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A Comprehensive Review of Risk Management Practices in Construction

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Abstract

Risk management is a critical component of the construction industry, where uncertainties related to financial stability, safety, regulatory compliance, and project execution can significantly impact outcomes. This research provides a comprehensive analysis of risk management practices in construction through a literature review, case study, and survey. The study explores key components of effective risk management, including risk identification, assessment, mitigation, monitoring, and contingency planning. The case study of Waffle Construction highlights the implementation of a structured Subcontractor Risk Management Program (SRMP), demonstrating the benefits of proactive risk mitigation strategies. Survey results reveal a disparity in risk management practices between large firms with structured methodologies and smaller contractors that primarily adopt compliance-driven approaches. Findings emphasize the necessity of integrating technology, leadership commitment, and strategic planning to enhance risk management effectiveness. The analysis reveals that while larger firms often adopt structured, technology-driven approaches to managing risk, smaller contractors tend to rely on minimal compliance, resulting in significant gaps in preparedness and response. The proposed standard advocates for a proactive, cyclical approach to risk management that leverages technology, fosters a culture of accountability, and promotes continuous improvement. By implementing these strategies, construction firms can reduce project disruptions, enhance safety, and improve overall project outcomes, positioning themselves as resilient and forward-thinking leaders in a dynamic industry. The study concludes that a proactive and standardized approach to risk management is essential for minimizing project disruptions, ensuring financial stability, and improving overall construction industry resilience.

Introduction

The construction industry is inherently complex and dynamic. The industry is constantly changing with uncertainties that can significantly impact project outcomes. These uncertainties come from a variety of factors such as design changes, resource constraints, environmental challenges, regulatory compliance, and market fluctuations. With these uncertainties, the problem is that the risk of these projects will increase significantly without any mitigation. Risk management has been critical in ensuring the success of construction projects. Effective and smart risk management practices help to mitigate potential disruptions, reduce financial loss, and can improve the overall quality and timeliness of the project delivery.

Risk management in construction presents its own challenges due to the nature of the industry and the involvement of multiple stakeholders. Projects typically face overlapping risks, such as from technical, financial, operational, and external sources. Due to the vast number of overlapping risks, it is important to implement a systematic and integrated approach to identification, assessment, and mitigation.

As advancements are made in technology and methodologies, this has opened new avenues for improving risk management practices. Data analytics, Building Information Modeling (BIM), and machine learning are increasingly being utilized to enhance predictive capabilities and decision-making processes. There has also been a growing emphasis on sustainability and resilience in construction which further highlights the need for robust risk management that addresses both traditional and emerging challenges.

The purpose of this study is to provide a comprehensive review of risk management for construction. By examining the existing methodologies, tools, and a case study, this research seeks to identify best practices, highlight gaps, and propose strategies for improvement.

Literature Review

This literature review develops a standard for risk management across the construction industry. Risk management is one of the nine knowledge areas of the Project Management Institute, (Project Management Institute, 2008). Risk management is the systematic process of identifying, assessing, and mitigating threats or uncertainties that can affect your organization. It involves analyzing risks' likelihood and impact, developing strategies to minimize harm, and monitoring measures' effectiveness. (Harvard Business School, 2023). Through this systematic approach are the following steps:

- "Integrate risk assessment into all areas of your organization.
- Structure risk management to generate consistent results.
- Customize the risk management program to specific internal and external objectives.
- Include knowledge, views and perceptions from all stakeholder levels.
- Anticipate and respond to changes and risks in a timely manner.
- Identify data, historical and current, and define expectations to aid decision-making.
- Acknowledge the influence of human performance and culture on risk management.
- Continually improve risk management by evaluating previous successes and determining the next steps. Risk management helps to ensure that projects are completed in a timely manner, within their budgets, and with minimal stress to stakeholders." (American Society of Safety Professionals, n.d)

There are many roles in risk management departments, such as assessing, controlling, and monitoring the risks once they've been identified, (Construct Connect, 2024). One of the most important objectives of risk management is minimizing financial risks. "By managing financial risks, organizations safeguard their financial health and stability. This is particularly crucial during economic downturns or unexpected events, as it helps mitigate the impact of adverse circumstances on financial performance," (Invensis, 2024). Construction typically has large budgets for projects, but plenty of unforeseen issues such as delays, going over budget, subcontractor defaults, or damages, (Procore 2025). These issues can lead to a significant financial loss. Another important role of risk management is protecting a company's reputation. Poorly managed projects can harm relationships resulting in lost opportunities for future work. Risk management ensures that projects are following the necessary laws, regulations, and agreements. Risk management departments will identify legal risks in contracts and ensure that projects will meet all the requirements of their contractual agreements, which reduces the possibility of claims and disputes. (Construction Business Owner, 2024). Risk management departments play a significant role in a company's health. Without risk managers, companies could be exposed to risks that they were never aware of. Risk management will continue to develop with technology, methods, systems, etc., but defining the standard across the industry is important.

There are six key components to a successful risk management program: identification, assessment, prioritization, mitigation strategies, monitoring and reporting, and contingency planning. (Struxhub, n.d). The first component of a successful risk management program is risk identification. Risk identification is, "a set of activities that detect, describe and catalog all potential risks to assets and processes that could have negatively impacted business outcomes in

terms of performance, quality, damage, loss or reputation." (Gartner, 2025). Knowing that a company has risks versus knowing what that risk is and how to assess it are two different things. Companies know that they have risk but classifying and clarifying what that risk is vital. In construction, everything is at risk. ISO 31000-2018 recommends that the following are considered when performing risk identification:

- "Tangible and intangible sources of risk
- Threats and opportunities
- Causes and events.
- Consequences and their impact on objectives
- Limitations of knowledge and reliability of information
- Vulnerabilities and capabilities
- Changes in external and internal context
- Indicators of emerging risks
- Time-related factors
- Biases, assumptions and beliefs of those involved" (American Society of Safety Professionals, 2019).

Construction companies face risks every day such as site conditions, design flaws, weather events, material delays, material quality, subcontractor default, etc. It is important for companies to assess their risk. To start this process, companies should look at the potential hazards of a project. Whether the risks are their subcontractors, location, regulatory compliance, equipment, weather, etc., all aspects should be reviewed for risk identification.

The risk identification process includes reviewing documentation, site analysis, engaging stakeholders, and speaking to suppliers, clients, and other relevant parties. These individuals

have expertise and experience in their field and can provide meaningful insight. Internally, companies can create checklists and use root cause analysis. Some common risks that can be identified through this process can be related to safety, schedule, cost, quality, legal, and environmental issues. (Safety Culture, 2024). Risk identification is a key aspect in the risk management process. It is the starting point necessary to assess needs at a company level.

After assessing the risks a company faces, a risk assessment should be conducted. Risk assessments analyze each identified risk. This will then help determine the likelihood of it occurring and the potential severity. Construction Risk assessments should achieve the following items: “

- Determine who is at risk and what they are at risk of, be they employees or site visitors.
- Create awareness surrounding the risks/hazards identified.
- Assess current risk prevention measures that are in place to determine if they are sufficient or if further action needs to be taken.
- Ensure that any (and all) legal requirements or contract requirements are being met regarding risk.
- Decide if additional controls need to be implemented or if changes need to be made to your construction risk management strategy” (Andony, 2022).

Risk assessments are incredibly important. Construction is arguably one of the most dangerous professions. These assessments pull from the information that was collected during risk identification. From there, risk management can begin analyzing the risk of each hazard. Risk analysis takes several factors into consideration such as hazards, consequences, likelihood, probability, events, controls, and effectiveness. A single event can have several different causes and outcomes, which means that it needs to be evaluated from all angles. Risk assessment is one

of the most crucial steps of risk management. Evaluating risks in depth provides a perspective into the severity of them.

