NAC Executive Insights

Internal Audit – It's Value to Construction and Engineering

Key Points

- **Internal Audit has a key role in projects** not just in corporate processes and financial results.
- **Comprehensive Role of Internal Audit:** Internal audit extends beyond traditional financial oversight, playing a crucial role in managing project risks and ensuring compliance with policies and regulations in engineering and construction projects.
- **Focus on Risk Management:** Internal auditors are essential in identifying, assessing, and mitigating risks that could impact project performance, thereby enhancing the overall resilience of the organization.
- **Operational Efficiency and Continuous Improvement:** The internal audit function is dedicated to evaluating processes and operations, identifying inefficiencies, and providing recommendations for improvement to streamline operations and reduce costs.
- **Compliance Assurance:** Internal audit ensures that organizations adhere to relevant laws, regulations, and internal policies, safeguarding against potential legal and financial repercussions associated with non-compliance.
- **Value as Trusted Advisors:** Internal auditors serve as trusted advisors to management, offering valuable insights and recommendations that aid in informed decision-making and contribute to the overall success and sustainability of the organization.
- **Foster Collaboration Between Internal Audit and Project Teams:** Encourage open communication and collaboration between internal auditors and project management teams to facilitate knowledge sharing and enhance project outcomes.

Introduction

This Executive Insight looks at the role, responsibility and application of internal audit with respect to project performance and contributions to overall engineering and construction company performance. It does not look at the more traditional application of internal audit to corporate financial and management processes. It recognizes, however, that our business is a business of projects and the sum of all project risks, both individually and collectively, contribute significantly to overall company risks.

Effectively used, internal audits provide measurable benefits both to project management teams as well as corporate management.

Internal Audit Responsibilities

The internal audit function plays a crucial role in ensuring an organization's operations run smoothly and effectively. For engineering and construction organizations these operations extend into and include the

full suite of project level policies and processes. The primary roles and responsibilities of internal audit include:

1. **Risk Assessment and Management**: Internal auditors identify, assess, and prioritize risks that could impact the organization. They work closely with management to develop risk management strategies and controls to mitigate these risks.
2. **Internal Controls**: Internal auditors evaluate the effectiveness of the organization's internal controls, ensuring they are adequate to mitigate risks and prevent fraud or errors. They also recommend improvements to enhance control measures.
3. **Compliance**: Internal auditors ensure the organization complies with relevant laws, regulations, and internal policies. They conduct audits to verify adherence and identify any areas of non-compliance, providing recommendations for corrective actions.
4. **Operational Efficiency**: Internal auditors review the organization's processes and operations to identify inefficiencies and areas for improvement. They provide recommendations to streamline operations, reduce costs, and enhance productivity.
5. **Financial Reporting**: Internal auditors assess the accuracy and reliability of the organization's financial reporting. They verify that financial statements are prepared in accordance with accounting standards and identify any discrepancies or irregularities.
6. **Fraud Prevention and Detection**: Internal auditors play a vital role in preventing and detecting fraud. They conduct investigations into suspected fraud and recommend measures to prevent future occurrences.
7. **Governance**: Internal auditors evaluate the organization's governance processes to ensure they are effective in achieving the organization's objectives. They assess the effectiveness of the board of directors, executive management, and other governance bodies.
8. **Advisory Role**: Internal auditors provide valuable insights and recommendations to management on various aspects of the organization, including risk management, internal controls, and operational efficiency. They serve as trusted advisors to help management make informed decisions.
9. **Continuous Improvement**: Internal auditors continuously monitor and evaluate the organization's processes and controls, ensuring they remain effective and relevant. They stay up to date with industry’s best practices and emerging risks to provide timely recommendations for improvement.

Through these efforts internal auditors contribute to the overall success and sustainability of the organization, helping it achieve its strategic objectives while minimizing risks and ensuring compliance.

Internal Audit Aids Project Management

Internal audit can be a game-changer for project performance. For one, it ensures compliance with policies and regulations, minimizing risks. It also identifies inefficiencies and areas for improvement, helping streamline processes. Plus, it offers an objective view, providing valuable insights to enhance decision-making. Overall, it is like an internal GPS guiding projects towards success. Let us look at each of these areas of valuable contribution.

