

Strategies to Mitigate Project Risk and Maximize Return



Growing pressures on project teams in construction and engineering

Few project teams are subject to higher levels of risk and uncertainty than those in engineering and construction. Of course, the larger and more complex the project scope, the greater the risk of its failure. Many "riskaverse" construction management firms and their clients employ mitigation strategies before a project begins, including elaborate contractual arrangements and contingency plans to protect the parties from unforeseen circumstances. However, few have explored ways to address the elements of risk that project parties encounter once the project is underway, and throughout the project's execution.

Perhaps these categories of risk are less understood because they are influenced by the project stakeholders themselves. They result from how team relationships are formed, how expectations are set with other project parties, and how they communicate and collaborate during project execution. While engineering and construction firms commonly point to "the unknown" as the greatest source of risk, many more recognizable risk factors—and opportunities to reap returns—can be redflagged by looking at their own business processes and collaboration methods.

As these people- and process-focused risk factors continue to be studied within the industry, organizations are looking inward to identify their own liabilities. This brief presents data from recent engineering and construction industry studies and success stories from project teams that point to collaboration strategies as a means for containing risk and delivering projects of better quality and with healthier bottom lines. After reading the brief, you'll know how to

- Build a framework for identifying risks and opportunities for returns throughout the project lifecycle
- Identify the often hidden causes of loss, delays, and noncompliance
- Harness sources of cost reduction and productivity improvement
- Apply proven collaboration strategies from high-stakes global projects

"Partnering....requires openness between the parties, ready acceptance of new ideas, trust and perceived mutual benefit...We are confident that partnering can bring significant benefits by improving quality and timeliness of completion whilst reducing costs."

Constructing the Team, Sir Michael Latham, July 1994

Sharing the pain and gain among all parties

Clearly, the goal of everyone involved in a project is to mitigate risks and maximize rewards in order to drive the best project and revenue outcomes. If risks are not adequately contained, budget overruns and production delays cut profit margins and damage reputations, especially on projects subject to public scrutiny.

To add insult to injury, costly claims, disputes, and litigation can often follow an unsuccessful project.

Several strategies are typically employed for counter-balancing these losses, and the trend is toward spreading the risk and reward across multiple parties, a practice known as "pain/gain sharing." For example, on-time or early completion can improve profit margins and even deliver early-completion bonuses. Contingency funds that are not needed can be reclaimed as a type of "profit." But what the industry lacks are reliable strategies to identify and calculate risk (or monetize rewards) delivered through strong working relationships and higher efficiency. On a complex project with multiple parties and varying agendas, how can a project team effectively turn collaboration into cash?

Some project teams have discovered that the same collaboration strategies that mitigate project risks can also maximize the efficiency and effectiveness of project workers and their document management processes, allowing them to accomplish more with less.

Considering alternatives for project delivery

Construction firms have long explored options for less adversarial approaches to project delivery. For instance, a 1994 study conducted in the United Kingdom1 explored the concept of partnering within the UK construction industry. Commissioned by UK government and industry organizations in the wake

of a lapse in growth, the report found that existing industry practices were "ineffective," "adversarial," "fragmented," and "incapable of delivery for customers." The report's author, Sir Michael Latham, outlined 53 specific recommendations and advocated a shift toward more collaborative practices that increase teamwork and reduce inefficiencies.

More recently, a new approach known as Integrated Project Delivery (IPD) has begun to emerge as an alternative that is rapidly being embraced in markets like the US. The IPD model suggests that by adopting contractual approaches and processes that foster collaboration rather than conflict, teams will be more likely to deliver a project on time, on budget, and to the required standard or better, without having to resort to claims, disputes, or litigation. But project delivery methods and contract structures alone won't overcome the challenges—as construction industry analyst Paul Wilkinson wrote in his 2005 book Extranet Evolution. 2 successful collaboration is 80% about people and process and 20% about technology, which is reinforced by instituting good practices learned from past projects.

A framework for identifying risk factors and uncovering returns

In the following sections, we'll examine three categories of risk and return, and give real-world examples of how strong data capture and communication practices have helped project teams create successful collaboration strategies.

The framework below shows both well-known and lesser-understood categories of risk. It also shows that each category has corresponding types of rewards that can be gained from successful project lifecycle collaboration, with benefits extending from planning through construction and even beyond project completion to ongoing operation of the facility or asset in question.

