APPLYING INSURANCE PRICING THEORY FOR PRICING ADR AS AN INSURANCE PRODUCT

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ABSTRACT

As litigation is recognized as a costly and time-consuming method to resolve disputes, alternative dispute resolution (ADR) techniques are being adopted in construction projects to help handle disputes in a more effective way. However, there are potential costs related to ADR implementation as it requires expenditures to cover the expenses incurred by the owner's/contractor's employees and third party neutrals. Normally those costs are determined during the project planning phase prior to the actual occurrence of disputes. In this paper, the possibility of pricing ADR as an insurance product will be explored. It is similar to the concept of "premium" in insurance industry, although it may be structured more like a self-insurance program. The objective is to provide project participants with an economic advantage by investing a certain amount of premium in the beginning of the project in exchange for compensation from the insurance company in the uncertain event of an unknown ADR cost that may be incurred during the construction phase. Insurance pricing theory's underwriting concepts will be utilized to develop similar concepts in ADR pricing. A conceptual model will be presented to perform the ratemaking process by drawing an analogy from health insurance. An example of a construction project is used to illustrate the mathematical calculations required to determine the premium of the proposed ADR techniques.

INTRODUCTION

The construction industry in the United States plays a powerful role in sustaining economic growth. It provides job opportunities for 7.6 million people, more than 5% of the total nonfarm workforce and makes a large contribution to the gross domestic product (GDP), totaling $1.2 trillion or 9% of GDP in 2006 (AGC 2008). The intricacy and magnitude of the construction work often result in complex contract documents, which furthermore lead to complex disputes (Harmon 2003). In the construction industry, disputes are almost inevitable in each and every project due to poorly prepared and/or executed contract documents, inadequate planning, financial issues, and communication problems, etc. (Harmon 2003). The increasingly costly and time consuming court proceedings (Treacy 1995) indicate a great need in the construction industry to find a more effective method to resolve disputes.

Alternative Dispute Resolution (ADR) is a general term for a number of methods by which conflicts and disputes are resolved privately other than through litigation in the public courts (Kovach 2004). A Dispute Resolution Ladder (DRL) was proposed by Findley (1997) where a broad spectrum of ADR techniques is organized in a stepped manner. It includes six steps from the lower stage of prevention, negotiation, to middle stage of standing neutral, non binding, and finally to the upper stage of binding resolution and litigation. When disputes escalate from lower stage to upper stage, the expenses and hostility also increase (Peña Mora et al. 2003). Compared to the general dissatisfaction with litigation, the implementation of ADR has proven to be faster, more effective, less formalistic, cheaper and often less adversarial (Treacy 1995). Questionnaire results in a study by Chau (2007) show that the top two reasons for project participants in Hong Kong to experiment with mediation or adjudication in construction disputes are ”time and cost savings; desirability to continue amicable business relationship.”

As mentioned above, ADR techniques are used to overcome the ineffectiveness of litigation in providing a fast and amicable settlement of construction disputes. However, it is not without cost. Neither time nor money is infinite and the implementation of ADR requires a certain amount of each, from both the owner’s/contractor’s employee and third party neutrals (Menassa 2007). According to Gebken II and Gibson (2006), while engaging in litigation is often more costly, resolving a dispute in the construction industry is an expensive endeavor no matter which dispute resolution methodology is selected. Moreover, although ADR techniques are implemented when disputes arise during the construction phase, the decision about the budget account for management and staff time spent on dispute resolution is usually undertaken during the project planning phase. Thus, people who make managerial decisions of investing in an ADR technique in exchange for the perceived savings in the project face the uncertainty of the exact amount of ADR cost in the future. Also, a contractually-agreed dispute resolution methodology may not be the best one once disputes have arisen (Harmon 2003). If this is the case, the project will incur an even higher cost to adapt new approaches in the dispute resolution process. Given that most construction projects operate on tight budgets, how to transfer this uncertainty of an unknown potential ADR cost to a third party is the question this paper will address.

