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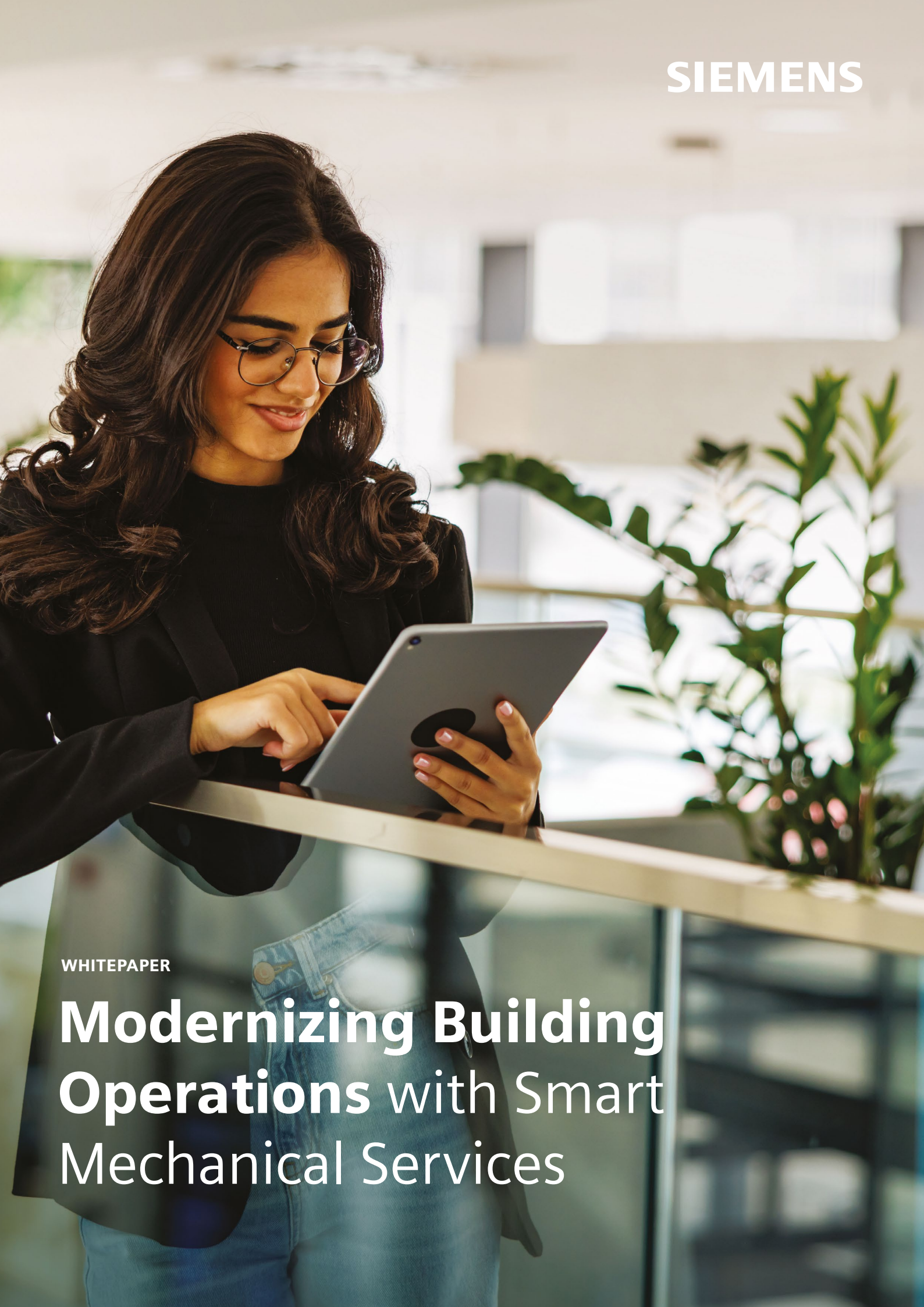
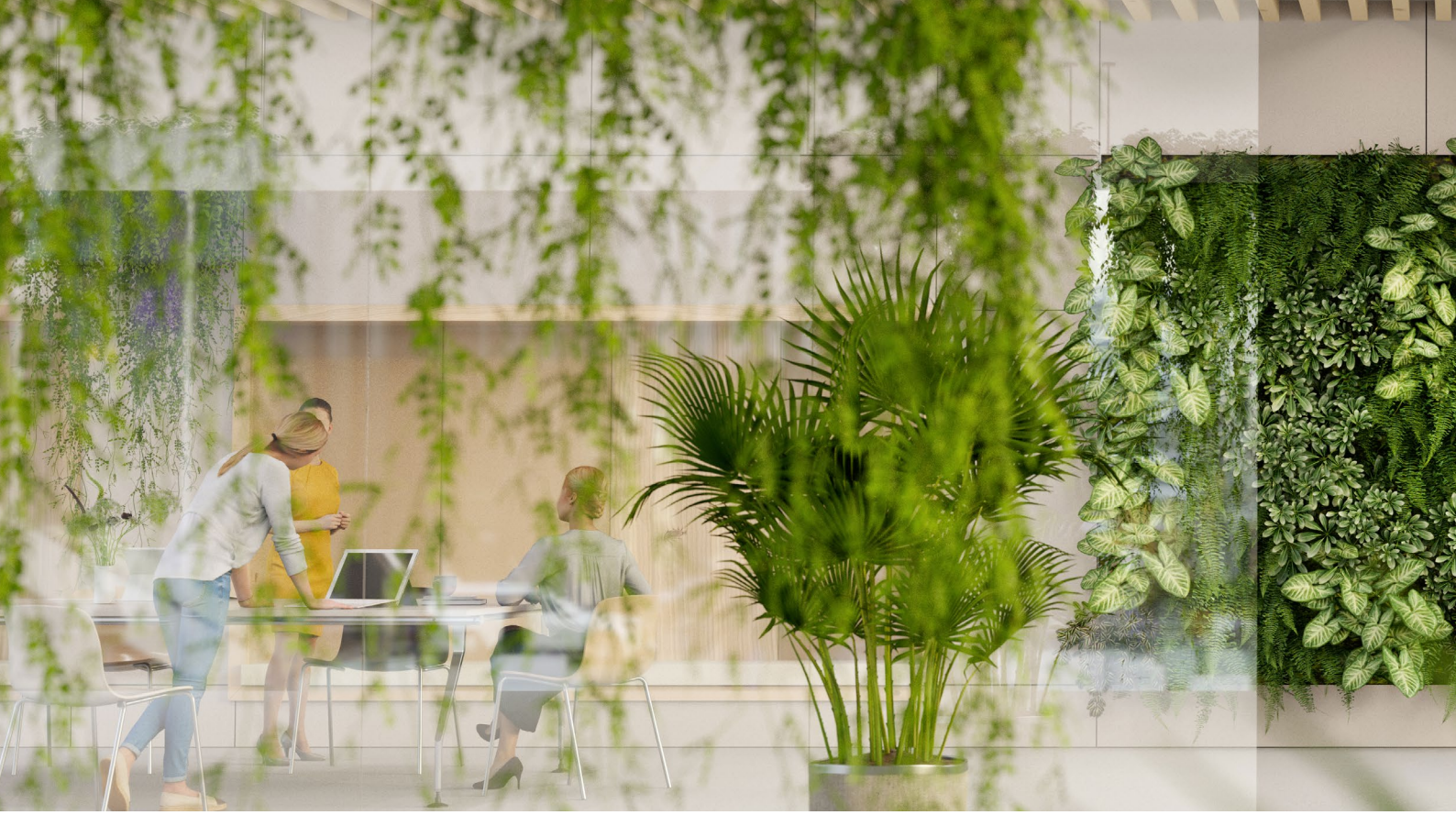


