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ECC Houston 2024 Responses summary

November 2020

Internal

Table A: Q1: What challenges do you see with your current project portfolio



What are the challenges you see with your current project portfolio?

18 of 18 responded • 72 responses

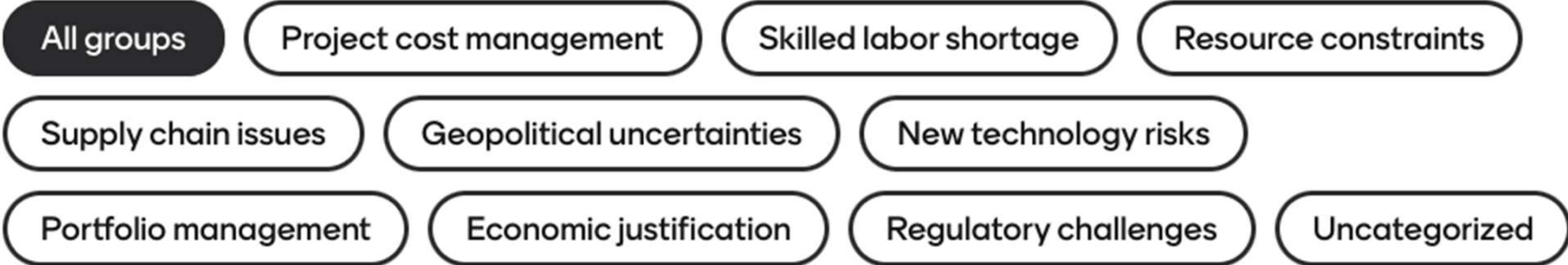


Table A: Q1: Responses and Tableings

Geopolitical uncertainties 5 responses

Geopolitical uncertainties	Political uncertainty impacting strategy and direction	Uncertainty requires many irons in the fire, spreading resources thin
Uncertainty on how to access capital for green projects.	Highly ambitious plans (energy transition) that are not economically strong	

New technology risks 5 responses

New technology "green" projects come with additional risk (cost/schedule/operability).	Clients risk adverse to adopting new technology. Don't want to be the first to adopt.	New technology prevents Reuse/ standard application of processes or tools/systems across projects
More work at risk- advanced work for later payments	Transition between phases and specialists is longer. Less appetite for taking the wrap.	

Portfolio management 5 responses

Portfolio management remains slow and ponderous- results in early at risk activities	Portfolios are larger, more diverse work slate, less specialization	Owner: shareholder expectations are misaligned with societal expectations yet need balance portfolio
Changes in operating model based on economic conditions have changed the risk profile or project portfolios	Return on Investment Benchmarking matches Objectivity and Objective setting	

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Economic justification 3 responses

Economic justification to spend capital in a constrained environment.	Cost of reduced GHG footprint impacts economics.	Better Business Case Development - defining the objectives
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Regulatory challenges 3 responses

Regulatory challenges	Evolving commercial & regulatory landscapes that make engineering projects difficult and not repetitive	Amount of insurance companies are required to carry
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Uncategorized 1 response

Construction resistance to change.

Table A: Q1: Responses and Tableings

Skilled labor shortage 15 responses

Robust skilled craft labor pool	Staffing shortage of skilled labor Legal requirements Commoditization of services Unrealistic project expectations.	Labor. Skilled, qualified
Skilled/qualified labor, material supply issues, logistical difficulties, availability of government approved suppliers, uncertain government regulations	Skillset and staffing	Availability of staffing to execute the work we need done. Talent availability.
Incentivize skilled labor Educate about the industry Automation and digitization to get young people	Staffing and skill set knowledge.	Lack of expertise
Engineering quality- talent depth and experience	Inexperience	Competent staffing and clear direction from owners...
Competency gaps around future/what's coming - and not building it into planning early enough	Talent depth as a owner (refiner) for not only projects but across operations and construction to execute the projects	More lump sum requests; less willingness to take lump sum- more focus on reimbursable work

