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Behavior Transition: A Framework for the Construction Conflict - Tension Relationship

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Abstract

Conflicts are inevitable in construction projects. One of the reasons is that all construction projects involve complex human interactions. Previous studies have shown that behavioral states can respond dynamically as the magnitude of a conflict increases. This has been empirically demonstrated using a Catastrophe-Theory-based, Three-variable System involving the level of construction conflict, the level of tension and the amount of behavioral flexibility [1]. This paper reports on a study that builds on the above-mentioned study by Yiu and Cheung [1] and examines the application of Moderated Multiple Regression (MMR) to the Three-variable System. It was found that not all MMR models display a significant moderating effect. Two out of six MMR models were found to be significant in their effect. These models affirm that the nature of the relationship between the degree of uncertainty and adversarial attitudes (or mistrust level) varies, depending on the behavioral flexibility of the parties. Disordinal interactions were also found, suggesting that the interaction between behavioral flexibility and the conflict-tension relationship can change radically. Critical points for the degree of uncertainty were also able to be calculated.

Beyond these points, even a flexible individual may find difficulty in minimizing or resolving construction conflicts. As such, it is suggested that such radical changes could be prevented by minimizing the degree of uncertainty in construction projects.

Keywords: Construction conflicts, Tension, Behavioral flexibility, Catastrophe theory, Moderated Multiple Regression (MMR)

Introduction

Conflicts are ubiquitous in construction projects [2-4]. They are often the inevitable outcomes of human interactions that involve an incongruence of goals, attitudes, values, interests or beliefs among project managers, architects, engineers and surveyors [5-7]. In practice, a project team is composed mainly of members from different organizations. Owing to the fact that they wish to maximize the benefits to their own organizations, the team members typically have different goals and needs, and thus the potential for conflict exists when they work collectively on construction projects [8-10]. Correspondingly, one of the important tasks of construction management is to handle conflicts properly; otherwise they may become expressed in the form of disputes [11-12], the presence of which may lead to detrimental effects on the work progress and the relationships between the contractual parties [13]. Due to the consequences so caused, the construction industry is often filled with an adversarial atmosphere. The cooperative and collaborative nature of the construction process can be eventually undermined [14]. In construction, researchers have raised concerns over the study of conflicts. The voluminous amount of publication on construction conflicts serves as good evidence of its significance [12-13, 15-16]. These studies have provided sound references for identifying the types and consequences of construction conflicts. Furthermore, studies of construction conflicts with regard to human factors have also been reported [15, 17-18]. Among these studies, interviews and case studies were often employed to provide qualitative analyses. For example, Gardiner and Simmons [15] examined the causes of dysfunctional conflicts in the light of people-centered mechanisms by conducting structured interviews of the participants of 19 construction projects. In addition, a case study was presented to demonstrate the outcomes of positive interactions when inter-organizational orientations and team building exercises are implemented early in construction projects. Furthermore, Harmon [16] undertook a qualitative study which suggested that the use of partnership and mediation as an intervention process could prevent and resolve conflicts. He also argued that the evaluation of this process may be based on the satisfaction levels of the parties. Notwithstanding that these types of qualitative studies have proved successful in identifying the causes of conflicts in the construction industry [3, 16, 19-24], the use of quantitative analysis can help researchers to take advantage of qualitative analysis to explore construction conflicts further. Recently, a quantitative study of construction conflicts has been completed by Yiu and Cheung [1]. This work described the dynamic changes in construction conflict behavior based on Catastrophe Theory. Using the same interacting variables defined in the study of Yiu and Cheung [1], i.e. construction conflict level, tension level and behavioral flexibility, this paper extends Yiu and Cheung [1]'s work by providing an alternative empirical technique - Moderated Multiple Regression

(MMR), to examine the relationships between these three variables.

To achieve this, this paper begins by briefly reviewing the findings of Yiu and Cheung [1]. Next, an introduction is given to each of the above three variables, followed by a presentation of the technique by which MMR is used to model these variables. As the MMR analysis is based on the data collected from a survey, the details of this survey are also reported. Finally, the paper presents conclusions based on the findings of the MMR analyses.

