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## RESEARCH ARTICLE

# Human Factors Influencing Contractors' Risk Attitudes: A Case Study of the Malaysian Construction Industry

Taofeeq D.M<sup>1\*</sup>, A.Q. Adeleke<sup>2</sup>, W.A. Ajibike<sup>3</sup>

<sup>1</sup>Faculty of Industrial Management, Universiti Malaysia Pahang; Email - [taofeeqmshood@gmail.com](mailto:taofeeqmshood@gmail.com)

<sup>2</sup>Faculty of Industrial Management, Universiti Malaysia Pahang; email - [adekunle@ump.edu.my](mailto:adekunle@ump.edu.my)

<sup>3</sup>Faculty of Industrial Management, Universiti Malaysia Pahang; email- [niyifavourite@gmail.com](mailto:niyifavourite@gmail.com)

**\*Corresponding author:** Taofeeq D.M, Email: [taofeeqmshood@gmail.com](mailto:taofeeqmshood@gmail.com)

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## Abstract

Malaysia is one of the most rapidly developing countries among developing nations. The construction industry has played a major role in Malaysia's rapid economic growth. Among the major sectors in Malaysia, the importance of the construction industry is unique regardless of the level of the country's development. However, the attitude of the construction industry in Malaysia towards managing contractors' risk attitudes is very weak. The introduction of the Occupational Safety and Health Act in 1994 by the Malaysian government made all industries in Malaysia to identify risks, conduct risk assessment and control risk. In addition, the Malaysian construction industry simultaneously implemented an integrated system to ensure consistency and better performance of projects. To identify the factors influencing contractors' risk attitudes, relevant literature was reviewed, and a questionnaire survey was conducted. This study focused on the G7 contractors operating in the Malaysian construction industry. One hundred and nineteen copies of a structured questionnaire were analysed with a response rate of 85%. Structural equation modelling was utilized to test the hypotheses developed for the study. Results showed that government policies played a moderating role in enhancing the relationship between human-related factors affecting contractors' risk attitudes in the construction industry.

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## Keywords:

**Risk Attitude, Risk Management, Malaysia, PLS-SEM.**

## Introduction

The construction industry is one of the main industries that have meaningfully contributed to the rapid growth of the Malaysian economy. According to the Construction Industry Development Board (CIDB), this industry has contributed RM170 billion and RM180 billion worth of projects in 2017 and 2018, respectively. These projects include infrastructure, transportation and, oil and gas projects (CIDB 2018). Implementation of projects on schedule is a difficult task in the undefined, complex, multiparty, and dynamic environment of construction projects. Because of this, the industry is always subjected to risks and disputes. For example, it is common for clients to chase claims for imperfect work, delayed completion, and changes of scope (Hwang, Zhao and Toh, 2014).

It is hard to avoid risk, which has become an indispensable part of the construction. Although risk has different meanings to different people, the concept of risk varies according to viewpoints, attitudes and experiences. Engineers, designers and contractors view risk from the technological perspective, lenders and developers tend to view it from the economic and financial aspect while health professionals, environmentalists, chemical engineers look at it from the safety and environmental perspectives. Risk is therefore seen as an abstract concept that is very difficult to measure (Al-Shibly, Louzi and Hiassat, 2013).

In general, contractors' risk attitudes are considerably related to the decision maker's sensitivities (Cha and Ellingwood, 2012). Risk attitude is defined as a chosen state of mind concerning those uncertainties that could have positive or negative consequences on any activities. Therefore, people's risk attitudes are reflected in their character and experiences, which in turn reflect on the economic procedure and management of the environment in which they reside. Decision-makers within the same environment and in similar circumstances are likely to make very different decisions and judgements (Shirodkar and Konara, 2017; Taofeeq and Adeleke, 2019). Individual judgment is related to some human factors in the decision-making process. However, those issues that are influencing decision-makers' risk attitudes in construction projects have not been properly identified. Previous literature has conflicting results on the role of a contractor's attitudes in the construction industry (Wang and Yuan, 2011; Kim and Reinschmidt, 2011; Taofeeq, Adeleke and Lee, 2019).

It is noteworthy that there are many studies conducted on the contractors' risk attitudes. Despite this extensive research work, many empirical studies reported inconclusive results (Wang and Yuan, 2011; Kim and Reinschmidt, 2011; Kang and Dingwell 2008; Taofeeq, Adeleke and Lee, 2019). Many of these studies (Hwang, Zhao, and Toh, 2014; Lauriola and Levin, 2001) argued that contractors' attitudes can increase organizational performance by providing many benefits, enhancing client services, minimizing risk record, improving sales growth, and helping organizations to gain competitive advantages over competitors. Wang et al., (2016), Othman et al., (2010) and Mwangi, (2016) studies that were carried out in Hong Kong, China, Malaysia, Perak and Kenya in Africa failed to relate their studies with government policy as a potential moderator to human factors influencing contractors' risk attitudes. Hence, this is the first gap to be filled in this research. Likewise, lengthening Organizational Control Theory (OGC) and Theory of Planned Behaviour (TPB) on the

proposed variables will serve as the second identified gap for this research. Consequently, there is a need for a refined explanation of factors affecting contractors' risk attitudes among Malaysian construction industries. Lastly, this paper aims to establish the human factor affecting contractors' risk attitudes in the Malaysian construction industry.

## Literature review

### CONTRACTORS' RISK ATTITUDES

According to Wang and Yuan (2011), attitude is established on a person's positive or negative assessment of the consequences of a specific type of behaviour, as well as the person's principles or knowledge about the consequences. In addition, attitude can be described as favourable/unfavourable dispositions towards a particular behaviour (Ajzen and Fishbein, 2000). Attitude plays a significant role in influencing decision-makers' behaviour. When different persons apply numerous risk attitudes, it would lead to different behaviours and consequences (Hillson and Murray-Webster, 2017). Even though such internal factor (attitude) is beyond the control of the decision-makers, contractors should not allow the related risks in the various operations in project construction. The reason is that the process involved in construction risk management would be problematic and imprecise without a good understanding of risk attitudes (Adeleke, Bahaudin and Kamaruddeen, 2018).