WHITEPAPER

Modernizing Building Operations with Smart Mechanical Services



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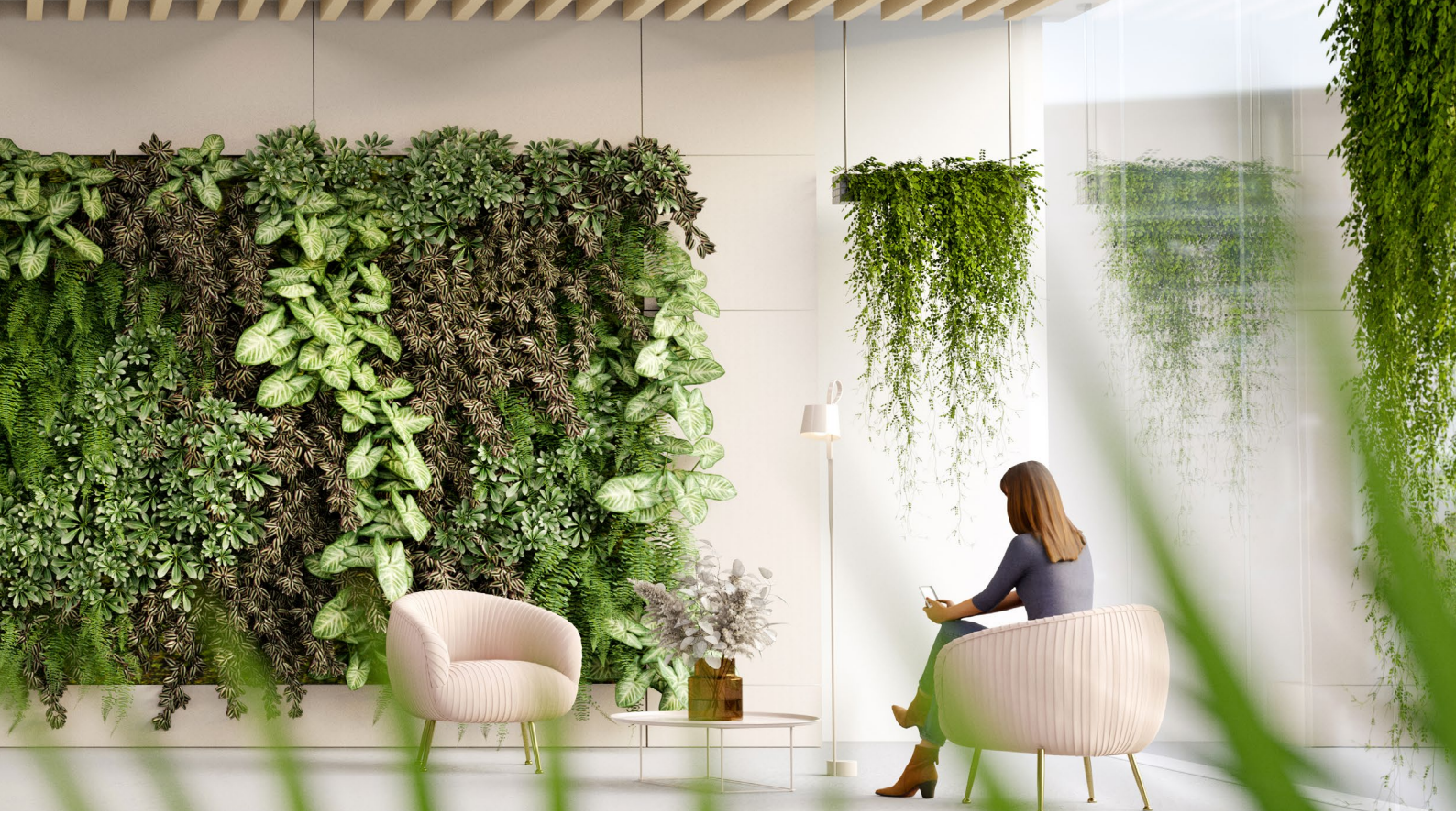
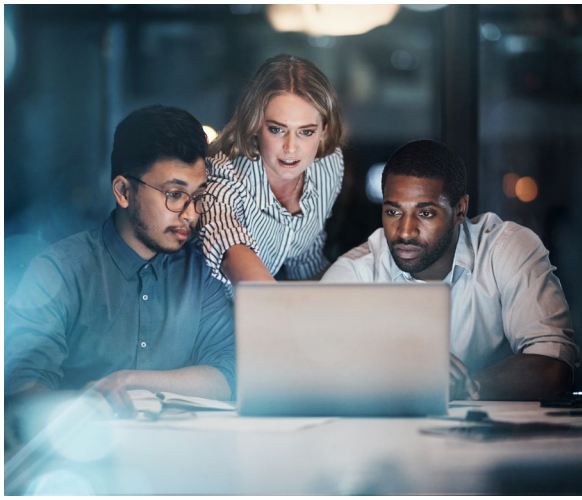


Modernizing building operations

To investigate the value of smart mechanical services in the built environment, Siemens commissioned independent research firm, Verdantix, to perform over 80 interviews to provide insights into customer sentiment towards smart mechanical services and indoor air quality.

Intensifying regulatory and standards requirements, growing technical complexities and heightening labor shortages are putting facilities leaders under immense pressure to improve operational efficiencies by embracing digital practices. These outsourced services are disrupting the global managed services market and are transforming building operations. Understanding how to leverage these services for business operations is core to achieving cost and energy savings, attracting and retaining talent and tenants, and securing long-term investment.

