

The background of the slide is a photograph of an offshore wind farm. Several wind turbines are visible, standing in the ocean. The sky is a mix of blue and orange, suggesting a sunset or sunrise. The water is calm, and the turbines are reflected in it. The overall mood is serene and modern.

Capital project excellence in *Offshore Wind*

From project controls to
AI-powered execution

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Executive Summary

While turbine technology is well established and installation methods are mature at scale, offshore wind projects continue to struggle with cost overruns, delays, and eroding margins. In an industry already challenged by inflation, supply chain constraints, and rising financing costs, project management has become one of the few controls that developers can actively influence.

This report is based on a Capgemini survey of 150 senior offshore wind professionals across Europe conducted in May 2026. It explores where value is lost in project delivery, and how digital and AI-enabled approaches can help resolve these failures. This domino effect is compounded by issues such as unrealistic scheduling, disparate data access, weak governance, and failed multi-party coordination.

The study demonstrates a stark disconnect between developers' aspirations and current industry capabilities. The ability to make rapid and effective decisions is deemed by surveyed professionals to be the most vital capability for offshore wind projects in the coming five years, and simultaneously it is one of the weakest performer areas. The disconnect is not due to a lack of governance, but rather due to issues like unintegrated data, limited visibility, and lack of structured decision support across complex project ecosystems. AI can potentially fill this gap: while nearly two-thirds of respondents believe there is strong potential with artificial intelligence in project management, adoption is currently low as delivery problems themselves continue to act as impediments. Most initiatives are isolated pilots, rather than integrated solutions tied to the comprehensive project lifecycle.

The offshore wind industry does not need another dashboard or isolated AI pilot but an integrated control and decision system that connects planning, costs, risks, contracts, interfaces and change management within one operational view. Artificial intelligence solutions will not suddenly overcome an organization's inability to practice rigorous execution discipline; however, it can improve

it significantly. With an integrated AI-enabled approach, project teams will have the ability to detect risks earlier, assess cross-party impacts faster, quantify costs and schedule consequences, and prepare decision ready options before problems become irreversible.

The main benefit is not only improved cost control, but also capital efficiency under uncertainty. Developers that make earlier, better-informed trade-offs deploy capital more precisely, carry less dead contingency and protect returns even when the operating environment becomes increasingly challenging. Leading Chinese operators offer here an interesting perspective: they are starting to industrialize AI across the project lifecycle, while many western players still treat it as a set of disconnected pilots.

This report translates these findings into a concrete plan for the industry. It sketches on its axes the capabilities of AI against the project management failure patterns in the industry and in doing so points the way for organizational leadership to unlock the largest amounts of value. It draws from the study's most potent insight, "The future strength of the industry most depends on its future weakness".

The practical response to such insight is not to ask how an AI program can help, but five technology-enabled organisational moves that shift decisions out to an earlier moment: freezing design maturity to business contract boundaries, developing a collaborative coordination backbone shared by players across the whole of ecosystem, contracting to acquire the data needed to plan, execute, and control, shifting to a risk-triggered form of project governance, not reporting and making execution intelligence a board-level performance discipline. All this relies on one thing: the quality of the underlying data. AI only makes trade off's clearer where the cost, schedule, contractual, and inter-face data into it is valid, complete, up to date and timely. Without this base line what AI delivers more rapidly, it more rapidly directs you to the wrong answer!

The Agentic Capital Project Control Brain: from signal to decision

The practical technology response to the market is neither generic AI solutions, it's an integrated project control and decision system in order to convert fragmented project signals into decision-ready action.

STEP	WHAT BUSINESS QUESTION DOES IT ANSWER?	OFFSHORE WIND EXAMPLE OUTPUT
1. Connects project signals	What is changing across schedule, cost, contracts, risks, interfaces and suppliers?	One shared view of project status: Connects P6 schedule, ERP cost data, contract registers, RFIs, supplier updates and weather windows
2. Detects weak signals	Which deviations are likely to affect cost, schedule, claims, contingencies or bankability?	Early-warning list ranked by materiality: Flags float erosion, late supplier data, vessel-window compression or interface slippage
3. Assess implications	What is the impact across delivery, commercial, contractual and financing dimensions?	Cross-domain impact assessment: a schedule slip becomes cost exposure, contractual notice risk, contingency burn and bankability impact
4. Prepare options	What are the realistic response options and trade-offs?	Decision package with cost/schedule/risk scenarios: Re-sequence works, mobilize additional vessel capacity, issue contractual notice, accept delay with quantified impact
5. Route decisions	Who needs to decide what (pre-built packages), by when, and under which authority?	Escalation path and decision forum with a draft decision note
6. Preserves auditability	What data, assumptions and decisions support the action taken?	Audit trail for governance, claims and lenders

Introduction and context

Offshore wind capital projects are reaching a new stage of maturity. Turbines are bigger, more reliable and deployed at industrial scale. Installation methods are increasingly standardized. Yet projects economics remain fragile. Over the past few years, a growing number of projects have been delayed, renegotiated, impaired or cancelled altogether. Ørsted's withdrawal from Ocean Wind 1 and 2 in 2023, and the subsequent impairment linked to Sunrise Wind, are reminders that project economics can deteriorate when delivery goes wrong¹.

The industry's biggest challenge is building offshore wind farms with predictability and profitability. Developers cannot control inflation, interest rates, commodity prices or geopolitical tensions. They can however control how projects are engineered, planned, governed and executed. That distinction matters because many of the cost overruns and delays affecting the industry originate inside the project delivery system itself.

Cost is where the pressure shows up first

The Capgemini survey of 150 senior offshore wind professionals across Europe points to a consistent pattern. Cost performance is the weakest aspect of project delivery: only 13% of respondents rate their recent projects as performing well on costs, while 36% rate them poorly. More than half (55%) report a significant gap between the asset originally designed and the asset ultimately delivered.

The data suggests that the problem is not primarily external. Engineering rework, late changes and unrealistic planning assumptions rank ahead of supply chain disruption as the main drivers of cost overruns. External factors clearly matter, but they often start upstream.

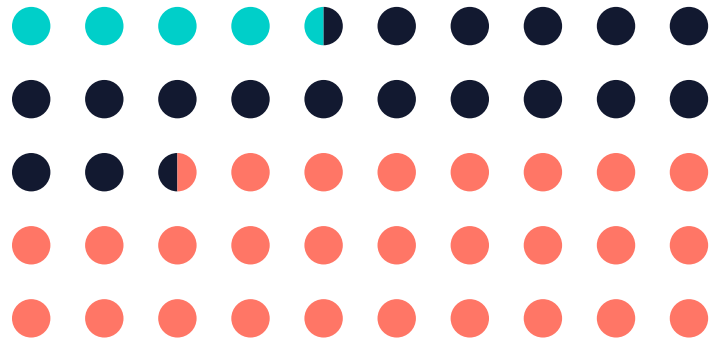


Figure 1 - 55 in every 100 say the asset they built is not the asset they designed

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.B1.

Anyone who has worked on large capital projects will recognize the pattern. A foundation design change is approved late. Monopiles have already entered fabrication. Installation vessels are booked months in advance. What started as an engineering issue quickly becomes a procurement issue, a marine campaign issue and potentially a financing issue. By the time the issue reaches a steering committee, the cheapest options have usually disappeared.

