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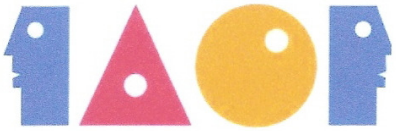

RISK ALLOCATION CONCEPT FOR MASS RAPID TRANSIT SYSTEMS IN TAIWAN

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Abstract

A failure trial operation for a construction project usually leads to possible disputes. The study objective is to identify which party needs to bear the liability under the following circumstances based on the risk allocation concept by force majeure clause, and personnel injury/death or other collateral damage. The comprehensive literature review brings out comparability among past verdicts and targeted investigation, and then yields suggestions for conducting the expert survey based on questionnaire, resulting in 8 stems with 5-scale Likert measurement to develop the proposed concept. There are 50 effective returns that establish 4 types of resolutions for disputes caused by construction projects in Taiwan. The empirical case involving in a disputed trial operation for a massive rapid transit (MRT) construction project is adopted to verify its feasibility. The findings demonstrate the guideline for practitioners to deal with possible disputes caused by construction projects.

Keywords: construction dispute, trial operation, MRT construction project, contract management

Introduction

The construction of Mass Rapid Transit (MRT) systems in Taiwan has been actively expanding. The Core Electricity and Mechanism System constitute the most significant part of the MRT to develop. Completion and acceptance of the Core E&M systems means both completion of project and successful operation of designed systematic functions. Therefore, in the final stage of acceptance, atrial operation is required by Government Procurement Act in order to determine whether or not the System Stability and System Availability meet the terms of the contract. As a result, after the assessment, in the name of having the completion and acceptance, mechanisms and structures go into use prior to the statutory acceptance of the whole project. Such a factor changes the process from one that is "transfer-and-operation" after acceptance by the client to one that consolidates "transfer and operation" and "acceptance" or even reserve these two sometimes.

This said, the issue may be resolved by contractual terms; nonetheless, a performance dispute may be raised if contractual terms failed to be concluded in regard of such dispute. Was the risk that caused the breach of contract identified at the time of formation and the allocation specified in the contractual provisions (Q1)? And second; was the risk of this particular breach shown in the formation of contract price and taken into consideration of price decision (Q2)? In order to shed light on issues involved, ranging from the perspective of the theory of risk allocation, to the analysis of comparative law and application of judicial opinion based on the circumstances of force majeure clause, and personnel injury/death or other collateral damage, the study objective is to identify which party needs to bear the liability.

Literature Review

Certain performances can be expected from the terms in the contract. Therefore, parties are supposed to stipulate specific and detailed contractual terms (Mazher et at. 2019). However, due to practical considerations or ignorance, oversights are inevitable. This is demonstrated by the conditions in the issues stated above which are applications of risk allocation. Realization of risk results in unjust enrichment and therefore liability is the main concern to parties. Proper allocation of risk benefits total construction risk management while decreasing risks. Thus the importance of construction risk allocation is obvious (Battarra et al. 2018; Curran et al. 2018). On issues of construction risks and its allocation, there have been numerous distinct arguments and definitions among the international academic community. Those arguments are primarily based on benefit ownership, cost-down, categorization and economic analysis (Xu et al. 2018; Tavakolan et al. 2017; Romero J and Queipo 2017).

Strauss and Burtch categorized the risks by the parties involved in construction after specifically defining risk. They allocated the risks of site acquisition, projects and quantities, unexpected instances, geological issues, delayed payment, inadequate supervision to the

client; judgments and measures of supervision, manpower assignment, contracts with contractors and suppliers, review and approval to the designer; equipment, materials and workforce, timely completion, defaults of subcontractors and suppliers, production of equipment, machines and workforce, construction defects, third party causing delay, traffic, site safety, and third party safety to the contractor; and, natural disasters and default of contractor to the insurer (Strauss 1979; Burtch, 1979). Williams and Terry further took into account the expected impact of risk, parties' competence and positions in managing risk, types of projects and contracts, and terms of contracts, to decide how to allocate the risk (Williams and Terry 1994).