This whitepaper primarily looks at the evolution of maintenance towards more proactive strategies bolstered by digital services. An accompanying whitepaper that addresses the increased focus on indoor air quality and associated services can be found on siemens.com/mechanical-services.



Taking advantage of the digital services revolution

Facility management priorities have traditionally been addressed in an ad hoc manner with multiple stakeholders. The mining of data from building systems has not only eliminated silos, but provided new unified insights to improve facility performance and achieve business objectives.

With HVAC systems accounting for an average of 39% of total energy consumption in buildings[1], innovative maintenance strategies are one critical method to addressing energy and sustainability, operational efficiency, and indoor air quality (IAQ) targets in an effective and unified fashion. Despite clear benefits, businesses are yet to fully embrace digitally enhanced building maintenance. For example, only 20% of UK firms have incorporated a digital building maintenance strategy[2]. With the shortage of trained knowledgeable maintenance professionals, firms will have to embrace leveraging digital services in order to realize the necessary optimization in daily operations.

Building operations optimization and decarbonization are top business priorities.

Facilities leaders face intensifying pressure to optimize building operations, with 23% of executives citing it as their top priority for the next three years[3]. Volatile energy prices, regulatory mandates and pressure from both financial and societal stakeholders are forcing sustainability and ESG agendas to the forefront of executives' minds. Another 22% of building executives rank decarbonizing their building portfolio as their top priority[4], with 42% of firms planning to extend, replace or invest in software to support energy management[5]. To achieve their goals, facilities leaders are increasingly turning to service providers to transform inefficient processes and maximize energy efficiency.

> "We are on the verge of introducing new technology which will help us proactively repair rather than reactively."
>
> **Assistant VP Facilities Services, USA, Higher Education**

Aspiring leaders are upgrading from reactive to proactive building maintenance strategies.

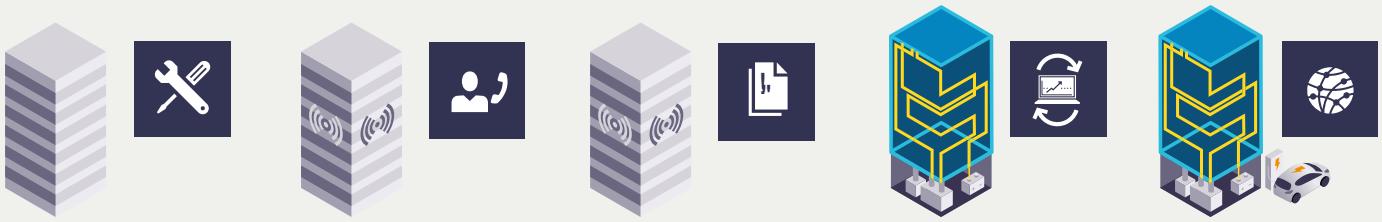
Traditional reactive approaches to facilities maintenance are no longer effective. With up to 99% of firms changing their maintenance strategies in the past 5 years[6], facilities leaders are making the leap from reactive approaches to embrace digital and proactive maintenance to capitalize on reducing costs, downtime and labor requirements. Although firms typically utilize a mix of maintenance approaches, 54% of facilities leaders are currently leveraging a condition-based or proactive maintenance strategy, compared to just 22% relying on a reactive approach. Growing demand is set to continue; 94% of executives expect technology innovations to have a significant impact on energy management over the next five years. Similarly, 92% of executives believe technology innovations will have a significant impact on building automation, whilst 81% believe the same for asset optimization in the next 5 years[7].

1 A 2021 Guide to the Indoor Air Quality Standards that Matter
2 SFG20 study claims low uptake of digital-led building maintenance
3 Verdantix Global Corporate Survey 2023: Smart Building Technology Budgets, Priorities & Preferences (Figure 4)
4 Verdantix Global Corporate Survey 2023: Smart Building Technology Budgets, Priorities & Preferences (Figure 4)
5 Verdantix Global Corporate Survey 2023: Smart Building Technology Budgets, Priorities & Preferences (Figure 13)
6 Maintenance and operations: Is asset productivity broken?
7 Verdantix Global Corporate Survey 2023: Smart Building Technology Budgets, Priorities & Preferences

The journey from a traditional to a smart building and beyond

Your pathway to better building performance

Traditional Building → **Smart Building** → **Autonomous Building**



Onsite Reactive
- Onsite services delivered by segment & vertical industry experts