Measuring value

Quantifying the future value of a completed project can be challenging when it requires forecasting business results that have not yet been delivered. However, a model has been put forth by researchers in the UK that can help to anticipate measurable impact. Referred to as the 1:5:200 model3, it quantifies the lifetime value of a built facility and suggests that project teams can deliver substantial return by looking at the business value delivered by better design and construction over the whole life of an asset. Variables in the model include:

Variable	Components	
1	Construction costs	
5	Rent, maintenance, and building operating costs	
200	Staff salaries and business operating costs	

Framework for identifying risk and corresponding returns				
Identify and Mitigate Risks	Avoid Losses Project budget overruns Lost operational revenue Cost of litigation/settlements Knowledge gaps Material errors/defects/rework Carbon credits/operational costs	Prevent Delays Lost production days Wrong information, wrong person, wrong time, wrong format Handover/operational delays Missed window of opportunity	Maintain Compliance Legal/regulatory pitfalls Policy/security breaches Governance Reputation impact "Green" mandates and certifications	
Maximize Corresponding Returns	Reduce Costs Margins Infrastructure and maintenance Travel expenses Printing/distribution/shipping	Boost Productivity	Increase Agility Flexibility Speed Growth Value-add	



Strategies for mitigating risk

We're all familiar with the "big three" risk factors on construction and engineering projects: budgetary losses, schedule delays, and contractual or regulatory non- compliance. What may be less readily recognized is the influence of a project team's data capture and communication processes on those risks. When it comes to managing the correspondence and documentation for a project, just how risky is the process of producing, reviewing, routing, printing, filing, and mailing documents, drawings, and other information?

In fact, the majority of schedule disruptions, design errors, and simple miscommunications are caused by inaccurate or incomplete information. On a three-year \$100M construction and engineering project, where documents are managed and shared largely in printed form

- 1,000 documents can be produced and mailed each week
- 50,000 or more project-related mails can be sent per year

Considering the volume of documentation and correspondence generated and routed, some level of risk can be measured by the amount of documentation produced. Effective information capture and distribution can eliminate knowledge gaps resulting from misplaced documents or inability to access the latest version. Complete capture and communication of data also decreases the chance of material errors and defects that cause expensive rework.

Information retention is also crucial to contain liability. Professional indemnity insurance typically requires retention of records for several years, potentially through the life of the asset. Public/private partnership or private finance initiatives (PPP/PFI) commit the winning consortium to operate and maintain the finished asset for 25 or 30 years.

This section explores ways to mitigate risk produced by mountains of project documentation and correspondence, in order to reduce losses, prevent delays, maintain compliance, and go "green" in the process.

Mitigating risk by avoiding losses

Recent studies show that better document control, creation of internal and project-wide collaboration processes, and use of an online project collaboration platform can directly impact project risk and drastically reduce the resulting losses. For example, an Aconex internal ROI study shows that, without an effective audit trail, a project audit spans an average of almost six months. But in one case, the use of an online collaboration platform that captured all project information electronically cut that project audit time to just two days.⁴ The same study found that the cost to process a legal dispute is nearly double without the availability of a complete project audit trail. Conversely, customers report that use of the Aconex online collaboration platform has reduced legal costs by an astonishing 69%.⁴

A collaboration platform helps avoid disputes by recording all interactions and securely stamping them with time and date. Team members can view the indisputable record of facts, shifting the focus of dialogue from blame to resolution. For example, when a European public transit system refurbished a busy capital city rail station, the project management firm assigned a dispute team of six. But since there were no disputes, the team was reallocated to other revenue-generating project work. The senior project manager attributed the ability to reallocate resources, and the timely completion of the project, to use of the Aconex online collaboration platform for "quick, easy, and auditable saving and transferring of documents and mail."⁴

Email poses a particular problem when project-related emails are stored on separate servers and networks, making discovery time-consuming and costly. For example, a 2004 defamation suit in the UK required an expenditure of over £4m (or over \$6.2 million US) for email discovery that stretched back five years.²

An online collaboration platform can also help avoid information losses that can occur when emails or faxes are not received properly or promptly. For instance, CVG Construction Management found that using the Aconex online collaboration platform enabled their firm to avoid errors by delivering project information more quickly, accurately, and reliably than emails and faxes.⁵ With a documented trail of who accessed what information and when, project participants spend less time on follow-up calls and emails and save the expense of mailing back-up copies.