When unjust enrichment occurs due to unfair contractual terms, the risk transfer may be arranged. In the 1990s, the "Abrahamson Principles" were proposed. It states that a party should bear construction risk if the party has advantage to control the risk or can transfer risk by insurance; the party is the one economic benefit of running the risk accrues on; such allocation is in the interests of efficiency and the long term health of the construction industry on which that depends; or the loss falls on the said party in the first instance when eventuating the risk (Diab et al. 2017; Elsawah et al. 2016; Zhang et al. 2016). Although the Principles is not practicable to cause expense and uncertainty to transfer the loss, it has been widely accepted due to the idea not asking a contractor to evaluate an unquantifiable risk (Salah and Moselhi 2016; El-Sayegh and Mansour 2015; Osipova 2015; Chan et al. 2015; Sriramdas et al. 2014). In 1987 the Federation International Des Ingenieurs-Conseils (FIDIC) prepared the 4th edition of "Conditions of Contract for Works of Civil Engineering Construction", in which clearly states that when "an experienced contractor could not reasonably have been expected to take precautions" the risk is to be allocated to the client (Karakas et al. 2013; Cruz and Marques 2013). The World Bank's version is a modification of FIDIC's model. The contractual terms show that risks allocated to contractors including domestic risks occurring in a state where the construction site is located, risks caused by a client's engineer, and construction site risks that are foreseeable or may be insured. FIDIC's model contract also shows that there is no final conclusion for risk allocation and the allocation can be settled by the parties to the contract. Due to FIDIC's new version, the rules for the allocation of risks in a construction project may simply revolve around the ability (Bunni 1997) to control the risk or to influence any of its resultant effects; to perform a task relating to it; and to benefit from the project.

Concept development: comparison among construction project performance disputes

On issues regarding risk allocation, the Civil Code, the main reference in understanding construction contract issues, prescribes the legal relationship between contractual parties. Article 508 of the Taiwan Civil Code provides that "the undertaker takes the danger of damage or destruction of the work before its

acceptance by the proprietor; if the proprietor delays accepting such work, the danger passes on to him; the undertaker is not responsible for loss or destruction by force majeure of materials provided by the proprietor. “It should be noted from the analysis of the statutory text that: 1) the first half of text prescribes acceptance as a condition for risk allocation, which means that the undertaker has a better position in controlling and managing the risk. However, from the perspective that the proprietor is liable for the materials they provide, ownership seemingly determines risk allocation rather than acceptance, which compromises the first half of text. Such a compromise might be inquired by equity as its ratio legist, but the dispute on whether inquiry is satisfied remains. 2) Furthermore, textual reading of Article 508 defines risk as the damage or destruction of the work. It does not imply that any other impacts on performance, such as efficiency, cost or time (Barnes 1983) are prescribed by this article.

Besides, other risk allocation may be based on customs or jurisprudence. Generally speaking, current rules in Taiwan regarding risk allocation, besides those stated above include the following: 1) Good faith: Paragraph 2 of Article 148 of the Civil Code, 2) Clausula rebus sic stantibus: Statutes similar to Paragraph 2 of Article 227 of the Civil Code and Article 397 of the Code of Civil Procedure which are promulgated in many countries, 3) Fairness and Reasonableness: Paragraph 1 of Article 6 of the Government Procurement Act. All of these are only abstract rules and there would be various applications in different cases. This is the key characteristic of risk allocation practices in Taiwan. The abstract rules draw the main concept, yet they might lead to completely different results in practice. However, application of abstract rules in specific cases by professional judges based on free evaluation of evidence through inner conviction is necessary in forming independent judicial opinions-but that will at the same time cause extreme differences in the result of application and danger of incredibility of judicial system due to over subjectivity. Therefore, there should be objective standards for the application of abstract rules in specific cases, and the objectiveness should be relative rather than absolute. Principles of risk allocation, with those abstract rules expressed in statutory text, may be deemed as an objective standard for the application of abstract rules and can further embody the concept of those rules. In other words, a reasonable risk allocation, in one degree or another, demonstrates that contract between parties meets the inquiry of good faith and fairness. Besides, there is no change of circumstances that results in obvious unfairness; and an unreasonable risk allocation demonstrates the existence of unpredictable change of circumstances that may cause obvious unfairness or contrary to general principles of good faith and fairness. Therefore, judicial opinions on construction disputes involving risk allocation usually consider 2 scenarios as well as the essential of the proposed concept:

Scenario 1: Completion and liability caused by delay

The issue here is how to interpret parties' true intention on completion when contractual terms are contrary to industry custom and usage. Appellate court weighed and balanced the risk allocation between parties and interpreted contractual terms from the view of good faith so as to conclude in accordance with the same rule. Court's holding indicates that good faith is a means for interpretation of contractual terms and affects risk allocation at the same time.

