RESOLUTE®
BUILDING INTELLIGENCE

Empowering Facilities Teams Through Building Analytics and Fault Detection & Diagnostics

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Table of Contents

Executive Overview

In today's rapidly evolving technological landscape, facilities management teams face unprecedented pressure from rising energy costs, stringent regulations, and a shifting workforce dynamic. Building analytics and fault detection and diagnostics (FDD) technologies present a transformative solution, providing real-time insights that empower facilities teams to transition from reactive maintenance to proactive, data-driven decision-making. This white paper delves into how analytics and FDD enhance operational efficiency, reduce costs, support workforce transitions, and elevate the overall occupant experience by improving comfort, safety, and satisfaction. Additionally, it outlines how these tools align with strategic business goals, environmental mandates, and long-term capital planning.

Introduction: The Evolving Facilities Landscape

Facilities management has traditionally been reactive, driven by urgent work orders, tenant complaints, and equipment breakdowns. Such an approach is increasingly untenable as buildings grow more complex, energy regulations tighten, and the industry faces a demographic shift. As seasoned professionals retire and fewer young people enter skilled trades, organizations confront a growing talent gap.

1. Industry Challenges and Opportunities

The facilities management sector is undergoing a transformation driven by several key factors:

Complexity of Modern Buildings: Modern buildings are equipped with advanced systems and technology requiring sophisticated management to ensure optimal performance. These systems include smart HVAC, integrated lighting, and complex security systems, all demanding a higher level of expertise and coordination. As technology advances, the integration of IoT devices and smart sensors becomes increasingly common, demanding that facilities teams be adept with digital tools and data interpretation.

Regulatory Demands: Increasingly stringent energy efficiency standards and environmental regulations require buildings to operate more sustainably. Compliance with these regulations may not be just a matter of legal obligation but also a driver of operational efficiency. Regulations such as those set by LEED (Leadership in Energy and Environmental Design) and BREEAM (Building Research Establishment Environmental Assessment Method) push for more efficient energy use, waste reduction, and sustainable practices.

The Rise of Smart Buildings

The movement toward smart, sustainable buildings has become more than a trend—it's a business imperative. Investors, occupants, and regulators increasingly demand energy transparency, operational resilience, and measurable outcomes. Building analytics and FDD form the backbone of these initiatives, supporting compliance, benchmarking, and reporting for ESG and net-zero goals.

Smart buildings use integrated technologies to enhance the operational performance of building systems, improving energy efficiency and minimizing environmental impact. These technologies provide a more comfortable and adaptable environment for occupants by adjusting lighting, HVAC, and other systems based on real-time data.

Demographic Shifts: The workforce in facilities management is aging, and as experienced technicians retire, there is a pressing need to attract new talent. According to a survey from the Journal of Facility Management Education and Research, the majority of respondents planned to retire in the next 15 years.[1] The newer workforce, comprised largely of Millennials and Gen Z, is more tech-savvy and values digital tools, data access, and user-friendly interfaces.

Technological Advancements: The rapid pace of technological change presents both opportunities and challenges. Facilities teams must keep up with new technologies that can improve building operations and energy efficiency. The advent of AI and machine learning in building automation systems allows for predictive analytics, enhancing the capabilities of FDD systems to not only diagnose problems but also predict future issues before they arise.

2. Building Analytics and FDD

Building analytics involves the collection, analysis, and visualization of data from building systems—including HVAC, lighting, energy meters, and occupancy sensors—to unearth inefficiencies, trends, and opportunities for improvement. Fault detection and diagnostics (FDD) is a subset of analytics focused on identifying abnormal operating conditions in mechanical or control systems and pinpointing likely causes.

Core Components of Building Analytics and FDD

- Data Collection: Sensors and meters installed throughout the building collect a wide range of data, from temperature and humidity levels to energy consumption and occupancy patterns. This data is the foundation for all subsequent analysis. The continuous collection of data ensures that the system captures every fluctuation and anomaly, providing a comprehensive view of building performance.
- Data Analysis: Advanced algorithms process the collected data, identifying patterns and anomalies that may indicate inefficiencies or potential failures. The analysis can uncover hidden inefficiencies that would be difficult to detect through manual inspection.
- Visualization and Reporting: The insights derived from data analysis are presented in user-friendly dashboards that provide facilities teams with actionable information. Reports can focus on specific areas of concern or interest, allowing teams to prioritize actions based on the most critical needs of the facility.