Considering the volumes of printed documents generated and transmitted on a typical project, the operational cost totals are impressive when you add up the savings on paper, printing, and copying; postal/ courier fees; storage; and printing equipment, as well as staff to manage it all. Better collaboration also delivers savings beyond construction cost, resulting in a more energy-efficient design and construction process.

Avoid losses

Eliminate project budget overruns

Avoid cost of plan exceeding budget

Avoid lost operational revenue

Prevent financial impact of not going live on time

Reduce cost of litigation and settlements

Avoid penalties due to breach of contract or missed dates

Fill knowledge gaps

Prevent lost documents or missing information

Reduce material errors/defects and rework

Eliminate errors due to wrong materials or plans

Earn carbon credits/reduce operational costs

Reduce cost of printing, shipping, and travel

Mitigating risk by preventing delays

When the right information isn't delivered to the right person, on time and in the right format, project delays are often unavoidable. An IDC white paper, The Hidden Cost of Information Work6, established that each information worker (someone who spends time searching for, producing, reviewing, routing, editing, printing, filing, and reading work-related information) on a typical project each week spends

- 14.5 hours reading and answering email
- 4 hours managing document routing
- 4.3 hours managing document approval
- 3 hours recreating content
- 6.8 hours filing and organizing documents
- 2.2 hours managing version-control issues

Multiply those 34 hours per week by dozens, or even hundreds of workers, and the potential for errors and delays caused by the huge amount of manual data management is staggering. And when the inevitable staff turnover happens, there is no guarantee of a smooth handover if information is not centrally stored or controlled. Lost production days, late handovers, or a missed window of opportunity—all of these issues eat away at the bottom line.

Once a built facility goes live, the ongoing collation of documents for manuals, such as compliance or operations handbooks, can be accelerated when they are stored and managed in a central online repository. And without a common system that captures all information and correspondence from multiple contractors and suppliers, the time spent gathering and integrating information across disparate systems can be significant.

A 2004 report by the National Institute of Standards and Technology (NIST) found that poor interoperability between CAD and other systems costs the US construction industry \$15.8 billion a year⁷,

and a McGraw-Hill Construction 2007 report suggested that "interoperability costs add 3.1% to a typical project budget."8 Integration with Building Information Modeling (BIM) systems in particular is becoming increasingly important—and Aconex is already used to manage tens of thousands of BIM models, providing 3D capabilities in its viewer to allow users to share them more easily.

Case study:

Venetian Macau prevents information delays to meet construction deadlines.

Building the US\$1.8 billion Venetian Macau—the largest single-structure hotel building in Asia—was a huge undertaking. To open the casino by Chinese New Year, a project team of 3,000 people from nine countries used the Aconex online collaboration platform to speed access and distribution of information, while cutting printing, distribution, and data storage costs. This allowed them to reduce the chances of miscommunication, prevent delays caused by an inability to locate files, and avoid errors caused by working from outdated drawings.¹¹

Prevent delays

Eradicate lost production days

Prevent information, resource, and permitting delays

Eliminate wrong information, wrong person,wrong time, wrong format

Avoid misinformation or incomplete access to information

Reduce handover/operation delays

Avoid exceeding original project timeline

Avoid a missed window of opportunity

Prevent business impact of not going live on time



Removing barriers to international execution

Anecdotal evidence from across the construction industry suggests that drawing review cycles can be reduced significantly by using online collaboration. In 2006, the Network for Construction Collaboration Technology Providers (NCCTP) identified a 26% reduction in drawing approval times⁹, and a study by Becerik and Pollalis in 2006 found that online collaboration saves money and time when processing RFIs, bids, and electronic transfers.¹⁰

This is in large part because a web-based collaboration platform provides anytime, anywhere access to project documents and correspondence via a web browser, something that an internally hosted system doesn't allow. Using an online collaboration platform, dispersed team members located in multiple time zones can easily hand off documents and tasks to staff in other regions to ensure that work continues around the clock. This seamless online interaction not only eliminates delays that can be caused when documents must travel long distances to participants in other regions, it also provides a particularly crucial competitive advantage in today's global economy.

