Construction Risk Identification and Allocation: Cooperative Approach

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Abstract: Over the past decades, numerous research efforts have been undertaken concerning the allocation of construction risks. Although the research currently available provides many valuable insights into the issue, industry participants remain concerned over risk associated with construction contracting. Based on this problem, a research product was developed to aid contracting parties in identifying, assessing, and allocating each construction risk. After a three-phase survey methodology for data collection, three worksheets were developed to identify construction risks with high potential for conflict and to aid in assessing and allocating these risks to the appropriate parties. To complement the model worksheets, three tools were developed: flowcharts, to help determine which party should carry each particular risk; legal research; and risk allocation principles, to help select appropriate contract language to address the identified risks. This paper discusses (1) the risk assessment and allocation model, including its accompanying tools, followed by a legal research discussion that will help parties to better understand construction contracts; and (2) the legal terms that often cause misallocation of risk with severe consequences. **DOI: 10.1061/(ASCE)CO.1943-7862.0000703.** *© 2013 American Society of Civil Engineers.*

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Introduction

Risk, defined in Merriam Webster, Inc.'s (1997) dictionary as "(1) the possibility of loss or injury or (2) someone or something that creates or suggests a hazard," is a reality that every commercial party faces on a daily basis. Construction companies often realize risk at an elevated level because of the involvement of numerous contracting parties, technological challenges, and difficult working conditions. As a result, allocation of risk in the construction industry is often a controversial process, with each party attempting to transfer as much risk as possible by drafting or negotiating favorable contract terms. This risk-averse mindset often results in risk being misallocated to inappropriate parties. Contractual misallocation of risk is cited as the leading cause of construction disputes in the United States (Megens 1997; Smith 1995). The authors acknowledge the difference between negative and positive risks; this paper deals with negative risks that consist of a threat and not an opportunity.

A lack of training and understanding in the area of risk shifting encourages contracting parties to continue their risk-averse ways. The common practice of contractually shifting risk to the contracting party with the least amount of bargaining power is recognized as inappropriate risk allocation. Inappropriate risk allocation, also referred to as risk misallocation, can be defined as "The practice of allocating risk without separately considering which party may be in the optimal position to evaluate, control, bear the cost, or benefit from the assumption of the risk" (Swanson 2006).

Unfortunately, it is a widely-recognized reality that many industry participants allocate construction risks by the process of risk transfer. Owners have a tendency to shift risk to the primary contractor, who in turn pushes risk to the lower-tier parties in the contracting arrangement (Jergeas and Hartman 1996; Smith 1995). As a consequence, parties with the least amount of control and influence over many of the risk-producing factors and decisions often carry the majority of the construction risk burden.

Because of the need for a standardized risk allocation process, the Construction Industry Institute (CII) formed Research Team 210. This paper discusses research findings of Research Team 210—specifically two deliverables. First, it describes the model resulting from the study, which helps contracting parties in determining how each risk in a construction contract can best be identified, assessed, and allocated. Then, the paper provides legal references that predict how courts will rule in situations requiring the application of common law in the area of six hot-button risks—risks commonly allocated in an inappropriate manner.

Literature Review

The topic of risk allocation and its associated risk concepts are not new topics for the construction research community. Numerous research entities have investigated the topic of risk allocation, and many helpful products are available as a result. Though much research has been done in the area of construction risk, there are still several gaps in the research to be filled. Each of the existing studies presents a portion of the solution, but the construction industry is still lacking a comprehensive, nonunilateral, multiparty, widely accepted risk allocation model.

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In the 1980s, two separate studies were conducted to identify the impact that contract language has on construction projects. Ibbs (1986) identified contract clauses that impact project performance in the areas of cost, schedule, quality, and safety. Then, the list of clauses was trimmed to include only the most frequently misinterpreted clauses, and recommendations were provided to increase clarity of such contract clauses. Ashley et al. (1989) focused on how to cost-effectively allocate risk in the areas of indemnification, consequential damages, differing conditions, and delay. Both studies point out the dire need for transparency in risk allocation procedures and the contingencies associated with acceptance of risk. However, recommendations are made for a limited number of contract clauses, and though a list of recommendations provides a great reminder of contracting principles to be applied, it does not give specific instructions or strategies for systematically optimizing risk allocation.

In the 1990s, Wilson (1993) attempted to provide a tool that optimizes risk sharing of insurable risks. The author proved that risk management lowers overall project costs, even though it may increase costs of an individual party. Jergeas and Hartman (1996) suggested that contractors should share the premiums that are charged when the contractor takes on a risk with owners to allow the owner to decide whether or not to accept this additional cost, or to take on some additional risk instead. The party most appropriate to take on risk on a specific set of 17 contract clauses was discussed in a study by Hartman et al. (1998). At the same time, a research study by the American Council of Engineering Companies (ACEC) and the Associated General Contractors of America (AGC) (1998) focused on nine areas of high risk, and identified methods by which these risks have been innovatively allocated in the industry. Though each study provided a great deal of information about risk, the studies each had their own limited focus and could not be widely applied to all types of risk, or the proposed method did not include multiparty involvement in mitigating risks.

