

Maritime Intelligence: Transforming Data into Smarter, Greener and More Resilient Operations

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Maritime Intelligence

Outline

1. The Case for Maritime Intelligence
2. Data as the Starting Point
3. From Data to Decisions
4. Testing and Securing Operations
5. Enabling Greener Maritime
6. Türkiye's Transformation Journey
7. The Way Forward



From Traditional Operations to Intelligent Maritime Ecosystems

Paradigm shift in Maritime

The maritime industry is moving from:

Manual → Automated

Reactive → Predictive

Fragmented → Connected

Data Collection → Data-driven Decisions

Digital transformation enables:

- Operational excellence
- Sustainable shipping
- Higher competitiveness
- Resilient supply chains



The real starting point: Data

AI Starts with Data, Not Algorithms

Maritime operations generate enormous amounts of data from:

- Vessels
- Ports
- Terminals
- Cargo systems
- Weather and ocean conditions

The challenge is not collecting data.

The challenge is:

Can we transform fragmented data into trusted operational intelligence?



Building Trusted Maritime Data Ecosystems

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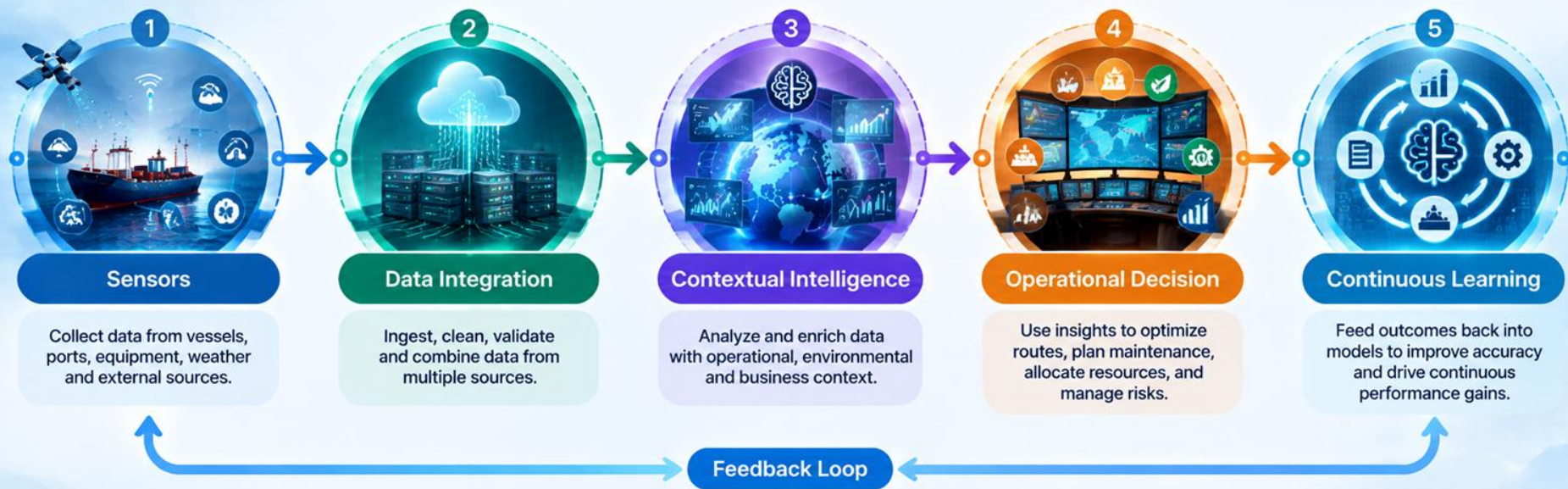
From fragmented data to shared decisions

Five foundations:



The value is created only when raw data becomes a contextualized action.

