Introducing a Quasi-judicial Party to Dispute Resolution in Construction Contracts

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In this paper, a model is proposed to analyze how a dispute resolution process can be controlled by third parties’ adjudications in construction projects. We analyze the effects of introducing two alternatives, Dispute Adjudication Board (DAB) and Dispute Review Board (DRB) into the dispute resolution process under the FIDIC standard conditions of construction contract. The model explains how the differences between DAB and DRB affect the efficiency of the dispute resolution process. Differences between dispute resolution processes in FIDIC and GCW, the standard conditions of construction contract in Japan, are also analyzed. The following conclusions are obtained. 1) DAB and DRB are efficient in settling disputes by agreement if the possibility of their errors is sufficiently small. 2) DAB is more likely to cause arbitration than DRB. 3) The GCW does not provide less efficient dispute resolution procedure than the old FIDIC. When the Japanese construction market becomes completely open to foreign contractors disputes may be followed by arbitration more often under the GCW model than under the FIDIC with no third parties’ adjudication.

KEYWORDS: construction contracts, dispute resolution, arbitration, adjudication, game theory

1. Introduction

A construction contract can be considered as an incomplete contract since it cannot describe every incident that may (or may not) occur in the future. If an unforeseeable event occurs and the contract does not provide the necessary rules to deal with such an event, the parties will be involved in a dispute in relation to the responsibilities of the additional costs arising from such an incident. The concerned parties will try to settle the dispute by negotiation, or ultimately, go to arbitration or litigation. An arbitration award or a court’s judgement is binding on the parties unless an appeal is authorized.

The 1987 version of FIDIC\textsuperscript{1} (hereinafter referred to as old FIDIC) clearly stipulates the detailed procedure for dispute resolution. This process begins by the contractor’s claim, which is followed by the party’s negotiations and the Engineer’s decision, and in the case one the parties turns out to be dissatisfied with that decision it may lead to arbitration. Resolving disputes normally requires considerable amounts of time and money. For this reason, in the 1999 version of FIDIC (hereinafter referred to as new FIDIC), it is mandatory for the parties to set a Dispute Adjudication Board (hereinafter referred to as DAB). As explained later, the existence of the DAB is expected to provide a more efficient dispute resolution mechanism than ever. In addition, a Dispute Review Board (hereinafter referred to as DRB), which is conceived and developed in the last ten years in United States, can be also assigned in order to aim the dispute resolution process by providing recommendations during the project. However, decisions made by a DRB are not binding to the parties.

In the 1989 version of GCW\textsuperscript{2} (hereinafter referred to as old GCW) no clause related to claims is provided. As pointed out in Kobayashi \textit{et al.} (2001), under this model the employer is expected to take the leading role in resolving every dispute. GCW was revised in 1995 (hereinafter referred to as new GCW) to cope with the globalization of the Japanese construction market. Although it does provide a claim clause, the figure of ‘the Engineer’ or the ‘DAB’ as a third party to resolve a dispute claim does not exist, as it does in the provisions of the new FIDIC. A dispute that has not been settled by negotiation between the parties has to go on directly to arbitration under the rules of the Dispute Committee

\textsuperscript{1} Abbreviated expression of the Condition of Contract for Works of Civil Engineering Construction Part 1 General Conditions, fourth edition published by Federation Internationale Des Ingenieurs Conseils. This is called ‘Red Book’ as the color of the book cover is red.

\textsuperscript{2} Abbreviated expression of the Standard Form of Agreement and General Conditions of Government Contract Works of Building and Civil Engineering Construction.
of the Ministry of Land, Infrastructure and Transportation. As the Japanese construction market globalizes, construction disputes will become more common and are expected to consume high amounts of time and money for their resolution.

In this study, we analyze the effects of introducing two alternatives, DAB and DRB of the old FIDIC, on a dispute resolution process. The effects of costs rules of arbitration are also analyzed. We discuss the characteristics of the dispute process of GCW as well. The basic ideas and the methodology of this study are presented in Section 2. The model describing the behavior of parties regarding arbitration and settlement choices is shown in Section 3. In Section 4, the efficiency of DAB/DRB and the costs rules of arbitration in terms of the effects on feasibility of settlements is analyzed. Finally in Section 5, the dispute process in the Japanese construction contract is discussed.

2. Idea and Methodology of the Study

2.1 Review of the previous studies

Dispute resolution processes between disputants are studied in the literature of bargaining game theory and law and economics. The bargaining theory is initiated by Nash (1950). Based on the bargaining model with sequential moves established by Rubinstein (1982), plenty of extended models are proposed in 1990s (Muthoo (1999)). There are a few studies related on the dispute resolution process with arbitration (Brams and Merrill (1983), Grout (1984), Brams and Merrill (1986), Brams (1990), Busch and Wen (1995), Ponsati and Sákovics (1998), Manzini and Mariotti (2001)).

In the literature of law and economics (Cooter and Ulen (1988), Miceli (1997)), the problem of choosing between agreement and law suit in a civil litigation has been already studied (Shavell (1995)). This model can be modified to study a negotiation process of a construction dispute by interpreting law suit as arbitration. In the economics of the law, Landes (1971), Gould (1973), Shavell (1982), Cooter and Rubinfeld (1989) have developed different models in which litigation arises from the different perceptions litigants have regarding the outcome of a trial. The different perceptions stem from the different convictions of the case, uncertainty of the relevant laws and the asymmetry of information (Bebchuk (1984), Bebcu (1988), Nalebuff (1987), Schweizer (1989), Spier (1992)). Litigants negotiate before trial, trying to account their expectations on the benefits and costs of litigation. The bargaining models proposed are based on differences in perception or asymmetry of information (Landes (1971), Posner (1992)).

