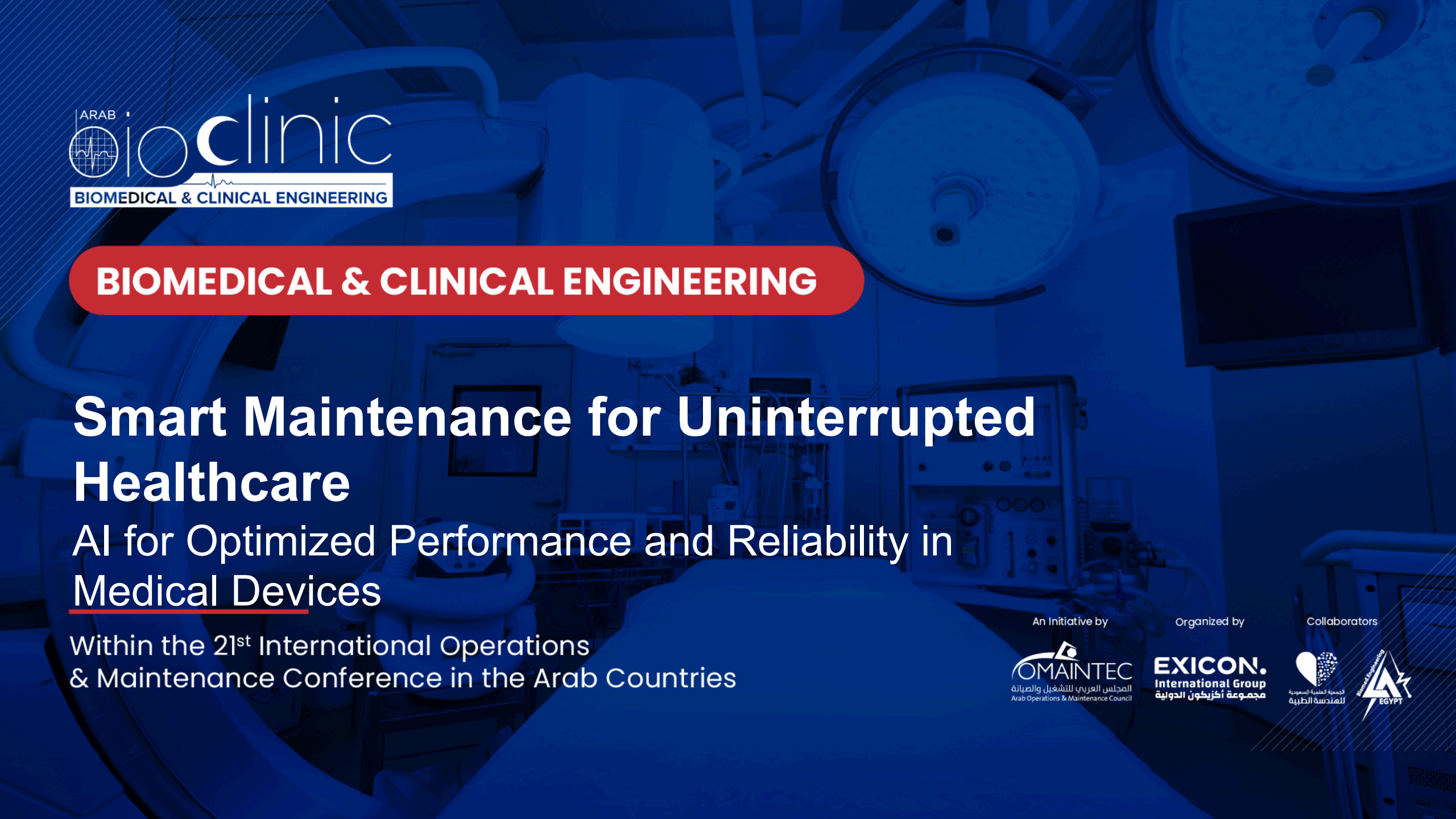
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BIOMEDICAL & CLINICAL ENGINEERING
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Smart Maintenance for Uninterrupted Healthcare
AI for Optimized Performance and Reliability in Medical Devices
Within the 21st International Operations & Maintenance Conference in the Arab Countries
An Initiative by
OMAINTEC
المجلس العربي للتشغيل والصيانة
Arab Operations & Maintenance Council
Organized by
EXICON.
International Group
مجموعة أكزيكون الدولية
Collaborators
EGYPT