Remote
- Faster resolution
- Remote diagnostics prepares onsite resolution
- Security, fire & life safety system monitoring

Proactive/ Preventive
- Proactive early warnings avoid chaos
- Increased digital touch points

Predictive
- Digital eye
- AI-based, optimized maintenance strategy
- Autonomous actions

Prescriptive
- Workflow integration
- Optimized, prioritized workflows based on impact
- Extended workbench
- System assurance & transparency

Connectivity + **Fault Detection & Diagnostics** + **Machine learning algorithms** + **APIs**

Increase opportunities to reduce system failures, disruptions, downtime & related costs, prioritize work, improve system performance, increase life of systems, and optimize workforce & energy efficiency

Firms are increasingly looking to outside sources for maintenance and Indoor Air Quality services.

To accommodate shifting maintenance strategies, growing numbers of firms are outsourcing maintenance processes and IAQ services to expert providers. Verdantix research finds that a majority of businesses expect to increase their use of service providers for energy efficiency & sustainability management (85%), facility management (71%), and asset monitoring and performance (57%). In the next 3 years[8], they plan to adapt their approach and distribute the burden of these key management processes.

[8] Verdantix Global Corporate Survey 2023: Smart Building Technology Budgets, Priorities & Preferences

The tide is shifting towards digital mechanical services

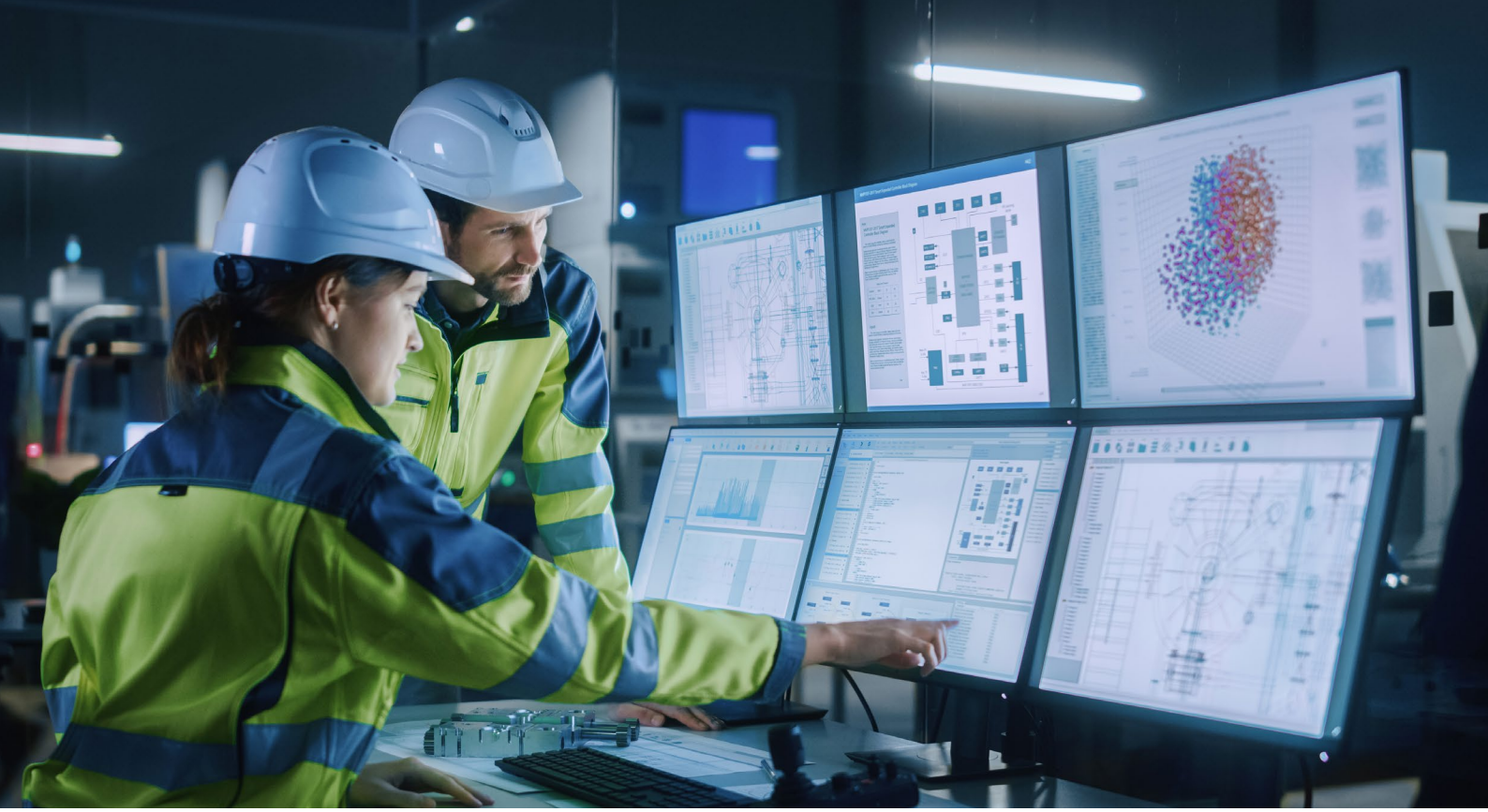
With the global market doubling down on asset maintenance to meet key business priorities, firms are turning towards digital services.

