale 4 represented quite agree for the risk, Scale 3 represented neither agree nor disagree for the risk, Scale 2 represented disagree for the risk, and Scale 1 represented strongly disagree for the risk.

### 4.3 Results of data for Ranking of Construction Risks

In this study, the researcher used SPSS 13.0 Software and Total Weightage Method to determine the ranks of construction risks. The rank depended on the value of total sum and mean.

#### 4.4.1 By Using SPSS 13.0 Software

The total overall sum shown in Table 4.1 shows that the type of construction risks with maximum value is “Increase in Price of Construction Materials” with a sum of 269. The lowest value is the risk of “Lack of Construction Materials” with a sum of 189.

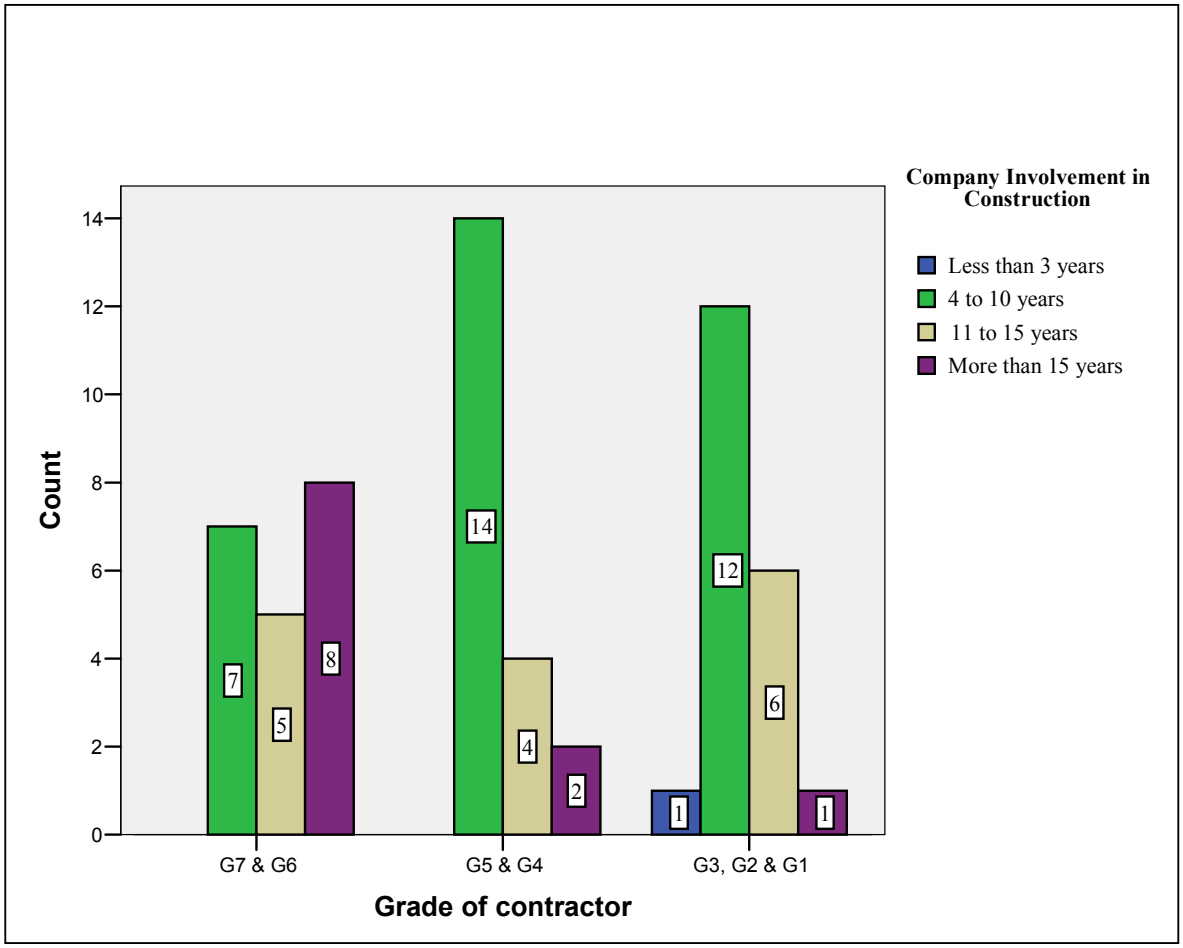


**Figure 4.4: Company Involvement in Construction Industry**

Furthermore, total overall mean also showed that the highest value of mean for risk is "Increase in Price of Construction Materials" with a mean of 4.48. That is can be concluded that "Increase in Price of Construction Materials" is the highest risk in constructions industry. The lowest value of mean for risk is "Lack of Construction Materials" with a mean of 3.15. It is also can be concluded that "Increase in Price of Construction Materials" is the lowest risk in constructions industry.

### 4.4.2 By Using Total Weightage Contribution Method

Based on Table 4.2, the first column in the table represents the degree of contribution to the construction risks (34 types of risks). The numbers outside bracket represent the number of respondents who had chosen the specific type of risk with a certain degree of contribution towards risk.

Total Contribution Weightage is summation of number of respondents multiplied by the degree of contribution for that specific type of risk.

$$\textbf{Contribution Weightage} = \sum \textbf{[(Number of Respondents) x (DCTD)]}$$

