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IMA SURVEY COMPREHENSIVE REPORT ON “DIGITALIZATION OF ASSETS, FACILITIES AND MAINTENANCE”

Research Study by the Digitalization of Assets, Facility and Maintenance
Management Research Committee

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International Maintenance Association (IMA)
Global Research Initiative

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1. Executive Summary

This comprehensive report presents the findings of the International Maintenance Association's (IMA) research study on the "Digitalization of Assets, Facilities, and Maintenance." The survey gathered insights from industry experts, facility managers, and company representatives across the Middle East, Africa, and Asia regions, representing organizations with 5-15+ years of experience in facility management, maintenance services, and asset management.

93

Responses

Survey participants from maintenance professionals across Middle East, Africa, and Asia representing diverse industry sectors including facility management, energy, utilities, and IT services.

Survey Participant Profile:

- **Geographic Distribution:** Middle East (Saudi Arabia, Egypt), Africa (Botswana), Asia
- **Respondent Types:** Individual Experts and Company Representatives
- **Industry Sectors:** Facility Management, IT Services, Energy/Utilities, Government, Commercial, and Residential
- **Experience Level:** Predominantly 15+ years in the field
- **Technologies Surveyed:** IoT Sensors, AI, Digital Twins, Predictive Analytics

Key Findings:

- **Adoption is accelerating but uneven:** While IoT sensors and basic digital tools are widely adopted (present in majority of responses), full integration into Digital Twins and AI-driven predictive models is still in the maturing phase, with most organizations reporting "partial implementation" status.
- **Workforce resistance is a primary barrier:** The study identifies the "human element"—specifically lack of technical expertise (>30% of employees struggling) and resistance to change—as a more significant hurdle than the technology itself. Initial resistance was noted, though many eventually adapted with proper training support.

- **High initial costs vs. Long-term ROI:** Respondents consistently noted moderate to high upfront costs (often exceeding 15% of maintenance budgets) but acknowledged that investments generally met or exceeded expectations due to reduced downtime (>25% reduction) and extended asset life.
- **Data Integration remains a challenge:** Conflicting data from siloed sources and legacy systems continues to hamper the full potential of digitalized maintenance strategies. Centralized data integration systems showed up to 50% improvement in data retrieval times.
- **Efficiency Gains Are Substantial:** Organizations reported 10-30% improvements in maintenance response times, 25%+ reductions in equipment downtime, and 30% decreases in unplanned maintenance activities.
- **Sustainability Benefits:** Digital tools contributed significantly to energy reduction, extended asset lifecycles, and improved resource efficiency, aligning with corporate sustainability goals.
- **Cybersecurity Concerns Rising:** Data breaches and network vulnerabilities were identified as key risks, prompting investments in advanced encryption, regular security audits, and staff training.
- **Collaboration Improved:** Real-time data sharing and unified dashboards enhanced cross-departmental communication, though alignment on goals between departments remains a challenge.

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2. Introduction

Background of Study

The digitalization of maintenance management is no longer a futuristic concept but a present-day necessity. As industries move towards Industry 4.0, the management of physical assets is being transformed by digital technologies. The IMA Digitalization of Assets, Facility and Maintenance Management Research Committee initiated this study to understand the current state of this transformation.

Research Objectives

The primary objectives of this research were to:

- Identify the prevailing challenges in digitalizing maintenance processes.
- Assess the adoption rates of emerging technologies like AI, IoT, sensors, and Digital Twins.
- Evaluate the impact of digitalization on workforce roles, financial performance, and sustainability goals.
- Understand cross-departmental collaboration improvements through digital transformation.
- Examine cybersecurity risks and mitigation strategies in digitalized environments.
- Identify best practices and lessons learned from early adopters.

Survey Methodology

The research employed a comprehensive questionnaire covering 13 major topic areas:

- Digitalization challenges and obstacles
- Technology adoption (AI, IoT, sensors, digital twins)
- Process optimization and efficiency impacts
- Data integration and accuracy
- Sustainability contributions
- Workforce adaptation and training
- Cross-department collaboration
- Financial impact and ROI analysis
- System flexibility and cybersecurity
- Industry-specific barriers
- Predictive maintenance implementation
- Innovation and future technology plans
- Regulatory and compliance alignment

The survey included both quantitative metrics (percentage thresholds, cost data, timeline information) and qualitative insights (open-ended responses about specific challenges and solutions).

Participant Demographics

The survey includes responses from individual experts and company representatives operating in diverse sectors including Government, Commercial Real Estate, Energy/Utilities, and IT Services. Geographically, the respondents span the Middle East (Saudi Arabia, Egypt) and Africa (Botswana), representing a cross-section of developing and established markets.