The implications go beyond project delivery. It directly affects bankability. In a market where auction prices are tight, interest rates remain material and contingencies are under scrutiny, project performance directly influences financing conditions and investment decisions. Schedule slippage, unresolved interface risks and late design changes can increase contingency requirements, weaken lender confidence, delay FID and ultimately undermine project economics. The ability to deliver projects effectively is increasingly influencing investment outcomes.

The timing could hardly be more challenging. Financing costs remain elevated, supply-chain are constrained, and auction economics leave little room for error. In this environment, a project's ability to execute consistently may matter as much as the quality of wind resource itself.

Demand is growing faster than delivery capability

The need for offshore wind continues to increase. Global installed capacity reached approximately 92.5 GW by the end of 2025², and demand for clean electricity is accelerating as electrification expands and data-centre growth drives additional power consumption. Large buyers are moving aggressively: Microsoft has contracted around 40 GW of renewable energy since 2020³, while Amazon increased its commitment to the Moray West offshore wind farm in Scotland to 473 MW⁴.

Despite its engineering sophistication, offshore wind remains relatively conservative in its use of digital technologies and AI to improve project management. Most organizations have invested in planning tools, dashboards and reporting systems. Far fewer have embedded AI into the way decisions are made, risks are identified or implementation managed day to day.

China provides an early indication of where the industry may be heading

Several Chinese energy companies have begun integrating AI into core operational processes rather than a standalone innovation initiative. Longyuan Power, for example, has reportedly deployed DeepSeek-R1 within its digital platform, making AI capabilities available across multiple business units through a secure environment⁵.

Chinese energy companies are increasingly embedding AI into operational workflows, business processes and shared platforms. In many Western organizations, AI remains concentrated in pilots, proofs of concept and isolated use cases. Whether these initiatives ultimately succeed is less important than the signal they send: some players are beginning to treat AI as an execution capability rather than a productivity tool.

The risk for Western offshore developers is that others learn to execute projects faster and make decisions faster while remaining trapped in fragmented systems and disconnected pilots. The delivery performance gap may then widen.

This report focuses on the levers that are yet under the control of the industry

The primary objective of this report is to answer the practical question of where does value leak out of offshore wind projects, and how can digital technologies and AI help address it?

Drawing on survey responses from 150 industry professionals, it identifies seven recurring failure patterns and explores where AI-enabled capabilities can improve project delivery across the lifecycle. This report aims not to present AI as a panacea, but to demonstrate that improvements in data integration, shortening of decision-making time, and strengthening of execution discipline will lead to more protected margins and more reliable project implementation.

The primary audience for this report is developers and asset owners. They carry the greatest exposure to cost overruns, financing pressure and delivery risk. They also sit at the centre of a complex ecosystem of OEMs, EPC contractors, marine contractors, ports, TSOs and suppliers.

Capital project management excellence cannot be achieved by developers alone, but it will have to be led by them.

This study captures hands-on experience from 150 senior professionals working across the European offshore wind project lifecycle during April-May 2026.

Importantly, 78% of respondents have direct involvement in four or more capital projects over the past five years, ensuring responses are grounded in real project dynamics rather than theoretical knowledge.

The offshore wind capital project reality

Study Methodology: Sample and Data Collection

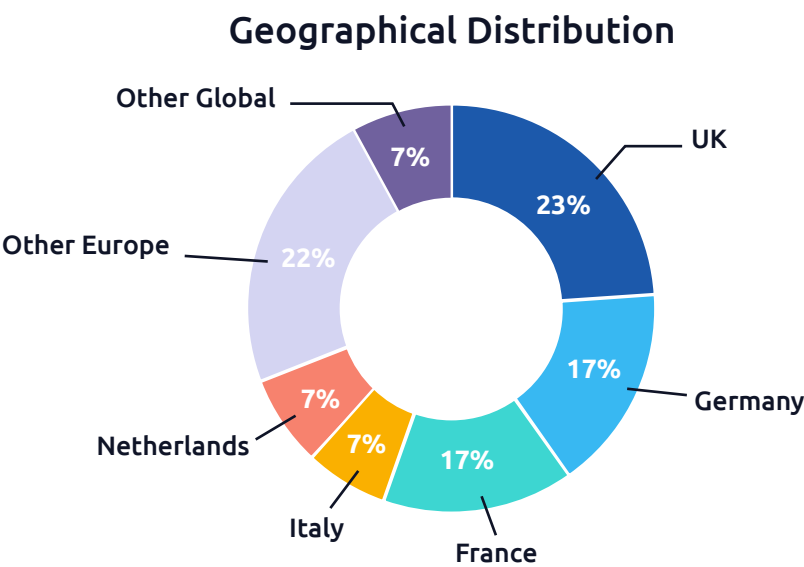


Figure 2 - Geographical Distribution

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.S1.

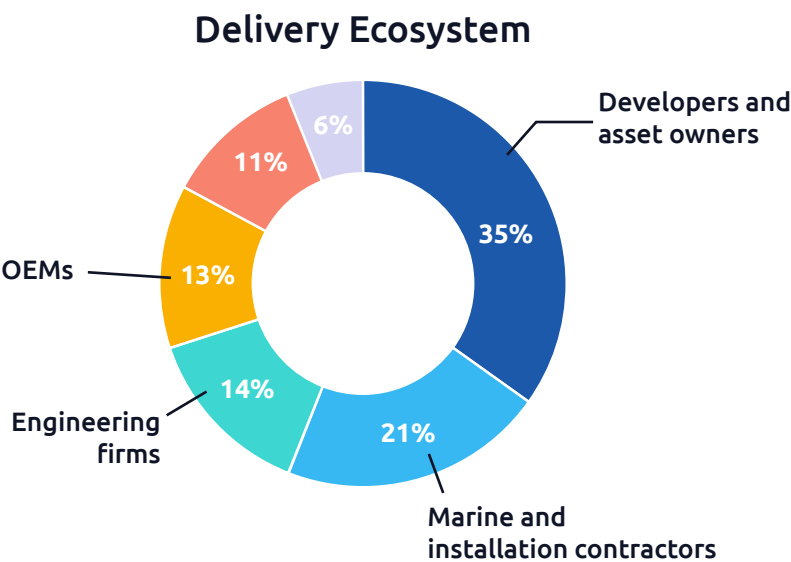


Figure 3 - Delivery Ecosystem

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.S2.

Performance reality: cost and design alignment are the systemic failure points

Asked to rate delivery performance against the initial project plan over the past 3–5 years, respondents point to a clear delivery gap, concentrated primarily on cost control and design-to-asset alignment rather than across all delivery dimensions.

Respondents identify engineering rework and late changes (40%), supply chain disruption and delays (37%) and unrealistic planning assumptions (32%) as the leading drivers of cost overruns. Installation and marine operations inefficiencies (27%), ineffective contracting or change management (22%), commissioning and handover issues (19%) and contractual disputes (17%) further reinforce this picture (B2). These results show that margin pressure stems as much from execution challenges during project design, planning and delivery as from market volatility and external disruptions.

