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BUILDING TECHNOLOGY BIZBITS

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JWCC, MUMBAI
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BAC E&C
BUILDING AUTOMATION COMMUNITY EXPO & CONNECT-CONVENTION

This is the right moment to bring our flagship event, ORGATEC Cologne, to India—fostering visionary ideas and innovative solutions that will shape the workplaces of tomorrow.

Building automation goes beyond control—it creates intelligent spaces that adapt, conserve, and empower, transforming buildings into sustainable ecosystems for the future.

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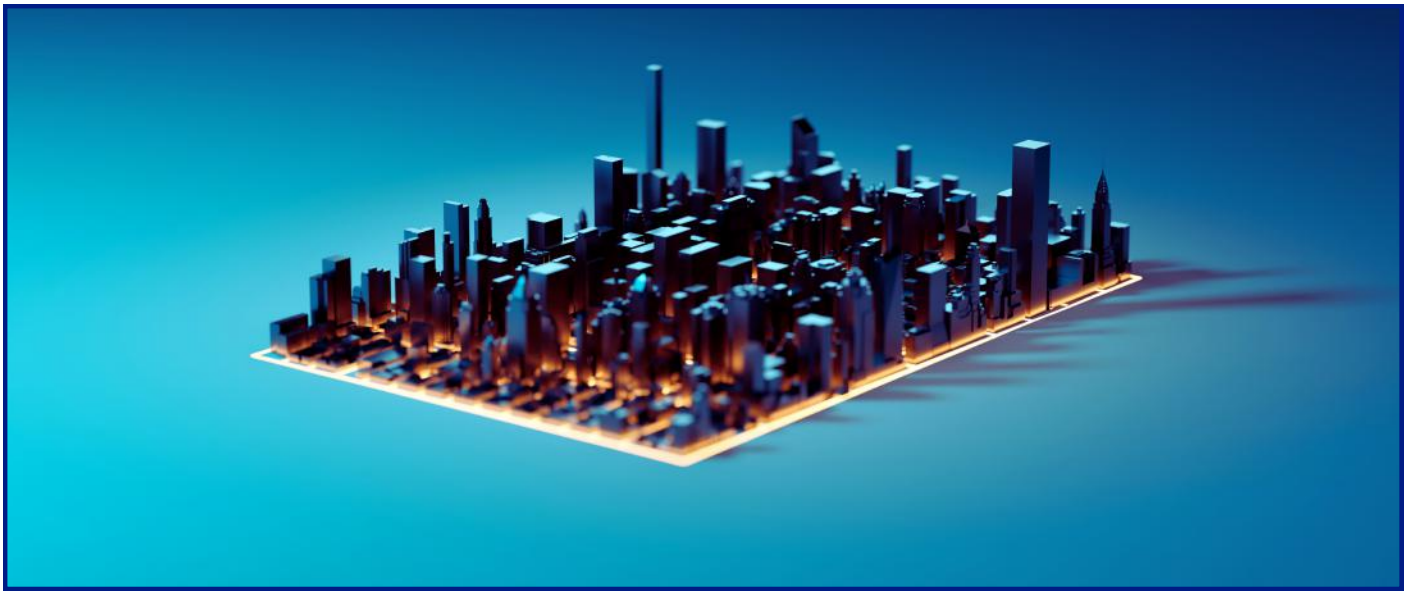
THE EDITOR'S DESK

"BUILDING AUTOMATION MEETS AI: SHAPING SMART, HEALTHY, AND HUMAN-CENTRIC ENVIRONMENTS"

In every edition of the INBAC magazine, the contributions of seasoned authors continue to elevate its value, turning it into a benchmark for knowledge in the field of building automation. Their diverse perspectives—rooted in years of research, practice, and innovation—bring depth to discussions on healthy buildings and healthy minds. By blending technical expertise with real-world insights, they help our readers navigate the rapidly changing ecosystem of smart buildings, while inspiring professionals across disciplines to adopt sustainable and people-centric approaches.

From an editorial perspective, the intersection of Building Automation and Artificial Intelligence is particularly transformative. AI-driven automation is enabling buildings to learn, adapt, and respond to occupant needs with precision—optimizing energy use, enhancing indoor air quality, and ensuring holistic wellbeing. These intelligent systems are not just about efficiency; they are about creating environments that nurture human health, productivity, and mental balance. As INBAC continues to curate thought leadership in this space, the magazine remains a platform where technology meets humanity—shaping the future of truly smart and healthy built environments.

Sincerely,
Dr. Amit Chaudhari (CFPS, LEED AP, PMP, WELL AP)
Editor-in-Chief
Building Technology BizBits Magazine



DESIGNING BAS FOR EMPATHY: THE ROLE OF INFRASTRUCTURE TECH IN HUMAN-CENTERED SMART BUILDINGS

In an era of buildings are slowly gaining traction of mandatory integration of sensors, algorithms, and automation systems in an effort to achieve post occupancy energy efficiency and thermal comfort, it's easy to forget why we automate in the first place.

Beyond energy efficiency or compliance, the true purpose of infrastructure technology in buildings is to meet the requirements of the end user —Indoor environmental comfort, well-being, productivity, and even happiness index. Yet too often, building automation systems (BAS) are engineered for systems, not humans. We have managed to integrate the requirement into compliance, executed on site but failed to release credible returns post occupancy.

What if we flipped that lens? What if we saw sustainable smart spaces not just as efficient, but empathetic?

As an architect turned building energy analyst, I've observed a persistent gap between design intent and operational reality. Architects intuitively designs spaces for light, air, and movement, but post occupancy, a building's behaviour may not even come close to those guesstimates often resting in the rigid algorithms of control systems that may not 'understand' the spatial or experiential intent. Infrastructure technology, when designed with empathy which is almost never a factor in our discussions, can become a bridge—not a barrier—between human comfort and performance goals. One reason why this has almost always been absent from our KPIs is a lack of solid financial touchpoint.

Smart Isn't Always Sensitive

Let's look at this with a simple example: automated blinds. In theory, as per the sun path – a motorized shading is a smart solution tackling multifaceted needs of a building throughout the year —minimizing glare, cutting down on heat gain and improving indoor comfort. But in practice, I've seen buildings where blinds lower on sunny winter days, blocking out much-needed warmth and daylight. The result? Occupants override the system or feel helpless, leading to discomfort and dissatisfaction.

This isn't a failure of technology. It's a failure of empathy.

What was missing was not more sensors or more data, but a better understanding of context and human needs. Buildings that evolve with time - seasonal, spatial, and behavioural cues—not just compliance thresholds—are more likely to succeed both environmentally and experientially.