Risk response approach remains the weakest part of the risk management process in the Malaysian construction industry. In a study conducted by Adeleke, Bahaudin and Kamaruddeen (2016) regarding the factors influencing contractors' attitudes towards risk management, factors such as employer's reputation to pay on time, contractor's need for more work and amount of liquidated damages were identified. Therefore, for the risk management process to be effective, proper management which requires a practical identification of risks in a well-defined manner must be attained so that all involved parties (clients, consultants, contractors, authorities and policymakers) in the construction project can comprehend their risk responsibilities, risk event conditions and risk handling capabilities (Wang and Yuan, 2011).

### HUMAN FACTORS AFFECTING CONTRACTORS' RISK ATTITUDES

Many critical factors influence the effectiveness of risk management. Practitioners have identified that educational background, professional competence, physical health, emotional intelligence and work experience are significant factors influencing the management of contractors' risk (Kim and Reinschmidt, 2011; Adeleke et al., 2018). Group factors include leadership styles, communication methods, coordination and empowerment while organizational factors consist of corporate policies, procedures and senior management styles (Taofeeq, Adeleke and Lee, 2019). The contractors' characters are supposed to be an organized, controlled, determined, and effective manner that should reflect in their dutifulness, cautiousness, rationality, and orderliness. Persons that are more careful tend to engage in less risky behaviour than other people do. Thus, careful persons are likely to be cautious and rational in risky situations so as to make appropriate decisions in extreme situations. They can also control their risk-taking tendencies better because they are perceived to be emotionally intelligent as regards exhibiting stability, calmness, impulse control, cool-headedness, and tranquillity (Goleman, 1998). The essence lies in the idea of fearlessness in many situations. In addition, this is related closely to how individuals perceive risk. The concepts of interest and

intellect are important in this dimension, as well as open-mindedness. Individuals tend to better understand some complex types of hazards and thus view certain technological risk as less risky (Dikmen, Birgonul and Han, 2007). Individual differences like the desire to control and tolerate uncertainty can also be important variables predicting risk perception.

Lauriola and Levin (2001) have shown how the management of construction projects have insufficient orientation and the tactical component required in decision-making is often under-prioritised. Most developments that take place are technological while improvising is more valued than being organised. This is in line with the opinion of Culp (2012) that deteriorating quality of managerial effort is mainly due to the lack of experience as well as clearly defined and measurable goals. All these calls for a well-organised improvement process in construction project development. Sathishkumar, Raghunath and Suguna, (2015) state that risks are very common in the construction sector and it is the possibility of suffering a loss that has an impact on the involved parties. Therefore, the risk is supposed to be identified, assessed and analysed.

Contractors' risk attitudes affect the contractors' bidding decisions because they are exposed to uncertainties and competition (Kim and Reinschmidt, 2011). The competing contractors may have different organizational risk attitudes that have been developed over time. Different risk attitudes can explain the differences in how firms do their businesses (Cha and Ellingwood, 2012). Heterogeneity in risk attitude and resultant differences in the ways they do business lead to the questions about the relationships between risk attitude and firm performance, especially as it relates to market diversification in the current study. In a risky condition, individuals perceive the situation in their ways, which are affected by their risk attitudes. Though organizational risk attitude is subconscious within an organization, it defines what risks can be accepted and what risks cannot be accepted within an organization.

There is a massive amount of literature on factors influencing contractors' risk attitudes in many developing countries. Most of the previous studies on the management of construction project risk have been concentrating on factors contributing to the success of the contractors in the construction industry, but they did not focus on factors that affect contractors' risk attitudes (human factors) in construction projects. Moreover, previous literature has given less attention to human risk factors.

## GOVERNMENT POLICY AS A KEY MODERATOR

According to Bamgbade et al. (2018), a policy is a guiding principle that is used to establish organizational regulations. Furthermore, the policy is a course of action that leads or influence decisions. In addition, it is used as a guide for making judgment following an assigned event within the structure of goals, objectives and the management philosophies as defined by the senior management. Government policy is described as the programme of actions whose aim is to change a definite state of affairs. Therefore, the government uses policies as the starting point for them to get a course of action to execute and contribute to a real-life change. Policies can even change the amount of taxes an individual or organization pay, parking fines, immigration laws and pension, as well as the landfill taxes. Bamgbade et al., (2018) found out that government policy (rules and regulations) plays a significant role in moderating the correlation between certain administrative internal factors and external factors in the designing of construction risk management in an organization. Government policy is used as a moderator in this research because it has been used as a moderator in the study of Adeleke, Bahaudin and Kamaruddeen, (2018) which revealed that in Nigeria context, government policy (rules and regulations) positively influenced construction projects in Nigeria.

## CONCEPTUAL MODEL AND HYPOTHESES DEVELOPMENT

This study considers work experience, educational background, physical health and emotional intelligence as human factors affecting risk attitudes and then identifies the relationship of those factors with contractors' risk attitudes and government policy as the examined moderator among the construction companies in Malaysia, as depicted in Figure 1.