In the 2000s, two models were developed to be used in allocating construction risk. Li et al. (2001) developed a model based on value for money to be used on public-private partnership (PPP) projects, and later, Gibson et al. (2004) developed a risk assessment tool for international projects. Each model uses a multiparty approach to identify and assess risk, but they can only be applied in the specific circumstances outlined by the scope of the research.

The authors of this paper considered the additions to and gaps in the current industry research on construction risk when creating a comprehensive, nonunilateral, multiparty tool for identifying, assessing, and allocating risk in construction. The goal of this research is to develop a standard risk allocation process that combines the current theories about construction risk into a robust, widely-accepted model that can be utilized on a wide range of construction projects to facilitate the proper sharing of risk, resulting in the reduction of project costs.

Research Methodology

To accomplish their goals, the authors collected data to support the premise that inappropriate allocation of risk results in financial impacts to a project, provides owners and contractors with a legal reference about contract risk allocation, and produces a model that helps determine how each construction risk is best identified, assessed, and allocated. The research methodology set forth was a two-fold process: data collection and model development.

Data Collection

Data collection was completed in three phases: initial questionnaire, web-based survey, and phone interviews. The initial questionnaire asked participants to list five risks that are the most frequently misallocated in the construction industry. From the responses to the questionnaire and input from the CII research team, a list of top risks was established; these risks are termed the 107 identified default risks. The identified default risks were the basis of the subsequent web-based survey, developed to establish the perceived frequency and severity of the common risks in construction. The web-based survey and consultation from construction risk experts narrowed the 107 risks to 14 hot-button risks frequently misallocated with severe impacts to project participants. The surveys were followed up with phone interviews that investigated the financial impacts of risk misallocation on the parties involved in the construction project. The objectives of collecting data were to establish a list of risks most frequently allocated in an inappropriate manner through contract provisions—hot-button risks—and to find data to support a constant, optimum allocation of those risks.

Data collection, specifically phone interviews, led to the discovery that risk allocation can in fact lead to direct financial consequences. Further interviews focused their attention on the financial impacts of risk allocation in 17 case studies. The studies included 11 different project types, from commercial building to laboratory facilities to airports. Each study exemplified a situation in which the owner inappropriately shifted risk to contractors. The financial impact of this inappropriate risk shifting was estimated at a cumulative \$159 million for the 17 case studies. This \$159 million amount accounts for 14% of the cumulative estimated budget. Risk misallocation financially impacted both the owners and contractors in the case studies; however, the owners took the brunt of the burden, accounting for \$122 million (77%) of the impact.

Upon completion of the data collection phase, three conclusions were made: (1) the construction industry has much to learn in the area of risk allocation; (2) it is neither appropriate or logical to specify that a particular risk be allocated a certain way for every project; and (3) inappropriate risk allocation can lead to increased costs for both owners and contractors.

Model Development

After data collection was complete, the list of frequently misallocated risks and suggestions for optimal legal allocation helped structure the risk allocation model. The model consists of three worksheets: a single-party worksheet to be filled out by the buyer, a single-party worksheet to be filled out by the seller, and a two-party worksheet to be completed cooperatively by both parties. The buyer and seller are defined by the contract between the parties. In an owner/contractor relationship, the contractor is the seller because he or she is providing a service for which the owner compensates him. However, in a contractor/subcontractor relationship, the contractor is the buyer because he or she is purchasing a service from the subcontractor.

Each of the three worksheets contains the 107 identified default risks, flowcharts developed to identify the party most qualified to accept each risk, and matrices that quantify the likelihood and severity of each risk. The purpose of the worksheets is to identify risks with high potential for conflict and to help assess and allocate these risks. To complement the model worksheets, three tools were developed to help determine which party should carry a particular risk and to help select appropriate contract language to address certain risks. The three tools, contract language tables, risk allocation principles, and legal research, focus on the 14 hot-button risks established during data collection. This paper provides examples of

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legal research for the six most common hot-button risks in the section titled "Legal Perspectives on Hot-Button Risks."

Scope

The research was directed toward design-bid-build lump sum projects, and focused on owner-contractor relationships within these projects. However, many of the research components are useful for several contract types and contracting relationships.

This paper discusses the risk allocation model and legal research conducted as part of the CII Research Team 210's research study. The paper does not discuss in detail the surveys used during the data collection portion of this project; it only makes note of the results of the data collection as they are used in the model development and legal research efforts.

Risk Allocation Model

The major output of CII Research Team 210 was the risk allocation model. The model not only helps to allocate risks, but first assists in identifying and assessing risk. This section discusses the four phases of the risk allocation model: risk alignment, risk identification, risk analysis, and risk action.

Risk Alignment

Risk alignment is a single-party process of establishing a strategy that details how to identify, analyze, take action on, respond to, and document the risks associated with the project in a manner that minimizes and/or hedges internal risk. Within a construction organization, there is often an internal disconnect regarding risk allocation goals and objectives. Effective risk alignment causes a contracting party to align its risk allocation priorities in accordance with the overall goals of the organization. To successfully assess and allocate risks between contracting parties, all contracting parties must first be internally aligned.

