Designing an AI-native future for maritime in the Middle East

Table of contents

01 The maritime industry at a turning point 03

02 Before AI comes readiness 04

03 The AI maturity curve 05

04 Turning readiness into operational reality 06

05 Where AI creates value today 07

06 What Middle East maritime leaders can do now and next 08

07 AI as a shared responsibility across the ecosystem 09

08 Leadership choices in an AI-enabled maritime future 10

01 The maritime industry at a turning point

The maritime sector, responsible for transporting over 80% of global trade, is undergoing one of the most consequential shifts in its history.[1] Markets are more volatile, regulations more complex and expectations for resilience, transparency and sustainability continue to rise. These pressures are reshaping how maritime organisations operate and how performance is measured across the industry.

A well-defined digital strategy is critical, providing the foundation to address these challenges and ensure technology investments deliver measurable, long-term value.

The acceleration of artificial intelligence (AI) has created an opportunity to rethink how maritime operations are planned, executed, monitored and governed. Rather than responding to change incrementally, AI makes it possible to redesign operating models to be more predictive, connected and resilient.

Globally, AI adoption is accelerating. More than 81% of maritime companies report they are piloting AI. However, many face challenges to move beyond pilot projects as optimism outpaces execution. According to the report Beyond the Hype: What the maritime industry really thinks about AI,[2] the maritime sector is both eager and cautious. The report indicates that while most organisations are optimistic about AI and actively running pilots, very few have the formal governance and policies needed to scale AI effectively.

In the Middle East, where GCC maritime regulators, port authorities and national logistics programmes are actively shaping ambitious futures for trade and logistics, AI has become a foundational driver of smarter, more automated, and more agile maritime ecosystems.

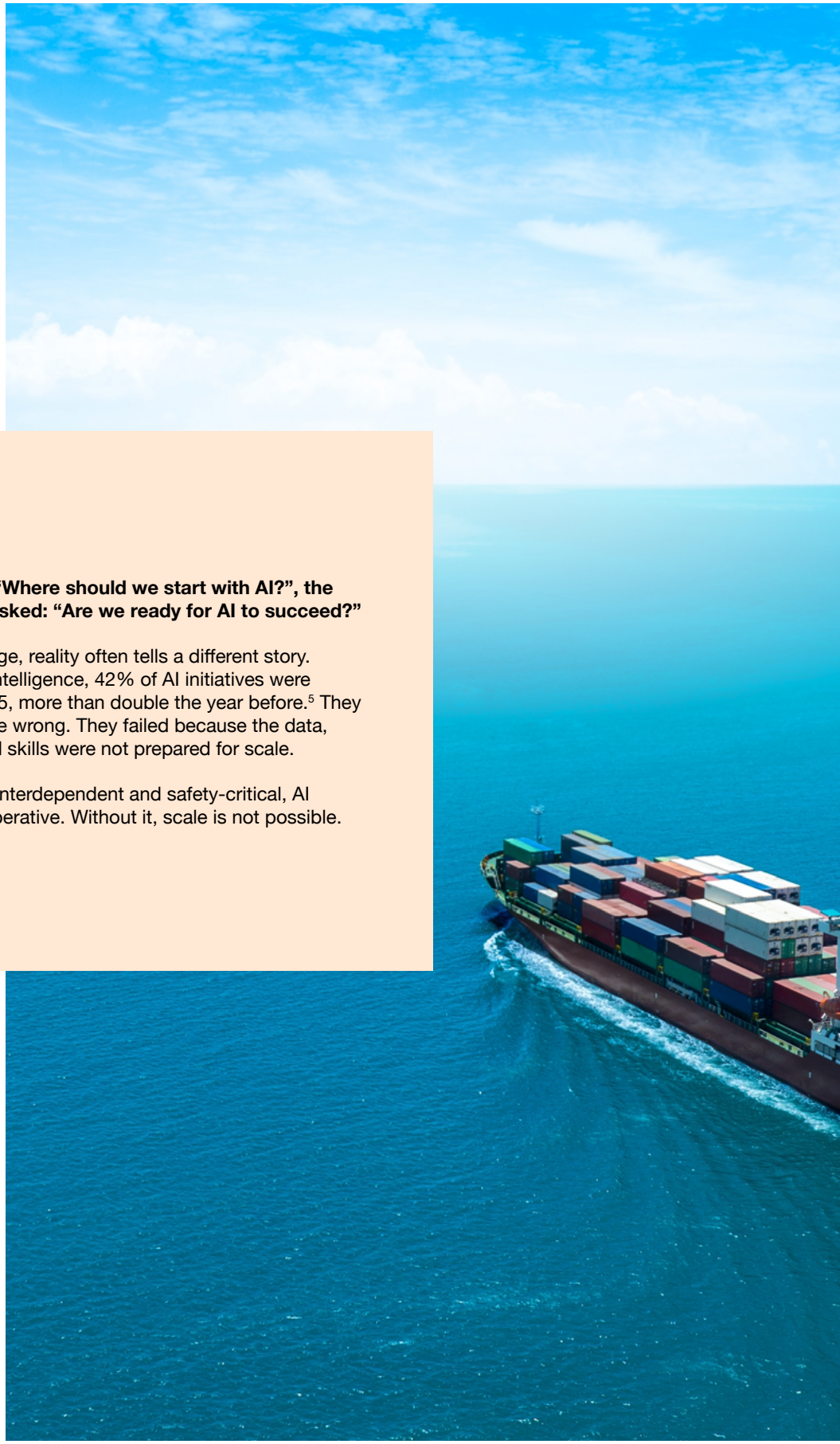
Saudi Arabia's push toward smart ports, underpinned by automation, IoT and AI is helping streamline trade flows, cut turnaround times, lower operating costs, and improve transparency, strengthening the Kingdom's appeal as a global shipping and logistics hub.[3] Across the region, similar momentum is visible in the deployment of AI-powered monitoring and automation technologies.