Internal Audit Ensures Compliance

Ensuring compliance with policies and regulations is crucial for the success of large engineering and construction projects. Internal audit can help achieve this through:

1. **Risk Assessment**: Conducting thorough risk assessments to identify potential compliance risks and areas of vulnerability. The internal auditor brings a different perspective, an essential element of effective risk management. This perspective may identify "white spaces" between a project's risk assessment and mitigation and risk management strategies.
2. **Policy and Procedure Review**: Regularly reviewing and updating policies and procedures to ensure they align with current regulations and best practices. This structured approach to reviewing and updating policies and procedures can be broadly adopted across a project's full suite of such policies and procedures.
3. **Training and Awareness**: Providing training sessions for employees to ensure they understand and adhere to compliance requirements. Compliance training helps projects build a common culture and is valuable in reinforcing cultural elements related to ethics, safety and baseline management. The latter aids in assuring achievement of project outcomes and financial performance.
4. **Monitoring and Reporting**: Implementing continuous monitoring systems to track compliance and generate regular reports for management review. Enhanced monitoring and reporting, supports quality project performance.
5. **Internal Controls**: Establishing strong internal controls to prevent and detect non-compliance.
6. **Audit Trails**: Maintaining detailed audit trails to document compliance efforts and provide evidence during inspections or audits. Audit trails provide additional benefits related to change management and dispute resolution.
7. **Stakeholder Engagement**: Engaging with stakeholders, including contractors and subcontractors, to ensure they also comply with relevant regulations. This engagement can highlight any latent communication issues.

The following table provides a top-level internal audit checklist for compliance.

Internal Audit Checklist for Compliance	
Financial Compliance	Review financial statements for accuracy and compliance with accounting standards.
	Verify that all financial transactions are properly documented and authorized.
	Ensure that budgeting and financial controls are followed.
Operational Compliance	Assess project management processes for adherence to project plans and schedules.
	Verify that procurement processes comply with company policies and regulations.

Internal Audit Checklist for Compliance	
	Check that contract management procedures are followed, including contract terms and conditions.
Regulatory Compliance	Ensure compliance with local, state, and federal regulations.
	Verify adherence to industry-specific regulations (e.g., environmental, safety, labor laws).
	Review permits and licenses to ensure they are up-to-date and valid.
Quality Compliance	Assess quality control measures to ensure they meet industry standards.
	Verify that materials and equipment meet specified quality criteria.
	Check that testing and inspection procedures are followed.
Safety Compliance	Ensure that safety protocols and procedures are in place and followed.
	Verify that safety training is provided to all employees.
	Check that incident reports are properly documented and investigated.
Environmental Compliance	Verify compliance with environmental regulations and standards.
	Assess waste management and disposal practices.
	Ensure that environmental impact assessments are conducted and followed.
Documentation and Record Keeping	Review documentation for completeness and accuracy.
	Ensure that records are properly maintained and accessible.
	Verify that documentation supports compliance efforts and audit trails.

This comprehensive checklist supports internal audit in providing the necessary assurance that large engineering and construction projects are compliant with all relevant policies and regulations, minimizing risks and ensuring project success.

Assessing Project Management Processes

Key processes that internal audit should focus on as part of project level reviews are shown below and each contributes to a broader corporate view on operational performance. Internal audit activities can be undertaken on a sampling basis or a deeper, more comprehensive dive undertaken at corporate or project management's request.

The multi-project and corporate systems view that internal audit brings provides a valuable perspective to project teams. They are in a position to connect dots across the company's portfolio of projects.

1. **Project Planning and Scheduling**: Internal auditors should review the project plan and schedule to ensure they are realistic and achievable. This includes verifying that milestones and deadlines are clearly defined and that there is a logical sequence of activities.
2. **Resource Allocation**: Auditors should assess whether resources (human, financial, and material) are allocated efficiently and whether there are any bottlenecks or shortages that could impact project timelines.
3. **Risk Management**: Evaluating the project's risk management plan to ensure that potential risks are identified, assessed, and mitigated effectively. This includes reviewing risk registers and mitigation strategies.
4. **Change Management**: Ensuring that there is a robust change management process in place to handle any changes in project scope, schedule, or budget. Auditors should check that all changes are documented, approved, and communicated to relevant stakeholders.
5. **Quality Control**: Reviewing quality control measures to ensure that project deliverables meet the required standards and specifications. This includes checking that quality assurance processes are followed and that any defects or issues are addressed promptly.
6. **Communication and Reporting**: Assessing the effectiveness of communication channels and reporting mechanisms within the project team. Auditors should ensure that there is clear and timely communication between team members and stakeholders.