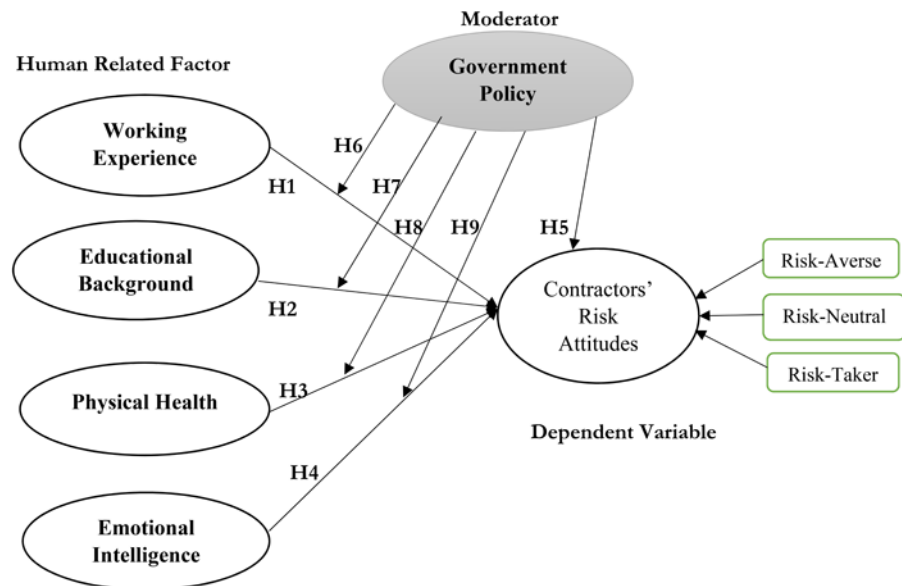


Figure 1 Conceptual Model

According to Adeleke, Bahaudin and Kamaruddeen, (2016), organisational control concerns everyone. Whether you are a manager attempting to run a department, a politician trying to frame legislation to control multinational corporations or just an individual affected by the activities of the many organisations that have an impact on you, organisational control is a fundamental issue of modern life. Organisational control theory establishes some theoretical underpinnings that can be employed in order to confirm the relationship between human factors and contractors' risk attitudes in the construction companies. Organisational control theory presumes that risk occurrence can be minimized through the introduction of control by the government and an organization with the influence of government policies to certainly encourage compliance, though should be flexible in every organization. The theory of planned behaviour is employed to complement the first theory because its basic concept is based on the fundamental construct of intention to perform a behaviour that is influenced by the attitude towards the behaviour and subjective norm. Attitude is the evaluative step of behaviour and it could be favourable or unfavourable depending on the salient information or beliefs linking the behaviour to the outcomes, such as cost and injuries incurred because of performing the behaviour. Therefore, the following hypotheses have been developed primarily based on the sturdy proof provided through the literature.

**H1.** Work experience will significantly influence contractors' risk attitudes.

**H2.** Educational background will significantly influence the contractors' risk attitudes.

**H3.** Physical health will significantly influence contractors' risk attitudes.

**H4.** Emotional intelligence will significantly influence contractors' risk attitudes.

H5. Government policy will significantly influence the contractors' risk attitudes.

H6. Government policy will moderate the relationship between work experience and the contractors' risk attitudes.

H7. Government policy will moderate the relationship between educational background and contractors' risk attitudes.

H8. Government policy will moderate the relationship between physical health and contractors' risk attitudes.

H9. Government policy will moderate the relationship between emotional intelligence and the contractors' risk attitudes.

## Research Method

According to Hair et al (2016), the variance-based PLS-SEM was chosen as the best over others. The explanation given by the authors was that the aim of the study lies in the confirmation of a relationship instead of prediction. However, the PLS-SEM seemed to be the appropriate data analysis technique for this study because the study aims to investigate the relationship between human factors affecting contractors' risk attitudes with the moderating role of government policy in Malaysian construction companies. This study focused on the G7 contractors that specialise in building, bridge and road construction projects.

The preliminary data for this research was collected through a literature review and the use of a questionnaire survey that targeted team members in Grade 7 contractors (G7). G7 contractors were selected as a survey sample due to its influence on the course of direction of the construction companies. G7 contractors can also put up tender and implement large projects in Malaysia. The duration of the data collection was between 5<sup>th</sup> of March and 28<sup>th</sup> of May 2019.

## THE QUESTIONNAIRE

In this paper, we mapped the scale point from 1 to 6 interval scale to quantify the risk attitudes of contractors in construction companies. Table 1 presents the measured variable and dimensions of the independent variables, dependent variable and moderator variable. Each independent variable was measured with 7 questions. The dependent variable was measured with 3 questions each, and government policy was measured with 7 questions. A six-point Likert scale ranging from 1 = Very low to 6 = Very high was used to measure perceptions of the respondents. In this study, the selection of an interval scale particularly the 6-point scale is appropriate because it will increase the reliability of the data as well as lessen social desirability bias.

Table 1 Summary of variables and measurement of indicators

Items	Variable & Dimensions	Scale	No. of questions
<b>Factors Affecting Risk Attitudes</b>	Education Background	6-points	7
	Working Experience	6-points	7
	Emotional Intelligence	6-points	7
	Physical Health	6-points	7

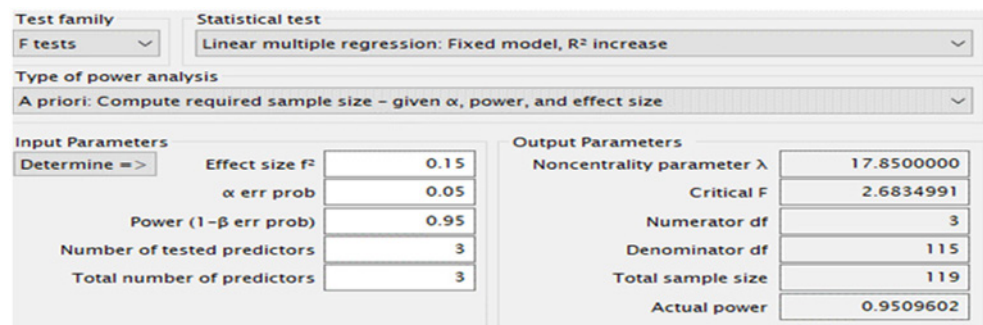


Table 1 continued

Items	Variable & Dimensions	Scale	No. of questions
<b>Contractors Risk Attitudes</b>	Risk-averse	6-points	3
	Risk-neutral	6-point	3
	Risk-taker	6-point	3
<b>Government policy</b>	Rules and Regulations	6-point	7

### SAMPLE SIZE AND RESPONSE RATE

For the sample size of this study to be ascertained, a power analysis was done by the use of a software package named G\*Power 3.1.9.2. Based on this G\*Power model, this study used three (3) predictors' variable equations in determining the sample size (Faul, Erdfelder, Lang and Buchner, 2007) as depicted in Figures 2 and 3.



The screenshot shows the G\*Power 3.1.9.2 interface. The 'Test family' is set to 'F tests' and the 'Statistical test' is 'Linear multiple regression: Fixed model, R<sup>2</sup> increase'. The 'Type of power analysis' is 'A priori: Compute required sample size - given  $\alpha$ , power, and effect size'. Under 'Input Parameters', 'Determine =>' is selected, with 'Effect size f<sup>2</sup>' set to 0.15, ' $\alpha$  err prob' set to 0.05, 'Power (1- $\beta$  err prob)' set to 0.95, 'Number of tested predictors' set to 3, and 'Total number of predictors' set to 3. Under 'Output Parameters', the 'Noncentrality parameter  $\lambda$ ' is 17.8500000, 'Critical F' is 2.6834991, 'Numerator df' is 3, 'Denominator df' is 115, 'Total sample size' is 119, and 'Actual power' is 0.9509602.