In the UAE, Dubai's launch of an integrated aerial monitoring system using autonomous drones and artificial intelligence is transforming port operations by enhancing real-time safety oversight, environmental monitoring, and infrastructure inspection.[4] These initiatives signal a shift toward intelligent, data-driven port ecosystems that improve efficiency, resilience, and sustainability across the maritime value chain.

Experience across the industry points to a consistent lesson. AI rarely fails because the technology does not work. It fails because organisations are not ready to support it at scale. Data, governance, operating models and trust across the ecosystem determine whether AI delivers lasting value.

This report explores how maritime leaders in the Middle East can move from experimentation to scale, strengthen AI readiness across the ecosystem, and design operating models where intelligence improves safety, resilience, efficiency and long-term competitiveness.

02 Before AI comes readiness



When maritime executives ask, “Where should we start with AI?”, the deeper question is often left unasked: “Are we ready for AI to succeed?”

While AI promises significant change, reality often tells a different story. According to S&P Global Market Intelligence, 42% of AI initiatives were abandoned after pilot stage in 2025, more than double the year before.[5] They didn’t fail because the models were wrong. They failed because the data, operating models, governance and skills were not prepared for scale.

In maritime, where operations are interdependent and safety-critical, AI readiness becomes a strategic imperative. Without it, scale is not possible.

03 The AI maturity curve

Before exploring implementation, it's essential to understand how AI capability evolves across the maritime ecosystem. In our work with global and regional maritime organisations, including regulators, terminal operators, logistics entities and national supply chain programmes, we see a consistent pattern of four maturity levels:

Digital foundations

Manual processes, siloed systems and inconsistent data dominate. Digital tools exist but are not integrated. Decisions are still intuition-driven.

Level 01

AI-ready organisation

Data becomes standardised, interoperable and governed. Digital culture begins shifting. Delivery models mature. GCC regulators and authorities participate in shaping acceptable AI use and digital integration standards.

Level 02

AI-augmented operations

Predictive, automated and optimisation tools are embedded in daily work. Documents, decisions, perception and planning increasingly rely on intelligent systems.

Level 03

AI-native ecosystem

Intelligence connects actors across the maritime value chain, including ports, shipping lines, customs, maritime regulators and logistics firms. Operations become anticipatory and largely self-adjusting.

Level 04

Most global and regional players sit between Level 1.5 and Level 2.5. The next leap is Level 3 – turning readiness into operational reality.

04 Turning readiness into operational reality

Once the foundations are strong, the tone inside an organisation shifts.
Conversations move from “What use case do we try next?” to “How does intelligence reshape our operating model?”

The organisations that scale AI do not rely on a single transformational programme.
They do it through intentional evolution – combining strategy, experimentation, governance and human capability.

In these organisations, AI is treated as a system capability rather than a collection of disconnected initiatives:

Linked explicitly to outcomes

Faster vessel turnaround, safer yards, cleaner compliance, more predictable flows

Aligned with national ambitions

In the GCC, for example, the drive to become more connected, resilient logistics hubs with world-class digital capability

Managed as a portfolio of bets

Ideas are tested, improved, or retired. Not all intelligence should scale and leaders know that

Governed with discipline

Explainability, bias checks, monitoring, cybersecurity and operational oversight become standard practice

Scaling AI is not an operational upgrade – it’s a leadership decision about how work, risk and accountability are structured.
The shift happens when leaders stop viewing AI as ‘projects’ and embed it into how decisions and operations are run.

05 Where AI creates value today

5.1 Generative and agentic AI understanding, explaining and coordinating work

Maritime operations generate more documents than almost any industry. From manifests to certificates to disbursement accounts, administrative friction slows down operations.

