Conceptualising Bias in Construction Dispute Negotiation

Keyao Li and Sai On Cheung

Introduction

Capital investments are characterised by massive resource input, long duration and lasting uses [1, 2]. Quality is one of the key indicators of a successful project because the built facilities are expected to last and function for a long period. Furthermore, infrastructural developments are used quite commonly as economic booster at times of recession. Capital investments have the ripple effect in vitalising other industries within the supply chain. With the advancement in living standard and the concern over preserving the natural environment, sustainable construction is now much advocated. Very often, this change in working paradigm is not met with sufficient commitment and enthusiasm. One reason may well be the lack of environmental concern of the stakeholders of the construction industry. Another possible cause is the profit maximising orientation of construction enterprises. This chapter offers an investigation on biases in construction decisions in general and for dispute in particular. The former provides the theoretical bases that support the conceptualisation of the latter.

Human factor in construction project is very much understudied in the construction project management domain. In fact, the complex contractual network and enormous resources that are at stake make rational analysis very difficult in many construction decisions [3]. Disputes are therefore inevitable in different phases of construction projects [4–6]. Dispute management is one of the key functions of construction professionals. Most professionals consider themselves rational and work according to principles. Observations by dispute facilitators suggest otherwise [7]. Cognitive

K. Li (✉)
Future of Work Institute, Faculty of Business & Law, Curtin University, Perth, Australia
e-mail: Keyao.li@curtin.edu.au

S. O. Cheung
Construction Dispute Resolution Research Unit, City University of Hong Kong, Hong Kong, China
e-mail: Saion.cheung@cityu.edu.hk

S. O. Cheung (ed.), *Construction Dispute Research Expanded*, Springer Tracts in Civil Engineering, https://doi.org/10.1007/978-3-030-80256-1_2

bias is a kind of psychological barrier against dispute negotiation [8–10, 3]. Biases obviate rational decisions that derail proper negotiation courses [11–14]. Li and Cheung [15] first explored the potential of bias happening in construction dispute negotiation (CDN). It was found that repeated evaluations invite biases. Studying biases in CDN should aim to mitigate its effect so that the chance of having negotiated settlement is preserved. If successful, the significance is evidently clear. In addition, construction project can be delivered more efficiently without wasting enormous time and resources. Hence, alleviating bias in CDN would increase sustainability parameters of construction projects in the following aspects: (1) economic aspect, minimizing the expenses and costs of settling construction dispute by smoothing and shortening the protracted dispute resolution processes [3]; (2) environmental aspect, saving enormous resources and materials that would be wasted in the prolonged dispute resolution processes [16, 17], and (3) social aspect, improving the intense relationship between the disputing parties and enhancing partnership collaboration and healthy community in construction industry [1, 18].

This study first offers biases conceptualisation for the purpose of establishing theoretical anchor for further studies on biases in CDN. Accordingly, types of bias in CDN are proposed.

To achieve this aim, five stages of work are involved. First, the constructs of bias are developed. Second, the extent of impact of biases is examined. Third, approaches to minimise biases are studied. Fourth, the usefulness of the bias minimising measures is evaluated. Fifth, a summary is provided. The flow of the study is presented in Fig. 1.

Bias Constructs in Construction Dispute Negotiation (CDN)

The empirical evidence of happening of biases in CDN has been reported in Chapter One. The characteristics and theoretical background of cognitive biases had also been outlined. Repeated evaluations may not always improve the quality of the decisions, with biases taking heel, rational decisions may become more remote. Providing a theory-rich bias conceptualisation underpins and paves the path for further studies on biases in CDN. This study therefore aims to develop a robust bias conceptualization in CDN with different sets of data collected from three sources. The first set of data is self-reflection by the disputants, which was collected in [16] with sixteen identification statements operationalised. The second set of data is self-realization of the respondents who participated in a construction project dispute resolution simulation. The simulation includes contextual information, making the environment closer to reality. In this way, the decisions in the simulation were more tangible and reflecting the real-life situation. The third set of data was collected from practicing third party neutrals. Their assessment on the practice of biased behaviours are based on their observations. It is believed that their assessment would be more objective when compared with self-reflection and self-realization. Further information on the three data sets is given here follows.