Infrastructure as a Conversation

We often describe smart buildings in technical terms: nodes, networks, controls, set points. But I propose a different metaphor: infrastructure technology as a conversation. A successful BAS isn't one that imposes decisions but engages in a dialogue—between designers, engineers, occupants, and the building itself.

This dialogue begins during design. When mechanical and automation consultants are brought in early, their systems can be integrated into the architectural intent rather than overlaid later. For instance, if a space is designed to promote natural ventilation, BAS logic should reinforce it—not shut windows the moment CO_2 rises slightly. Likewise, if a daylight strategy guides window placement, sensors and lighting controls should be tuned to support—not undermine—that strategy.

Infrastructure tech should remember what the building was meant to be

Empowering Occupants without Overwhelming Them

Another layer of empathy lies in how we empower occupants. Giving people control over their environment has been shown to improve comfort and satisfaction. But too much control—poorly designed interfaces, cryptic thermostats, or overwhelming dashboards—can cause confusion.

The answer isn't binary. It's not about choosing between full automation and full manual control. It's about creating intuitive interfaces and meaningful defaults, where users feel guided, not dictated to.

One inspiring example comes from buildings that allow occupants to provide feedback through simple interfaces (e.g., "too hot," "too dim") that adjust settings and also inform system tuning over time. This kind of feedback loop humanizes automation—treating people as partners, and not a point in time mechanical response to the data collected by the sensors.

Sustainability Beyond the Dashboard

Much of the current approach and materials on smart buildings focuses on operational efficiency guided by local codes and compliance mandates —energy savings and carbon metrics. These are crucial, especially in a climate-constrained world. But sustainability also has a fourth wall, a layer slowly being recognised for its qualitative aspects beyond numbers on that BAS dashboard.

We all have used the jargon "sustainable smart space" upteen times, allied with frequent adjectives that describes such a space : is one that is adaptive, inclusive, and resilient. But, now that we have power of automation with awareness of what our end result should look like – we might start prioritizing natural ventilation in low-energy contexts, provision for thermal comfort with mixed mode cooling strategies, or integration lighting schemes that support circadian rhythms.

In countries like India, where energy access and building performance are uneven, automation can also be a tool for climate justice—bringing quality indoor environments to more people without increasing resource consumption. It will help realise the quantitative aspects of design while balancing out the qualitative requirements of the end user.

SOURCE: GENERATED BY AI

The Future: Infrastructure That Feels

Looking ahead, we must ask: what does it mean for buildings to "feel"? Can infrastructure tech begin to sense not just temperature or light levels, but mood, comfort, or intention?

With the growth of AI and ever increasing accessibility combined with vast uskilling in machine learning in AEC industry - this isn't far-fetched.

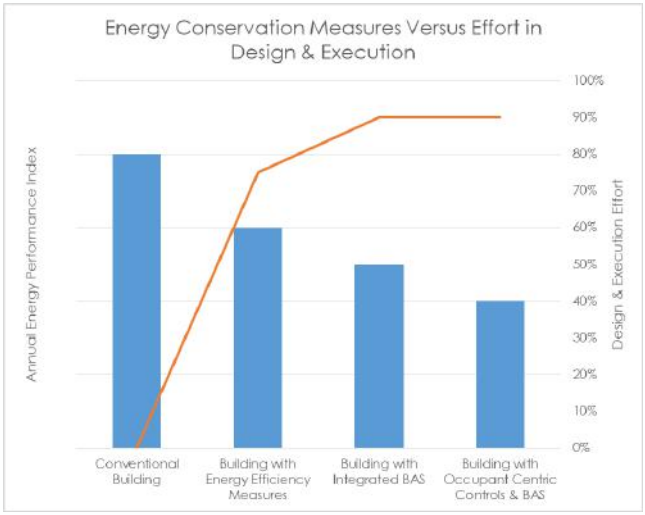
Imagine a classroom that knows when students are disengaged and adjusts lighting or ventilation accordingly. Or a home that senses stress through biometrics and adapts its acoustic or thermal profile.

Of course, these ideas raise questions of privacy and agency—but they also open doors to deeper, more responsive experiences of space.

Closing Thoughts

Building automation is no longer just about efficiency—it's about experience. As professionals shaping the built environment, we have an opportunity to reimagine smart infrastructure as a deeply human tool—one that respects context, supports comfort, and tells the story of a building long after the architect's drawings are archived. The buildings we design and build today are going to be part of the real estate stock for the next 50 years. We have all the resources and awareness at our fingertips to go that last mile and elevate the function and possibility of a BAS system!

To build sustainably, we must also build sensitively. Not just smarter buildings—but kinder ones.



Caption: Fine Tuning BAS to Occupant Centric Behaviour does not require additional time or cost but may result in reduction of annual operational energy consumption. (Source: Schematic Graph by Author)

NAME : RESHMI GOSWAMI
DESIGNATION : JUNIOR ENVIRONMENTAL CONSULTANT
FIRM : UPTON HANSEN ARCHITECTS
LOCATION : MUMBAI

SMART MEP IN MIXED-USE DEVELOPMENTS – A PATHWAY TO SUSTAINABLE AND INTEGRATED INFRASTRUCTURE

As our cities evolve and the boundaries between living, working, and leisure continue to blur, **mixed-use developments (MUDs)** have become a defining element of urban growth. These integrated spaces—combining residential, Office, Hotel and Retail—promise convenience, connectivity, and compactness. But behind this architectural versatility lies an intricate web of infrastructure that keeps everything running smoothly: the **Mechanical, Electrical, and Plumbing (MEP) systems.**

In such dynamic environments, traditional MEP approaches often fall short. Systems that work well in single-use buildings tend to struggle in mixed-use settings, leading to energy wastage, user discomfort, and increased operational complexity. This is where **Smart MEP** systems—leveraging automation, IoT, and data analytics—step in as game changers.

The Complexity of Mixed-Use Projects

A mixed-use building isn't just a blend of spaces; it's a blend of **expectations, occupancy patterns, and technical demands.**

Consider this:

- **Offices** require efficient air-conditioning, task lighting, high data connectivity, and weekday peak load readiness.

- **Retail outlets** prioritize ventilation, lighting aesthetics, and high energy use during weekends and evenings.
- **Hotels** demand personalized climate control, high hot water loads, and 24/7 operational reliability.
- **Residential units** focus on comfort, safety, water supply, and low noise HVAC systems.

