



NAC Executive Insights

Enterprise Risk Management in the Engineering and Construction Industry

Key Points

- Enterprise risk management (ERM) is defined and its importance outlined.
- The journey ahead for the engineering and construction industry is described.
- A preliminary classification of enterprise risks is outlined and described.
- The recognition of the aggregation of project risks as a unique feature of enterprise risk in the industry is called out and top project level risk categories summarized.
- The dynamic nature of risk and the importance of understanding these dynamics at an enterprise level are recognized.
- Enterprise risk is dynamic. The portfolio of underlying risks is constantly changing in composition and relative levels as new projects enter the business and others are completed.
- Identifying and tracking risk management strategies and their effectiveness is integral to assessing ERM effectiveness.
- The work still required to design industry relevant ERM dashboards is described.
- Risk and reward as two sides of the same coin is recognized and an Enterprise Opportunity Management (EOM) system may be warranted rather than treating opportunities as “negative risk.”

Introduction

The focus of this Executive Insight is enterprise risks and their management in the engineering and construction (E&C) industry. The industry has lagged in the adoption of strong enterprise risk management systems and processes. Many of the ERM systems the industry put in place fail to recognize the features that make the E&C industry unique. This uniqueness arises from the project nature of the industry and the firms operating in it. This project nature is contrasted with the continuous operational nature of many of the early adopters of enterprise risk management (ERM).

What is Enterprise Risk Management (ERM)?

Enterprise risk management (ERM) encompasses the processes, systems, strategies, and tactics to manage the totality of risks and opportunities that a business faces across the entirety of the organization and its portfolio. ERM is focused on assuring that the enterprise can achieve the strategic business outcomes it has set for itself.

This portfolio view is important in distinguishing ERM from risk management within key functional and organizational elements. In essence, it subsumes all lower tier risk management strategies into a broader, all-encompassing one at the highest enterprise level. Management, often including the board of directors, utilizes the ERM process for identifying, analyzing, responding to, and monitoring risks and opportunities within the internal and external environment facing the enterprise.

Top level enterprise risk strategies are developed within the bounds of the risk appetite that has been established for the organization. Several potential scenarios are considered in developing the enterprise risk strategies.

Risk Appetite:

The types and amount of risk, on a broad level, an organization is willing to accept in pursuit of value.

- COSO - Committee of Sponsoring Organizations of the Treadway Commission

Why is ERM Important?

ERM's primary focus is to support the organization in its achievement of its strategic business outcomes. Increasingly, ERM is of interest to investors and financial regulators. This financial and regulatory focus is not limited solely to publicly traded corporations as larger private companies are being required to meet comparable standards and disclosure requirements.

Current State of ERM in the E&C Industry

ERM in the E&C industry has lagged other industries due to several factors, including the small fraction of work carried out by publicly traded firms; the bespoke nature of commercial arrangements and supply chains; and unique risk factors that are not present in other industries.

ERM is a board level focus in more of the industry with each passing day, but suffers from an inadequate understanding of the industry and its risks by traditional audit firms, which are often the drivers for greater risk disclosures in financial statements.

Later, one particular weakness in industry enterprise risk assessments is highlighted in this discussion with respect to the aggregation, modeling, and mitigation of project level risks.

Classifying Enterprise Risk

One of the first steps in classifying enterprise risks is to put in place a common risk language. This must reflect industry norms as well as those aspects of the business unique to the enterprise or the subsector in which it operates. There are many lists of enterprise risks available, but for purposes of this Executive Insight they are defined as including:

- Culture, control, and integrity risks
- Strategy risks
- Human resource risks
- Operating risks
- Supply chain risks
- Environmental, social, and governance (ESG) risks
- Information security

Culture, Control, and Integrity Risks

All engineering and construction companies strive to develop well-defined and recognized corporate cultures. These cultures act to define who the corporation is, what it is trying to achieve, and how it conducts its business. Culture speaks to shared values within the organization and provides a foundation that facilitates the management of all risks faced by the company and the development of organizational trust. The sustenance and strength of a company's culture is essential, and the monitoring of culture includes measuring understanding, alignment, and employee perceptions and sentiment around culture. Understanding changes to culture or its perception are important to overall enterprise risk management. All too often these changes are lost as subelements of human resource risks.