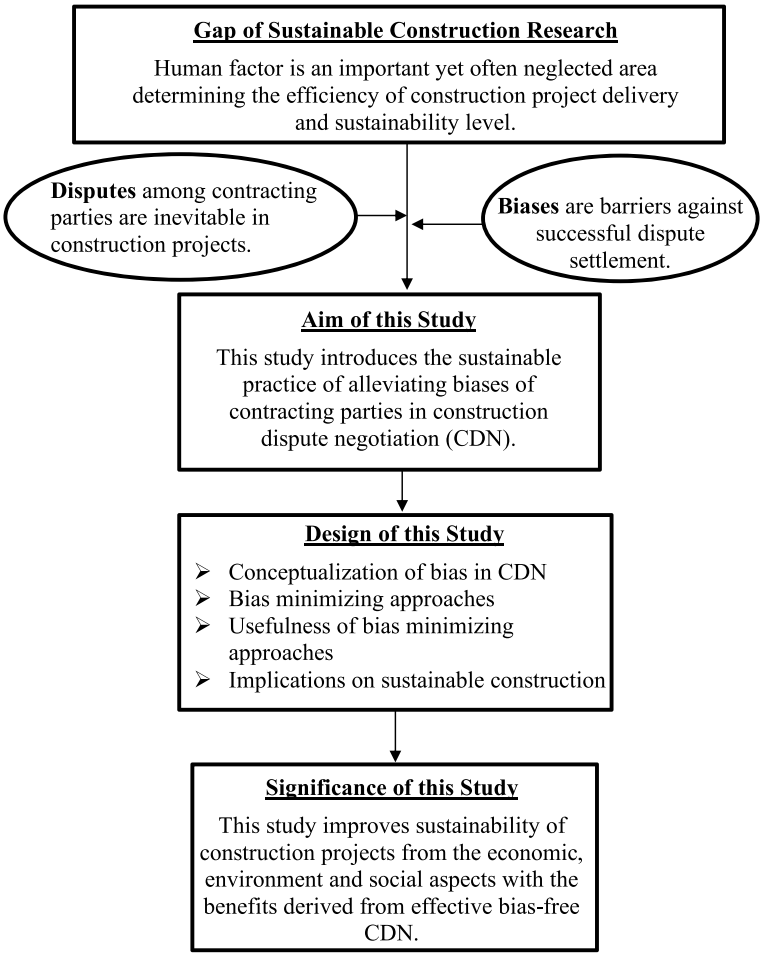

Fig. 1 Flow of the study

Self-reflection of Disputants

First set of data is extracted from self-reflection of disputants collected by [16]. In that study, bias identification statements were developed by operationalizing effects of bias into biased behaviours. Respondents were then asked to rate on the frequency of happening of the bias behaviours according to the reflection of their own CDN practice. A Likert six-point scale was used. For the second set of data, the respondents of the first data set [16] were approached for participation in the simulation (details to follow). Their responses were called self-realization. Only the data provided by those respondents who completed both self-reflection survey and simulation in this study were used for data analysis. Profile of the respondents to both self-reflection

Table 1 Profile of the subjects completed in both self-reflection survey and simulation

Professional organization	Percentage (%)	Dispute involved	Percentage (%)	Years of experience	Percentage (%)
Contractor	26.8	Building services work	12.5	Below 5 years	19.6
Client	37.5	Building (foundation) work	7.1	5–10 years	46.4
Consultant	35.7	Building (superstructure) work	46.4	11–15 years	21.4
Total	100	Civil engineering work	19.6	16–20 years	8.9
		Maintenance work	14.3	Above 20 years	3.6
		Total	100	Total	100

survey and self-realization simulation is shown in the Table 1. A total of 56 responses were obtained for this study.

Principal component factor analysis (PCFA) was applied to the first set of data to unveil the underlying bias constructs. IBM SPSS version 24.0 was used. Varimax rotation was applied and sampling adequacy and suitability of the data were supported by Kaiser–Meyer–Olkin (KMO) value of 0.697 ($\geq$0.6) and significant Bartlett's test of sphericity result (<0.001)[19, 20]. Eigenvalue greater than one was considered as significant for factor extraction as suggested by Hair et al. [21]. Accordingly, only bias manifestations with factor loadings larger than 0.5 were retained [22–24]. The PCFA result points to a four-factor structure without cross loading (Table 2). The four constructs of bias are: preconception, self-affirmation, optimism and interest-oriented. Preconception bias describes that disputants form preconceptions about the dispute before commencing CDN. Furthermore, their subsequent assessments were also heavily influenced by these preconceptions. Once preconceptions were formulated, it is mentally hard to ignore and go back to first principles. Self-affirmation bias occurs when disputants in CDN selectively search information with the aim of supporting their already held positions. This would prevail even other possible options become available. Optimism biased disputants are having unrealistic expectation that their requirements would be satisfied. Very often the expectation has been elevated without reasonable grounds. Interest-oriented bias makes disputants only focus on their own interests even at the expense of neglecting win–win solutions. All four types of biases would render communication ineffective among the disputing parties in CDN.

Table 2 Bias constructs extracted from the three sets of data

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
Preconception bias	1. My final assessment has been influenced by the first offer of E	0.732				0.580				0.807			
	2. My assessment has been influenced by unsubstantiated figures raised by E during the resolution process	0.774				0.766				0.769			

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	3. My decision has been adjusted because of the ambitious arguments of E	0.766				0.586				0.655			
	4. I cannot get away with my claim amount HK$ 1.13 billion made before the mediation stage	0.540				0.611				0.786			

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
Self-affirmation bias	5. When receiving new information, I have paid more attention to the information that is consistent with my prior knowledge of the dispute		0.585				0.570				0.741		

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	6. I have inclined to interpret further information as evidences to justify my assessment of the claim		0.625				0.667				0.732		
	7. I search for information that confirms my assessment		0.840				0.849				0.685		

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	8. I would endorse information that supports my assessment		0.688				0.847				0.679		
Optimism bias	9. I have been very optimistic about the likelihood of winning irrespective of the arguments of E			0.556				0.646				0.794	

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	10. I totally believe that the outcome of the resolution will be good for my party			0.737				0.679				0.873	
	11. I am very confident that my ambitious arguments will succeed			0.778				0.699				0.770	

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	12. If the mediation fails to reach a settlement, I believe I know this outcome all along			0.661				0.605				0.630	
Interest-oriented bias	13. I think that E is having bias				0.712				0.664				0.822

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	14. If the mediation fails to reach a settlement, I believe We should take greater responsibility				0.857				0.862				0.847
	15. If the mediation fails to reach a settlement, I believe the arguments of E during the mediation are unreasonable				0.506				0.856				0.631

(continued)

Table 2 (continued)

	Manifestations in CDN	Data set 1: self-reflection				Data set 2: self-realization				Data set 3: 3rd party neutral			
		Factor				Factor				Factor			
		1	2	3	4	1	2	3	4	1	2	3	4
		1.328*	1.819*	1.540*	5.018*	1.540*	2.857*	1.866*	3.345*	1.313*	2.779*	4.480*	1.778*
	16. If the mediation fails to reach a settlement, I believe the failure of mediation is inevitable because of the opportunistic attitude of E				0.822				0.698				0.502