In the insurance industry, the uncertainty about whether a particular loss will occur is referred to as risk. To reduce their risk, businesses and individuals transfer the potential financial consequences of their loss exposure to an insurer by purchasing an insurance product (Myhr and Markham 2003). For example, a family purchases health insurance to cover medical costs they might incur in the future. The risk transfer process does not eliminate the possibility that a loss will occur, but it does reimburse the costs associated with that loss. In return for this transfer, an insurer receives a premium (Myhr and Markham 2003). In the construction industry, because of the uncertainty of the frequency and magnitude of disputes and the potential disruption they could cause to the project, it would be important to think about the possibility of pricing dispute resolution methods---ADR techniques as an insurance product and transferring the uncertain potential cost of ADR implementation to a third party by paying a certain amount of premium at the project planning phase and throughout the project.

PROBLEM STATEMENT

In applying the basic concepts of risk management and insurance pricing models to an ADR pricing model, this paper will focus on the following questions, while being mindful of the overriding objective of promoting ADR techniques in the most possible effective and cost saving manner.

1 Why it is useful to consider treating ADR techniques as an insurance product?
2 How can ADR be priced as an insurance product?

An analogy between general insurance products and ADR techniques may prove to be an answer to the first question and an ADR pricing model based on the insurance pricing model will be proposed later.

ADR CONSIDERED AS INSURANCE PRODUCT

In risk management process in the insurance industry, insurance products have served as both risk control and risk financing techniques. The first function is designed to eliminate or reduce the likelihood or amount of loss (Myhr and Markman 2003). For example, as part of most health insurance plans, routine visits to a doctor's office or periodic physicals provide ways to reduce the likelihood of getting sick. Similarly, keeping ADR experts on the project can help identify potential conflict items before the actual occurrence of disputes and thus provide opportunities for preventing these issues from becoming the basis of a future dispute (Gebken II and Gibson 2006). Moreover, even if disputes do occur, consultants and experts who have close association with the project would be able to quickly identify conflict resources and help keep the dispute resolution process on the lower, less contentious and less costly stages of the dispute resolution ladder.

On the other hand, as a risk financing technique, an insurance product also provides a mean to pay for losses that do occur (Myhr and Markman 2003). Again, taking health insurance as an example, the insurance company will compensate customers for their medical expenses wholly or partially, in return for payment of a specified premium. In dispute resolution, typical ADR implementation cost may include fees and expenses paid to lawyers, accountants, claims consultants and other experts; salaries and associated overhead of in-house lawyers, company managers, and other employees who have to assemble the facts, serve as witnesses and otherwise process

the dispute, etc. (Gebken II and Gibson 2006). If ADR techniques can be priced as insurance products, project participants could expect to substitute a certain expense– the premium–for a potential unknown ADR implementation cost.

In addition, we see the potential for cost savings by applying the insurance concept of In-Network/Out-of-Network Coverage to ADR implementation. Outside counsel fees account for over 62 percent of the entire transactional cost in dispute resolution and are larger than the next most costly subcategory by almost four times (Gebken II and Gibson 2006). In health insurance, coverage and cost saving are greatest when an in-network medical care provider is chosen. In the same way, parties involved in construction disputes could seek outside counsel within a network pre-agreed with the insurance company and realize project savings.

INSURANCE PRICING THEORY

The pricing methodology used in insurance industry depends significantly on the variable (product, person, organization, activity) to be priced and the statistical data available (Myhr and Markman 2003). However, the basic principles of pricing methods are common across many types of insurance. The process of determining what loss exposure will be insured, for what amount of insurance, at what price, and under what conditions is called underwriting (Myhr and Markman 2003). Underwriting is common in all forms of insurance (Merlis 2005). For example, medical insurers will charge higher premiums to old people who have a smoking habit; property insurers may offer reduced premiums for safety features such as smoke detectors.

In insurance pricing, ratemaking refers to the process by which an insurance company calculates the price it seeks to charge its customers for the insurance it provides (BISHCA 2008). The ratemaking process is challenging because the amounts of fortuitous future loss and their associated expenses are unknown when the insurance prices are developed at the beginning of an insurance contract period (Myhr and Markman 2003).

ADR pricing, analogously to insurance pricing, should take into account of the amount needed to pay potential ADR costs, and expenses as well as the targeted profits by the insurance company (which, if achieved, compensates the capital invested by the insurer in support of the process and the risk of uncertain financial outcomes that is shouldered by the insurer).