Management effectiveness measures the degree of control the organization is exhibiting in the achievement of its strategic business outcomes and the delivery of current period performance. While many measures track operational results, control risks speak to conformance with established processes and procedures, especially those related to the risk management system. Are all required approvals being obtained in a timely manner? Are all risk management processes being conformed to and appropriately documented? Are the root causes of risks encountered understood and any enterprise level risk impacts considered? Has the effectiveness of any risk mitigation strategies put in place to address the risk been reassessed?

Integrity risks in many ways speak to culture, but also are explicit as to whether the organization can be trusted. Does the enterprise conduct its business in a lawful and socially responsible manner? (Social responsibility is discussed with respect to ESG risks later in this Executive Insight.) Legal risks include a wide range of traditional corporate legal requirements and norms and are not repeated here.

Also with regard to integrity risks, the E&C industry suffers from a serious corruption challenge. Therefore, the enterprise risk management system must be diligent in order to prevent materialization of these risks. The system at an enterprise level also must track potential red flag behaviors. Such behaviors to be considered in the aggregate at an enterprise level are shown in Table 1.

Table 1
Red Flags - Potential Signs of Corruption in Construction

Goods or services in excess of project requirements or not required by the project.
Poor quality goods or services compensated at normal rates for industry standard.
Suspicious invoices including duplicate, backdated, or unwarranted (no goods or services provided) invoices.
Degraded quality or ethics focus. <ul style="list-style-type: none"> a. Resistance to take required training. b. Compliance activities deliberately reduced or resisted.
Bias in procurement practices and unsupportable outcomes.
Preference to deal only with one individual.
Resistance to training backup for fear of exposing unethical actions.
Reluctance to take annual leave, especially during "high value" periods.
History of corruption.
Checks and balances being regularly bypassed in the interest of expediency.
Contemporaneous written records nonexistent

Strategy Risks

Risks that affect or are created by an organization's business strategy and strategic objectives cause a reexamination of the continuing validity of strategic business objectives in light of the strategic outcomes chosen for the business (purpose). For example, has the market grown at the predicted rates? Is market share increasing or have competitor strategies proven to be more effective or are the strategies less differentiating than believed? Does the preferred approach to contracting remain relevant and what implications does a change have to the overall enterprise risk?

Black Elephant -vs- Black Swan Risks

*A **Black Elephant** is a cross between a Black Swan and the proverbial "elephant in the room." Black Elephants are high-impact events that lie beyond the realm of regular expectations, but are ignored despite evidence of their existence.*

***Black Swans** are outliers, beyond the set of expectations concerning allowable "value." The belief is that no past experience suggests the possibility. Second, Black Swans have a significant impact and often cause a new paradigm to develop that may not fundamentally reduce risks. Third, rationalization after the fact deems a Black Swan was predictable.*

Strategy risks also consider the enterprise’s success in implementing its selected strategy at the pace the organization. Are milestones being met and are the actions producing the targeted results?

Finally, the assessment of potential risks to a strategy must consider how the assessment of major industry-driving risks compares to broader perceptions. The dynamic nature of these broader risks can be seen in changes to the World Economic Forum’s top risks over the years, as shown in Table 2. Consider whether there are Black Elephant risks that can suddenly become impactful as these global risks emerge.

Table 2 Top Five Global Risks in Terms of Impact									
2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Financial failure	Fiscal crises	Water crises	Climate action failure	Weapon of mass destruction	Weapons of mass destruction	Weapons of mass destruction	Climate action failure	Infectious disease	Climate action failure
Water crises	Climate action failure	Infectious diseases	Weapons of mass destruction	Extreme weather	Extreme weather	Climate action failure	Weapons of mass destruction	Climate action failure	Extreme weather
Fiscal imbalance	Water crises	Weapons of mass destruction	Water crises	Water crises	Natural disasters	Extreme weather	Biodiversity loss	Weapons of mass destruction	Biodiversity loss
Weapons of mass destruction	Unemployment	Interstate conflict	Involuntary migration	Natural disasters	Climate action failure	Water crises	Extreme weather	Biodiversity loss	Social cohesion erosion
Climate action failure	Infrastructure breakdown	Climate action failure	Energy price shock	Climate action failure	Water crises	Natural disasters	Water crises	Natural resource crises	Livelihood crises

Human Resource Risks

People are a firm’s greatest asset. They are also one of the greatest risks an enterprise faces. Recruitment of the right individuals in the right place at the right time is key to management of many of the risks an engineering and construction enterprise faces. This simple challenge has been compounded by the desire for and likely persistence of hybrid working models in a post-COVID world. Enterprise level risks associated with human resources include recruitment, development, and retention, where degraded performance in any of these areas can have broad impacts across the company’s portfolio of projects. Staffing shortages of appropriately skilled individuals can significantly elevate project risks in fairly short order.

