

# Development of a Topics Course for Construction Risk Management

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The Cal Poly Construction Management program has been proven to produce some of the most prepared graduates heading into new careers in every facet of the construction industry. Speaking with faculty member Tom Kommer, we have concluded that there is a need for an increased focus on construction risk management within the curriculum. In order to develop a course which would suitably educate Cal Poly Construction Management students in the topic of risk management, I performed a literary review during which I determined which risks are most prevalent within the construction industry and how firms in the construction industry manage these risks. It was also revealed through interviews with industry professionals that an education in construction risk management is critical for a successful career in the construction industry. Using the information collected through a literary review and the interview responses obtained from industry professionals, it has been determined that a Construction Risk Management topics course would benefit Cal Poly Construction Management students in their future careers in the construction industry.

Key Words: Risk Management, Construction, Risk, Project Management, Risk Mitigation

## Introduction

After having achieved completion in the majority of the Cal Poly Construction Management courses required for graduation, I feel that a topic with as much importance as risk-management should be covered in greater detail to prepare students for positions in the construction industry. Several courses within the curriculum offer some knowledge of risk-management, including CM 313 – Commercial Construction Management, CM 413 – Jobsite Construction Management, and CM 443 – Management of the Construction Firm. By discussing the topic of risk-management noncongruently by several different lecturers, students may not receive the entirety of necessary information. Tom Kommer, a professor with the Cal Poly, SLO Construction Management Department, expressed similar concerns during a discussion regarding risk-management. The objective of this research project would be to develop a topics course which would allow for a more comprehensive view of risk management. This class would offer lessons in financial, schedule, safety, environmental, and logistical risks. After these lessons, students would be offered the opportunity to practice their navigation of these risks through various case study analysis.

## Literature Review

As Construction Management students, it is crucial to our future career performance that we learn how to best manage and navigate risk within the construction sector. In order to develop a Construction Risk Management course to best prepare Cal Poly Construction Management students, I will establish which risks are most commonly encountered. After establishing common risk trends, I will investigate how these issues are most effectively managed in order to establish the best practices for Risk Management.

### *Project Risks*

The clearest trend amongst the various sources I will review is that several authors attribute a stern majority of

construction risk to changes arising during the course of construction. The authors also tend to agree that the possibility of change is unavoidable. It is our job as construction professionals to identify these risks early and mitigate the effect that changes have on project cost, schedule, and quality. Nigel Thompson, author of *Managing Risk in Construction Projects*, describes that a change, or “risk event,” “implies that there is a range of outcomes for that event which could be both more and less favorable than the most likely outcome, and that each outcome within the range has a probability of occurrence (Thompson, 2014).” Most sources also agree that construction risk management begins during the project procurement period and carries through to the end of the construction project.

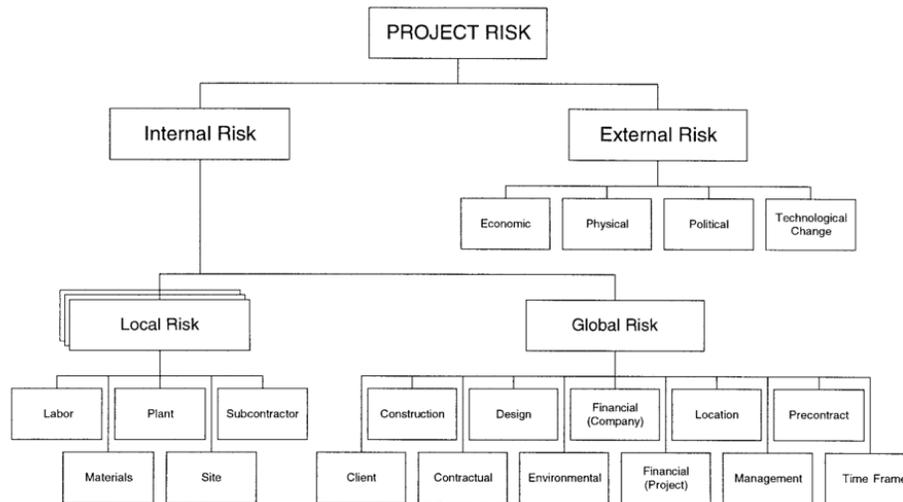


Figure 1: The hierarchal order of project risk is explained as being internal risks which can be responded to within business practice or external risks which occur outside the realm of the business and are uncontrollable. Specific examples of internal and external risks in construction are then identified.

There are an unquantifiable and almost unfathomable amount of risks which can occur on any construction project, no matter the type of project. These project risks can be categorized as internal risks, which are more controllable through proper management practices, and external risks, which are more uncontrollable and must be identified as they arise (Tah, 2001). Internal risks can then be classified as local risks for a particular project or as global risks which have the same probability of effecting projects around the world (see figure 1).

