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CASE STUDIES: DISPUTE RESOLUTIONS SELECTION IN CONSTRUCTION

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Disputes simply cannot be prevented all the time in the construction industry. As such, common dispute resolution systems such as negotiation, mediation, arbitration and litigation are widely used. Compared to litigation, negotiation and mediation have high popularity owing to their low cost and faster duration to dispensation. However, proper selection of dispute resolution techniques becomes very critical in real business practice. In this article, a numerical method using pairwise comparisons and the analytic hierarchy process are used to discover the most appropriate method evaluated against specific selection factors. Eight major selection factors are used, and an importance scale is assigned to weigh each factor, followed by a pairwise comparison. The rationale for selection of factors is explained. Final scores of the effectiveness of each dispute resolution technique are calculated for six cases that are meaningful in the construction industry, thereby providing a practical guideline and system to disputants for selecting a suitable dispute resolution method for their specific case.

Keywords: Alternate dispute resolution (ADR), Negotiation, Mediation, Arbitration, Litigation, Pairwise comparison, Analytic hierarchy process.

1 INTRODUCTION

Disputes commonly happen in construction projects due to underprepared contracts, uncleared scope of work, insufficient planning, budget issue, and communication problems, among many other (Cheung and Pang 2013). It is very important to address and properly resolve the disputes to ensure a successful construction project. However, the complexity and uncertainty of construction projects led to the rising popularity of alternative dispute resolution (ADR) techniques, in contrast to litigation. ADR methods are those such as mediation, negotiation, and arbitration. In this article, six case studies are presented to illustrate the selection of an appropriate dispute solution strategy.

2 METHODOLOGY OF DISPUTE RESOLUTION SELECTION

Four major dispute resolution techniques that are widely used in construction projects are negotiation, mediation, arbitration and litigation. Among these four techniques, negotiation is the most common method in the construction industry, further reporting that more than 70% of disputes are resolved using negotiation (Tam 1998). Mediation is performed by a third-party mediator, if negotiation cannot provide a satisfactory solution. Arbitration is a method where disputants agree to seek solutions by the decision of an arbitrator, where the solution may be legally enforced. Litigation is considered as the ultimate legal method for settling controversies or disputes between and among persons, organizations, and governments. It is obvious that when disputes occur,

disputants need to decide on which resolution to pursue. In this article, a criterion-based rating method is utilized.

2.1 Criteria for Dispute Resolution Selection

Cheung and Suen (2002) did a study by sending a survey to 13 professionals to identify five most important criteria for selecting a construction dispute resolution strategy from a list of 16. Based on the voting results, the five most important criteria were overall duration, relative cost, flexibility in issues and strategy, confidentiality, and preservation of the relationship. Other minor considerations included binding decision and enforcement, degree of control by parties and degree of control by third-party neutral, etc. In the construction industry, different entities will put ahead their own interests and preferences to choose the criteria to evaluate. In terms of having a quantitative rating system, the criteria weighting system is developed.

2.2 Criteria Raw Points

The scores in the study by Cheung and Suen (2002) to identify important criteria were converted to raw points as summarized in Table 1. Higher scores represent higher suitability and appropriateness. Raw points act as base parameter in the entire selection procedure. In the next step, the weighting evaluation is done by using the analytic hierarchy process (AHP).

Table 1. Raw points for the dispute resolutions strategies (Data source: Cheung and Suen, 2002).

Attribute designation	Decision parameter	Dispute resolution strategies			
		Negotiation	Mediation	Arbitration	Litigation
A	Overall duration	9	8	2	1
B	Relative cost	8	8	2	1
C	Flexibility	10	9	5	1
D	Confidentiality	8	8	9	2
E	Preservation of relationship	9	8	3	1
F	Binding decision and enforcement	1	2	10	10
G	Degree of control by parties	10	9	5	3
H	Degree of control by third party neutral	1	3	9	10

2.3 Weighting Method

The weights assigned to selected criteria in the construction dispute case can be somewhat subjective. Therefore, a systematic weighting method is necessary. Hence, the analytical hierarchy process (AHP) is adopted to ascertain the priority ratings of those weights, and also to ascertain whether the weights have been assigned with reason, without bias. The AHP process employs pairwise comparison techniques in which the disputants must make judgments on the relative standings of the criteria, and it is guided by an importance scale shown in Table 2.