**Table 4.1: Ranking of Construction Risks Based on Sum and Mean Values**

**Descriptive Statistics**

| | N | Minimum | Maximum | Sum | Mean |
|---|---|---|---|---|---|
| | Statistic | Statistic | Statistic | Statistic | Statistic |
| Increase in Price of Construction Materials | 60 | 3 | 5 | 269 | 4.48 |
| Corruption | 60 | 2 | 5 | 248 | 4.13 |
| Cash Flows | 60 | 2 | 5 | 235 | 3.92 |
| Labour Supply | 60 | 2 | 5 | 232 | 3.87 |
| Delay in Approvals | 60 | 2 | 5 | 232 | 3.87 |
| Materials Supply | 60 | 2 | 5 | 231 | 3.85 |
| Design Failure | 60 | 2 | 5 | 228 | 3.80 |
| Drawing Issuance & Approval | 60 | 2 | 5 | 225 | 3.75 |
| Changes in Designs | 60 | 2 | 5 | 223 | 3.72 |
| Environmental Impacts | 60 | 2 | 5 | 223 | 3.72 |
| Capital Supply | 60 | 2 | 5 | 222 | 3.70 |
| Interest Rates | 60 | 2 | 5 | 221 | 3.68 |
| Cost Control | 60 | 2 | 5 | 219 | 3.65 |
| Weather | 60 | 2 | 5 | 219 | 3.65 |
| Equipment & Systems Failure | 60 | 2 | 5 | 218 | 3.63 |
| Change in Law | 60 | 2 | 5 | 218 | 3.63 |
| Equipment Availability | 60 | 2 | 5 | 218 | 3.63 |
| Soil Conditions | 60 | 2 | 5 | 217 | 3.62 |
| Estimation Error | 60 | 2 | 5 | 217 | 3.62 |
| Productivity | 60 | 2 | 5 | 216 | 3.60 |
| Rentals | 60 | 2 | 5 | 216 | 3.60 |
| Credit Ratings | 60 | 2 | 5 | 215 | 3.58 |
| Quality Assurance | 60 | 2 | 5 | 214 | 3.57 |
| Human Resource Management | 60 | 2 | 5 | 213 | 3.55 |
| Delays in Design | 60 | 2 | 5 | 213 | 3.55 |
| Health & Safety | 60 | 2 | 5 | 211 | 3.52 |
| Inflations | 60 | 2 | 5 | 209 | 3.48 |
| Exchange Rates | 60 | 2 | 4 | 208 | 3.47 |
| Lack of Skilled Workers | 60 | 2 | 4 | 207 | 3.45 |
| Fiscal Policies | 60 | 1 | 5 | 206 | 3.43 |
| Tariffs | 60 | 1 | 5 | 205 | 3.42 |
| Regulations & Codes | 60 | 2 | 5 | 200 | 3.33 |
| Contract Clauses | 60 | 2 | 5 | 200 | 3.33 |
| Lack of Construction Materials | 60 | 2 | 5 | 189 | 3.15 |
| Valid N (listwise) | 60 | | | | |

where DCTD = Degree of Contribution Toward Risk The last column in the Table 4.2 shows the total overall contribution weightage toward type of construction risk.