Speaker

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Outline

- Introduction to Maintenance
- Smart Maintenance
- AI-Powered Performance Optimization of Medical Devices
- AI Integration for Enhanced Device Reliability
- Best Practices

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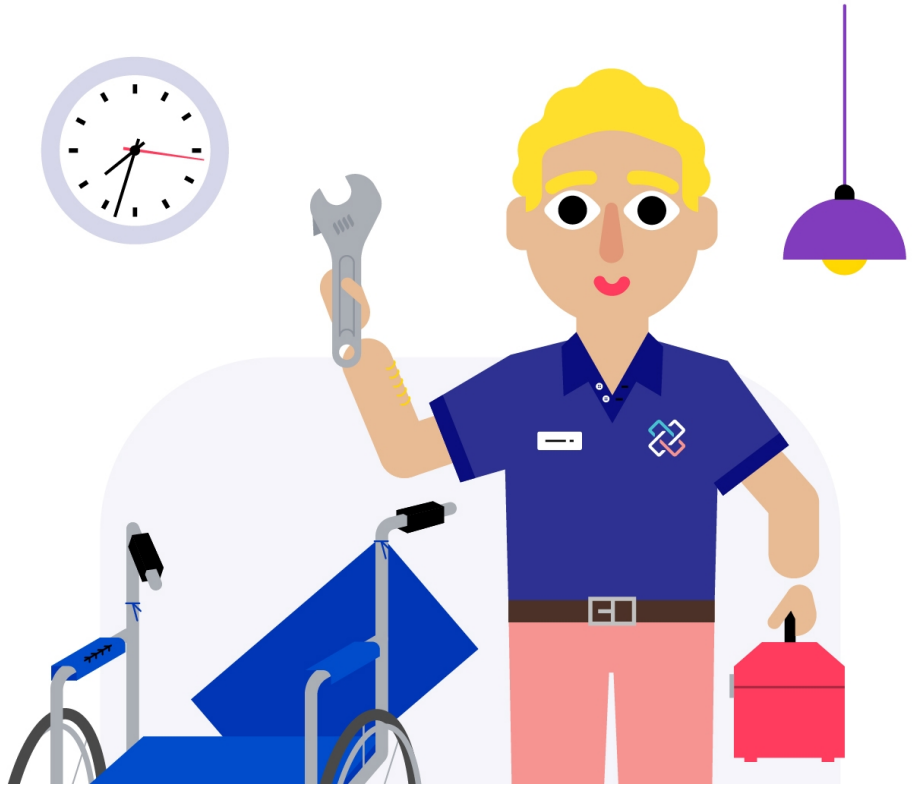
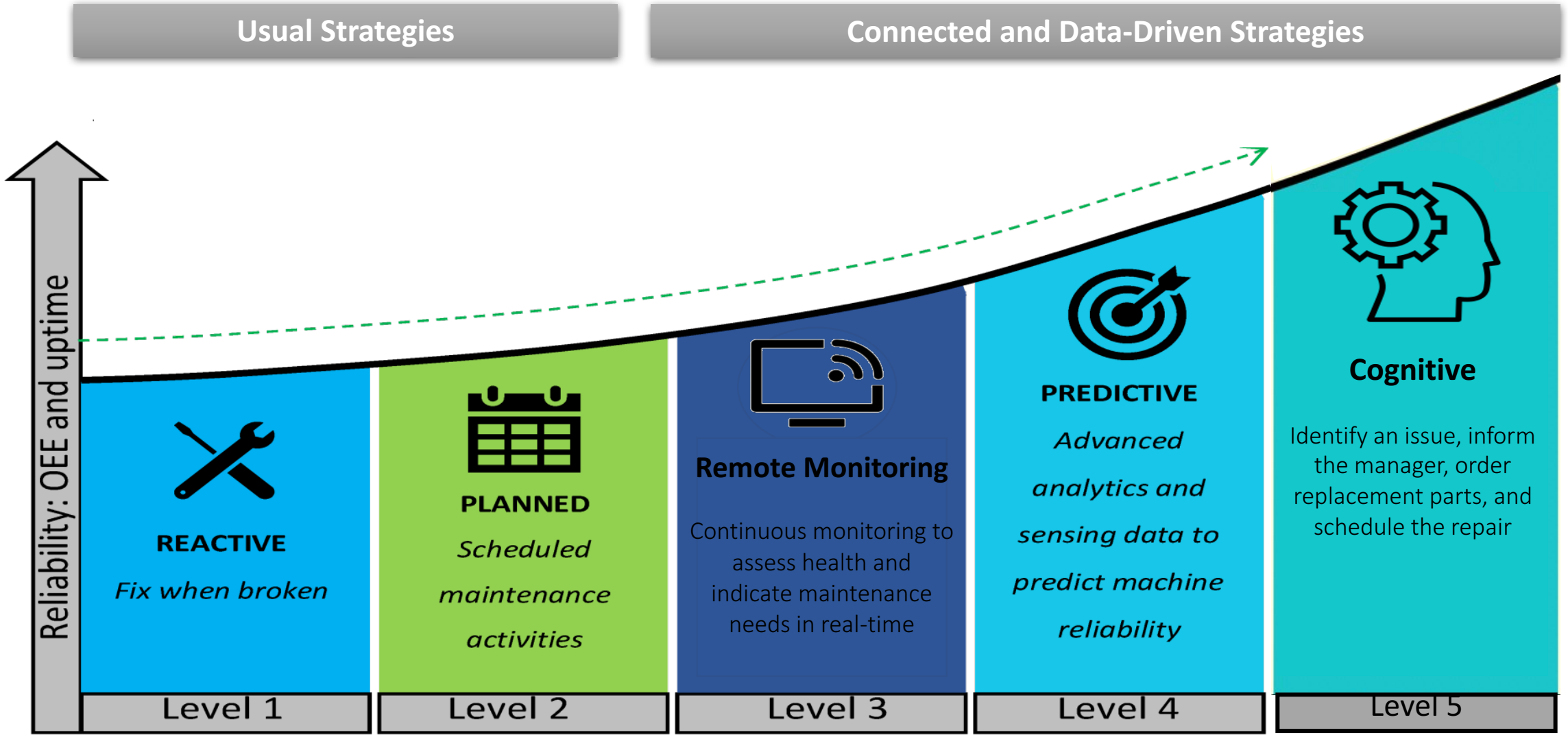
Maintenance