These services offer advanced technologies for real-time maintenance to improve operational efficiencies across real estate asset types. As digital service offerings advance, firms must capitalize on actionable insights to be more responsive and forward-looking regarding investment decisions.

Investment in managed services is snowballing.

Digital managed services are disrupting the global building maintenance market, with 78% of firms having invested in or planning to deploy managed services to proactively maintain their mechanical equipment. The US is no exception to this trend, with 67% of firms having invested in or planning to invest in proactive services. Equally, only 25% of Australian firms still leverage in-house maintenance as their primary maintenance method. In higher education, 30% foresee their maintenance approach or contractual agreement changing in the next 12 months, while only 10% of commercial firms and 31% of hospitality firms plan to leverage in-house maintenance as their primary contractual maintenance approach. This further demonstrates the shift to outsourced services across asset types.

> If clients don't have competency in-house, they want external experts. They want information on-hand and to be kept updated on what is happening."
>
> **Senior Manager Business Development, Global, Facilities Management Firm**



Energy and cost savings and increased uptime are the biggest drivers of investment.

Firms rank energy savings, increased uptime and cost savings as the top three drivers for investment in managed services, with improvements in these areas forming the business case for investment in these services. Energy savings are the most significant driver for the USA and UAE markets and are of particular focus amongst hospitality firms, whilst increasing uptime is the most prominent driver in India and across the healthcare and K-12 education verticals.

Labor deficits and compliance risk further incentivize outsourcing services.

Facilities management teams are increasingly subject to dwindling numbers of skilled technicians brought on by retiring workforces; 80% of facilities management staff are 40 or over[9], and around 60% of personnel are expected to exit the field in the next 5 to 7 years[10]. Firms also face compliance pressures with regulations and frameworks around ESG, for example, driving the need for optimized facilities performance. Demand for specialized expertise will continue to grow as facilities become more technologically advanced and compliance risk rises.

Investment in digital services gives firms a competitive edge.

Leading firms are leveraging digital managed services and proactive maintenance to gain a competitive advantage and remain agile to changing economic conditions. Furthermore, digital services lay the foundation for future innovation by providing the first step towards more advanced analytics.

> “We might alter our maintenance strategy because, in my opinion, putting innovative maintenance philosophies into practice like condition-based maintenance or collaborating with tech-enabled providers could be a part of a larger innovation strategy.”
>
> **Facilities Operation Manager, USA, Commercial firm**

[9] Facilities Professionals are Retiring: Here’s Why That Can be a Good Thing
[10] The Great Retirement and the Future of Facilities Management, Operations & Maintenance

The cost of inaction is too great to ignore

Firms that fail to invest in digital services risk falling behind energy efficiency and sustainability goals, suffering reduced employee productivity and risking longer periods of asset downtime.

A reactive maintenance approach leads to heightened long-term costs.

A staggering 82% of companies experienced at least one unplanned downtime over the past three years[11] which can cause significant interruption to business operations. Inefficient reactive maintenance approaches result in higher and compounded long-term maintenance costs and disruption, with a reactive maintenance approach costing up to 10 times more than with a proactive maintenance strategy[12]. Thus, transitioning to proactive maintenance is an effective way to cut costs, as well as free facilities leaders to focus on more value-added tasks.

> "It may be necessary to modify maintenance procedures and contractual agreements due to changes in accreditation requirements and updates to healthcare regulations."
>
> **Engineering Manager, UAE, Healthcare**

Poor energy efficiency exposes firms to the looming threat of regulatory mandates.