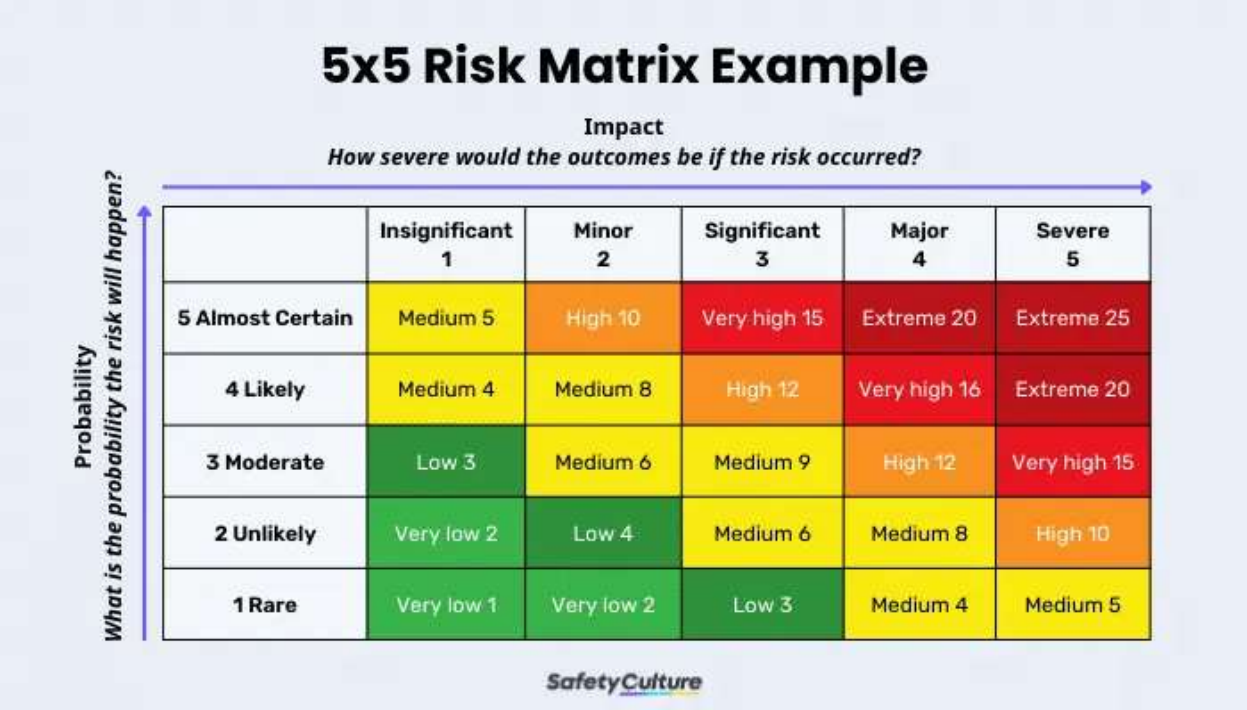

Figure 1. 5x5 Risk Matrix Example. https://safetyculture.com/topics/risk-assessment/5x5-risk-matrix/)

After risk assessment is completed, risk prioritization should follow. Risk prioritization is the ranking of risks based on their potential impact and likelihood to guide mitigation efforts. There are not many resources for risk managers in general, so most times, when evaluating these risks we will use a risk matrix (See figure 1). A risk matrix is a tool that can help identify and prioritize potential risks. “The core principle behind the risk prioritization matrix is to evaluate each risk based on two key factors: the likelihood or probability of the risk occurring, and the potential impact or consequence if it does occur. These two factors are plotted on a grid, with the x-axis representing likelihood and the y-axis representing impact.” (Six Sigma, 2025). A risk matrix is a quick and simple way of ranking hazards.

There are a lot of benefits from using a risk matrix for prioritization. It can help businesses identify their most pressing risks, allocate resources for higher hazard risks, and help maintain a real-time view of their risk environment. Using the risk matrix is an important aspect of risk prioritization. By attaching a ranking based on risk, companies will have an easier time prioritizing risks. Once the risks are established and ranked, risk mitigation strategies can be put into place.

Risk mitigation is the "practice of putting an action plan in place to reduce the impact or eliminate risks an organization might face." (IBM, 2023). Companies will develop their own mitigation measures for subcontractors. There are many recommended best practices to minimize and mitigate subcontractor risks, the first being Thorough Subcontractor Selection. "General contractors should choose subcontractors based on a thorough pre-construction planning process. Construction management software manages the details and communication, allowing GCs to work in tandem with subcontractors from pre-construction meetings through mobilization, construction, and handover of the completed project. (Procore, 2024). A common industry standard is establishing a Subcontractor Risk Management Program (SRMP). This process is used to identify, assess, and mitigate potential risks associated with hiring subcontractors on projects. Insurance agencies are recommending that SRMP programs are to be implemented into operations structures.

It is common for companies with a Subcontractor Risk Management Program to have a pre-qualification process. Prequalification is a way for general contractors to assess a subcontractor based on a variety of line items such as their financials, safety, insurance, legal, references, etc. Prequalification requirements are subjective and based on the company. If a prequalification is more thorough, it will give general contractors a better understanding of the

subcontractor's risk level. From there, the general contractor can implement mitigation measures based on this established risk level. It is recommended with Thorough Subcontractor Selection to establish a pool of prequalified subcontractors and start there when inviting companies to bid. (Procore, 2024). Projects will have an easier time given now that the subcontractor is already prequalified and trusted within the company.

The next recommended practice is to ensure that contracts are airtight, (Bolender Law Firm, 2019). Contracts should have the correct legal language and the full scope of work for the subcontractor. "This contractual risk transfer makes the appropriate parties responsible for their work and acts as a risk-sharing mechanism for general contractors. The language in the contract needs to comply with relevant laws and specify the mechanisms that trigger indemnification or liability." (Procore, 2024). The scope of work should match exactly what the owner wants, as well as matching the main contract. Subcontractors will review and sign the scope of work. Signing the scope of work means the work is doable, and the subcontractor can deliver within the schedule. With scope sheets, descope meetings should be scheduled as well. Descope meetings are when the project teams and the subcontractor meet and review the scope sheet in depth, (Knowify, 2022). This provides the subcontractor with an opportunity to get the clarification they need on specific aspects of their scope.

The last recommended practice is to manage the subcontractor's performance. General contractors should be implementing a standard operating procedure or system to manage their subcontractors once they arrive at a worksite. This process should involve all team members from field staff to the internal team, such as the superintendent, project managers, etc. Superintendents should be walking their site daily, keeping daily logs, and preparing to notify project managers of any issues or changes, (Procore, 2024). Project managers handle the billing

to make sure it is accurate and push to keep the project on schedule as a key to managing subcontractor performance.

Subcontractor risk mitigation is incredibly important to the risk management process, especially for construction. Having proactive measures in place to attempt to reduce the likelihood or impact of identified risks will keep general contractors ahead of the risk. (Procore, 2024). Being proactive before the project starts is vital.

Another key aspect of risk management is monitoring and reporting. It is crucial because it allows organizations to continuously track the status of their identified risks, assess their potential impact, communicate with their stakeholders, and continue to be proactive to mitigate them. "An effective risk monitoring and reporting process requires careful planning and consideration. It should be regularly reviewed and updated to ensure that it meets the changing needs of the business. By establishing an effective process, businesses can better identify potential risks, assess their impact, and create plans for addressing them," (Caisse, 2023).

Having proper risk monitoring is vital. Businesses can detect emerging risks early and correct them. Another reason is that risk monitoring is important for continuous improvement. Continuous improvement is extremely important in construction. Risk monitoring allows for the collection of data, which allows organizations to proactively address issues before they escalate and identify areas for improvement. Some examples are quality control, project management, and cyber security.

Finally, the last aspect to a successful risk management program is contingency planning. A contingency plan is a risk management strategy that is prepared and used to respond to risks and emergencies. Having a contingency plan in place is vital to saving a project. "A contingency plan is executed when the risk presents itself. The purpose of the plan is to lessen the risk of

damage when it occurs," (Heimann, 2000). This is typically the last resort option. Contingency plans can help project managers identify risks associated with their projects and mitigate them. It is important for project managers to be aware of the risks and have a backup plan. Projects face challenges such as project delays, going over budget, etc. Contingency plans are made for identified risks and are reactive. There are four guidelines for creating a contingency plan. The first is to identify triggers. What will trigger the contingency plan? Then the logistics need to be determined such as who will be involved, what everyone's job is, what will happen, and how it will be executed. Next is establishing communication and reporting. Figuring out how communication will happen, and how it will get to the appropriate parties. Finally, the plan needs to be adapted and monitored when it is enacted, (Buildertrend, 2024). Contingency planning is crucial in the event of an emergency, but relying on the contingency plan is not in the best interest-or being overconfident in the initial plan. Contingency planning is incredibly important for project management. Without a backup plan in place, the whole project could fall apart.

Risk management is complex, but implementing the basic aspects of risk management will provide a strong foundation for any company. Risk management is crucial for the construction industry because it helps identify, assess, and mitigate potential risks that could jeopardize the safety, cost, timeline, and quality of a project. By proactively addressing risks such as accidents, delays, legal issues, and financial instability, construction companies can minimize negative impacts and ensure smoother projects. Effective risk management not only protects the well-being of workers and stakeholders but also enhances a company's reputation, fosters financial stability, and increases the likelihood of project success. Ultimately, incorporating risk management practices is essential for building resilience and achieving long-term success in the construction industry.

Methodology

Research Design

This study employs a qualitative research approach to provide a comprehensive review of risk management practices in the construction industry. The methodology consists of three main components: a literature review, a case study, and a survey. The findings from these components were compared and analyzed to identify key trends, best practices, and gaps in current risk management strategies.