*The initial eigenvalues for each factor

Self-realization of Disputants Through a CDN Simulation

Self-reflection data may be affected by the inherent bias of the respondents. Another method was used to obtain data from the same group of respondents—answering what they would do in a simulated construction project dispute resolution situation. The data collected from the simulation is called self-realization to distinguish from the way data were obtained in the self-reflection survey. Simulation aims to create a decision environment closer to reality by incorporating contextual information. The dispute was related to a simulated land reclamation project. There are four parts in the simulation. Part A introduces particulars of the project, including project scope, contract sum and contract period. Part B explains the dispute and include the issues, arguments presented and the amount in dispute. In Part C, the respondents went through the mediation of the dispute including preparation before mediation, joint caucus and then private caucus. In Part D, respondents were asked to describe their decision-making approaches taken in the simulation by rating the bias identification statements that were developed by Li and Cheung [16] with a seven-point Likert Scale from "1 = Strongly Disagree" to "7 = Strongly Agree". Higher scores would suggest greater chance of happening of the biased behaviours. These bias identification statements have been modified in contexts with due regard for the simulation. For example, "I cannot get away with the assessments made at prior round of resolution of the dispute." was changed to "I cannot get away with my claim amount HK$ 1.13 billion made before the mediation stage."

56 valid responses to the simulation were received (the self-reflection data set has 105 responses). The profile of the subjects participated in the simulation is shown in Table 1. When extracting the factor structure, PCFA suggests the same four bias constructs as shown in Table 2.

Observations of Third-Party Neutrals

To explore the bias constructs from another perspective, the third Data Set was collected from practicing construction dispute third party neutrals, including accredited mediators, arbitrators and adjudicators in CDN. This approach further avoids the influence of bias inherent within the disputants as respondents. Moreover, the observation of third-party neutral can only be useful if the observations are truly reflective of the thinking of the disputants. Input of experienced third-party neutral is thus critical. As an international business and financial centre, Hong Kong offers full range of high-quality professional dispute resolution services. Accredited third-party neutrals listed in globally recognized dispute resolution services providers were approached. The contacts of potential respondents were collected from learned societies, including Society of Construction Law Hong Kong (SCLHK), the Hong Kong International Arbitration Centre (HKIAC), the Hong Kong Mediation Accreditation Association Limited (HKMAAL), the Hong Kong Institute of Arbitrators (HKIAB) and the Hong

Kong Institution of Engineers (HKIE). This group of third-party neutrals are having a good mix of expertise as they come from various professional backgrounds as well as nationality, practice location, jurisdiction of admission and dispute resolution expertise. The validated bias identification statements previously used were distributed to third party neutrals to solicit their opinion on the frequency of disputants having these behaviours with a frequency scale from "1 = Never" to "7 = Always".

The survey was distributed online through email with a cover letter introducing the background information of the study. In total, 66 valid responses were received out of more than 600 questionnaires distributed. Among the respondents, 76% of them have more than 15 years' experience in CDN, nearly 60% of them have worked in CDN for more than 20 years. The profile of the respondents is shown in Table 3. Practice locations of the respondents presented in Fig. 2. This set of data is the third of the study.

PCFA was performed to explore the constructs of bias based on the responses received under Data Set Three. KMO value of 0.68 and significant Bartlett's test of sphericity result supported the sampling adequacy and data suitability [19]. Again, only identifications with factor loadings larger than 0.5 were retained and factor matrix extracted is shown in Table 2. The same four bias constructs were extracted, indicating that third-party neutral group observed the same four types of bias occurring in CDN—preconception, self-affirmation, optimism and interest-oriented. Thus, these four bias constructs were verified by Data Set Three. The robustness of the bias constructs is enhanced by the consistent results obtained from the three data sets.

Table 3 Profile of the third-party neutral respondents

Years of experience	Percentage (%)	Roles in CDN	Percentage (%)
Less than 5 years	6	Mediator	42
5–10 years	11	Arbitrator	53
11–15 years	7	Adjudicator	3
16–20 years	17	Others	2
More than 20 years	59	Total	100
Total	100		
Dispute type	Percentage (%)	Cause of the dispute	Percentage (%)
Building services installations	4.5	Risk uncertainty	7.6
Building (Foundation) Work	7.6	Collaboration among the parties	19.7
Building (Superstructure) Work	36.4	Contract incompleteness	42.4
Civil engineering work	39.4	Opportunistic behaviour	12.1
Maintenance work	9.1	Affective conflict	1.5
Others	3.0	Others	16.7
Total	100	Total	100

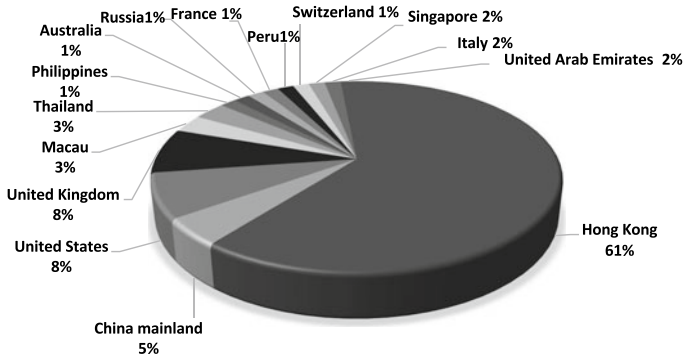

Fig. 2 Practice locations of the respondents

Magnitude of the Biases

Magnitude score (MS) can be used to indicate the potency of the four sources of bias [18]. As the constructs of bias reflect the respective sources of bias, the MS for each source of bias was calculated as the average of the mean scores of the bias identification statements under each bias construct and was calculated according to the Eq. (1):

$$MS_i = \frac{\sum_{j=1}^{n} BS_{ij}}{n} \tag{1}$$

where MS_i is the magnitude score of bias type i; BS_{ij} is the mean score of the j th bias identification statement of bias type i; n is the number of bias identification statements in bias type i.