Culture and ethics risks are most evident in the human resource set of risks, but are not confined to just this type of risk.

Operating Risks

Operating risks in the E&C industry can be broadly defined. For purposes of this Executive Insight, they are defined as including:

- **Business development risks** – Inadequate volume of qualified opportunities and below target success rates represent risks to meeting the enterprise’s strategy. Shortcomings here may suggest inadequate differentiation or a changed competitive environment.
- **Scope completeness and change management** – From an enterprise risk perspective, systemic shortcomings in contracted scope (missed/incomplete items of scope) or the management of owner-driven changes to scope (late notices; denied changes) are important risks to manage.
- **Cost estimating, subcontractor buyouts, and project level cost control** – Systemic shortcomings in cost estimates as a result of either internal (mis-estimates; inadequate quantity takeoffs; dated cost data) or external (mis-estimate of market price trends, including escalation in materials and energy costs) factors; achievement of subcontractor buyout cost savings targets; and weak project-level cost control contributing to margin erosion represent significant enterprise level risks.
- **Schedule performance** – Portfolio performance against schedule is an enterprise level risk likely to manifest in increased labor costs (overtime); late project finishes (impacts client satisfaction and repeat work opportunities; potential late start on subsequent work).
- **Quality performance** – Rework is indicative of broader management, training, and staffing risks. Adequacy of quality assurance/quality control (QA/QC) programs for the required work profile and environment must be assessed. Are adequate numbers of quality audits happening? Have deliverables gone through required quality reviews before being released? Are the targeted number of QA training sessions and audits being performed? Quality problems can spread across a firm’s portfolio of projects quickly and may manifest before the cost and schedule impacts become evident.
- **Risk management systems and processes** – The establishment of a robust risk management process and system is a good first step. It must be complemented, however, by rigorous implementation. Operational risk in this area can be assessed by monitoring staffing and training in the risk area; knowing the extent and level of training delivered; requiring timeliness of required risk reviews and coverage of projects; and making an assessment of risk mitigation, which can measure performance and inputs and then inform the broader enterprise risk management system.
- **Project execution tools** – Are the right levels and capacities of tools to undertake the work in the project portfolio in place? Are strategies to close any gaps identified, and are the actions and investments necessary to do so defined? Are capital investments being made faster than assets are depreciating? Is technology innovation creating added risks or new opportunities?
- **Contract, legal and regulatory** – Enterprise risks may arise from systemic weaknesses in contract negotiating strategies; failure to comply with various legal requirements, including obtaining necessary licenses, permits, and approvals; failure to adequately address various environmental, social, governance (ESG) requirements incorporated in the contract; and changes in regulation or failure to comply. These risks are typically highlighted on an occurrence basis.

Materialization of risks associated with terms and conditions found across many of a company's portfolio of projects warrants special attention.

Claims management and liquidated damages that become significant in the aggregate are considered above threshold levels.

- **Project management and project oversight** – Project managers are the line managers in E&C organizations. Revenue is only realized in a project context. The enterprise's risk level is elevated when there are an inadequate number of trained individuals. Inadequate management oversight of projects results in inadequate challenge to project managers and can be a primary contributor to margin erosion. Indirect costs can erode project margins and should be reviewed carefully. The frequency, coverage, and adequacy of project reviews are important in managing enterprise-level risks associated with projects.
- **Aggregation of project risks at the enterprise level** – This is a unique pool of enterprise risk in the E&C industry that will be discussed later in this Executive Insight.
- **Overhead** – Overhead is part investment in the future and part tax on the present. Enterprise risk is related to the levels of each type of spend. For example, cybersecurity training of project personnel and additional cyber processes and systems may be regarded as unnecessary project costs, but in the aggregate they act to protect the enterprise from much more significant risks in the future.
- **Business continuity** – Are the right types and levels of resources in place to respond to a wide range of crises and recover within targeted time frames? Periodic assessments help inform overall enterprise risk levels and improve the ability to respond to any Black Swan events that may occur.