To mitigate risk for two hotel developments in Morocco, an international team that included firms from Morocco, Thailand, and the UK centrally captured and stored the project's information using Aconex. Using advanced and intuitive search functionality, documents were accessible on-the-spot. Document control functions to manage versioning and routing improved the update process, which had a positive impact on quality. But one of the most significant improvements realized by the project team was in the speed and accuracy of approvals needed to keep the project on-track and on-schedule.⁴

"When using hard copies and an FTP site, a 10-day review process often turned into 12 days due to the administrative work required. With Aconex, 10 days actually meant 10 days."

Gerard Couturier, A&E Division Director, Oger Abu Dhabi.

Mitigating risk by maintaining compliance

Government agencies in the US and other countries are required to preserve all records relating to decisions, procedures, and transactions on their projects and report any removal, alteration, or destruction of records. These mandates can extend to the private sector as well, such as with public-private partnerships, or projects in highly regulated industries, and for professional firms that must meet Professional Indemnity Insurance (PII) requirements. The stakes are so high that industry working groups are beginning to proactively specify the use of collaboration technologies, as evidenced by guidelines published by the Construction Industry Council (CIC),12

Typically, government regulations require project teams to provide satisfactory proof of compliance with mandated procedures, requiring an audit trail of actions taken in the course of projects. Such controls are also often required to meet terms of project contracts as well. For example, the NEC3 suite of contracts¹³ in the UK imposes strict time limits on the completion of various processes, and project managers are increasingly using contract change management systems integrated into collaboration platforms to produce reports and monitor contract compliance.

Maintaining information security and availability is also a major concern. Security vulnerabilities or information leaks can result in fines, litigation, and reputation damage. Internal collaboration systems that are not housed on redundant systems or routinely backed up can put the firm's project information at risk in the event of a disaster.

Using an externally hosted collaboration platform transfers that risk to the solution provider, who has likely invested in highly available data centers with dedicated service staff to maintain availability, backed by a sophisticated continuity/recovery plan. In addition, third-party solutions often include built-in security to ensure compliance with standards such as ISO section IEC27001.

As one government project expert said, "Enhanced security and reporting requirements associated with most federally funded...programs almost demand some type of electronic content management solution to track and protect the myriad of data collected and exchanged."14

Collaboration technology can also help organizations comply with "green" mandates by helping teams identify greener design or construction alternatives, sourcing materials locally, reducing travel requirements, and cutting waste. An audit trail can also help projects qualify for "green" certifications such as LEED and BREEAM by simplifying the process of collecting design and construction documents and highlighting the green achievements actually delivered on a project.

Avoid legal/regulatory pitfalls

Prevent liabilities or penalties for compliance/legal violations

Eliminate policy/security breaches

Meet security standards or compliance controls

Simplify governance

Produce documents for compliance; use independent system to maintain audit trail

Prevent reputation damaget

Avoid tarnishing image due to mistakes and enable rapid response

Achieve "green" mandates and certifications

Mitigate growth of greenhouse gasses



Strategies for maximizing return

This framework for seeking and maximizing project returns expands the definition of, and strategies for, controlling costs—whether through overhead expenditures, increased productivity of existing resources, or improved agility when projects face change. For example, staff productivity is an area with excellent potential for cost reductions through online collaboration. According to 2010 ROI research from Aconex, users calculated savings of up to 50% in administrative costs due to more streamlined information management processes.⁴

Having the right information in the right format where and when it's needed can also cut operational costs associated with travel for meetings and the shipping and distribution of project information. For example, one technical support group working for a contractor in Libya responded to over 380 requests for technical assistance from over 240 projects in just one year. With more efficient information processing, the support group estimates that each of their engineers saves five hours every week for a total of US\$78,000 a year.⁴

But the increased efficiency doesn't stop there. The firm estimates an additional US\$678,000 in savings, including US\$540,000 saved on housing in Libya for staff and families, US\$60,000 per year saved on flights, and fewer incountry support resources such as drivers and cars for the team.⁴

This section explores several more profitable options for managing project expenses and ways to leverage project resources to increase the productivity and agility of project teams.

Aconex helps manage the tracking and reporting of numerous requests for technical assistance provided by our department, saving 5 to 10 hours each week."