The Study of Construction Conflicts – An Application of Catastrophe Theory

In the work of Yiu and Cheung [1], Catastrophe Theory was applied to the study of construction conflict behavior. Catastrophe Theory is a branch of dynamical system theory; it was devised by Rene Thom [25] and further popularized by Zeeman [26-28]. The theory applies to systems that undergo sudden changes in behavior in response to a gradual changing of the variables. Previous applications of the theory can be widely found in a number of behavioral studies in the areas of perception research [29-30], client psychology [31], management [32-33], finance [34] and social sciences [35-36]. In construction, Yiu and Cheung [1] have successfully applied this theory in studying conflict behavior as influenced by the level of conflict, which in turn depends on the interacting variables of tension level and behavioral flexibility. Behavioral flexibility is defined as the ability to act differently and appropriately in different situations [37-38]. It is a type of personality trait that demonstrates the adjustment in one's behavior to one's surroundings. This is reported to have implications for the conflict level [39]. In the study of Yiu and Cheung [1], behavioral flexibility was successfully applied to the study of construction conflicts by incorporating the model of conflict handling styles suggested by Rahim [40]; Rahim & Bonoma [41]. This model adopted the five conflict handling style classifications of Blake & Mouton [42], i.e. Integrating, Obliging, Compromising, Dominating and Avoiding. Moreover, two dimensions were added to Rahim's model. The first dimension describes the degree to which an individual attempts to satisfy his own concern. The second dimension explains the degree to which an individual wants to satisfy the concerns of the others. With the use of this model, Glaser and Glaser [43] and Yiu & Cheung [1] suggested that flexible individuals adjust their own conflict resolution styles according to the situation so as to maximize prospective collaboration.

In the Catastrophe Model, one of the interacting variables is called the normal factor and the other is called the splitting factor [44]. The normal factor is related to the dependent variable (i.e. construction conflict behavior) in a consistent pattern. The splitting factor is the key variable as it is described as "*a moderator variable which specifies conditions under which the normal factor will affect the dependent variable in a continuous fashion, and other circumstances under which the normal factor will produce discontinuous changes in the dependent variable…it is the splitting factor that determines the "breaking point" or threshold of change in the dependent variable…"[44]*. In the study of Yiu and Cheung [1], the hypotheses of tension level as the normal factor and behavioral flexibility as the splitting factor were first established. Based on the algorithm suggested by Cobb [45-47] and Thom [25], the 'catastrophe' of construction conflict behavior was demonstrated with a robust program called Cuspfit, which was developed by Hartelman [48] and van der Maas [49-50]. With this program, the appropriateness of the interacting variables and the fitness of the model were tested by checking goodness-of-fit indices such as Akaike's Information Criterion (AIC) and the Bayesian Information Criterion (BIC) [48-55]. Based on these statistics, a final catastrophe model of construction conflict behavior was developed.

The primary result of Yiu and Chueng [1] can be summarized by stating that a bimodality in the nature of construction conflict behavior may be detected among the interacting variables of the Three-variable System, i.e. if a point residing in the model reaches a certain level of tension at a given level of behavioral flexibility, a sudden jump in conflict behavior occurs. The hypotheses of tension level as the normal factor and behavioral flexibility as the splitting factor were also confirmed statistically for the Catastrophe Model. The relationships between tension level, construction conflict level and behavioral flexibility could then be constructed for the Three-variable System (Refer to Figure 1).

< Figure 1 here >

Technically, this Three-variable System can be described as a moderated causal relationship [56], i.e. the relationship between tension level and construction conflict level is moderated by a third variable, behavioral flexibility. In other words, the nature of the relationship between tension level and construction conflict level varies, depending on the degree of behavioral flexibility. As suggested by Jaccard and Turrisi [56], such a relationship can be analyzed with the use of moderated multiple regression (MMR). Under this method, tension levels are set as predictors, construction conflict levels as criteria, and behavioral flexibility levels as moderator variables. The analysis involves examining the moderating effect of behavioral flexibility (B_i) on the relationship between tension level (T_i) and construction conflict level (C_i). If the moderating effect is not significant, it can then be said that the tension level has a "constant" effect on the construction conflict behavior [56-57]. However, if such a moderating effect were statistically significant, this would mean that a moderating effect is present in the relationship [56]. This study, which is built upon the earlier work of Yiu and Cheung [1], specifically examines the application of MMR to the Three-variable System as shown in Figure 1. As the potential effect of behavioral flexibility is to modify the relationship between tension level and conflict level, this study enables project participants experiencing a high tension level to cope better with conflict situations in construction projects.