Supply Chain Risks

An E&C company's ability to achieve the corporation's strategic business objectives depends significantly on the governance of third-party relationships. The enterprise's ability to manage uncertainty and risk requires that risk be managed in third-party relationships. The integrity and ability of the organization to comply with regulations, commitments, and values are measured by the integrity of its relationships. Risk management does not stop at the execution of a contract.

Enterprise risk management must aggregate all third-party risks, paying attention to concentration risk or overdependence on one supplier; single points of failure in the supply chain, including the associated logistical chain; and common risk drivers that may have broad enterprise level versus singular project-level impacts. Emerging artificial intelligence (AI) tools may assist in identifying coupling through common risk drivers¹.

¹ Coupling refers to the interdependencies between activities. Precedence and unnecessary coupling of activities may harm a project's performance in ways that may not be evident on initial inspection. Tight coupling, for example, creates new risks in large scale projects. More traditionally sized projects, by contrast, are less susceptible. Coupling can be classified and is presented in the Executive Insight on Coupling in Large Complex Projects.

Supply Chain Resilience

On a multi-billion-dollar infrastructure program, one structural steel supplier was dominant, but relied on a single facility likely operating at a strained capacity. In assessing steel procurement risks at the project level, an enterprise perspective was sought. As a result of that perspective, a larger multi-facility supplier was solicited to provide steel. They matched the lowest price of the traditional provider in the market, but with a shorter schedule.

Later, when a fire at the facility that made the project's steel damaged the project materials, the new steel provider was still able to deliver required steel from other facilities on the contracted schedule.

ESG Risks

Environmental, social, and governance (ESG) risks represent a growing set of enterprise-level risks. These risks arise from a combination of reputational and compliance factors and are increasingly subject to disclosure and compliance requirements. These disclosure and compliance requirements are not limited to public companies, but are being increasingly applied to large private entities through procurement and audit channels.

ESG risks include those related to climate change impacts, mitigation, and adaptation; environmental management practices and duty of care; working and safety conditions; respect for human rights; anti-bribery and corruption practices; and compliance to relevant laws and regulations. ESG risks share common elements related to culture, control, and integrity while including factors related to health, safety, and environmental (HSE), which feature prominently across the E&C industry.

A major focus of ESG risks today is identifying and reporting so-called Scope 1 and Scope 2 emissions. According to the EPA, Scope 1 emissions are direct greenhouse gas (GHG) emissions that occur from sources that are controlled or owned by an organization (e.g., emissions associated with fuel combustion in boilers, furnaces, and vehicles). Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling. Although Scope 2 emissions physically occur at the facility where they are generated, they are accounted for in an organization's GHG inventory because they are a result of the organization's energy use.

Increasingly the engineering and construction industry will be tasked with providing what the EPA labels Scope 3 emissions data to major, forward-leaning clients. Scope 3 emissions include all sources not within an organization's Scope 1 and 2 boundary. The Scope 3 emissions for one organization are the Scope 1 and 2 emissions of another organization. Scope 3 emissions, also referred to as value chain emissions, often represent the majority of an organization's total GHG emissions.

Other enterprise-level ESG risks include:

- Governmental actions, including changes in law and regulations.
- Relationships with employees, suppliers, partners, shareholders, and the overall community and stakeholders.

- Wage and labor issues.
- Health care costs.
- Modern day slavery.
- Diversity, equity, and inclusion.
- Board practices.
- Transparency in shareholder communications.
- Data privacy.
- Philanthropy (an opportunity area).

Information Security

Without a comprehensive ERM program, organizations have no way to identify and assess the relationship between cyber risk and its impact on the business.

Cybersecurity is a problem that will never be solved. Instead, it is a risk to be managed. It is an issue for the entire business, not just the IT department. Cyber risk management must go beyond compliance reporting, client requirements, and regulations. Cyber risk management must support the organization achieving its strategic business objectives while simultaneously providing necessary levels of protection.

Enterprise level consideration of cyber risk includes business continuity, disaster recovery, and data protection. Assessment of the level of exposure to cyber risks should be continuous, including monitoring numbers of external users or third-party data providers; currency of the installed software fleet from a virus, and malware protection perspective; results of stress testing of system security; and outstanding corrective actions to address identified weaknesses.

Enterprise level risk monitoring in this area benefits from benchmarking against vulnerabilities exposed in comparable industry organizations.

Related considerations include network resiliency, data², and intellectual property protection.