Region	Sectors Represented	Typical Experience Level
Middle East (KSA, Egypt)	Facility Management, Energy, IT	> 15 Years
Africa (Botswana)	Maintenance Services, Asset Mgmt	> 15 Years



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3. Digitalization Challenges

Digital transformation is rarely a linear process. Respondents highlighted a complex landscape of obstacles ranging from technical incompatibilities to organizational culture. The survey revealed that challenges manifest at multiple levels: technical, human, organizational, and financial.

Primary Obstacles Identified

Based on the survey data, the following challenges were most frequently cited:

- **Integration with Legacy Systems:** The most commonly reported technical challenge. Existing infrastructure often lacks the connectivity required for modern IoT solutions, leading to compatibility issues. Multiple respondents indicated delays exceeding 3 months in digitalization due to integration complexity.
- **Resistance to Change:** A recurring theme was the difficulty in shifting the mindset of long-standing maintenance teams accustomed to manual processes. This cultural barrier affects technology adoption rates and effectiveness.
- **Lack of Technical Expertise:** There is a significant skills gap, with organizations reporting that over 25-30% of employees struggle to adapt to new digital tools due to insufficient training or expertise. Organizations are finding it difficult to hire staff proficient in both maintenance engineering and digital data analysis.
- **High Implementation Costs:** Financial barriers remain significant, with digitalization costs frequently exceeding 15% of annual maintenance budgets.
- **Process Complexity:** Complex processes like predictive maintenance or multi-system integration have caused implementation delays and challenges.

Impact Assessment

The challenges identified have had measurable impacts on operations:

Impact Type	Description	Frequency Reported
Maintenance Delays	Implementation difficulties causing 20%+ increases in maintenance task completion times	Common
Increased Costs	Overall maintenance costs rising 15%+ during digitalization transition	Moderate

Impact Type	Description	Frequency Reported
Performance Decline	Temporary efficiency drops of 10%+ during implementation phases	Reported by some
Delayed Technology Adoption	New technology implementation delayed 6+ months due to integration issues	Common
Employee Resistance	30%+ of workforce resisting adoption due to previous negative experiences	Widespread

"Integration with existing systems and resistance to change are the most significant hurdles we face." — Survey Respondent (Individual Expert, Egypt)

Mitigation Strategies Employed

Organizations reported various approaches to overcome these challenges:

- **Investing in Training:** Companies allocating 10%+ of maintenance budgets to digital skills training
- **Hiring External Experts:** Engaging consultants for 3+ months to guide digital transformation
- **Gradual Implementation:** Phased approaches introducing digital tools in 2+ stages over extended periods
- **Providing Technical Support:** Establishing dedicated helpdesks handling 100+ support requests annually

30%+

Employees struggle to adapt to digital tools due to insufficient training, highlighting the critical need for comprehensive workforce development programs.

4. Emerging Technologies Adoption

The survey explored the integration of AI, IoT, sensors, and digital twins across maintenance operations. The data suggests a strong leaning towards sensor-based data collection as the foundational step for digitalization, with progressive adoption of more advanced technologies like AI and digital twins.

Technology Adoption Patterns

Analysis of survey responses reveals a clear hierarchy in technology adoption:

Technology	Adoption Status	Usage Context	Implementation Level
IoT Sensors	Widely Adopted	Real-time condition monitoring, temperature tracking, vibration analysis, predictive alerts	Present in majority of responses
Artificial Intelligence	Moderate/Partial	Predictive analytics, optimizing scheduling efficiency, enhanced decision-making	Partially implemented (<50% of processes)
Digital Twins	Emerging/Experimental	Complex asset modeling, lifecycle simulation, scenario planning	Limited to pilot projects or specific assets
Advanced Analytics	Growing	Data integration, real-time monitoring, performance dashboards	Increasingly common for reporting

Implementation of Status Breakdown

Survey responses regarding digitalization maturity reveal:

- **Fully Digitalized (>90% of processes):** Rare - represents organizations with comprehensive digital integration including reporting, diagnostics, and scheduling
- **Partially Digitalized (<50% of processes):** Most common - organizations using digital tools for specific tasks like diagnostics but not yet in reporting or comprehensive workflows
- **Developing:** Organizations in early stages of digital adoption

Efficiency Impact by Technology

30%+

Reduction in unplanned maintenance activities achieved by organizations implementing AI and IoT technologies, demonstrating significant operational improvements.