Benefits of Building Analytics and FDD

These tools continuously monitor real-time data and historical trends, issuing alerts with prioritized recommendations and impact analysis. Together, these technologies:

- Deliver real-time monitoring and performance benchmarking
- Detect faults early to reduce downtime
- Enable predictive and condition-based maintenance
- Improve energy efficiency and reduce operating costs
- Support environmental compliance and carbon reduction
- Extend asset lifespan and support capital planning

By providing a comprehensive overview of building performance, analytics and FDD enable facilities managers to make informed decisions that enhance both the operational and financial performance of their buildings.

3. The Cost of Reactive Maintenance

Operating reactively is both costly and unsustainable. According to the U.S. Department of Energy, predictive maintenance saves up to 40% on reactive maintenance[2], with expenses arising from emergency labor, parts premiums, and higher equipment replacement rates.

REACTIVE MAINTENANCE CAN COST

40% MORE

THAN PREDICTIVE MAINTENANCE

Consequences of Reactive Maintenance

Without analytics or FDD, teams typically rely on scheduled walkthroughs or occupant complaints to detect problems, resulting in:

- Undetected Inefficiencies: Systems may operate inefficiently for extended periods, wasting energy and increasing costs without anyone noticing the issues. This can have a significant impact on the overall energy consumption of a building.
- Accelerated Equipment Wear-Out: Reacting to problems only when they become critical leads to increased wear and tear on equipment, shortening its lifespan. Frequent breakdowns lead to more replacements and higher capital expenditures.
- Frequent Emergency Service Calls: Unplanned failures necessitate emergency repairs, which are costly and disruptive. This can also result in downtime, affecting the productivity of building occupants.
- Missed Comfort and Air Quality Issues: Occupants may experience discomfort or poor indoor air quality, leading to dissatisfaction and potential health risks. Poor air quality can also lead to increased absenteeism and reduced productivity.
- Poor Lifecycle Asset Planning: Without insights into system performance and degradation, it is challenging to plan for equipment replacement or upgrades effectively. This results in a reactive approach to capital planning, which can be costly in the long run.

Administrative Overhead

Reactive maintenance also leads to high administrative overhead. Managers must prioritize emergencies, appease stakeholders, and constantly reallocate limited resources, leaving little time for strategic planning, training, or innovation. This can also lead to burnout and high turnover rates among facilities staff.

4. Efficiency Gains and Cost Savings

Adopting analytics can unlock significant efficiencies for facilities teams:

- Prioritized Work Orders: Staff can focus on high-impact issues, increasing their effectiveness. By addressing the most critical issues first, facilities teams can maximize the impact of their efforts.
- Fewer Failures: Early fault detection helps prevent downtime. By identifying potential failures before they occur, facilities teams can take proactive measures to prevent disruptions.
- Lower Energy Bills: Identifying and correcting system inefficiencies leads to substantial savings. Energy-efficient operations not only reduce costs but also contribute to sustainability goals.
- Reduced Carbon Footprint: A reduction in energy equates to a reduction in carbon. Sustainability goals are measurable and achievable.
- Longer Equipment Life: Optimized operation reduces wear and tear. By maintaining equipment in optimal condition, facilities teams can extend the lifespan of their assets, reducing capital expenditures.
- Automated Insights: Dashboards streamline reporting and compliance. Automated reporting reduces the administrative burden on facilities teams, allowing them to focus on more strategic tasks.

Quantifying the Savings

Resolute's customers typically see returns on investment within the first year, with ROI averages at 300%.

Resolute's Average Return on Investment:

300%

Strategic Capital Planning

Moreover, analytics supports capital forecasting and budget prioritization. By identifying systems at risk of failure or underperformance, teams can proactively plan upgrades rather than reacting to emergencies. This strategic approach to capital planning allows organizations to allocate resources more effectively and avoid costly last-minute replacements. With the Resolute Rebates program, utility experts increase customers' savings by managing capital-spending incentives from utility companies' programs and other special opportunities.

5. Workforce Transition: Adapting To the New Generation

As a more tech-savvy workforce enters the field with new expectations and a high value of digital tools, data access, and user-friendly interfaces, analytics platforms are a natural fit.

Adapting to a Digital Workforce

These tools also accelerate onboarding and training by providing:

- Visual Dashboards: Simplify diagnostics and enable new team members to quickly understand system performance. This reduces the learning curve for new hires and enables them to contribute more quickly.
- System Performance Histories: Provide context for faults and performance issues, aiding in decision-making. By understanding the history of a system, technicians can make more informed decisions about maintenance and repairs.
- Creating and Tracking Action Items: Action plays an important role in the performance-improving process, and through our Action Center, we have provided the functionality needed to make sure analytics-enabled answers become performance-driving realities.

Capturing Institutional Knowledge

Analytics captures institutional knowledge and embeds it into system logic, helping new team members succeed quickly. This technology supports both hiring and retention, offering meaningful work, career growth, and recognition. By providing opportunities for professional development, organizations can attract and retain top talent in a competitive job market.