Project Risk as a Component of Enterprise Risk

In considering a range of operational risks that feed into enterprise-level risk assessment and management, the portfolio of project risks is a unique feature of the E&C industry. Yet many ERM programs in the industry do not incorporate this risk at the enterprise level, essentially considering risk on a project-by-project basis.

These project-level risks have a range of common characteristics as well as common risks and risk mitigation strategies. Many of these risks are coupled. The effectiveness of various risk mitigation strategies may shape an enterprise level view of retained or unmitigated risk. This is where a common risk vocabulary becomes very important.

Table 3 provides a summary of some project-level risks E&C firms may encounter. Project risk lists would contain significantly more granularity. This list is not all inclusive and bespoke risks may exist in one-of-a-kind projects. Looking across the enterprise's portfolio of projects, there are discrete risks such as these can be associated with several project features, including:

- Client

² Data governance is an increasing area of regulation and oversight in all business, both domestic and international.

- Project type
- Project size
- Business line or organization
- Geographic region
- Office
- Contract type
- Project phase
- Joint venture partner
- Major subcontractors or suppliers
- Labor availability and supply

These provide insights into the history of risk materialization, frequency, and risk cost.

Enterprise-level risk assessments can consider not only overall unmitigated and mitigated risk exposure, but also risks and attendant reserves associated with each type. This opens the aperture for more effective enterprise risk management through tracking of risk drivers, changes in risk likelihood and impacts, and assessment of the effectiveness of risk mitigation strategies facilitating any required adjustments. This may result in risk mitigation at a portfolio level, versus on a project-by-project basis, where additional risk mitigation strategies may be available, including risk retention (with self-insurance) and risk transfer through a portfolio-based financial hedge.

Table 3	
Top Level Project Risk Categories	
Top Level Category	Select Components
External	Economic, including capital availability and competitive environment
	Social, including stakeholders and socio-economic
	Political, including legal and regulatory
	Cultural, including risks related to corruption
Client	Accessibility to real decision makers; client interference; change order process and timeliness; accounts payable risks and retainage
Management	Brand and reputation risks
	Joint venture partner risks
	Decision support, including ability of corporate decision and approval processes to support project schedule
	Resource availability to support project
	Adequacy of corporate backbone systems, including health, safety & environmental; human resources, including recruitment, on-boarding, and training; legal (contracts and claims); IT, including ability to support project start-up
	Management oversight of projects

Table 3
Top Level Project Risk Categories

	Financial support, including adequate working capital; available bonding capacity; pension payments; effective payroll systems; financial audit and fraud detection
Operational	Contract specific risks related to specific contract provisions, including those related to client scope changes or schedule delays; timely receipt of information or client furnished materials or equipment; responsibility for third-party delays; consequential damages; force majeure coverage; and liquidated damages
	Estimating and cost risks, including labor costs and provisions for adjustments for general wage or benefit changes; escalation costs and provisions for indexing or adjustment; labor productivity; adequacy and completeness of cost risk analysis and associated contingency; and schedule related assumptions related to availability of site, timely permit approval, workdays, and work hours.
	Design related risks, including availability of staff; number of clients required hold and approval points and ability to support overall design schedule; technical challenges and uncertainties related to ground conditions; deployment of new technologies in the project; and adequacy of QA/QC support
	Availability of construction labor, including skilled labor, in right quantities and timeframes; state of labor relations; and competition for resources from other projects
	Ability of permitting agencies to support project schedule; ability of third-party utility relocations to support project schedule
	Procurement related risks, including market capacity; lead times for equipment and materials; bonding capacity; ability to meet mandatory flow down requirements including those related to ESG; expected quality and level of rework anticipated; and pricing risk and associated contingency reflected in estimates
	Logistical risks, including access, constrained transport (load limits; restricted hours) for final site and any offsite module or prefabrication areas

Tracking Enterprise Risk

Enterprise risk is dynamic. The portfolio of underlying risks is constantly changing in composition and relative levels as new projects enter the business and others are completed. Similarly, risks are “retired” as individual projects reach key milestones. Underlying risk drivers are similarly changing with pricing and likelihood of occurring continuously evolving.

While portfolio-based enterprise risk management tends to smooth out many of these changes, more systemic changes will play through to the enterprise level.