**Table 4.2: Types of Construction Risks Based on Contribution Weightage**

| Types of Risks | Degree of Weightage Contributions Toward Risks | | | | | Total Weightage |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Tariffs | 1(1) | 4(8) | 26(78) | 27(108) | 2(10) | 205 |
| Inflations | 0(0) | 1(2) | 32(96) | 24(96) | 3(15) | 209 |
| Fiscal Policies | 2(2) | 2(4) | 28(84) | 24(96) | 4(20) | 206 |
| Exchange Rates | 0(0) | 3(6) | 26(78) | 31(124) | 0(0) | 208 |
| Materials Supply | 0(0) | 3(6) | 13(39) | 34(136) | 10(50) | 231 |
| Labour Supply | 0(0) | 3(6) | 13(39) | 33(132) | 11(55) | 232 |
| Equipment Availability | 0(0) | 3(6) | 19(57) | 35(140) | 3(15) | 218 |
| Increase in Price of Construction Materials | 0(0) | 0(0) | 2(6) | 27(108) | 31(155) | 269 |
| Interest Rates | 0(0) | 2(4) | 20(60) | 33(132) | 5(25) | 221 |
| Credit Ratings | 0(0) | 2(4) | 26(78) | 27(108) | 5(25) | 215 |
| Capital Supply | 0(0) | 1(2) | 23(69) | 29(116) | 7(35) | 222 |
| Cash Flows | 0(0) | 3(6) | 8(24) | 40(160) | 9(45) | 235 |
| Rentals | 0(0) | 2(4) | 24(72) | 30(120) | 4(20) | 216 |
| Contract Clauses | 0(0) | 6(12) | 31(93) | 20(80) | 3(15) | 200 |
| Regulations & Codes | 0(0) | 9(18) | 25(75) | 23(92) | 3(15) | 200 |
| Drawing Issuance & Approval | 0(0) | 1(2) | 21(63) | 30(120) | 8(40) | 225 |
| Lack of Construction Materials | 0(0) | 14(28) | 27(81) | 15(60) | 4(20) | 189 |
| Lack of Skilled Workers | 0(0) | 8(16) | 17(51) | 35(140) | 0(0) | 207 |
| Productivity | 0(0) | 8(16) | 16(48) | 28(112) | 8(40) | 216 |
| Quality Assurance | 0(0) | 5(10) | 19(57) | 33(132) | 3(15) | 214 |
| Cost Control | 0(0) | 5(10) | 19(57) | 28(112) | 8(40) | 219 |
| Human Resource Management | 0(0) | 7(14) | 19(57) | 28(112) | 6(30) | 213 |
| Changes in Designs | 0(0) | 4(8) | 17(51) | 31(124) | 8(40) | 223 |