Figure 2 Power Analysis for Medium Effect

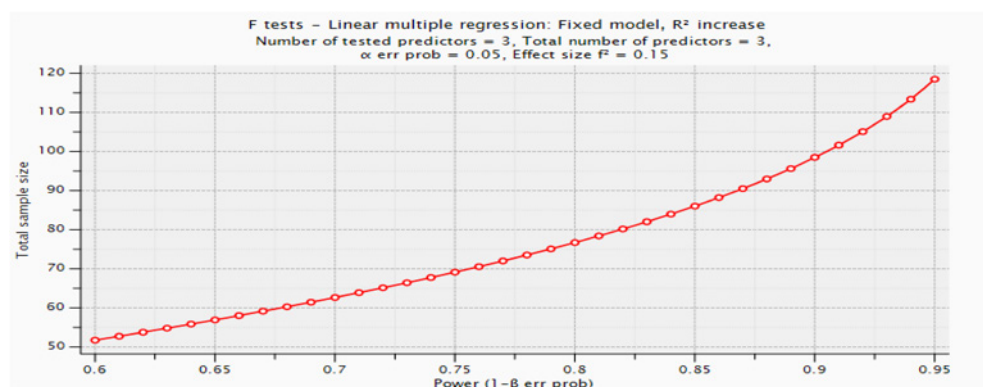


Figure 3 X-Y Plot for Medium Effect Power Analysis

To achieve the proper response rate for this study, a total of 140 copies of questionnaire were distributed to the construction companies in Malaysia randomly. Out of the 140 distributed copies, 132 copies were received with an equal percentage of 94% and unreturned copies of the questionnaire were 8, which corresponded to 5.7 %. Conversely, 13 copies of the questionnaire were found to be unusable due to missing data and providing the same responses to all the questions, which made the percentage to be 9.3. Thus, 85% of the total

copies of the questionnaire were usable making up an effective sample of 119. Therefore, with the population size of 140, a sample size of 119 was used for this study following the G\*Power 3.1.9.2 assumptions for PLS-SEM. Table 2 presents the demographic profile of the respondent sample: gender, age, education, job position, Job specialized and work experience.

Table 2 Profile of Respondents

Profiles Items	Frequency	Percentage%
<b>Q1. Ages</b>		
Between 18-34	47	39.5%
Between 35-44	45	37.8%
Between 45-60	21	17.6%
Sixty's above	6	5.1%
<b>Q2. Gender</b>		
Male	104	87.5%
Female	15	12.5%
<b>Q3. Job Position</b>		
Contract managers	11	9.2%
Architects	9	7.6%
Project managers	16	13.4%
Contractors	71	59.7%
Engineers	12	10.1%
<b>Q4. Years of Experiences</b>		
Below 3years	43	36.2%
4-6 years	53	44.5%
7-9 years	15	12.6%
Above 10years	8	6.7%
<b>Q5. Qualifications</b>		
PhD	22	18.5%
Master Degree	65	54.6%
Bachelor degree	32	26.9%
<b>Q6. Job specialized</b>		
Buildings	83	69.6%
Roads	23	19.6%
Bridges	13	10.8%



## Assessment of Measurement Model (Outer Model)

The PLS-SEM method and statistical software SmartPLS 3 were used to estimate the hypothesized model. Composite reliability, outer loadings, Cronbach's alpha, Average Variance Extracted (AVE for convergent validity) and discriminant validity, which were determined by cross-loading, Fornell–Larcker criteria and heterotrait-monotrait data ratio were used to examine the measurement models.

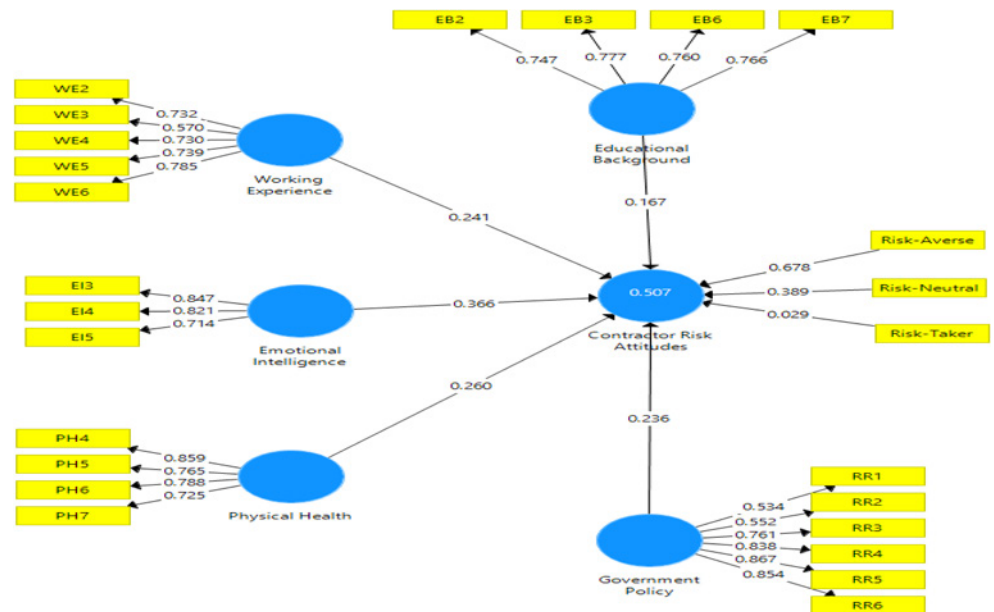


Figure 4 Evaluation of Measurement Model through PLS Algorithm (Modified PLS Path model)

The authors deleted 13 of the 44 items because the loadings were below the threshold. However, for the whole model, only 31 items were retained with the loading between 0.534 and 0.867 (Figure 4 and Table 3).