Effective enterprise risk management, therefore, must not only report on the current levels of enterprise risk, but more importantly highlight changes in underlying risk drivers. Selection of risk assessment parameters becomes imperative in designing an effective enterprise risk management system. Risk trends (rising, falling) must go hand in hand with risk levels. Recognition of common risk drivers such as general inflation or major supply chain disruptions (pandemic, sanctions) will affect many of the component risks tracked at an enterprise level.

The enterprise risks tracked can be broadly grouped into strategic, operational, market, and client. In addition, tracking the condition and effectiveness of the risk management system itself is important at an enterprise level.

Strategic risk tracking at the enterprise level seeks to confirm that the adopted strategy is in place and being implemented (implementation milestones are being met). It further monitors its effectiveness in achieving target levels and timely achievement of key strategic actions. At an enterprise level, a strategy’s ability to anticipate and respond to emerging changes in underlying strategy assumptions, market conditions and behaviors, and broader industry trends should be assessed.

Operational risks at an enterprise level tend to focus on effectiveness of the management systems (performance to targeted levels; compliance and reporting completeness), resource levels to support strategy (human, material, technology and financial), organizational development (training, upskilling, technology deployment) and portfolio risk materialization and changes (aggregation of project-level risks). Organizational alignment and “trust” (measurable using a Net Promoter Score, for example) are key enterprise-level metrics.

Operational risks from the aggregation of project-level risks will highlight greatest mitigated and unmitigated risk categories, categories growing at significant rates, and profile of risk management strategies being employed (avoid, retain, reduce, transfer). These risks may be further parsed as appropriate to highlight the greatest sources of enterprise risk from projects. An aggregate value of the enterprise risk associated with the portfolio of projects can be developed using appropriate Monte Carlo techniques (not just the sum of all project risks) with appropriate consideration of correlation.

Market risks at an enterprise level monitor changes in overall market volumes, absolute performance of client relationship management and business development programs (with an emphasis on performance against strategic opportunities), effectiveness of strategic differentiators and changes in the competitive environment (competitor actions and market share changes; and change in contract mix (lump sum vs reimbursable).

Client risks at the enterprise level tend to focus on top clients by aggregate risk levels, noting profits generated from the assumption of this risk. It is at an enterprise level where a decision to “fire” a client

will likely occur. Concentration risk by client, sector, and geography also will typically be monitored at the enterprise level and common risk categories highlighted.

Important in the design of an effective enterprise level risk management system is recognizing that significant coupling of risks may exist. As a result of coupling, low probability, low impact events may lead to the realization of low probability, high impact events emerging. Earlier the broader impacts from an increase in general inflation as one example of risk coupling were highlighted.

Operational risk assessment at the enterprise level also will benefit from an aggregate assessment of portfolio schedule performance. That is, on average (weighted by value remaining to be put in place), is the portfolio of projects on (or ahead) of schedule, slightly behind schedule (a few days) or significantly behind schedule (many weeks)? Aggregate schedule performance reflects resource availability, productivity, and client related issues to name a few. Importantly, however, time is a “risk aggregator.”

Importantly, the condition and effectiveness of the risk management system itself must be assessed to provide confidence in what is being seen at the enterprise level. As noted previously, it is important to monitor staffing and training in the risk area; extent and level of training delivered; timeliness of required risk reviews and coverage of projects; and assessment of risk mitigation measures performance.

Identifying and Tracking Risk Management Strategies

Organizations put in place both enterprise-level risk management strategies as well as a portfolio of risk management strategies available at the project level. Enterprise-level strategies build on the agreed to risk appetite and must be tested for conformance with that appetite. It is important to underscore that risk appetite is not synonymous with risk aversion. Given that, enterprise level risk strategies may include avoidance of certain risks (contract type, client, geography, service); retention of certain risks with conditions (individual projects) and limitations (project and enterprise-wide); and transfer to competent (threshold levels defined) counterparties (subcontract/joint venture, financial hedges).

Portfolio aggregation of project risks allows the enterprise’s risk management strategies to be assessed, headroom identified in each risk category or mitigation strategy, and informed evaluation and decision making to occur relative to risk levels and mitigation measures.

Deployed risk management strategies may be aggregated across the enterprise and their effectiveness tracked and assessed.