These issues are then amplified by structural constraints that remain difficult for developers to absorb: supply chain capacity and OEM lead times (31%), permitting and environmental assessments (27%), ports, logistics and vessel availability (26%), grid connection and TSO interfaces (19%), environmental and weather constraints (17%), financing cost and ROCE pressure (15%), and auction price or CfD structures (12%) (B3). Taken together, the findings suggest delivery performance and project margins are rarely affected by a single issue. They are shaped by the interaction between external constraints and execution challenges.

Developers remain at the centre of the investment case, but many of the risks materialize outside their direct organization. OEMs, cable suppliers, foundation manufacturers, ports, vessel operators and installation contractors increasingly determine whether projects stay on plan. Lead times, design changes, serial defects, vessel scarcity and port constraints can quickly turn into schedule slippage and margin erosion for the developer.

PERFORMANCE RATING, PAST 3-5 YEARS - % GOOD/VERY GOOD VS POOR/VERY POOR

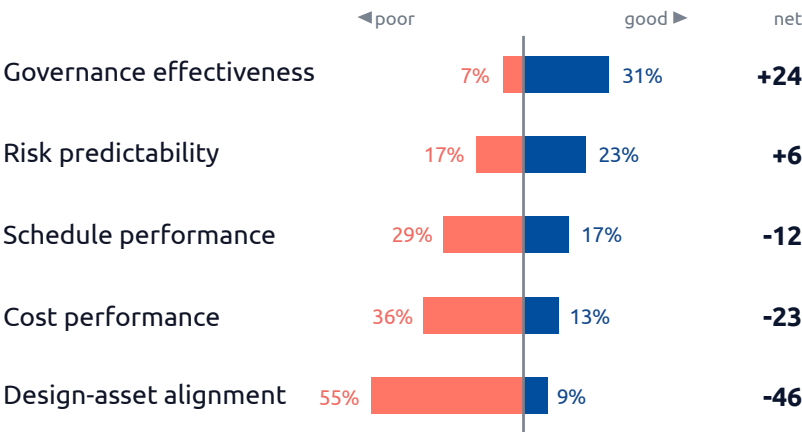


Figure 4 — Design to asset alignment performance (Top-2-Box vs. Bottom-3-Box, %)

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.B1.

These findings highlight that offshore wind project management has become a system-level challenge, where delivery performance depends not only on the effectiveness of internal project controls but also on the ability to coordinate activities across developers, OEMs and critical suppliers. Stronger interface management, earlier visibility of emerging risks and more disciplined change control are increasingly important to maintaining project performance as projects grow in scale and complexity.

Operational risks increasingly feed directly into financing risk. In capital-intensive offshore wind projects, late design changes, schedule slippage and unresolved interface risks can increase contingency requirements, weaken lender confidence, delay FID and reduce equity returns. As auction prices and offtake structures leave limited room for error, the ability to demonstrate design maturity, schedule realism and disciplined change control becomes part of the investment case, not only a delivery requirement.



Seven execution failures explain why offshore wind projects miss plan

Failure pattern	Observed to some/significant extent (Top-3-Box)	What the survey shows
Upstream maturity failures		
1. Late design freeze & cascading rework	92%	Design maturity lags procurement by 6–8 weeks; subsystems freeze at 60–70% through delivery, forcing field modification.
2. Unrealistic scheduling	81%	Plans assume 90%+ vessel availability and continuous operations; real North Sea conditions reduce workable windows by 25–40%.
Ecosystem coordination failures		
3. Multi-party coordination failure / interface overload	49%	Export cables, offshore substations, grid connections and turbine installation are often delivered by different contractors under separate contracts. Delays frequently emerge at the interfaces between those scopes rather than within them.
Decision-system failures		
4a. Slow decisions from incomplete data	40%	Design and risk decisions are delayed 1–2 weeks waiting for cost, schedule and contract data to be assembled.
4b. Fragmented data across tools & parties	29%	Project data sits across 5–8 incompatible systems with no single version of the truth.
5. Weak governance & unclear accountability	25%	Decision authority is diffuse; steering committees meet monthly rather than weekly, slowing escalation.
Control and learning failures		
6. Change management circumvention	40%	Formal change control is bypassed in the field; undocumented changes accumulate to 5–10% of contract scope.
7. Knowledge silos & repeated mistakes	25%	Lessons remain anecdotal; new projects repeat interface conflicts & scheduling errors already encountered elsewhere.

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.C1 (Top-3-Box, 7-point scale) and Q.C2 (forced single choice).

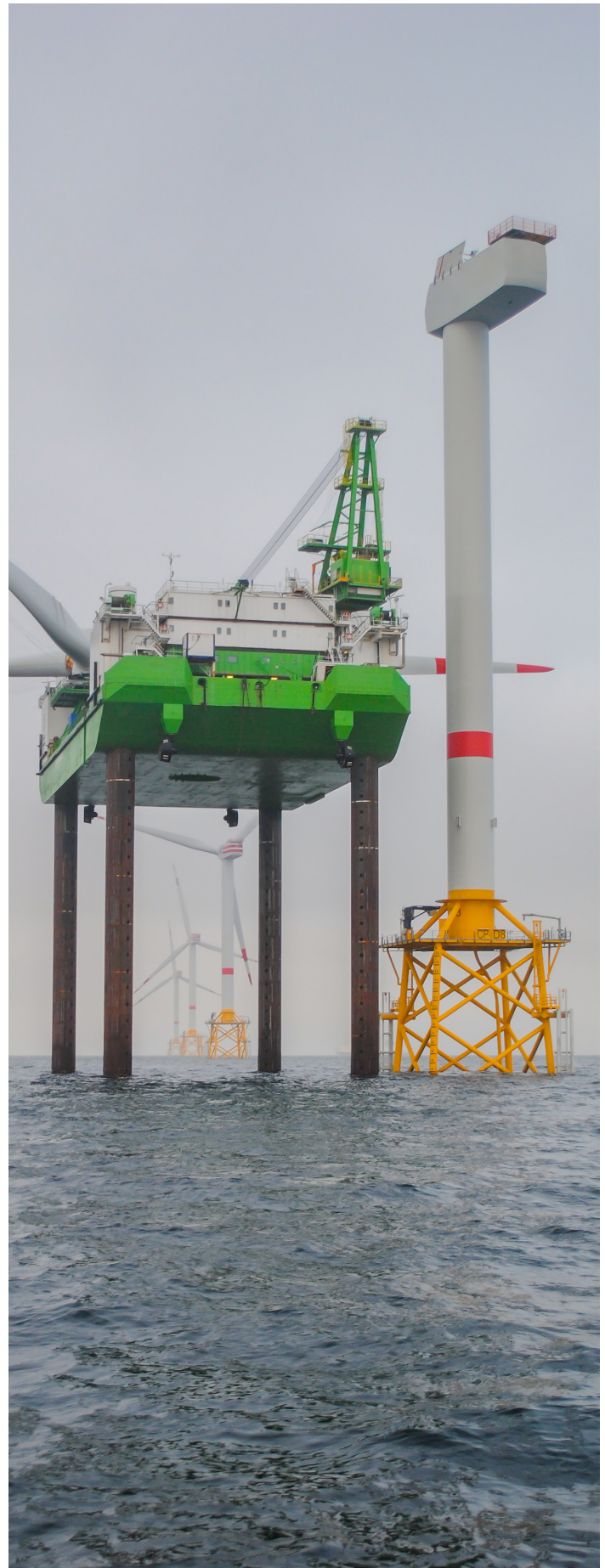
Beyond the aggregate cost and schedule figures, the survey highlights a set of recurring execution patterns that explain why offshore wind projects struggle to stay aligned with their initial plans. Respondents were asked to assess how frequently specific issues are observed and which one most disrupts delivery.

