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Artificial Intelligence in the Built Environment—Customer Insights and Business Models

How AI Is Redefining Value, Platforms, and Monetization

FOCUS POINTS

1	AI IN THE BUILT ENVIRONMENT
2	AI OPPORTUNITY ASSESSMENT FRAMEWORK
3	AI & IoT-BASED PREDICTIVE MAINTENANCE SYSTEM ARCHITECTURE
4	CUSTOMER INSIGHTS ON IOT- AND AI-DRIVEN SMART BUILDING PLATFORMS
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AI IN THE BUILT ENVIRONMENT

Value Creation

Planning & Design
AI-driven insights to empower AEC design professionals to create a design vision for stakeholders.

Construction
AI-powered analytics to enable construction engineers to increase cost savings and reduce inefficiencies from pre-construction to handover.

Operations & Maintenance
AI-driven smart building solutions to empower building managers to reduce energy-related costs and equipment downtime and increase operational efficiency.

Facility Management
AI-enabled FM solutions will automate repetitive tasks and mainly improve health and wellness of occupants.

Property Management
AI-driven property management solutions to improve overall customer experience.

Home Automation & Personalization
Next-generation voice assistants and AR-powered smart devices will deliver personalized user experience and drive immersive connected home experiences.

AI IN THE BUILT ENVIRONMENT

Top Trends

01 Infrastructure Metaverse

AI reduces capital risk in low-carbon infrastructure using digital twin platforms

02 Building Asset Maintenance

AI enables remote, proactive building maintenance

03 Building Energy Optimization

AI continuously optimizes building energy performance.

04 AI & Supercomputing for Climate Change Mitigation

AI digital twins improve climate prediction and disaster risk management

05 Outcome-based BIM

AI simplifies BIM workflows and shifts design toward outcome-based delivery

06 Immersive 3D Experience for Property Management

Digital twins convert spatial data into immersive 3D property experiences

07 As-built Verification during Construction

AI automates as-built verification using reality capture

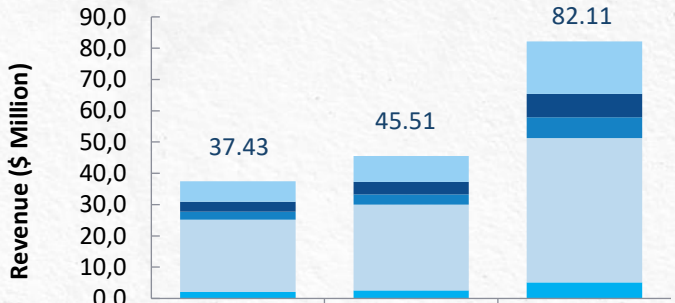
08 Generative AI-enabled Customer Service

Conversational AI transforms property customer support across all channels

AI IN THE BUILT ENVIRONMENT

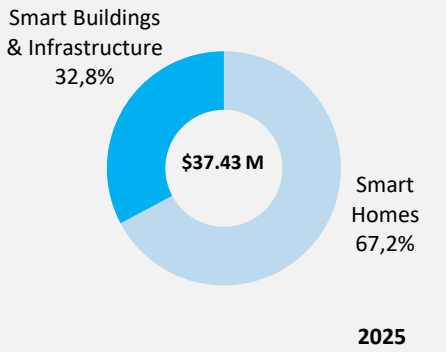
Revenue Metrics

Homes and Buildings: AI Revenue Forecast by Application, Global, 2025, 2026, and 2029