The MSs of the sources of bias are listed in Table 4. In Data Set One, the assessment of bias practice was based on a six-point Likert Scale frequency level. In Data Set Two and Three, seven-point Likert Scale was employed. Transformation of the assessments in Data Set One was conducted for easy comparison with the following Eq. (2) as recommended by statistical handbook [25]:

$$\mathrm{R7} = \frac{R6 - 1}{5} \times 6 + 1 \tag{2}$$

where R7 is the rescaled variable, which is 1 to 7 scale in this study; R6 is the original scale, which is 1–6 scale in this study.

After the MSs were transformed into a same metric, it can be noted that the MSs of the biases in Data Set Two (self-realization) are larger than the MSs in Data Set One (self-reflection). The results indicate that with the same group of respondents, use of simulation made biased behaviours more notable. Moreover, the relative rankings of the biases remain unchanged for Data Set Two and Data Set One. Hence, in both Data Set Two and Data Set One, self-affirmation bias was identified as the strongest and happened most frequently. It thus was confirmed by the disputants that they tended to

Table 4 Magnitude of biases in data set one, data set two and data set three

Bias magnitude in CDN									
Data set one				Data set two			Data set three		
Bias type	MS (6-point Scale)	MS (7-point Scale)	Rank	Bias type	MS (7-point Scale)	Rank	Bias type	MS (7-point Scale)	Rank
Pre-conception	2.85	3.22	4	Pre-conception	4.16	4	Pre-conception	4.06	4
Self-affirmation	4.17	4.80	1	Self-affirmation	5.32	1	Self-affirmation	5.05	2
Optimism	3.38	3.86	3	Optimism	4.33	3	Optimism	4.59	3
Interest-oriented	3.40	3.88	2	Interest-oriented	4.38	2	Interest-oriented	5.13	1

defend themselves and did not mind or subconsciously collect and interpret information in pre-disposed manner. Interest-oriented bias was ranked 2nd highest and can be interpreted as confession of the disputants about their interest-maximization strategy. Optimism and preconception were ranked 3rd and 4th, indicating that although the disputants are overly optimistic and affected by previously formed perception, they believe these two types of behaviours happen less frequently than self-affirmation and interest-oriented tendency.

The MSs of the biases based on the Data Set Three were shown in Table 4. The four constructs of bias in Data Set Three are higher than those obtained from Data Set One, suggesting that 3rd party neutrals in CDN observed more frequent happening of biased behaviours of disputants than the self-reported results. Looking into the rankings of MSs obtained from the three data sets, it can be concluded that by the inclusion of contextual information whereby the respondents can more readily relate to their practices. In other words, contextual information of CDN scenario makes biased behaviours more apparent. Third party neutrals' responses were based on their observations of disputing parties' biased practices in real CDN situations and may well be the most objective among the three. Similarly, the third-party neutrals observed more frequent happening of biased behaviours than the self-reflection of the disputants in Data Set One.

It cannot be excluded that the disputants may have the tendency to project positive self-image of being professional and be influenced by biases in their decisions. As such, they were more reluctant to admit that they had made biased decisions [26, 27]. Their self-reflection on their biased behaviours in Data Set One may well have been downplayed. Besides, the bias magnitude ranking in Data Set Three is slightly different from the results in Data Set Two and Data Set One. Third-party neutrals consider that interest-oriented bias rather than self-affirmation is the strongest bias displayed by disputants. As third-party neutral can only deduce the thinking of the disputants through their decisions during the negotiations like proposals and exchange of offers, it is not too surprising to spot self-interest disposition that is more manifest. Interest-oriented bias explains why aggression is used even without justifiable causes. Interest-oriented bias is thus more notable and observable. For example, it is easier for the third party neutral to objectively observe that the disputants are bargaining for their self-interest by insisting on their positions without any will to compromise. Self-affirmation bias focuses on disputants' suboptimal choices in information searching and interpretation, which are more subtle and less detectable from observations. Thus, it is harder to observe disputants' behaviours of biased information analysis as these are mental processes.

To summarize the findings for objective one, with three different data sets, the same four constructs of bias in CDN have been resulted from PCFA. The following section of the chapter deals with the work for the accomplishment of objective two.

Bias Minimizing Approaches

To accomplish objective two, four bias minimizing approaches are identified through a literature review. These are: (1) allow adequate time and effort in making decisions; (2) consider the opposite and question oneself; (3) keep rational and consider long-term benefit; and (4) review design of dispute resolution mechanism. These approaches were further operationalized into twenty bias minimizing measures. The afore-mentioned bias minimizing measures and their respective references are listed in Table 5.

The usefulness of the listed bias minimizing measures was evaluated. First, the measures were incorporated in the CDN simulation as consulting mediators' suggestions. In Part D of the simulation, respondents were asked to consider the usefulness of these bias minimizing measures from "1 = Helpless" to "7 = Absolutely helpful". The practicality of these bias minimizing measures was also considered by the practicing third-party using the afore-mentioned scale. With the ratings by the disputants and third-party neutrals, the relative usefulness of these bias minimizing measures was calculated. The Usefulness Index (UI) of each single bias minimizing measure was calculated by Eq. (3) [68, 69]:

$$\text{Usefulness Index} = \frac{\sum_{i=1}^{7} (a_i * x_i)}{6 \sum_{i=1}^{7} x_i} \tag{3}$$

where a_i = constant expressing the weight assigned to the ith response; $a_i = 0, 1, 2, 3, 4, 5, 6$ for $I = 1, 2, 3, 4, 5, 6, 7$, respectively; $a_1 = 0$ is assigned to "Helpless"; $a_7 = 6$ is assigned to "Absolutely helpful"; X_i = the percentage of the degree of helpfulness; X_1 = percentage of frequency of "Helpless" responses; X_7 = percentage of frequency of "Absolutely helpful" responses.