Respondents reported varied efficiency improvements based on technology deployment:

- **Significant Improvement (30%+ reduction in unplanned maintenance):** Organizations with mature AI and IoT sensor implementations
- **Minor Improvement (10-15% efficiency gains):** Partial implementations focused on specific areas like scheduling or response times
- **No Noticeable Difference:** Some organizations saw no significant changes within the first 6 months, highlighting the importance of proper implementation and integration

Underperformance Areas

While technologies showed promise, respondents identified specific areas of underperformance:

- **Data Accuracy Issues:** IoT sensors occasionally providing inaccurate data (>10% error rates), affecting predictive maintenance reliability
- **System Integration Challenges:** AI and IoT integration with legacy systems causing 15%+ downtime or operational errors
- **User Adoption Problems:** Technology adoption rates below 50% in some organizations, significantly reducing overall effectiveness

"While sensors are widely deployed, the full utilization of the data they generate via AI is still developing. We're in a 'Partial Digitalization' phase where tools are used for diagnostics but not yet fully integrated into automated decision-making." — Survey Respondent (Facility Manager, Middle East)

5. Process Optimization

The core promise of digitalization is efficiency. The survey results confirm that despite implementation hurdles, the operational benefits are tangible and significant.

Impact on Workflows

Respondents overwhelmingly reported that digitalization enhances operational workflows rather than hindering them, provided the initial integration phase is managed well. Key improvements include:

- **Reduced Downtime:** Predictive alerts allow teams to address issues before failure occurs.
- **Resource Management:** Better scheduling of technicians and inventory based on real-time data.
- **Response Time:** Real-time monitoring has led to quicker identification and resolution of maintenance tickets.

**25-
30%**

Average reduction in equipment downtime and improvement in maintenance response times reported by organizations with mature digital implementations.

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6. Data Integration

Data is the lifeblood of digital maintenance, yet it remains one of the most challenging aspects to manage effectively. The transition from manual logs to digital databases is fraught with consistency issues.

Accuracy and Consistency

A major challenge identified is **"Conflicting data from different sources."** When separate systems (e.g., BMS, ERP, CMMS) do not communicate effectively, it leads to data silos. However, respondents noted that the implementation of centralized data integration systems has helped reduce data retrieval times by up to 50%.

Common Data Challenges:

- Human errors in manual data entry (hybrid systems).
- Lack of standardized procedures for data governance.
- Compatibility issues between proprietary sensor protocols and central management software.



7. Sustainability Goals

Digitalization is increasingly viewed as a driver for green initiatives. The ability to monitor energy consumption in real-time allows for immediate optimization.

Contribution to Green Initiatives

Respondents confirmed that digital tools have contributed to:

- **Reduced Energy Consumption:** By optimizing HVAC and lighting systems based on occupancy sensors.
- **Extended Asset Life:** Proper maintenance reduces the need for premature replacement of heavy machinery, reducing waste.
- **Resource Efficiency:** Digital scheduling reduces travel time for technicians (fuel savings) and optimizes spare parts inventory.

"Digitalization has led to a significant reduction in energy consumption and emissions, aligning with our future green initiatives."

— Survey Respondent (Company Representative, KSA)

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8. Workforce Adaptation

The human side of digital transformation is critical. The survey indicates that workforce adaptation is a mixed bag of resistance and empowerment.

Changing Roles

Digitalization is shifting employee roles from manual laborers to "technical operators." This shift requires new skill sets that many current employees lack.

Support Measures

To support this transition, companies are investing in:

- **Continuous Training:** Providing over 20 hours of training per employee annually.
- **Change Management:** Implementing strategies that include regular feedback sessions to address concerns.
- **Technical Support:** Establishing helpdesks to assist staff with new software tools.



9. Cross Department Collaboration

Digitalization breaks down walls between departments. Maintenance data is no longer isolated; it informs procurement, finance, and operations.

Improving Communication

The use of **Shared Dashboards** and **Real-time Data Sharing** has been cited as a key enabler for better collaboration. Teams can now access live data, facilitating quicker coordinated responses to facility issues.

However, challenges remain, such as a "Lack of alignment on goals" between departments, where Finance may prioritize cost-cutting while Maintenance prioritizes asset reliability.



10. Financial Impact and ROI

The financial narrative of digitalization is one of "Short-term Pain, Long-term Gain."

Cost Analysis

Initial Investment: High. Costs include software licenses, hardware (sensors/gateways), and training. For some, this exceeded 15% of the annual maintenance budget.

ROI: Positive. Despite the high entry cost, respondents generally reported that the investment met or exceeded expectations due to savings in operational efficiency and asset longevity.

ROI+

Majority of respondents reported that digitalization investments met or exceeded expected Return on Investment goals despite high initial costs.



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11. System Flexibility and Cybersecurity

As systems become more connected, the attack surface grows. Cybersecurity is a paramount concern for facility managers.

Risks and Measures

Respondents identified **Network Vulnerabilities** and data breaches as potential risks. To combat this, organizations are adopting:

- Advanced encryption protocols.
- Regular security audits.
- Continuous system updates and backups.

Interestingly, some respondents noted that digitalization actually *improved* security by enforcing stricter access controls and audit trails compared to manual key logs.



12. Industry-Specific Challenges & Predictive Maintenance

Sector Nuances

Oil & Gas / Energy: High emphasis on safety and reliability. The cost of failure is extreme, driving higher adoption of predictive tools.