Moderated Multiple Regression (MMR)

Multiple regression is a commonly used statistical technique that quantifies the relationship between two or more predictor variables and the dependent variable [47, 58-59]. The outcome of the regression predicts the dependent variable from several continuous independent variables. An example of a multiple regression model (with two independent variables) is shown as follows: -

$$Y = a + b_1X + b_2Z + \varepsilon \quad \ldots\ldots(1)$$

where,

Y = dependent variable

X, Z = independent variables

a, b_1, b_2 = unknown constants

ε = random error of any given set of values for X, Z

As shown in Equation (1), X and Z have an independent effect on the prediction of Y, i.e. they have a "constant" effect on the dependent variable [60]. However, if the predictive power of X on Y is dependent upon Z, a moderator (or interaction) effect exists [56-57, 60]. A moderator term, which is a compound variable formed by multiplying X by the moderator Z, is added to the regression equation by introducing the moderator variable XZ. Equation (1) then becomes:

$$Y = a + b_1X + b_2Z + b_3XZ + \varepsilon \quad \ldots\ldots (2)$$

where,

XZ = moderator variable

Equation (2) is known as the moderated multiple regression (MMR) model. Similarly, the MMR model of construction conflict behavior can be developed. Firstly, a multiple regression model of construction conflict behavior can be constructed:

$$C_i = a + b_1T_j + b_2B_k + \varepsilon \quad \ldots\ldots (3)$$

where C_i is the *i*th variable of the construction conflict level. T_j is the *j*th variable of the tension level and B_k is the *k*th variable of behavioral flexibility. In Equation (3), T_j and B_k have independent effects on C_i. If T_j depends on B_k, Equation (3) shall be modified. The prediction of C_i can be achieved using the following equation:

$$C_i = a + b_1T_j + b_2B_k + b_3T_jB_k + \varepsilon \qquad (4)$$

The MMR Procedure

As suggested by Jaccard *et al*. [61] and Cohen *et al*. [57], the first step in the MMR procedure is the formation of interactions using Equations (3) and (4). The presence of a significant moderating effect is indicated if the inclusion of the predictor-moderator product (i.e. T_jB_k term) in the regression model produces a significant change in the R^2 value, i.e. ΔR^2, of Equations (3) and (4). As a rule of thumb suggested by Jaccard *et al*. [61], the F-test can be used to test the significance of ΔR^2 for each MMR model. The formula for the F-test is:

$$F = \frac{(R_2^2 - R_1^2)/(k_2 - k_1)}{(1 - R_2^2)/(N - k_2 - 1)} \qquad (5)$$

where, k_2 is the number of predictors in the expanded equation (refers to Equation (4)), k_1 is the number of predictors in the original equation (refers to Equation (3)), N is the total sample size, $(k_2 - k_1)$ and $(N - k_2 - 1)$ is the degree of freedom, R_2 is the multiple R for the expanded equation (refers to Equation (4)) whereas R_1 is the multiple R for the original equation (refers to Equation (3)).

For the F-test, the critical values are obtained from the F-distribution table at different significance levels (α =0.10*, α =0.05** and α =0.01***). The value of ΔR^2 is regarded as significant at these significance levels and a significant interaction effect is thus deemed to be present in that particular moderated regression model.

A Survey involving the Three-variable System

The Three-variable System of Yiu and Cheung [1] describes the relationships between construction conflict level, tension level and behavioral flexibility. To specifically examine this relationship, a questionnaire was prepared to collect data for each of the three interacting variables. Each of these variables was measured using their sub-variables as suggested in the literature. For the construction conflict level, two sub-variables were used - adversarial attitudes and mistrust level [6, 16, 62-65]. In comparison, three sub-variables, inconsistent demands, degree of uncertainty and work overloads, were used to measure the tension level [19, 23]. As for behavioral flexibility, it was measured by integrating the conflict handling styles of Rahim [40] and Rahim & Bonoma [41]. This method was successfully used in the study of Yiu and Cheung [1]. A summary of these sub-variables is given in Table 1.

< Table 1 here >

Data Collection

The survey was conducted in Hong Kong, and was administered by post or faxed to the potential respondents who had been contacted and had expressed interest in participating. The targeted respondents were construction professionals such as project managers, engineers, architects and quantity surveyors who had experience in project management. They were randomly selected from the Builder Directory according to their professional backgrounds. The list of the items included in the questionnaire for this survey is shown in Table 1. As the data needed to be case specific, the respondents were asked to select one of their most recent construction projects as a reference for the completion of the questionnaire.

The questionnaire contained four sections. The first section required the respondents to provide background information such as their professions and relevant experience. The next three sections addressed the measurement of sub-variables in the Three-variable System (refer to Table 1). The respondents were asked to rate the degree of significance of the construction conflict level and tension level on a Likert scale of 1 (least significant) to 5 (most significant). As discussed, for the measurement of behavioral flexibility, the model of Rahim *et al.* [41]; Rahim [40, 66] and Blake *et al.* [42] was used and reduced to a Likert Scale ranging from 1 (High concern for self and others) to 5 (Low concern for self and others).