The UIs of the bias minimizing measures were calculated and shown in Table 5. Usefulness of each approach was calculated as the average of the UIs of the bias minimizing measures under the approach. The usefulness of these approaches was ranked in Table 5 as well. The usefulness indices were grouped in Table 6 to show the respondents' evaluation.

From Tables 5 and 6, it can be seen that disputants rated the four approaches as "Moderately Useful". Third party neutrals rated Approach 1: Allow adequate time and effort in making decisions, Approach 2: Consider the opposite and question oneself and Approach 3: Be rational and consider long-term benefit as "Reasonably Useful". Approach 4: Dispute resolution mechanism design was rated as "Moderately Useful". Therefore, these bias minimizing approaches were validated by both disputants (Data Set Two) and third-party neutrals (Data Set Three).

Besides, both the disputants and third-party neutrals ranked similarly the usefulness of the four bias minimizing approaches. They believe Approach 3: Be rational and consider long-term benefit as the most useful among the four approaches because uncontrolled emotion invites biases. Staying rational, enhancing mutual understanding and focusing on long-term benefit and reputation were rated as valuable

Table 5 Usefulness of bias minimizing approaches and measures

Bias minimizing approaches and measures	References	UIs data set two (Rank)	UIs data set three (Rank)
• ***Strategy-based (for preconception bias and self-affirmation bias)***			
• ***Approach 1: Allow adequate time and effort in making decisions***		***40.10 (2)***	***47.6 (2)***
1. Disputants should allow adequate time for making decision to avoid premature closure of thinking	[28–31]	40.17	47.17
2. Disputants should review the case and the possible bottom line of the counterpart when a very low offer was forwarded	[29, 32]	42.17	43.50
3. Disputants should check the accuracy of the evidences provided by the counterpart	[29, 32]	43.83	52.00
4. Disputants should delay forming an assessment until all the available information has been considered	[32, 33]	34.33	45.00
5. Disputants should be open to other alternatives even after a first assessment about the dispute has been formed	[34–37]	40.00	50.50
• ***Approach 2: Consider the opposite and question oneself***		***38.38 (3)***	***46.6 (3)***
6. Disputants should consider information that may work against a prior assessment	[32, 38, 39]	37.83	45.83
7. Disputants should readily question the soundness of a prior assessment	[30, 40–42]	37.83	47.00
8. Disputants should review the reasons of the counterpart	[42–45]	42.33	49.50
9. Disputants should ask for feedbacks and assistance from third party neutral	[46, 47]	35.50	44.17
• ***Attitude-based (for Interest-oriented bias and Optimism bias)***			
• ***Approach 3: Be rational and consider long-term benefit***		***40.60 (1)***	***49.3 (1)***

(continued)

Table 5 (continued)

Bias minimizing approaches and measures	References	UIs data set two (Rank)	UIs data set three (Rank)
10. Disputants should consider mutually beneficial trade-offs between the parties	[16, 33, 48–50],	43.33	51.00
11. Disputants should avoid being emotional	[33, 51–54]	45.17	53.33
12. Disputants should try to understand the position of their counterpart by stepping in their roles	[36, 55–57]	40.83	49.83
13. Disputants should respectfully listen to their counterpart's grievances	[36, 55–57]	40.33	49.33
14. Disputants should consider long-term relationship and future collaboration with their counterpart in handling the dispute	[14, 51, 58, 59]	39.83	46.83
15. Disputants should consider the chance of settlement failure	[44, 60–62]	36.83	48.50
16. Disputants should think about their own responsibilities when the dispute fails to settle	[59, 63]	37.83	46.17
• ***Process-based (for Preconception bias and Interest-oriented bias)***			
• ***Approach 4: Review design of dispute resolution mechanism***		***35.38 (4)***	***36.4 (4)***
17. Disputants should receive de-biasing training before participating in resolution processes	[14, 29, 44, 60, 64, 65]	33.50	37.33
18. To start a new round of resolution, the resolution team should include new members	[44, 66]	34.00	30.17
19. Re-assessment and reconstruction of decisions are required to start a new round of resolution	[33, 67]	36.50	38.50
20. A process to ensure needs are reviewed is required at each round of resolution	[33, 67]	37.50	39.67

Table 6 Usefulness groups and indices

Usefulness group	Usefulness Index (UI)
Useless	0–14.3
Slightly useful	14.3–28.6
Moderately useful	28.6–42.9
Reasonably useful	42.9–57.2
Very useful	57.2–71.5
Most useful	71.5–85.8
Absolutely useful	85.8–100

measures because all these underpin rational analysis. Approach 1: Allow adequate time and effort in making decisions was ranked as the 2nd most useful, therefore, adequate time and effort in decision making were confirmed in calming heated disputants and encouraging a considerate and mature decision. Approach 2: Consider the opposite and question oneself and Approach 4: Dispute resolution mechanism design were ranked 3rd and 4th in usefulness respectively.

Grouping of Bias Minimizing Approaches

This part of the chapter analyses bias minimizing approaches based on their nature and with reference to the types of bias identified for objective one. Accordingly, three groups of approach are proposed: strategy-based, attitude-based and process-based. Table 5 gives the tabulated framework together with the UIs.