When using the risk allocation model, the first two sections of the single-party risk assessment worksheet are to be completed during internal risk alignment, before the two-party process is initiated. Despite the title, the single-party risk assessment worksheet is completed by both contracting parties. Single-party, in this case, means that each party will fill out its assigned worksheet individually.

The first section of the single-party risk assessment worksheet requires the input of general company and project information. The second section is a list of risks. The risks can be a company standard list generated from experience or a customized, project-specific list.

Risk Identification

After individually completing risk alignment, the parties should come together for risk identification. Risk identification is a two-party process that involves identifying risks that have the potential to be inappropriately allocated, and documenting their possible time and cost impacts. During this phase, the parties should compare their list of risks from section two of the single-party worksheets. By involving both parties in the risk identification process, the likelihood of overlooking risks is greatly diminished.

Risk Analysis

Risk analysis is the single-party and two-party process of assessing each identified risk and determining its specific attributes and characteristics. In the model, risk analysis is done in section 3 of the single-party risk allocation worksheet and in section 2 of the two-party risk allocation worksheet.

Section 3 of the single-party worksheet, the risk assessment section, provides for the input of several risk analysis measures, including the likelihood of risk realization (LORR), relative impact (RI), risk rating, and the input of recommendations and notification of a 1–5 risk. Section 2 of the two-party worksheet automatically calculates other risk analysis measures—the risk rating disagreement and combined risk rating. Each of these measures is discussed further in the following sections.

LORR

The LORR of a risk is the likelihood that the risk will materialize during the life cycle of the project. This likelihood is commonly determined through the use of simulation models such as Monte Carlo simulations, sensitivity analysis of historical data, and/or the intuition of experienced personnel. The likelihood of risk realization is assigned using a numerical value from zero to five:

- 0 = Not applicable to project (0% chance)
- 1 = Very low chance (<10% chance)
- 2 = Low chance (10–35% chance)
- 3 = Medium chance (35–65% chance)
- 4 = High chance (65–90% chance)
- 5 = Very high chance (>90% chance)

RI

The RI is the impact on time or cost that can be experienced if the risk materializes. Contracting parties should use established historical data, experienced personnel, actuarial science, and accounting methods to aid in the estimation of RI. Like the LORR, the RI of a risk is assigned using a numerical value from zero to five. The qualitative language describing each numerical RI value was taken from the CII international project risk assessment research (CII 2003), and the percentage ranges were assigned by the authors as follows:

- 0 = Not applicable to project (0% impact)
- 1 = Negligible and routine procedures sufficient to deal with the consequence (<5% impact)
- 2 = Minor and would threaten an element of the function (5–10% impact)
- 3 = Moderate and would necessitate significant adjustment to the overall function (10–20% impact)
- 4 = Significant and would threaten goals and objectives (20–50% impact)
- 5 = Extreme and would stop achievement of functional goals and objectives (>50% impact)

Risk Rating

The risk rating is the product of the LORR and the RI of the risk. The risk rating value helps the single-party user assess risks that have more potential for inappropriate allocation, and therefore which risks should be given the highest priority to optimize allocation. If a risk has a high risk rating (ten or higher), it is critical that the allocation be placed with the party best able to manage and mitigate the risk. The concept of risk ratings is widely accepted throughout risk management and assessment strategies, and has been employed in recently developed research by the CII international project risk assessment (CII 2003).

Risk Rating Disagreement

The risk rating disagreement is the absolute difference between the two parties' individual risk ratings for each risk. This difference represents the degree to which the two contracting parties disagree on the importance of a risk. If the two parties strongly disagree on

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the importance of a risk, the risk will be brought to the attention of the parties so that they can discuss the reasons for the differing views and ensure optimum allocation. A large risk rating disagreement may indicate that one of the contracting parties possesses information that the other contracting party does not. A high disagreement may also indicate that the parties have different financial capacities. The purpose of calculating the risk rating disagreement for each risk is to determine if both parties agree on the level of concern and attention that should be given to a particular risk, to ensure that it is properly allocated. The higher the risk rating disagreement, the more incentive there will be to put the risk on the table for discussion.

Combined Risk Rating

The combined risk rating is the product of the party 1 and party 2 risk ratings. The purpose of calculating the combined risk rating is to identify the risks that both parties deem highly important, and to bring those risks to the table for balanced discussion and appropriate allocation. The level of combined risk rating is intended to identify extreme commonalities in risk assessment between the contracting parties. This ensures that the risks that are of a major concern for both parties will not be unknowingly assumed by one of the contracting parties, but instead allocated to the party who is in the most appropriate position for assumption. Furthermore, the higher the combined risk rating, the more crucial it becomes to ensure proper allocation because the risk is likely to occur and will have drastic financial impacts. The contracting parties may be able to more effectively make allowances and plans for such a risk cooperatively rather than individually. Fig. 1 shows two single-party worksheets and how they are both used to calculate factors such as the risk rating disagreement and the combined risk rating in the two-party worksheet shown subsequently.