### CONSTRUCT RELIABILITY AND VALIDITY

Composite Reliability (CR) must be above 0.80, outer loading is significant at not less than 0.50 level, Average Variance Extracted (AVE) value for each construct must be higher than 0.50 and Cronbach alpha coefficients of 0.60 are considered suitable (Hair, Ringle and Sarstedt, 2011).

Table 3 Construct Reliability and Validity

Construct	Items	Outer Loading/Weight	Cronbach's Alpha	rho_A	CR	AVE
Contractor Risk Attitudes	Risk-Averse	0.667	NA	NA	NA	NA
	Risk-Neutral	0.401				
	Risk-Taker	0.031				

Table 3 continued

Construct	Items	Outer Loading/Weight		Cronbach's Alpha	rho_A	CR	AVE
Educational Background	EB2	<b>0.501</b>	<b>0.746</b>	0.778	0.811	0.845	0.582
	EB3	<b>0.215</b>	<b>0.778</b>				
	EB6	<b>0.324</b>	<b>0.761</b>				
	EB7	<b>0.277</b>	<b>0.767</b>				
Emotional Intelligence	EI3	<b>0.451</b>	<b>0.848</b>	0.725	0.762	0.838	0.634
	EI4	<b>0.524</b>	<b>0.819</b>				
	EI5	<b>0.263</b>	<b>0.715</b>				
Physical Health	PH4	<b>0.442</b>	<b>0.859</b>	0.800	0.850	0.865	0.617
	PH5	<b>0.296</b>	<b>0.765</b>				
	PH6	<b>0.324</b>	<b>0.788</b>				
	PH7	<b>0.192</b>	<b>0.725</b>				
Working Experience	PC7	<b>0.421</b>	<b>0.866</b>				
	WE2	<b>0.311</b>	<b>0.732</b>	0.780	0.806	0.838	0.511
	WE3	<b>0.137</b>	<b>0.570</b>				
	WE4	<b>0.155</b>	<b>0.729</b>				
	WE5	<b>0.339</b>	<b>0.739</b>				
	WE6	<b>0.421</b>	<b>0.785</b>				
Government Policy	GP1	<b>0.235</b>	<b>0.534</b>	0.855	0.795	0.880	0.559
	GP2	<b>0.090</b>	<b>0.553</b>				
	GP3	<b>0.179</b>	<b>0.761</b>				
	GP4	<b>0.264</b>	<b>0.838</b>				
	GP5	<b>0.318</b>	<b>0.867</b>				
	GP6	<b>0.342</b>	<b>0.854</b>				

**Note:** (CRA) Contractor Risk Attitudes, (EB) Educational Background, (EI) Emotional Intelligence, (PH) Physical Health, (GP) Government Policy, (WE) Work Experience, both **NA** (Not applicable) for formative scale.

### DISCRIMINANT VALIDITY

In this study, discriminant validity was evaluated using three criteria which include cross-loadings (Table 4), Fornier-Lacker criterion, and HTMT as suggested by Hair et al., (2016) and Taofeeq, Adeleke and Lee (2020).

Table 4 Cross Loading

Items	EB	EI	GP	PH	WE
EB2	<b>0.746</b>	0.128	0.100	0.186	0.424
EB3	<b>0.778</b>	0.125	0.010	0.151	0.392
EB6	<b>0.761</b>	0.224	0.102	0.045	0.307
EB7	<b>0.767</b>	0.184	0.068	0.038	0.203
EI3	0.226	<b>0.848</b>	0.110	0.102	0.141
EI4	0.138	<b>0.819</b>	0.109	0.197	0.125

Table 4 continued

Items	EB	EI	GP	PH	WE
EI5	0.155	<b>0.715</b>	0.060	0.084	0.085
GP1	0.016	0.029	<b>0.534</b>	0.476	0.200
GP2	0.070	0.066	<b>0.553</b>	0.102	0.142
GP3	0.017	0.088	<b>0.761</b>	0.184	0.032
GP4	0.128	0.012	<b>0.838</b>	0.203	0.006
GP5	0.029	0.044	<b>0.867</b>	0.241	0.093
GP6	0.159	0.046	<b>0.854</b>	0.192	0.089
PH4	0.012	0.146	0.278	<b>0.859</b>	0.045
PH5	0.064	0.014	0.324	<b>0.765</b>	0.053
PH6	0.017	0.155	0.256	<b>0.788</b>	0.038
PH7	0.028	0.045	0.156	<b>0.725</b>	0.020
WE2	0.298	0.140	0.015	0.133	<b>0.732</b>
WE3	0.293	0.167	0.065	0.100	<b>0.570</b>
WE4	0.291	0.170	0.060	0.027	<b>0.729</b>
WE5	0.341	0.012	0.044	0.068	<b>0.739</b>
WE6	0.378	0.129	0.007	0.063	<b>0.785</b>

The second approach of discriminant validity was evaluated using the criteria suggested by Fornell and Larcker (1981) (Table 5). The author suggests that discriminant validity is achieved when the square root of each construct's AVE is higher than the correlation of the construct to other latent variables (Fornell and Larcker 1981; Nawanir, Fernando and Teong, 2018; Hassan et al., 2019).

Table 5 Discriminant validity results based on Fornell-Larker criterion

Items	EB	EI	GP	PH	WE
Educational Background	<b>0.760</b>				
Emotional Intelligence	0.220	<b>0.796</b>			
Government Policy	0.100	0.008	<b>0.748</b>		
Physical Health	0.040	0.127	0.331	<b>0.786</b>	
Working Experience	0.450	0.151	0.026	0.020	<b>0.715</b>

Additionally, a new approach in examining the discriminant validity of variance-based SEM is the Heterotrait-Monotrait ratio of correlations (HTMT) (Henseler and Fassett, 2010; Nawanir, Binalialhajj, Lim, and Ahmad, 2019). According to Henseler, the Heterotrait-Monotrait ratio of correlations (HTMT) approach determines the Discriminant Validity (DV) of the constructs. To achieve DV, the HTMT value should not be greater than the HTMT .85 value of 0.85, or the HTMT .90 value of 0.90 (Hair, et al., 2016; Sekaran and Bougie, 2010). As shown in Table 6, all values have not passed both HTMT .85 and HTMT .90 measures, indicating that the discriminant validity has been established.