Senior Wastewater Engineer for a government contractor in Libya

"Aconex has saved us to date about 2 million AED (US\$600,000) on 220,000 printouts of drawings."

Gerard Couturier, A&E Division Director, Oger Abu Dhabi

Maximizing return by reducing costs

When collaboration technology is delivered in a Software-as-a-Service model, additional IT infrastructure is completely unnecessary. Avoiding maintenance, hardware and energy expenses for servers and storage—plus staff to manage them— makes SaaS very cost-effective. Research conducted in 2006 by the Software and Information Industry Association (SIIA)15 identified additional cost factors often omitted when comparing the TCO of traditional software versus SaaS, such as

- Hiring and training staff to install, manage, and maintain the onpremise applications
- Staffing a help desk to provide training and support to end-users
- Building and maintaining redundant secure network and hardware infrastructure

These costs are included in SaaS service fees, significantly reducing the investment required. SaaS collaboration tools are also ideal for bringing together geographically dispersed project teams. When the process of requesting and reviewing bids or tenders is conducted online, firms can save on paper and delivery fees, and gain productivity improvements.

For example, a large shopping complex in a European capital used the Aconex online collaboration platform to share electronic documents instead of paper versions, saving US\$79,000 in black and white printing alone.4

Document storage is an additional cost that is increasing with compliance requirements. Research from Aconex shows that firms can recoup up to US\$10,000 in document storage costs in a seven- year period.⁴

Case study:

Abu Dhabi Financial Centre reduces review cycles and cuts overhead costs.

This four-tower development by Saudi Oger Limited was managed by 840 participants from 85 organizations, producing 1.3 million documents and 500,000 correspondence items throughout the project. Using online collaboration processes enabled by Aconex, the team cut at least 220,000 extra document printouts, and reduced review cycles from around 25 minutes per drawing per reviewer to only 8 minutes each.¹⁶

Boost margins

Protect margins with a record of agreement on all decisions that affect your bottom line

Streamline infrastructure and maintenance

Limit additional headcount; reallocate personnel to billable projects; spend less on servers/storage and support, enable teleworking and mobile access

Save on travel expenses

Reduce flight/hotel costs and staff time for travel

Create greener printing/distribution/shipping

Reduce printing and distribution costs

Maximizing return by increasing agility

Today, forward-thinking engineering and construction firms are looking for ways to maintain profitability in challenging times and to position themselves to capture even more revenue when the economy recovers. Accordingly, increased agility in the face of change is a critical point of competitive differentiation requiring investment in both technology and processes.

One way to increase agility is by using online collaboration, which allows business rules to be adjusted easily when changes in project scope or approach demand it. These adjustments are often required when rapidly integrating a specialist consultant, bringing on a new supplier, or forming and training a new team. These changes must also be made quickly, and without a significant cost penalty.

With the flexibility of a data management system that does not require infrastructure maintenance, project teams can more easily work across diverse regions and partner with other firms from any country. For example, the project team responsible for building the largest offshore wind farm in Europe used online collaboration to give international partners quick, secure access to project information. It allowed them to easily manage processes and approvals, track correspondence and documents—especially those of staff who had left the company or the project—and helped bring the first phase of the wind farm in on schedule.⁴

Increases in flexibility, efficiency, and productivity allow firms to focus more time and resources on building their businesses—expanding geographic reach, extending expertise and entering new markets, or simply expanding project capacity. Faster engagement with other stakeholders such as suppliers and subcontractors can enable the team to finish a project early to capture more opportunities to generate revenue that would otherwise have been delayed.

Case study:

Mcdonald's enables change with agile processes and standards.

McDonald's Restaurants update the design of their 730 stores in Australia quarterly. Ensuring that upgrades are made to exact specifications requires large volumes of documentation between internal teams and up to 50 external consultants.

Using Aconex streamlined communication, reduced costs and administrative work, and accelerated the ability to expand store capacity. McDonald's also uses Aconex security features to control risk by assigning unique passwords.²¹

Increase agility

Improve flexibility

Gain a flexible foundation to enable rapid business change (adding partners, subcontractors, or processes)

Gain speed

Mobilize faster to engage with clients and execute on requirements quickly and shorten approval processes

Accelerate growth

Reduce barriers to entering new markets or delivering new services

Add value

Enable staff to focus on value-added tasks

Delivering better project results through collaboration

As we've seen, the primary driver of improved efficiency, project quality, and bottom lines is transparency—the ability to share information more effectively and in a controlled way that drives accountability and security at the same time. However, the demanding operating environment of multi-party projects is a challenge for most technology solution providers. There's clearly a need for a robust, secure, and neutral collaboration solution tailored specifically for the challenges of engineering and construction project parties.

