NAC **Executive Insights**

Organizational and Management Considerations in the Adoption of Artificial Intelligence in Engineering & Construction Organizations

Key Points

- Artificial Intelligence (AI) represents tremendous potential within the E&C industry.
- Good AI "hygiene" is required to capture the benefits of AI and manage attendant risks.
- Three elements of AI "hygiene" are discussed from an organizational and management perspective:
    1. Strengthened governance requirements created by this rapidly evolving technology.
    2. Capturing the benefits of AI innovation in a responsible and safe manner.
    3. Understanding, tracking, managing and continuously assessing the risks.

Introduction

Artificial Intelligence represents tremendous potential both within the E&C industry as well as society more broadly, with predictions that AI could drive a seven percent (or almost $7 trillion) increase in global GDP and lift productivity growth by 1.5 percentage points over a ten-year period. As the second largest global industry, construction accounts for 13 percent of global GDP yet is among the slowest industries in terms of adoption rate. The late 2022 roll out of generative AI, the fastest adopted technology in history, provides another upward leg to AI incorporation into enterprises, including in the E&C industry.

This Executive Insight focuses on organizational and management considerations that E&C organizations should weigh as they set out on or accelerate their own AI efforts. Prior Executive Insights have addressed:

- "Impacts of Artificial Intelligence on Management of Large Complex Projects"
- "Artificial Intelligence Ethics in the Project Management and Civil Engineering Domains"
- "Proper Reliance on Artificial Intelligence in Project Management"
- "Verification and Validation of Project Management Artificial Intelligence"
- A Member Viewpoint on "Evolving Artificial Intelligence Challenges and Risks in Construction."

Meeting the AI Imperative

The industry is at a significant technological inflection point that requires both concerted industry efforts as well as prudent and responsible risk-taking by the various E&C organizations that comprise the industry. To meet the AI imperative that is here today and its continued acceleration in broader societal adoption, each E&C company must focus on:

- Strengthened governance requirements created by this new and rapidly evolving technology.
- Driving, leveraging, and capturing the benefits of AI innovation in a responsible and safe manner.
- Understanding, tracking, managing, and continuously assessing the risks associated with the use of AI, recognizing that its sensitivity to an ever growing set of "training" data may change the risk assessment.

The balance of this Executive Insight will succinctly outline some of the organizational and managerial considerations that E&C organizations should consider as they develop their own AI efforts. These considerations can be thought of as basic "AI hygiene."

AI Hygiene

AI hygiene can be thought of as preparing the organization and management for successful and healthy AI adoption.

The three components revolve around:

- Strengthened governance
- Responsible and safe AI innovation
- Managing AI risks

Strengthening Governance

As a minimum, strengthening AI governance should include the following:

- **Clear designation of a Chief AI Officer (CAIO)** — This designation should reflect the changed operational and risk environments that AI will create with respect to engineering and construction operations, IT systems and capabilities, and risk profiles and management strategies. Given the tremendous potential impacts from AI, especially generative AI, which is still at the earliest stages of evolution, such a position should not be buried within one of the interfacing organizational elements.

  The CAIO must coordinate AI use, innovation, and risk management across the enterprise and prioritize appropriate use in conjunction with the AI Management Board described in the following point. The management of risk should include as a primary focus any safety-impacting risks from the use of AI. The CAIO should

ensure there are sufficient processes to measure, monitor, and evaluate AI performance to ensure they are delivering the intended results.

- **AI Management Board** — The rapid evolution of AI requires a senior cross-functional management team to provide real time oversight and guidance. A clear charter for this board is required.
- **Clearly articulated and communicated AI principles and guidelines** — These ensure consistency across the organization and provide an opportunity to align AI efforts with the organization's broader strategic business objectives. These AI principles and guidelines provide a place to address any ethical or safety concerns that may emerge.
- **Approved AI use cases** — Careful use of AI is required and an inventory of approved use cases, like the listing of approved software that many organizations maintain, is essential. The use cases should provide both a plain language description of acceptable uses as well as those for which use is not acceptable. Training data and confidence levels should be described as well as any detected "hallucination rates."
- **Inventory of AI-embedded in third party programs and tools** — As the use of AI becomes more pervasive, it will be obvious that AI will be embedded into many of the third party tools and programs in use today. Those tools may be based on deterministic models whereas a shift towards AI will bring a probabilistic component to their output. Companies need to be aware of these interfacing AI tools and assess any risks they may present.