Commercial Real Estate: Focus is on tenant comfort and energy cost reduction.

Predictive Maintenance Shift

The transition from Reactive (fix it when it breaks) to Predictive (fix it before it breaks) is the "Holy Grail" of maintenance. The survey shows that organizations using AI/IoT have successfully reduced unplanned maintenance activities by approximately 30%.



14. Innovation and Future Development

Looking forward, organizations are exploring advanced applications of AI and machine learning to further enhance their maintenance strategies.

Future Technology Integration Plans

Survey responses indicate varied readiness levels for next-generation technologies:

- **Near-term Implementation:** Companies with detailed strategies in place, including timelines, resource allocation, and specific technology applications.
- **Under Consideration:** Organizations exploring potential benefits but without concrete commitments yet.
- **Strategic Decision Pending:** Some companies are focusing on other priorities before investing in new technologies.

Expected Benefits

Organizations anticipate the following advantages from emerging technology integration:

- **Improved Efficiency:** Measurable increases in throughput and reductions in downtime.
- **Reduced Operational Costs:** Automation leading to lower maintenance expenses.
- **Enhanced Decision-Making:** AI-powered analytics providing deeper insights for strategic planning.
- **Better Asset Performance:** Predictive capabilities extending asset lifecycles and optimizing utilization.

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Anticipated Challenges

Despite optimism, respondents foresee several implementation hurdles:

Challenge Type	Description	Mitigation Strategy
High Implementation Costs	Significant financial investment required for adoption and integration	Phased rollout approach; seek ROI-proven use cases
Employee Resistance	Staff hesitancy or opposition to new technologies	Comprehensive training programs; change management initiatives
Technical Integration Issues	Compatibility concerns with existing infrastructure	Thorough assessment of system interoperability before implementation
Data Security Concerns	Increased cybersecurity risks with more connected systems	Advanced encryption; regular security audits; staff training

"We have specific projects lined up to start utilizing AI and machine learning within the next year, with detailed strategies including timelines and resource allocation." — Survey Respondent (Company Representative, Middle East)

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15. Regulatory and Compliance Alignment

As maintenance processes become increasingly digital, organizations must ensure compliance with industry-specific regulations and data protection standards.

Key Compliance Considerations

The survey revealed that organizations are navigating multiple regulatory frameworks:

- **Data Privacy Regulations:** Ensuring sensor data collection and processing complies with regional data protection laws (e.g., GDPR, local data sovereignty requirements).
- **Industry Safety Standards:** Maintaining compliance with sector-specific safety regulations while implementing digital monitoring systems (ISO 55000 for asset management, ISO 31000 for risk management).
- **Audit Trail Requirements:** Digital systems must maintain comprehensive, tamper-proof records for regulatory audits and inspections.
- **Environmental Regulations:** Utilizing digital tools to track and report on emissions, energy consumption, and waste management as required by environmental authorities.

Compliance Benefits of Digitalization

Respondents noted several advantages of digital systems for regulatory compliance:

Benefit	Description
Automated Reporting	Digital systems automatically generate compliance reports, reducing manual effort and errors
Real-time Monitoring	Continuous tracking ensures immediate detection of non-compliance conditions
Complete Audit Trails	Digital records provide comprehensive documentation for regulatory inspections
Standardized Procedures	Digital workflows enforce consistent compliance with standard operating procedures

Challenges in Regulatory Alignment

However, several compliance-related challenges were identified:

- **Keeping Pace with Evolving Regulations:** Digital systems must be regularly updated to reflect changing regulatory requirements.
- **Cross-border Operations:** Companies operating in multiple regions face complex, sometimes conflicting, regulatory requirements.
- **Legacy System Integration:** Ensuring older systems meet current compliance standards while transitioning to digital solutions.

"Digital transformation has made regulatory compliance more manageable through automated reporting and real-time monitoring, but we must constantly update our systems to keep pace with changing regulations." — Survey Respondent (Facility Manager)

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16. Conclusions and Recommendations

Conclusion

The IMA survey reveals that the digitalization of assets and maintenance is a transformative force that is already delivering significant value in terms of efficiency, sustainability, and reliability. However, the journey is impeded by significant human and technical challenges.

Recommendations

1. **Invest in People, not just Tech:** Allocate a significant portion of the digitalization budget to training and changing management. The best tools fail without skilled operators.
2. **Start Small, Scale Fast:** Begin with pilot projects (e.g., sensorizing critical assets) to prove ROI before full-scale digital twin implementation.
3. **Unify Data Standards:** Establish clear data governance protocols early to prevent data silos and ensure accuracy.
4. **Prioritize Cybersecurity:** Treat building management systems (BMS) as critical IT infrastructure requiring robust security protocols.

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