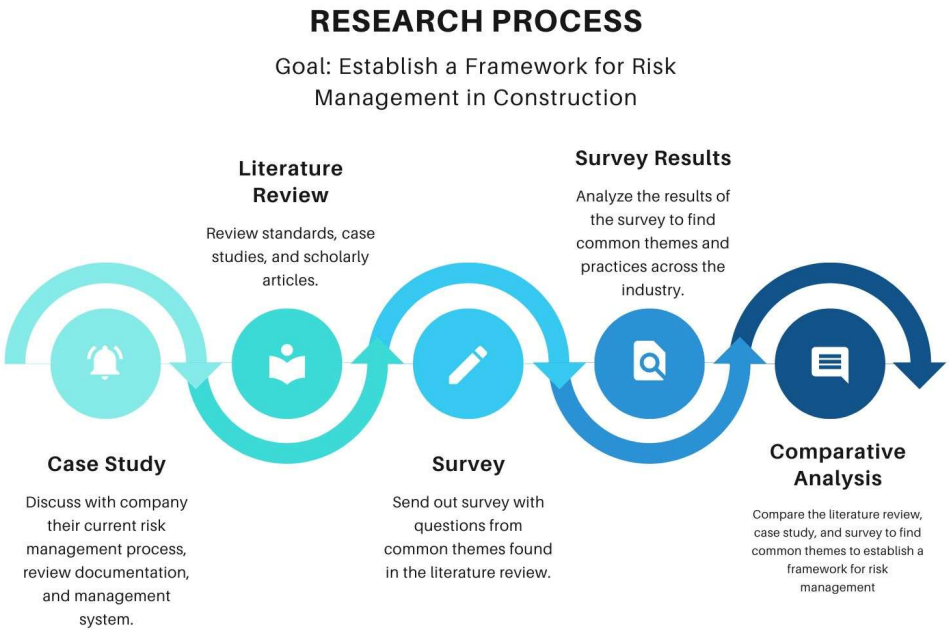

Figure 2, Research Process Flowchart.

Literature Review

A literature review was conducted to establish a theoretical framework for risk management in construction. The review included academic journals, industry reports, and relevant books published within the last two decades. When looking for data, the key words used

were risk management, practices, standards, and key components. The literature review aimed to identify common risk factors, mitigation strategies, and baseline practices in the industry. Databases such as Google Scholar were used to collect relevant sources. Selection criteria included citations in reputable publications, and relevance to the study's objectives.

Case Study

A case study approach was undertaken to gain an in-depth understanding of risk management practices on a real-world construction company. The selected case involved a medium-to-large-scale construction company, with about 250 employees, which had implemented formal risk management strategies. Data collection included project documentation analysis and discussions with staff such as the director of risk management and the risk engineer. Some of the discussions included conversations on pre-planning for projects, risk identification, risk mitigation, and contingency planning. The case study examined risk identification, assessment, mitigation, and monitoring techniques utilized in the project.

Survey

A survey was designed to gather quantitative data from construction professionals regarding their experiences and perceptions of risk management practices. The survey targeted professionals such as Directors of Risk Management across various construction firms. A structured questionnaire was distributed via email and professional networking platforms. The questionnaire consisted of open-ended responses to capture both statistical trends and qualitative insights.

The survey aimed at:

- Assess the awareness and implementation of risk management strategies.
- Identify common challenges faced in risk management.
- Evaluate the effectiveness of different risk mitigation techniques.

Data Analysis

The data analysis involved a comparative approach, integrating findings from the literature review, case study, and survey responses.

Literature Review Analysis: Key themes, risk factors, and mitigation strategies were extracted and categorized.

Case Study Analysis: Risk management practices in the selected case were evaluated and mapped against established frameworks found in the literature.

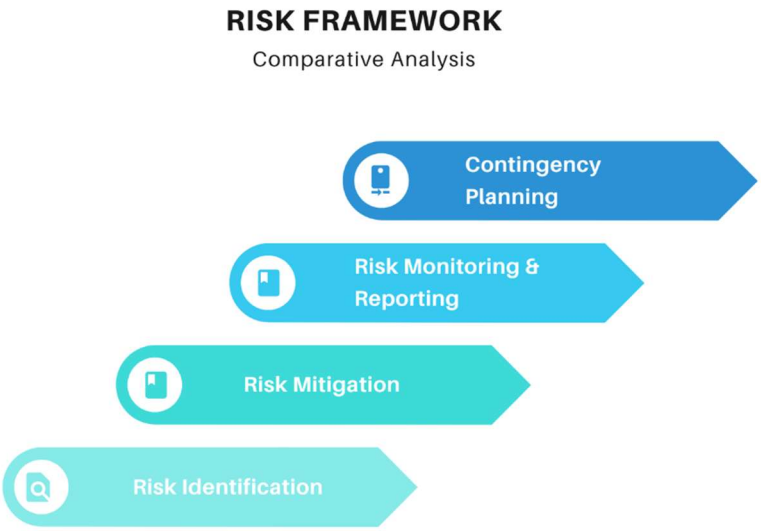

Figure 3, Risk Framework based off comparative analysis.

Comparative Analysis: The results from the case study and survey were compared with findings from the literature review to assess similarities, differences, and gaps in current risk management practices. The literature review found that the six key components to risk management are risk identification, risk assessment, risk mitigation, monitoring and reporting, and contingency planning. Each source was reviewed five times, to find common themes to establish a standard for the industry. The purpose of comparing information is to establish a standard across the Construction Risk Management industry.

Ethical Considerations

Ethical considerations were adhered to throughout the research process. Survey participants were assured of anonymity and confidentiality, and informed consent was obtained

before data collection. The case study was conducted with permission from the relevant stakeholders, ensuring that sensitive information remained confidential.

Limitations

While this study provides valuable insights into risk management practices in construction, certain limitations must be acknowledged: The case study is limited to a single company, which may not be representative of the entire industry. The survey sample size may not encompass all perspectives across different regions and project types. The literature review may have excluded some relevant studies due to access restrictions.

Despite these limitations, the study provides a comprehensive analysis that contributes to understanding and improving risk management practices in the construction industry.

Case Study of Waffle Construction

The construction industry is inherently exposed to various risks due to its complex and dynamic nature. From financial uncertainties and regulatory challenges to safety hazards and environmental concerns, effective risk management is crucial to ensuring project success. This case study examines risk management practices within a specific construction company, analyzing the identification, assessment, and mitigation strategies employed to address potential threats. By evaluating real-world challenges and their resolutions, this study aims to provide insights into best practices and lessons learned, contributing to the broader discourse on risk management in the construction sector. The findings will help construction professionals enhance risk mitigation frameworks, improving overall project efficiency and safety.

For confidentiality purposes, this company will be called **Waffle Construction Inc**. Waffle Construction started assessing their risk management program about 5 years ago. This was after an audit from their Subcontractor Default Insurance carrier (SDI). The first step implemented was creating a Subcontractor Risk Management Program (SRMP). Their SDI carrier recommended curating this program to manage subcontractor risk as nothing was put in place before. This Subcontractor Risk Management Program was broken down into two parts, a prequalification for subcontractors and a documentation process for project managers. They have a standard operating procedure specifically for their SRMP program.

The process starts in preconstruction. Once the project is turned over to operations, they will complete the process. The prequalification is through a platform called TradeTapp. TradeTapp is a website that general contracting managers can use to create prequalification to send out to their subcontractors who bid on their projects. Waffle Construction has eight subsections within the prequalification: general information, contact information, project

references, safety, insurance, financial, quality, and legal. Prequalification is important as it allows an inside look into a company. The general information section for documentation such as w-9, Company Tax name, Federal Tax ID, and if there are any parent/child companies. This section also asks questions on the scope of work performed, where/when the company was found, what regions they work in, if there are any union affiliations, professional licenses, and enterprise business certifications. This section is important as it provides an inside look into the company. The next section asks for company contacts. Any owners or principles in the company should be added.

The next section is the projects section. The project section asks a company for their current backlog. The backlog is the total value of uncompleted work that your company has committed to via written contract. In this section, references and any additional documentation can be created and uploaded here.

The safety section asks for documentation such as an Experience Modification Rate (EMR) letter for the current and past three years, Occupational Safety and Health Administration (OSHA) 300A logs for the current and past three years, and their safety manual. It also asks if the company has any OSHA citations or fatalities, if any field supervisors have OSHA 30-hour certifications, information about their safety director, and if they subcontract any work. The insurance section asks for the subcontractor's brokers or agency, as well as information about their policies. It also asks for a surety letter as well as a copy of their certificate of insurance. In the financial section, it asks for financial documentation such as balance sheets, statement of income, a letter of good standing or line of credit renewal, and their current Internal Revenue Service (IRS) Form W-9. It also asks for banking references and information about a company's credit line of applicable. The Quality Section asks if a company has a written quality control

program, as well as the contact information for who handles the quality control at their company. The last section is the legal section. This section has questions that ask if the company has been disbarred from public work, if it has operated under any different names, if they have ever been assessed for liquidated damages by an owner or general contractor, if they are currently/were in any lawsuits, arbitrations, liens, or bond claims.