The most widely used online collaboration platform

Unlike generic document management and file- sharing tools such as Documentum®, eRoom®, and Microsoft SharePoint, Aconex has been specifically built to handle complex construction relationships and workflows that typically span multiple organizations. Aconex is the most widely used online collaboration platform for multi-party engineering and construction projects worldwide. The global leader in Software-asa-Service (SaaS) in this industry, Aconex, manages 160,000 users in over 6,000 projects in 70 countries. The Aconex platform incorporates best practices from all of these projects and is well suited for even the most complex relationships and communication paths required by public-private partnerships, design/build, joint venture, integrated project team, and alliance contract arrangements. Aconex customers are among the industry's most respected firms, including builders and developers of some of the world's largest projects, with values in the hundreds of millions or billions of dollars.

A deep commitment to information rights

The Aconex platform is built around the principle of trust and fair treatment, linking all project partners through a single, secure, common collaboration solution. The company's deep commitment to participants' information rights and its advanced technology enable stakeholders to trust the platform with even their most sensitive documents. The Aconex platform consistently drives adoption to the highest levels among project participants by keeping information accessible, accurate, up-to-date and secure.

> "So much time is saved searching for information. The keyword search capabilities are powerful so people can instantly bring up what they need. The time saved in locating documents is very important on this project and it's something we can do extremely quickly with Aconex."

Shankar Narayannan, Head of Project Controls at Larsen & Toubro on the DIAL Project

A focus on optimizing system usage

Aconex recognizes that the success of a collaboration solution depends on the people who use it. That's why Aconex offers unlimited support to all stakeholders—clients, architects, engineers, project managers, suppliers, contractors, and facilities managers—no matter their location or level of usage, throughout the life of the project.

During implementation, the Aconex team quickly configures the system to fit the needs of the participants and applies practices learned on earlier projects, delivering "economies of skill" that allow project teams to benefit from the learning of other Aconex users worldwide through pre-configured forms and workflows that avoid the need to reinvent the wheel. Ongoing innovation ensures customers get immediate access to improvements that further accelerate their project success.

The platform is easy to understand and Aconex also provides unlimited free training sessions to bring everyone on board. Then Aconex goes the extra mile to assure that stakeholders continue actively using the system, performing regular health checks and recommending process improvements when needed. No construction collaboration solutions provider does more than Aconex to increase levels of information capture, improve control, and contain project complexity.

Minimizing risks and maximizing return

Construction and engineering firms know that their projects are subject to many forms of risks, with the potential for financial, contractual, legal, environmental, business, and even political consequences. Especially on large, multi-party projects, controlling information is essential to management of risk, and in uncovering opportunities for return. One of the most effective strategies available today is to implement project collaboration processes supported by an online collaboration solution. With full information visibility and control, firms can do their jobs more easily and with optimal project and financial results.

> "Aconex delivers the right information exactly when and where we need it, and drives a timely response. It has become a critical tool for reducing our timeframes, which is a key competitive advantage in this industry."

Eric Willden, Director of Major Healthcare Facilities, Graham Construction and Engineering

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About Aconex

Aconex provides the #1 cloud solution to manage information and processes for the world's largest construction and engineering projects. Aconex gives owners and contractors project-wide visibility and control between the many different organizations collaborating across their projects.

With more than 500,000 users and over US\$1 trillion of project value delivered in 70 countries, Aconex is the industry's most widely adopted and trusted platform. The company's global customer base includes nine of the top ten engineering, procurement and construction (EPC/EPCM) firms, 23 of the 25 largest global design firms, and nearly all Fortune 500 construction and engineering companies.

Founded in 2000, Aconex has 40 offices throughout the world, including headquarters in Melbourne, Australia and San Francisco, California.

Our clients have recognized that the Aconex solution is rich in features that support industry processes and that it meets or exceeds their internal security and data management standards. This is backed by unmatched client service that ultimately drives user adoption, maximizes return, mitigates risk and promotes project success.

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