Bargaining models focus on the payoffs of the parties, whereas models in the literature of law and economics are focused on those conditions in which a dispute is settled by negotiation or arbitration. Manzini and Mariotti (2001) made a model of dispute resolution process based on the bargaining model with two-sided outside option. Omoto et al. (2002) also proposed a bargaining model based on Rubinstein (1982) with arbitration as an outside option. Omoto et al. (2002) is different from Manzini and Mariotti (2001) in that the former assumes each party does not need mutual approval to go to arbitration. Omoto et al. (2002) derive the parties’ expected payoffs in case of settlement and the conditions in which arbitration is referred to. This result is compatible to the results of the litigation models proposed by Shavell (1993) and Posner (1992). In this paper, by applying the results of those models, the parties’ choice between agreement and arbitration is analyzed.

2.2 Indescribability and verifiability

If a construction contract was complete and provided the rules for every contingency occurring in the future, no disputes between the parties would arise. All contract stipulations would be just followed by the parties. However, it is impossible to design a contract stipulating all the contingencies that might occur. In other words, a construction contract cannot help but be an incomplete contract. Nevertheless, Kobayashi et al. (2001) show that it is possible to design an incomplete construction contract for public infrastructures that achieves social efficiency. Still, the existence of risks in construction, that cannot be described thoroughly beforehand, generally bring about differences between the parties at the moment they occur, specifically, from each party’s interpretation of the contract in relation to risk bearing. These differences in interpretation may become the cause of a dispute. According to the FIDIC conditions of contract, a dispute (not a legal dispute yet) is initiated by the contractor’s claim. Most of the claims may be settled by negotiation. But it is possible to go to arbitration if the difference of the parties’ assessment on the merit of claim is large.

are such that cannot be solved by themselves. Achieving a settlement by negotiation of the contract terms is based on the merits and the quantum of the claims. However, since an agreement for the merits of the claims is precedent for a negotiation of quantum, the merits of the claims are of primary importance. From this point of view, this paper focuses on the discussion on the merits of the claims during the negotiation.

2.3 The dispute resolution process in FIDIC

Figure 1 shows the process of claims and disputes resolution as described in the old FIDIC. The process begins by a claim served by the contractor who is asking for an adjustment of either time or money, or both, when a given situation differing from that at the time of the contract was signed is realized. The basis for a claim may be a change in the design, additional works, delays in the construction, late site possession, encountering APC (Adverse Physical Conditions), suspension of the works, force majeure, etc. When the contractor recognizes or feels (at Point a) that it has or will suffer a negative impact on the programme or costs because of any of the reasons described above, it serves a
notice of claim to the Engineer (at Point b, in accordance with Subclause 53.1). The contractor is required, when making a claim, to submit contemporary records related to the claim (in accordance with Subclause 53.3). It is often the case that the Engineer/the employer and the contractor negotiate and settle the claim. A settlement is dealt with as a variation, in accordance with Subclause 52.2.

It is common in standard forms for construction and engineering works contracts that the contractor continues to perform and completes the works whatever happens (FIDIC Subclauses 8.1/12.1/13.1/51.1). The parties does not always settle on the additional payments. If a settlement is not attained, the parties can resort to an arbitrator’s award or a judgment in a court. However, if the parties resort directly to an arbitrator’s award or a judgement in a court for each and every claim, whenever it arises, such proceedings would jeopardize the progress of the construction itself. Therefore, the standard forms of construction contract are designed for the parties to settle the claim(s) within the framework of the conditions of the contract. FIDIC enpowers the Engineer to make a decision on a dispute as an independent and impartial professional (at Point e). His decision is final and binding on the parties unless and until the arbitrator(s) give an award otherwise. This system permits time and money savings in the arbitration and litigation proceedings. If a party is not satisfied with the Engineer’s decision, it may still refer the dispute to arbitration (at Point f). An arbitral tribunal is conducted by a sole or multiple arbitrators (arbitral tribunal) and it gives an award based on the facts and the law. An arbitral award is final and binding on the parties.

2.4 Role of the third party

The Engineer stipulated in the old FIDIC plays two roles (Dual Role), he acts on behalf of the employer as his agent to supervise and monitor the project costs, progress of the works, method of construction and quality control of the contractor. On the other hand, he certifies the progress, fixes the rates of varied works and evaluate the contractor’s claims as an independent and impartial professional (quasi-adjudicator). Thus, he is expected to facilitate the dispute resolution effectively. It is often observed in the operation of FIDIC that the later role of the Engineer, i.e., role as quasi-adjudicator, is not functioning properly and that a dispute goes on to either arbitration or litigation. This is because the Engineer is employed by the employer throughout the project as a consultant to carry out the feasibility study, design and prepare the tender documents and evaluate each tender to decide the contractor for the works. It is quite understandable that it is very difficult for a consultant to become completely impartial in giving the Engineer’s decision in accordance with the Clause 67 of the old FIDIC.