All these sections are important to the prequalification process. Although the process is in-depth, it is incredibly important for Waffle Construction to know who they are going into business with.

After the prequalification is submitted, it is reviewed by different departments within the company. The accounting department reviews the financials submitted and scores on a 1-3 system. A 3 indicates that they are low risk, and a 1 indicates high risk. There are three benchmarks for financial scoring such as shareholders equity ratio, current ratio, and debt to equity ratio. The accounting department will comment on the total equity and available line of credit as well as 50% of their prior years' revenue. Depending on the score, the financial department will put in mitigations such as calling their credit references, requiring periodic financial reviews through project duration, direct pay major suppliers, or joint check major suppliers. Internal mitigations include scrutinizing project billing and alerting superintendents of high-risk subs. When a subcontractor presents bad financial, it is an indication that a subcontractor could potentially default. This is worst case scenario for a general contractor as it could potentially be a huge hit financially.

The other department that performs a review is safety. Safety reviews the recent three years of the company's EMR as well as their OSHA 300A logs, and their company safety manual. They also review the questions associated with the safety section. The company will be

given a score on a 1-10 scale, 10 being low risk, and 1 being high risk. There are a multitude of mitigations that can be included from safety's perspective. Some of the most common are Designation of an on-site competent person for safety, Daily Job Site Inspections by the competent person, On-site competent person must have OSHA 10 or greater and submit proof prior to beginning work, Monthly documented safety inspection by contractor's competent person or safety professional submitted to WCC project safety engineer, In the event safety violations are not corrected or safety is persistently ignored, WCC reserves the right to hire a 3rd party safety consultant to monitor daily activities at the expense of subcontractor and Consult with safety manager prior to issuance of contract.

After financial and safety do their reviews, the risk engineer will calculate the company's internal single limit and total limit. The internal single limit is the maximum a subcontractor can be awarded on one project. The Total limit is the aggregate total across all projects. Only once the subcontractor becomes qualified in TradeTapp is when the project manager is allowed to award the contract. The mitigations assigned to the subcontractor will sit in the scope. The subcontractor will review the scope sheet and sign off on the mitigations.

The SRMP process for project managers or project executives involves specific documentation to be completed. When the project is turned over from preconstruction to operations, the project manager will receive project specific questionnaires (Appendix C) from each subcontractor that bids on the project. The project specific questionnaire is a list of questions that the subcontractor receives in the invitation to bid documents. The questionnaire is a way for the project team to gauge how reliable the subcontractor is based on their experience and backlog. The project specific questionnaire is filed away.

After that, the first thing a project manager will do is send out a letter of intent (Appendix A) to the subcontractor. The letter of intent explains that the project manager is looking to award the subcontractor for the agreed amount, and next steps. The letter of intent will also include mitigations if the subcontractor is already qualified. If not, there will be language that mitigations are pending. Following the letter of intent, the project manager will complete a pre-award checklist (Appendix B).

The pre-award checklist is broken down into three sections. The first section is general items. This is where the project managers will put in the scores from TradeTapp for financial and safety. The next portion is the subcontractor project closeout scorecard. In the general section of TradeTapp, the project administrators will upload the project closeout scorecard. This scorecard is completed at project closeout by the project managers. It rates the subcontractors on a variety of factors such as their staffing, communication, coordination, etc. The project manager is to take the meaning of the three most recent scorecards. If the subcontractor is new to the company, they will put an average rating of 2.5 for the subcontractor. The new portion of the pre-award checklist is the financial specific questions. This portion of the checklist reviews the contract value against a variety of factors such as their prior year's total revenue, equity, internal single limit, and their aggregate total limit. If any of these factors warrant a mitigate portion, they will have to review the decision to award the project executive. The next portion on the pre-award checklist is the project specific items. This section asks if the subcontractor has been fully descoped on project responsibilities, how close they are to the site, if they have enough manpower, references, their experience, and backlog. The mitigations from TradeTapp are placed into the bottom portion of the checklist where it says mitigation plan. The project manager and the project executive need to sign off on the pre-award checklist. If the pre-award

checklist is over $1,000,000, the director of risk management is to sign off on it. This is considered a significant award for the company. The director of risk management might add in his own mitigations for the subcontractor as he sees fit. For example, he will typically request subcontractors who do wet work, that they submit a site-specific quality control plan. This is to make sure that no floods or leaks occur. Other mitigations will occasionally be put into place however the director of risk management sees fit. Once the pre-award checklist is signed off on, the project administrator can draft the contract.

The project manager puts together the scope sheets (Appendix D) for the subcontractor. The mitigations are placed at the bottom of the scope sheet for the subcontractor to review and sign off on. Once the contract is signed, it is now fully executed. That is the process necessary for project managers. There is a standard operating procedure for the project managers to follow. In addition, there is also annual training every year for the project managers.

To ensure that the process is being followed, the risk engineer will audit the project teams every month. On the first of the month, the risk engineer will receive a list of contracts that were executed the month prior. Each subcontract on that list is audited to ensure that the proper documentation steps were completed prior. This is all tracked through excel. After the audit is completed, emails will go out to the project managers who had discrepancies, and they will be asked to correct them. The audit will also be sent to upper management for them to assess. They keep a list of the project managers, and the mistakes they make. If a project manager messes up a multitude of times, they will be retrained on the process.

Waffle Construction also has pre-installation meetings for each project, and each trade on that project. The purpose of these meetings is to review scope, safety, timeline, etc. This is where the safety engineer will typically reiterate the necessary safety mitigations, and the project

manager will emphasize any financial mitigations. The safety engineer also has an agenda that they review that is trade specific to ensure that the subcontractor is aware of the safety regulations that they have. Safety engineers will also ask for specific plans such as crane plans for review. If the plan is inadequate, they will ask for corrections.

Waffle Construction project managers review the scope of their projects with their safety engineers as well. Any concerns of potential risk they will consult with their safety engineer or the safety manager.

One of the biggest concerns for the company is wet work. In the past, flooding/leak claims have cost the company thousands of dollars. The company can face claims due to their subcontractor's making mistakes on-site. Wet work has always been an issue, so the company is working to mitigate, and eventually prevent completely.

Waffle Construction's Risk management program is one of the newer items introduced into the company, and it is continually involving.

Survey Results Analysis

The survey created offers a deep dive into how various professionals approach risk within the construction industry. The survey asked 13 questions about the participants' experience, to specific questions about risk management in construction (see Appendix F for questions asked). There were 20 responses from a pool of safety professionals and risk managers in the construction industry, as well as healthcare and general industry. The survey also provides a multi-faceted view of how industry professionals perceive, implement, and manage risk across various construction sectors. The responses highlight the common practices, challenges, and areas of improvement within the industry, revealing both progressive risk management strategies and persistent gaps in execution. The data collected from individuals with different backgrounds, ranging from subcontractors to general contractors, risk consultants, and safety executives, highlights industry-wide patterns, persistent challenges, and opportunities for improvement. The purpose of this survey is to see if there are any common practices amongst risk management professionals. One of the most striking observations from the survey is that while risk management practices are widely implemented, they vary greatly in sophistication, execution, and effectiveness depending on the company's size, culture, and leadership commitment.

Common Themes in Construction Risk Management

Industry Experience and Its Influence on Risk Management

A significant theme across the survey responses is the vast experience and expertise of the participants. Many respondents have spent decades managing risk in construction, with some holding over 30 to 40 years of experience. This level of expertise provides a nuanced understanding of how risk management has evolved over time, from basic safety compliance to more comprehensive, strategic approaches.

Professionals working for larger general contractors or risk management firms tend to have well-developed, structured methodologies in place, often incorporating global safety standards, industry best practices, and proactive risk assessment techniques. On the other hand, smaller subcontractors or independent consultants often operate with more limited risk management resources, relying heavily on client-driven requirements or regulatory compliance. This discrepancy highlights a key challenge within the industry: while larger firms have the resources to develop and enforce robust risk management programs, smaller contractors may struggle to go beyond meeting minimum safety requirements.

One of the most significant insights from the survey is that risk management has evolved beyond simple safety compliance. Historically, construction companies approached risk as a reactive function, responding to incidents rather than preventing them. However, modern risk management strategies—particularly among larger contractors and industry leaders—focus on proactive identification, mitigation, and continuous monitoring of risks.