In this survey, a total of 200 questionnaires were sent out and 91 sets were completed and returned. This represents a response rate of 46%. All returned questionnaires were completed by project managers (20%), architects (20%), engineers (19%), quantity surveyors (38%) and others (construction lawyers and mediators) (3%). Most of the respondents were, at the time, holding senior positions in the industry, with 56% having more than 10 years of experience. The composition of the respondents by their professions and working experience are shown in Tables 2 and 3.

< Table 2 here>

<Table 3 here>

The Results

As described previously, the tension level, construction conflict level and behavioral flexibility were used as predictors, criteria and the moderator variable respectively [57, 61, 67-68]. In this study, there were a total of six ($2\times3\times1$) moderated multiple regression models (devised from the combinations of sub-variables of the

Three-variable System as shown in Table 1). These models were then subjected to a test of significance of their interaction effects. The presence of a significant moderating effect is indicated if the inclusion of the predictor-moderator product (i.e. T_jB_k term) in the regression model produces a significant change in the R^2 (i.e. ΔR^2) between equations (3) and (4). Based on the use of the F-test [61], two out of six MMR models were found to be statistically significant (Table 4 refers). However, significant moderating effects were not detected for the other four MMR models. In sum, the moderating effects were significant in the relationships between (1) the degree of uncertainty and behavioral flexibility on adversarial attitudes and (2) the degree of uncertainty and behavioral flexibility on the mistrust level. These relationships are illustrated in Figure 2.

< Table 4 here >

< Figure 2 here >

To discuss such findings further, the most commonly used method is to present the moderating effects with graphs. Regression lines were plotted for the regression of construction conflict level and tension level at the “low” and “high” values of behavioral flexibility. The “low” value is defined as one standard deviation below the mean score and the “high” value as one standard deviation above the mean [56]. This method has been successfully applied in similar studies using MMR [56, 69-71]. However, in this study, because the Likert Scale for the measurement of behavioral flexibility ranged from 1 (High concern for self and for others) to 5 (Low concern for self and others), the meaning of “low” and “high” as defined by Jaccard and Turrisi [56] required be modification. The *“low”* value of behavioral flexibility was defined as one standard deviation *above* the mean score, and the *“high”* value of behavioral flexibility as one standard deviation *below* the mean. To generate these plots, the original moderated regression equation (i.e. Equation (4)) was applied. Mathematically, Equation (4) can be rewritten as:

$C_i = a + b_1T_j + b_2B_k + b_3T_jB_k + \varepsilon$

$= (a + b_2B_k) + (b_1 + b_3B_k)T_j + \varepsilon$

$= c + (b_1 + b_3B_k)T_j + \varepsilon$ ……………………….……………………………….(6)

$= c + b_{total}\,T_j + \varepsilon$, where $c = (a + b_2B_k)$, $b_{total} = b_1 + b_3B_k$ …………………..…..(7)

where c is the intersection in the regression equation for the interaction model and b_{total} is the regression coefficient associated with the moderator variable in Equation (7).

According to the regression outputs, the two significant MMR models can be presented as:

$C_{AA} = 1.534 + .457T_{DU} + .364B + -.085T_{DU}B + \varepsilon$ ……………………………………(8)

$C_{ML} = 1.103 + .604T_{DU} + .390B + -.099T_{DU}B + \varepsilon$ ……………………………………(9)

where C_{AA} comprises the sub-variables of the construction conflict level related to adversarial attitudes. C_{ML} comprises the sub-variables of the construction conflict level related to the mistrust level. T_{DU} is the sub-variable of the tension level that relates to the degree of uncertainty.

Similarly, Equations (8) and (9) can also be written as

$C_{AA} = (1.534+.364B) + [.457+ (-.085)B]T_{DU} + \varepsilon$ …………………………(10)

$C_{ML} = (1.103+.390B) + [.604+ (-.099)B]T_{DU} + \varepsilon$ ……………………….....(11)

For the variable of behavioral flexibility (B), the mean ($\bar{y}$) and standard deviation (SD) were found to be 3.23 and 0.94 respectively. Hence, the "*low*" and "*high*" degree of behavioral flexibility can be calculated.

$B_{low} = \bar{y} + SD = 3.23+0.94 = 4.17$ ……………………………………………......(12)

$B_{high} = \bar{y} - SD = 3.23-0.94 = 2.29$……………………………………………………(13)

where B_{low} and B_{high} are the "low" and "high" values of behavioral flexibility respectively.