In order to resolve this dilemma, FIDIC was restructured by introducing a DAB in its 1999 First Edition (new
FIDIC). DAB is a standing board whose members (one or three according to the size of the project and the contract amount) are selected and agreed at the outset of the project by both parties. The members should be familiar with the type of the project and well experienced in contract interpretations. They are required to be impartial and independent of the employer, the contractor and the Engineer. The members are provided with the agreement, conditions of contract, drawings, specifications and the progress reports so that they become and remain familiar with the project and its development. The members are also required to visit the construction site periodically, for example, three or four times a year. Whenever a dispute is brought in front of them for the DAB’s decision, the nature and the magnitude of the claim must be already well known to the members. Its decision has to be made in a short time, and this decision is final and binding on the parties until and unless it is overturned by arbitration or litigation when authorized. Since the members are often well qualified as arbitrators, the decision of the DAB seems to be close to an arbitration award for the case the dispute goes on to arbitration.

In USA, the DRB was developed greatly during the last ten years. The DRB has a similar construct as that of DAB, but there is a fundamental difference in that the judgment does not constitute a decision but a mere recommendation, not binding on the parties. It is the parties right to agree to accept or not, or resume negotiations based on the recommendation. It is noted that the Engineer’s certificates are enforceable contractually after DRB has given a recommendation, in contrast to DAB’s decision, which is enforceable. Nevertheless, both processes are expected to be an efficient measure for dispute resolution in construction contracts. We discuss below the effects on the negotiation process brought about by whether the decision or recommendation of DAB/DRB (Neutrals, hereinafter called collectively) is binding on the parties or not.

3. Model of Choice between Arbitration and Settlement

3.1 Different perceptions between the parties

A dispute stems from the difference between the parties in the interpretation of the contract as to the justification (or merit) of a claim. The parties negotiate with each other while it is not possible to know the arbitration’s award in advance. Hence, each party has its belief on how valid the claim is. When the parties have different perceptions on the merit of the claim, they may negotiate to reach a settlement or may refer the claim to arbitration.

To make the model as simple as possible, we set up the following assumptions: 1) The costs of negotiation are ignored. 2) As to the cost of arbitration, we first apply the American and Japanese rules. Under the American and Japanese rules, the parties pay their own arbitration costs, while under the so-called the UK rules, the loser pays the winner’s arbitration costs. 3) The claimant (the contractor) does not make a frivolous claim, expecting legal error\(^3\) in arbitration. 4) The causation of a dispute is the difference in the interpretation of the contract as to the merit of a claim, and the employer (the Engineer) and the contractor have different assessments of the additional costs to be compensated. Neither party takes a strategic action such as concealing facts or providing false data. 5) All the evidence is of common knowledge to both parties.

Suppose that the contractor’s assessment of the merits of his claim is

\[
p_a = p_a(y_a) \quad (0 < p_a < 1)
\]

where \(y_a\) is the contractor’s assessment of the capability of his evidence. The more complete the evidence is, the higher \(y_a\) is assessed. Thus, \(dp_a(y_a)/dy_a > 0\).

Now consider arbitral tribunal’s error. \(\eta_1\) is the contractor’s assessment on the probability that the arbitral tribunal does not support the claim, though the claim has the merit (type I error). \(\eta_2\) is the contractor’s assessment on the probability that the arbitral tribunal supports the claim, though the claim does not have the merit (type II error). Then, the contractor expects to have a favorable award in the arbitration with probability

\[
P_a = p_a(1 - \eta_1) + (1 - p_a)\eta_2
\]

Like the contractor, the employer (the Engineer) has his own assessment

\[
q_p = q_p(y_p) \quad (0 < q_p < 1)
\]

where \(y_p\) is the employer assessment of the capability of his evidence, and \(dq_p(y_p)/dy_p > 0\). Assume the employer (the Engineer) has the expectation to have the award in favor of him with a probability

\[
Q_p = q_p(1 - \xi_1) + (1 - q_p)\xi_2
\]

where \(\xi_1\) and \(\xi_2\) represents the employer’s assessment on the probability of the type I and II error respectively. Further suppose that the employer’s expectation on the probability that the claim will be accepted by the tribunal with probability \(P_p = 1 - Q_p\). When \(P_p > P_a\), there is no need for negotiation because the employer assesses the merit of claim stronger than the contractor.

\(^3\) The legal error can be classified into two type; Type I and II, to be explained later.
3.2 Choice between settlement and arbitration

Suppose that the contractor claims an additional payment $J_p$. The employer (or the Engineer) assesses the claim as $J_a$. The difference between the claimed amount by the contractor and the assessment of the employer comes from the difference in the interpretation of the variation or on other grounds of a claim in accordance to the conditions of the contract. This difference does not arise from an inflated or false claim by the contractor, according to the premises for the model, but from different positions regarding which party should bear the additional costs. The payoff of the employer and the contractor can be shown as follows, respectively:

\[
\begin{align*}
\pi_p &= -J \\
\pi_a &= J
\end{align*}
\]

when the claim is approved

\[
\begin{align*}
\pi_p &= 0 \\
\pi_a &= 0
\end{align*}
\]

when the claim is not approved

If the dispute goes to arbitration and the award supports the contractor, the employer has to make an additional payment $J$. If the award is in favor of the employer, no additional payment is required. The employer’s expected payoff in case of arbitration can be shown as follows:

\[
E[\pi_p] = (1 - P_p) \cdot 0 - P_p J = -P_p J
\]

(5)

Thus, the employer gets the net expected payoff $w_p = -P_p J - C_p$, where $C_p$ represents the cost of arbitration the employer has to pay including his own expenses and legal fees. On the other hand, the contractor’s expected payoff in case of arbitration can be shown as follows:

\[
E[\pi_a] = P_a \cdot J + (1 - P_a) \cdot 0 = P_a J
\]

(6)

And the contractor will get the net expected payoff $w_a = P_a J - C_a$, where $C_a$ represents the cost of arbitration the contractor has to pay. The parties negotiate to decide who owes the difference of their expectations $(P_a - P_p)J$. They get the expected payoff by going to arbitration, $(w_p, w_a) = (-P_p J - C_p, P_a J - C_a)$. Omoto et al. (2002) have regarded the expected payoff in case that arbitration is chosen as an outside option in the bargaining model aiming the settlement.