Strategy-Based

Approach one (allow adequate time and effort in making decisions) and approach two (consider the opposite and question oneself) were grouped into strategy-based group of bias minimizing approach. It is advocated that disputants would obtain a better picture of the current situation and a more holistic view of the dispute through taking enough time to review the case and carefully considering the offer and evidence provided from the counter project team. Assessment should not be hastily taken before available information was considered. This would lower the chance of being affected by preconception of the issue in dispute. Hence, enough time and effort paid in making assessment would avoid a premature formation of opinion and position that will become enduring preconception. Besides, questioning previously held positions before making every major decision would help disputants objectively review their earlier assessments about the issue in dispute. Seeking feedbacks and assistance from third party neutrals (consulting mediators and dispute resolution

advisors) would also help disputants to get an outsider point of view whereby avoiding self-affirmation. Therefore, approach one and approach two are strategies helping project contracting parties to obtain a holistic view of the dispute and to keep an open mind to further information. Preconception bias and self-affirmation bias would be minimized correspondingly.

Attitude-Based

Approach three (be rational and consider long-term benefit) minimizes bias by adjusting project contracting parties' attitude and restraining their negative emotions in making decisions. This attitude-based strategy group is effective in alleviating disputants' interest-oriented and optimism biased behaviours. By considering mutual benefits, meaningful trade-offs, long-term relationship and potential future collaboration with the counterpart, disputing parties would restrain from short-term interest-maximizing behaviour. They would love to work for an amicable partnership to seek long-run benefits. Besides, when they try to step in counterpart's shoe and understand their positions and concerns, they may adopt a more collaborative negotiation. In fact, focusing on the possibility of having a win–win solution would be beneficial to the disputing parties. In addition, by reality testing with the negative impact resulting from a negotiation breakdown, the disputants would calm down and be less unrealistically optimistic. All in all, when the disputants can stay away from being too emotional, overly optimistic expectations can be avoided. As a result, they are more ready for rational decisions in construction dispute negotiation (CDN).

Process-Based

Approach four (dispute resolution mechanism design) aims to minimize bias by optimizing the CDN process. This process-based approach points to the minimization of preconception bias and interest-oriented bias. By incorporating pre-negotiation training, disputing parties would be reminded of the happening of biases. They would be trained to detect and skip possible bias minefields. In addition, including new members would also bring fresh new ideas to the CDN team. The input of new member would decrease the obstinate adherence to old positions. Re-framing of the dispute and assessment before the commencement of a new round of CDN would help the disputants to re-organize the strategy. Revisiting the assumptions, expectations etc. would mitigate the influence of preconception bias. A process of reviewing initial needs would help project disputing parties to realize that the current impasse is not conducive in achieving their needs. Disputing parties are encouraged to think about other alternatives that would better serve for their essential interests and at the same time could be accepted by the counterpart.

Implications on Dispute Management

Biases have been identified as one of the major barriers against conducive construction dispute negotiation, thus alleviating biases in CDN should be an integral part of dispute negotiation training. In fact, construction industry is dispute prone, protracted dispute resolution hampers efficiency. In the last few decades, there is clearly a rising use of multi-tiered dispute resolution (MTDR) in construction contracts. Basically, MTDR incorporates alternative dispute resolution (ADR) as pre-condition before arbitration [3, 15]. The design intent of MTDR is to resolve construction disputes in the earlier stages of ADR, without proceeding to more formal proceedings like arbitration and litigation. The advantages of implementing ADR are saving time and cost. However, MTDR may not achieve the intended outcome as repeated evaluations can be breeding ground for biases [16]. In this connection, alleviating bias in CDN as proposed in this study would enhance the efficiency of MTDR processes. Effective dispute negotiation saves substantial resources and materials that would otherwise be wasted in the prolonged dispute resolution processes.

In social aspect, alleviating bias in CDN improves the intense relationship between the construction contracting parties. Minimizing biases enhances the decision-making performance of the disputing parties and keeps them in rational courses [7]. It also reduces their negative view on each other whereby engendering more collaborative effort to seek mutual beneficial win–win positions. When biases are removed, trust relationship, partnership and positive collaboration could be built among the contracting parties [18, 70, 71]. Team efficiency, job satisfaction and employee engagement would also be increased with a positive working environment [72, 73]. Therefore, the practice of alleviating bias in CDN contributes to the building of social sustainability and healthy community in construction industry.

Summary

Biased decisions prohibit effective construction dispute negotiation [16]. Cogent dispute management calls for dispute decisions free from biases. The saving in valuable resources through amicable negotiations can be used in more productive courses. This study contributes to the body of knowledge of dispute management by offering constructs of biases in CDN. This study is robust in going beyond the conventional approach of obtaining self-reflection of biased behaviours by disputants. Instead, data was obtained from three sources: i self-reflection of disputants; ii self-realization of disputants in a dispute negotiation simulation; and iii observations of dispute resolution third party neutrals. Conceptualization of biases in CDN is triangulated by interpreting results of PCFA performed with the three data sets. The use of three sets of data served as triangulation of the empirical findings. The same four bias constructs were extracted as a result. Four major types of biases in CDN were identified as: preconception, self-affirmation, optimism and interest-oriented. This study

also suggested bias minimizing measures that address the respective bias sources. Categorically, three groups of bias minimizing measures were proposed: (i) strategy-based approach to deal with preconception bias and self-affirmation bias; (ii) attitude-based approach works to alleviate interest-oriented bias and optimism bias; and (iii) process-based approach is suitable to alleviate the effect of preconception bias and interest-oriented bias minimization. Curbing biases is a prerequisite for effective dispute negotiation and should be conducted by negotiators. Biases hamper rational decisions and derail settlement course. It is also suggested that alleviating bias would improve the relationship between construction contracting parties. Conceptualizing biases in CDN also paves the path for further studies on biases in construction.

Acknowledgements The empirical work of this chapter has been reported in a paper entitled "Alleviating bias to enhance sustainable construction dispute management" of the Journal of Cleaner Production. The texts have been substantially re-written. The support of the HKSAR RGC General Research Fund Project (no. 11209118) is duly acknowledged.