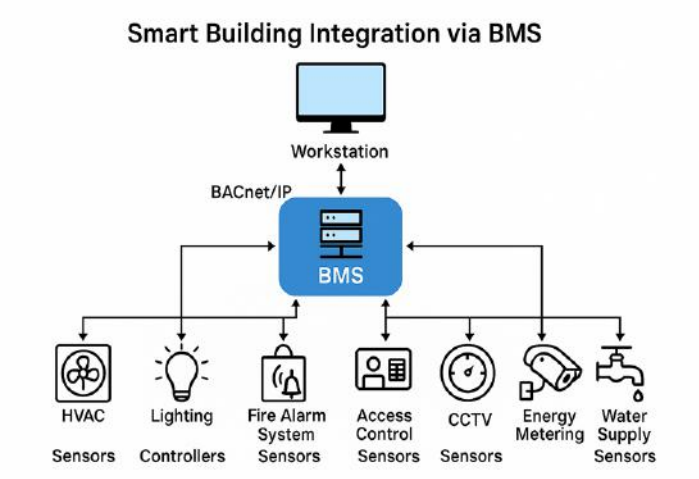
This diversity means that a one-size-fits-all approach simply doesn't work. If not carefully planned, one system can interfere with another—say, excess exhaust from a commercial kitchen(from Hotel) affecting fresh air intake for residential units—or common equipment may be oversized or underutilized, leading to inefficiencies.

What is Smart MEP?

Smart MEP refers to the integration of intelligent, responsive, and connected systems within the MEP infrastructure. It uses real-time data, automation, and advanced controls to ensure systems are not just operating—but optimizing themselves based on demand, occupancy, and environmental conditions.

Core elements include:

- **Building Management Systems (BMS)** that centralize and automate HVAC, lighting, and water systems.



- **IoT sensors** that monitor temperature, air quality, air flow, water flow, energy usage, and occupancy.
- **Demand-based control systems** that adjust operations dynamically—like dimming lights in unoccupied areas or modulating fresh air based on CO_2 levels.
- **Predictive maintenance tools** that identify potential failures before they occur.

This integration doesn't just add intelligence—it creates synergy between MEP systems, architectural form, and human usage.

Key Benefits in Mixed-Use Developments

1. **Energy Efficiency**

Smart systems reduce energy consumption by adapting to real-time conditions. For example, in office areas that are empty during weekends, HVAC and lighting systems automatically scale down. In retail areas with fluctuating occupancy, ventilation adjusts based on CO_2 or footfall sensors.

2. **Improved Comfort and Well-being**

Comfort isn't just about temperature. It's also about lighting quality, air freshness, humidity levels, and noise. Smart MEP ensures these parameters are balanced zone-wise, based on use-case—residential bedrooms get low-noise ACs, while hotel lobbies enjoy uniform cooling and welcoming lighting.

3. **Operational Transparency**

Facility managers can monitor every pump, fan, and circuit from a central dashboard. Alerts are sent when something drifts from its set parameters. Historical data helps fine-tune performance or identify causes of recurring issues.

4. **Ease of Maintenance**

With predictive analytics and remote diagnostics, maintenance becomes proactive rather than reactive. This avoids unplanned breakdowns and extends the life of equipment.

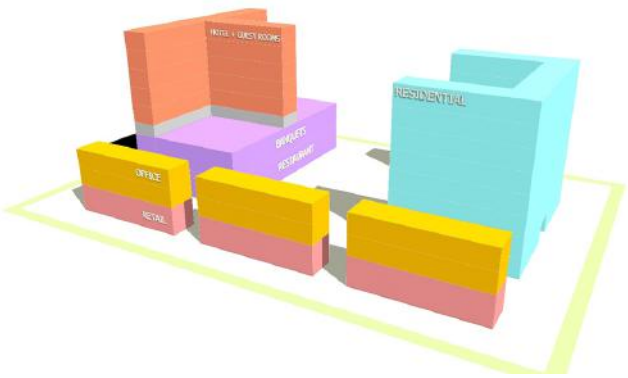
5. **Sustainability and Compliance**

Smart MEP solutions contribute directly to green building certifications (IGBC, LEED, GRIHA) by reducing energy use, managing water efficiently, and improving indoor environmental quality. They also help in meeting government norms for building performance and environmental reporting.

Real-World Application – A Quick Scenario

Imagine a complex with having below towers:

-Residential
-Hotels
-Office + Retail on ground floor



A Smart MEP approach would:

- Use **zoned chillers or VRF systems**, with load prediction based on occupancy sensors and weather forecasts.
- Provide **individual water metering** and usage tracking for each apartment and office.
- Ensure **ventilation demand control** in basements, retail shops, and toilets based on air quality.
- Integrate solar panels or battery storage to power common areas or offset peak load.
- Deliver **centralized alerts** and mobile app dashboards for facility teams to monitor all services.

The result? Lower operating costs, improved tenant satisfaction, and higher asset value.

Looking Ahead: A Smarter Tomorrow

As urbanization continues and ESG (Environmental, Social, and Governance) goals become central to development, the relevance of Smart MEP will only increase. It empowers developers to build responsibly, operators to run efficiently, and occupants to live and work comfortably.

In mixed-use developments—where complexity is high and stakes are higher—Smart MEP is not just a technology upgrade; it's a design philosophy. One that embraces data, adaptability, and sustainability at its core.

By embracing Smart MEP, we move toward a future where buildings are not just built, but intelligently alive—responding, adapting, and thriving in harmony with those who use them.

BY PRIYANKA PRAVIN JAGUSHTE
SENIOR MANAGER
ECOFIRST

BUILDING TOMORROW: INFRASTRUCTURE TECHNOLOGY FOR SUSTAINABLE SMART SPACES

Introduction: A Smarter Way Forward

As cities grow and the pressure on urban systems mounts, the need for intelligent, sustainable infrastructure is no longer optional—it's urgent. Infrastructure Technology (InfraTech) is fast becoming the cornerstone of smart urban planning. But beyond the buzzwords and digital dashboards, the true revolution lies in how InfraTech is helping cities become more sustainable, resilient, and people-centric.

In this article, we explore groundbreaking InfraTech innovations —some emerging, some disruptive—that are shaping the next generation of smart spaces in ways rarely discussed.

Digital Twin Ecosystems: The Brain of Smart Spaces

Digital Twins have moved beyond their initial hype and are now operating at the scale of entire cities. Urban leaders in Singapore and Helsinki, for example, are building digital replicas that simulate everything—from energy flow and water usage to pedestrian behavior and air quality.

The next wave? AI-enhanced twins that learn from real-time data and simulate outcomes like flooding, traffic rerouting, or energy demand spikes. These digital brains aren't just reactive—they're predictive. When applied to green building clusters or smart campuses, they can cut utility costs by up to 20% while enhancing livability.

Embedded Carbon Intelligence: Building with a Lighter Footprint

Smart infrastructure doesn't start with smart meters—it starts with smart materials.