Substituting the values of B_{low} and B_{high} into Equation (10) and (11), the following equations can be derived:

When the value of B_{low} in Equation (12) is substituted into Equation (10)

$$C_{AA}= (1.534+.364B_{low}) + [.457+ (-.085)B_{low}]T_{DU} + \varepsilon$$

$$= 3.05 + .10T_{DU} + \varepsilon \quad \text{………………………………………………………(14)}$$

When the value of B_{high} in Equation (13) is substituted into Equation (10)

$$C_{AA}= (1.534+.364B_{high}) + [.457+ (-.085)B_{high}]T_{DU} + \varepsilon$$

$$= 2.37+ .26T_{DU} + \varepsilon \quad \text{………………………………………………………(15)}$$

Similarly,

When the value of B_{low} in Equation (12) is substituted into Equation (11)

$$C_{ML}= (1.103+.390B_{low}) + [.604+ (-.099)B_{low}]T_{DU} + \varepsilon$$

$$= 2.73 + .19T_{DU} + \varepsilon \quad \text{………………………………………………………(16)}$$

When the value of B_{high} in Equation (13) is substituted into Equation (11)

$$C_{ML}= (1.103+.390B_{high}) + [.604+ (-.099)B_{high}]T_{DU} + \varepsilon$$

$$= 2.00 + .38T_{DU} + \varepsilon \quad \text{………………………………………………………(17)}$$

From Equations (14)-(17), the regression lines for “*low*” and “*high*” degrees of behavioral flexibility for adversarial attitudes and mistrust level can be plotted. These are presented in Figures 3 and 4 respectively. Were there to be no interaction between the variables, the regression lines would all be parallel [56, 71]. As the figures show that the lines of low behavioral flexibility are steeper than those of high behavioral flexibility, the interaction effects are indicated by the nonparallel lines in Figure 3 and

4.

< Figure 3 here >

< Figure 4 here >

Discussion

This paper further examines the three-variable system that was depicted in the study of Yiu and Cheung [1]. The above findings identify relationships between the degree of uncertainty, adversarial attitudes and the mistrust level in response to variations in behavioral flexibility. The moderating effect of behavioral flexibility has significant impacts on the relationships between (1) adversarial attitudes and the degree of uncertainty (refer to Figure 3); (2) the mistrust level and the degree of uncertainty (refer to Figure 4). In these figures, the regression line for one group intersects with the corresponding regression line for the other group. To explain the meaning of these intersection points, the concepts of *ordinal* and *disordinal* interactions are applied. As suggested by Jaccard and Turrisi [56]; Cohen *et al*. [57] and Pedhazur [71], "*An ordinal interaction is one in which the regression lines are non-parallel but do not interact*" and *"A disordinal interaction (also called a crossover interaction) is one in which regression line that regresses Y onto the continuous predictor for one group intersects with the corresponding regression line for the other group."* However, for any given set of non-parallel lines, there is always an intersection point. Theoretically, all interactions are disordinal in nature. Interactions are classified as ordinal if the regression lines do not intersect *within the range being studied* [56, 71]. In Figures 3 and 4, as the intersection points appear within the range being studied, the plots reveal that the interaction is disordinal (or a crossover interaction).

To allow for a richer discussion, it is possible to identify the point where the regression lines intersect using Equation (18). This is a commonly used technique by social researchers that has successfully been applied by Jaccard and Turrisi [56] and Cronbach & Snow [72].

$$P = \frac{(a_1 - a_2)}{(b_2 - b_1)} \quad \text{(18)}$$

where P is the point of intersection (or crossover point), a_1, a_2 are the intercepts of the first and second regression lines respectively, and b_1 and b_2 are the slopes of the first and second regression lines respectively.

Hence, from Equation (14) to (17), the points of intersection are:

P_{AA} = (3.05-2.37)/(0.26-0.10)=4.25……………………………………………………(19)

P_{ML} = (2.73-2.00)/(0.38-0.19)=3.84 ………………………………………………(20)

where P_{AA} and P_{ML} are the intersection points of the graphs in Figure 3 and 4 respectively.

These intersection points, P_{AA} and P_{ML}, obtained from Equations (19) and (20), describe the scores for the degree of uncertainty where the level of adversarial attitudes (or mistrust level) is the same under the low or high degree of behavioral flexibility. When the degree of uncertainty corresponds to a score of 4.25 (or 3.84), the level of adversarial attitudes (or mistrust) is predicted to be the same for low or high behavioral flexibility. *If this score falls below 4.25 (or 3.84), the level of adversarial attitudes (or mistrust) is predicted to be higher under low behavioral flexibility than high behavioral flexibility*. The intensification of adversarial attitudes and mistrust result from the behavior of an inflexible individual who is unable to be responsive and to adjust his own behavior to his surroundings. On the other hand, a flexible individual is able to mitigate the level of adversarial attitudes (or mistrust). This is due to the fact that such an individual accommodates his ownconcerns and those of the others in resolving conflicts. However, as this score exceeds 4.25 (or 3.84), the level of adversarial attitudes (or mistrust) is predicted to be higher under a high degree of behavioral flexibility than a low degree of behavioral flexibility. This implies that a flexible individual cannot mitigate the conflict level. Correspondingly, demarcation lines can be established in Figures 5 and 6 to demonstrate the effectiveness of behavioral flexibility. The behavioral flexibility is considered to be effective if it can mitigate the conflict level.