Responsible and Safe AI innovation

Responsible and safe AI innovation begins with the development of organizationally appropriate AI strategies. These strategies must include:

- **Identification and removal of organizational barriers** — These barriers may manifest in existing policies, delegations of authority, organizational structures, or people. The clearly articulated and communicated AI principles and guidelines described above provide a foundational measure. Barrier removal is essential to achieving responsible use, achieving broad AI maturity, and effective management of the risk classes that may emerge with the broad adoption of AI.

  Some barriers to be anticipated include:

  - Adequacy of IT infrastructure, including that required for both AI training and inference.
  - Inadequate access to the tools, open-source data, and other capabilities required.
  - Inadequately curated company data sets.
  - Inadequate understanding of third-party data sets and lack of sufficient industry specific data sets.

- **Supporting tactics in the form of existing or planned priority AI use cases**.
- **Maximizing the value of data** for AI, including any client or vendor lock up of data.
- **Ensuring that the requisite capacities and capabilities exist** to capitalize on and manage the risks from AI adoption.

Managing AI Risks

The range of potential risks that may be encountered in the use of AI has been described in other Executive Insights. Management of AI risk will require organizations to:

- **Understand the new and emergent forms of risk** they may encounter with the adoption of AI.
- **Develop and implement risk management systems**, processes, and tools that address these new risks.
- **Integrate any AI risk management assessment into the broader portfolio of enterprise risks**, assuring a clear understanding of the aggregate risks such systems may represent.
- **Identifying and implementing a full range of risk management strategies** focused on addressing these new risks (pricing, contract language, insurance).
- **Determine which AI may carry a safety-related risk** and articulate strategies for mitigating these risks. Broadly these include:
  - Systems, structures, or components that, if they failed, would pose a meaningful risk to safety, especially the health and safety of the public.
  - Control systems, which can lead to adverse consequences during operations (nuclear reactor; electric grid; systems controlling transit, traffic, and water systems).
- **Ensuring that AI documentation fully identifies all risks,** especially highlighting any that may be judged to be safety-impacting and conduct appropriate AI impact assessments. These AI impact assessments should address:
  - Purpose and benefits anticipated using AI — Quantitative metrics should take precedence over qualitative ones where possible. Positive factors can include cost and time while negative factors can include risk to human life.
  - Potential risks — This assessment should include added mitigation measures to be adopted. Risk should include both the direct system risks, but also a broader system-of-systems perspective.
  - Data quality, integrity, and relevance to the intended use case — The use case is only relevant to the quality and extent of the data it was trained on.
- **Evaluate and thoroughly test the developed AI.**
- **Continuously monitor the AI** and implement periodic, structured human review — Pay particular attention of below target or degraded performance or any changes in safety-related risks. Mitigate these risks as appropriate, including removal of the application from the approved AI use cases.
- **Ensure required capabilities and capacities exist.**

Conclusion

AI carries with it both tremendous opportunities as well as risks. To remain healthy, E&C organizations need to adopt good AI hygiene practices and routines. This Executive Insight lays out organizational and management approaches to help prevent and control the potential risks associated with AI.

For Further Reading — Other Executive Insights

- Artificial Intelligence Ethics in the Project Management and Civil Engineering Domains
- Artificial Intelligence-Enabled Supply Chain
- Evolving Artificial Intelligence Challenges and Risks in Construction
- Impacts of Artificial Intelligence on Management of Large Complex Projects
- Innovation and Technology Convergence
- Proper Reliance on Artificial Intelligence in Project Management
- Use of Artificial Intelligence in Construction Safety
- Verification and Validation of Project Management Artificial Intelligence
- Technology and Innovation in the Engineering and Construction Industry

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About the Author

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