Scenario 2: Work destructed by typhoon (force majeure)

The issue here is whether or not, by statutory text or contractual terms, risks may be allocated to the client due to the usage prior to completion of work; and the application of relevant rules when insurance paid by the client who, on grounds of natural disasters, cannot be indemnified there from.

Resolution development: expert survey

To seek the solution proposed based on the above mentioned scenarios, expertise is critical. Therefore, personnel having been taking part in the dispute settlement procedure are selected for questionnaire which include judges, arbitrators, mediators, who play the role as an adjudicator, owners and contractors and their agents. Every interviewee has related work experience in this field for over a decade. According to the proposed concept and Likert 5-scale method, there are 8 stems with 5 choices to each question, "strongly agree", "agree", "neutral", "disagree", and "strongly disagree" Table 1 demonstrates the questions that directly related to the results from the previous section. The first question is designed to see if the subjects agree with the proposed concept and, thus, it is not included for the further analysis if the response is neutral. According to the criteria of data sampling at 95% confidence level and 10% limit of error in a 10-90% proportion (Oglesby et al 1988; Chen et al. 2017), the valid returns should be greater or equal to 35.

As a result, we distribute the questionnaire to 102 professionals where 64 returns are received but 14 out of 64 returns are invalid due to ambiguous response provided for Question 1 (neutral). A total of 50 returns are valid and taken into the further analysis for verifying the results. Table 2 shows the result of the validity and reliability analysis which has Cronbach's $\alpha = 0.715 > 0.7$ and KMO and Bartlett's test = 0.708, representing a valid survey. The brief background for respondents can be revealed in Figures 1 and 2. In Figure 1, the statuses for respondents are distributed to 5 types: owner, contractor, arbitrator, registered professional engineer (PE), and attorney (lawyer). The respondents with attorney status make up approximately 30%, the largest proportion. From the chart of work experience for the respondents shown in Figure 2, around two-third respondents have over 25 years work experience. Their comments are adequately regarded as expertise. The result clearly shows that every respondent agrees (or strongly agrees) that a more objective standard shall be applied for the construction dispute settlement to a contract, rather than the