References

1. Carvajal-Arango D, Bahamón-Jaramillo S, Aristizábal-Monsalve P, Vásquez-Hernández A, Botero LFB (2019) Relationships between lean and sustainable construction: positive impacts of lean practices over sustainability during construction phase. J Clean Prod 234:1322–1337
2. Gan X, Zuo J, Ye K, Skitmore M, Xiong B (2015) Why sustainable construction? Why not? An owner's perspective. Habitat Int 47:61–68
3. Cheung SO, Li K (2019) Biases in construction project dispute resolution. Eng Constr Archit Manag 26(2):321–348
4. Cakmak E, Cakmak PI (2014) An analysis of causes of disputes in the construction industry using analytical network process. Procedia Soc Behav Sci 109:183–187
5. Cheung SO, Yiu TW (2006) Are construction disputes inevitable? IEEE Trans Eng Manage 53(3):456–470
6. Love P, Davis P, Ellis J, On Cheung S (2010) Dispute causation: identification of pathogenic influences in construction. Eng Constr Archit Manag 17(4):404–423
7. Li K, Cheung SO (2019) Unveiling cognitive biases in construction project dispute resolution through the lenses of third-party neutrals. J Constr Eng Manag 145(11):04019070
8. Hollander-Blumoff R, Tyler TR (2008) Procedural justice in negotiation: procedural fairness, outcome acceptance, and integrative potential. Law Soc Inq 33(2):473–500
9. Mnookin RH (1992) Why negotiations fail: an exploration of barriers to the resolution of conflict. Ohio State J Dispute Resolut 8(2):235–249
10. Ross L, Ward A (1995) Psychological barriers to dispute resolution. Adv Exp Soc Psychol 27:255–304
11. Brett J, Thompson L (2016) Negotiation. Organ Behav Hum Decis Process 136:68–79
12. Guthrie C, Sally D (2004) The impact of the impact bias on negotiation. Marquette Law Rev 87:817–828
13. Guthrie C, Rachlinski JJ, Wistrich AJ (2002) Judging by heuristic-cognitive illusions in judicial decision making. Judicature 86(1):44–50
14. Thompson L, Nadler J, Lount Jr RB (2000) Judgmental biases in conflict resolution and how to overcome them. The handbook of conflict resolution: theory and practice. pp 213–235
15. Li K, Cheung SO (2016) The potential of bias in multi-tier construction dispute resolution processes. In: Chan PW, Neilson CJ (eds) Proceedings of the 32nd annual ARCOM conference, vol 1, pp 197–205

16. Li K, Cheung SO (2018) Bias measurement scale for repeated dispute evaluations. J Manag Eng 34(4):04018016
17. Vazquez E, Rola S, Martins D, Freitas M, Rosa LP (2011) Sustainability in civil construction applied in the construction site phase. WIT Trans Ecol Environ 144:265–276
18. Wong PSP, Cheung SO (2004) Trust in construction partnering: views from parties of the partnering dance. Int J Project Manage 22(6):437–446
19. Cerny BA, Kaiser HF (1977) A study of a measure of sampling adequacy for factor-analytic correlation matrices. Multivar Behav Res 12(1):43–47
20. Kaiser HF (1958) The varimax criterion for analytic rotation in factor analysis. Psychometrika 23(3):187–200
21. Hair JF, Anderson RE, Tatham RL, Black WC (1998) Multivariate data analysis, 5th. Prentice Hall International, NY
22. Kannan VR, Tan KC (2005) Just in time, total quality management, and supply chain management: understanding their linkages and impact on business performance. Omega 33(2):153–162
23. Matsunaga M (2010) How to factor-analyze your data right: do's, don'ts, and how-to's. Int J Psychol Res 3(1):97–110
24. Reynolds WM (1982) Development of reliable and valid short forms of the marlowe-crowne social desirability scale. J Clin Psychol 38(1):119–125
25. Little TD (2013) Methodology in the social sciences. Longitudinal structural equation modelling. Guilford Press, New York, NY, US
26. Edwards AL (1957) The social desirability variable in personality assessment and research. The Dryden Press, New York
27. Phillips DL, Clancy KJ (1972) Some effects of "social desirability" in survey studies. Am J Sociol 77(5):921–940
28. Chapman GB, Johnson EJ (2002) Incorporating the irrelevant: anchors in judgments of belief and value. In: Gilovich T, Griffin D, Kahneman D (eds) Heuristics and biases: the psychology of intuitive judgment. Cambridge university press, pp 120–138
29. Croskerry P, Singhal G, Mamede S (2013) Cognitive debiasing 2: impediments to and strategies for change, BMJ Qual Saf, bmjqs-2012-001713
30. Epley N, Gilovich T (2006) The anchoring-and-adjustment heuristic why the adjustments are insufficient. Psychol Sci 17(4):311–318
31. Mussweiler T, Englich B, Strack F (2004) "Anchoring effect." In: Pohl R (ed) Cognitive illusions—a handbook on fallacies and biases in thinking, judgment, and memory. Psychology Press, pp 183–200
32. Galinsky AD, Mussweiler T (2001) First offers as anchors: the role of perspective-taking and negotiator focus. J Pers Soc Psychol 81(4):657
33. Fisher R, Ury WL, Patton B (2011) Getting to yes: negotiating agreement without giving in. Penguin
34. Anderson CA (1982) Inoculation and counter explanation: debiasing techniques in the perseverance of social theories. Soc Cogn 1(2):126–139
35. Bentz BG, Williamson DA, Franks SF (2004) Debiasing of pessimistic judgments associated with anxiety. J Psychopathol Behav Assess 26(3):173–180
36. Hammond JS, Keeney RL, Raiffa H (1998) The hidden traps in decision making. Harv Bus Rev 76(5):47–58
37. Heiman VB (1990) Auditors' assessments of the likelihood of error explanations in analytical review. Account Rev 65(4):875–890
38. Kray LJ, Galinsky AD (2003) The debiasing effect of counterfactual mind-sets: increasing the search for disconfirmatory information in group decisions. Organ Behav Hum Decis Process 91(1):69–81
39. Schulz-Hardt S, Jochims M, Frey D (2002) Productive conflict in group decision making: genuine and contrived dissent as strategies to counteract biased information seeking. Organ Behav Hum Decis Process 88(2):563–586