The seven failure patterns are best understood as interconnected elements of a broader execution system rather than as isolated issues. Two upstream weaknesses (late design freeze and unrealistic scheduling) create the initial instability. Coordination failures then spread this instability across multiple parties. Fragmented data and weak governance slow the decisions needed to contain it. Change-control circumvention allows unresolved issues to accumulate in the field. Finally, knowledge silos prevent the organization from learning fast enough across projects.

The core issue is not that offshore wind projects suffer from seven different problems. It is that one weak project management system allows early instability to propagate too far, too late and at too high a cost.

A major driver behind these failure patterns is contractual fragmentation. Offshore wind projects are often delivered through multi-contract structures in which engineering, manufacturing, marine operations, grid interfaces and installation are governed by different commercial arrangements. Each party optimizes against its own scope, risk allocation and claims position, while the developer carries the cumulative impact on the project economics.

This creates a structural tension: the project needs integrated coordination, but the contract architecture often reinforces fragmentation. Interface issues, late design changes and undocumented field modifications become harder to resolve when data-sharing obligations, escalation routes and change-control mechanisms are not clearly embedded in the contract from the start.



92% and 81%: the two failures that start every overrun

Late design freeze is the most widely observed issue. 92% of respondents report cascading rework from late design freeze to some or significant extent, and 23% name it as the single biggest disruptor. Its impact is material: In offshore wind, late design changes rarely affect a single work package. A modification to foundation design can propagate into fabrication schedules, transport plans, installation campaigns and vessel bookings, creating knock-on effects across the project. The issue is not simply that design changes occur, but that they occur too late, after procurement and field execution have already been committed. Best-in-class projects address this through stronger Stage-Gate discipline: design maturity is frozen at defined milestones before procurement commitments, supported by parallel engineering during FEED and monthly maturity tracking.

Unrealistic scheduling is the second major upstream weakness. 81% of respondents observe it, and 15% identify it as the biggest disruptor. Project schedules often assume 90%+ vessel availability and near-continuous operations, while actual

North Sea conditions reduce workable windows by 25–40% over the year. As a result, projects can already be 2–3 weeks behind by Week 10 of delivery, yet formal re-baselining often happens only at mid-project. By then, the accumulated delay can translate into a 5–15% increase in total budget.

So what? Those two costliest failures, late freeze and unrealistic schedules, are both addressable: An engineering change-impact lets teams freeze earlier with confidence, not hope.

The other five patterns are less often identified as the single biggest disruptor, but they intensify the impact of these two upstream issues. Interface overload makes coordination slower and more contradictory. Fragmented data and weak governance delay the decisions needed to contain problems while they are still manageable. Change control circumvention and knowledge silos allow undocumented issues and past mistakes to resurface from one project to the next. Together, the seven patterns point to the same underlying problem explored in the next section: offshore wind projects need faster, better-informed decisions, yet this is precisely where delivery systems remain weakest.



The capability gap: knowing what to build is not the constraint

Decision speed, integrated project controls and reliable data are critical, yet materially underperforming.

The survey reveals one of the clearest diagnostics of the study: offshore wind organizations know which capabilities will matter most over the next five years, but they are not yet able to deliver them at the required level. Respondents were asked to rate capabilities both in terms of future importance and current organizational performance (D1, D2). The largest gaps are the core capabilities needed to keep projects under control: decision-making, integrated project controls and reliable project data.

The most striking gap concerns decision-making. Speed and quality of decision-making is rated as the most important capability for future delivery success, yet only 17% of respondents say their organization performs strongly today, creating the widest gap in the survey. This is not simply a question of governance design. The issue is that decision forums often lack integrated, timely and risk-adjusted information needed to act quickly. The same pattern appears in integrated cost-schedule-risk control and consolidated project data across parties, both of which are seen as critical but remain under-delivered.

Offshore wind's biggest gaps are in the capabilities that matter most



Figure 5 — Importance for future success vs. current organizational performance, Top-2-Box (%)

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.D1 (importance) and Q.D2 (current performance).

What respondents are describing is the absence of a shared decision backbone. When cost, schedule, risk, contract and interface information sit in different systems, teams spend considerable time reconciling facts rather than evaluating options. As a result, decisions are delayed, trade-offs are not always assessed holistically and issues often become visible only after they have already affected project performance.

In practice, improving decision speed and establishing a consolidated view of project

information represent the two most immediate priorities. The two are closely linked because faster and better decisions depend on having reliable information available at the right time and in the right context. Organizations that establish stronger data foundations, clearer information flows and greater visibility across project partners are likely to narrow many of the other performance gaps identified in the survey at the same time.

The investment priorities identified by respondents confirm this diagnosis.

Biggest opportunity for improvement

Project controls are the industry's biggest improvement policy

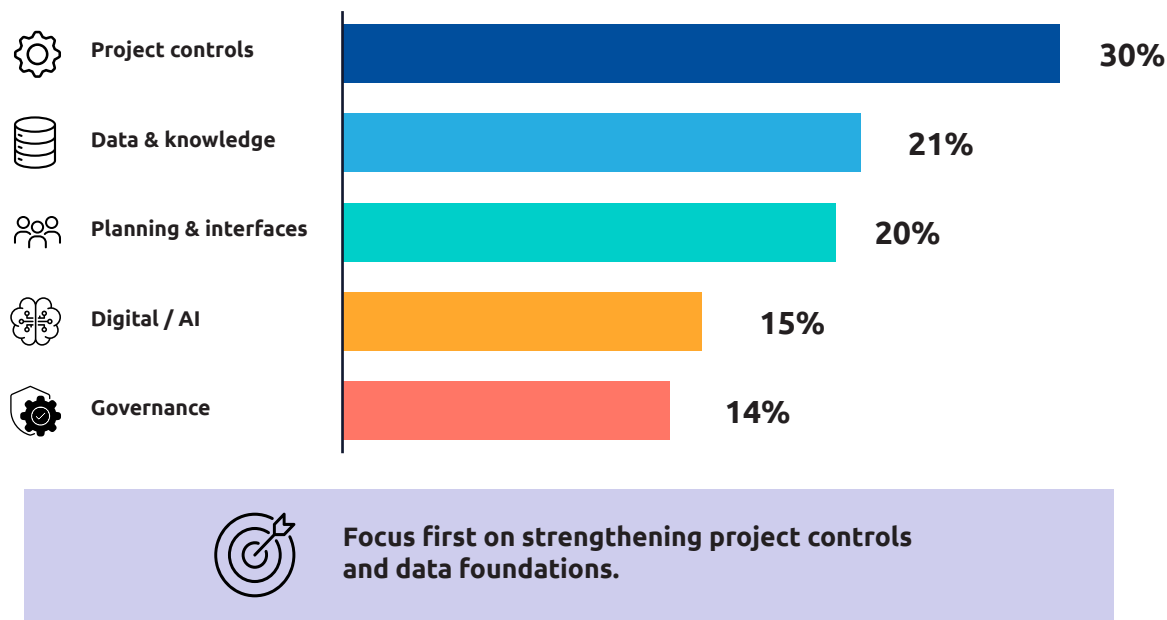


Figure 6 — Project controls and data absorb half of all improvement priorities

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.D3

Project controls (57%) and data & knowledge management (40%) emerge as the two leading areas for improvement, followed by planning and interfaces, digital/AI and governance (D3).