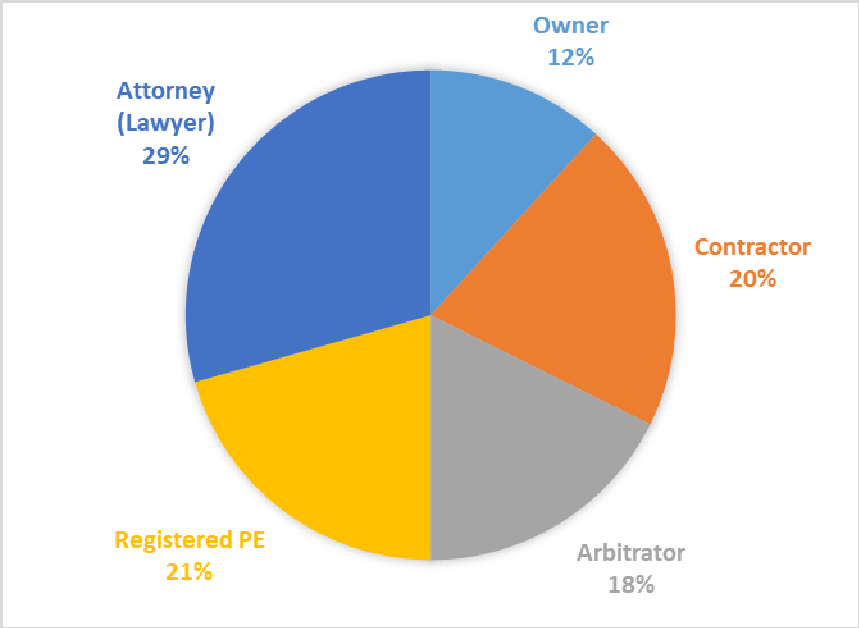

Figure 1: Respondents' status

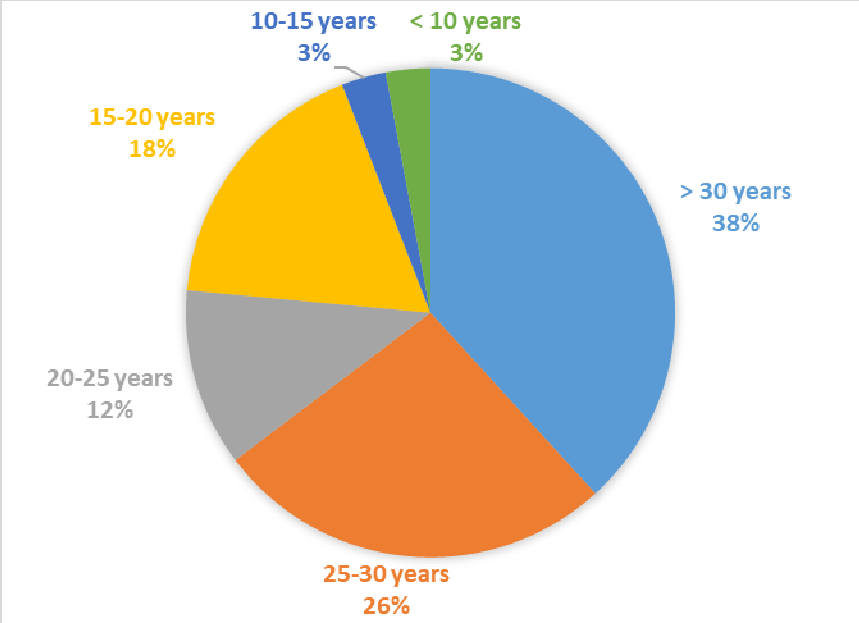

Figure 2: Work experience of respondents

Table 1: Expert survey questionnaire

	Questions	SA	A	N	D	SD
1	Objective criteria can be set up to resolute similar construction disputes by written contract.					
2	It is better to establish objective criteria rather than "free evaluation of evidence through inner conviction" to resolute construction disputes. The judgement can be more consistence.					
3	Contract risk allocation should be based on solid evaluation and scope for possible risk.					
4	It is not beneficial to the owner if risk baring in the contract is not balanced.					
5	Risk allocation is agreed and concluded in contract. (Type I)					
6	Risk is allocated based on bidder's appraisal (Type II)					
7	Risk attributable to bidder, and thus bidder is liable (Type III)					
8	Risk is allocated according to the principles of risk allocation (Type IV)					

SA: Strongly Agree; A: Agree; N: Neutral; D: Disagree; SD: Strongly Disagree

grammatical interpretation of which differences regarding its application are not solved. This result highlights a fact that an objective standard explored by that this study for construction dispute settlement is imperative to the industry. Besides, the majority of respondents agree that construction disputes can be categorized as 4 major types by their contractual terms and price structure. The response from in-depth interviews unintentionally reveals that these 4 types of process model are recognized by owners and contractors as a more objective standard than the grammatical interpretation. What is more interesting is that all the judges interviewed take a positive view. Some of judges even state that although the objective standard proposed by this study is not credited academically and thus is not directly applied in the judgments, the said standard has been taking into consideration for the purpose of interpreting contractual terms.

Resolution to disputes on construction performance

The previous section has brought us the framework and can be summarized as 4 resolutions shown in Table 2. They are: Type I where risk allocation is agreed and concluded in contract; Type II where risk is allocated based on bidder's appraisal; Type III where risk is attributable to bidder and thus bidder is liable; Type IV where risk is allocated according to the principles of risk allocation.

Type I

When the answers to these two questions are affirmative, that is the risk of breach has been specified during the formation of contract and prescribed in the contractual provisions and parties, during the proceedings of reaching their consent understood the allocation of risk which is regarded as a concern for price decision as shown in Table 2 column I., then the risk bearing has been considered as a factor for cost decision, and risk allocation may be decided by contractual provisions. Therefore, there is nothing

Table 2: Validity and reliability analysis for the survey

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
VAR00002	24.7800	10.991	.437	.691
VAR00003	24.9200	10.483	.351	.699
VAR00004	25.1200	9.210	.537	.653
VAR00005	25.0600	10.098	.438	.680
VAR00006	25.2400	8.758	.638	.625
VAR00007	25.5400	8.702	.455	.678
VAR00008	25.5000	10.092	.245	.737
			N of Items = 8	Cronbach's α = .715

Kaiser-Meyer-Olkin Measure of Sampling Adequacy.		.708
Bartlett's Test of Spheric-ity	Approx. Chi-Square	97.405
	df	21
	Sig.	.000

Table 3: Risk allocation

Q1 / Q2	Yes	No
Yes	Risk allocation is agreed and concluded in contract. (Type I)	Risk is allocated based on bidder's appraisal (Type II)
No	Risk attributable to bidder, and thus bidder is liable (Type III)	Risk is allocated according to the principles of risk allocation (Type IV)

unfair in theory. Explicit definition of the measures for risk allocation does not necessarily mean that it must be the client or contractor to burden the risk. If the contract prescribes that risk is allocated to client, the price proposed by contractor should not enclose the cost for burdening risk. Also client cannot ask contractor to be liable after the fact. But if the contract prescribes that risk is allocated to contractor, then contractor should enclose the cost for burdening

risk to be liable for the risk prescribe in the contract provisions.