Maintenance in Healthcare

- Medical equipment plays a critical role in providing quality healthcare to patients.
- Maintaining optimal performance levels of the many machines, tools, devices, and medical equipment takes a dedicated effort.
- This is crucial to healthcare providers, as downtime in any single component within an operation can lead to costly complications.



Maintenance Strategies



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Maintenance Strategies Trade-offs

	Benefits	Challenges
Reactive	• Maximum utilization of tooling or machine components	• Potentially greater damage to machine beyond failed part • Unplanned downtime • Higher maintenance costs
Planned	• Less likelihood of broken machinery • Less unplanned downtime • More cost-effective than reactive	• Increased replacement costs over time • Need for additional spare parts inventory • Increased planned downtime
Proactive	• Longer lifespan of equipment • Decreased downtime, planned and unplanned • More cost-effective than run-to-failure or planned maintenance • Lower spare parts inventory	• Ongoing maintenance and monitoring • Need for organizational changes • Increased training

Source: Deloitte analysis.

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Smart Maintenance

Smart Maintenance

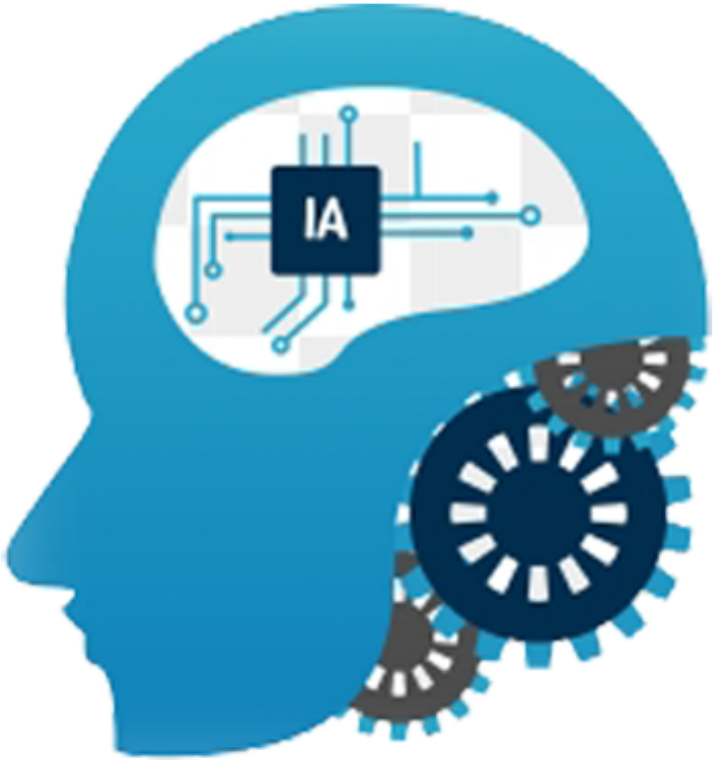
- *Smart Maintenance is a type of predictive maintenance that uses advanced technologies such as artificial intelligence (AI), machine learning (ML), and the Internet of Things (IoT) to monitor and analyze the performance of equipment and assets.*

- Allows **deeper analysis** of data from the physical world and drive further **intelligent action**.

- Depends on **accurate data** and **continuous monitoring**.

- Data gathered from **connected, smart machines** and equipment can be used to predict **when and where failures** could occur, potentially **maximizing parts' efficiency** and **minimizing unnecessary downtime**.

- The most efficient maintenance strategies available—a gold standard for which to aim.



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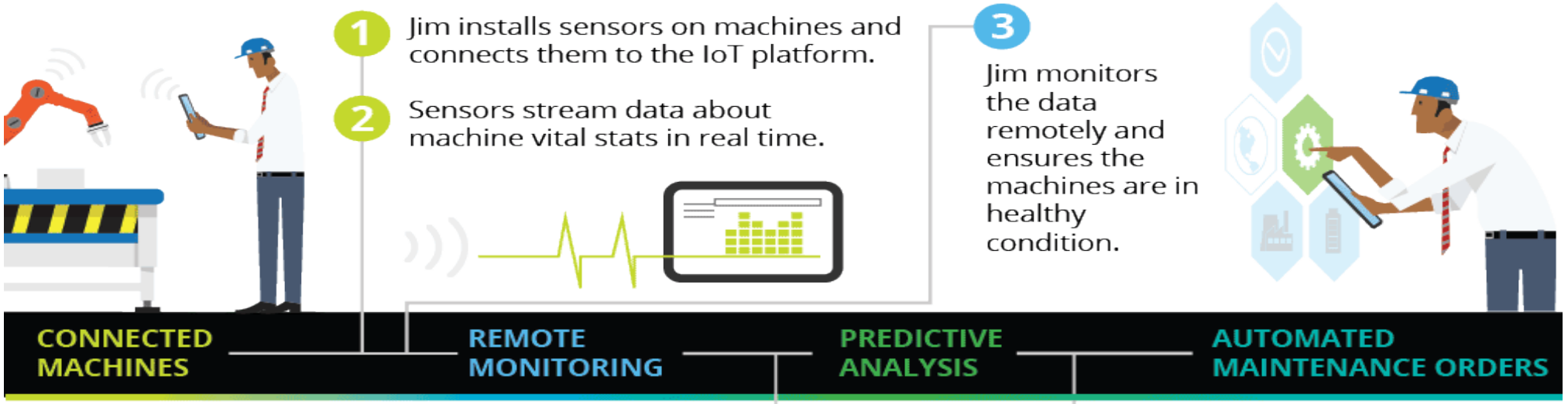
The Smart Maintenance Process

Jim is a factory floor supervisor in a manufacturing plant in charge of monitoring and maintaining numerous machines.



Source: Deloitte analysis.