Table 6 Discriminant validity results based on the Heterotrait-Monotrait ratio of correlations (HTMT)

Items	EB	EI	GP	PH	WE
Educational Background					
Emotional Intelligence	0.305				
Government Policy	0.121	0.157			
Physical Health	0.189	0.217	0.363		
Working Experience	0.543	0.219	0.176	0.158	

**Criteria:** Discriminant validity is established.

## Assessment of Structural Model (Inner Model)

The structural model (Figure 5) tested the causal relationships between human factors affecting contractors' risk attitudes and the moderating effect of government policy with both bootstrapping method and product term indicator method. A bootstrapping process with 5,000 interactions was performed to generate t-values and standard errors to confirm the statistical significance (Hair, et al., 2016; Taofoeq, Adeleke and Chia-Kuang, 2020).

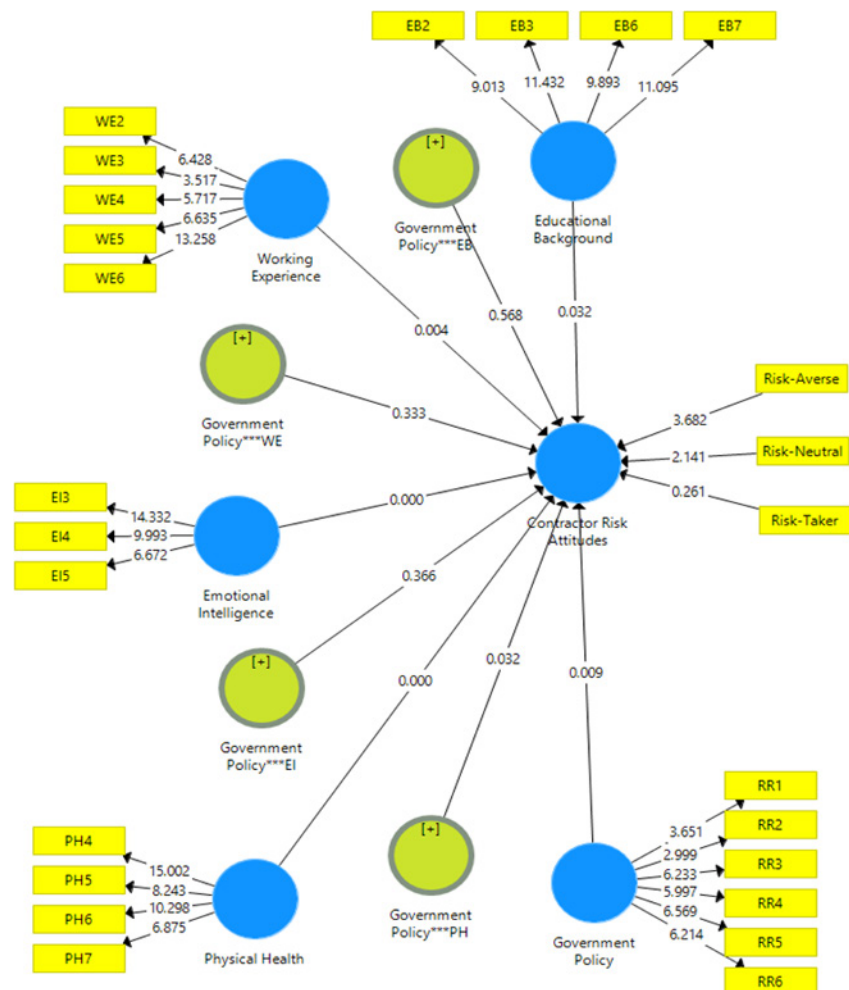


Figure 5 Evaluation of Structural Model through PLS Bootstrapping

Table 7 Results of Bootstrapping for Structural Model Evaluation

Hypothesis	Variables	Beta ( $\beta$ )	T-Value	P-Value	Findings
H1	Work Experience -> CRA	0.081	2.924	0.004	Supported***
H2	Educational Background -> CRA	0.079	2.152	0.032	Supported***
H3	Physical Health -> CRA	0.075	3.933	0.000	Supported***
H4	Emotional Intelligence -> CRA	0.075	4.717	0.000	Supported***
H5	Government Policy -> CRA	0.085	2.607	0.009	Supported***
H6	Government policy***WE -> CRA	0.081	0.968	0.333	Not Supported
H7	Government policy***EB -> CRA	0.080	0.571	0.568	Not Supported
H8	Government policy***PH -> CRA	0.066	2.148	0.032	Supported***
H9	Government policy***EI -> CRA	0.090	0.904	0.366	Not Supported

Note: \*\*significant at 0.05 (P-Value), \*significant at 1.65 (T-Value), (CRA) Contractor Risk Attitudes.

The results showed that all human factors affecting contractors' risk attitudes were directly significant. Therefore, results in Table 7 indicate that H1, H2, H3, H4 and H5 possess a positive relationship with contractors' risk attitudes. Result in Table 7 also revealed that the moderating effect of government policy has a positive relationship with the only H8, (physical health) and contractors' risk attitudes ( $\beta = 0.066$ ,  $t = 2.148$ ,  $p < 0.03$ ). But the product term method was used for H6, H7, and H9 of this study, which strengthened the relationship positively (Fig. 6, 7 and 8).

### TESTING THE MODERATING EFFECT

To employ the product indicator method in testing the moderating effects of government policy on the relationship between human factors affecting contractors' risk attitudes, the product terms between the indicators of the latent predictor variable and the indicators of the latent moderator variable need to be established. Thus, the product terms would serve as the indicators of the interaction term for the structural model (Taofeeq, Adeleke and Lee, 2019).

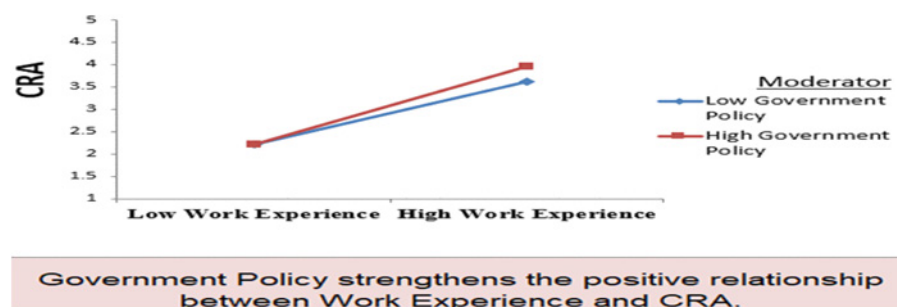


Figure 6 Interaction Effect of Government Policy on Work Experience and Contractors' Risk Attitudes (CRA).