There are three categories of ratemaking methods insurers commonly use for insurance products such as medical insurance or property/casualty insurance that we have been examining as analogies for ADR: pure premium methods; loss ratio methods; and judgment methods (Myhr and Markman 2003). Pure premium methods are used to develop rates from past claims experience; loss ratio methods are used for modifying existing rates; judgment methods rely heavily on the experience and knowledge of an actuary (Myhr and Markman 2003). This paper will use a pure premium method to illustrate how one might calculate premium rates for an insurance-like approach to funding ADR in the construction industry.

Pure premium methods calculate indicated insurance rates using estimates of future claims and expenses, typically based on an examination of historical claims and expense experience, and also include a profit loading factor (Myhr and Markman

2003). The following formula uses several terms of art (Myhr and Markman 2003): Exposure units are the persons or items of property that are insured for a specified period of time; Pure premium means the amount included in the rate per exposure unit required to pay claims; Expense loadings include the insurer's acquisition and operating expenses plus premium tax and possibly loss adjustment expenses (i.e., the administrative costs of handling claims), as well as a provision for profit; Gross premium is the final premium indicated to be paid to the insurance company and equals to Pure premium plus Expense loading.

In pure premium methods,

$$\text{Gross Premium} = \text{Pure Premium} / (1\text{-Expense Loading Factor}) \quad \text{Eq. (1)}$$

where,

$$\text{Pure Premium} = \text{Loss Frequency} \times \text{Loss Severity} \quad \text{Eq. (2)}$$

and where loss frequency is the average number of claims per exposure unit, and loss severity is the average cost incurred per claim. Because insurance is a mechanism of sharing, or averaging, financial risk across a population of insured, these concepts specifically do not imply that each insured has, or is expected to have, the same number of claims per year, or that all claims involve similar costs.

AN ANALOGY BETWEEN HEALTH INSURANCE & ADR TECHNIQUES

To explain more clearly how to apply this formula to calculate the premium of ADR techniques, the process of ratemaking in health insurance is used as an analogy in this paper. There are several parallels between health insurance and ADR. First, both deal with unique objects. In health insurance, the exposure unit is individual human beings while ADR deals with individual projects. The ratemaking process in health insurance considers each customer's unique features such as age, gender and life style, etc. Similarly, the likelihood, nature and cost of disputes in construction projects is influenced by each project's unique features such as site condition, contract type and construction methods. The types of disputes that may arise, in turn would affect the implementation of ADRs. Second, both health insurance and ADR reflect various methods for addressing the underlying issue. In health insurance, there are many choices to deal with sickness, such as taking medicine, visiting a doctor's office, or visiting a hospital, and the related outcomes and medical cost may be different depending on which method the customer chooses. Similarly, in dispute resolution there are many combinations of ADR methods. Third, the results of health care, like ADR, are not guaranteed. In health insurance, despite the measurements taken and medical expense incurred, the insurer does not guarantee to completely cure the disease. Likewise, using ADR techniques does not guarantee a satisfied settlement of disputes. The implementation might escalate to litigation eventually.

Basically, health insurance provides protection against the possibility of financial loss due to health care use (Fernandez 2005). The insurance company obtains information on an applicant's current health status, medical history, and other indicators of potential future costs. Then it estimates the overall risk of healthcare expenses and develops a routine finance structure such as a monthly premium (Claxton 2008). In the ratemaking process, pure premium refers to the total amount of financial obligation due to injury and illness that the insured is expected to incur over a certain period (Chen 2004). The pure premium can be separated into two aspects: frequency and severity. Frequency is how often a loss occurs during a defined time period;

Severity is the average amount of loss (Chen 2004). In a construction project, if considering the use of ADR as analogous to an insurance claim (as ADR costs both time and money), then loss frequency is analogous to the possibility of dispute occurrence, which is also the possibility of ADR being utilized. In health insurance, loss frequency is related to each customer's unique features such as age, gender, life style, etc., and can be estimated once the insurer knows those characteristics of the insured. In construction projects, the possibility of disputes occurring and ADR being applied varies with the project characteristics, and can be estimated by knowing those characteristics of a particular project (Peña-Mora et al. 2003). Table 1 illustrates twenty-five potential sources of disputes in construction projects:

Table 1 Sources of Conflict and dispute (adopted from Peña-Mora et al. 2003)