Similarly, respondents see risk anticipation and early warning as the top differentiator over the next five years, ahead of broader data-driven project management excellence and interface management (F1).

Survey responses point in the same direction: executives are not asking for technology in isolation, or for AI as a standalone product. They are looking for the execution backbone that can turn fragmented project information into earlier warnings, faster decisions and more disciplined delivery. This is where AI becomes relevant; not as the solution on its own, but as an enabler of stronger project controls, better risk anticipation and more reliable decision-making at scale.

Capabilities which will most differentiate winners

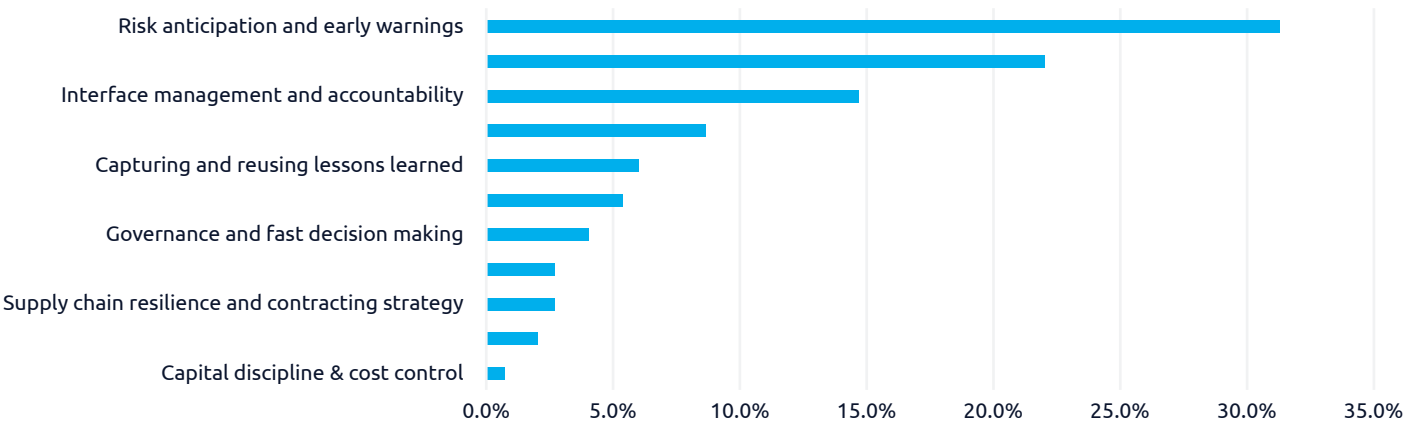


Figure 7 — the capabilities which will most differentiate leaders in offshore wind over the next 5 years?

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.F1 – Summary of Rank 1.

From project controls to AI-enabled execution: building the decision backbone

Offshore wind projects have traditionally been overseen by project managers with combination of expert judgement, specialized tools and extensive coordination across engineering, procurement, construction and operations teams. Project teams already have access to schedules, cost reports, contract registers, risk logs, interface registers, supplier updates, engineering documents and field reports. The challenge is that these signals rarely come together at the right moment, in the right format, for the right decision.

A delay is a good example. Planning teams may see schedule slippage. Engineering teams may see a design change. Commercial teams may see contractual exposure. Finance teams may see contingency consumption. Each function sees part of the problem. Few see the whole picture. As a result, decisions are often slower than the project requires. By the time the information has been assembled, validated and escalated, the cheapest recovery options may already have disappeared.

This challenge becomes more acute as projects grow in scale and complexity. Offshore wind projects increasingly involve multiple EPC contractors, OEMs, marine contractors, grid operators and suppliers, each operating with different systems, reporting structures and contractual incentives. Coordinating these interfaces is often more difficult than solving the underlying technical issue.

The opportunity for AI is not to replace project managers or automate project delivery. It is to help project teams connect information faster, understand consequences earlier, and make better-informed decisions.

Consider a foundation design change identified during execution. Today, assessing the implications may require multiple teams to manually review schedules, contracts, procurement plans, vessel availability and risk registers. An AI-enabled project environment can help assemble that information automatically, identify affected interfaces and quantify potential schedule, cost and contractual impacts before the issue reaches a governance forum.

The benefit is not limited to automating analysis. What matters is improving the speed and quality with which issues are assessed, discussed and resolved. This distinction matters because the survey highlights a recurring industry weakness: organizations struggle most with the capabilities they consider most important for future success. Decision quality, decision speed and integrated project controls all rank among the largest performance gaps.

AI is therefore best understood as an enabler of stronger project controls rather than a standalone capability. It helps project teams spend less time collecting information and more time acting on it.

Generative and agentic AI can strengthen project governance across three complementary capability layers:

- **First, a data and integration layer:** This layer connects schedules, cost systems, contract registers, interface logs, supplier updates and field reports into a shared operational view. Its role is not to replace existing systems, but to eliminate the manual effort required to reconcile multiple versions of project reality across functions and contractors. This layer relies on a governed semantic model that provides common definitions for key project entities such as schedules, contracts, changes, risks and interfaces.
- **Second, a project control and decision layer:** This is where AI creates the greatest value. It helps detect material deviations, assess cross-functional impacts across cost, schedule, risk and contracts, and prepare decision-ready options for project teams and governance forums. Rather than generating additional reporting, the objective is to provide a clearer view of what has changed, why it matters and which decisions require attention.

- **Third, an expert augmentation layer:** Project performance ultimately depends on scarce expertise. AI can reduce the time engineers, planners and project controls specialists spend gathering information, while capturing assumptions, decisions and lessons learned so they can be reused across projects rather than recreated each time.

Taken together, these capabilities are not intended to replace project teams or decision-makers. Their primary contribution is to shorten the time required to identify an issue, understand its implications and determine the appropriate course of action. In a sector where delays and design modifications can quickly propagate across suppliers, vessels, contracts and financing arrangements, even modest improvements in decision speed and coordination can have a meaningful impact on project outcomes.