1–5 Risk

Indication of a 1–5 risk means the user has given a risk a LORR of 1 and a RI of 5. In the worksheets, a 1–5 risk is indicated by an X and is more of a notification than a measure of risk. This type of risk is red flagged because it will have extreme impacts if it materializes, even though this risk has a very low likelihood of occurrence. Because a 1–5 risk only produces a risk rating value of 5, it may otherwise be disregarded. However, a 1–5 risk is worth a second look to ensure that the user has considered the maximum possible loss, however unlikely it may be.

Risk Action

After risk analysis, risk action is needed. Risk action can be defined as a two-party process of developing and recommending actions to

Party 1 Risk Assessment Worksheet

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
List of Risks	Risk Applies?	Contract Risk?	Likelihood of Risk Realization (0–5)	Relative Impact (0–5)	Risk Rating (0–25)	Expected Value of the Risk	Recommended Action	Risk Allocation Recommendation	1–5 Risk?	Comments
2c. Legal/Insurance/Risk Management Review			0	0	0					
2c.1 Acquisition of necessary easements (x w/ 3a)	Yes	No	5	5	25	$400,000	Transfer	Contractor		
~~2c.2 Ambiguous acceptance criteria (x w/ 4)~~	~~No~~		~~0~~	~~0~~	~~0~~					
2c.3 Back charge provisions	Yes	Yes	1	5	5	$25,000	Accept	Owner	X	
2c.4 Cumulative impact of change orders	Yes	Yes	2	3	6	$55,000	Transfer	Contractor		
~~2c.5 Consequential damages~~	~~No~~		~~0~~	~~0~~	~~0~~					
2c.6 Design responsibility	Yes	Yes	5	5	25	$425,000	Transfer	Contractor		
2c.7 Differing site conditions (x w/ 3b)	Yes	Yes	1	1	1	$2,500	Accept	Owner		
2c.8 Disputes provisions	Yes	Yes	1	5	5	$35,000	Transfer	Contractor	X	

Party 2 Risk Assessment Worksheet

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
List of Risks	Risk Applies?	Contract Risk?	Likelihood of Risk Realization (0–5)	Relative Impact (0–5)	Risk Rating (0–25)	Expected Value of the Risk	Recommended Action	Risk Allocation Recommendation	1–5 Risk?	Comments
2c. Legal/Insurance/Risk Management Review			0	0	0					
2c.1 Acquisition of necessary easements (x w/ 3a)	Yes	No	5	5	25	$375,000	Transfer	Owner		
2c.2 Ambiguous acceptance criteria (x w/ 4)	Yes	Yes	5	5	25	$395,000	Transfer	Owner		
2c.3 Back charge provisions	Yes	Yes	2	2	4	$35,000	Accept	Contractor		
~~2c.4 Cumulative impact of change orders~~	~~No~~		~~0~~	~~0~~	~~0~~					
~~2c.5 Consequential damages~~	~~No~~		~~0~~	~~0~~	~~0~~					
2c.6 Design responsibility	Yes	Yes	5	5	25	$410,000	Accept	Contractor		
2c.7 Differing site conditions (x w/ 3b)	Yes	Yes	5	5	25	$390,000	Transfer	Owner		
2c.8 Disputes provisions	Yes	Yes	1	5	5	$50,000	Transfer	Owner	X	

Two-Party Risk Assessment Worksheet

[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]
List of Risks	Party 1 Risk Rating (0–25)	1–5 Risk?	Party 2 Risk Rating (0–25)	1–5 Risk?	Risk Rating Disagreement (0–25)	Combined Risk Rating (0–625)	Party 1 Risk Allocation Recommendation	Party 2 Risk Allocation Recommendation	Comments
2c. Legal/Insurance/Risk Management Review	0		0		0	0	0	0	
2c.1 Acquisition of necessary easements (x w/ 3a)	25		25		0	625	Contractor	Owner	
2c.2 Ambiguous acceptance criteria (x w/ 4)	0		25		25	0	0	Owner	
2c.3 Back charge provisions	5	X	4		1	20	Owner	Contractor	
2c.4 Cumulative impact of change orders	6		0		6	0	Contractor	0	
2c.5 Consequential damages	0		0		0	0	0	0	
2c.6 Design responsibility	25		25		0	625	Contractor	Contractor	
2c.7 Differing site conditions (x w/ 3b)	1		25		24	25	Owner	Owner	
2c.8 Disputes provisions	5	X	5	X	0	25	Contractor	Owner	

Fig. 1. Single-party and two-party worksheets

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enhance the probability of project success. The remaining sections of both the single-party and two-party worksheets help facilitate risk action along with other tools such as buyer and seller flowcharts and risk allocation principles.

Buyer Flowchart

The buyer flowchart is designed to be used by the buyer of the services (e.g., owner in a general contractor-owner contract, general contractor in a subcontractor-contractor contract). This flowchart, shown in Fig. 2, should be used by a buyer entity when evaluating what action should be taken for each particular risk being assessed. To use the flowchart, the buyer must start at the top left of the figure and answer the question as it pertains to the risk in question. The tree will lead the buyer to the most appropriate action to take for each specific risk. The flowcharts are color-coded to represent the more extreme recommended actions farther down the flowchart.