Resource constraints 10 responses

Resource	Qualified resources	Resourcing and lead time availability
Contractor/EPC supplier: resource constraints to support early project dev work	Personnel resources	Constraint capital
Resources unavailable or higher priced - more dependency on HVEC	Resistance to change	Margins are tighter. Higher costs with less revenue
Schedule		

Supply chain issues 9 responses

Supply chain issues	Supply chain issues	Supply chain disruption
Supply chain	Availability / shipping disruptions	Quality of materials and equipment in general for projects has declined . May be an opportunity for partnerships with key providers to develop improvements .
Seeing a disconnect between project teams and suppliers because procurement blocks the relationship. Does not allow the supplier to use their experience to help with project success.	Partnering Owners and Suppliers	Misaligned stakeholders particularly with JV

Intern:

Table A: Q1: Responses and Tableings



Project cost management

16 responses

Project risk and logistics.	Managing change. Accurately tracking and forecasting project cost. Turnover from client	Finding economic projects
Accelerated project timelines.	Project vs operations conflict.	Projects taking longer to materialize
Budget.	More projects than affordability.	Maturity of owners teams to identify project leaders.
Material procurement	Work Process / Governance Simplification	Cost of Capital
Cost a capital.	Project Durations dont allow full defiinition required for traditional contracting. Different contract models are used.	Design bases on multinational projects (Units, Standards, Conditions) are unknown or not well supported.
Process Standardization /Modularity		

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Table A: Q2: What do we need to work on to address these challenges



What do we need to work on to address these challenges?

14 of 18 responded • 56 responses

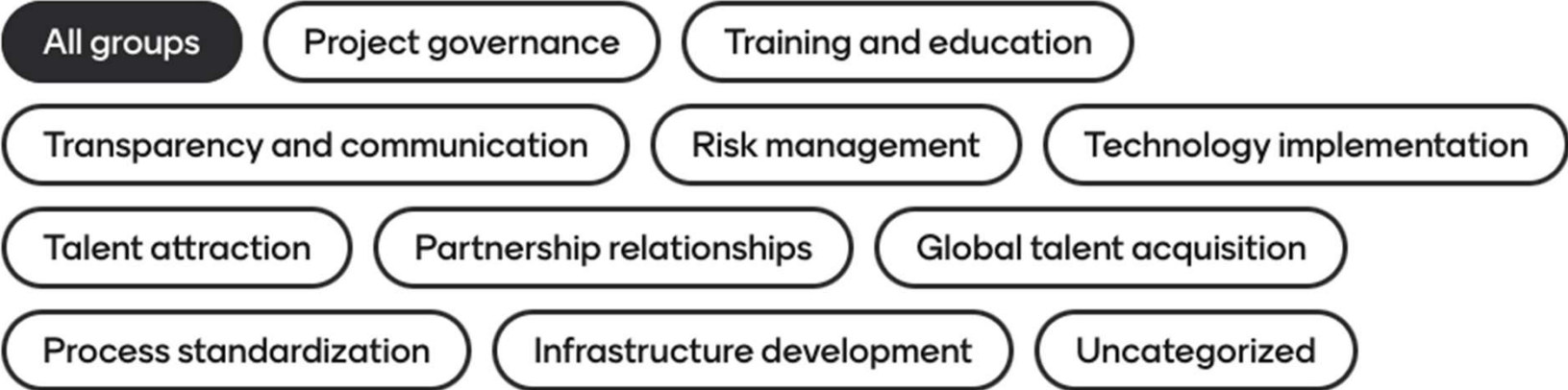


Table A: Q2: Responses and Tableings

Transparency and communication
7 responses

- More transparency between contracts and owners. Better communication.
- Better communication with client
- Provide innovative contracting strategies and be transparent and open dialog on sharing risks to deliver opportunities - mutual benefit
- Portfolio communication from owner to contractor is key - optimized feedback loop
- Cross-industry communication/ engagement. ECC is good example of that
- Better appreciation for business drivers
- Better schedule of activities