2.4 Selection Procedure

When there is a dispute in a construction project, disputants can use the following step-wise procedure to identify the appropriate resolution:

1. Evaluate the dispute and review the criteria for selection;
2. Select major criteria that apply to the dispute and conduct pairwise comparisons;
3. Apply the results from pairwise comparisons to AHP to obtain normalized weights for each selected criterion;
4. Get the raw points of each selected criterion for every dispute resolution from Table 1;
5. Calculate the weighted scores by multiplying the raw points by the normalized weights;
6. Get the total weighted score for each dispute resolution, and compare the results;
7. Select the appropriate dispute resolution based on total weighted score. Usually the highest score represents the most favorable choice.

Table 2. Importance scale.

Level of preference	Numerical points	Reciprocal for diagonal
Equal	1	1
Moderate	3	0.33
Strong	6	0.17
Very Strong	9	0.11

3 CASE STUDIES

In the construction industry, disputes usually occur between or among partners, collaborators, owners and contractors, etc. Based on the different roles and requirements on a construction project, and to illustrate the selection of a dispute resolution technique, the following six cases are studied:

Case I: Large enterprise/corporation
Case II: Small business owner
Case III: General contractor
Case IV: Subcontractor
Case V: Disputant who wants to maintain a good business relationship
Case VI: Disputant who is in a high-confidentiality environment

Table 3. Selection criteria for six cases.

Attribute designation	Decision parameter	Case I	Case II	Case III	Case IV	Case V	Case VI
A	Overall duration	X	X	X	X	X	X
B	Relative cost	X	X	X	X	X	X
C	Flexibility				X		
D	Confidentiality	X		X			X
E	Preservation of relationship	X		X		X	
F	Binding decision and enforcement						
G	Degree of control by parties			X			
H	Degree of control by third party neutral						

When a construction dispute arises, the involved parties must evaluate all listed criteria and select the relevant ones to reflect their business interests and aspirations. Table 3 shows the different choices of criteria for the six cases based on the relevance they have to the specific case

(Haugen and Singh 2014). It is noticeable that all the cases considered overall duration and relative cost as their dispute resolution factors. From Table 1, it is obvious that negotiation and mediation have the highest points in these two criteria. Furthermore, negotiation or mediation may be decided as the best practice for dispute resolution even without conducting the selection procedure. However, the detailed selection procedure is still necessary to provide a quantitative guidance for the disputants to take final decisions.

Subsequently, the weights for each criterion are calculated using pairwise comparison as shown in Tables 4 to 9. Attribute designations A to H are assigned to each criterion. Selected criteria are paired, and level of preference is assigned to each pair using the numerical scale shown in Table 2. For example, in Case I, E (preservation of relationship) has strong preference over D (confidentiality). Therefore, the scale number "6" is filled in the corresponding cell; while 0.17 is filled in the reciprocal cell. Furthermore, the geometric mean and normalized weight are calculated (Saaty 1980).

Table 4. Pairwise and AHP matrix for Case I.

Criteria	Pairwise/AHP points				Geometric mean	Normalized weight
	E	D	A	B		
E	1	6	3	0.17	1.32	0.20
D	0.17	1	0.17	0.11	0.24	0.04
A	0.33	6	1	0.17	0.76	0.12
B	6	9	6	1	4.24	0.65
Sum	-	-	-	-	6.55	1.00

Table 5. Pairwise and AHP matrix for Case II.

Criteria	Pairwise/AHP points		Geometric mean	Normalized weight
	A	B		
A	1	0.33	0.58	0.25
B	3	1	1.73	0.75
Sum	-	-	2.31	1.00

Table 6. Pairwise and AHP matrix for Case III.

Criteria	Pairwise/AHP points					Geometric mean	Normalized weight
	E	D	A	B	G		
E	1	6	6	0.17	6	2.05	0.24
D	0.17	1	0.33	0.11	6	0.52	0.06
A	0.17	3	1	0.17	3	0.76	0.09
B	6	9	6	1	9	4.93	0.58
G	0.17	0.17	0.33	0.11	1	0.25	0.03
Sum	-	-	-	-	-	8.51	1.00

Table 7. Pairwise and AHP matrix for Case IV.

Criteria	Pairwise/AHP points			Geometric mean	Normalized weight
	A	B	C		
A	1	0.11	0.33	0.33	0.06
B	9	1	9	4.33	0.81
C	3	0.11	1	0.69	0.13
Sum	-	-	-	5.35	1.00

Table 8. Pairwise and AHP matrix for Case V.

Criteria	Pairwise/AHP points			Geometric mean	Normalized weight
	E	A	B		
E	1	9	6	3.78	0.75
A	0.11	1	0.17	0.26	0.05
B	0.17	6	1	1.00	0.20
Sum	-	-	-	5.04	1.00

Table 9. Pairwise and AHP matrix for Case VI.