Many respondents emphasized the importance of integrating risk management into overall operational excellence. Risk is no longer just about preventing accidents; it is about ensuring project efficiency, minimizing financial losses, and maintaining business continuity. Organizations that understand this connection tend to have more robust risk management frameworks, while those that treat risk as a secondary concern struggle with enforcement, resource allocation, and buy-in from employees.

Cross-Functional Collaboration and Communication

Several participants emphasized the need for cross-functional collaboration and effective communication to manage risks. One response highlighted the importance of "frequent site evaluation by cross-functional roles (safety and ops)," which ensures that deficiencies are

communicated, addressed, and tracked. This implies that risk management is a shared responsibility across various departments, and ongoing feedback loops are necessary to maintain and improve safety standards.

Another participant stressed that risk assessments should be an "integrated part of operational excellence," implying that risk management is not just a siloed activity but should be woven into the core operational practices of the business. This collaboration also extends to the involvement of workers in risk planning, as noted by a response stating, "engagement of the worker in the planning of safety each and every day," which underlines the importance of having everyone on board to ensure safety practices are effective.

Risk Identification and Mitigation

The responses consistently reflect a thorough approach to risk assessment and mitigation. Key components mentioned include risk identification, assessment, and analysis, which are foundational steps in managing risks. For instance, one participant outlined the process as "Identify risk, assess risk, prioritize risk, mitigate risk, then monitor risk," which highlights a systematic and cyclical approach to risk management.

Furthermore, several participants mentioned the necessity of having formal strategies in place, such as "risk response planning" and "contractual risk management," to address risks. One response provided a detailed description of a comprehensive risk management strategy that included "Risk Identification," "Safety and Environmental Management," "Risk Ownership and Accountability," and "Insurance and Financial Risk Management."

This demonstrates that a proactive approach is taken, with mechanisms for not only identifying risks but also developing contingency plans and securing appropriate insurance coverage. Several respondents also underlined the importance of periodic assessments and

adjustments to risk strategies, reflecting the evolving nature of risks and the need for constant monitoring.

Training, Accountability, and Consistency

Training and accountability were repeatedly mentioned as crucial elements in effective risk management. Responses indicated that "training, accountability and consistency" are fundamental to maintaining high safety standards. In addition, one participant emphasized the importance of "competent, emotionally intelligent, empathetic, and value-driven leaders" in a safe safety culture, which highlights that leadership qualities play a key role in fostering a safe work environment.

Another respondent pointed out the significance of "daily job site safety inspections and immediate abatement of safety violations," demonstrating that safety practices must be applied consistently on the ground, and immediate corrective actions should be taken when issues arise.

Policies, Procedures, and Standardization

A recurring theme across the responses was the importance of standardized safety policies and procedures. Several participants mentioned international standards such as "ISO 31000" and "ISO 45001," which provide frameworks for risk management and safety. These standards guide organizations in developing and implementing effective risk management systems, ensuring that safety practices meet global benchmarks.

Additionally, one participant listed the steps to mitigate risk as "Identify the risk, develop policies & procedures to eliminate or reduce the risk, Implement the policy, ensure compliance through communication, inspection, and feedback from the field," illustrating the need for clear, actionable policies that are regularly communicated and enforced.

Subcontractor Safety and External Risk Management

Managing risks associated with subcontractors was another critical point raised in the responses. One participant specifically noted the importance of "prequalifying your subcontractors based on their safety programs, OSHA recordable and day away incident rates and EMR," indicating that a comprehensive evaluation of subcontractor safety performance is necessary before they are engaged. This ensures that external parties align with the organization's safety standards, preventing any risk to the overall project.

Culture of Safety

A few responses highlighted the importance of fostering a safety culture within the organization. This includes building an "internal safety/risk culture," where employees are encouraged to take responsibility for safety and are provided with the resources necessary to address risks. One respondent also stressed the value of having "leaders who are emotionally intelligent, empathetic, and value-driven," further underlining the idea that safety is not just about rules and procedures but also about building the right mindset and culture within the workforce.

Risk Monitoring and Continuous Improvement

Several participants mentioned the need for continuous monitoring and evaluation to ensure that risk controls remain effective. This was summed up in the response stating, "Follow the plan-do-check-act cycle," which is a well-known approach for continuous improvement in safety and risk management practices. The effectiveness of a risk management program depends not just on identifying and assessing risks but also on monitoring and continuously improving risk control measures. Many respondents emphasized that regular audits, real-time risk tracking, and thorough incident investigations are essential for maintaining safety standards and preventing recurring hazards. However, a common challenge reported in the survey is the failure to act on

risk assessments. While many companies conduct routine inspections and audits, some fail to implement corrective actions effectively, leading to repeat incidents.

Additionally, there is a notable lack of structured post-incident analysis in some companies. While high-performing organizations conduct root cause analyses and use lessons learned to refine their risk management strategies, others simply address immediate hazards without investigating broader systemic issues.

Another recurring issue is excessive bureaucracy in risk reporting, which can discourage frontline workers from actively participating in risk identification and mitigation. Some respondents noted that risk reports often get buried in paperwork rather than leading to actionable improvements, emphasizing the need for simplified yet effective reporting mechanisms. This approach emphasizes that risk management is not a one-time task but an ongoing process that requires regular review and adaptation to changing conditions.

Leadership Buy-In and Employee Engagement

One of the most critical factors in determining the success of a risk management program is buy-in from leadership and front-line supervisors. Multiple respondents emphasized that risk management is only as effective as the commitment of those enforcing it.

When senior management actively supports and prioritizes risk management, it tends to become ingrained in company culture. Organizations where risk management is treated as a strategic initiative rather than a compliance obligation tend to experience lower incident rates and stronger safety engagement from employees. In contrast, when risk management is seen as a regulatory burden, safety practices are often reduced to mere "box-checking" exercises with little real impact on worker behavior.

Buy-in is not only crucial at the executive level but also at the front-line supervisory level. Some respondents pointed out that foremen and project managers play an essential role in ensuring that risk management principles are applied in daily operations. Without their engagement, even the most well-designed safety programs can fail at the implementation stage.

One example of this disconnect is the tendency for some companies to accept low-bid subcontractors without properly vetting their safety practices. This cost-driven approach can lead to increased risk exposure, as poorly trained subcontractors may not adhere to the same safety standards as more established firms. In several responses, participants noted that when financial considerations take priority over risk management, safety performance often suffers.

Another challenge in securing buy-ins is overcoming resistance to change, particularly among workers and subcontractors. Many construction workers, especially those in challenging environments, perceive safety meetings, risk assessments, and compliance paperwork as obstacles to efficiency. Some respondents noted that subcontractors often prefer to "get in and get the job done" rather than spend time reviewing risk assessments. This culture of speed over safety can undermine even the most well-intentioned risk management policies, leading to higher incident rates and project delays due to workplace injuries.

Industry-Specific Considerations

One respondent provided detailed insights specific to healthcare, covering "Pre-Design Project Safety" and "Pre-Construction Project Safety," including areas like infection control, hazardous materials, and noise/vibration. This reflects how industry-specific risks require tailored approaches and specialized risk management strategies to address unique challenges.

Challenges in Construction Risk Management

While risk management is widely recognized as essential, implementing a successful program comes with numerous challenges. One of the most frequently mentioned obstacles is the lack of an initiative-taking risk culture in some organizations. Many companies still operate under a reactive mindset, addressing safety concerns only after an incident occurs rather than anticipating and mitigating risks beforehand.

Another major challenge is balancing compliance with effectiveness. Some companies focus too heavily on compliance with OSHA regulations and client-mandated requirements rather than developing comprehensive risk management strategies that truly reduce incidents. While compliance is important, companies that view risk management only as a legal obligation rather than a core business function often fail to achieve meaningful improvements in workplace safety.

Resource allocation is another concern, particularly for small to mid-sized firms. Many construction companies operate with limited budgets for risk management, meaning that safety personnel are often stretched thin, covering multiple projects with minimal support. This leads to inconsistent enforcement and gaps in risk mitigation efforts. Some respondents pointed out that safety managers often must fight for financial resources to implement better training, technology, or safety initiatives, particularly in companies where leadership views risk management as a cost rather than an investment.

Additionally, as construction projects become more complex, risk management must evolve to address emerging risks such as cybersecurity threats, supply chain disruptions, and climate-related challenges. A few respondents acknowledged that while traditional risks (e.g., worker injuries, falls, equipment malfunctions) remain top priorities, new threats such as cyberattacks on construction software and environmental concerns are becoming increasingly relevant.

Conclusion

The survey data suggests that while risk management practices are improving, the industry still faces significant challenges in consistency, culture, and execution. Organizations that successfully integrate risk management into their business strategy, rather than treating it as a regulatory requirement, tend to have better safety outcomes and lower incident rates.