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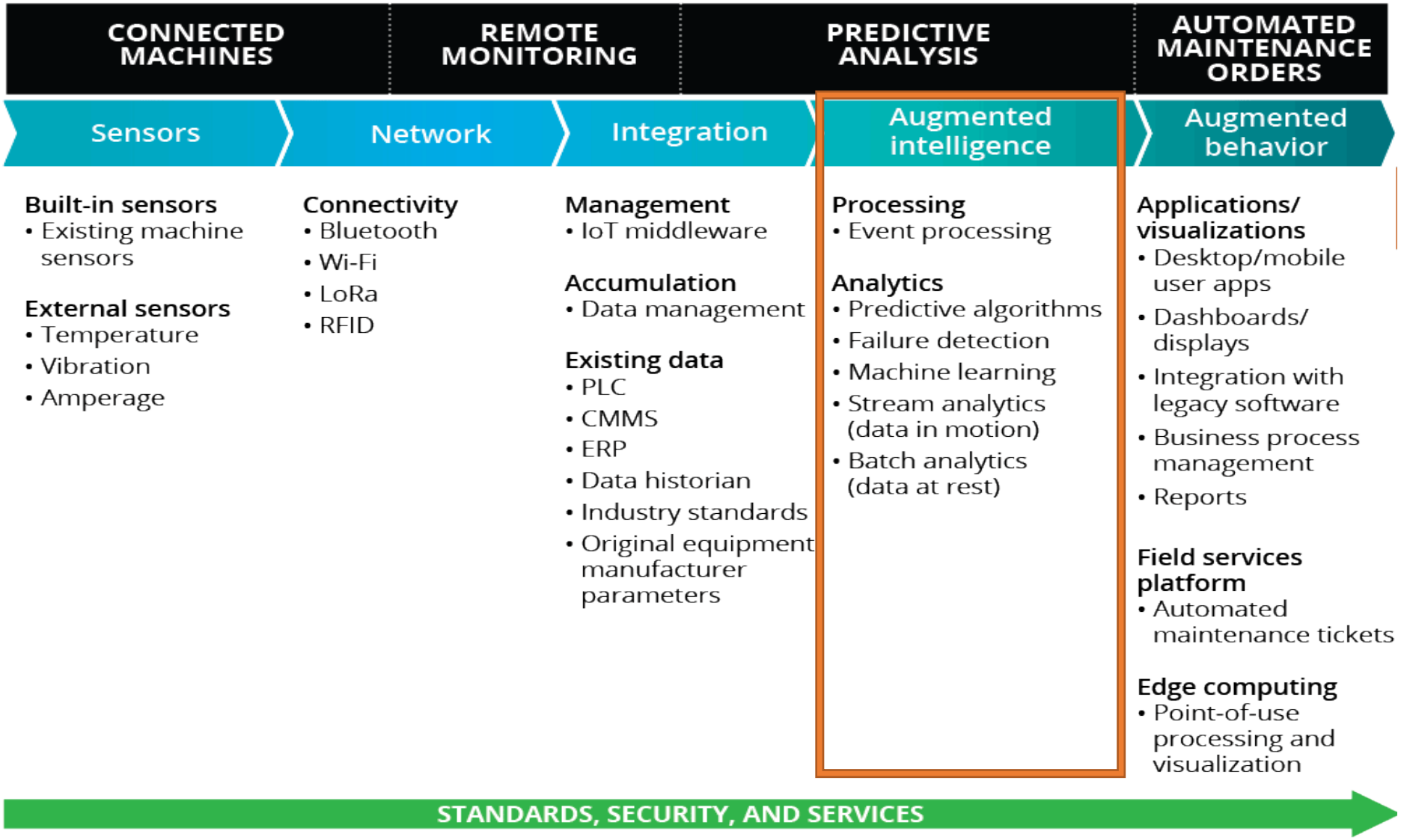
Smart Maintenance Technologies



Source: Deloitte analysis.

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The Impact of Smart Medical Equipment Maintenance

01

Enhanced Patient Care

Smart maintenance **ensures the reliability and optimal performance** of medical devices, contributing to improved patient care and safety.