Most tangible value for project management

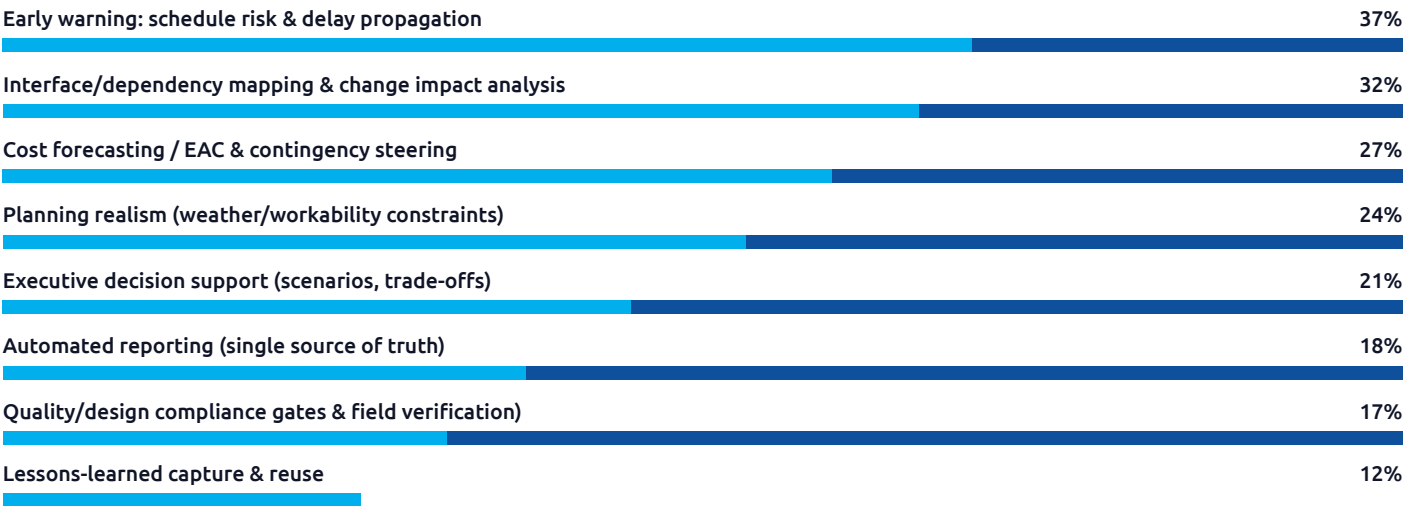


Figure 8 — Where would AI/digital deliver the most tangible value for project management

Source: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150). Q.E0, multi-select.

Adoption is real, but still focused on visibility rather than decisions

Digital and AI-enabled tools are already widely used across offshore wind projects. Nearly half of respondents use advanced planning and scheduling tools (46%), while 41% rely on automated progress tracking and reporting solutions. However, most deployments remain focused on monitoring and visibility. Far fewer organizations have embedded AI into risk anticipation, impact assessment, change management or decision support. Only a minority (10%) report that AI capabilities are fully integrated into day-to-day project operations, while a further 26% have deployed them at scale across multiple projects. The remaining 64% are still operating through pilots, isolated implementations or early experimentation phases, highlighting a significant gap between technology potential and operational deployment. (E0a)

Where the respondents see the greatest value of AI

When asked where artificial intelligence could deliver the most tangible impacts, respondents consistently prioritized use cases linked to anticipation and optimisation rather than administrative automation. Early warning of schedule risks (37%), interface management and change-impact analysis (32%) and cost forecasting (27%) all rank ahead of generic productivity applications.

Delays in offshore wind projects frequently originate from poorly understood dependencies, fragmented information flows and difficulties coordinating multiple stakeholders. These findings suggest that AI becomes valuable when it helps answer practical project questions: What has changed? Why does it matter? What are the likely consequences? What options are available? Who needs to decide?

The faster and more reliably those questions can be answered, the greater the opportunity to protect project economics. Agentic AI could further strengthen these capabilities by connecting previously separate workflows. Rather than analysing isolated datasets, agent-based systems can orchestrate multiple sources of information and specialized models to provide a more integrated view of project management. For example, a potential schedule delay could automatically trigger dependency assessments, procurement reviews and engineering impact analyses, helping project teams evaluate consequences and response options more rapidly.

AI adoption must be governed as part of project management. In offshore wind, AI recommendations can affect commercial decisions, contractual notices, schedule re-baselining, contingency use and safety-critical operations. AI should therefore be deployed as decision support, not delegated accountability. Major decisions require human ownership, audit trails, model validation and clear escalation rights. In multi-party projects, data access must also be governed through role-based permissions, cybersecurity controls and contractual rules for how shared project data can be used.

Capgemini frames this discipline around the concept of an agentic control plane: a governance layer that defines, for every agent, what data it can access, what actions it can take autonomously, and where a human must approve before anything is executed. Without such guardrails, the risk is not too little automation but too much of the wrong kind, hundreds of employees and agents operating with effectively unlimited rights across sensitive project, cost and contract data. The control plane, not the underlying AI model, is what determines whether agentic AI can be trusted with governance-critical decisions.

The real barrier is data

AI won't fix offshore wind until the data is connected

Industry interest in AI is already strong with nearly two-thirds of executives believing AI could materially improve project management or unlock significant additional value, while more than half consider their organization more advanced than its peers in AI adoption. (Q.F0)

Despite this optimism, respondents consistently identify data-related challenges as the main obstacles to scaling AI. Data quality and availability (22%), data ownership and access across partners (17%), and fragmented technology environments (17%) (Q.E2).

This goes beyond a compliance consideration. Supporting better decisions requires reliable information across schedules, costs, contracts, risks and interfaces, because confidence in any recommendation depends on the quality of the data behind it. When information is fragmented or inconsistent, the challenge is not simply analytical accuracy. It becomes harder to assess trade-offs such as accelerating a schedule while managing the associated cost impact or evaluating whether a design change justifies the additional delivery risks it may introduce. These are precisely the types of decisions executives consider most critical, which is why improving data quality should be viewed not only as an enabler of advanced analytics, but as the foundation for more informed and transparent decision-making.

Much of the challenge, however, extends beyond technology. OEMs, EPC contractors and specialist suppliers often have contractual incentives to protect performance, cost and operational information that they consider competitively sensitive. Reluctance to share data is therefore as much a commercial and governance challenge as a technology one, and it needs to be addressed through contracts and incentive structures, not only through better tooling.

For this reason, the industry's AI challenge is increasingly a data and governance challenge. The value of generative and agentic AI depends on reliable, accessible and connected data across owners, developers, EPC contractors and suppliers. Without these foundations, even the most advanced analytical capabilities struggle to move beyond pilots and isolated use cases.

At the same time, technology and data alone are rarely sufficient to close the gap. Even when information is available and digital tools are in place, project performance continues to depend on how engineers, project managers and contractors interpret and act upon that information. The ability to embed new ways of working, encourage adoption and integrate insights into day-to-day decisions therefore remains just as important as strengthening data infrastructure.

The next step is about embedding AI into operational processes and ensuring that information can flow across project boundaries. Organizations that succeed are unlikely to be those with the most sophisticated models. They will be the ones that create a shared, trusted and governed view of project information across the delivery ecosystem.

Where AI really creates value in offshore wind projects

The survey identifies what to prioritize and where respondents expect value. This section maps those priorities onto the physical stages of an offshore wind capital project and onto the seven failure patterns identified, using named, publicly documented deployments rather than generic technology claims.

Four phases, four AI levers

While individual AI applications are already in use across the industry, no operator has yet integrated them at scale across an entire project. This end-to-end integration remains the largest opportunity.