Threats from incoming regulations are forcing firms to act and upgrade their maintenance strategies. Regulations are a key driver in Australia and Hong Kong. In addition, in climates like the Middle East, optimized HVAC equipment is essential to maintain healthy indoor environments whilst minimizing energy consumption. With poor efficiency, firms risk incurring fines. For example, the Bank of America Tower is set to face millions in annual fines due to New York City's Local Law 97[13], despite previously attaining a LEED Platinum certification. This ever-changing regulatory landscape requires expert support.

[11] Human Error is More Common Cause of Unplanned Downtime in Manufacturing Than Any Other Sector, According to New Research
[12] What Is Reactive Maintenance: A Complete Guide
[13] LEED Platinum office tower faces millions in fines due to New York's Local Law 97

Smart mechanical services outcomes present a significant opportunity

Digitized managed services to enable proactive maintenance bring a host of operational benefits whilst enabling facilities leaders to balance priorities such as energy efficiency and performance.

Facilitate efficient use of resources and enable capital planning visibility.
Digital services use less onsite staff and minimize equipment failures. Proactive maintenance approaches leverage real-time asset performance monitoring to prevent resource and staffing inefficiencies and enable improved capital planning due to enhanced visibility into asset operation. Proactively identifying potential failures allows parts to be ordered in advance and catastrophic failures can be avoided reducing costs, minimizing business interruption, and extending the life of assets.

Bridge the gap between labor demand and supply.
Skilled workers in the maintenance and facilities management sectors are dwindling due to a globally retiring workforce. Digital managed services are reducing the strain on workforces by automating troubleshooting, remotely monitoring and streamlining operations. Attracting new talent into the industry is also vital, and digital enablement is key for attracting and retaining a younger generation of digitally native workers.

Enhance operational efficiency via prioritized actions.
Proactive managed services for maintenance go beyond traditional control systems and result in more efficient mechanical systems with measurable uptime and improved operational performance. Proactive maintenance approaches with advanced analytics prioritize issues to ensure the efficient utilization of facilities teams.

Maximize energy savings and align with sustainability agendas.
Amid global mandates and state-specific local laws, facilities leaders are turning to digital managed services to aid in reporting on emissions and energy consumption associated with operations. Firms are capitalizing on actionable analytical insights on a month-by-month basis to ensure their equipment is operating at optimal efficiency, reducing the need for replacements and lowering the embodied carbon emissions associated with poor maintenance. 'Green premiums' for more sustainable buildings will further fuel the value of digital managed services for improving energy efficiency in buildings.

> We have an aging workforce globally around HVAC and trying not only to address that gap as people retire, but also attracting new talent into this market is a key driver for that because the younger workforce want to work with digital solutions"
>
> **Global Business Development Director, Global Service Provider**