Key Risk Areas in Engineering and Construction Projects

Key risk areas which need to be considered in any internal audit undertaken at the project level include:

1. **Scope Creep**: Uncontrolled changes or continuous growth in a project's scope. This can lead to delays, increased costs, and resource strain. The internal auditor must be cognizant of the primacy of the scope baseline.
2. **Schedule Delays**: Delays in project timelines due to unforeseen circumstances, such as weather conditions, supply chain disruptions, or labor shortages. Potential delays from constraint coupling should also be assessed by internal audit.
3. **Budget Overruns**: Exceeding the project budget due to poor cost estimation, unexpected expenses, or inefficient resource management. Risk reserves, planned contingencies and indirect field costs (IFC) should be part of any budget audit.
4. **Safety Incidents**: Accidents or safety violations that can lead to project delays, legal issues, and increased costs. Adequacy of near-miss reporting should be assessed.
5. **Regulatory Compliance**: Failure to comply with local, state, and federal regulations, which can result in fines, legal action, and project shutdowns.
6. **Subcontractor Performance**: Issues with subcontractors, such as poor performance, delays, or non-compliance with contract terms, which can impact the overall project. Effectiveness of communications with subcontractors and effective subcontract management are important focus areas.

7. **Environmental Impact**: Negative environmental impacts that can lead to regulatory issues, community backlash, and additional costs for mitigation measures.

By focusing on these key areas and implementing a robust internal audit process, organizations can ensure that their engineering and construction projects adhere to plans and schedules, minimizing risks and improving overall project performance

Internal Audit Contributes to Improvement

Identifying inefficiencies and areas for improvement in large, complex engineering and construction projects is a key role of internal audit. Approaches that can aid internal audit in this endeavor include:

1. **Continuous Monitoring**: Implementing continuous monitoring systems to track project performance in real-time. This allows for timely identification of issues and immediate corrective actions.
2. **Collaborative Audits**: Engaging with project managers, team members, and contractors in a collaborative audit process. This fosters a culture of transparency and continuous improvement, where everyone is invested in identifying and addressing inefficiencies. This approach is particularly effective in joint venture (among engineers/contractors) and partnering (with client) arrangements.
3. **Risk-Based Auditing**: Focusing on high-risk areas and critical processes that have the most significant impact on project performance. This ensures that resources are allocated effectively and that the most critical issues are addressed first.
4. **Regular Reviews and Updates**: Conducting regular reviews and updates of project plans, schedules, and processes. This helps in keeping the project aligned with its objectives and adapting to any changes or challenges that arise.

Tools and techniques available to internal audit include:

1. **Data Analytics**: Using advanced data analytics tools to analyze project data and identify patterns, trends, and anomalies. This can help pinpoint areas where processes may be inefficient or where there are deviations from expected performance. Increased utility of machine learning approaches applied to structured data and large language models applied to unstructured data are important, rapidly evolving tools.
2. **Process Mapping**: Creating detailed process maps to visualize the entire project workflow. This helps in identifying bottlenecks, redundancies, and areas where processes can be streamlined.
3. **Benchmarking**: Comparing project performance metrics against industry standards or best practices. This can highlight areas where the project is underperforming and provide insights into potential improvements. Initially this benchmarking can occur against a firm’s own historical and current projects.
4. **Root Cause Analysis**: Conducting root cause analysis to determine the underlying reasons for inefficiencies or issues. This involves techniques such as the "5 Whys" and fishbone diagrams to systematically identify and address problems.
5. **Surveys and Interviews**: Gathering feedback from project team members, stakeholders, and contractors through surveys and interviews. This can provide valuable insights into areas that may not be immediately apparent through data analysis alone. Additionally, existing unstructured data provides an added avenue of inquiry using various AI tools.

6. **Audit Software**: Using specialized audit software to manage and track audit activities, document findings, and generate reports. This ensures a systematic and organized approach to the audit process. Increasingly these programs are being enabled with AI.

By leveraging these tools, techniques, and approaches, internal audit can effectively identify inefficiencies and areas for improvement, helping to streamline processes and enhance overall project performance.