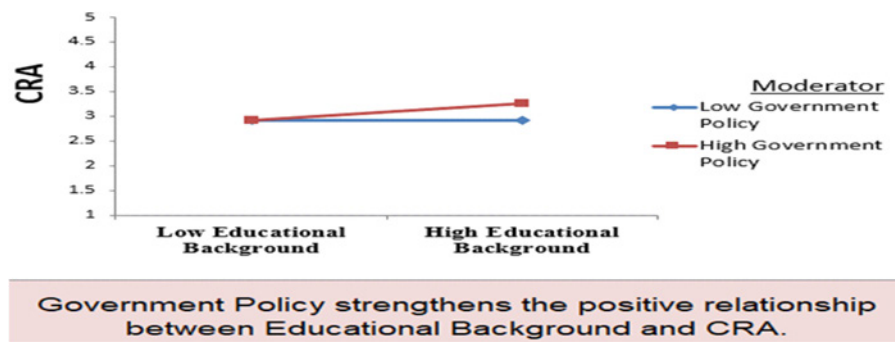


Figure 7 Interaction Effect of Government Policy on Educational Background and Contractors' Risk Attitudes (CRA).

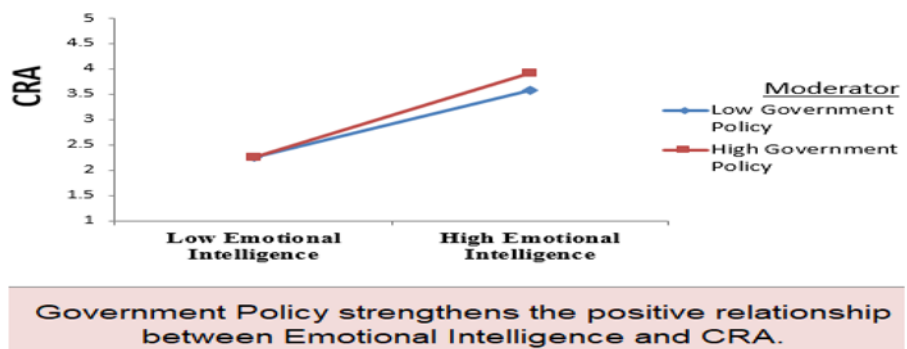


Figure 8 Interaction Effect of Government Policy on Emotional Intelligence and Contractors' Risk Attitudes (CRA).

$$\text{Effect size: } f^2 = \frac{R^2_{\text{model with moderator}} - R^2_{\text{model without moderator}}}{1 - R^2_{\text{model with moderator}}}$$

Moderating effect sizes ( $f^2$ ) values of 0.35, 0.15 and 0.02 can be considered as strong, moderate and small respectively (Cohen, 1992 and Henseler and Fassett, 2010). Nevertheless, according to Chin, Marcolin and Newsted, (2003), effect sizes with low values do not essentially mean that the moderating effect is insignificant (Adeleke et al., 2018; Taofeeq, Adeleke and Lee, 2019). See Table 8 for moderating effects yielded in this study.

Table 8 Strength of the Moderating Effects

Endogenous Latent Variable	R-squared		f-squared	Effect Size
	Included	Excluded		
Government Policy	0.507	0.461	0.0933	Small

## COEFFICIENT OF DETERMINATION ( $R^2$ )

The  $R^2$  is employed in determining the model's predictive accuracy (Hair, Ringle and Sarstedt, 2011) and it is embraced by a variety of disciplines. Researchers must follow the rule of thumb regarding an acceptable  $R^2$ . The value of  $R^2$  with 0.75, 0.50, 0.25, describes substantial,



moderate, or weak levels of predictive, respectively (Chin, 1998). See Table 9 for  $R^2$  values yielded in this study.

Table 9 Variance Explained in the Endogenous Latent Variable

Latent Variable	Variance Explained ( $R^2$ )
Contractor risk attitudes	0.507

## EFFECTIVE SIZE

To get an effect size for each path model, it requires using Cohen's  $f^2$ . The effect size of  $f^2$  is estimated in such a way that 0.35, 0.15 and 0.02 are represented as large, medium and small, respectively. See Table 10 for effect sizes of the path models tested in this study.

$$\text{Effect size: } f^2 = \frac{R^2_{\text{Included}} - R^2_{\text{Excluded}}}{1 - R^2_{\text{Included}}}$$

Table 10 Effect Sizes of the Latent Variables on Cohen's (1992) Recommendation

R-squared	Included	Excluded	F-squared	Effect Size
1. EB	0.507	0.488	0.0385	Small
2. WE	0.507	0.464	0.0872	Small
3. PH	0.507	0.454	0.1075	Medium
4. EI	0.507	0.384	0.2494	Medium

**Note;** (EB) Educational Background, (EI) Emotional Intelligence, (PH) Physical Health, (RR) Rules and Regulations, (WE) Work Experience.

## Discussion

The research hypotheses were developed and tested with the use of PLS path modelling. Firstly, in line with **H1**, result disclosed a significant relationship between work experience and contractors' risk attitudes ( $\beta = 0.081$ ,  $t = 2.924$ ,  $p < 0.04$ ). The contractors with work experience are more likely to be proper project managers and experience less likelihood of risk occurrence during construction activities. This can increase their standing as professionals on construction projects and it is the utmost expectations of every company to have experienced workers.

**H2** revealed that educational background has a significant effect on contractors' risk attitudes ( $\beta = 0.079$ ,  $t = 2.152$ ,  $p < 0.03$ ) among construction companies in Malaysia. The result supported the positive and significant impact of educational background on contractors' risk attitudes as broadly reported in the literature of risk management; it also supported the importance of educational background as a management philosophy and a determinant for any organization to survive, develop, and enjoy its clients.