Table 1: The most critical risk factors are explained here in terms of importance to Contractors and Project Management Practices, as well as the average. The numbers are in reference to the risk premium placed by businesses on the identified risks when pursuing a construction project.

	Contractors	Project management practices	All firms
Environmental (e.g. weather)	2.33	1.69	2.05
Political, Social & Economic (e.g. inflation)	2.52	2.20	2.37
Contractual arrangement (e.g. responsibilities)	3.40	3.54	3.44
Financial	3.50	3.55	3.50
Construction (productivity, injury, safety)	2.93	2.50	2.71
Market/industry (availability of workload)	2.90	3.00	2.95
Company (corporate)	2.50	2.58	2.56
Development in IT	1.89	1.71	1.81
Project (design information)	2.69	3.08	2.88

Organization risk premium index (RPI) is defined as  $RPI = \sum_{i=0}^{i=4} E_i P_i$ , where  $E_i$  =  $i$ th extent of premium; and  $P_i$  = percentage of respondents.

As is evident by figure 1, the identifiable risks to any given construction project are vast and a construction management student should at least be familiar with each of these internal and external risks as well as the effect that they can have on a project. In a ten-week topics course, however, it would be unreasonable to assume that each be covered in the depth that they deserve. For this reason, I will focus on the risks which construction project management firms and general contractors view as being most impactful to the success of a construction project (see

table 1). The data suggests that contractual risk and financial risks are most critical to the success of contractors and project management practices.

Contractual risks are those that are associated with unfavorable or flawed contract documents. Incorrect documents such as previously modified construction drawings, when submitted as part of the official contract, can also expose a project to risk because the team does not have the most up to date designs during preconstruction (Akintoye, 1997). Another risk which can arise in a contract is the creation of improper contractual relationships where the liability of risk is not properly separated (Akintoye, 1997). These contract document errors can also lead to financial risk such as the way in which the contract stipulates change order procedures (Odeh, 2002). Other, more general financial risks that the preconstruction team should be aware of, include the financial stability of the owner and their ability to finance a project to its completion, including timely payment of work completed (Akintoye, 1997). Unidentified or poorly managed financial risks have an extreme impact on the cash flow of companies involved, which is why this risk is among the most critical to construction companies in all areas of construction.

Construction risks, according to (table 1) are far more critical to the success of projects for contractors than for project management practices, but in my experience, the majority of Cal Poly Construction Management students seek jobs with general contractors upon graduation so it is crucial to discuss these risks in a risk management topics course. According to Akintoye, construction risks include “productivity of labour, soil and site conditions, material shortages and quality, site safety, etc.” Labor productivity is a constant battle on any construction project and can be affected by a variety of factors including, availability of skilled labor, familiarity to the type of work being performed, project duration, weather, and so much more. Soil and site conditions present an extremely volatile risk to schedule and cost on a project. At the beginning of the project, the procurement team will make decisions based of the contract documents which may or may not contain a proper soils report at this time. Even with access to a soils report, unforeseen conditions can arise.

#### *Risk Management Strategies*

Now that I have identified the primary project risks which plague the construction industry, it is now important to identify the methods in which the construction industry addresses these risks. One trend within the sources examined is that it is critical to begin managing risk during the procurement stages of the project, during which time the team should identify potential risk elements of the project. These project risks can be classified into several areas of the project, as defined by Akintola Akintoye in the paper entitled “Risk Analysis and Management in Construction.” Akintoye states that “these are physical, environmental, design, logistics, financial, legal, political, construction and operation risks.” There are several ways that construction firms can approach these risks during procurement; avoid the risk, accept the risk, mitigate the risk, or transfer the risk.

Avoiding risk is one of the most radical methods to manage risk on a project. When practicing this method, the company chooses not to participate in the project at all. Al-Bahar states that an example of risk avoidance would be “if a contractor is concerned about potential liability losses associated with asbestos material or hazardous waste, he could avoid the risk by never acquiring any project that involves operations with such materials.(Al-Bahar, 1990)” Though avoiding these projects would prevent the contractor from potential negative cost impacts, it also limits the financial gain they could have received by participating in the project. “Risk avoidance in construction is generally recognized to be impractical as it may lead to projects not going ahead or a contractor submitting an excessively high bid for a project (Akintoye, 1997).” Not only is risk avoidance less practical than other risk management strategies, it is dangerous for a contractor to limit their cash flow by avoiding work. Instead, contractors would preferably accept, mitigate, or transfer the risk.