Training and Development Opportunities

The implementation of analytics and FDD systems opens up numerous opportunities for training and development. Facilities teams can benefit from:

- Certifications in Data Analytics and Systems Management: These certifications can enhance the skills of facilities professionals, making them more valuable to their organizations.
- Workshops on Emerging Technologies: Staying updated with the latest technologies in building management is crucial for maintaining a competitive edge.
- Cross-Functional Training: Understanding how different building systems interact can provide a holistic view of building operations, leading to more effective management.

6. Stress Reduction and Team Morale

Reactive maintenance environments are inherently high stress. Facilities managers and technicians face constant interruptions, after-hours calls, and pressure from tenants or senior leadership. Analytics reduces this burden by providing visibility and control. Teams receive early alerts, plan maintenance proactively, and collaborate using shared dashboards and digital tools.

Improving Work Environment

Key benefits include:

- Better Work-Life Balance: Proactive maintenance reduces the need for after-hours calls and emergency interventions. This allows facilities teams to work more regular hours and reduces the risk of burnout.
- Clear Priorities: Data-driven insights help teams focus on the most critical issues, reducing ambiguity and enhancing efficiency. By having a clear understanding of priorities, teams can work more effectively and confidently.
- Improved Communication: Shared dashboards and digital tools facilitate collaboration and information sharing. This enhances teamwork and ensures that all team members are aligned and informed.
- Higher Job Satisfaction: Reduced stress and clear performance metrics contribute to a more satisfying work environment. By recognizing and rewarding performance, organizations can boost morale and retention.

Elevating the Role of Facilities Professionals

Additionally, data-backed insights elevate the role of facilities professionals. With performance metrics and cost justifications, they gain credibility with finance, sustainability, and executive teams, transitioning from problem solvers to strategic contributors. This recognition can lead to greater career advancement opportunities and a more fulfilling work experience.

Recognition and Reward Systems

Organizations can implement recognition and reward systems to further enhance team morale. These systems can include:

- Performance-Based Incentives: Rewards for achieving specific energy savings or efficiency targets.
- Professional Development Opportunities: Offering training or conference attendance as a reward for outstanding performance.

7. Risk Mitigation and Equipment Reliability

Unplanned equipment failures can have serious consequences, from uncomfortable tenants and reputational damage to legal and financial risks. FDD tools mitigate these risks by continuously analyzing performance and identifying anomalies long before failures occur. This proactive approach ensures:

Keep buildings safe from:

☑ Legal & financial risks

☑ Reactive Accidents

☑ Reputational damage

- Optimal System Maintenance: Critical systems are maintained in optimal condition, reducing the likelihood of failures. This ensures that building operations are uninterrupted and that occupants are comfortable and safe.
- Preserved Safety and Comfort: Ensuring that building occupants are comfortable and safe is a top priority. By maintaining optimal indoor conditions, organizations can enhance occupant satisfaction and productivity.
- Avoided Financial Losses: Downtime is minimized, reducing the financial impact of equipment failures. By avoiding costly repairs and replacements, organizations can protect their bottom line.
- Minimized Risk of Code Violations: Compliance with safety and efficiency standards is maintained, reducing the risk of penalties. By adhering to regulations, organizations can avoid legal and financial repercussions.

Reactive Maintenance and Accidents

According to an IDCON Safety/Reactive maintenance Survey, results showed that the majority of respondents from multiple industries estimated that more than 60% of all safety incidents occurred when a maintenance job was executed as reactive.[2]

Resource Allocation and Prioritization

A complete analytics platform also quantifies fault impact, helping managers allocate resources efficiently, prioritize high-risk issues, and justify budget requests with solid data. By understanding the financial and operational impact of faults, facilities teams can make more informed decisions about resource allocation.

8. Case Examples: Impact of Proactive Operations

Case 1: McLaren Health Care

A medical campus with 15 primary hospitals with a variety of age, design, functionality, and maintenance needs, along with more than 100 operating rooms with requirements that include air changes per hour (ACH), strict temperature, humidity parameters, pressure relationships, and energy-intensive (often heat-generating) surgical lighting systems.

- **$7 million** in cumulative utility savings.
- **Up to 29% reduction** in utility costs across the hospital network.
- **Total potential annual portfolio savings of $1,215,000** by balancing all operating rooms to a max of 20 ACH and set back all operating rooms to 8 ACH during unoccupied times.
- **$1.5 million in utility rebate checks to date:** Dedicated engineers also oversee Resolute Rebates, managing the administration for available capital expenditure incentive programs.