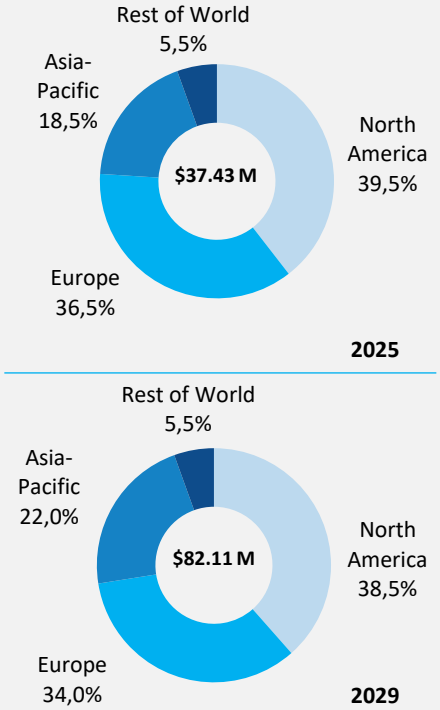


	2025	2026	2029
Digitized Maintenance and Optimization	6,55	8,27	16,74
Building Performance Optimization	3,20	3,97	7,43
Simulation, Modeling, and Visualization	2,52	3,25	6,69
Home Automation and Personalization	23,11	27,45	46,14
Indoor Environmental Control and Monitoring	2,06	2,57	5,11

Homes and Buildings: AI Revenue Breakdown by Vertical, Global, 2025 and 2029



Homes and Buildings: AI Revenue Breakdown by Region, Global, 2025 and 2029



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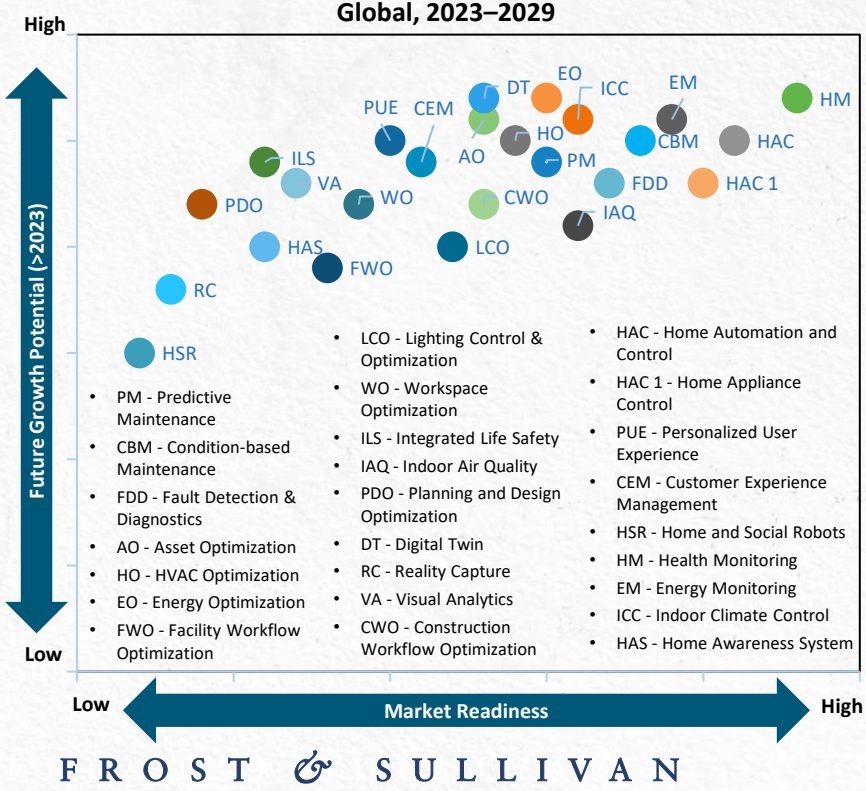
Source: Frost & Sullivan

AI OPPORTUNITY ASSESSMENT FRAMEWORK

Overview

Homes & Buildings: AI Opportunity Assessment Framework, Global, 2023–2029



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The AI Opportunity Assessment Framework maps the top 25 AI applications and use cases considering 2 key criteria that are further broken down into parameters:

- **Market readiness:** Presented on the X-axis, this indicates the current stage of the technological awareness and business development of top AI applications in the industry.
- **Future growth potential:** Presented on the Y-axis, this indicates the growth potential that the plotted applications will exhibit till 2029.