Before starting the negotiation and choosing settlement or arbitration, each party understands the position of the other in the dispute and has its own assessment of the capability of the evidence, thus $\gamma_p$ and $\gamma_a$ are known. If $w_p + w_a \leq 0$, both parties can get more payoffs by agreeing on compromising than the net payoffs they expect from the outcome of arbitration. If $w_p + w_a > 0$, that is, the net expected payoffs of the parties are larger than those from agreeing on compromising, the parties choose to go to arbitration to get the net payoffs on the partition $(w_p, w_a)$. The condition for agreeing on the settlement, therefore

\[
(P_a - P_p)J \leq C_p + C_a.
\]

(7)

When the condition (7) is not satisfied and there is no other outside option (for example, of compromising on the partition for future businesses between the parties) the dispute is to be taken to arbitration. The condition (7) implies that the smaller the difference in perceptions $(P_a - P_p)$ and the disputed payoff $J$ is, the more possible for the parties to settle by agreement. It also implies that the greater the arbitration cost is, the more possible for them to settle. It should be noted that the arbitrated outcome has not been known to the parties. If the award is in favor of the employer, the parties get the payoffs on the partition $(-C_p, J)$. If in favor of the contractor, the partition yields $(-J, C_p)$. The condition for agreement under the American and Japanese rules (7) implies that the smaller the difference in perceptions $(P_a - P_p)$ and the disputed payoff $J$ is, the more possible for the parties to settle by agreement.

3.3 Effect of the cost rule of arbitration on claim settlement

We have applied to the model the American and Japanese rules for cost of arbitration. Now consider the case that we apply the UK rule by which the unfavored party shall pay the other party’s cost for arbitration. Under UK rule, the expected payoffs of the both parties are the same as the ones under the American and Japanese rule and the parties can settle the dispute by agreement when

\[
(P_a - P_p)(J + C_p + C_a) \leq C_p + C_a
\]

(8)

We compare the requirements for settlement by agreement, under the American and Japanese rules (7) and under the UK rule (8). Since $(P_a - P_p)J < (P_a - P_p)(J + C_p + C_a)$ the possibility of agreement under the American and Japanese rules is higher than under UK rules. Shavell (1982) points out that the frivolous claims can be better eliminated under the UK rules than under the American rules. In our study, we are dealing with a dispute that has already arisen and focusing on an effective process of dispute resolution. The effect of the cost rules on the contractor’s claiming strategy may be an important subject but it is outside of this study.
4. Quasi-judicial Third Party and Efficiency of Dispute Resolution

4.1 DRB model

The purpose of having DRB in a project is to help in the avoidance of disputes by changing the probability $P_p$, $P_a$ when a recommendation is given by the independent Neutrals to the parties rather than to enforce its recommendation for settling dispute. We apply the Bayesian Learning Model to establish a mechanism in which the parties revise their expectation with probability. $P_p$, $P_a$. Note that they are described by eqs. (2) and (4). The expectations on the outcome of arbitration with probability, (2) and (4), will be revised by Bayes’ theorem upon receipt of the DRB recommendation.

4.2 When DRB rejects the contractor’s claim

First, we discuss the situation when DRB rejects the contractor’s claim. The contractor’s assessment of the merit of its claim will be revised, by Bayes’ theorem, with a probability

$$p_a = \frac{P_a \eta_1}{P_a \eta_1 + (1 - P_a)(1 - \eta_2)}$$

under the condition that the claim has been rejected. Assume that probabilities of errors by DRB are the same as those of arbitrators. The contractor’s expectation for a successful outcome of arbitration will be revised by Bayes’ theorem with a probability

$$\hat{P}_a = \frac{p_a(1 - \eta_1) + \bar{p}_a \eta_2}{p_a(1 - \eta_1) + \bar{p}_a \eta_2} = \frac{P_a \eta_1(1 - \eta_1) + (1 - P_a) \eta_2(1 - \eta_2)}{P_a \eta_1 + (1 - P_a)(1 - \eta_2)}$$

when the dispute has been rejected. On the other hand, when the claim is rejected, i.e., the Employ’s position is supported by DRB, his assertion for the contractor’s claim will be revised by Bayes’ theorem with a probability

$$\hat{q}_p = \frac{q_p(1 - \zeta_1)}{q_p(1 - \zeta_1) + (1 - q_p) \zeta_2}$$

Then the revised expectation of the employer for a successful outcome of arbitration is derived by Bayes’ theorem;

$$\hat{Q}_p = \frac{q_p(1 - \zeta_1) + (1 - \hat{q}_p) \zeta_2}{q_p(1 - \zeta_1) + (1 - q_p) \zeta_2}$$

when the contractor’s claim has been rejected.

