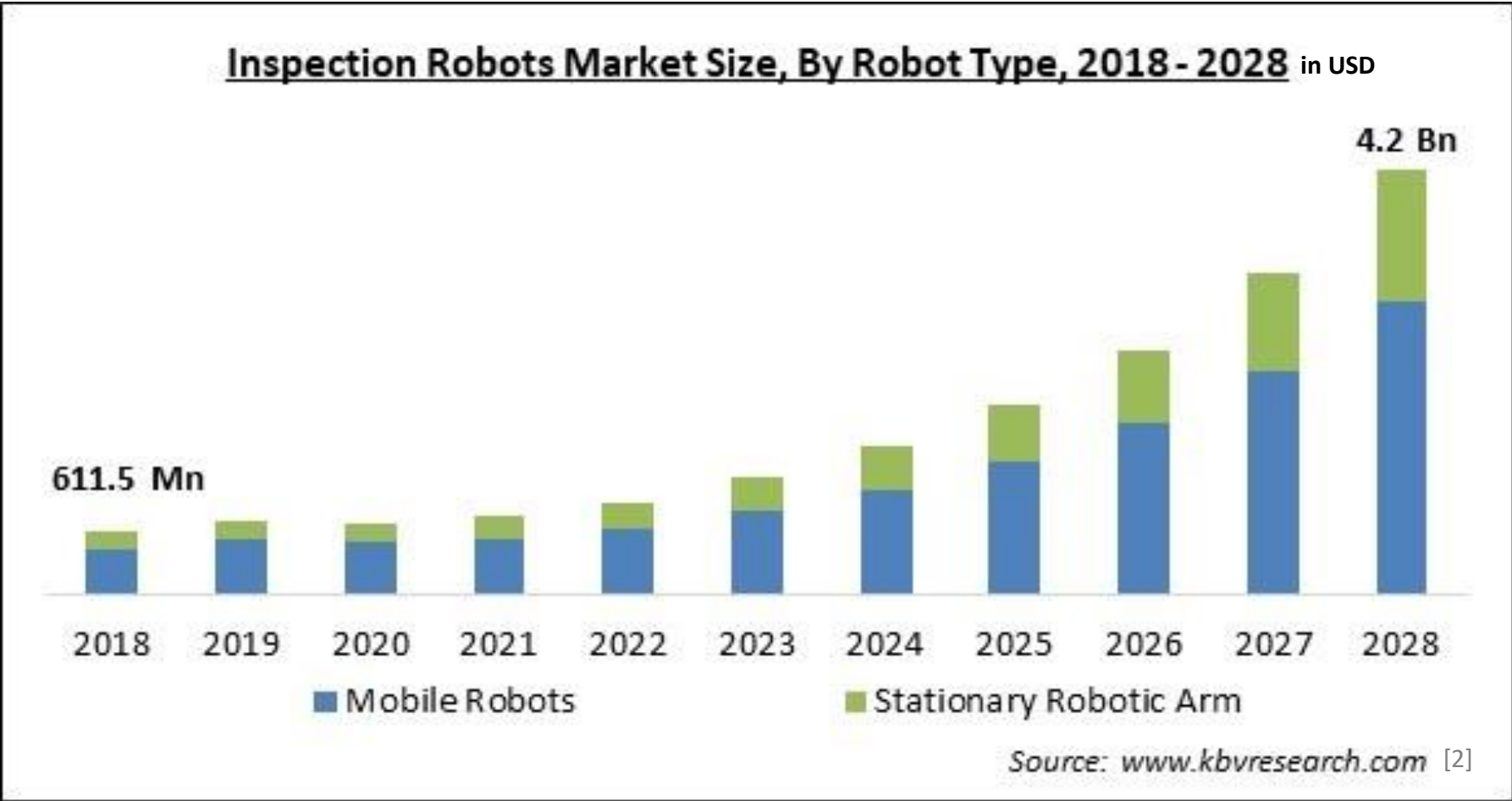# Use cases and cross-cutting challenges in ADR for inspection and maintenance