Also known as risk retention, accepting risk is becoming an increasingly more common method of managing risk. Risk retention is the method of determining the financial impact of a risk to the firm before either accepting partial or full financial responsibility for the risk (Al-Bahar, 1990). Accepting risk is an effective way for a construction firm to remain relevant in an increasingly competitive market by lowering the bid comparatively to other firms and building relationships with owners. There is, however, an important distinction between planned and unplanned acceptance of risk. Ideally, the construction firm would have identified the risk during the procurement phase and actively accepted the risk, which would qualify as a planned risk. In the other more negative realm of the unplanned risk, a company “does not recognize or identify the existence of a risk and unwittingly or unconsciously assumes the loss that could occur (Al-Bahar, 1990).” This mistake in identifying a risk leaves the firm liable for the financial

burden accompanying it. Another instance of an unplanned risk occurs when the firm properly identifies a risk but fails to estimate the burden that accompanies the risk. Unplanned risks can be extremely detrimental to a firm who may not have the cash to accept the risk.

Often times, a retained risk is coupled with the method of mitigating risk. For the risk mitigation method to be appropriate and effective, the project team must first accurately identify the potential risks of a project. Once these risks are identified, the project team can focus on, “(1) reducing the probability of a risk; and (2) reducing the financial severity of risk if it does occur (Al-Bahar, 1990).” Examples of this method include loss prevention measures for equipment and material including anti-theft devices and security fences or other services. The purchase of proper insurance policies is also seen as a popular risk mitigation technique because it transfers the burden of a risk.

Though transferring risk is desirable for contractors, it is even more so for project management firms. Transferring risk is not a magical method for passing of risk to another party, however. “First, consideration should be given as to whether or not the party that the risk is being transferred to can do anything to manage or control the risk, and whether they could accept the consequences should the risk be realized (Thompson, 2014).” For most companies, it is safest to transfer financial risk during construction to insurance institutions. Insurance policies with certain deductibles allow the company to transfer the amount of financial liability they hold for construction-related risks. Another method of transferring risk occurs through contract wording. During negotiations, it is possible to reach a consensus on how certain project risks will be spread out or shared between entities on a project. Transferring risk in this manner varies from insurance transfers because the transferee does not hold the historical data or ability to evaluate risk exposure that insurers do (Al-Bahar, 1990). For this reason, it is critical that the entity transferring risk keeps the success of the project in mind when determining how to transfer risk because some entities on the project may not be able to carry the liability. The benefit of this method over insurance, however, is that “the potential consequences of the risk, if the risk does occur, are shared with or totally carried by a party other than the contractor (Al-Bahar, 1990).”

## **Methodology**

In order to develop a course curriculum to best prepare the Construction Management students at Cal Poly, San Luis Obispo for positions in the modern construction industry, a literature review was performed to determine what risks plague the industry and how construction companies react to these risks. Using the key words listed at the beginning of this paper, sources were analyzed for credibility and quality of material. Sources containing information for common construction risks were first selected for review. These sources outlined common construction risks as well as what entities in the construction industry are most concerned about those risks. Attention was then focused towards developing a knowledge of how construction risks are managed. Material regarding the methods of risk avoidance, risk mitigation, and risk transferring, were selected for review. These sources outlined the pros and cons behind each method of risk management as well as examples of situations in which the specific strategy would be utilized.

## **Interview Testimonials**

### *Managing Risk*

In order to focus the class curriculum on information which will be most useful to Cal Poly Construction Management students in the future, interviews with industry professionals of various industry roles was crucial. Using my previous industry contacts, I facilitated interviews with Ray Trebino, Bay Area Business Unit Leader with DPR construction; Brandon Para, Project Manager with DPR Construction; and Tim Bolton, Vice President of The Hanover Company. To achieve an unbiased response, these interviews were conversational and mostly unscripted, with the exception of starting the conversation with the question of whether the individual saw a need for a facilitated “Construction Risk Management” topics course, and what they see as being crucial for a future industry professional to be aware of regarding construction risk.

*Ray Trebino, DPR Construction Business Unit Leader*

Ray Trebino has worked in numerous management roles with DPR Construction since he joined the company in 1994. After 25 years, Trebino currently serves as a Business Unit Leader for the San Francisco Bay Area. Business Unit Leaders, who serve in upper-management positions within DPR Construction deal with risk management on a daily basis. I was fortunate enough to schedule a moment with Trebino to discuss risk management from an upper-management position and the benefits that a risk management topics course would have on graduates from the Cal Poly Construction Management program. The interview proceeded as follows:

Interviewer: In your opinion as an industry professional in an upper management position, how critical is a firm knowledge of risk management in the construction industry?

Ray Trebino: “I didn’t fully understand the topic of risk management until later in my career. Though risk is managed differently at each level, every member of the construction industry deals with risk in some caliber during their average day.”