Internal Audit Improvement Examples

Internal audit can contribute to project related process improvement across the entire project lifecycle. Let us look at some examples to highlight what is possible.

1. Project Management Processes

Streamlining and Improvement:

- **Automated Project Tracking**: Implementing project management software that automates tracking of tasks, deadlines, and resource allocation.
- **Real-time Reporting**: Utilizing real-time reporting tools to provide up-to-date status of the project, allowing for timely interventions.
- **Case Study**: A large infrastructure project in New York utilized Primavera P6 for project scheduling and tracking. Internal audit identified inefficiencies in manual reporting processes and recommended the implementation of automated reporting tools. This led to a 20% reduction in project delays and improved on-time completion rates.

Integrated Project Delivery (IPD)

- **Company**: A healthcare facility construction project. The **Children's Hospital of Philadelphia (CHOP)** used IPD for its new hospital tower project.
- **Challenge**: Coordination issues between design, construction, and engineering teams led to delays and cost overruns.
- **Solution**: Internal audit recommended implementing IPD, which promotes collaboration and shared responsibility among all stakeholders. . The project involved a multi-party agreement among the owner, architect, and contractor, fostering collaboration from the project's inception through completion. This approach minimized conflicts, reduced change orders, and ensured that the project was completed on time and within budget.
- **Impact**: This approach improved communication, reduced rework, and led to a 15% cost saving.

2. Design for Construction Processes

Streamlining and Improvement:

- **Standardized Design Templates**: Creating standardized design templates to ensure consistency and reduce design time.
- **Collaborative Design Platforms**: Using collaborative design platforms like BIM (Building Information Modeling) to enable real-time collaboration among architects, engineers, and contractors.

- **Case Study**: A hospital construction project in London used BIM to streamline the design process. Internal audit identified communication gaps between design teams and recommended the adoption of BIM. This resulted in a 15% reduction in design errors and rework, saving significant time and costs.

Modular Construction

- **Company**: A residential housing project.
- **Challenge**: Traditional construction methods led to long build times and high labor costs.
- **Solution**: Internal audit identified the benefits of modular construction, where components are built off-site and assembled on-site. **Habitat 67** in Montreal, designed by Moshe Safdie, is a famous example of modular construction. The complex consists of 158 prefabricated concrete modules stacked in various configurations, creating a unique and innovative housing solution. This project demonstrated the potential of modular construction to create diverse and adaptable living spaces.
- **Impact**: This approach reduced construction time by 30% and labor costs by 20%.

Lean Design Principles

- **Company**: A commercial building project.
- **Challenge**: The design process was slow and prone to errors.
- **Solution**: Internal audit recommended adopting Lean design principles, such as value stream mapping and continuous improvement.
- **Impact**: This led to a more efficient design process, with a 20% reduction in design errors and faster project approvals.

3. Construction Supply Chain

Streamlining and Improvement:

- **Supplier Performance Metrics**: Establishing clear performance metrics for suppliers and regularly auditing their compliance.
- **Just-in-Time Inventory**: Implementing just-in-time inventory practices to reduce storage costs and minimize waste.
- **Case Study**: A bridge construction project in California faced delays due to supplier issues. Internal audit introduced a supplier performance evaluation system, which led to improved supplier accountability and a 30% reduction in material delivery delays.

E-Procurement Systems

- **Company**: A large infrastructure project.
- **Challenge**: Manual procurement processes were time-consuming and prone to errors.
- **Solution**: Internal audit recommended implementing an e-procurement system to streamline the procurement process. The **ProQsmart e-Procurement System** is a comprehensive solution that includes features like electronic catalogs, automated approval workflows, and supplier management. This system helps businesses manage

their procurement activities more efficiently, reduce costs, and improve transparency and control over purchasing processes.
- **Impact**: This resulted in faster procurement cycles, reduced administrative costs, and improved supplier collaboration.

4. Field Erection Processes

Streamlining and Improvement:

- **Site Coordination Tools**: Using site coordination tools like Procore to improve communication and coordination among field teams.
- **Safety Protocols**: Regularly auditing and updating safety protocols to ensure compliance with the latest standards.
- **Case Study**: A commercial building project in Chicago experienced frequent safety incidents. Internal audit recommended the implementation of Procore for better site coordination and regular safety audits. This resulted in a 40% reduction in safety incidents and improved overall project safety.