4.3 When DRB supports the contractor’s claim

When the contractor’s claim is supported by DRB, the party’s expectation for successful outcome of arbitration will be revised with probabilities

$$\hat{P}_a = \frac{p_a(1 - \eta_1)^2 + (1 - P_a) \eta_2^2}{p_a(1 - \eta_1) + (1 - P_a) \eta_2}$$

$$\hat{Q}_p = \frac{q_p \zeta_1(1 - \zeta_2) + (1 - q_p) \zeta_2(1 - \zeta_1)}{q_p \zeta_1 + (1 - q_p)(1 - \zeta_2)}$$

respectively.

4.4 The effect of DRB recommendation

Arbitration can be shown as an outside option for DRB Bargaining Model with a partition $(w_p, w_a) = \{-\hat{P}_a J - C_p, \hat{P}_a J - C_a\}$. By the same discussion made in Section 3.2, the conditions for settlement by agreement under the American/Japanese rules and the UK rules yield,

$$(\hat{P}_a - \hat{P}_p) J \leq C_p + C_a$$

$$(\hat{P}_a - \hat{P}_p)(J + C_p + C_a) \leq C_p + C_a$$

respectively. In any event (whether the claim is rejected or supported), whether the possibility of agreement increases or decreases depends on the revised magnitude of the gap between the parties’ expectations of the outcome of arbitration. We define the difference between the parties’ expectations in the basic model with probability, $P_a - P_p$, and the one revised after DRB’s recommendation, $\hat{P}_a - \hat{P}_p$, as $\Delta = (P_a - P_p) - (\hat{P}_a - \hat{P}_p) = (P_a - \hat{P}_a) - (P_p - \hat{P}_p)$, where $\hat{P}_p = 1 - \hat{Q}_p$.

Assume that both parties have the same assessment of both types of errors of DRB and arbitration and the errors of DRB and arbitration, i.e., $\eta_1 = \eta_2 = \zeta_1 = \zeta_2 = \eta$. When DRB rejects the claim,
\[ \Delta = \Delta_a - \Delta_p \]  
(16a)

\[ \Delta_a = P_a - \hat{P}_a = \frac{p_a(1 - p_a)(1 - 2\eta)^2}{p_a\eta + (1 - p_a)(1 - \eta)} \]  
(16b)

\[ \Delta_p = P_p - \hat{P}_p = \frac{q_p(1 - q_p)(1 - 2\eta)^2}{q_p(1 - \eta) + (1 - q_p)\eta} \]  
(16c)

The parties will have more chance on reaching an agreement when the left side of eqs. (7) and (8) becomes smaller, thus, after obtaining DRB’s recommendation, the difference of revised magnitude of the parties’ expectations become smaller. We note that the condition \( P_a > P_p \) is required for disagreement. It is necessary that the probability of giving the right recommendation is, at least, larger than that of a wrong recommendation so that the parties will trust the DRB’s recommendation. Thus, \( \eta < 0.5 \) is the condition. When these conditions are met and if

\[ \eta \leq \frac{q_p(1 - p_a)}{(1 - p_a)q_p + p_a(1 - q_p)} \]  
(17)

then, \( \Delta > 0 \) (refer to Appendix) and it is assured that the difference of the revised expectations of the parties becomes smaller. When DRB supports the claim,

\[ \Delta_a = \frac{-p_a(1 - p_a)(1 - 2\eta)^2}{p_a(1 - \eta) + (1 - p_a)\eta} \]  
(18a)

\[ \Delta_p = \frac{-q_p(1 - q_p)(1 - 2\eta)^2}{q_p(1 - \eta) + (1 - q_p)(1 - \eta)} \]  
(18b)

in eq. (16a). In the same discussion as above, if

\[ \eta < \frac{p_a(1 - q_p)}{(1 - q_p)p_a + q_p(1 - p_a)} \]  
(19)

then, \( \Delta > 0 \). The condition (17) satisfying \( \Delta > 0 \) when DRB rejects the claim can be rewritten in a form of

\[ \eta < \frac{1}{1 + \frac{p_a}{1 - p_a} \cdot \frac{1 - q_p}{q_p}} \]  
(20)

In the above inequality, the right side becomes smaller as \( p_a \) increases and \( q_p \) decreases. This means that the larger the difference between the DRB’s recommendation and the parties’ expectation, the smaller the probability of DRB’s error must be to secure the possibility of agreement. Moreover, inequalities (17) and (19) show that the smaller the probability of error is, the more chance on reaching an agreement the parties have (refer to Appendix). We summarize the foregoing as the following Proposition 1.

**Proposition 1.** Suppose \( p_a > P_p, 2\eta < 1 \). When the probability of DRB’s error (by parties assessment) is small enough and satisfies inequalities (17) and (19), the chance on reaching an agreement increases upon DRB’s recommendation.

Proposition 1 shows that the chance of agreement increases when the probability of DRB’s error is smaller than a certain critical number whether DRB supports or rejects the claim. If we ignore the cost of DRB relating to a specific claim, DRB can be said to have achieved an efficient measure for dispute resolution. This conclusion can be applied to both the American/Japanese and UK rules for costs of arbitration. The foregoing discussions have been made on the assumption that the parties have confidence in the assessment of the reliability of DRB whether \( \eta \) is small or large. If the parties have no concrete assessment, we do not know whether the DRB process can achieve an efficient dispute resolution. Therefore, the reliability of DRBs’ recommendations shall be improved (we are not saying that the current quality of DRBs is not satisfactory) and the information pertaining to the results of DRBs’ recommendations shall be disclosed so that the parties can form confidence in relying on DRBs’ recommendations.