No single AI application is transformative on its own. Origination levers mainly compress time-

	01 Origination	02 Engineering	03 Development	04 Construction & Commissioning
AI APPLICATIONS	• Satellite & ML resource mapping • AI-driven geophysical interpretation • Automated EIA modelling	• Generative foundation design • Surrogate FEA/CFD models • Layout optimisation • GenAI engineering tools	• GenAI for tendering & document automation • Supply-chain optimisation • Logistics optimisation	• Weather-aware vessel scheduling • Autonomous drone inspection • Computer vision
ILLUSTRATIVE IMPACTS	<i>Site assessment reduced from months to hours, accelerating permitting preparation</i>	<i>–30% foundation steel mass and +7–18% engineering productivity</i>	<i>–10% logistics costs and 50% faster offer comparison</i>	<i>–13 to –15% installation costs and 70% faster inspections</i>
EXAMPLES	CLS SARWind Spinergie × Ocean Winds Microsoft × Venterra (INSPIRE)	Akselos × Shell/RWE/EDPR/Hexicon/Lamprell; DNV WindFarmer (340 GW reference dataset)	GE Renewable Energy/GE Vernova BCG procurement benchmark	Spinergie × Ocean Winds RWE × DTU Ørsted × Microsoft OxMaint

Sources: Capgemini Research Institute analysis of public operator and vendor disclosures (Akselos, Spinergie, DNV WindFarmer, GE Vernova, BCG, RWE/DTU, Ørsted/Microsoft, OxMaint, CLS, Microsoft/Venterra), 2024–2026. Magnitudes are indicative ranges from cited sources, not portfolio-level guarantees.

to-bid, engineering levers reduce structural CAPEX and lift energy yield, development levers protect schedule and procurement margin, and construction levers reduce campaign cost and risk premium. The cumulative effect across phases is what determines project economics, and it is only realized when each lever is industrialized rather than piloted in isolation.

Mapping AI to the seven failure patterns

While a range of solutions has been developed across the value chain, they do not fully address the key patterns identified in our analysis. The seven failure patterns do not require seven separate digital tools. They require a more integrated way of running project controls. For example, a potential delay in jacket fabrication could automatically trigger an assessment of vessel availability, offshore installation windows, contractual obligations and likely schedule recovery options.

Each function (planning, cost, risk, contracts, interfaces and change) needs to keep its own expertise, but the decision workflow must be connected. When one issue emerges, the project team should immediately see its impact across the full delivery and commercial system.

The prerequisite for all seven is the same one the survey identifies as the largest barrier: clean, governed, shared data across parties. Structured processes with clear decision points, integration across systems and stakeholders, and validation mechanisms that build trust are what convert a promising AI pilot into a scaled capability, without them AI pilots join roughly 95% that fail to scale industry wide.

Potential barriers & mitigation strategies

Data fragmentation: A developer may receive schedule data from one contractor, fabrication progress from another, vessel updates from a marine contractor and interface information from

a TSO, each using different structures, definitions, terminology and reporting cycles. The challenge is not integrate them but aligning on meaning (how do 'cost', 'schedule', 'risk', 'change' and 'interfaces' mean within the different contractors, suppliers and internal departments?). Mitigation: Establish a governed semantic layer that provides a common language for key project entities. This semantic layer should sit above the legacy systems providing the foundational capability for data integration, agentic reasoning and cross-stakeholder collaboration. Data governance by defined owners: ownership and management responsibilities over entities and domain must be designated to individuals (defined accountable owners). Focus initially on 1 or 2 high-value domains (schedule, cost, changes). Each agent should operate within an approved action catalogue, autonomy limits, source-of-truth hierarchy, escalation rules and human approval points. Every signal, data source, recommendation, escalation and human decision should be logged. This audit trail is not an administrative requirement; it is what makes agentic execution defensible in a multi-contract offshore wind environment where decisions can affect claims, contractual notices, contingency consumption, financing confidence and regulatory accountability.

Legacy IT Estate Barrier: The obstacle is not only fragmented data, but the difficulty of interacting with engineering CAD or CAE, ERP and document systems to automate tasks (many offshore wind IT estates were not built with APIs or automation in mind). Mitigation: the systems shall expose interfaces with API's and Or MCP.

Resistance to Automation Barrier: Project managers worry AI decision support will reduce their role. Mitigation: Position AI as decision support, not replacement. Frame it as freeing PM time from data compilation for strategic oversight.

FAILURE PATTERN	AI-POWERED RESPONSE	ILLUSTRATIVE EFFECT
 Late design freeze & cascading rework	 AI design-compliance checking against procurement, construction and vessel constraints	 Earlier freeze decisions with quantified trade-offs
 Multi-party coordination failure	 Interface agents monitor cross-contractor milestones, RFIs, handoffs and data dependencies	 Coordination-driven delay reduction thanks to one shared view of interfaces risk
 Unrealistic scheduling	 Schedule health & delay propagation agents test schedule realism against weather, vessel availability and supplier readiness	 Risk-triggered re-sequencing before slippage becomes embedded
 Fragmented data & slow decisions	 Integration layer connects P6, ERP, contract registers, risk logs, supplier data and field reports	 Decision packages built in hours, not weeks
 Weak governance & unclear accountability	 Governance agent routes issues based on thresholds, authority limits and escalation rules + decision tracking	 Risk flags surface weeks before threshold breach, not after
 Change management circumvention	 Digital change control with automated cost/schedule/contract impact quantification	 Less informal scope creep and stronger claims defensibility
 Knowledge silos & repeated mistakes	 Project memory captures across inspection reports, RFIs and delay logs prior delays, claims, workarounds and lessons learned	 Reuse of institutional knowledge across projects and portfolios

Sources: Capgemini Research Institute analysis; Vind AI multi-developer platform case (TotalEnergies, Corio Generation, EnBW, RWE, Statkraft); vessel-scheduling optimisation studies (J. Marine Sci. & Eng., MDPI, 2026).

Model Accuracy Barrier: Offshore wind projects are bespoke; historical models may not generalize to new projects. Mitigation: Use ensemble models combining historical patterns with project-specific inputs. Maintain human review of all AI recommendations.

Governance Complexity Barrier: Multi-party delivery makes change difficult. Mitigation: The minimum is to Anchor delivery of Data all along the project with the associate legal discussion around the right to use the data. Make AI recommendations visible to all parties simultaneously.

Capability Gap Barrier: In-house teams lack data science expertise. Mitigation: Partner with external vendors initially, with knowledge transfer. Hire 1-2 core data science practitioners in-house.

These six barriers concern AI adoption itself. They sit alongside broader commercial and technical challenges already inherent to offshore wind

delivery, which AI and digital tools can help manage but do not remove: higher installation costs, particularly the complexity and cost of foundations in deeper water; the cost and economic viability of floating platform technologies where needed; transport and logistics complexity, since offshore projects generally require full turbine assembly before towing and installing offshore, unlike onshore wind; the added engineering complexity this creates, requiring closer collaboration with floating-foundation technology providers where relevant; higher operations and maintenance costs for offshore assets; and delays and uncertainty tied to permitting processes and auction timelines, which can materially affect project economics and investment decisions. Keeping this structural, industry-level layer distinct from the five AI-adoption barriers above helps target mitigation effort where it belongs, while recognizing that better data and project management intelligence make each of these underlying challenges easier to plan for and absorb.



Five moves to industrialize offshore wind execution

The starting point is redesigning the project management operating model in which an “AI-enabled” Integrated project control and decision system can work safely: common data definitions, contractual data access, clear decision rights, escalation rules, human approval points and board-level metrics. AI then becomes an accelerator of that model, not a substitute for it. The five moves below describe how developers can move from fragmented project controls to an integrated project control and decision system that improves decision speed and quality.