Prefabrication

- **Company**: A high-rise building project.
- **Challenge**: On-site construction was slow and labor-intensive.
- **Solution**: Internal audit identified the benefits of prefabrication, where building components are manufactured off-site and assembled on-site. The **Nakagin Capsule Tower** in Tokyo, designed by Kisho Kurokawa, is an iconic example of prefabrication. The building consists of 140 prefabricated concrete capsules that were manufactured off-site and then assembled on-site. This approach allowed for quick construction and flexibility in design, making it a pioneering example of modular architecture.
- **Impact**: This approach reduced on-site construction time by 35% and labor costs by 25%.

Advanced Work Packaging (AWP)

- **Company**: An oil and gas facility construction project.
- **Challenge**: Poor coordination between engineering, procurement, and construction teams led to delays and cost overruns.
- **Solution**: Internal audit recommended adopting AWP, which involves planning and organizing work packages to ensure smooth execution.
- **Impact**: This approach improved project alignment, reduced delays, and resulted in 20% cost saving.

These examples demonstrate how internal audit can identify and implement process improvements to streamline project management, design for construction, supply chain, and field erection processes, leading to more efficient and successful projects.

Summary

In conclusion, the role of internal audit in engineering and construction organizations is pivotal for enhancing project performance and ensuring compliance with established policies and regulations. This Executive Insight has outlined the multifaceted responsibilities of internal audit, emphasizing its contributions to risk assessment, operational efficiency, compliance, and continuous improvement. By adopting a proactive approach, internal audit not only identifies inefficiencies and areas for improvement but also serves as a trusted advisor to management, guiding projects toward successful outcomes.

Key Takeaways:

1. **Risk Management:** Internal audit plays a crucial role in identifying, assessing, and mitigating risks associated with engineering and construction projects. By implementing robust risk management strategies, organizations can minimize potential disruptions and enhance project resilience.
2. **Operational Efficiency:** Through continuous monitoring and evaluation of processes, internal audit helps streamline operations, reduce costs, and improve productivity. This focus on operational efficiency is essential for maintaining competitiveness in a complex industry.
3. **Compliance Assurance:** Ensuring adherence to relevant laws, regulations, and internal policies is vital for project success. Internal audit provides the necessary oversight to maintain compliance, thereby safeguarding the organization against potential legal and financial repercussions.
4. **Continuous Improvement:** The commitment to ongoing evaluation and adaptation of internal controls and processes ensures that organizations remain agile and responsive to emerging risks and industry's best practices.

Recommendations:

- **Integrate Internal Audit Early in Project Lifecycle:** Engage internal audit teams from the project's inception to ensure that risk assessments and compliance measures are embedded in the planning stages.
- **Enhance Training and Awareness Programs:** Regular training sessions for employees on compliance requirements and internal controls can foster a culture of accountability and ethical behavior within the organization.
- **Leverage Technology for Continuous Monitoring:** Implement advanced monitoring systems that provide real-time insights into project performance, enabling timely corrective actions and informed decision-making.
- **Foster Collaboration Between Internal Audit and Project Teams:** Encourage open communication and collaboration between internal auditors and project management teams to facilitate knowledge sharing and enhance project outcomes.
- **Regularly Review and Update Policies:** Establish a routine for reviewing and updating internal policies and procedures to ensure alignment with current regulations and industry standards.

By embracing these recommendations, organizations can harness the full potential of internal audit, driving project success while minimizing risks and ensuring compliance. Ultimately, a robust internal audit function not only protects the organization but also contributes to its long-term sustainability and growth in the competitive engineering and construction landscape.

For Further Reading – Other Executive Insights

- Project Pitfalls (or The Audit Report You Never Want)
- Know What You Are Trying to Accomplish: The Primacy of the Scope Baseline
- Coupling in Large Complex Projects
- Indirect Field Costs

About the Author

Bob Prieto was elected to the National Academy of Construction in 2011. He is a senior executive who is effective in shaping and executing business strategy and a recognized leader within the infrastructure, engineering, and construction industries. Bob received the 2024 ASCE OPAL Award (Outstanding Projects and Leaders) for his Outstanding Lifetime Achievement in Management.