4.5 DAB model

The decision of a DAB is final and binding unless either of the parties invokes arbitration when it has a strong confidence in its assessment that the DAB’s decision is wrong, thus is dissatisfied with the DAB’s decision. As the DAB’s decision is legally enforceable, there is little chance for the parties to renegotiate and agree after DAB delivers its decision. In our discussion, therefore, we assume that there is no negotiation upon receipt of the DAB’s decision. Moreover, like DRB, DAB is a standing board from the outset of the project and the parties share the costs. In order to mitigate the negotiation costs, the parties may bring disputes in front of DAB quickly. As a result of the application of DAB process to the project, the parties do not have many negotiations, thus the process of dispute resolution under DAB is not described as a bargaining model but as a model in which the party receiving an unfavorable decision is to
choose whether going to arbitration or not.

First, assume that DAB rejects the contractor’s claim and that the employer will accept the decision. The contractor is to choose whether he accepts the decision and give up an additional payment or to invoke arbitration. As a result of the decision, the employer, by Bayes’ theorem, revises his assessment on the expectation with a probability to (10). The conditions for the contractor to accept the DAB decision are

\[
\begin{align*}
\hat{P}_a J &\leq C_a, \\
\hat{P}_a (J + C_p + C_a) &\leq C_a
\end{align*}
\]

according to the American/Japanese and the UK rules, respectively. Secondly, assume that DAB supports the contractor’s claim. The contractor accepts the decision and the employer has two alternatives, accepts the decision and makes an additional payment \(-J\) or chooses to go to arbitration. The condition for the employer not to go to arbitration is

\[
\begin{align*}
(1 - \hat{P}_p) J &\leq C_p, \\
(1 - \hat{P}_p) (J + C_p + C_a) &\leq C_p
\end{align*}
\]

If we compare the above conditions for reaching agreement by negotiation under the DAB process with those under the DRB process, we obtain the following Proposition 2.

**Proposition 2.** The possibility that the parties choose arbitration after having a decision or recommendation is larger under the DAB than under the DRB process.

Since the DAB’s decision is binding on the parties, there is no other place than arbitration where the dissatisfied party can assert his position. Contrary to the DAB’s decision, the DRB’s recommendation is not binding on the parties and there is still a chance on reaching an agreement by negotiation. As a result, as shown by Proposition 2, the possibility that the parties choose arbitration after having a decision/recommendation is larger under the DAB process than under the DRB process. This conclusion can be applicable to both the American/Japanese and the UK rules for costs for arbitration. We have ignored the costs for negotiation for the foregoing discussions. Under this assumption, the DRB process is more effective than the DAB process as shown in Proposition 2. If we take the costs for negotiation into account, the DAB process may be more effective than the DRB process since it may be better for the party receiving an unfavorable decision to invoke arbitration to mitigate the costs for a long negotiation, rather than going to arbitration quickly.

### 4.6 Negotiation cost and efficiency of dispute resolution

The above discussion is based on the assumption that the negotiation cost is ignored. However, in the case that the negotiation cost is considerable, it is not guaranteed that the DRB is more efficient than the DAB. Here, we analyze the case when negotiation cost is considered. Let \(f\) be the negotiation cost. The negotiation cost is assumed to be less than the arbitration cost, that is \(f < C_p + C_a\). The negotiation cost includes direct cost of negotiation and additional cost due to delay. As far as a settlement is reached, the arbitration cost does not arise. As far as a settlement is reached, the arbitration cost does not arise.

Firstly, consider the case of DRB. The total cost the parties owe under the American and Japanese rule is

\[
TC_R = \begin{cases} 
\frac{f J}{P_a - \hat{P}_p} & \text{if } J \leq \frac{C_p + C_a}{\hat{P}_a - \frac{1}{\hat{P}_p}}, \\
\frac{f + C_p + C_a}{\hat{P}_a - \frac{1}{\hat{P}_p}} & \text{if } J > \frac{C_p + C_a}{\hat{P}_a - \frac{1}{\hat{P}_p}}.
\end{cases}
\]

(25)

Secondly, consider the case of DAB. When DAB rejects a claim, the total cost the parties owe is

\[
TC_A = \begin{cases} 
0 & \text{if } J \leq \frac{C_a}{\hat{P}_a}, \\
C_p + C_a & \text{if } J > \frac{C_a}{\hat{P}_a}.
\end{cases}
\]

(26)

When DAB supports a claim, the total cost the parties owe is

\[
TC_A = \begin{cases} 
0 & \text{if } J \leq \frac{C_p}{1 - \hat{P}_p}, \\
C_p + C_a & \text{if } J > \frac{C_p}{1 - \hat{P}_p}.
\end{cases}
\]

(27)

By assuming the both parties assessments on the capability of their evidence \(y_a\) and \(y_p\) is constant, we compare efficiency of DAB and DRB in response to the additional cost \(J\). From the results above and Proposition 2, when a claim is rejected,
On the other hand, when a claim is supported,

\[
TC_R \geq TC_A \quad \text{if} \quad J \geq \frac{C_p + C_u}{P_a - P_p},
\]

\[
TC_R < TC_A \quad \text{if} \quad \frac{C_p + C_u}{P_a - P_p} > J > \frac{C_u}{P_a},
\]

\[
TC_R \geq TC_A \quad \text{if} \quad \frac{C_u}{P_a} \geq J
\]

(28)

Even under the UK rule, we can derive the same discussion. Those results imply that efficiencies of the DAB and the DRB cannot be uniquely determined since it depends on the attributes of claims. The DAB is efficient when it is apparent that the claim is going to be referred to the arbitral tribunal or that the claim is not going to be referred to arbitral tribunal. However, if the parties can settle on the claim by using DRB, the total cost can be reduced. In practice, the determination of DAB or DRB depends on the negotiation power of the parties and the attributes of the construction project.