40. Hoch SJ (1985) Counterfactual reasoning and accuracy in predicting personal events. J Exp Psychol Learn Mem Cogn 11(4):719
41. Kennedy J (1995) Debiasing the curse of knowledge in audit judgment. Account Rev 70(2):249–273
42. Koriat A, Lichtenstein S, Fischhoff B (1980) Reasons for confidence. J Exp Psychol Hum Learn Mem 6(2):107–118
43. Bazerman MH, Neale MA (1982) Improving negotiation effectiveness under final offer arbitration: the role of selection and training. J Appl Psychol 67(5):543
44. Larrick RP (2004) "Debiasing". In: Koehler DJ, Harvey N (eds) Blackwell handbook of judgment and decision making. Blackwell Publishing, pp 316–338
45. Mussweiler T, Strack F, Pfeiffer T (2000) Overcoming the inevitable anchoring effect: considering the opposite compensates for selective accessibility. Pers Soc Psychol Bull 26(9):1142–1150
46. Alexander FG (1980) Psychoanalytic therapy: principles and application. University of Nebraska Press
47. Landa Y, Silverstein SM, Schwartz F, Savitz A (2006) Group cognitive behavioral therapy for delusions: helping patients improve reality testing. J Contemp Psychother 36(1):9–17
48. Bazerman MH, Curhan JR, Moore DA, Valley KL (2000) Negotiation. Annu Rev Psychol 51(1):279–314
49. Drolet AL, Morris MW (2000) Rapport in conflict resolution: accounting for how face-to-face contact fosters mutual cooperation in mixed-motive conflicts. J Exp Soc Psychol 36(1):26–50
50. Lyons C (2009) I win, you win: the essential guide to principled negotiation. Bloomsbury Publishing
51. Baron RA (1991) Positive effects of conflict: a cognitive perspective. Emp Responsibilities Rts J 4(1):25–36
52. Forgas JP (1995) Mood and judgment: the affect infusion model (AIM). Psychol Bull 117(1):39
53. Hastie R (2001) Problems for judgment and decision making. Annu Rev Psychol 52(1):653–683
54. Schwenk CR, Cosier RA (1980) Effects of the expert, devil's advocate, and dialectical inquiry methods on prediction performance. Organ Behav Hum Perform 26(3):409–424
55. Babcock L, Loewenstein G (1997) Explaining bargaining impasse: the role of self-serving biases. J Econ Perspect 11(1):109–126
56. Galinsky AD, Ku G (2004) The effects of perspective-taking on prejudice: the moderating role of self-evaluation. Pers Soc Psychol Bull 30(5):594–604
57. Galinsky AD, Moskowitz GB (2000) Perspective-taking: decreasing stereotype expression, stereotype accessibility, and in-group favoritism. J Pers Soc Psychol 78(4):708–724
58. Sedikides C, Campbell WK, Reeder GD, Elliot AJ (1998) The self-serving bias in relational context. J Pers Soc Psychol 74(2):378
59. Soll J, Milkman K, Payne J (2014) A user's guide to debiasing
60. Arkes HR (1991) Costs and benefits of judgment errors: implications for debiasing. Psychol Bull 110(3):486
61. Hirt ER, Markman KD (1995) Multiple explanation: a consider-an-alternative strategy for debiasing judgments. J Pers Soc Psychol 69(6):1069–1086
62. Sanna LJ, Schwarz N (2004) Integrating temporal biases. Psychol Sci 15(7):474–481
63. Bowman Williams J (2017) Accountability as a debiasing strategy: does race matter?
64. Fischhoff B, Beyth-Marom R (1983) Hypothesis evaluation from a Bayesian perspective. Psychol Rev 90(3):239–260
65. Mowen JC, Gaeth GJ (1992) The evaluation stage in marketing decision making. J Acad Mark Sci 20(2):177–187
66. Burke A (2007) Neutralizing cognitive bias: an invitation to prosecutors. NYU J Law Liberty 2:512–530
67. Ashton RH, Kennedy J (2002) Eliminating recency with self-review: the case of auditors' 'going concern' judgments. J Behav Decis Mak 15(3):221–231
68. Ezeh GN, Ogbuehi CN, Eleke N, Diala UH (2013) Severity index analysis of the problems of optical fiber communication in Nigeria: a case study of South Eastern Nigeria. Acad Res Int 4(1):431–438

69. Johnson RA, Bhattacharyya GK (1996) Statistics: principles and methods. Wiley, New York
70. Chow PT, Cheung SO, Chan KY (2012) Trust-building in construction contracting: mechanism and expectation. Int J Project Manage 30(8):927–937
71. Wong PS, Cheung SO, Ho PK (2005) Contractor as trust initiator in construction partnering—prisoner's dilemma perspective. J Constr Eng Manag 131(10):1045–1053
72. Griffin MA, Patterson MG, West MA (2001) Job satisfaction and teamwork: the role of supervisor support. J Organ Behav 22(5):537–550
73. Spence Laschinger HK, Finegan J, Shamian J (2002) The impact of workplace empowerment, organizational trust on staff nurses' work satisfaction and organizational commitment. In: Advances in health care management. Emerald Group Publishing Limited, pp 59–85