**Table 4.2 (contd) : Types of Construction Risks Based on Contribution Weightage**

| Types of Risks | Degree of Weightage Contributions Toward Risks | | | | | Total Weightage |
|---|---|---|---|---|---|---|
| | 1 | 2 | 3 | 4 | 5 | |
| Delays in Design | 0(0) | 6(12) | 21(63) | 27(108) | 6(30) | 213 |
| Design Failure | 0(0) | 3(6) | 19(57) | 25(100) | 13(65) | 228 |
| Equipment & Systems Failure | 0(0) | 5(10) | 20(60) | 27(108) | 8(40) | 218 |
| Health & Safety | 0(0) | 10(20) | 17(51) | 25(100) | 8(40) | 211 |
| Estimation Error | 0(0) | 3(6) | 23(69) | 28(112) | 6(30) | 217 |
| Delay in Approvals | 0(0) | 2(4) | 13(39) | 36(144) | 9(45) | 232 |
| Corruption | 0(0) | 1(2) | 9(27) | 31(124) | 19(95) | 248 |
| Change in Law | 0(0) | 3(6) | 23(69) | 27(108) | 7(35) | 218 |
| Weather | 0(0) | 8(16) | 12(36) | 33(132) | 7(35) | 219 |
| Soil Conditions | 0(0) | 5(10) | 17(51) | 34(136) | 4(20) | 217 |
| Environmental Impacts | 0(0) | 3(6) | 16(48) | 36(144) | 5(25) | 223 |

Total overall contribution weightage in Table 4.3 shows that the type of construction risks with maximum contribution weightage is “Increase in Price of Construction Materials” with a weightage of 269. The lowest weightage is the risk of “Lack of Construction Materials” with a weightage of 189.

The ranking of the construction risks based on the contribution weightage is shown in Table 4.3.

## 6.0 DISCUSSION AND CONCLUSION

From the results of the questionnaires and the analysis using SPSS 13.0 Software and Total Weightage Method, the majority of the respondents were of the opinion that the main construction risk in the construction industry is “Increase in Price of Construction Materials”. Beside that, the majority of the respondents also thought that “lack of construction materials” was the least construction risk in the construction industry.

The majority (51.7%) of the contractors also selected fraudulent practices and corruption as a major risk in a project. Corrupt practices can occur at every phase of a construction project: during planning and design, prequalification and tender, project execution, and operation and maintenance.

**Table 4.3: Ranking of Construction Risk Based on Contribution Weightage**

| Ranking | Type of Construction Risk | Total Weightage |
|---|---|---|
| 1 | Increase in Price of Construction Materials | 269 |
| 2 | Corruption | 248 |
| 3 | Cash Flows | 235 |
| 4 | Labour Supply | 232 |
| 5 | Delay in Approvals | 232 |
| 6 | Materials Supply | 231 |
| 7 | Design Failure | 228 |
| 8 | Drawing Issuance & Approval | 225 |
| 9 | Changes in Designs | 223 |
| 10 | Environmental Impacts | 223 |
| 11 | Capital Supply | 222 |
| 12 | Interest Rates | 221 |
| 13 | Cost Control | 219 |
| 14 | Weather | 219 |
| 15 | Equipment Availability | 218 |
| 16 | Equipment & Systems Failure | 218 |
| 17 | Change in Law | 218 |
| 18 | Estimation Error | 217 |
| 19 | Soil Conditions | 217 |
| 20 | Rentals | 216 |
| 21 | Productivity | 216 |
| 22 | Credit Ratings | 215 |
| 23 | Quality Assurance | 214 |
| 24 | Human Resource Management | 213 |
| 25 | Delays in Design | 213 |
| 26 | Health & Safety | 211 |
| 27 | Inflations | 209 |
| 28 | Exchange Rates | 208 |
| 29 | Lack of Skilled Workers | 207 |
| 30 | Fiscal Policies | 206 |
| 31 | Tariffs | 205 |
| 32 | Contract Clauses | 200 |
| 33 | Regulations & Codes | 200 |
| 34 | Lack of Construction Materials | 189 |

This study is important and beneficial to contractors, employer or other researchers as guidance for risks prediction in Malaysia Construction Industry. However, the limitations of this study provide some opportunities or area of improvement for future research. Since the samples sizes for this study were obtained only from 60 respondents, it is difficult to generalize the findings to all contractors in Malaysia.

*The permission granted by the Director of UiTM Pulau Pinang to undertake this study is gratefully acknowledged. Deep appreciation also goes to the CREAM, CIDB for the funding of this study. Any opinion expressed is solely the writer's and do not necessarily reflect the view of the University.*

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