< Figure 5 here >

< Figure 6 here >

The left of the demarcation line is assigned to be the effective region of behavioral flexibility, while the ineffective region is assigned to the right of the line. As discussed by Cronbach and Gleser [73] and Jaccard and Turrisi [56], such treatments of disordinal interactions are commonly used by educational, organizational and psychological researchers. For example, decisions on the assignment of people to treatment, such as clinical interventions and types of educational curricula, are frequently guided by the identification of the intersection points in disordinal interactions. Those who fall within to the left of the intersection point are assigned to the other treatment [56]. In this study, the existence of disordinal interactions suggests a discontinuity in the effect of behavioral flexibility on tension-conflict relationships, i.e. the interaction with behavioral flexibility is not constant. Hence, if the degree of uncertainty reaches a threshold level of 4.25 or 3.84, the interaction between behavioral flexibility and tension-conflict relationships will change radically, i.e. even a flexible individual will be unable to minimize or resolve conflicts. This finding suggests that minimizing uncertainty is the key factor in preventing such changes.

Conclusion

Conflict in construction typically results from the interactions between the project team members. Previous studies have found that behavioral changes respond dynamically to changes in the magnitude of conflicts. This particular phenomenon has been modeled and empirically tested by the authors using a Catastrophe-Theory-based Three-variable System [1]. The three variables are the construction conflict level, the tension level and the amount of behavioral flexibility. This paper reports on a study that builds on the work of Yiu and Cheung [1], with the specific aim of examining the application of moderated multiple regression (MMR) to the Three-variable System. The findings suggest that not all MMR models display a significant moderating effect. The MMR models that were found to be significant affirm that the nature of the relationship between the degree of uncertainty and adversarial attitudes (or mistrust level) varies with the behavioral flexibility of the parties. With the aid of graphical representation the interaction effects were found to be disordinal. The presence of disordinal interactions suggests that the interaction between behavioral flexibility and tension-conflict relationships can change radically. Such changes may be identified by the critical points of the degree of uncertainty. Beyond these points, a flexible individual may find it difficult to minimize or resolve construction conflicts. It is suggested that such changes could be prevented by minimizing the degree of uncertainty in construction projects.

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Tables and Figures

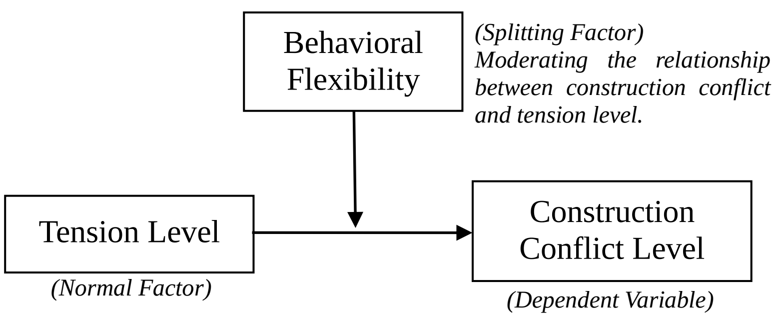

Figure 1 The Three-variable System of the Catastrophe Model by Yiu and Cheung [1].

Table 1 A Summary of Sub-variables

<table>
<tr><th colspan="2"></th><th>Sub-variables and their measurement methods</th></tr>
<tr><td rowspan="3">The Three-variable System of Yiu and Cheung [1]</td><td>Construction Conflict Level</td><td>• Adversarial attitudes among project teams* and;
• Mistrust level among project teams* [6, 16, 62-65]</td></tr>
<tr><td>Tension Level</td><td>• Inconsistent demands from different project members* [19, 23];
• Degree of uncertainty on the project* and;
• Work overloads of project team members* [15, 23].</td></tr>
<tr><td>Behavioral Flexibility</td><td>Details of the five-point scale [40-42, 66]:
<table>
<tr><td>1</td><td>High concern for both self and others (Integrating)</td><td>High Behavioral Flexibility</td></tr>
<tr><td>2</td><td>Low concern for self, high concern for others (Obliging)</td><td>↓</td></tr>
<tr><td>3</td><td>Neutral (Compromising)</td><td>↓</td></tr>
<tr><td>4</td><td>High concern for self, low concern for others (Dominating)</td><td>↓</td></tr>
<tr><td>5</td><td>Low concern for self, low concern for others (Avoiding)</td><td>Low Behavioral Flexibility</td></tr>
</table></td></tr>
</table>