Risk management
7 responses

- More balance risk in the contracting process
- Assume more risk
- Better planning
- Improve early project scope definition while continuing to improve risk and uncertainty management.
- Flexible in metrics/criteria to assess business planning decisions
- Continue to invest in having a balanced portfolio
- Improved forecasts of the work coming at the industry- hard to forecast when rules / regulations keep changing

Project governance
9 responses

- Rigor in project governance
- Effective project governance to align on priorities.
- Collaboration across project life cycle vs adversarial relationships- engaging regulators proactively
- Agree on value and quality expectations. For the entire project start to completion. Require supply chain providers to uphold kpi standards as set by management.
- Identifying qualified staff to manage project portfolios in a LEAN Environment
- Increased timeframe to deliver projects
- Overlap on turnaround and Capital projects
- Speed of "killing projects"- we need to shut "zombie" projects down more quickly
- Capital planning: 3 year ahead - furthest ahead can look

Training and education
7 responses

- Better training
- Better training
- Investment in training.
- Better education
- Focus on people development
- Lessons learned
- Go back to basics

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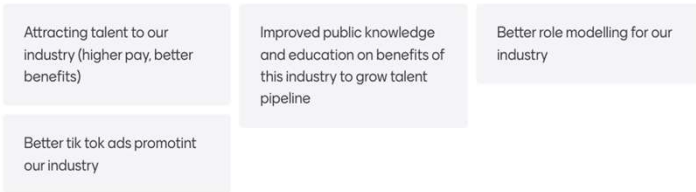
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Table A: Q2: Responses and Tableings

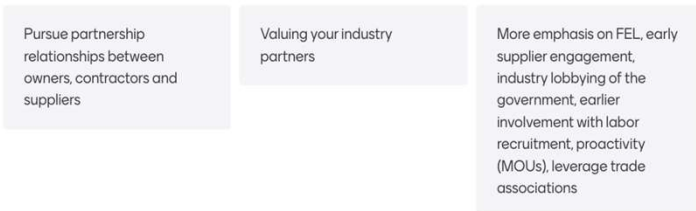
Technology implementation 5 responses



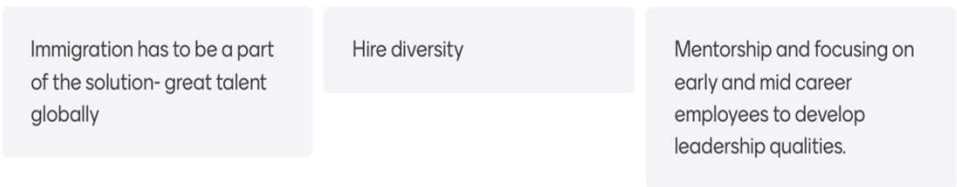
Talent attraction 4 responses



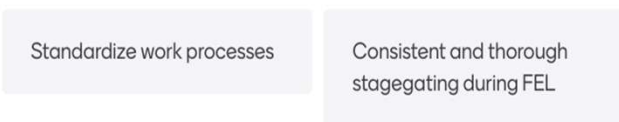
Partnership relationships 3 responses



Global talent acquisition 3 responses




Process standardization 2 responses



Infrastructure development 1 response



Table A: Q2: Responses and Tableings

 **Uncategorized**
8 responses

Use technology to create scenario based training to help build experience. Use to fill knowledge gap.

Define objective portfolio management and selection criteria to grab the best projects, limiting the wide scope of the portfolio

Use previous performance data to optimize a specific project or design process prior to the outset

AI can use previous operating and maintenance data to define the design class (level of gold plating) to achieve design life goals.

Use of datasets to optimize maintenance programs

Use AI to determine which jobs are real, and which ones should be bid to better the chances of success

Connect Construction stakeholders to project objectives and value improvement programs earlier in the project life cycle and implement new contracting strategies that improve efficiencies and cost.

Procurement and contracts mindset shift to understand new/innovative ways of execution can significantly drive down cost, and it's not always best to choose the lowest bidder.

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Table A: Q3: How do you see AI benefiting projects in the future?



How do you see AI benefiting projects in the future?