5. GCW and Its Dispute Resolution Process

5.1 GCW model

The old GCW does not provide for a claim clause and instead, stipulates that “the parties shall negotiate and agree” (Clauses 18, 19, etc.) The GCW provides for a clause for the contractor to claim. But there is no facilitator or quasi-adjudicator like the Engineer or the DAB. If the contractor is not satisfied with the employer’s decision, the situation will give rise to a dispute which may go to arbitration (Clauses 52 and 53). It is often the case that the employer takes the lead in settling claims. The employer and the contractor do not play a role as the contracting parties with equal position, instead, the employer always has the firm belief that he is just and that there will be no settlement between the parties. Consequently, the parties’ assessment of their expectations are

\[
P_p = 0
\]

(30a)

\[
P_a = p_a(1 - \eta_1) + (1 - p_a)\eta_2
\]

(30b)

The employer does not negotiate with the contractor and always insists \(s_p = 0\). Furthermore, he is not in a position to elect arbitration. Nevertheless, he has to abide by the award of the arbitration which the contractor invoked. In the GCW bargaining model, the contractor expects to have a favorable award in the arbitration with probability \(P_pJ\), and \(P_aJ - C_u\) with net probability, where \(C_u\) represents the contractor’s costs for arbitration. He expects 0 when he does not go to arbitration. Here, the condition that the contractor does not go to arbitration is

\[
P_aJ \leq C_u
\]

(31)

because he goes on to arbitration only when he expects that the net expectation is positive. Compare the inequality (31) with the condition for agreement in old FIDIC model (7). It may not be appropriate to compare the effectiveness of dispute resolution between the models of FIDIC and GCW because the contractual backgrounds are different. However, if all relevant parameters are the same, there is more chance to go to arbitration in the GCW model than in the FIDIC model (refer to Appendix). Here we have the following proposition.

Proposition 3. As far as the parameters \(P_p, J, C_u, C_p\) are the same, there is more chance of arbitration in the GCW model than in the FIDIC model.

It is to be noted that Proposition 3 does not mean that there is more chance of arbitration in an individual case of GCW. In fact, there is little construction arbitration brought under GCW to the Dispute Committee. If the employer is capable of investigating and assessing properly each change, variation and/or any unforeseeable condition etc. in the first place, there would not be a big difference between the parties’ assessment when they actually have a dispute. There would be little chance for a dispute to last long and go on to arbitration if the difference of assessment \(P_aJ - P_pJ\) is not very large. There is another consideration that the parties have contracts repeatedly and it would not be a good business strategy for the contractors to prolong the disputes. In other words, the costs for arbitration \(C_a\) includes the loss which
comes from the detriment to the long business relationship. If such a loss is large, the dispute will not go on to arbitration.

However, if all other parameters are the same, GCW model does not represent an efficient dispute resolution. If, and especially when, the employer is not capable of assessing disputes, the dispute may well go on to arbitration and the costs for dispute resolution will increase. Alternatively, the costs for dispute resolution will be put on the contract amount and thus the construction costs will rise. A dispute may well go on to arbitration if the contractor is a foreign national and disregard the long business relationship.

5.1.1 Problems in the GCW model

Compare inequalities (31) and (21) for the conditions that the parties will not go to arbitration in the GCW model and in the DAB model respectively. If we put aside the conditions that 1) the employer may invoke arbitration in the DAB model but not in the GCW model and 2) the Neutrals will decide on a dispute in DAB but the employer himself makes a decision in GCW, the structures of dispute resolution mechanism are identical to the new GCW and the DAB of the new FIDIC. The parties have to incur additional costs for the standing board for the outset of the project on the one hand, there will be no additional costs to be incurred by the parties because the employer himself assess the claims, on the other hand. Thus, the GCW model is more efficient in terms of dispute resolution as long as all the parameters are the same as in the DAB model. To maintain the efficiency of the GCW model, firstly, the employer must be capable of assessing the merits and the quantum of the claims. Secondly, there must be trust between the parties so that the contractor believes in the impartiality of the employer’s judgment.

Whether the disputes between the domestic employers and the foreign contractors can be resolved efficiently depends on whether they can create mutual trust as existing between the domestic employers and the contractors. To provide such an environment, it is definitely necessary that all the information as to disputes and resolution be disclosed. If an employer who is not capable of assessing claims, Neutrals like the DAB or DRB shall be adopted. It is also necessary to discuss about the cost rules for negotiation in order to eliminate the so-called ‘frivolous’ claims.