* A Five-point Likert scale was adopted for each measurement (From 1= Least Significant to 5= Most Significant)

Table 2 Composition of Respondents (by Professions)

Professions	**Number**	**Percentage**
Project Managers	18	20
Architects	35	38
Engineers	17	19
Quantity Surveyors	18	20
Others (Construction Lawyers and Construction Mediators)	3	3
TOTAL	91	100

Table 3 Composition of Respondents (by Working Experience)

Working Experience (Years)	Number	Percentage
Below 5	23	25
5-10	17	19
11-15	10	11
16-20	17	19
Above 20	24	26
TOTAL	91	100

Table 4 The six MMR models of Construction Conflict

		Construction Conflict Level							
		Adversarial Attitudes				Mistrust Level			
		b_3	R^2	ΔR^2	test statistic#	b_3	R^2	ΔR^2	test statistic#
	Tension Level								
A	Inconsistent Demands × **Behavioral Flexibility**	.018	.231	.000	.000	.007	.145	.000	.000
B	Degree of Uncertainty × **Behavioral Flexibility**	-.085	.039	.005	.453**	-.099	.074	.006	.564**
C	Work Overloads × **Behavioral Flexibility**	.046	.171	.002	.210	-.026	.091	.001	.100

#The test statistic was computed using Equation (5); p<0.10*, p<0.05** and p<0.01***.

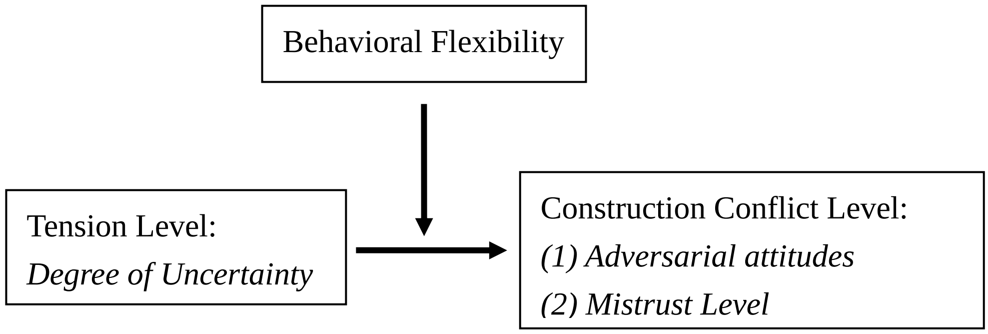

Figure 2 The two significant MMR models

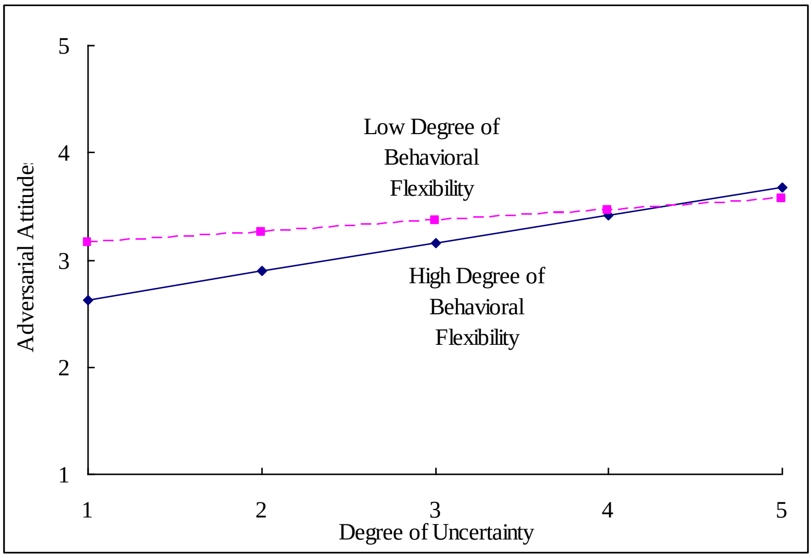

Figure 3 Moderating effect of behavioral flexibility on the Relationship between degree of uncertainty and adversarial attitudes