Seller Flowchart

The seller flowchart, shown in Fig. 3, is designed to be used by the seller of the services (e.g., general contractor in a general

Fig. 2. Buyer flowchart

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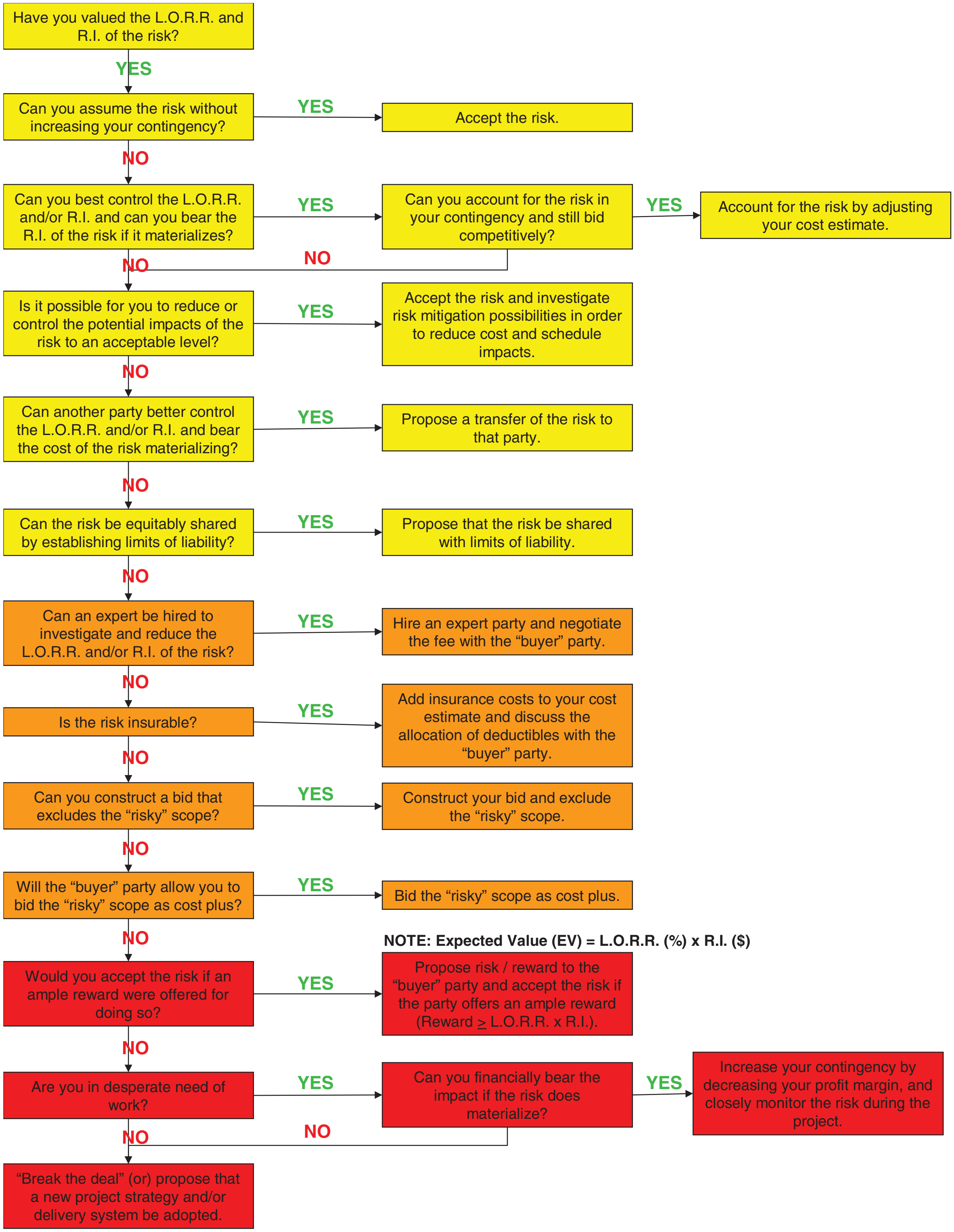

Fig. 3. Seller flowchart

contractor-owner contract, subcontractor in a subcontractor-contractor contract) when evaluating necessary actions for each particular risk being assessed. The seller flowchart is used in the same way as the buyer flowchart discussed in the previous section.

Legal Perspectives on Hot-Button Risks

The risk allocation model discussed previously was designed to be used for all risks present on a construction project. Though

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consideration of all project risks is highly important in risk management, special attention should be paid to the risks most commonly misallocated with severe consequences. This section provides a portion of the study's legal research on such issues to enhance the understanding of these important risks. It also discusses the contract language generally used related to these risks so that all parties are aware of the legal outcomes likely to take effect if the risk occurs.

Legal research in this paper will aid the parties in achieving appropriate contractual allocation for hot-button risks isolated in the data collection process. The legal research is performed to determine (1) how the U.S. judicial system will allocate a particular risk in the case that it is not allocated in the contract documents; and (2) the exceptions to enforceability established by the courts when the risk is included in the contract documents.

The research team sought to establish a list of hot-button risks most commonly allocated in an inappropriate manner. The following sections will discuss the six most common and significant hot-button risks, as determined by the data collection surveys: "No Damages for Delay," "Consequential Damages," "Indemnity," "Ambiguous Acceptance Criteria," "Cumulative Impact of Change Orders," and "Differing Site Conditions."