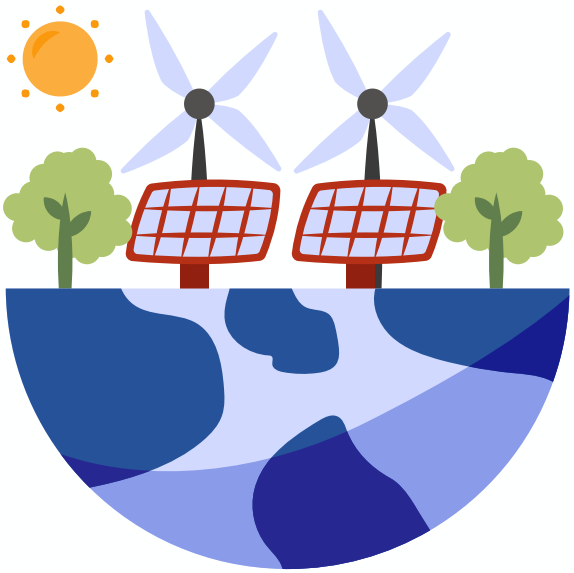
Today, AI and blockchain are being used to track the embedded carbon in every material from source to site. Low-carbon concrete with carbon-capturing minerals, bio-cement, and optimized mix designs are reducing emissions while boosting thermal performance in buildings.

A fascinating development is the "materials passport"—a digital ID for every component in a building. It helps ensure materials can be reused or recycled, supporting zero-waste deconstruction and the circular economy.

Edge Infrastructure: Utilities That Live Where You Do

Gone are the days of relying solely on central utilities. Edge infrastructure—like microgrids, on-site water recycling, and distributed air purification—is now being embedded into individual buildings and neighborhoods.

With help from IoT and AI, these systems dynamically balance energy and water loads, adapting in real time. One standout example: using waste heat from data centers to warm adjacent housing blocks—creating energy-positive communities that give back more than they consume.



Responsive Infrastructure: Built Environments That React

Imagine a building that heals itself, learns from the weather, and adapts its look and feel depending on who's inside.

From self-healing concrete to adaptive façades that change with sunlight and temperature, responsive infrastructure is changing how we think about buildings. In Tokyo, AI-integrated materials are being tested that adjust opacity and texture based on climate and occupancy—cutting cooling costs by 30% and supporting occupant well-being.

Sensorless Smart Cities: The Power of the Invisible

Why install millions of sensors when your infrastructure itself can be the sensor?

New-age smart systems are leveraging existing urban assets—pipes, cables, and roads—as data collection tools. For example:
- Vibration patterns in pipelines can detect underground vehicle movement
- EM signals from power cables show consumption peaks
- Fiber optics in roads estimate traffic weight and density

This approach slashes costs and complexity, especially for Tier-2 and Tier-3 cities, helping them leapfrog into smart solutions with minimal disruption.

Climate-Resilient Urban Fabrics: Designing for a New Normal

As climate threats rise, infrastructure must do more than just withstand shocks—it must actively mitigate and adapt.

Cities are now integrating nature-based and predictive tech like permeable pavements with rain sensors, urban heat-mapping drones, and digital wind models for safer high-rise clusters. Some smart cities are deploying AI-based hydrology systems that predict and divert stormwater before flooding occurs, protecting the most vulnerable areas.

AI-Driven MEP Coordination: Smarter Construction, Lower Impact

Mechanical, Electrical, and Plumbing (MEP) coordination is often overlooked—but it's where InfraTech shines during construction.

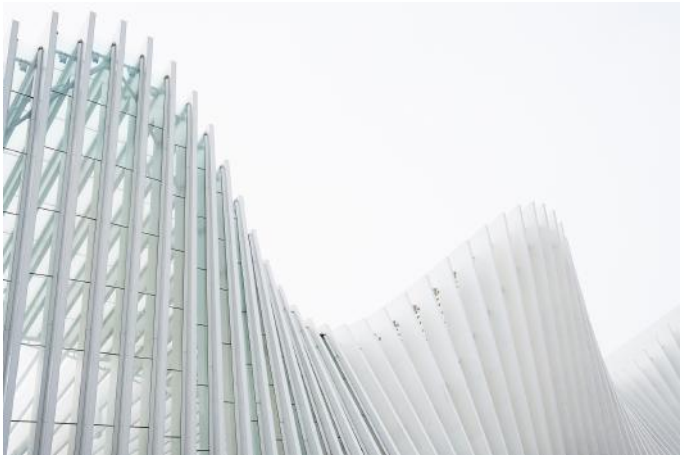
Today's AI-powered MEP tools are automating clash detection, optimizing routing, and reducing material waste. But the real leap forward? Real-time integration with energy simulation tools. Designers can now visualize the carbon, energy, and water impacts of every design decision—before the first brick is laid.

Citizen Interfaces: Bringing People into the Loop

Smart cities aren't truly smart unless their citizens feel connected to them.

New technologies are putting power in the hands of residents. Augmented Reality (AR) lets people visualize local energy flows, while interactive dashboards reveal personal or community carbon footprints. In some pilot projects, mobile apps let citizens vote in real time on whether to draw energy from solar panels or the grid.

By giving people agency, these interfaces are turning sustainability from a policy goal into a daily lifestyle.



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A Thoughtful Closing

At its core, InfraTech isn't just about efficiency or innovation—it's about redefining how we relate to the spaces around us.

As we move forward, the challenge isn't to simply build smarter cities—it's to build more human, more regenerative, and more responsive environments. Infrastructure should not just serve us, but grow with us, adapt to us, and, ultimately, empower us.

This is not the future. It's already being built—brick by intelligent brick.

BY AMIT PATHAK
GENERAL MANAGER – ENGINEERING
DOSTI REALTY LTD.

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HEALTHY BUILDINGS, HEALTHY MINDS: HOW SUSTAINABLE INFRASTRUCTURE IMPACTS PEOPLE, NOT JUST ENERGY BILLS

For decades, the sustainability conversation in construction and real estate has focused largely on reducing energy consumption, conserving water, and lowering operational costs. While these goals remain important, a growing body of research reveals that true sustainability must also prioritise the health, comfort, and productivity of building occupants.

A building may be technologically advanced and energy-efficient. Still, if its occupants experience headaches, fatigue, or poor concentration due to inadequate indoor conditions, it cannot truly be considered sustainable. A new era is emerging—one where sustainable infrastructure is both eco-friendly and human-friendly.

Why Sustainability Needs a People-First Approach

The traditional “green building” model measured success through metrics such as kilowatt-hours saved or tonnes of CO_2 avoided. These are vital achievements, but they don’t reflect the full impact of a building on its users.

Consider this: we spend an estimated 90% of our lives indoors (U.S. Environmental Protection Agency, 2018). The quality of that indoor environment has a direct effect on physical and mental well-being. Research from the World Green Building Council (WGBC) shows that improved indoor environments can boost employee productivity by 8–11%.