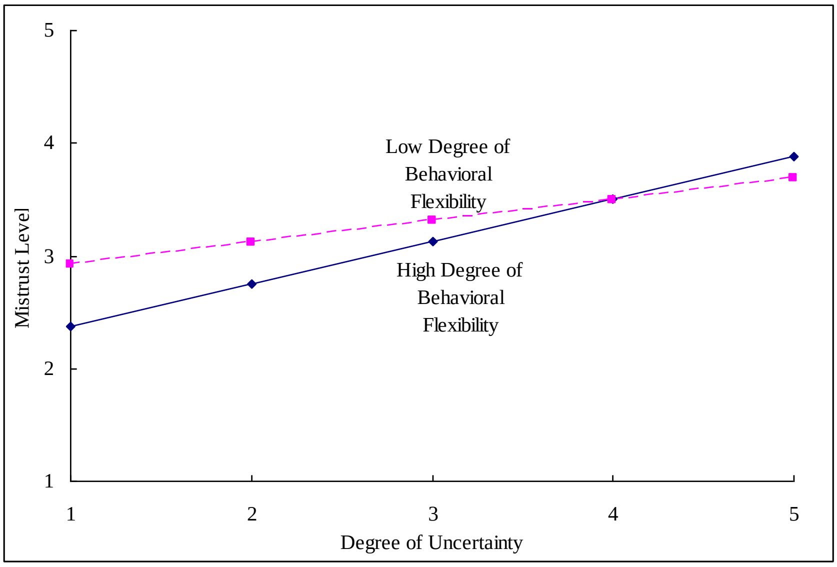

Figure 4 Moderating effect of behavioral flexibility on the Relationship between degree of uncertainty and mistrust level

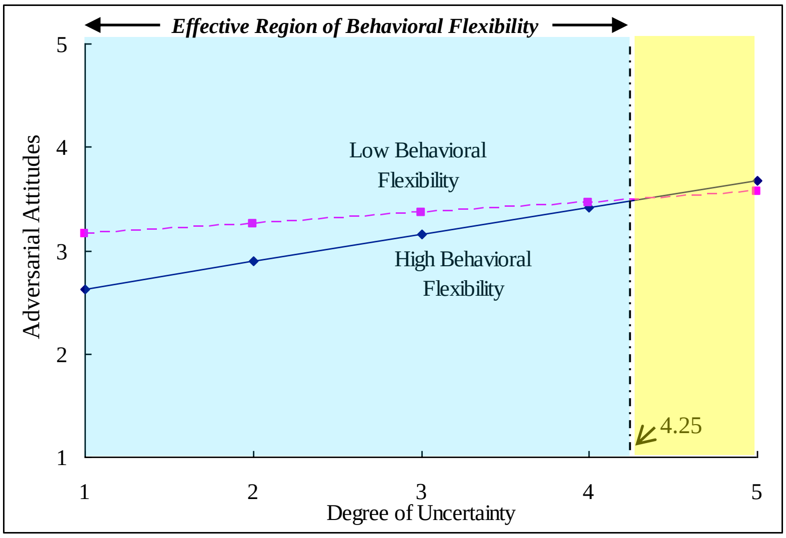

Figure 5 Effective region of behavioral flexibility for the Relationship between degree of uncertainty and adversarial attitude

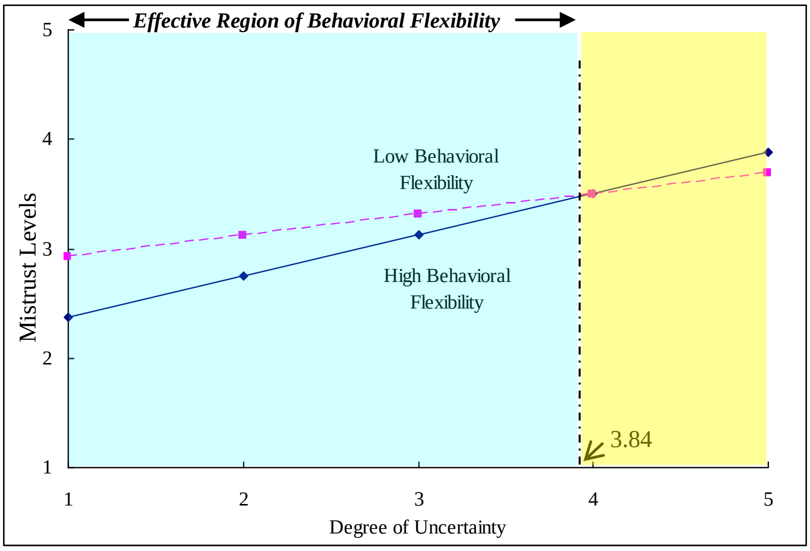

Figure 6 Effective region of behavioral flexibility for the Relationship between degree of uncertainty and mistrust level