Interviewer: What do you view as the being the most efficient and complete risk management practice?

Ray Trebino: “It is critical that as a management team, we identify and assess potential project risks during the proposal stage of a project and align the known members of the project team ahead of time, so they are aware of the risks in the future. We need to provide ourselves with the tools and the best position to navigate these risks, before they occur.”

Interviewer: What risk management strategies do you see as being the most critical in your position?

Ray Trebino: “In my position, and in any position, it is important to have an extensive knowledge about construction insurance. You should understand what is covered by your various forms of insurance and the premiums that are associated with these policies. It is also crucial that you understand the processes for filing claims because if done incorrectly, you leave yourself exposed to the full extent of the risk.”

### *Brandon Para, DPR Construction Project Manager*

Brandon Para is currently working as a project manager with DPR Construction but has worked in the construction industry for a total of eleven years, working in various roles throughout many different construction project types. Most recently, Para was stationed in Washington state as a part of DPR’s mission critical group completing several projects at a time. Being a Cal Poly Construction Management alumnus, I was very interested in Para’s opinions on the teachings of risk management in our curriculum. The interview occurred as follows:

Interviewer: How much of your time would you estimate you spend managing risk?

Brandon Para: “It is a significant part of my day to day, but I would say half of my time.”

Interviewer: Do you feel that having a course dedicated to risk management would benefit our curriculum?

Brandon Para: “Absolutely. Providing the framework for risk analysis and risk assessment will greater support the Cal Poly CM curriculum. There is a fine balance on managing risk on a project that can easily impact safety, budget, and schedule without proper assessment and planning. It takes a collaborative/ open environment to foster an environment where risks can be assessed promptly and minimizing exposure to multiple parties.”

Interviewer: What is the importance of risk management in the construction industry?

Brandon Para: “Risk Management is critical to an organizations reputation and success. It takes a culture of discipline within an organization to ensure that teams can make prompt, educated decisions that consider multiple entities within the decision-making process. As a builder, we need to protect our own interest, while ensuring that we protect those of our owners and our trade partners. If you are unsuccessful in the later, you will be unable to forge longstanding relationships.”

### *Tim Bolton, The Hanover Company Vice President*

Tim Bolton is a Cal Poly Construction Management alumnus and the current vice president of the Hanover Company, who is a developer of high-end multifamily apartment buildings in the United States. Previously, Bolton worked as a senior project manager for Morley Builders and as senior vice president for Lowe Destination Development, totaling thirty-two years in the construction industry. A transcript of the interview is as follows:

Interviewer: How much of your time would you estimate you spend managing risk?

Tim Bolton: “It depends on your definition of Risk Management. In some ways everything we do is to manage the risk to the company and project. Even staffing decisions on a project are done to ensure success and manage risk. If you are talking about more traditional risk management – Legal, Insurance etc...probably 25% of my time.”

Interviewer: Do you feel that having a course dedicated to risk management would benefit our curriculum?

Tim Bolton: “I think this would be a very good add to the curriculum. It is something we likely do not teach enough to the students.”

Interviewer: What is the importance of risk management in the construction industry?

Tim Bolton: “If you do not manage the companies risk well, the company may not survive. Every contract you negotiate does two main functions:

1. Exchange goods or services for a fee
2. Assign Risk to the proper parties

Deciding which subcontractor to use (based on qualifications and price) is also making a risk decision. Training and managing of your staff is managing risk. Insuring for unforeseen conditions is managing risk. Evaluating your client to determine if you will be paid on time, is managing risk.”

### **Conclusions**

Construction is a constantly evolving industry. The one thing that will never change, however, is the need for a comprehensive knowledge of risk management. In order to best perform in new careers within the construction industry, it is critical that Cal Poly Construction Management students receive a proper education in the risks they may encounter as well as how to manage these risks. Though covered briefly in current Cal Poly Construction Management classes, the addition of a Risk Management topics course to the curriculum would benefit current students in their future careers. The most common risks that are encountered in the construction industry and that should be taught to students are contractual, financial, construction, and market risks. These risks, when expected on a construction project or upon occurrence, are handled through a variety or combination of risk management techniques. These techniques are avoiding, accepting, mitigating, or transferring the risk. Industry professionals that practice risk management as part of their careers share the sentiment that Cal Poly Construction Management students would directly benefit from a risk management course teaching the aforementioned industry risks and the accompanying risk management strategies. Each individual, when interviewed, stated that risk management is a critical part of the construction industry and that they spend a significant amount of their time dealing with risk in some form. Cal Poly’s Construction Management undergraduates are often regarded as some of the most prepared professionals entering the construction industry and a class in risk management would only solidify this reputation.

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