Generative AI becomes the linguistic and reasoning layer of the port by reading, validating, summarising, reconciling and drafting documentation across parties.

Agentic AI adds the power to act by triggering workflows, retrieving information, escalating exceptions, pre-populating forms and routing approvals.

The result is an environment in which documentation no longer 'slows the port down', and instead becomes a fluid, automated, trusted operational layer.

5.2 Combinatorics the art and science of optimal decisions

Every few minutes, ports and shipping operations face a complex decision:

- Where should containers be placed?
- Which sequence minimises reshuffles?
- Which berth assignment optimises time windows?
- How should inspections be prioritised?

Optimisation AI is the decision engine, evaluating millions of possible combinations to find the most efficient solution. It transforms decisions from human intuition to mathematically superior outcomes, creating unprecedented precision and flow.

5.3 Computer vision the eyes and awareness of the ecosystem

Much of maritime reality is visual. Cameras, drones and sensors capture information that was once overlooked or too laborious to examine. Computer vision turns this into actionable insight.

It becomes the perception layer – spotting safety risks, tracking movements, monitoring compliance and enabling remote inspection. Ports equipped with strong vision capabilities operate with situational awareness that human-only oversight cannot match.

5.4 Classical machine learning the predictive pulse of operations

If optimisation answers, 'what is the best next move?', machine learning answers 'what will happen next?'

Machine learning anticipates congestion, equipment failure, volume patterns, risk levels and resource needs. It gives ports the ability to plan, rather than react. Together, these four intelligences – language, optimisation, perception and prediction – form a connected ecosystem capable of understanding, anticipating, coordinating and acting.

06 What Middle East maritime leaders can do now and next

AI in maritime is often described as futuristic. In practice, many high-value capabilities are already delivering results. For ports in the GCC with the right foundations for AI, the opportunities for capturing value will continue to evolve as the technology matures.

Available today (0-12 months)

This focuses on proven, near-term use cases that deliver immediate efficiency, cost, and risk benefits.

- Automated documentation checks
- AI-enabled customs clearance
- Predictive maintenance
- Yard and stacking optimisation
- Safety and security vision systems
- Empty container forecasting
- Automated disbursement reconciliation

Emerging (12-24 months)

This represents the phase where AI begins to connect systems, partners, and decisions across the port ecosystem.

- Cross-ecosystem port call optimisation
- Integrated digital twins with predictive behaviours
- Multi-party estimated time of arrival (ETA) synchronisation
- AI-supported regulatory risk engines
- Semi-autonomous yard flows

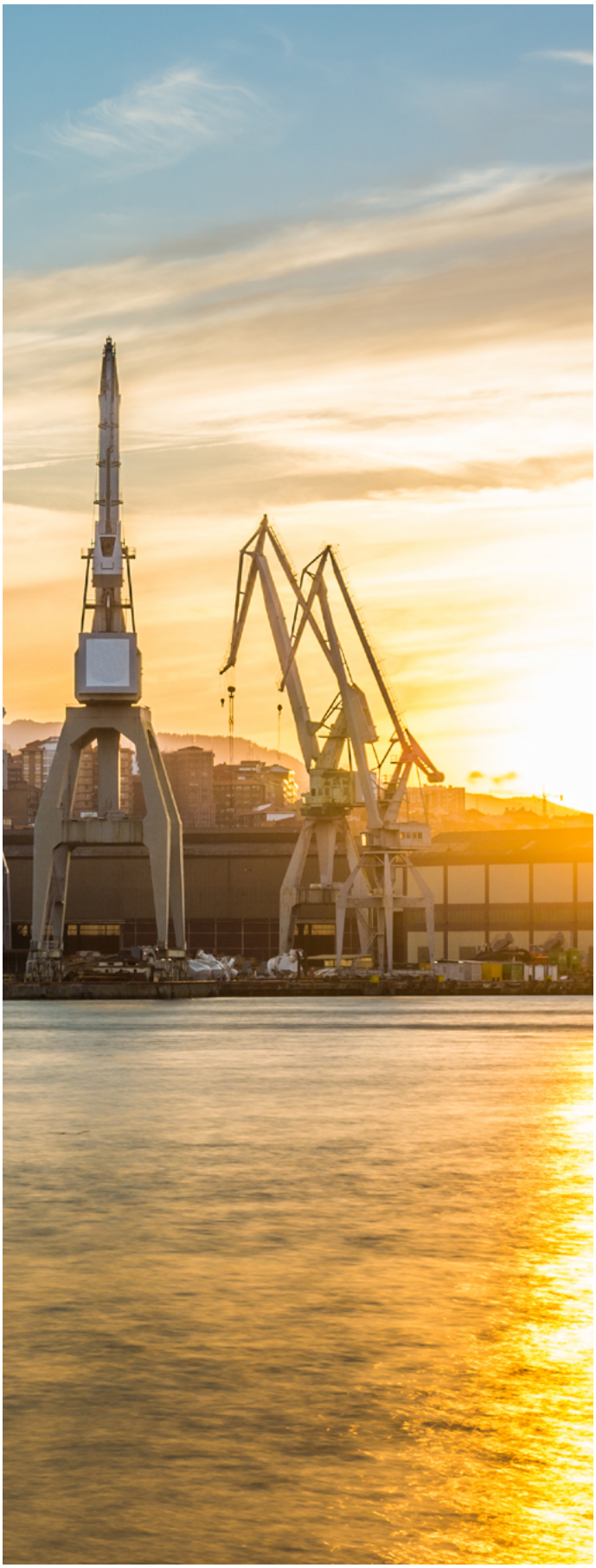
Horizon (24-36 months)