6. Conclusion

We have discussed the mechanism of dispute resolution by introducing a bargaining model with arbitration as an outside option. Furthermore, we have discussed the dispute resolution process under Neutrals (DRB/DAB) decision. The following conclusions are obtained. 1) DAB and DRB are efficient in settling disputes by agreement if the possibility of their errors is sufficiently small. 2) DAB is more likely to cause arbitration than DRB. 3) The GCW does not provide less efficient dispute resolution procedure than the old FIDIC. However, when the Japanese construction market becomes completely open to foreign contractors disputes may be followed by arbitration more often under the GCW model than under the FIDIC with no third parties’ adjudication. It may be necessary to consider having some form of the Neutrals to secure an effective dispute resolution mechanism.

The foregoing study has been made on a very simplified model. Taking into consideration the complexity of the actual contracts, we may expand our study in the following areas: 1) We can point out in the international construction contracts the existence of the so-called frivolous claims by which the contractor intends to get additional payment by error in the neutrals judgment. The UK rule of costs for arbitration is less effective than the American/Japanese rule for settlement by agreement, but it is also pointed out that the UK rule can assist in the reduction of the number of claims to be asserted. In order to deal with frivolous claims, it is necessary to study costs rules in detail. 2) Either party is 100% responsible for the claim in the foregoing discussions. We can discuss the cases where the parties may share the obligation included in a claim. 3) The merit of the claim has been dealt with so far, but the quantum discussion shall be made to reflect the real construction disputes.

Appendix

The Relationship between the Probability of Error $\eta$ and the Possibility of Settlement by Agreement

Assume the case DRB rejects the contractor’s claim. We consider the complementary set for the set $(q_p, p_a)$ in which agreement can be reached for a certain $\eta^*$ as

$$\Omega(\eta^*) = \{(p_a, q_p) \mid \eta^* \geq \frac{q_p(1 - p_a)}{1 - p_a q_p + p_a(1 - q_p)}\}$$

It is obvious that $\Omega(\eta) \subseteq \Omega(\eta^*)$ for $\eta (< \eta^*).$ 1). The same thing can be said when the claim is supported.

Proof of Proposition 1

When $p_a > p_p$,

$$(1 - p_a - q_p)(1 - 2\eta) < 0$$

therefore, when $2\eta < 1, p_a > 1 - q_p$. When the claim is rejected,
\[ \Delta = (1 - 2\eta)^2 \left\{ \frac{p_a(1 - p_a)}{p_a\eta - (1 - p_a)(1 - \eta)} - \frac{q_p(1 - q_p)}{q_p(1 - \eta) + (1 - q_p)\eta} \right\} \]

When \( \eta \) exists in the area \((0, 0.5), (1 - 2\eta)^2 > 0 \). Assume \( p_a \neq 0, p_a \neq 1, q_p \neq 0, q_p \neq 1 \), then the value in the \( \{ \cdot \cdot \} \) is positive when
\[
\eta < \frac{q_p(1 - p_a)}{(1 - p_a)q_p + p_a(1 - q_p)}
\]
therefore, \( \Delta > 0 \). When the claim is supported,
\[
\Delta = (1 - 2\eta)^2 \left\{ \frac{q_p(1 - q_p)}{q_p(1 - \eta) + (1 - q_p)\eta} - \frac{p_a(1 - p_a)}{p_a\eta - (1 - p_a)(1 - \eta)} \right\}
\]
When \( \eta \) exists in the area \((0, 0.5), (1 - 2\eta)^2 > 0 \). Assume \( p_a \neq 0, p_a \neq 1, q_p \neq 0, q_p \neq 1 \), then the value in the \( \{ \cdot \cdot \} \) is positive when
\[
\eta < \frac{p_a(1 - q_p)}{p_a(1 - q_p) + (1 - p_a)q_p}
\]
therefore, \( \Delta > 0 \).

**Proof of Proposition 2**

When the claim is rejected, referring to the conditions (15a) and (21), we define the indicator of agreement by (the right side)--(the left side)
\[
D_a = C_a - \hat{P}_a J
\]
\[
D_R = (C_a - \hat{P}_a J) + (C_p + \hat{P}_p J)
\]

thus, \( D_a < D_R \). Therefore, the possibility of agreement decreases. When the claim is supported,
\[
D_a = C_p + \hat{P}_p J - J
\]
\[
D_R = (C_p + \hat{P}_p J) + (C_a - \hat{P}_a J)
\]

thus, \( D_a < D_R \). Therefore, the possibility of agreement decreases.

**Comparison between DAB and old FIDIC**

Assume the claim is rejected and \( C_a = C_p = C \). The condition for agreement under the American/Japanese rule of costs of arbitration is \((P_a - P_p)J \leq 2C\). The condition for agreement under DAB is \( \hat{P}_a J \leq C \). The condition that the maximum \( J \) under DAB is larger than \( J \) under old FIDIC must satisfy \( P_a - P_p \geq 2\hat{P}_a \). Same can be said when the claim is supported.

**Proof of Proposition 3**

Since \( 0 \leq P_p \leq 1 \), \( P_a J \geq (P_a - P_p)J \) for any \( P_a \). Assume \( C_p = 0 \). The condition for agreement under old FIDIC is \((P_a - P_p)J \leq C_a \). \( P_a J \leq C_a \) is the condition for agreement under GCW. For the same \( C_a \), the extent of \( P_a \) which satisfies the condition for agreement for FIDIC is larger than that of GCW. When \( C_p \) is positive, the extent of \( P_a \) which satisfies the condition of agreement becomes larger.

REFERENCES