1. Stop committing commercially before the design is mature

The survey leaves little room for ambiguity. Late design freeze is the most widespread execution issue reported by 92% of respondents and one of the most expensive. This is particularly important for foundations, substations and export cable systems, where late design changes can create disproportionate downstream consequences.

Developers often face pressure to accelerate procurement and commercial commitments before engineering maturity is fully established. In the short term this creates the appearance of progress. In practice it frequently shifts cost and risk downstream into procurement, installation and commissioning. The objective is not to eliminate change but to ensure that major design decisions are taken before they become expensive to reverse.

AI can help by quantifying the schedule, cost and interface consequences of design changes earlier, allowing teams to freeze critical decisions

with greater confidence. Offshore wind project governance typically combines multiple EPC contractors under an owner’s overall orchestration, with the owner generally responsible for the heavy transport vessels that connect them. Managing these interfaces and continuously updating the schedule is essential to absorb weather variability, since offshore installation windows are inherently weather-dependent. Components also typically move twice (from manufacturing site to assembly site, then from assembly site to the offshore location) so manufacturing and assembly capacity must be planned jointly with erection rates, local-content requirements and weather forecasts, not in isolation. An agentic scheduling capability that combines fabrication and assembly plans with weather forecasting can already be used to stress-test scheduling assumptions and local-content trade-offs at tender stage, giving developers a materially more realistic view of what a project can deliver before contracts are signed.

2. Manage the project as a system, not as a collection of contracts

Offshore wind projects need one common view of schedule, costs, risks, interfaces, field progress, contracts and changes across the full delivery chain. Fabrication yards, ports, vessel operators, OEMs and grid operators all contribute to the final outcome. This does not require one single platform for everyone, but it does require common data definitions, clear ownership and a governed integrated project control and decision system that creates a shared version of the project delivery truth. It gives the AI agents a governed way to reason across them.



This backbone matters most at the interfaces between EPC contractors. With an owner typically orchestrating several contractors rather than a single one, each contractor's schedule and quality decisions affect the others, and the owner carries the cumulative risk. A shared data environment with clear, contractually defined data exchange, from OEM, to contractor, to system integrator, to operator, is critical to manage these interfaces; several publicly reported system-integration delays in offshore transmission projects have been traced back to late or incomplete data inputs from upstream suppliers. Making this exchange an agentic "Digital Thread", continuously updated layer rather than a periodic manual reconciliation is what turns a shared data environment into a shared project governance backbone.

3. Treat project data as a contractual deliverable

Most discussions about AI focus on technology. The survey suggests the biggest issue (56%) is access to reliable data. Developers cannot manage what they cannot see. Yet critical project information often remains fragmented across contractors, suppliers and internal systems, with different definitions, reporting cycles and ownership rules. Data requirements should therefore be treated like any other project deliverable. Contracts should define what data must be provided, when it must be provided, how it should be structured and under which conditions it can be used.

Without this foundation, digital tools can improve visibility but will struggle to improve decisions.

4. Make decisions when the risk appears, not when the steering committee meets

Many projects still rely on monthly governance cycles. The problem is that execution risk does not. A vessel breakdown, a cable manufacturing delay or a seabed condition issue can create significant downstream consequences long before the next steering committee takes place. The role of project

controls should therefore evolve from reporting what happened to identifying what requires attention now.

Technology can support this shift by highlighting material deviations, assessing their consequences and preparing decision-ready information before issues become difficult or expensive to recover from. Only 5% of executives rank AI controls as the single most differentiating capability, yet AI underpins the top three (Risk anticipation & early warnings, Data-driven execution excellence, Interface management & accountability).

5. Put project management intelligence on the board agenda

Offshore wind companies devote significant attention to markets, regulation, financing and technology. Execution deserves the same level of attention. The survey shows that the strongest future differentiators are not new turbine designs

or new digital tools. They are capabilities such as risk anticipation, data-driven project management and effective interface management.

Anchor AI on the three highest value pools: Concentrate on early warning (37%), interface & change impact (32%), and cost forecasting / EAC (27%). These three map directly onto cost and design alignment, the two worst-performing dimensions.

Boards and investment committees should therefore track leading indicators of project management health with the same discipline applied to financial performance, and treat project management intelligence as a strategic capability, not a project control function.

The objective is not to become “AI mature”. The objective is to become performant, with AI embedded where it improves anticipation, coordination and decision quality.



Conclusion: Execution certainty as a competitive advantage

Offshore wind is no longer constrained primarily by turbine maturity or installation know-how. The survey of 150 senior offshore wind professionals points to a different bottleneck: the ability to freeze design earlier, coordinate a fragmented ecosystem, anticipate risk and decide before cost and schedule impacts become irreversible.

The evidence is consistent. Only 13% of respondents rate recent projects as performing well on costs and 55% report a significant gap between the asset designed and the asset delivered. The causes are largely internal: engineering rework and late changes are cited more often than supply chain disruption, and 92% observe cascading rework from late design freeze. The industry knows what it needs: decision speed and quality is ranked the single most important capability for the next five years. And 17% believe they have it today. The gap, 40 points is the widest in the study.

This has moved beyond a delivery concern. In a market where auction prices are tight, financing costs remain elevated and contingencies remain under scrutiny, execution performance now shapes financing conditions directly. Late design changes, unresolved interface risks and schedule slippage increase contingency requirements, delay FID and compress equity returns. Execution certainty has become part of the investment case, not only a delivery requirement.

Technology matters here because it addresses the industry's weakest capability directly. But the differentiator is not AI in isolation: only 5% of respondents name AI-powered controls as the single most differentiated capability. What differentiates is the ability to embed AI inside an



integrated project control and decision system that connects shared project data, detects weak signals, reasons across planning, costs, risks and contracts, triggers human decisions and preserves the audit trail. Today 64% of deployments remain pilots or isolated implementations. The organisations that succeed will not be the ones with the most sophisticated models, but the ones that created a shared, trusted and governed view of project information across the delivery ecosystem.

To turn this advantage into reality, executives must act differently now. They should:

- Treat execution certainty as part of the investment case, not only as a delivery metric. FID readiness should include evidence of design maturity, schedule realism, interface control & contingency discipline.
- Lead the ecosystem, not only the internal project team. Developers should set the execution rules for OEMs, EPC contractors, marine contractors and critical suppliers before problems emerge.
- Contract for the data needed to manage the project. The test is simple: if a supplier withholds it, is that a breach or a negotiation? If it's a negotiation, the obligation was never contractual.

- Shift governance from reporting to decision-making. Set the escalation threshold, not the meeting calendar. If a risk can only be tabled at the next steering committee, governance is a constraint.
- Use AI first where it improves judgement. The highest-value use cases are early warning, interface mapping, change impact, cost forecasting and decision support, not generic productivity.

Execution certainty will increasingly influence bid discipline, contingency levels, FID readiness and lender confidence. The next cost benchmark in offshore wind will not only be set by turbine scale, procurement leverage or cheaper financing, but also by developers that industrialize information management and turn project management and decision intelligence into a repeatable operating model across their portfolio. The question for executives is whether their organization has the operating model, contracts and governance needed to turn AI into better project management decisions.

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Primary source for all statistics unless otherwise noted: Capgemini Research Institute, Offshore Wind Capital Project Excellence Survey, April–May 2026 (n=150 senior offshore wind professionals, Europe).

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