14 of 18 responded • 46 responses

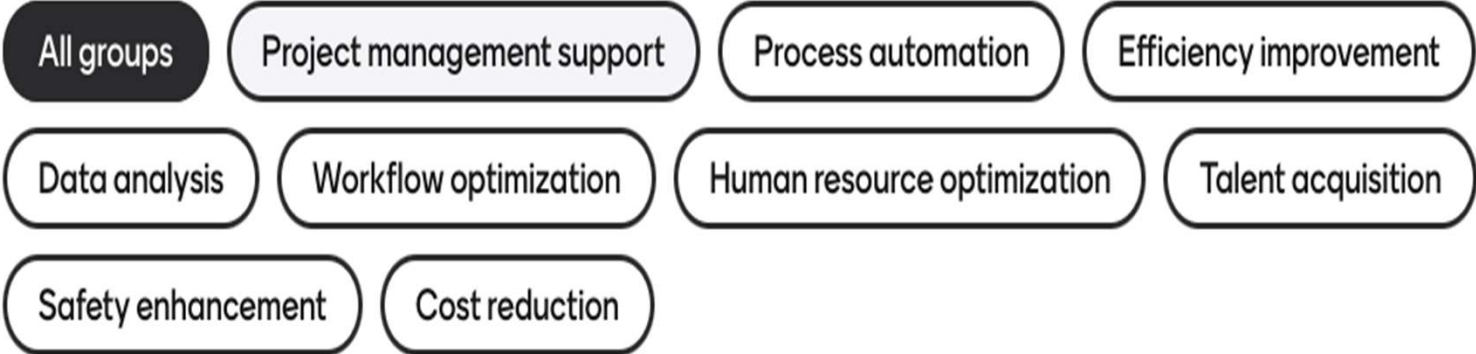


Table A: Q3: Responses and Tableings

Project management support 8 responses

To help align project	Project control opportunities- but relies on data quality and data availability	Support with training
Knowledge management		Material management.
Asset performance management solutions	Help collect and find project data and procedures. Lessons learned, training etc.	
	Use it to identify roadblocks and also to capture data that can make future project planning faster.	

Process automation 7 responses

Process safety	Workflow of design execution, automation of these key steps	Automating the repeatable
Apply AI to the work process for the most accurate effective methods of design of equipment and materials	Document control, scheduling, admin activities.	Help with engineering drawings Troubleshooting processes and plant operations
Unit and piping design		

Efficiency improvement 6 responses

Increased efficiency	Increase in engineering quality	Efficiencies for planning, improved data integrity, consistency across different functions, predictive safety measures, more effective RCAs, reduced environmental impact, increased plant reliability
Improve schedule	Better data, quicker decisions	
		Standardize

Data analysis 6 responses

Alternative analysis	Used data for more predictable outcomes	Field walkdowns and progressing with tech - drones, scanning, AI analysis- improved data and efficiency
Strong use case in estimating	Design phase data...can be leveraged better for construction phase	Use data as an enterprise asset

Workflow optimization 5 responses

Faster process optimization	Optimization of sequencing	More consistent deliverables. Example - automate piping layouts.
Keep structure in the planning phase	Standard document generation.	

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Table A: Q3: Responses and Tableings





 Human resource optimization 4 responses		
Fewer employees = Fewer HR headaches	Reduce human error	Find ways to better manage work front interfaces in the field.
Removing humans?		
 Talent acquisition 4 responses		
Finding talent	AI to help talent recruitment and short listing talent	Hire AI knowledgeable talent to accelerate applications and solutions vs learning as we go
Fill personnel gaps		
 Safety enhancement 3 responses		
Improved safety, better analysis	Quality assurance	Supported construction
 Cost reduction 3 responses		
Lower costs	Cost estimation.	Contract comparisons.

Table B: Q1: How have recent supply chain issues impacted your projects?



How have recent supply chain issues impacted your projects?

17 of 17 responded • 31 responses

- All groups
- Long lead items
- Schedule delays
- Cost escalation
- Supply chain planning
- Risk management
- Transportation challenges
- Material lead times
- Procurement strategy impact
- Uncategorized

Table B: Q1: Responses and Tableings

Long lead items 6 responses

In general we are now buying many long lead items in Feed. In the past it was very rare.