02

Optimizing Performance

Smart maintenance strategies can **optimize the performance of medical equipment**, ensuring accurate diagnostics and treatment.

03

Prolonging Asset Life

Effective maintenance can **extend the lifespan of medical devices, reducing the need for frequent replacements and minimizing costs.**

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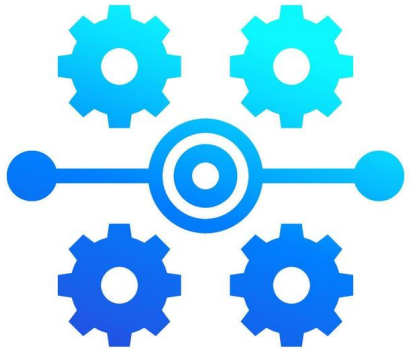
AI-Powered Performance Optimization of Medical Devices

Operational Efficiency and Resource Optimization



Streamlined Workflows

AI-enabled maintenance strategies **streamline maintenance processes**, **optimizing resource allocation and reducing downtime**.

Data-Driven Decision-Making

AI algorithms provide **data-driven insights** for efficient resource management and maintenance planning in healthcare facilities.

Proactive Equipment Health Management

01

Remote Monitoring

AI-powered systems enable **remote monitoring of medical devices**, allowing maintenance teams to assess equipment health from a **centralized platform**.

02

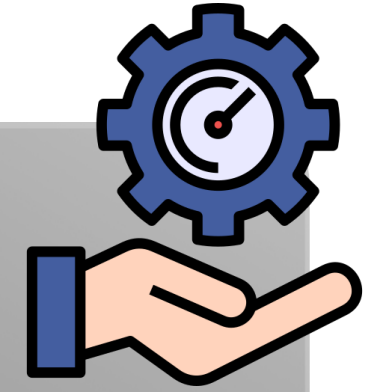
Performance Trend Analysis

AI conducts **trend analysis to predict** equipment degradation, guiding proactive maintenance actions to prevent failures, enabling early intervention and issue resolution.

03

Prescriptive Maintenance

AI **suggests specific maintenance actions** based on equipment health data, optimizing maintenance schedules and activities.



04

Optimization Recommendations

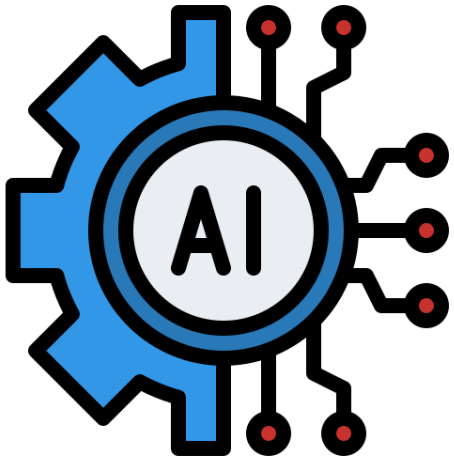
AI-generated **recommendations for performance optimization** contribute to sustained reliability and efficiency.

Adaptive Maintenance & Performance Optimization

Dynamic Maintenance Schedules
AI can dynamically **adjust maintenance schedules based on real-time** device performance data, optimizing device uptime.

Dynamic Performance Adjustments
AI facilitates **adaptive performance optimization**, adjusting device parameters based on real-time operational data.

Continuous Improvement
AI ensures **continuous improvement in device performance and reliability**.



Customized Configurations
AI allows for customized device configurations to meet specific operational requirements.