Area	Discipline	Sources of Dispute
Organizational issues	Structure	Internal/ external organizational structure, delivery systems, inappropriate contract type, contract documents, contract terms, and law
	Process	Performance, quality, tendering pressures, payment, delays, disruption, acceleration, administration, formal communication channels, information sharing, reports, and poor communication
	People	Misunderstanding, unrealistic expectations, culture, language, communications, incompatible objectives, management, negligence, work habits, and lack of team spirit
Uncertainty	External	Change, variations, environmental concerns, social impacts, economics, political risks, weather, regulations, uncertainty, and unpredictability
	Internal	Incomplete scope definition, errors in design, unforeseen site conditions, construction methods, and workmanship

Based on past experience and statistical data, project participants should be able to identify and weight the possible indicators of dispute occurrence from the above categories. For example, an international design-build commercial building project may have higher likelihood of disputes arising from problems in communication channels (i.e., organizational-process) and changing political environment (i.e., uncertainty-external). In the model explained later, each identified source will be given a weight to show its anticipated impact on the probability of dispute occurrence. In health insurance, loss severity, or the estimated medical cost is influenced by the kind of medical service the customer is likely to seek, such as visiting a doctor's office or hospital. Different medical services result in different costs. For example, average expense per outpatient visit and average expense per hospital stay are significantly different. Similarly, the estimated cost for ADR implementation is determined by the different combinations of ADR techniques (such as DRLs) the project participants decide to incorporate into the contract documents, the likelihood of the different techniques being used, and the effectiveness and cost of these techniques. For example, in an airport project, the project participants decide to

implement a DRL which goes through an Architect/Engineer or Supervising Officer to mediation, then arbitration if the first two fail to provide a satisfactory settlement. Then the "loss severity" can be calculated as the product of the daily expense and the estimated days for dispute resolution. (Normally there is a time limit before parties escalate the dispute to the next stage.) Moreover, in health insurance, the medical service the customer first seeks might not guarantee to cure the disease. For example, patients infected with an influenza that cannot be cured in a clinic may later be hospitalized. In dispute resolution, the first step of the contractual DRL might not achieve a satisfactory settlement. Thus, the ADR cost may escalate as the resolution process is brought to a higher stage. This further illustrates the merits of considering managing ADR techniques through an insurance product that transfers some of the risk to the insurance company.

INSURANCE PRICING MODEL

The application of the insurance pure premium pricing model to ADR is illustrated in this section through two simplified examples. The figures used in the examples are totally hypothetical, significantly over-simplified and are only used for explanation.

Suppose that Mike wants to purchase private heath insurance for himself. The insurer, based on Mike's characteristics (40-year old, male, using tobacco regularly), estimates that he has a 10% chance of becoming severely ill during a policy period of one year. Based on past experience of similar people, the insurer estimates that the average healthcare expenses per illness will be $10,000. In this case, the estimated Loss Frequency (LF) for insureds similar to Mike is 10%, Loss Severity (LS) is $10,000. Thus according to Equation (2), the estimated Pure Premium (PP) is: $10,000 X 10%= $ 1,000. For our representative health insurance company, add an Expense Loading Factor (ELF) of 20% to cover the expenses and the target profits. Then according to Equation (1), the indicated Gross Premium (GP) is: $ 1,000/ (1-0.20) =$ 1,000/0.80= $ 1250. Thus, $ 1250 is the premium the insurance company calculates to be an appropriate price for Mike to pay for his health insurance[1].

In ADR for construction projects, the ratemaking process could be similar. For example, a homebuilder is considering constructing three new houses in a local subdivision. Assume that we have identified four sources of conflicts and evaluated them using a 0~1 rating system (Table 2) to weight the loss frequency based on the past experience of this builder, the past experience of other builders, and the project characteristics. Here, Loss Frequency refers to the probability of dispute occurrence P(c) during the project. (The use of a maximum value of 1.0 in Table 2 corresponds to the highest frequency dispute type occurs on average per contract period.)

Table 2 Loss Frequency Rating System (adapted from Peña-Mora et al. 2003)

Very low	Low	Medium-Low	Medium	Medium-High	High	Very high
≈0	0.1	0.25	0.5	0.75	0.9	≈1

[1] The actual price charged for insurance may, and often does differ from the indicated price due, for example, to competitive pressures in the marketplace, legal and regulatory constraints, insurer objectives of growth and customer retention. And, the customer may choose not to pay the price quoted by the insurance company, instead choosing different coverage, a different insurance company, or no insurance at all.