Market Readiness	Future Growth Potential
• Funding and investments • Industry participation • Technology maturity • Application scope and criticality • Customer adoption • Regional penetration	• Drivers and restraints • Impact of evolving regulations • Unmet market needs • Enhanced outcomes • Cost reduction potential • Ease of entry for new market participants

Source: Frost & Sullivan

AI OPPORTUNITY ASSESSMENT FRAMEWORK

Frost Perspective

AI Applications and Use Cases	Market Readiness	Future Growth Potential	Frost Perspective
• Condition-based Maintenance • Energy Monitoring • Home Automation and Control • Health Monitoring	High	High	These AI applications are expected to see strong adoption and growth through 2029, driven by customer priorities around energy efficiency, automation, and occupant well-being, making them core tools for both businesses and individuals.
• Customer Experience Management • Personalized User Experience • Predictive Maintenance • Asset Optimization • HVAC Optimization • Energy Optimization • Fault Detection and Diagnostics • Lighting Control Optimization • Construction Workflow Optimization • Indoor Climate Control • Indoor Air Quality • Digital Twin • Home Appliance Control	Medium to High	Medium to High	These solutions deliver clear operational and user-experience benefits, supporting efficiency, comfort, and optimization, and are likely to see steady adoption as demand for digital building solutions continues to rise.
• Home and Social Robots • Reality Capture • Workspace Optimization • Facility Workflow Optimization • Home Awareness System • Planning and Design Optimization • Visual Analytics • Integrated Life Safety	Low to Medium	Medium to High	Although adoption is still emerging, these applications have significant long-term upside, as advances in technology, affordability, and integration address growing needs for safety, security, and efficiency in built environments.

CUSTOMER INSIGHTS ON IOT- AND AI-DRIVEN SMART BUILDING PLATFORMS

Criteria	Commercial Real Estate	Hospitality	Pharmaceutical	Factory
Customer Type	Multinational software company	Luxury hotel	Medical device manufacturer	Steel production company
Asset Size / Footprint	350,000 sq. ft.	6 million sq. ft.	90 manufacturing facilities	Industrial plant
Geography	India	Singapore	North America	France
Installed BMS / Legacy Systems	Schneider Electric	Honeywell (BMS); Schneider Electric (power)	ABB and multiple legacy systems	Multiple systems; no prior EMS
Smart Building / AI Platform	Honeywell Forge	Lynxspring Onyxx/Connexxion (SkySpark)	ABB Ability	Metron EMOS
Primary Customer Objective	Guaranteed energy savings and performance accountability	Energy efficiency with advanced analytics	Process standardization and legacy integration	Energy consumption reduction
Commercial Model	Performance-based OPEX with SLA penalties (5-year term)	Upfront on-prem server + SaaS fee + hourly analytics (shift toward lump-sum preferred)	3-year contract with annual payments (evaluation phase)	Subscription-based pricing; scalable with no extra counter cost
Deployment & Support Highlights	Occupancy-based HVAC/lighting; on-site engineer; strict escalation SLAs	Hybrid cloud/on-prem due to data privacy; global support with penalties	Seamless onboarding for standardized sites; single technical contact	Rapid deployment (4 months); cloud-based monitoring
Delivered Value	Enforced energy targets; fast issue resolution; outcome-driven accountability	Strong SLA performance; analytics cost predictability challenge	High confidence in legacy integration and service quality	€340k energy savings in 12 months; energy-efficient operating culture

BUSINESS MODEL INNOVATION

Overview

Consumption-based Model

- This model charges customers based on actual usage, such as data volume, storage, or analytics hours. It is rarely adopted in smart building platforms because usage is hard to measure accurately and customers are reluctant to switch.
- When used, it is typically limited to data-intensive or mission-critical applications. From the customer's perspective, it can be costly and unpredictable, often ending up more expensive than a standard SaaS model for day-to-day building operations.
- Usually adopted in data-intensive, mission-critical environments such as airports, casinos, and large campuses, where applications like video surveillance or advanced analytics justify variable, usage-linked pricing.