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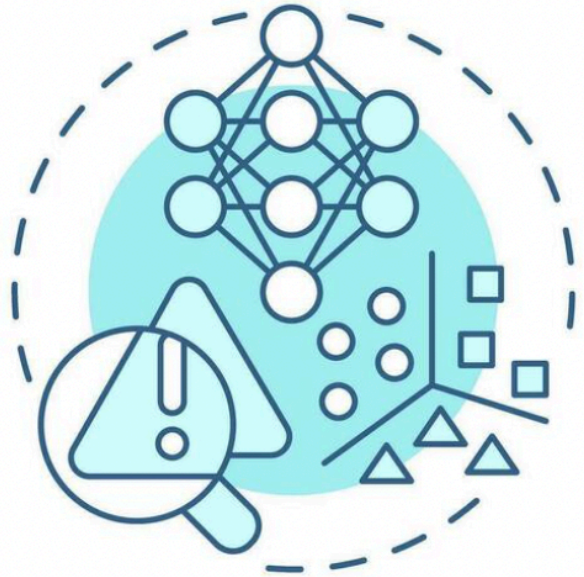
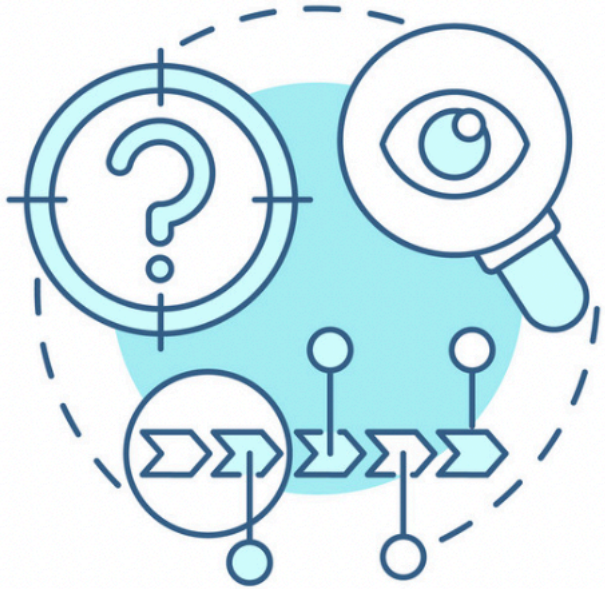
AI for Enhanced Medical Device Reliability

Fault Diagnosis



Anomaly Detection & Early Failure Prediction

AI algorithms **identify abnormal patterns** in device behavior, **signaling potential faults or malfunctions**.



Root Cause Analysis

AI facilitates the **identification of underlying causes of equipment issues**, aiding in **targeted** maintenance and repairs.

Automated Alerts and Notifications

AI systems **generate real-time alerts** for maintenance personnel, enabling swift responses to emerging equipment issues.

Reliability Monitoring, Testing, and Reporting

01

Continuous Monitoring

AI enables continuous monitoring of device reliability**, providing real-time insights** into performance and potential issues.

02

Comprehensive Reporting

AI **generates comprehensive reports on device reliability,** highlighting areas for improvement and proactive maintenance.

03

Virtual Testing Environments

AI facilitates virtual reliability testing, **simulating various scenarios to assess device performance and reliability**.

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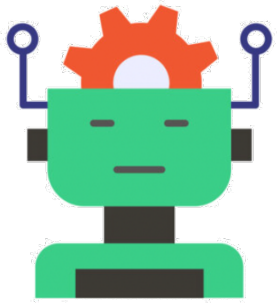
Best Practices

Continuous Improvement and Adaptation

Feedback Mechanisms

Establishing **feedback loops** to gather insights from **maintenance personnel** and **stakeholders** for **refining AI-driven maintenance processes**.



Adaptive Maintenance Models

Developing adaptive maintenance models that **evolve based on changing equipment needs and operational dynamics.**

Collaborative Innovation

Fostering collaboration between **healthcare institutions, technology providers, and regulatory bodies** to drive continuous improvement in AI-driven maintenance.

Empowering Healthcare Professionals

Training and Education

Providing **comprehensive training programs** to equip **healthcare professionals** with the skills and knowledge to leverage AI-driven maintenance effectively.

Recognition of Expertise

Acknowledging the expertise of maintenance professionals and integrating their insights into AI-driven maintenance frameworks.

Summary

01

AI-driven maintenance **strategies improve equipment reliability and operational efficiency** in healthcare facilities.

02

AI has the **potential to revolutionize healthcare maintenance practices**, leading to improved patient outcomes and cost savings.

03

Resistance to AI adoption, initial investment, and integration complexities may pose challenges in implementing AI-enabled maintenance solutions.

04

As technology continues to advance, **the role of AI in this field is only expected to grow**, revolutionizing the way healthcare providers maintain their essential equipment.

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Dr. Sarah Alkhodair

THANK YOU!

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