In workplaces, schools, and healthcare facilities, a people-first approach can mean the difference between environments that drain energy and those that foster well-being.

The Science of Wellness in Buildings

Environmental psychology and building science confirm that indoor environmental quality (IEQ) influences how we feel and perform. The Harvard T.H. Chan School of Public Health’s COGfx Study (2015) found that occupants in green-certified buildings scored 61% higher on cognitive function tests compared to those in conventional buildings.

Key wellness factors:

PILLAR	DESCRIPTION
Air Quality	Higher oxygen levels and reduced pollutants support mental clarity and respiratory health.
Thermal Comfort	Stable, comfortable temperatures reduce physical stress and distraction.
Humidity Control	Maintaining 40–60% relative humidity minimizes respiratory irritation and inhibits mold growth.
Lighting Quality	Access to natural light supports circadian rhythms and reduces eye strain.

Air Quality: The Invisible Foundation

While temperature control is often prioritised, indoor air quality (IAQ) plays a more critical role in human health. The World Health Organisation (WHO) warns that exposure to poor indoor air can contribute to respiratory diseases, allergies, and even impaired cognitive performance.

The Global Burden of Disease study (2019) estimates that indoor air pollution contributes to 3.2 million deaths annually worldwide. Even in developed economies, air inside buildings can be two to five times more polluted than outdoor air (U.S. EPA).

A sustainable building must:

- Introduce controlled amounts of fresh outdoor air.
- Filter particulate matter (PM2.5, PM10) and volatile organic compounds (VOCs).
- Balance humidity to optimise comfort and reduce microbial growth.

The WELL Building Standard now includes stringent IAQ criteria, acknowledging its central role in occupant wellness.

Automation: The Silent Caretaker

Smart building technologies are making it possible to maintain optimal comfort and air quality without sacrificing energy efficiency.

Examples include:

- **CO_2 Sensors** that activate ventilation systems when indoor levels exceed thresholds (often 800–1,000 ppm).
- **Occupancy-Based Controls** that adjust lighting and HVAC systems according to real-time usage.
- **Predictive Maintenance Algorithms** that detect issues before they impact comfort or safety.

According to a 2021 study by the American Council for an Energy-Efficient Economy (ACEEE), automation and smart controls can reduce HVAC energy use by up to 30% while maintaining or improving indoor environmental quality.

The Wellness-Economy Connection

Healthy buildings deliver economic as well as human benefits, from reducing absenteeism to improving productivity and enhancing talent retention.

Factor	Impact on People	Research Reference
Better Air Quality	61% higher cognitive scores	Harvard COGfx Study (2015)
Reduced CO_2 Levels	Improves decision-making speed & accuracy	Harvard T.H. Chan School of Public Health
Balanced Temperatures	10–15% increase in productivity	World Green Building Council
Improved IAQ	Up to 35% reduction in absenteeism	World Green Building Council

This shift aligns with the “triple bottom line” approach—people, planet, and profit.

ABOUT US

We are a non-profit community of building automation stakeholders, with the vision to facilitate an ecosystem that supports efficient, safe, healthy and connected buildings through globally accepted ISO based open standards in India.
To see India as a leader on the Building Automation world map, is deeply embedded in the DNA of INBAC.

This shift aligns with the “triple bottom line” approach—people, planet, and profit.

The Future: Buildings That Care

Looking ahead, the definition of sustainable infrastructure will continue to evolve. We are likely to see:

- Wellness certifications (WELL, Fitwel) are integrated into mainstream building codes.
- Data-driven IAQ monitoring in offices, schools, and homes is a standard practice.
- Holistic design strategies that balance renewable energy, efficient HVAC, and biophilic elements for both environmental and human health gains.

The next generation of sustainable buildings will be measured not only by how little energy they consume, but by how much better they make people feel.

Closing Summary

Sustainable infrastructure is no longer just an environmental responsibility—it’s a human imperative. Air quality, thermal comfort, and intelligent automation are not add-ons; they are essential components of a truly sustainable, people-first design.
When buildings actively support both the health of the planet and the well-being of their occupants, they transform from passive structures into active partners in human thriving. In this new vision of sustainability, healthy buildings will lead to healthy minds, and in turn, healthier societies.

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BY DR PRIYANKA MOKSHMAR
CHAIRMAN & MANAGING DIRECTOR
VAAYU HOME APPLIANCES (INDIA) PVT. LTD.

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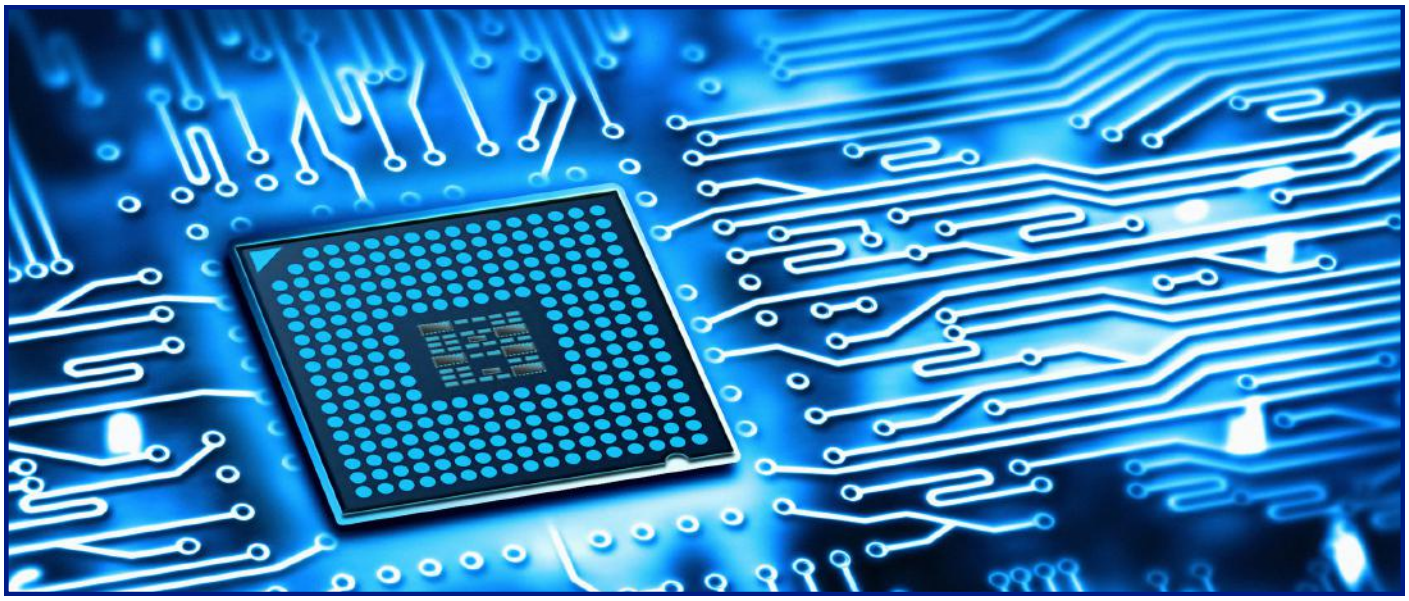