A flowchart to aid in determining the appropriate party to carry the risk was developed for each of the hot-button risks. Examples of the no damages for delay and cumulative impact of change orders flowcharts are given in the following sections of this paper.

No Damages for Delay

Delay is an ever-present risk on any construction project. Numerous difficulties can arise because of delay, and lost time claims can reach very large sums. As a result, many owners mitigate their losses by shifting the risk of delay damages through the inclusion of a no damages for delay clause that attempts to shift the risk of owner-caused delay to the contractor.

Public entities often have appropriation limits that restrict the availability of additional project funds. A no damages for delay clause seeks to protect the owner from end-of-project delay claims for which funding is not available by putting everything on the table up-front at the signing of the contract.

Contractors may contend that the inclusion of no damages for delay clauses in the contract encourages owners and their design professionals to conduct their work in an unmotivated, subpar manner because they are protected by the clause. However, courts rarely recognize these concerns. Because no damages for delay clauses can result in financial impacts to both contractors and owners, it is worth the time and effort to investigate the common law principles concerning these clauses.

Fig. 4 displays a flowchart that helps determine probable legal action in the case of project delay. Beginning at the left of the figure, the user should consider the question provided and follow the arrow associated with the yes or no answer. Working from left to right, the parties will be able to determine which party will most likely be held legally responsible for the delay given the project circumstances. It should be noted that the flowchart depicts current legal trends and should be used as an educational tool only, not relied upon to determine how a jurisdiction will rule.

Consequential Damages

Direct damages are commonly realized on construction projects and include items such as defective workmanship, interest on late payments, and additional equipment costs. Frequently, construction claims also take consequential or less direct damages into consideration. Consequential damages are damages resulting from a breach of contract that goes beyond direct damages. They are a result of indirect or special circumstances that the contracting parties knew of, or should have known at the time the contract was entered.

True consequential damages are foreseeable, making them ideally allocated through insurance (Sweet and Schneier 2004). It is important to know what each insurance policy covers to accurately ascertain the amount of risk that is not covered by insurance.

Indemnity

Indemnification can be defined as the action by which one contracting party (indemnitor) holds another party (indemnitee) harmless for a loss that was caused by the indemnitor. Depending on the contract and the legal jurisdiction in question, the indemnitor may also end up indemnifying the indemnitee even if the loss was caused in whole or in part by the indemnitee. Indemnity can be provided contractually through express written provisions, or noncontractually through the court's application of the legal concepts of qualitative (common law indemnity) and quantitative (doctrine of contribution) comparisons of negligence.

When a severe personal injury or loss occurs on a construction project, one of the contributing parties may bear all of the losses even though other parties contributed to the injury or loss. The

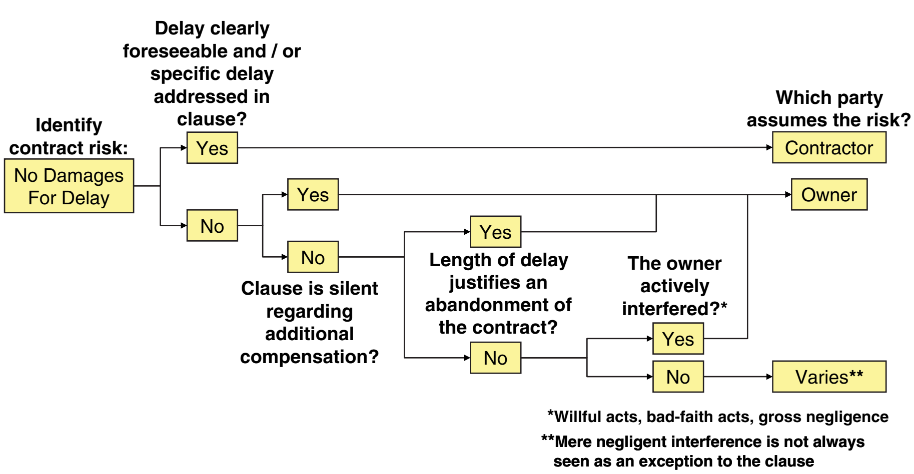

Fig. 4. No damages for delay legal issues and considerations flowchart

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party who pays all of the losses will often be interested in recovering some of its losses from the other guilty parties, known as contribution. Some U.S. courts do not require contribution among wrongdoers (Sweet and Schneier 2004). In Johnson v. Chicago & P. Elevator Co., 105 III. 462 (1882), the court affirmed that, "There is no right of contribution between wrong-doers." However, approximately half of the U.S. states have implemented some type of contribution statute (Sweet and Schneier 2004). These statutes vary from state to state, but generally specify that a joint tortfeasor (wrongdoer) against whom judgment is entered is entitled to recover losses from other joint tortfeasors whose negligence contributed to the injury. Contribution will only be allowed if the other joint tortfeasors are not protected by workers' compensation statutes.