Non-consumption-based Model

- This model relies on fixed, predictable pricing, commonly based on assets, floor area, data points, or users. It is preferred by most vendors because it is simple to explain, easy to quantify, and lower risk for both parties.
- Some vendors experiment with performance-based pricing, where fees are linked to building energy outcomes, but this is seen as risky, as vendors may face penalties if performance targets are not met.
- Usually adopted in commercial and institutional buildings (offices, hospitals, retail, education) where customers prefer predictable, asset- or area-based pricing for core building operations and maintenance.

BUSINESS MODEL INNOVATION

Consumption-based Model

Pricing Model	Applications	Examples
Data storage-based model	• Video surveillance • Cloud data storage	• Vendors charge based on connected devices and data volume stored, typically with an upfront engineering (NRE) fee and a base storage allowance. • Most commonly used in airports and casinos, where data-intensive, mission-critical systems justify usage-based pricing.
Consulting (analytics hours) model	• Advanced analytics services	• Analytics services are monetized based on the number of expert hours consumed, usually layered on top of SaaS or fixed pricing. • This model is applied to specialized or ad-hoc analytics, rather than continuous building operations.

BUSINESS MODEL INNOVATION

Non-consumption-based Model

Pricing Model	Applications	Examples
Performance-based Model	• Energy performance improvement • Outcome-driven building optimization	• Customers pay an upfront setup fee covering site assessment, hardware updates, installation, integration, and configuration. • Vendor fees are linked to pre-agreed performance or outcome targets, and payment is triggered only when outcomes are achieved, transferring performance risk to the vendor.
Non-performance-based Model (Asset / User-based)	• Core building operations • Monitoring and control platforms	• Pricing includes an upfront setup fee plus charges based on price per square meter, data point, zone, or user. • Fees are fixed and predictable, regardless of actual platform usage, making this model easier to budget and scale across portfolios.
Pure SaaS Model	• Software platforms • Add-on analytics and diagnostics	• No upfront fee is required, even if additional hardware is commissioned. • Customers pay a fixed monthly subscription for platform access, with modular pricing for add-on features such as maintenance management or fault detection and diagnostics.

GROWTH OPPORTUNITIES

Outcomes-driven Circular Business Models	Traditional product-centric smart building offerings are giving way to outcome-based, service-led models that reduce CAPEX burden, shift to OPEX, and guarantee measurable outcomes such as energy savings and asset performance.
AI-powered Smart Home Devices	Advances in generative AI, voice assistants, and IoT are enabling personalized, secure, and interoperable smart home experiences, expanding opportunities across home automation, wellness, security, and immersive consumer lifestyles.
AI-driven Digital Twins for Infrastructure Metaverse	AI-enabled digital twins are becoming foundational for infrastructure metaverse platforms, supporting decarbonization, risk mitigation, and what-if simulations for large-scale, capital-intensive, and sustainability-driven infrastructure projects.

CALL TO ACTION

01.

Shift from Products to Guaranteed Outcomes

Vendors must shift from product-led CAPEX models to outcome-based services, embedding AI into operations, guaranteeing performance through SLAs, diversifying revenue streams, and accelerating customer adoption via OPEX-friendly offerings.

02.

Scale Personalization through Generative AI Ecosystems

Companies should integrate generative AI into smart home platforms, enable cross-device interoperability, strengthen data privacy, and partner across wellness, security, and entertainment ecosystems to deliver highly personalized consumer experiences.

03.

Invest in Cognitive Digital Twin Platforms

Vendors must invest now in AI-enabled digital twin platforms with predictive and prescriptive capabilities to support decarbonization, manage capital risk, and enable scenario-based decision-making for large-scale infrastructure projects.

KEY TAKEAWAYS

1. **AI Is Now Core to Buildings:** Embedded across design, construction, operations, and management
2. **Adoption Favors Proven Optimization Use Cases:** High readiness driven by efficiency, automation, and analytics
3. **Digital Twins Are Strategic Platforms:** Evolving from visualization to intelligence and decision support
4. **Business Models Are Outcome-Driven:** Shift from product CAPEX to SaaS and performance-linked services
5. **Customers Expect Measurable Value:** Efficiency, sustainability, predictability, and accountability matter most