AUTOMATION AS THE INVISIBLE ARCHITECTURE: REIMAGINING BUILDING PERFORMANCE WITH INTEGRATED MEPF DESIGN

As an Architect rooted deeply in the systems side of buildings, I've often described automation as the "invisible architecture"—a structural and sensory network that doesn't define the form of a building but decisively shapes its function, performance, and long-term value. At Noesis Consultancy, we specialize in MEPF (Mechanical, Electrical, Plumbing, and Firefighting) design and HVAC optimization, where building automation has become both a design philosophy and a critical tool in reshaping user experience, energy consumption, and lifecycle management.

This article is a reflection on how automation is no longer an "add-on" but an essential design layer—particularly from the lens of systems integration and how MEP consultants and system integrators must collaborate earlier and more closely to achieve smart, sustainable, and seamless environments.

The Shift from Passive to Predictive

Traditional MEP systems were passive—designed to operate within fixed parameters. However, as expectations around sustainability, user comfort, and operational efficiency evolved, we've entered a predictive era, where systems self-optimize based on real-time data, usage patterns, and environmental inputs.

Automation transforms a static HVAC design into a dynamic, responsive climate system. In our recent project—a commercial tower in Pune—we integrated a Building Management System (BMS) that not only monitored air quality and occupancy but also predicted cooling loads using weather forecasts and historical usage. The result was 18% lower energy consumption in the first year of operation**.**

Designing for Automation: An MEPF Perspective

System integrators often enter the project post-design—but at Noesis, we advocate for their inclusion from the design development stage. Here's why:

1. **Integrated Infrastructure Planning**

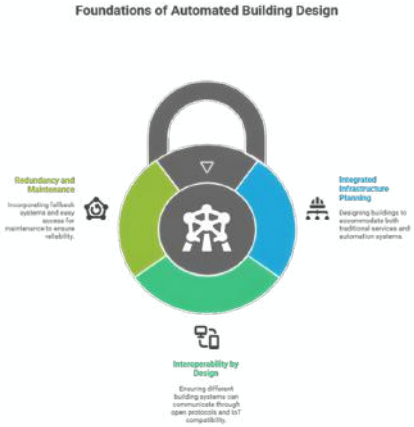
In high-rise and large-format buildings, mechanical shafts, duct routing, and electrical conduits must accommodate not only traditional services but also sensors, control panels, and network cabling required for automation systems. We design with this foresight—embedding spatial and system-level integration from day one.

2. **Interoperability by Design**

Our approach includes selecting open-protocol systems (BACnet, Modbus) and specifying products with IoT compatibility, ensuring that multiple systems—HVAC, lighting, fire alarms, access control—can "speak" to each other through a central interface.

3. **Redundancy and Maintenance**

Automation enhances performance but adds dependency on electronics and software. We design fallback loops, isolated manual overrides, and easy access points for sensor maintenance—often ignored in traditional designs.



Use Case: High-Performance Mixed-Use Building, Mumbai

In a 6-lakhs sq. ft. mixed-use development in Mumbai, Noesis was tasked with designing MEPF systems with strong automation integration:

- **HVAC:** VRV system controlled by occupancy sensors, CO_2 detectors, and time-based scheduling. Cooling setpoints adapt dynamically to daylight and interior loads.
- **Lighting:** Automated dimming and daylight harvesting in commercial zones.
- **Water Management:** Smart metering and leak detection integrated into the plumbing risers, reducing water loss incidents by 60%.
- **Energy Dashboard:** A customized BMS interface allowed the facility management team to remotely monitor energy KPIs and fine-tune operations.

The system integrator was brought on board during the concept stage, allowing us to co-develop the digital layer in parallel with physical systems. The result: a truly “living building”, where automation is not just a backend function but a strategic enabler of performance.

The Role of System Integrators in MEP Design Evolution

System integrators are no longer just technicians; they are performance partners. From my practice, I’ve identified three emerging roles they play:

Digital Twin Enablers

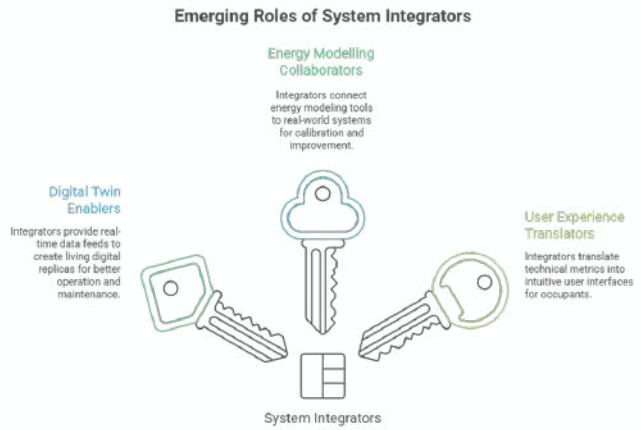
Automation is the backbone of creating digital twins. As MEP consultants, we model systems in BIM, but without real-time data feeds, the model remains static. Integrators who provide sensor networks, real-time feedback loops, and analytics engines help us create living digital replicas for better operation and maintenance.

Energy Modelling Collaborators

In high-performance building design, energy modeling tools like eQuest or IES VE can now be connected to real-world automation systems for calibration and ongoing improvement. The data integrators provide closes the loop between design intent and operational reality.

User Experience Translators

While we handle thermal comfort and air quality metrics, integrators translate these into intuitive user interfaces—mobile apps, wall-mounted tablets, or voice-controlled panels—bringing automation to the fingertips of occupants.



Automation in HVAC: More Than Just Efficiency

While automation in HVAC systems is often seen through the lens of energy efficiency, I argue that thermal comfort, IAQ (Indoor Air Quality), and user control are equally critical.

For example, in one of our healthcare projects, the automation system allowed for zonal control with patient-specific temperature and humidity settings. This not only improved comfort but also reduced cross-contamination risks by controlling airflow direction and filtration cycles—an invaluable feature during the pandemic era.

Similarly, in a recent education campus design, we automated ventilation systems linked to CO_2 levels, dynamically adjusting fresh air intake based on occupancy. This created a more engaging and healthy learning environment while ensuring operational efficiency.