From Raw Data to Operational Intelligence



AI Applications for Maritime Competitiveness



Operational Efficiency

Optimize:

- Vessel scheduling
- Port operations
- Resource allocation



Cost Reduction

Reduce:

- Fuel consumption
- Downtime
- Manual processes



Sustainability

Improve:

- Energy efficiency
- Emission monitoring



Safety

Enable:

- Predictive maintenance
- Risk detection



Connecting Ships, Ports and People Through Digital Infrastructure

Digital Infrastructure Architecture

A Smart Maritime Ecosystem Requires:



Real-time sensing

Collect real-time data from vessels, ports, equipment and the marine environment.



Vessel sensors



Port infrastructure



Weather & ocean data



Satellite data



Secure connectivity

Transmit data reliably and securely across ships, ports and stakeholders.



Satellite communication



5G / 4G networks



Network infrastructure



Cybersecurity & data protection



Cloud intelligence

Integrate, analyze and transform data into actionable insights using cloud platforms and AI.



Data integration



AI & analytics



Fleet-wide models



Shared dashboards



Human decision-making

Enable crew, fleet operators, port authorities and stakeholders to make faster, safer and smarter decisions based on trusted information.



Crew operations



Port operations



Fleet & asset management



Customers & partners



AI Use Cases

Where AI Creates Value Across Maritime Operations



Vessel Operations

- Route optimization
- Fuel efficiency



Ports

- Berth planning
- Yard optimization



Cargo

- Visibility
- Exception management



Maintenance

- Predictive analytics



Testing Decisions Before Taking Action

Digital twins

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Ship Digital Twins

Support smarter vessel management through:

- Performance monitoring and optimization
- Predictive maintenance planning
- Fuel consumption analysis
- Emission reduction strategies



Port Digital Twins

Enable more efficient port operations by optimizing:

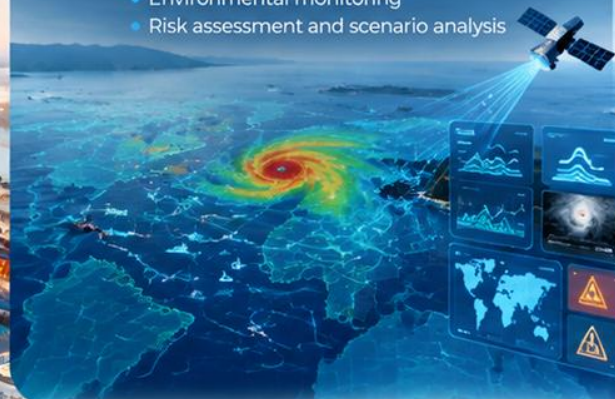
- Berth allocation and vessel turnaround
- Yard utilization and cargo flow
- Equipment performance
- Gate and terminal operations



Ocean Digital Twins

Improve maritime awareness through:

- Weather and ocean condition modelling
- Traffic prediction
- Environmental monitoring
- Risk assessment and scenario analysis



Digital Twins transform maritime operations from reactive management into predictive decision-making by allowing organizations to simulate, evaluate and optimize actions before execution.

More connectivity increases operational visibility — and also expands the attack surface

Digital Transformation Requires Digital Trust



More connectivity creates:

- More visibility
- More efficiency
- More cyber responsibility

Main risk categories

- DoS / DDoS attacks disrupting ship networks and operations
- Unauthorized access or insider threats manipulating critical systems
- Ransomware affecting digital workflows and business continuity
- Supply-chain compromise through weaker connected partners
- Data breaches exposing cargo, crew or operational information

AI as Enabler of Green Maritime Transformation



AI supports:

Fuel Optimization

- Dynamic route planning based on weather, currents and vessel performance
- Reduced fuel consumption through speed optimization

Emission Reduction

- Real-time carbon monitoring and emission forecasting
- Support for IMO decarbonization targets and regulatory compliance

Voyage Efficiency

- Predictive ETA management
- Optimized vessel scheduling and reduced waiting times

Regulatory Compliance

- Data-driven reporting for environmental regulations
- Improved visibility of carbon intensity and operational performance