**H3** result showed that there was a positive relationship between physical health and contractors' risk attitudes ( $\beta = 0.075$ ,  $t = 3.933$ ,  $p < 0.00$ ). The environmental policy that governs safety at work is largely reflected in the enacted legislation at the provincial level and decisions made in the appropriate situation. The finding supported hypothesis 3, which states that physical health is correlated with contractors' risk attitudes in the Malaysian construction

companies. In this study, it is found that the implementation of risk reduction policy and the implementation of occupational safety at work in the Malaysian construction companies would lead to an effective performance of the contractors.

**H4** revealed that emotional intelligence had a positive relationship with contractors' risk attitudes ( $\beta = 0.075$ ,  $t = 4.717$ ,  $p < 0.00$ ) among construction companies in Malaysia according to the bootstrapping method. Emotion is an important variable to be considered because it can influence contractors' attitudes toward risks. After all, contractors uphold morals that influence their thoughts, feelings, and actions; nevertheless, each possesses a unique conception of principles that are necessary for contractors, project managers and team members to achieve the project goals.

This study adopted government policy as a moderator and **H5** of this study predicted that there is a significant relationship between government policy and contractors' risk attitudes among construction companies in Malaysia. The result in Table 7 indicates that government policy has a significant relationship with contractors' risk attitudes in construction companies in Malaysia ( $\beta = 0.085$ ,  $t = 2.607$ ,  $p=0.009$ ). This study has found that those organizations that actually follow government rules and regulations are less likely to be affected by construction risk.

To answer the questions raised in this study and meet the research objectives, the researcher investigated the moderating effect of government policy on the relationship between human factors affecting contractors' risk attitudes in the Malaysian construction companies (Table 7). According to the bootstrapping, only **H8** was significant but **H6**, **H7** and **H9** were not significant with the product term indicator method that is shown in Fig. 6, 7 and 8. The relationship between the human factors that affect contractors' risk attitudes was positively strengthened. From organizational control view, high level of government policy in society enables organizations to predict event within the organization and to develop ways to control those events. Hence, it is expected that high levels of government policy could positively energize employees coping activity during the execution of the construction project. It affirms the view that government policy moderates the human factors affecting contractors' risk attitudes. More importantly, these results confirmed that when employees find it easy to follow all protocols involve during project execution, policy, rules, regulation and action programmes, it helps them to achieve their milestones with significant and effective risk management within the organization.

## Practical Implications

The findings of this study provide support for the top management to continuously guide and motivate construction employees for better job performance, promote a learning culture, be open-minded, and provide focus on frequent staff training and learning. It will facilitate the creation of policies by the government and enforcement of strict compliance for the control of risk attitudes, risk reduction method, policies on contractors' risk attitudes and intense support for the incentives among the construction companies in Malaysia to ensure the efficiency and effectiveness of contractors' attitudes.

In addition, the research results demonstrate that government policy plays an important role in risk attitude of the construction companies and that organizational support will help contractors to control their attitudes in their place of work. The human factor has a direct relationship with contractors' risk attitudes; therefore, project managers must ensure that the rules and regulations have an impact on their workers.

Apart from that, managers should also focus on organizational goals especially in managing professional and skilled contractors. Employees who perceived their employers as uncaring or not supporting their needs and well-being may not be happy working with the organization; thus, the tendency for them to change their attitudes towards risk will be very low. Moreover, one of the benefits of this study is an increasing understanding of human behaviour and the relationship between human factors and contractors' risk attitudes. It will generate more awareness particularly on the preference of project managers or owners as the decision-makers.

Additionally, this research will assist human resource managers in the Malaysian construction sector, especially the contributions related to the contractors' selection processes. Since this study shows that human factors significantly influence contractors' risk attitudes, human resource practitioners are encouraged to consider all factors when job applicants are evaluated. Most importantly, recruiting employees with similar values and beliefs can increase the likelihood of more organized workgroups, which, in turn, will reduce risk in construction projects.

Industry owners or leaders may use the findings to improve their understanding of the role of human factors affecting risk attitudes strategies as a driver of productivity. Owners could also use the findings to identify appropriate employee recruitment, training, compensation, and motivational practices in the construction industry. The results may help the owner to create innovative ways that contractors can employ in improving their risk attitudes and enacting positive organizational changes to reduce risk. Leaders could also use the findings to establish ongoing and continuing training to update their employees' skills and expertise. The results of this study could also inform the construction company owners about strategies to improve government policy.

## Theoretical Implications and Limitation

The framework for examining the moderating effect of government policy on the relationship between human factors and contractors' risk attitudes will provide a direction for future studies. Furthermore, the study of contractors' risk attitudes will represent a yardstick for providing a means of assessing construction risk management in the Malaysian construction companies. The model developed in the study will determine the importance of the moderating effect of government policy influencing the relationship between human factors and contractors' risk attitudes. Particularly, six factors (IV, DV and Moderator variables) were assembled to develop nine hypotheses based on the research model of contractors' risk attitudes that lead to the development of efficiency and effectiveness. This model will offer future researchers the framework needed to investigate other factors affecting contractors' risk attitudes among construction companies so as to complement the existing literature. Theoretically, the study assessed and tested the model developed for human factors to utilize the dependent variable (contractors risk attitudes). The research study can provide policymakers and private organizations the instrument to assess how human factor could affect the adoption of a good risk management system. Underpinned by the organizational control theory and theory of planned behaviour, this study provided empirical evidence for bridging the knowledge gap about measuring and organizing contractors' risk attitudes among construction companies in Malaysia. Also, the present framework, perhaps, will offer the right drive for changing the current inactivity towards better risk attitudes practices among contractors in Malaysian construction companies.

## Conclusions

It is evaluated in this study how government policy theoretically moderates the relationships among the exogenous and endogenous variables. This study's theoretical framework has also contributed to the field of risk management; organizational control theory and theory of planned behaviour have been employed to investigate the influence of human factors on contractors' risk attitudes with moderating effect of government policy. Equally, the theoretical contributions and the findings from the present study have offered some essential practical implications to the contractors and the construction companies. On the limitations of the present study, various future research directions are described. In conclusion, the current study has contributed practically, methodologically and theoretically to the body of knowledge in the domain of construction industry, particularly project management.

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