Purchasing long lead equipment in feed. Used to be very rare.

list of long delivery items is getting longer

Little

Long lead times on items are causing us to have to seek alternative solutions when they exist. Sometimes requiring more outdated technology

Transformers, Analog input modules on control systems.

Schedule delays 5 responses

Lengthened schedules.

Significant. Cost gone up, schedules pushed out. Other industries are impacting energy, refining, chemicals, etc.... Businesses (ie chip fab, data centers, pharmaceutical, etc...).

Delays in electrical components (power transformers, PDCs)

Clients have either looked outside their AML/AVL, Or canceled the project until the next T/A until the equipment can arrive

Schedule impacts. Long lead items. Estimating costs. Buying more equipment in FEED, before would otherwise we would buy. Increased construction costs due to late delivery of materials. Working out of

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Cost escalation 5 responses

Schedule and cost escalations

Cost and Schedule. Difficulty estimating. Bid validity. Over compensation of ROM budgets > kills projects. Contracting strategies.

cost escalation and schedule uncertainty.

Considering alternative resources with little history or experience. These suppliers are sometimes not up to the standard owners are used to.

Delayed startup, increased cost, more claims, added contractor focus, shifted risk, increased manpower to manage, more standby time due to delays, project portfolio impacts (reprioritizing FID).

Supply chain planning 4 responses

Better Procurement planning very early

building stronger relationships with suppliers. Developing frame agreements

Inability to identify shipping routes in advance are requiring design to always consider worst case scenario for things like temporary shipping steel. Which can greatly increase cost.

Lack of belief in supplier schedules. Longer schedules. Different critical paths than traditional. Early purchasing and definition. Purchasing of fabrication slots. Establishing new supply chain.

Risk management 2 responses

"long lead" is being re-defined; which items, how long, what costs risk management becoming more challenging; predicting and quantifying accurately.

Potential penalties/damage for the company (liquid damages, reputation, etc)

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Table B: Q1: Responses and Tableings

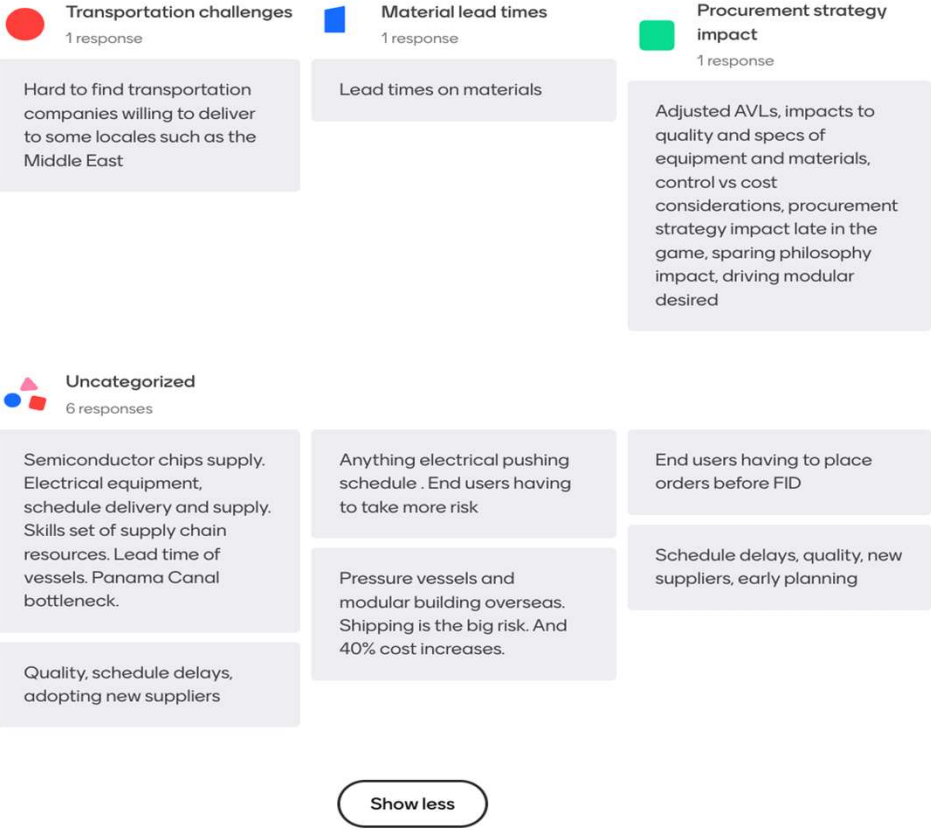


Table B: Q2: What mitigation measures have you utilized and implemented?