The transition to proactive maintenance begins now

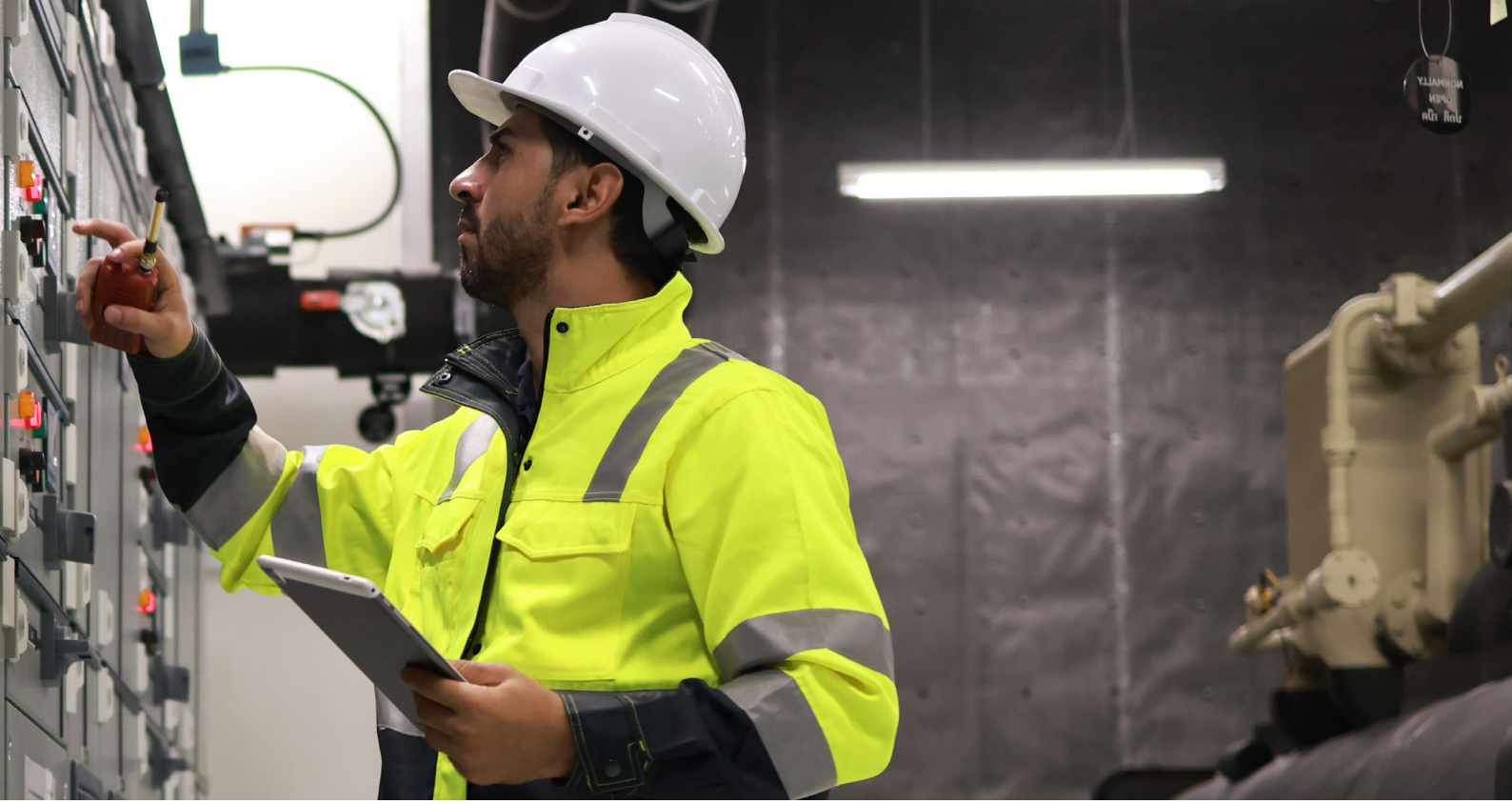
The market is providing strong indications of movement towards digitally based mechanical services, with a view to a more proactive maintenance strategy. Therefore, firms need a clear roadmap and implementation process to facilitate this transition. To achieve this efficiently and effectively, firms must:

Formulate the transition strategy for proactive maintenance with the help of an expert partner.

The first step to a successful maintenance transition is to select an expert partner for digital mechanical services, preferably one with hardware-agnostic solutions. This partner will support processes across the transition, such as assessing the current situation and reconciling the impact of decisions on different areas like energy use and sustainability. The partner should also provide proactive maintenance solutions and services for post-transition operations. Firms should begin by working with the partner to align goals and build a roadmap for upgrading from reactive to proactive maintenance, starting by assessing the health of assets.

Understand systems health.

Leveraging the expertise and solutions of the partner, firms should perform a health assessment and establish an asset condition and performance baseline. This perspective, when factored in with the implications on cost, business disruption, resources and remaining asset life – a process the partner should lead – will help effectively assess the feasibility of replacing, repairing or refurbishing assets.



Digitize the asset database for improved visibility.

Once the condition assessment is complete, the asset database should be updated. This information will be used in a comprehensive review of building systems, in context with other data such as location, redundancy, business impact, and remaining useful life. This information also enables operational asset monitoring and improved decision-making.

Invest in monitoring, visualization and reporting on the operational ecosystem.

The next step is to demystify the day-to-day operations of assets via easy-to-understand visualizations. Digital dashboards take advantage of the monitoring capabilities established through the digital database, as well as delivering frequent reporting to give users a connected view of building systems and their ongoing health and status.

Invest in fully digitized mechanical services for actionable insights.

The final step to proactive maintenance exercises the infrastructure and best practices from previous steps. Firms should implement solutions that prioritize alerts, based on monitoring and reporting, and proactively provide actionable insights. For example, this solution could identify a deterioration of asset performance before failure; an insight that could trigger a decision to intervene early and limit later disruption and cost. This proactive maintenance service means firms are better placed to analyze efficiencies, identify issues ahead of time and make decisions related to resources and capital in a highly informed manner.

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