Criteria	Pairwise/AHP points			Geometric mean	Normalized weight
	D	B	A		
D	1	9	9	4.33	0.79
B	0.11	1	6	0.87	0.16
A	0.11	0.17	1	0.26	0.05
Sum	-	-	-	5.46	1.00

Table 10. Case scores summary.

Case/Criteria		AHP Scores	Negotiation		Mediation		Arbitration		Litigation	
			Raw Points	Score	Raw Points	Score	Raw Points	Score	Raw Points	Score
I	E	0.20	9	1.81	8	1.61	3	0.60	1	0.20
	D	0.04	8	0.29	8	0.29	9	0.32	2	0.07
	A	0.12	9	1.04	8	0.93	2	0.23	1	0.12
	B	0.65	8	5.18	8	5.18	2	1.29	1	0.65
	Total			**8.32**		**8.00**		**2.45**		**1.04**
II	A	0.25	9	2.25	8	2.00	2	0.5	1	0.25
	B	0.75	8	6	8	6.00	2	1.5	1	0.75
	Total			**8.25**		**8.00**		**2**		**1**
III	E	0.24	9	2.17	8	1.93	3	0.72	1	0.24
	D	0.06	8	0.49	8	0.49	9	0.55	2	0.12
	A	0.09	9	0.80	8	0.71	2	0.18	1	0.09
	B	0.58	8	4.64	8	4.64	2	1.16	1	0.58
	G	0.03	10	0.30	9	0.27	5	0.15	2	0.06
	Total			**8.39**		**8.03**		**2.76**		**1.09**
IV	A	0.06	9	0.56	8	0.50	2	0.12	1	0.06
	B	0.81	8	6.47	8	6.47	2	1.62	1	0.81
	C	0.13	10	1.30	9	1.17	5	0.65	1	0.13
	Total			**8.32**		**8.13**		**2.39**		**1.00**
V	E	0.75	9	6.74	8	5.99	2	1.50	1	0.75
	A	0.05	8	0.42	8	0.42	2	0.10	1	0.05
	B	0.20	10	1.98	9	1.78	5	0.99	1	0.20
	Total			**9.15**		**8.20**		**2.59**		**1.00**
VI	D	0.79	8	6.33	8	6.33	9	7.13	2	1.58
	B	0.16	8	1.28	8	1.28	2	0.32	1	0.16
	A	0.05	9	0.44	8	0.39	2	0.10	1	0.05
	Total			**8.05**		**8.00**		**7.54**		**1.79**

Table 10 summarizes the final dispute resolution selection for the six cases, the numerical results show that the most preferred resolution for all six cases is negotiation, followed by mediation; least preferable option is litigation. However, in real construction disputes, negotiation

may not always work, in which case the disputants must select other resolutions based on their situation.

Consistency Ratio (CR) is used to verify the reasonability of the pairwise comparison and weights. CR is the ratio between CI and RI, where a reference random index (RI) is provided for different sizes of an AHP matrix. The Consistency Index (CI) is calculated using Equation 1 (Saaty, 1980), in which, λ_{max} is the largest eigenvalue for the *n* size AHP matrix.

$$CI = \frac{\lambda_{max} - n}{n - 1} \tag{1}$$

For instance, if the acceptable consistency ratio is 15%, Case I yields a consistency ratio of 14.4%. Being less than 15%, the assignment of weights is considered reasonable.

4 DISCUSSION AND CONCLUSION

Among the six cases, Case I to Case IV considered overall duration and relative cost as the first two priorities due to the nature of the business. However, if different companies or parties will make distinctive decisions in pairwise comparison, the results may vary. Case V and Case VI represent particular requirements that may occur in the construction industry. As such, the resolution procedure recommended negotiation as the first option. Owners should also consider using alternate resolution based on their own market position and business attribute. It is worth noticing that in Case VI, the score of arbitration is 7.54, only 0.5 less than mediation. It is indicated that when confidentiality has high priority in the business, choosing arbitration as the dispute resolution should be in the construction contract.

By conducting six hypothetical case studies, this paper presented a numerical method for dispute resolution selection, based on eight measures such as overall duration, relative cost, flexibility, confidentiality, etc. Among these four resolution strategies, negotiation and mediation were discovered to be the most favorable solutions. Furthermore, based on the different demands in dispute events, eight major criteria provided a guideline for disputants to convert their subjective opinion into a systemic rating system by using pairwise comparison and AHP. The following observations are made to these six cases:

- Overall duration and cost are considered primarily in all six cases.
- Because of the time consuming and expensive litigation process, ADR methods are preferred over litigation.
- Negotiation was the most preferred, followed closely by mediation, and then by arbitration. Litigation is the least preferred by a factor of more than 4 times compared to negotiation.

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