Type II

This is a scenario that the risk of breach was not specified or allocated at the beginning of forming a contract, but was considered at time of price decision, as is shown in Table 2. Colum II. Most of the reasons why such a particular scenario happens are the fact that the contract failed to describe or the client provided a general insurance for the contract performance and the risk was transferred to the third party via insurance policy. Parties will in fact evade from the allocation of the risk through insurance claim. Even more precisely, parties will be reimbursed for their damages caused by risk through insurance claims. Since the damages are reimbursed by insurance claims, there should be no contract disputes theoretically. In fact, after the risk is realized, the parties to whom the risk is allocated may be reimbursed from the third party and therefore, cannot make any claim against the other party. No matter what causes this said scenario, if contractor who has enclosed the cost for bearing risk into contract price actually does not burden any risk, the payment of contract price is deemed to be duplicate and illogical. Therefore, contractor who is paid the contract price should bear the risk even if parties consent to the allocation of specified risk at the time of conclusion of a contract. This fulfills the core rule of contract.

Type III

Table 2 Column III indicates a scenario that the risk of breach has been specified or allocated at the beginning of the formation of a contract, but failed to consider breach as a factor for price decision.

This scenario is mainly created by the reason that a contractor decides the price. Either it is because the contractor regards the price as reasonable and thus volunteered to bear the risk or it is because the contract negligently disregards the reasonableness of the price. Realistically speaking, at the time when risk is realized, the contractor should assume the risk according to the contract regardless of contractual provisions on assumption of risk as a result of contractor's negligence. Contractor should also not make claims against client for additional expense or payment. In case of a scenario where the client's decision on whom to enter a contract with is based on the price offered by contractor, the contractor is not allowed to nullify offer. Otherwise the basis for awarding the contract will be destroyed and contractor will be encouraged to nullify their offer. In the end the basic principle that a contract should be strictly abided by will be wiped out.

Type IV

When the answers to these two questions are negative, that is neither one of the parties to the contract has been allocated the risk of breach because the risk was not specified at the beginning of the proceeding of contract formation and the cost for risk allocation was not considered at the time of price

decision (Table 2 Colum IV), in order to delineate fairly the rights and duties between parties the question that how to allocate the risk should be based on reasonable allocation of general risk. This conclusion embraces the reasonableness of risk allocation which is the issue that risk allocation theories are always concerned with. From the perspective of reasonable parties, in the proceeding of forming a contract the probability of risk allocation is affected by the adjustment of price or other contractual factors and the risk allocation is thus versatile. At the stage of resolving disputes, employment of basic principles of reasonable risk allocation tends to reach a consensual conclusion. (This is because no contractual institution for adjustment exists, and therefore effect on fairness of a contract is disregarded). In other words, simply from the mere perspective of (1) the benefit allocation resulted from risk avoidance, (2) dominate position of risk control, (3) general development of the whole industry and maximization of the overall economic benefit, the measures for risk allocation may be deduced. From the explanation stated above, the three criteria are better met if aftereffects derived from this type of risk are assumed by the owner.

Empirical evidence: trial operation of Taipei MRT Wenhu Line

The Wenhu Line, connected to the previous Muzha Line, made the Taipei MRT complete. Its construction was composed of extension of the existing Muzha line, installation of new E & M, and integration with old E &M which was installed more than two decades ago. The quantity and technical requirement of the system are far more demanding than civil construction. Yet the characteristic of E&M system is that functions cannot be certified even if the work is completed. Its function cannot be certified for acceptance without certification of system stability and system availability. Therefore, the contract has to set a test prior to completion of work, acceptance or delivery. To ensure full function of public transportation such test needs to simulate real operations, and this is why the “trial operation “is embedded in contractual provision to certify the performance of simulation operation. The contractor of the Wenhu line worked with the client to process trial operation. During that period, operation was forced to shut down due to system defect. As a result, the client demanded compensation claiming that the contractor should be liable. The issue here is, is the contractor liable for damages during trial operation processed for the purpose of acceptance? The trial operation is set up for the certification of a performance that is qualified for operation. The situation that performance is not qualified for operation can be expected or even certain to happen, thus the contractor is still engaged in development and modification of the system so as to meet the standard of acceptance. From the perspective of the contractor, the trial operation is a part of the proceedings of performance and it does not stand for a confirmation that duties are performed. Because the contractor is not paid in full at this time neither has the client accepted the completion of the project, the client cannot claim any right to the project. However, from the perspective of the client, since