The key to improving risk management across the industry lies in shifting from a compliance-based mindset to a proactive, integrated approach. This requires:

- Strong leadership commitment at all levels to drive safety culture.
- Effective training and communication to ensure that workers understand and engage with risk management protocols.
- Technology adoption to streamline risk assessment, documentation, and real-time monitoring.
- Comprehensive contingency planning to prepare for unforeseen challenges.

Ultimately, construction risk management is not just about reducing accidents; it's about creating a culture where safety, efficiency, and operational excellence go hand in hand. Companies that embrace this holistic approach will not only protect their workers but also improve project outcomes and financial performance in the long run.

Comparative Analysis

Table 1. Comparative Analysis				
Aspect	Literature Review	Survey Analysis	Case Study (Waffle Construction)	Comparison
Risk Identification	Emphasizes comprehensive documentation, stakeholder engagement, and ISO 31000-2018 guidelines.	Acknowledged as important, but depth and frequency of assessments vary widely.	Uses TradeTapp for subcontractor prequalification, evaluating financial, safety, and legal aspects.	Literature emphasizes structured frameworks, while firms show inconsistent application; Waffle Construction follows a technology-based structured approach.
Risk Mitigation	Suggests subcontractor prequalification, contractual risk transfer, and continuous monitoring.	Some firms use technology-driven approaches, but many rely on outdated methods.	Requires subcontractors to submit financial statements, safety records, and undergo periodic audits.	Best practices suggest proactive risk mitigation, but industry adoption is inconsistent; Waffle Construction follows a structured verification process.
Risk Monitoring & Reporting	Advocates real-time tracking and data-driven decision-making.	Many firms conduct audits but fail to implement corrective actions effectively.	Conducts monthly audits to ensure compliance and address discrepancies.	Literature supports real-time tracking, yet firms struggle with implementation; Waffle Construction follows a strict compliance-driven approach.
Contingency Planning	Recognized as crucial but often overlooked.	Many firms lack structured contingency plans, leaving them vulnerable to disruptions.	Focuses on mitigating wet work-related risks to prevent flooding incidents and legal liabilities.	While literature stresses the importance of contingency planning, industry practices are lacking; Waffle Construction applies targeted contingency measures.

`Figure 4, Comparative Analysis.

The comparative analysis' purpose is to synthesize the findings from the literature review, survey results, and the case study to evaluate risk management practices in the construction industry. Each component provides distinct insights—academic foundations from the literature review, industry-wide trends from the survey, and real-world applications from the case study. By analyzing these elements, this study identifies best practices, common challenges, and areas for improvement in construction risk management.

The literature review establishes a structured framework for risk management, emphasizing systematic identification, assessment, prioritization, mitigation, and continuous monitoring. Industry best practices highlight the importance of proactive strategies, leveraging technology (e.g., BIM, data analytics), and regulatory compliance. The survey analysis indicates that while risk management is widely acknowledged, its execution varies based on company size and culture. Larger firms employ structured methodologies, whereas smaller subcontractors often adopt a compliance-driven approach, meeting only minimum legal requirements. The case study of Waffle Construction demonstrates the implementation of a formalized Subcontractor Risk Management Program (SRMP), incorporating prequalification procedures, financial and safety scoring, and proactive mitigation measures. Risk identification is fundamental to effective risk management. The literature review advocates comprehensive documentation, stakeholder engagement, and best practices like ISO 31000-2018 guidelines. The survey reveals that while companies acknowledge the importance of risk identification, the depth and frequency of assessments vary. High-performing companies use structured methodologies like risk matrices, whereas others treat assessments as periodic compliance exercises. Waffle Construction employs Trade Tapp for subcontractor prequalification, evaluating financial, safety, and legal aspects to assess risk levels before project initiation. Risk mitigation strategies differ across sources. The literature review suggests subcontractor prequalification, contractual risk transfer, and continuous performance monitoring as effective strategies. The survey highlights discrepancies in mitigation effectiveness, showing that while some companies integrate technology-driven risk monitoring, others rely on outdated, manual approaches. Additionally, subcontractors often resist risk management measures due to time and budget constraints. Waffle Construction employs a structured mitigation approach, requiring subcontractors to submit financial statements, safety

records, and performance evaluations. The company integrates mitigations into contracts and conducts periodic audits to enforce compliance.

The findings from this comparative analysis highlight significant gaps and opportunities for improvement in construction risk management. While the literature provides a structured framework, survey results and case study insights indicate that implementation levels vary widely across the industry. Larger firms tend to have well-established risk management strategies, while smaller contractors often adopt a reactive approach, primarily focusing on compliance rather than proactive risk mitigation. This difference suggests a need for industry-wide standardization and improved accessibility to risk management resources for smaller firms.

Technology-driven risk management is increasingly critical in mitigating potential disruptions. High-performing companies leverage tools like BIM, data analytics, and digital documentation to enhance predictive capabilities and streamline decision-making. Waffle Construction aligns with best practices by employing TradeTapp for subcontractor evaluations, and financial/safety scoring. However, many smaller contractors still rely on manual or outdated systems, leading to inconsistencies and potential oversight in risk assessment.

Leadership commitment plays a crucial role in fostering a strong risk management culture. The survey data indicates that organizations where executives actively prioritize risk management experience lower incident rates and higher employee engagement. Conversely, companies where risk management is treated as a regulatory burden often struggle with enforcement and compliance. Waffle Construction enforces accountability through structured audits and executive oversight, setting an example of proactive leadership in risk mitigation.

Contingency planning remains a weak point across the industry. Despite its recognized importance in the literature, both survey responses and Waffle Construction's case study

highlight a lack of structured contingency strategies. Many firms fail to develop comprehensive emergency response plans, leaving them vulnerable to unforeseen challenges. This gap underscores the necessity for construction firms to integrate detailed contingency protocols into their broader risk management frameworks to ensure project resilience and minimize financial losses.

Another critical implication is the resistance among subcontractors to adopt extensive risk management measures. The survey highlights that subcontractor, particularly those under tight budget constraints, often perceive risk management protocols as unnecessary delays rather than essential safeguards. This resistance creates challenges in enforcing consistent safety and compliance standards across projects. To address this, companies must improve subcontractor engagement through clearer communication, training, and incentive-based compliance strategies.

Risk monitoring and reporting are emphasized in literature as essential components of risk management, advocating for continuous monitoring, real-time tracking, and data-driven decision-making. The survey identifies gaps in structured monitoring, where many companies conduct audits but fail to implement corrective actions effectively, leading to recurring risks. In contrast, Waffle Construction ensures compliance through monthly audits by the risk engineer, tracking project execution and identifying discrepancies in real time.

Contingency planning is recognized in the literature as a crucial but often overlooked component of risk management, focusing on predefined risk response protocols. The survey reveals that many firms lack structured contingency plans, leaving them vulnerable to unexpected disruptions. A notable example cited in the survey was a subcontractor causing a hospital flood due to inadequate risk controls. Waffle Construction acknowledges contingency

planning as a developing area, with a focus on mitigating wet work-related risks to prevent flooding incidents and legal liabilities.

The comparative analysis of the literature review, survey results, and case study reveals both strengths and weaknesses in construction risk management. While best practices exist and are implemented effectively by some firms, others still struggle with risk identification, mitigation, monitoring, and contingency planning. The disparity between structured approaches in larger firms and reactive measures in smaller contractors highlights the need for broader industry standardization and accessible risk management tools.

Technology adoption emerges as a critical factor in enhancing risk management practices, with digital tools enabling proactive risk assessment and mitigation. However, resistance among smaller firms and subcontractors to fully integrate these solutions remains a challenge. Leadership commitment plays a vital role in shaping company culture around risk, with firms that prioritize safety and structured monitoring experiencing better outcomes.

A key takeaway from this analysis is the necessity for firms to move beyond compliance-based risk management toward a more strategic, integrated approach. The case study of Waffle Construction exemplifies best practices in subcontractor risk assessment, yet even within structured programs, areas like contingency planning require further development. Moving forward, industry stakeholders must emphasize a cultural shift toward proactive risk management, leveraging technology, leadership, and strategic contingency planning to build a more resilient construction sector.

Recommendations for Waffle Construction

Based on the comparative analysis of the literature review, survey results, and case study findings, several key areas for improvement in Waffle Construction's risk management practices have been identified. The following recommendations aim to enhance the company's approach to risk identification, mitigation, monitoring, contingency planning, and overall risk culture.

Strengthening Risk Identification

Waffle Construction currently utilizes TradeTapp for subcontractor prequalification, which assesses financial, safety, and legal risks. To further improve risk identification, the company should integrate AI-driven predictive analytics and real-time risk monitoring tools. These technologies can provide early warnings for potential project risks by analyzing patterns in subcontractor performance, material availability, and environmental conditions. Additionally, expanding risk assessment frameworks to include scenario-based planning will improve the company's ability to anticipate and address emerging risks.