Ambiguous Acceptance Criteria

All parties benefit when the acceptance criteria avoid qualitative statements and contain clearly measurable, objective, and quantitative criteria. Frequently, acceptance criteria may include ambiguous phrases that specify that the work be completed so that it is fit for purpose or to the owner's satisfaction. This can lead to a situation in which the contractor believes the acceptance criteria have been achieved, but the owner views the contractor's performance as unacceptable.

When ambiguous acceptance criteria exist, both parties will likely absorb direct and indirect costs that stem from delays. In the end, the owner may be forced to accept a finished product that does not meet its needs, and may have to absorb additional costs for rework.

Patent versus Latent Ambiguities

If there is more than one reasonable interpretation, the contract term in question will be established as ambiguous. Ambiguous contract terms are then classified by a court as either patent or latent ambiguities. In Beacon Constr. Co. v. United States, 314 F.2d 501 (Ct. Cl. 1963), the court defined a patent ambiguity as "an obvious omission, inconsistency, or discrepancy of significance." In Jamsar, Inc. v. United States, 442 F.2d 930 (Ct. Cl. 1971), the court stated that for an ambiguity to be patent, it has to be "the type of discrepancy, omission or conflict which should alert a reasonable man of a difference in interpretation."

If a patent ambiguity exists, the contractor must have sought clarification from the drafter of the ambiguity before placing its bid. If the ambiguous contract terms are not patently ambiguous, then they are latently ambiguous. Latently ambiguous terms do not produce a duty of inquiry from a prospective bidder. Instead, if a contractor relies on a reasonable interpretation of a latent ambiguity, the court will accept the contractor's interpretation as sufficient. This legal principle stems from the contra proferentem rule, which holds that an ambiguity will be construed against the drafter of the ambiguity.

Cumulative Impact of Change Orders

The direct and indirect costs associated with change orders can be expensive, so they are often at the center of legal disputes. A large issue regarding costs associated with change orders is cumulative impact.

A cumulative impact of change orders occurs when, according to Michael R. Finke in Claims for Construction Productivity Losses, 26 Pub. Cont. L. J., 1997, "the issuance of an unreasonable number or unusual kind of change orders creates a synergistic disruptive impact such that the total disruption caused by the changes exceeds the sum of the disruptive impacts caused by the individual change orders when looked at independently" (Jones 2001).

Often, the owner demands that all direct and indirect costs associated with a change order be estimated at the time the change order is submitted and approved. This can quickly lead to conflicts because the cumulative impact of change orders is not foreseeable at the time that each single change order is issued.

The two important types of construction changes—cardinal changes and constructive changes—are integral to recovering costs associated with the cumulative impact concept.

Cardinal Change

A cardinal change qualifies as a breach of contract by the owner. A cardinal change can occur in a couple of situations: (1) the owner mandates (not a proposal) that a contractor perform a single change that is outside of the scope of the contract; or (2) the owner directs an aggregate of multiple or drastic change orders that causes the project as a whole to become materially different from what was expected when the parties entered into the contract (Hanna 2001).

Constructive Change

A constructive change occurs when the contractor is ordered to perform work that he or she qualifies as an increase in scope, whereas the owner or owner's agent feels that the work is already included in the contractor's original scope. Essentially, a constructive change occurs when it is determined that a change order should have been issued.

Foreseeability of Cumulative Impacts

When pricing a single-change order, it is not possible to predict the entire cumulative impact that will result from that particular change order. Typically, it is only possible to price the direct costs associated with the change. If a contractor is able to foresee a cumulative impact stemming from a change order, the contractor must adjust the change order price to reflect the expected and foreseeable impact. If the contractor is aware of circumstances at bid time that may cumulatively impact the project, the contractor must account for the possible impact accordingly.

Figs. 5(a and b) display the cumulative impact of change orders flowchart. To use the chart, parties should begin at the left, answering yes or no to the questions asked. Moving from left to right, the parties can identify whether or not the contractor may legally collect for the cumulative impact of changes. Again, it should be noted that the flowchart depicts current legal trends and should be used as an educational tool only, not relied on to determine how a jurisdiction will rule.

Differing Site Conditions

The risk of differing site conditions is divided into two distinct types: Type I, conditions that materially differ from those indicated or represented in the contract documents; and Type II, conditions that materially differ from those that cannot ordinarily be reasonably expected by the contracting parties for the type of work performed. Because differing site conditions can increase costs drastically by causing severe delays and mitigation costs, differing site conditions clauses should clearly and appropriately allocate the risk of encountering such conditions. If a differing site conditions clause is not included in a contract, the contractor may dramatically increase its contingency to account for the risk, and the ultimate allocation of the risk will be left to the courts.