Always providing MORE:

MORE savings
MORE efficiency
MORE safety
MORE comfort
MORE sustainability

Case 2: Chicago Public Schools

The fourth largest school system in the U.S. with a variety of Building Automation Systems, HVAC systems and equipment that needed centralized visibility to optimize facility performance and ensure a safe, healthy, and productive learning environment.

- **All managed buildings now easily viewed through a single portfolio:** Connected to seven different BAS including Siemens, Alerton, ALC, and Schneider.
- **Now eligible for nearly $1 million in incentives:** As the Data Partner for the Demand Response Program, an incentive program for electricity consumers to reduce energy usage during peak periods or when the grid is under stress, Resolute is monitoring the school system for incentives that meet required kW reduction.
- **First school district to earn sustainability certification in a national program:** Resolute helped CPS earn a gold certification, the highest available under the point system for the Healthy Green Schools and Colleges program, aimed at improving health and sustainability at schools.

9. Implementing Analytics: What Teams Need to Succeed

To successfully implement analytics and FDD, organizations need to consider several factors:

- **System Compatibility:** Integration with existing BAS, sensors, and metering systems is crucial. Ensuring that all systems can communicate and share data is essential for effective analytics.
- **Training:** Providing tools and education helps build user confidence. Training ensures that all team members understand how to use analytics tools and interpret the data they provide.
- **IT and Leadership Support:** Data access and funding are essential for success. Ensuring that IT infrastructure can support analytics and that leadership is committed to funding and supporting the initiative is critical.
- **KPIs:** Clear goals are necessary to measure ROI and success. By defining key performance indicators, organizations can track progress and demonstrate the value of analytics.
- **Change Management:** Engaging staff early and often is crucial for smooth transitions. By involving team members in the implementation process, organizations can ensure buy-in and reduce resistance to change.

Choosing the Right Partner

Choosing Resolute Building Intelligence, a complete solution that offers scalable, cloud-based architecture, easy-to-use dashboards and alerts, continuous tuning and support, and collaboration features for teams and vendors is essential. By selecting the right technology partner, with dedicated engineering and integration support, along with the ability for customization, organizations can ensure a successful implementation and maximize the benefits of analytics.

Developing an Implementation Roadmap

A successful implementation requires a well-defined roadmap that includes:

- **Assessment of Current Systems:** Evaluating the existing infrastructure and identifying areas for integration and improvement.
- **Setting Clear Objectives:** Defining what the organization hopes to achieve with analytics and setting measurable goals.
- **Engaging Stakeholders:** Involving key stakeholders from the beginning to ensure alignment and support throughout the process.
- **Monitoring and Evaluation:** Continuously assessing the performance of analytics systems and making adjustments as needed to optimize results.

10. Conclusion: Resolute–the Smart, Sustainable Path Forward

The demands on facilities teams are growing: limited resources, rising costs, and mounting expectations. Building analytics and FDD provide a roadmap for smarter, more sustainable operations. With real-time insights and predictive tools, teams can move from firefighting to foresight. They reduce stress, improve performance, and help their organizations meet business, environmental, and occupant goals.

The result? Facilities teams that are not just maintaining buildings, they're leading their transformation, fostering environments that support the well-being of occupants and the sustainability of operations. By embracing analytics and FDD, organizations can enhance their operational efficiency, reduce costs, and create more sustainable and comfortable spaces for occupants.

The Resolute Solution

Resolute's cloud-based architecture has no limit to the amount of building data that can be collected, aggregated, analyzed, and stored or the number of users that can be added to the system.

Our patented building configuration functionality, pre-defined, ASHRAE-based analytic rules, and proprietary connector technology minimizes complexity and accelerates time to value.

Finally, our direct and rapid SOC-2 compliant connections from a variety of leading BAS and control systems mean no need for additional devices, equipment, or coding, minimizing total cost of ownership.

By investing in building analytics and FDD technologies, organizations position themselves at the forefront of innovation, ready to meet the challenges of the future with confidence and agility. This proactive approach not only ensures operational excellence but also contributes to broader sustainability goals, enhancing the reputation and competitiveness of the organization in the marketplace.

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Footnotes

1. Journal of Facility Management Education and Research, "United States Facility Management Industry Demographic Trends and Contemporary Workforce Challenge," https://meridian.allenpress.com/jfmer/article/6/1/15/490313/United-States-Facility-Management-Industry
2. U.S. Department of Energy, "O&M Best Practices Guide Release 3.0," https://www1.eere.energy.gov/femp/pdfs/OM_5.pdf
3. IDCON Safety/Reactive maintenance Survey, https://www.idcon.com/resource-library/leadership-in-maintenance/safety-reactive-maintenance/