Improving Risk Monitoring and Reporting

Effective risk management requires continuous monitoring and real-time reporting. Waffle Construction can enhance its risk monitoring by implementing an automated risk tracking dashboard that integrates with TradeTapp and other project management software. This system should provide real-time alerts for deviations in subcontractor performance, safety compliance, and financial stability. Automated tracking reduces human oversight errors and ensures that all stakeholders are informed of potential risks as they arise.

Strengthening Contingency Planning

The comparative analysis indicates that contingency planning remains a weak point across the industry, including at Waffle Construction. To address this, the company should develop

structured emergency response protocols and conduct quarterly scenario-based contingency drills. These drills will prepare employees and subcontractors for various risk scenarios, including supply chain disruptions, safety incidents, and extreme weather events. Establishing predefined risk response protocols will ensure faster and more effective reactions to unforeseen challenges, minimizing financial losses and project delays.

Leveraging Technology for Risk Management

Many leading construction firms are adopting Building Information Modeling (BIM) and digital twin technology to enhance risk assessment and mitigation. Waffle Construction should explore these technologies to improve its ability to predict potential construction risks and visualize risk scenarios before they materialize. Implementing BIM for project risk assessment will help the company proactively identify design flaws, logistical challenges, and safety concerns before they impact project execution.

Cultivating a Risk-Aware Organizational Culture

A strong risk management culture is critical for ensuring consistent compliance and enforcement of risk policies. Waffle Construction should embed risk accountability into its company culture by making risk management a key performance indicator (KPI) for project managers and executives. This approach will encourage leadership to take an active role in identifying and mitigating risks, fostering a company-wide commitment to safety and compliance. Regular risk management workshops and internal audits should be conducted to reinforce the importance of proactive risk mitigation.

Improving Subcontractor Engagement and Compliance

Subcontractors play a vital role in construction projects, yet many resist extensive risk management measures due to perceived inefficiencies. To improve compliance, Waffle

Construction should implement a subcontractor rating system that ties contract renewals to safety, compliance, and performance metrics. High-performing subcontractors should receive financial incentives or priority in bidding processes, while non-compliant subcontractors should be subject to additional training and risk mitigation requirements. This system will create a structured incentive for subcontractors to adhere to the company's risk management policies.

By implementing these recommendations, Waffle Construction can strengthen its risk management framework, reduce project disruptions, and enhance overall safety and efficiency. Leveraging technology, fostering a strong risk culture, and improving subcontractor engagement will ensure a proactive approach to risk management. These steps will position Waffle Construction as a leader in risk mitigation and project resilience within the construction industry.

Standard for Risk Management in the Construction Industry

Effective risk management is a crucial component of success in the construction industry. Projects are often exposed to complex variables as mentioned previously. With a proactive, structured approach to risk management, this enables companies to mitigate potential issues before they escalate into costly claims. Drawing on insights from the literature review, industry survey, and the case study, this standard provides a comprehensive guide to establishing a resilient risk management framework. It emphasizes the integration of technology, leadership involvement, subcontractor engagement, and continuous improvement to drive safer, more efficient and reliable construction practices.

Figure 5, Standard for Risk Management in Construction Industry.

The first step to establishing a risk management standard is leadership commitment. It is a key driver of successful risk management. Executives and project managers should model risk-aware behavior and integrate risk management into their performance metrics. By embedding risk management into the organizational culture, companies can encourage proactive engagement at all levels. This can be reinforced through regular training, workshops, and the establishment of internal champions who advocate for the best practices.

The next recommendation is to establish a comprehensive risk framework. A comprehensive and structured framework is the cornerstone of effective risk management. This framework should be cyclical and adaptive, encompassing the continuous processes of risk identification, assessment, prioritization, mitigation, monitoring, contingency planning, and regular review. Establishing a formal risk management framework ensures a proactive, rather than reactive, approach and provides a foundation for informed decision-making and consistent risk handling across all project phases.

Next is risk identification, Risk identification must go beyond basic compliance. Organizations should use a combination of documentation, stakeholder engagement, and historical data to identify potential risks early in the project lifecycle. Tools such as TradeTapp, predictive analytics, and scenario-based planning should be employed to detect subcontractor performance issues, supply chain vulnerabilities, and environmental risks. Risk identification should be treated as an ongoing process rather than a one-time event, with regular updates and reassessments.

Next is risk assessment & prioritization. Following identification, each risk must be assessed for its likelihood and potential impact. Organizations should use both qualitative and quantitative methods, including risk matrices, scoring systems, and simulations. Factors like

financial impact, safety implications, and project delay potential should be considered. Prioritizing risks allows project teams to allocate resources more effectively and address the most critical threats first.

Following, risk mitigation strategies should be integrated early in the project lifecycle and incorporated into contractual agreements. This includes prequalification of subcontractors based on financial stability, legal compliance, and safety records. Techniques such as contractual risk transfer (e.g., insurance requirements) and the use of BIM help in identifying and preventing risks before they occur. Regular compliance checks and audits should also be scheduled to ensure mitigation measures remain effective throughout the project.

After, Ongoing monitoring and transparent reporting are essential to maintaining control over risks. Real-time dashboards and risk tracking systems should be used to monitor subcontractor performance, safety compliance, and financial indicators. Monthly audits led by risk engineers can help identify discrepancies and enforce corrective actions. A clear reporting structure ensures that all stakeholders are informed of potential risks and that there is accountability at every level.

Despite best efforts, not all risks can be prevented. Therefore, robust contingency planning is vital. This involves developing emergency response protocols and conducting regular drills to prepare for potential disruptions such as accidents, material shortages, or extreme weather events. Contingency plans should include pre-allocated budgets, predefined actions, and assigned roles to ensure swift and coordinated responses during crises.

Next is subcontractor engagement and compliance. Since subcontractors play a critical role in project execution, their engagement in risk management is essential. A structured subcontractor rating system should be implemented, linking contract renewals and bidding

opportunities to compliance and performance metrics. Incentives such as preferred bidder status or financial rewards can encourage adherence to safety and quality standards. Conversely, subcontractors with poor performance histories should be required to undergo additional training and closer monitoring.

Finally, continuous improvement. Risk management must evolve alongside project complexity and industry changes. Organizations should conduct post-project reviews to evaluate the effectiveness of risk strategies and update policies accordingly. Engaging with industry forums, staying informed about regulatory updates, and benchmarking against industry leaders can help companies refine their approaches. Continuous improvement ensures that the risk management framework remains relevant and resilient.

By implementing and adhering to this comprehensive standard, construction firms can significantly reduce project disruptions, improve stakeholder confidence, and enhance long-term sustainability and success in an increasingly complex industry environment.

Conclusion

In conclusion, risk management in the construction industry is an essential practice that ensures project success by minimizing financial losses, enhancing safety, and improving efficiency. The research highlights the importance of a structured approach that includes risk identification, assessment, prioritization, mitigation, monitoring, and contingency planning. While larger firms often have well-established risk management programs, smaller contractors tend to rely on compliance-driven approaches, leaving gaps in effective risk control. The case study of Waffle Construction demonstrates the benefits of implementing a formalized risk management strategy, particularly in subcontractor prequalification and financial risk assessment. However, challenges such as subcontractor resistance, inadequate contingency planning, and inconsistent enforcement still exist across the industry. Moving forward, companies must shift toward proactive, technology-driven risk management approaches that integrate leadership commitment and continuous improvement. By fostering a culture of risk awareness and preparedness, construction firms can enhance project outcomes, protect stakeholders, and ensure long-term industry resilience.

Appendix A

January 15, 2025

Name
Subcontractor Company Name
Subcontractor Company Address

RE: Letter of Intent to Award – [Type of Work] – [Project Name]

Name,

This letter is to confirm Waffle Construction Company's intent to award a subcontract to [Subcontractor Name] to perform the [Type of Work] scope of work, in strict accordance with the contract documents and the local authority having jurisdiction, on the [Project Name] in the amount of $_____.

Please use this letter as approval to begin your submittal package for this Project, effective immediately. Please see attached, Waffle's Subcontractor/Vendor Submittal Request Form to fill out each line and provide with each of your submittals. A complete submittal package must be returned within (2) weeks of receipt of this letter. All submittals should be sent electronically to the attention of [Name] at [Email], [Name] at [Email] and copied to myself at [Email]. Please refer to the procedure manual, distributed with the contract, for formal submittal directions.

[IF APPLICABLE - if SRMP process is ongoing, keep this paragraph. If not, delete paragraph] Note that award of this contract is subject to successfully qualifying through our pre-qualification process. Any financial or safety mitigation responsibilities that may arise out of this process, will be updated on our scope sheets and included in the subcontract agreement.
See the third page of this letter for Risk Mitigation Requirements for your subcontract and ensure your staff is following the inspections & documentation required throughout the project.