Looking Ahead: Automation as a Design Principle

For automation to truly reshape the built environment, it must become a design principle, not an afterthought. As architects and MEP specialists, we must:

- Collaborate with system integrators early to define control logic, data collection strategies, and user experience flows.

- Advocate for open systems that ensure future scalability and integration of newer technologies like AI and ML.

- Push clients to view automation not as a capex cost, but as a lifecycle asset—one that pays for itself through energy savings, better occupant experiences, and reduced maintenance overheads.

Conclusion: Building Synergies, Not Just Systems

The journey to intelligent buildings isn't a solitary one. It's a collaborative choreography—between architects, MEP consultants, system integrators, and clients. At Noesis, we see automation not as a layer of technology, but as a fabric woven into every aspect of building performance.

To the system integrator community—your role is evolving fast, and your early collaboration is the key to unlocking the next generation of sustainable, responsive, and resilient buildings. Let's build not just connected systems, but co-created environments.

By Ar. Bhagyashri Varma,
Founder,
Noesis Service Consultants

About the Author:

Ar. Bhagyashri Varma is the Founder of Noesis Services Consultants, a leading MEPF and HVAC design firm. With over a decade of experience in integrated systems design, she advocates for automation as a cornerstone of future-ready buildings. Noesis has delivered solutions across commercial, healthcare, educational, and industrial projects, with a focus on energy efficiency, user wellbeing, and smart integration.

Service Consultants

SUSTAINABLE SOLUTIONS IN BUILDING AUTOMATION SYSTEMS IN INDIA

In India's rapidly urbanizing landscape, buildings now account for a significant share of energy consumption, carbon emissions, potablewater usage, and the environmental impact of construction material manufacturing. As M.D. of Ex-buzz Fire & Security Private Limited, I see firsthand how sustainable building automation systems (BAS) can transform this trajectory—turning operational efficiency and environmental responsibility into a powerful competitive advantage.

Why Sustainability in BAS Matters.

That is a million-dollar question!! The Indian green-building market is projected to reach a staggering USD 3G billion by 2025, with smart homes and commercial buildings playing key rolesin propelling this growth. As we build the next generation of offices, malls, hospitals, and residential enclaves, smart, sustainable BAS will be the infrastructure spine.

A) Market in Ascendancy

IMARC estimates that India's smart-building market reached USD 12.5 billion in 2024 and is expected to grow at a 24.2 % CAGR to USD 10G billion by 2033. Meanwhile, specific BAS adoption is growing even faster: between 2023 and 2028, the India building automationmarket is expected to grow at over 11 % annually, buoyed by cloud-native architectures, IoT, and wirelessretrofits. Mature solutionslike those by Honeywell, Schneider, and Siemens are increasingly integrated in both new builds and retrofit projects.

B) What are some Technology Trends Driving Sustainability?

AI-Enhanced Energy Management

Artificial Intelligence (AI) is taking center stage: predictive analytics anticipate equipment failures, optimize HVAC scheduling, and dynamically balance indoor comfort with energy efficiency. In India, companies like 75F have demonstrated savings of up to 50 % on HVAC energy, with AI and cloud-based control at the helm.

IoT Sensors s Digital Twins

Widespread deployment of IoT sensors—tracking occupancy, lighting, airflow, air quality, and equipment health—facilitates intelligent operations and predictive maintenance. Digital twin technology creates virtual replicas of mechanical and electrical systems for real-time monitoring and optimization.

Cloud-Native, Wireless BAS

Moving from siloed, wired BMS to cloud-native, wireless BAS enables smarter, safer, and more scalable control. Wireless protocols like Zigbee, Z-Wave and LoRa allow cost-effective retrofit of existing buildings, bringing smart automation to heritage structures, schools, mid-tier offices,and housing societies.

Renewable Integration s Net-Zero Designs

Green buildings harness on-site renewables, energy storage, and demand response systems. Examples include solar PV, smart battery systems, EV charging integration, and building energy management tied to smart grids. Prestigious projects like Indira Paryavaran Bhawan in New Delhi and Surat Diamond Bourse illustrate how passive strategies, photovoltaics, geothermal heat exchange, and radiant cooling systems deliver net-zero performance.

C) Building Materials s Sustainable Construction Methods

Automation begins in the design and build phase. Prefabricated construction—like the Technopark prefabricated 50,000 sq ft building in Kerala—builds sustainability by reducing waste, improving quality control, and shortening project timelines. Materials such as bamboo, fly-ash bricks, recycled steel, and rammed earth are gaining ground in urban projects—all conducive to efficient BAS planning.

D**) Policy s Certification Stack**

India has instituted robust frameworks—Smart Cities Mission, ECBC, GRIHA, LEED, IGBC,FSAI—to catalyze green and intelligent building adoption. Central government mandates for public buildings have deepened uptake of IoT-enabled fire safety, automated lighting, HVAC, and energymetering.

E**) Human-Centric Design s Indoor Environmental Quality**

Sustainability is incomplete unless the WELL-being of occupants is prioritized. Sensors ensure clean air (CO_2, PM, VOCs), adaptive lighting mimics circadian cycles, and human-centric controlsempower individuals. Officeswith high indoorcomfort show greaterproductivity, reduced sick days, and increased tenant retention.

F**) Safety, Fire s Cybersecurity**

The role of intelligent fire and life-safety systems—BMS-linked smoke/heat detectors and smart suppression systems—is a core capability for Fire Safety System Integration company and a sustainability imperative. As systems interconnect, cybersecurity is critical: securing BAS against intrusions protects occupant wellbeing, data integrity, and carbon-cutting credentials.

G) Resilience: Heat Vulnerability s Climate Adaptation

Recent heatwave crises have underscored the need for data granularity and context-aware control. BAS must evolve from mere automation to climate resilience— responding to micro-climatic exposure, enabling adaptive cooling strategies, and integrating responses with health alerts and energy management.