Aksel A. Transeth, SINTEF
I&M workshop on ADRA Forum 9 Nov 2023

ADR = AI, Data and Robotics

Inspection Robots Market Size, By Robot Type, 2018 - 2028 in USD

4.2 Bn

611.5 Mn

2018 2019 2020 2021 2022 2023 2024 2025 2026 2027 2028

■ Mobile Robots   ■ Stationary Robotic Arm

Source: www.kbvresearch.com [2]

The inspection and maintenance market is expected to reach **US$ 8.3 billion by 2030** [1]

[1] SNS Insider, https://www.snsinsider.com/reports/inspection-and-maintenance-robot-market-1364
[2] kbv research, https://www.kbvresearch.com/inspection-robots-market/

The most important common drivers for decision making in the petroleum and (petro)chemical industry

Improve Safety

Improve environmental performance

Increase operational efficiency

cost avoidance + cost reduction

Source:

SPRINT Robotics
Roadmap 2021

I&M market sectors for ADR technologies

35 % of the Horizon Europe's resources are committed to be spent on climate actions

Energy generation and distribution
Wind, solar, hydro, coal; power distribution (off-shore and on-shore infrastructure)

ENERGY

Oil & gas and chemical
Refining and distribution infrastructure, including off-shore and decommissioning

OIL & GAS

Nuclear
Life management, maintenance, in-service inspection, waste disposal, decommissioning

NUCLEAR

Transport, cargo and mobility
Large transport hubs like ports, airports and interchanges

HUBS

Water supply and sanitation
Sustainable, safe water infrastructures including clean water, wastewater and storm water

WATER

Urban
Buildings, local transport systems (trams, track and trackside equipment), bridges, tunnels and roads, rolling stock

TRANSPORT

Three main types of infrastructure in the industry and public sector – large variety

Assets and equipment

Pressure vessels, ship hulls, hydro turbines, flare stacks, aquaculture net cages, generators, pipe bends, storage tanks, …

Plants and areas

Electrical substations, offshore/onshore O&G platforms, harbors, nuclear facilities, power stations, buildings, airports, quay walls, …

Credit: D Sharon Pruitt

Long-distance / linear

Rail infrastructures, tunnels, bridges, dams, waterways, drinking water networks and installations, power lines, …

Test/simulate
process functionality,
visualization,
training, …

Monitor condition
and predict
plant/component
maintenance need,
detect anomalies,
estimate lifetime,
decision support…

In-field support from
off-field experts,
training, integration
with digital twins, …

Digital twins

**Predictive
maintenance
systems**

**Augmented
reality**

Key ADR technologies for I&M

*What
else?*

Robotics

**Autonomous
capabilities**

**Human-
machine
collaboration**

HW for mobility and
access, tooling,
sensors, support
infrastructure (e.g.,
charging),
communication, …

Path planning, task
planning, collision
avoidance, long-
term operations, …

Interaction via text
and speech, in-field
access to knowledge,
, …

Adra
The AI Data Robotics
Association

RIMA
ROBOTICS FOR INSPECTION
AND MAINTENANCE

eu ROBOTICS
TOPIC GROUPS

SINTEF

Business / industry acceptance

Change management, new business models, business readiness level, understand the risk of ADR, cost of robot ownership, …

Automatic data analysis

Interpretability and explainability, data quality and availability, model training automation, ownership of data, …

Standard-ization

verification and validation, testing procedures to prove capabilities and set requirements to suppliers, …

Robustness and reliability

Robust long-term autonomy, bad weather, ATEX, GNSS-denied, …

Sustainable deployments

Manage transition from one-off tests to ADR as standard tools in day-2-day operations

Integration

Integration into systems and operations, e.g., digital twins, plant management systems, work procedures, cyber security,…

Overall challenges for ADR technologies in I&M

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TOPIC GROUPS

Further reading …

- Challenges for robotics (incl. AI & data) defined in connection with the open calls from the RIMA project: https://rima-network.eu-robotics.net/open-call

- Major themes in I&M robotics (euRobotics Roadmapping process in 2022). Link here.

- Offshore Renewable Energy (ORE) publications. Link here.

Thank you!

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