What mitigation measures have you utilized and implemented?

15 of 17 responded • 41 responses

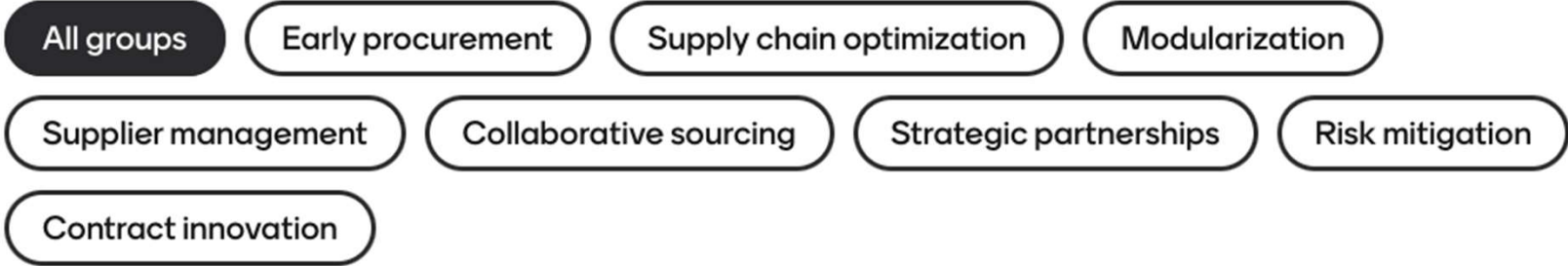


Table B: Q2: Responses and Tableings

Early procurement
13 responses

Early procurement on long lead items	Early engagement with suppliers including market surveys	Issuance of purchase order/notice to proceed in advance of beginning of work
Making early commitments on projects and purchases.	Early collaboration. Partnerships, STOP 3bids and Buy. Preplanned escalation mechanisms. Early Bid/buy packages.	Commit to equipment early
Qualify New suppliers, early engagement, partnerships, advanced pay terms, incentives (not malus), and constant communication and collaboration	Use of incentives to advance schedules - all down the line from EPC to vendors etc	Having two locations to build everything. Buying materials well in advance, sometimes at a cost premium
Client engagement in expediting vs just EPC managing.	Being more diligent on all buying, not just long leads.	End users buying the transformers at risk. May get canceled. Having to plan projects two years out
Add contingency on the front end of a project		

Supply chain optimization
6 responses

Could AI be used to help guide what can be delivered just in time vs what needs to be early and stored.	better material management to improve efficiency over multiple projects	Expanding support base in search of better deliveries
Optimized site manpower ramp ups	Qualification of more suppliers. Homogeneous equipment and design, optimization of facilities. Industry diversification of fabrication plants. Trading agreements between countries.	As contractors Better coordination to shift labor resources to mitigate harm from project schedules shifting.

Modularization
6 responses

Domestic modularization	More domestic modular fabrication	Standardization, alternate transportation (air freight), impact on estimating, modularization
becoming more open than in the past to considering alternatives, for example: - modular construction - other suppliers - local customization solutions	Better risk studies to quantify cost differences between modules and stick built.	Flexibility with both operational and execution aspects of a project

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Table B: Q2: Responses and Tableings

Supplier management 6 responses

- More manufacturing in the us
Expand your vendor base to non traditional suppliers
- Looked to overseas for new suppliers
- Flexibility on AMLs. Looking at some lesser-known suppliers, especially on non-critical path items.
- Look at co-designs between EPCs and Suppliers vs EPC dictating design to supplier.
- helping vendors with cash flow to keep them going
- Expand approved vendor lists. Add options