Assessing ERM Effectiveness

The effectiveness of an ERM system is founded on the quality of the overall risk management system and the completeness, accuracy, and timeliness of its information. The timeliness of ERM information is also important. While quarterly snapshots may serve the board of directors and regulators, management needs a much more dynamic picture, especially in large, often global enterprises. Today’s business management systems can provide a substantial part of the backbone of the system, but true effectiveness will continue to rely on timely management and oversight of the organization. This is especially true of timely updating of risk assessments for individual projects as they move from phase to phase or encounter a significant change. Regular (monthly or more frequent) reviews of projects will keep the status of projects current from a performance perspective in addition to supporting timely interventions.

The bottom line, however, is that an effective ERM supports the achievement of an organization’s strategic business objectives by supporting effective implementation of its selected strategies. An effective ERM should provide the organization with the ability to respond to negative surprises as well as capitalize on positive ones (opportunities).

ERM Dashboards

The E&C industry is good at constructing project-level risk reports and dashboards. At an enterprise level, risk management systems are evolving and increased reporting often driven by external forces are improving the efforts. Enterprise-level dashboards for E&C firms continue to struggle to reach requisite maturity. This is driven largely by a plethora of consultants and exemplars who exist for other industries but who do not readily translate to the E&C industry. Industry efforts underway may prove to be promising.

Table 4 describes one potential set of dashboard components and is intended to serve as an exemplar. Each component would be supported by available drill downs. Graphical portrayal of dashboard information is a key feature of effective dashboards, and a range of data presentation options are available but not described here.

Table 4 Engineering & Construction Dashboard Exemplar		
RISK APPETITE		TRUST BAROMETER (<i>Net Promoter Score; Corruption Risk Index</i>)
ENTERPRISE RISKS	PROJECT PORTFOLIO RISKS	RISK MITIGATION STRATEGIES
<ul style="list-style-type: none"> Top Risks, based on potential impact (<i>Heat map of likelihood vs impact</i>) 	<ul style="list-style-type: none"> Top Project Risk Categories 	<ul style="list-style-type: none"> Top Risk Mitigation Strategies (Based on value at risk) (<i>Displaying mitigated and unmitigated risk remaining</i>)
<ul style="list-style-type: none"> Key Risk Drivers (<i>Current level and trend</i>) 	<ul style="list-style-type: none"> Project Portfolio Risk “S” Curve (Total and category risk) (<i>Displaying mitigated and unmitigated risk remaining</i>) 	<ul style="list-style-type: none"> Effectiveness of Risk Mitigation Strategies (Risk mitigated/risk materialized)
<ul style="list-style-type: none"> Top Risk Metrics (select) (<i>Current level and trend</i>) 		
	PROJECT PORTFOLIO SCHEDULE RISK (<i>Weighted schedule performance against baseline; value of delayed schedule performance</i>)	STATUS OF ERM PROGRAM (<i>various performance metrics</i>)
TOP COUNTERPARTY EXPOSURE (<i>Assessment of counterparty performance and risks weighted by value at risk; mitigated (bond) and unmitigated</i>)		

Table 4 Engineering & Construction Dashboard Exemplar
ENTERPRISE VALUE AT RISK “S” Curve <i>(Mitigated and unmitigated; excluding and including Project Portfolio Risk)</i>

A Final Caution on Risk Perspective

A final caution on risk management systems is warranted. Strong risk management cultures must be protected from becoming just compliance processes. Checklists are great, but only if real consideration of the items on the checklist has occurred.

Risk and reward are two sides of the same coin. While many view opportunity as “negative risk,” it may be better to consider opportunities through a broader lens. Opportunity analyses are often integral in strategic planning exercises, but there is much to be gained by conducting structured opportunity analysis at the project level. Aggregation of these potential opportunities into an Enterprise Opportunity Management system and dashboard may pay dividends.

Conclusion

In this Executive Insight enterprise risk management (ERM) is defined and its importance outlined, highlighting the journey still ahead for the E&C industry. A preliminary classification of enterprise risks is outlined and these top-level risks described. The recognition of the aggregation of project risks as a unique feature of enterprise risk in the industry is called out and top project-level risk categories summarized.

The Executive Insight also recognizes the dynamic nature of risk and the importance of understanding these dynamics at an enterprise level. Similarly, identifying and tracking risk management strategies and their effectiveness is recognized as integral to assessing ERM effectiveness. The work still required to design industry relevant ERM dashboards is recognized and can be informed by this Executive Insight.

For Further Reading

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National Academy of Construction Executive Insights – Effective Project Review Meetings
National Academy of Construction Executive Insights – Black Swan Risks
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