This reflects the future state of AI-native maritime operations.

- Agentic orchestration of entire port call workflows
- Real-time cross-border maritime compliance engines
- Autonomous gate and yard operations
- Fully AI-native Port Community System (PCS) ecosystems

This timeline helps leaders anchor expectations, sequence investment and avoid premature bets.

07 AI as a shared responsibility across the ecosystem



AI transformation in maritime will not be achieved by any single authority, operator, port, terminal, or shipping line. It depends on deliberate coordination across operators, regulators and policy makers.

Shipping lines contribute operational data that fuels optimisation and prediction

Ports and terminals orchestrate flows and set technical and data standards that enable ecosystem-wide intelligence

Customs and border authorities drive AI-enabled compliance and shape what automation is permissible

Maritime regulators and authorities in the GCC and broader region determine legal acceptance, safety thresholds and transparency norms for AI systems

Policy makers create the incentive structures that accelerate innovation, research and cross-border alignment

Progress will be defined by ecosystem coordination, not isolated capability.

08 Leadership choices in an AI-enabled maritime future

The leaders who will shape the next era of maritime operations understand that AI is not a tool. It's a way of organising decisions, accountability and risk.

A commercial mindset

AI not as a cost, but as a value generator, creating new revenue streams for maritime organisations, including:

- Predictive ETA APIs
- Carbon optimisation advisory
- Premium safety monitoring services
- Trade facilitation insights for governments
- Predictive maintenance analytics for fleet customers

The commercial angle is no longer optional, and it will differentiate competitive ports.

A workforce evolution

Humans are augmented, not replaced, as AI redefines roles:

- Operators become AI-enabled decision-makers
- Planners become scenario conductors
- Inspectors become risk analysts supported by AI
- New roles emerge including AI safety officer, data steward, digital berth planner

In the GCC, where workforce nationalisation and capability-building are priorities, AI becomes a platform for talent development, not displacement.

Governance as the foundation of trust

Maritime organisations and regulators must co-create:

- AI assurance frameworks
- Explainability standards
- Oversight principles
- Model drift, monitoring and retraining requirements
- Safety, liability and auditability constructs

Trust determines whether maritime AI is accepted, scaled and sustained

The final step of becoming AI-native

An AI-native port or maritime ecosystem is one where:

- Intelligence flows across actors
- Decisions update automatically
- Compliance is continuous
- Risk is anticipated, not discovered
- Operations synchronise without human choreography

Achieving this requires intent, discipline and follow-through. It's a design choice.

AI is the new operating logic of maritime operations, making the industry more connected and resilient. The maritime industry was built on centuries of navigation. Its next era will be defined by how effectively intelligence is embedded across the maritime ecosystem.

References

1. https://unctad.org/news/navigating-future-how-ai-big-data-and-autonomous-systems-are-reshaping-maritime-transport

2. https://www.zawya.com/en/business/technology-and-telecom/maritime-firms-struggling-to-scale-ai-despite-high-enthusiasm-says-report-ick9p1au

3. https://www.arabnews.com/node/2595302/business-economy

4. https://gulfnews.com/business/dubai-launches-regions-first-ai-powered-drone-system-for-smart-port-monitoring-1.500310414

5. https://www.ciodive.com/news/AI-project-fail-data-SPGlobal/742590/

Contact us

Abdel Raouf ElOr
Partner, Technology Consulting, PwC Middle East

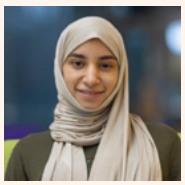
Sharang Gupta
Partner, Technology Consulting, PwC Middle East

Dipesh Guwalani
Senior Manager, Technology Consulting, PwC Middle East

Daniel Poots
Manager, Digital Innovation, PwC Middle East

Contributors:

Manu Gupta
Manager, PwC Middle East



Hawra Aljawad
Associate Consultant, PwC Middle East

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