trial operation takes place after completion of work, the contractor is liable for any damages that resulted from the defect of the completed work such as system shut-down or other irregular conditions. Contractor is liable for the damages and loss to the client. The respective aspects of contractor and client indicate a basic issue. The work project was opened to the public by the client during trial operation. However, the performance was not completed yet at that time but trial operation was intended to improve the quality of project, due to it being open to public use. The suspension of operation caused further damages which were huge ones, but the contractor's pure intention to rectify the defects caused further damages. Thus the question; whether the contractor's liability for these damages was a major issue

Risk evaluation was generally assessed by the possibility and influence. Both the possibility and the influence should be considered for risk allocation. If we define risks as "public losses on the utilization of facility due to the suspension of trial operation" which are caused by defect performances of the contractor and the client's permission for trial operation, then such losses were foreseeable by the contractor and the client. The fact that public transportation is the subject matter makes consequences versatile after the realization of risk owing to it being open for operation and the degree that the public was involved. Regardless of the client's acknowledgement and plan, it is hard to expect that a contractor assumes the same liability as it does at the time of transferring and acceptance. In other words, trial operation is nothing but a preparation stage before a formal acceptance. Since the work was not recognized and accepted by client, the client did not expect that contractor assumes the same liability as it does at the time of formal acceptance and operation. Both parties reached consensus that trial operation was set up to insure the stability and availability of system for formal acceptance rather than be employed by the client. In doing so, contract between parties should not be interpreted as to include provisions that allow complete openness to the public use, not to mention the damages caused by the inconvenience to public who used the work. From the perspective of contract price, it was difficult to specify the scope, time and degree of the damages caused by suspension of public transportation. Therefore, it is the insurance or other mechanisms that are usually adopted as a measure to transfer or reduce the risk. However, the fact that there exists no price analysis regarding the cost or consideration of risk shows that parties did not have any consensus on the risk allocation nor have they any calculation of cost. From the analysis, this case falls into Table 2 Type IV. The risk was not specified by parties at the beginning of formation of contract, neither was the affect to cost taken into consideration for risk allocation at the time of price decision. Consequently, the parties' liability for damages caused by operation suspension during the process for rectifying the defect in this instance could have been decided from these aspects: (1) the benefit allocation resulted from risk avoidance, (2) dominate position of risk control, (3) general development of the whole industry and maxi-

mization of the overall economic benefit. The trial operation is part of construction for performance and the contractor should not be liable for any failure that happened during trial operation.

Conclusion

The most proper measure for risk allocation is the one that allocates risks before their occurrence so as to avoid disputes on liabilities. The study has brought about resolutions using four types of risk allocation aspect. The proposed concept is developed and then verified using comprehensive literature review, comparability among past verdicts, expert survey, and empirical case. Furthermore, the empirical evidence from disputes by MRT trial operation suggests the Type IV resolution for practitioners. The findings demonstrate the guideline to deal with possible disputes based on the proposed concept. The major contributions in this study lie in a feasible view: in Type I, risk bearing is considered as a factor for cost decision and risk allocation may be decided by contractual provisions; in Type II, the parties to whom the risk is allocated may be reimbursed from the third party and therefore cannot make any claim against the other party; in Type III, the contractor should assume the risk according to the contract regardless of contractual provisions on assumption of risk as a result of contractor's negligence; in Type IV, the allocated liability simply comes from the mere perspective of (1) the benefit allocation resulted from risk avoidance, (2) dominate position of risk control, (3) general development of the whole industry and maximization of the overall economic benefit. The future studies may bring more empirical analyses and merits to practitioners. The beneficial analyses for economic and social impacts are also suggested.

Abbreviations and Symbols:

Mass Rapid Transit systems, MRT

Core Electricity and Mechanism, Core E&M

Federation International Des Ingenieurs-Conseils, FIDIC

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