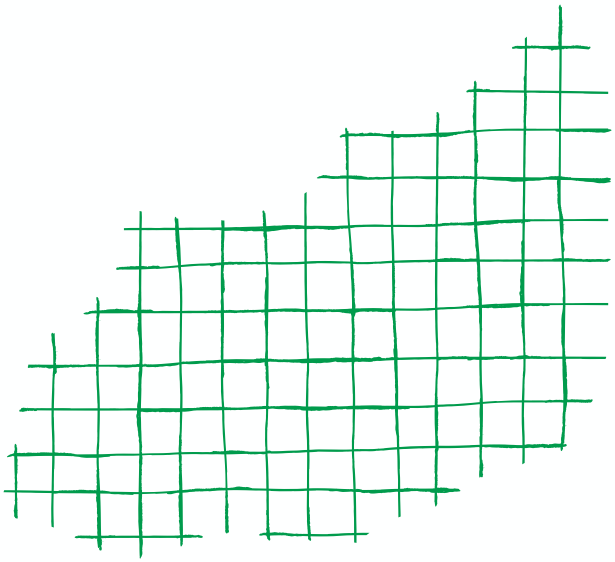
H) Emerging Models: SBaaS s Modular Deployment

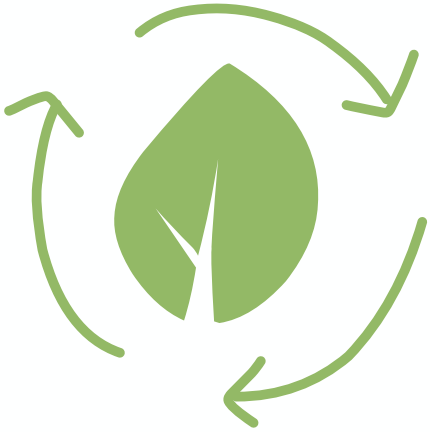
Subscription-based BAS (SBaaS),akin to SaaS,allows properties to tap into ongoing, managed smart building services—avoiding high CapEx. ModularBAS roll-outs enable phased value delivery in retrofit and affordable housing sectors.

The Evolution: Strategy for India in 2025

What shifts are defining the present—and immediate future—for sustainable BAS in India?

Trend	Impact
Wireless C Retrofit	Opens segment for existing structures– heritage, small-mid real estate
AI + Edge + Cloud	Delivers predictive intelligence across millions of devices; improves uptime and performance
ESG- Compliant IoT	Provides measurement and reporting needed for carbon accountability.
Hybrid Passive-Active Systems	Combines biophilic design, radiant cooling, geothermal and rooftop PV in signature net-zero builds.
Cyber-Safe Automation	Critical as BMS become attack vectors.
SBaaS C Outcome-Driven Contracts	Moves operators to pay for performance (kWh saved, carbon avoided), not just for equipment.





What This Means for Fire & Safety Industry

I envision a future where safety, comfort, efficiency, and sustainability are integrated—through IoT-enabled sensors, AI-powered control logic, and connected fire/life-safety systems.

As your trusted BAS partner:

Ø Integrate fire safety with HVAC and lighting control via cloud-native, wireless systems.

Ø Optimize HVAC energy use with edge-deployed AI.

Ø Support ESG reporting with automated emissions and energy data capture.

Ø Ensure robust cybersecurity—aligned to ISO 27001 and NIST frameworks.

Ø Deliver SBaaSoptions—performance-based BAS with Opexversus CapEx models.

Our roadmaps align with the Government's Smart Cities, ECBC, and climate-resilience programs—delivering measurable carbon savings, cost reductions, and occupancy health benefits.

By 2030, India will no longer ask if a building is smart or green—it will be assumed. Standard trends in 2025 will be baseline expectations in five years. The leadership opportunity belongs to those who:

Ø Adopt AI + IoT early,

Ø Pioneer passive-active net-zero BAS models,

Ø Democratize SBaaS in mid-tier residential and commercial sectors,

Ø Advance cybersecurity practices, and

Ø Engage ESG-compliant metering and reporting.

We should continue innovating the integration of fire safety, AI, renewable energy, and sustainability—making our systems not just smart, but truly sustainable and citizen-centric.

Sustainable BAS are no longer optional—they are fundamental to India's urban and economic future. By converging AI, IoT, renewables, policy, and design,we can build systems that are efficient, resilient, carbon-neutral, and safe

C. K. ASHER, M.D., EX-BUZZ FIRE & SECURITY PRIVATE LIMITED. (MUMBAI).
CURATED BY DEEPTI CHACKO BANGERA (INDUSTRY 4.0 ENTHUSIAST)

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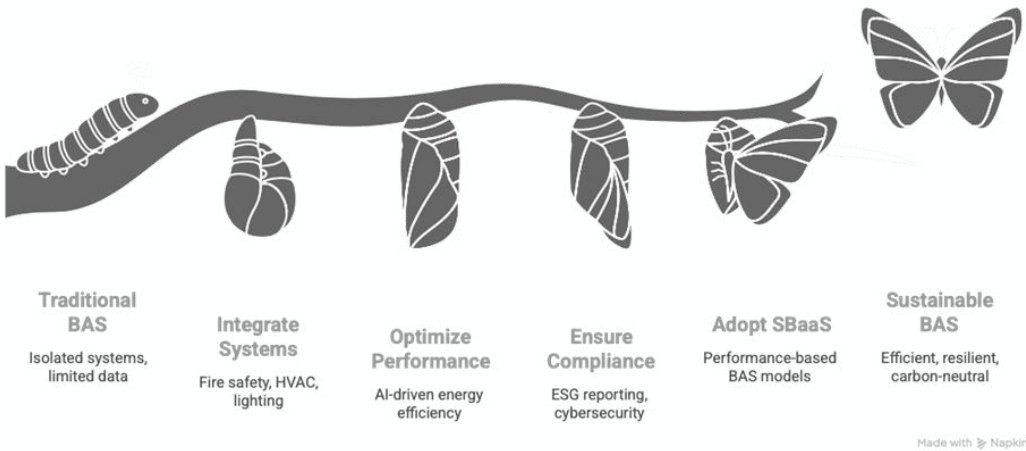
Building Automation Evolution



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For more than 40 years, Digilock has been the global leader in providing electronic locks and locker security solutions. With best-in-class materials, flawless design, and service that is second to none, our goal is to provide convenience, flexibility, and peace of mind to our customers. A partnership with Digilock isn't just about providing security solutions. It's about knowing that Digilock has your business covered — security simplified.

OUR MISSION

To create high-quality solutions that simplify security and improve user experience.

OUR VISION

To continuously innovate cutting-edge lock technology that exceeds the expectations of our customers and end users.

OUR VALUES

We are driven by innovation, quality, design, and enduring relationships. We grow by encouraging creativity, invention and innovation.

Digilock®

Founded in Northern California in 1981, Digilock is recognized as the global leader in keyless lock solutions, delivering more than 40 years of proven performance and pioneering 290 utility and design patents.

We offers variety of locks like mechanical, electronic, and smart network locks comes in a variety of designs, models, and finishes with tiered product lines designed to accommodate a range of facilities and budgets with credentials like RFID, Keypad, Mobile ID & Pin. Every Digilock lock shares the same commitment to quality and performance.

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Sakhee Chandrayan
BTB Team

Dr. Amit Chaudhari
Chief Editor

Anukriti
BTB Team

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Write to us: editor@inbac.org