Last, please refer to the second page of this letter for the Waffle's Construction supervision team who will be running the aforementioned project. Please add this contact information into your system.

With our "Clients for Life" mentality in mind, we look forward to [Subcontractor Name] joining our team and completing another successful project. If you have questions, do not hesitate to contact me.

Sincerely,

Project Superintendent
[Name]
[Phone]
[Email]

Project Executive
[Name]
[Phone]
[Email]

Project Manager
[Name]
[Phone]
[Email]

Project Engineer
[Name]
[Phone]
[Email]

Field Engineer
[Name]
[Phone]
[Email]

Project Administrator
[Name]
[Phone]
[Email]

SAFETY AND/OR FINANCIAL – RISK MITIGATION REQUIREMENTS for [SUBCONTRACTOR NAME]

[UPDATE SUBCONTRACTOR REQUIRED MITIGATION STEPS BELOW]

1. Designation of an on-site competent person for safety
2. Daily Job Site Inspections by the competent person
3. On-site competent person must have OSHA 30. Proof must be submitted to WCC's safety department prior to starting work.

OR

SAFETY/FINANCIAL – RISK MITIGATION REQUIREMENTS for [SUBCONTRACTOR NAME] It is understood that the risk mitigation review has not yet been completed and any mitigation requirements for this contract will be included on the project specific scope of work.

ACCEPTANCE by [Subcontractor Name]

_____ _____

Signature Date

_____ _____

Printed Name Title

Appendix B

Subcontractor Pre-Award Checklist
Enter Project Name Here
3/25/2025

Subcontractor Pre-Award Checklist
ENTER SUBCONTRACTOR NAME HERE

No.	General Items	Ops. Entered Values	Review (1)	Mitigate (2)	Award (3)	Comments
1	Enter rating from subcontractor Financial Scorecard Report (0-3)	3.00			3	
2	Enter rating from subcontractor Safety Scorecard Report (0-10)	10.00			3	
3	Enter rating from subcontractor Project Closeout Scorecard (0-5)	5.00			3	
	Subcontractor General Rating		OK to Award			

No.	Financial Specific Questions	Yes	No	Award (0); Review / Mitigate (1)	Subcontract Value	Entered in respective values.
4	Is the Subcontract Value Less than 50% of Their Prior Year's Total Revenue?			0		
5	Is the Subcontract Value Less than the Value of Their Combined Equity and Available Line of Credit?			0	$0.00	$0.00
6	Does their Subcontract Value exceed their Internal Single Limit with Warfel? (TradeTapp)			0	$0.00	$0.00
7	With the addition of this Subcontract, does their Aggregate Total of Volume from Power BI exceed their Internal Total Limit from TradeTapp?			0	$0.00	$0.00
	Subcontractor General Rating			OK to Award		

No.	Project Specific Items	Ops. Entered Values or Y/N		Review (1)	Mitigate (2)	Award (3)	Comments
8	Is subcontractor fully descoped?			N/A			When were they descoped? Who was present?
9	Rate the potential impact of the subcontractor's proximity to the job location (0-3)	3.0				3	What is the distance from their shop to the project?
10	Rate the potential impact of the manpower resources this subcontractor has? (0-3)	3.0				3	How many? Any plan for 2nd or 3rd Tier Subcontractors?
11	Did this subcontractor provide references from previous projects?			N/A			Who? When were they called?

11	Did this subcontractor provide references from previous projects?			N/A		Who? When were they called?
12	Rate the experience of this subcontractor relative to the size and scope of the project, along with the number of years in business and largest project to date (0-3)	3.0			3	Largest Project to Date? How many years in business?
13	Rate the subcontractors backlog based on the scheduled start and duration of their scope of work (0-3)	3.0			3	What is their current year backlog?
	Subcontractor Project Rating		OK to Award			

Both PM and PX to sign off on every scorecard regardless of "OK to Award" status.

PM Signature: _____ Date: _____

PX Signature: _____ Date: _____

Director of RM Signature: _____ Date: _____
(Required if Award is over $1,000,000)

Mitigation Plan:

Cells to Enter WCC Information

Enter Mitigation Plan if Cell Turns Highlighed

Appendix C

SUBCONTRACTOR PROJECT SPECIFIC QUESTIONNAIRE

Please complete this questionnaire for the project you are bidding and return to _____within (1) week of receipt.

Company Name_____

Date_____

Project_____

Company Resume

1. Do you plan to subcontract any of the work for this project? **Y/N** If yes, what scope(s) will be subcontracted on this project?
   a. _____
   b. _____
   c. _____
2. Please provide a record of your backlog of work scheduled prior to three (3) months of your mobilization date and ending three months after your completion date. (Please attach as a separate document)
3. Who from your company is the proposed Project Manager for this project?_____
4. Has he/she ever done a Warfel project before? **Y / N** If yes, please list the Warfel Projects.
   a. _____
   b. _____
5. Who from your company is the proposed Field Supervisor for this project? _____
6. Has he/she ever done a Warfel project before? **Y / N** If yes, please list the Warfel Projects.
   a. _____
   b. _____
7. Please Provide a record of past projects (within the past 5 years) that have similarities to this particular project.
   a. _____
   b. _____
   c. _____

By signing this statement, I, (name)_____, duly authorized as,

(title)_____of (company name) _____

affirm and certify this information herein is accurate.

Signature_____Date_____

Appendix D

50	Courtyard Railings	x	
51	Ships stair crossover for mechanical access on rooftop	x	
52			
53	Furnish all miscellaneous metals per the contract documents to be installed by others including, but not limited to, the following:	x	
54	Loose lintels	x	
55	Loose relief angles	x	
56	Support angles at Louver L-2	x	
57	Bearing plates	x	
58	Sill angles at aluminum storefront	x	
59	Projector supports	x	
60	Elevator sump pit frame and cover	x	
61	Elevator sill angles	x	
62	Hoist beams	x	
63	WF Lintels - 8C	x	
64	Cooridor handrail angles	x	
65	Galvanized sign bollards	x	
66	Galvanized bollards	x	
67			
68	It is understood this contractor is responsible for all deliveries and unloading (this includes all safety measures and flagman for trucks/cranes/equipment to ensure safety of pedestrians outside of the jobsite). In addition, all material should be placed on dunnage and protected to avoid dirt and or rust. If the materials provided under this scope of work are not placed on dunnage on protected prior to installation, it will be the responsibility of this contractor to clean and or re-prime all materials following erection/installation	x	
69	It is understood this subcontractor is responsible to follow all requirements for design, fabrication and installation listed on the structural drawings as well as within the specifications.	x	
70	It is understood the erection sequence will be completed in such a manner that the erection and detailing of one phase (area by area) will be complete, prior to the next phase of erection and detailing. This is done in such a manner to allow other trades the ability to get started with work prior to the erection of the entire building.	x	
71			
72	**ADD/DEDUCT ALTERNATES**	**ADD/DEDUCT**	**$$$**
73	CCIP	ADD	$ 10,000.00
74			
75	**UNIT PRICING**	**Unit**	**$$$**
76	Iron Worker	HR	$ 104.21
77	Crew Foreman	HR	$ 108.36
78	4" galvanized sign bollard	EA	$ 175.00
79	6" galvanized sign bollard	EA	$ 275.00
80			
81	**MITIGATION PLAN REQUIREMENTS TO FULFILL CONTRACT**	x	
82	Designation of an onsite competent person for safety.	x	
83	Daily job site inspections by the competent person.	x	
84	On-site competent person must have OSHA 30 and submit prior to beginning work.	x	
85	Monthly documented safety inspection by the contractor's competent person or safety professional submitted to WCC project safety engineer.	x	
86	Proof of fall protection training for workers working at heights greater than 6' must be submitted prior to the start of work.	x	
87			
88			

Appendix E

Interviews

1. Tell me about industry experience in construction risk management.
    a. Years, companies, etc.
2. What kind of work does your company do?
3. Do you have a risk management program in place?
4. Who created/manages this plan?
5. What do you think is the industry standard for construction risk management programs?
6. What do you think are key components for a risk management program for construction?
7. What are factors that make a risk management program successful?
8. Any examples that you can think of where risk management should have been applied and was not?
9. Risk identification, assessment, prioritization, mitigation strategies, monitoring and reporting, as well as contingency planning are the six components I identified for a successful risk management program in construction. Do you think these are relevant to your company's risk management program?
10. How do you perform risk assessments? Is there a specific procedure?
11. What do their contingency plans look like? What are the key elements in their contingency plans?
12. What are some of the challenges in creating a successful risk management program?

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