Collaborative sourcing 4 responses

- More collaboration vs bidding- choosing wisely. Looking for preferential locations, transparency, similar cultures.
- Engagement in material sourcing challenges as a partnership with owner and contractor. Purchasing interim equipment, or accepting defects, shop premiums to get im que. Early vender R&D engagement.
- Reserving key rental equipment, cranes, bridges, etc. Reserving subcontractors. Sharing of schedules more freely.
- Leverage "buying power" of owner organizations and large EPCs

Strategic partnerships 2 responses

- trying different contracting strategies (e.g. longer term alliances)
- face to face meetings to work through issues

Risk mitigation 2 responses

- Brainstorming what if's and figuring out what's the highest probability to go wrong
- Allow for additional scheduling contingencies

Contract innovation 2 responses

- Creative contract strategies. Lump sum smaller bits where you can
- AVL adjustment, moving contract structure (increased owner risk). Advance planning for shop leverage and logistics planning, finding 3rd party leverage. Innovating the engagement model (stakeholders)

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Table B: Q3: Who in your organization should lead the implementation of AI in your projects and why?



Who in your organization should lead the implementation of AI in your projects and why?

13 of 17 responded • 24 responses

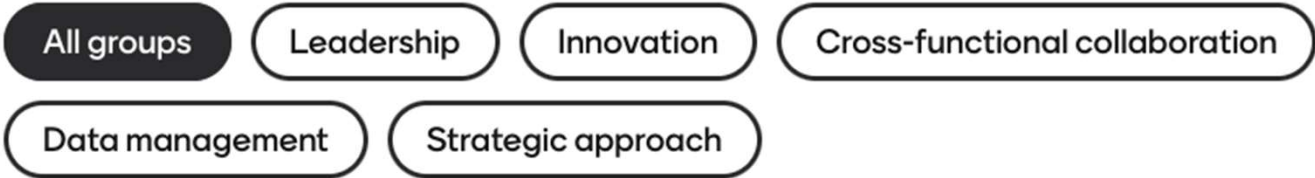


Table B: Q3: Responses and Tableings

Cross-functional collaboration 6 responses

Multi function steering committee with one executive officer driving the process	IT people combined with people on the project who understand the data	Data architecture people plus functional experts in the projects group
Research and development organization in line with operations.	You have to empower project level people to experiment with emerging technologies to figure out ideal use cases and best practices.	project admin tasks e.g document controls

Data management 5 responses

More operations focused, data management focus on consistency of data	Focusing on valid data capture and storage across the company- and then grassroots movement of how to use the data by individual users.	Initiated by a Business Leader/Project Director. Implementation by a new role called "AI Manager" who is in-house at end user. Supported by a data manager specialist across stakeholders.
Need consistency in deployment.	Quality Assurance: AI tools could quickly flag anomalies to allow teams to more quickly find where to apply extra focus challenge with availability of data, in the quality necessary	

Leadership 6 responses

A team should lead the effort- not a single person. Needs support from leadership and usership from rank and file.	Targeting young leadership group- they have energy around this, and bravery.	This should be lead by someone with previous experience and access to data, along with input from key stakeholders within the organization
OT resource with long term responsibility, procurement, Business & strategy leaders, Why: needs to be the teacher and the business owner, with SME input to ensure context. And a PM to drive it!	First identify the problem being solved, then pick the team to lead the solution.	Chief Operations officer. AI will impact every aspect of EPC business within next 10 years.

Innovation 6 responses

An innovator and highly tech person and a YOUNG person who grew up with technology . Someone with the authority to implement the change	Success using AI in business development	We're seeing a movement of grassroots ideas. Looking at centralizing it to avoid overlap.
Don't know enough to answer	not sure at this time	not a developer!

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Table B: Q3: Responses and Tableings



Strategic approach

1 response

must be led from a strategic position, not starting from deep in the project organization use an agile approach to find quickly what does not work / add value as well as what does

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