Suppose that the builder is considering including a DRL in the contract document. In this DRL, once the dispute occurs, it goes through Architect/Engineer or Supervising Officer (ADR1) to mediation (ADR2), then arbitration (ADR3) if the first two fail to provide a satisfactory settlement. Then the "loss severity" is the product of the daily expense and the estimated days for dispute resolution. More specifically, when the dispute resolution process starts, the dispute is first turned to Architect/Engineer or Supervising Officer. To cover this expense, assume for this illustrative calculation that the unit cost is $ 500 per day for this step. If the initial attempt fails to achieve the settlement within the maximum allowable time, the dispute escalates to the next level with mediation between the owner and contractor representative; assume the cost at this level also is at a unit cost of $500 per day. Additionally, if the dispute is not resolved at the previous levels, it is turned to the final step of arbitration. Assume for this illustration that the cost at this level is $1000 per day. The builder then evaluates the impact of each source of conflict based the estimated duration of each dispute resolution process. As the builder lists various sources of conflicts and relates the probability that they will occur and the impact of each, he/ she develops a combined risk exposure table like Table 3.

Table 3 General Conflict Exposure

Sources of Conflicts	Probability of Occurrence P(ci)	Duration of dispute resolution process (days)			Expected total cost of ADR implementation i(ci)
		ADR1	ADR2	ADR3	
Miscommunication	High (0.9)	20	-	-	$10,000
Performance/ Quality	High (0.9)	20	20	-	$20,000
Management	Med (0.5)	30	20	-	$25,000
Contract type	Low (0.1)	30	20	20	$45,000

From this analysis, the builder and the insurance company are able to get a sense about the level for the estimated premium. According to Equation (2), the estimated pure premium (PP) is:

$$PP = \sum_{i=1}^{4} P(ci) \times i(ci) = 0.9 \times 10{,}000 + 0.9 \times 20{,}000 + 0.5 \times 25{,}000 + 0.1 \times 45{,}000$$

$$= \$44{,}000$$

Add an Expense Loading Factor (ELF) of 20% (illustrative value, assumed for this example) to cover the expenses and the target profits of the insurance company, and then according to Equation (1), the Gross Premium (GP) should be: $ 44,000/ (1-0.20) =$ 44,000/0.80= $ 55,000. Thus, $ 55,000 is the indicated premium for the builder needed to pay the insurance company for his ADR implementation insurance. (As noted earlier, actual premiums in the marketplace may vary.)

CONCLUSIONS

The objective of this paper was to explore the possibility of transferring the potential cost of construction project ADR implementation to a third party. It appears that there are both risk management and risk financing benefits potentially available to builders if such a process can be devised. The risk is susceptible to analytical risk

transfer pricing techniques similar to those used in pricing traditional insurance coverages such as health insurance, specifically pure premium methodologies. Given the relatively simple example, the model proposed in this paper is by no means an encompassing system for ADR pricing. While the approach illustrated in this paper is easy to understand and apply, it is likely that much more sophisticated pricing structures will be needed in practice to reflect the wide variations of construction projects, parties, disputes, and the dispute resolution processes.

For future research, more data must be collected regarding construction projects, and dispute resolution, particular the frequency and cost of relevant events. Additional data will allow for analyses that are more detailed and relevant, while remaining practical. In addition, future research should attempt to perfect the model in a more systematical way. While this paper provided a framework of the pricing method, the details of how to use it directly in a construction project still need more work.

To next generation of pricing model for ADR might contain four modules: Information, Modeling, Results and Decision. Information includes the input of exposure data such as project location, engineering characteristics, contract type, etc. and policy information such as coverage value, deductible, limits. Then all the information will go through the Modeling process producing the Results of indicated Gross Premium. Finally, the calculated Gross Premium enters a decision making module in which the participants may consider the marketplace conditions regarding actual premiums, the effects of any risk management programs on the dispute frequency or cost, and the other financing alternatives available to the participants. If the marketplace allows for a fair profit, the insurance company may be willing to sell the product in the marketplace. If the risk transfer allows for a useful reduction of the builder's risk and the marketplace allows for a reasonable premium level, the builder may also be interested in paying a premium to transfer that risk to an insurer.

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