The use of a Type I/Type II differing site conditions clause is now commonplace in construction contracts. Such clauses typically provide a definition for a changed condition and specify the procedures and cost reimbursement policies when differing site conditions are encountered. However, a contractor cannot expect

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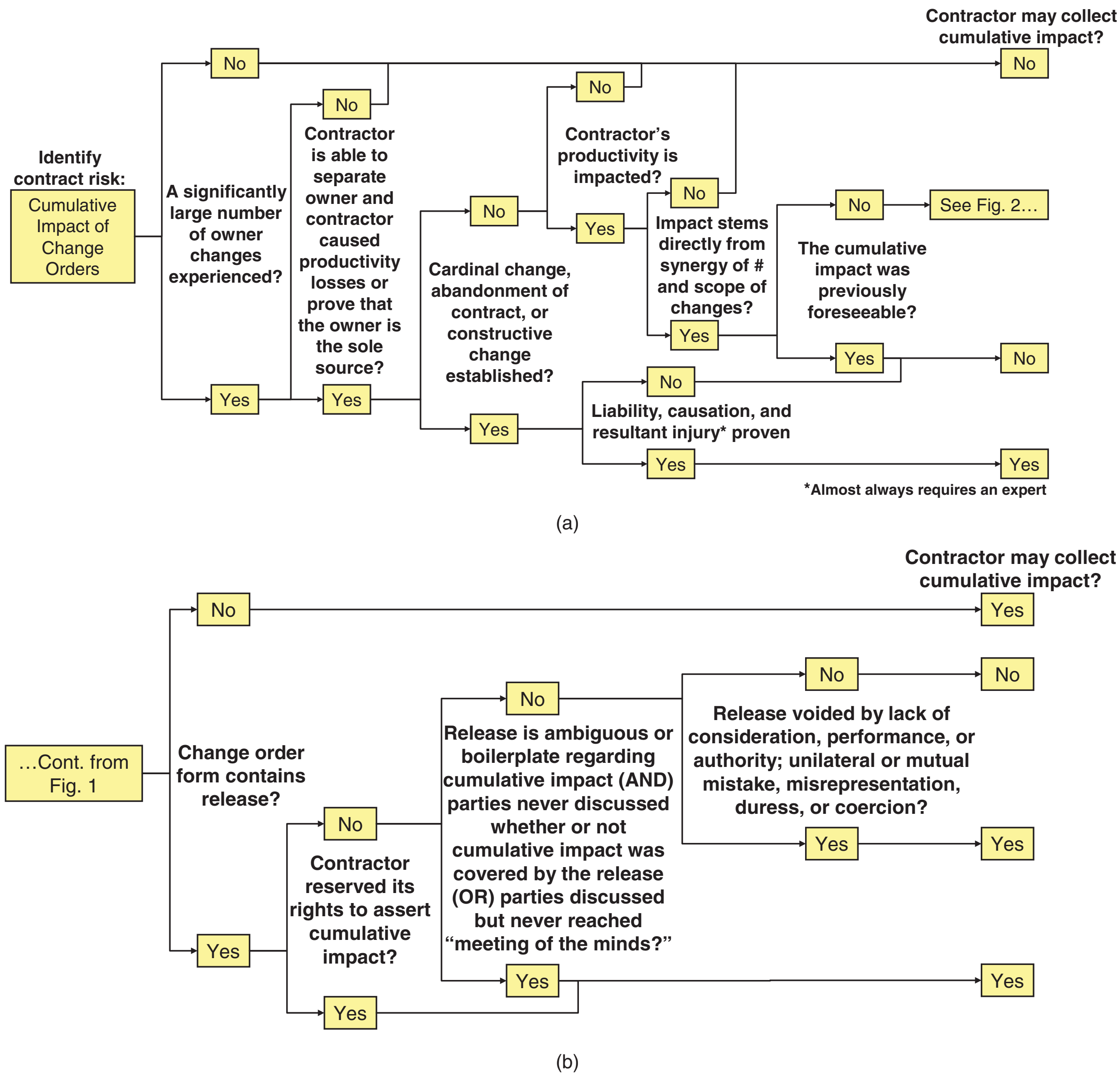

Fig. 5. Cumulative impact of change orders legal issues and considerations flowchart: (a) part 1; (b) part 2

to rely on a differing site conditions clause to save their company from increased costs in all differing site conditions circumstances. On the contrary, there are several elements that may prevent a contractor from recovery, notwithstanding the presence of a differing site conditions clause, including site investigation requirements, exculpatory contractual statements, notice requirements, and proof of the certainty of resultant damages.

Conclusion

It is clear that optimum risk allocation is highly dependent on project-specific circumstances and participants. The industry still has much to learn concerning the topic of inappropriate risk allocation that will directly impact risk management and project costs for the participants. Recognizing these industry needs, the single-party risk assessment worksheet was developed to allow the participants to perform internal risk alignment before contracting. Additionally, the two-party risk assessment worksheet allows participants to perform external risk alignment. Together, these worksheets make up the risk allocation model. A similar cooperative approach can be used on a weekly, monthly, or quarterly basis. The risk allocation model is supplemented with several helpful tools such as flowcharts, risk matrices, contract language tables, risk allocation principles, and legal research. Legal research for hot-button risks allows parties to understand the consequences of relying on common law to allocate the risk burden. Knowledge about probable court decisions regarding a certain risk can help parties to make informed decisions about the contract language used to allocate risks and understand the legal implications of such language.

Even with increased knowledge of construction risk and a helpful risk allocation model, construction will always have risk associated with it. However, careful drafting of construction contract clauses can allocate risk where it appropriately belongs, thereby eliminating many of the uncertain and legal arguments of common law principles.

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