Digitalization + AI + Data = More Efficient, Lower-Carbon Maritime Transport



Türkiye's Maritime Digital Transformation Journey

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Current Status

Turkish ports have established:



Port
Management
Information
Systems
(PMIS)



Terminal
Operating
Systems
(TOS)



Basic
automation
applications



Electronic
information
exchange
systems



Next step:

Moving from:

Port 4.0 → Smart Port Maturity



Data-driven
operations



Integration
and
interoperability



Advanced
automation
and AI



Sustainable
and resilient
ports



Supporting Ecosystem in Türkiye

| Key Stakeholders



TURKLIM

- Smart port roadmap
- Digital skills
- Port Academy



TÜBİTAK / UDHAM

- Maritime R&D
- AI technologies
- Smart systems



Ports & Industry

- Pilot projects
- Operational innovation



Challenges for Türkiye

1 Digital Maturity Gap

- Need for advanced automation
- Limited integration between systems



2 Data Management

- Lack of common data platforms
- Need for interoperability



3 Human Capital

Need for:

- Data analysts
- AI specialists
- Cybersecurity experts
- Digital terminal operators



4 Cybersecurity

Smart ports require:

- Secure data exchange
- Risk management
- Protection of critical infrastructure



The Transformation Gap: Beyond Technology



Data

Fragmented systems



Skills

Digital workforce shortage



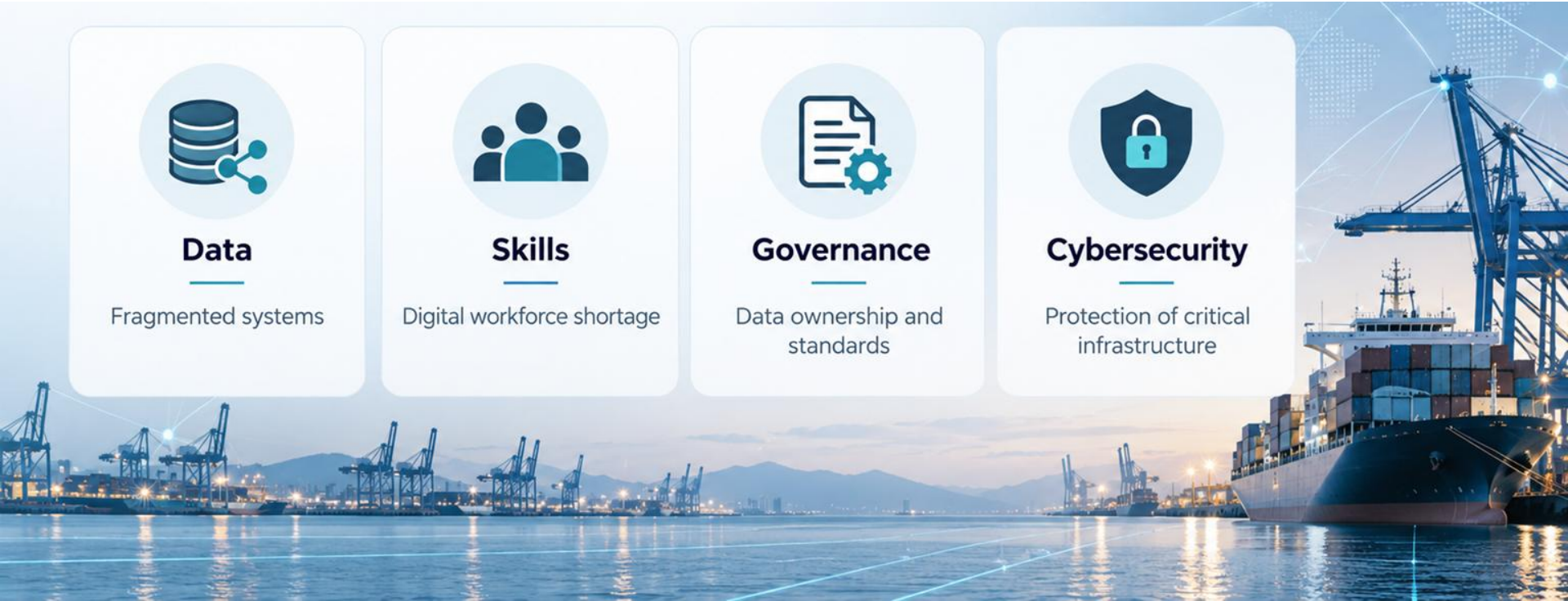
Governance

Data ownership and standards



Cybersecurity

Protection of critical infrastructure



The Future of Maritime is Intelligent, Connected and Sustainable

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Success requires:



Trusted Data



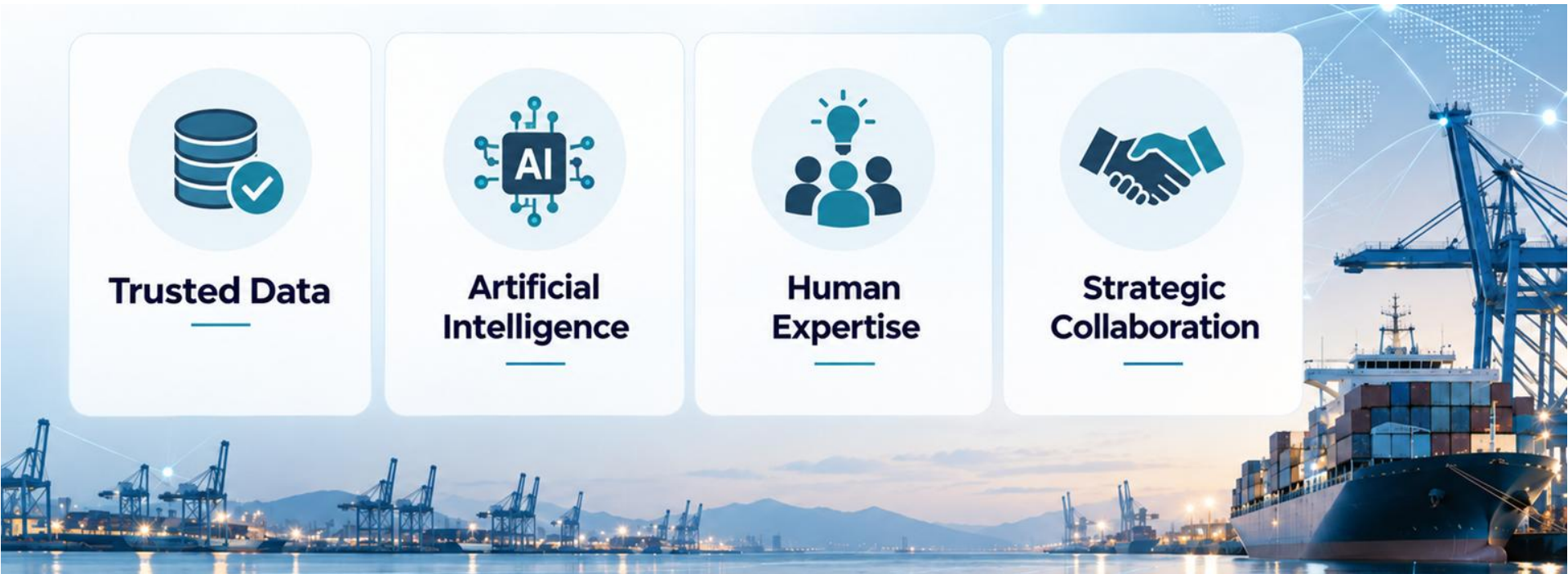
**Artificial
Intelligence**



**Human
Expertise**



**Strategic
Collaboration**



Thank you

