GUIDE

LED

A SMART BUILDINGS IMPLEMENTATION MODEL FOR INTERDISCIPLINARY TEAMS

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LEDG guides help information technology, network, and facility leaders evaluate current trends and incorporate meaningful, high-impact changes to their data centers and built environments.

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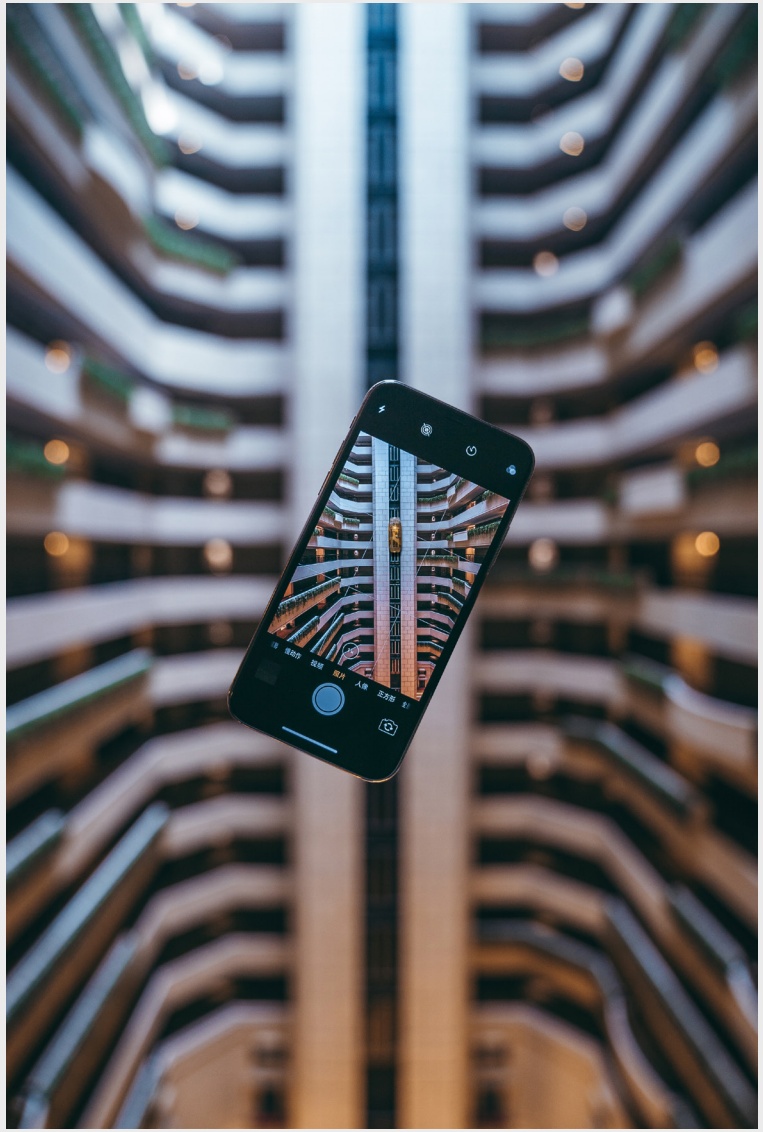


No longer are buildings built to provide just a comfortable location for which to work, live, learn, and heal. Today, buildings are required to deliver secure technology services and engaging, productive experiences to its occupants all while making sure the structure is efficient, reduces costs, and has a lower environmental impact.

A smart building uses an integrated set of technology, systems, and infrastructure to optimize building performance and occupant experience. To realize the promise of a smart building, leaders need to plan beyond the installation of a single property technology or a request from one department – it requires an integrated, organizational-wide adoption and deployment model.

This LEDG guide introduces the Smart Building Implementation Model© that helps organizations take the right steps to plan, design, and deploy a smart building.

CREATE A SMART BUILDING CULTURE

The current barrier to adoption of smart buildings is not a technological one. The technology set exists to allow an owner to fully integrate building systems across a unified platform and to leverage artificial intelligence against that data to optimize building performance and occupant experience. The barrier to smart building adoption for most companies is cultural.

The effects of this cultural barrier manifests in many ways. Some view the technology set for a Smart Building as a departure from the existing Building Management Systems that their staff has deep experience with and can troubleshoot without external expertise. Others struggle with defining the role that Facilities and IT teams will play in a more technology-rich built environment, especially in identifying who will hold the responsibility for systems reliability and uptime when Operational Technologies (OT) and Information Technologies (IT) are more interdependent. Regardless of the barrier that exists, it is critical step in the adoption process is to recognize that Smart Buildings will fundamentally change the way we design and operate our facilities and the cultural impact of doing so is significant.

58%

of employees want IoT-enabled solutions, AI assisted-features.*

*https://www.75f.io/blog/employee-productivity-smart-building
*https://www.greentechmedia.com/articles/read/clean-efficient-buildings-boost-worker-productivity#gs.cW1h2tRC

It is tempting for organizations that recognize the value of Smart Buildings to focus their efforts on identifying, piloting, and deploying technology solutions first. Doing so without completing the difficult work of defining the impact of Smart Building adoption on your organization and the cultural change required to do so will limit the effectiveness and longevity of any technology implementation. Organizations ready to begin the implementation process should follow the Smart Building Implementation Model© shown in Figure 1, which will provide a realistic framework for ensuring lasting adoption of Smart Building Technology.

This guide will provide insight on the first three levels of the Smart Building Implementation Model© – *Opportunity Awareness, Gap Analysis, and Technology Selection and Systems Integration Design.*

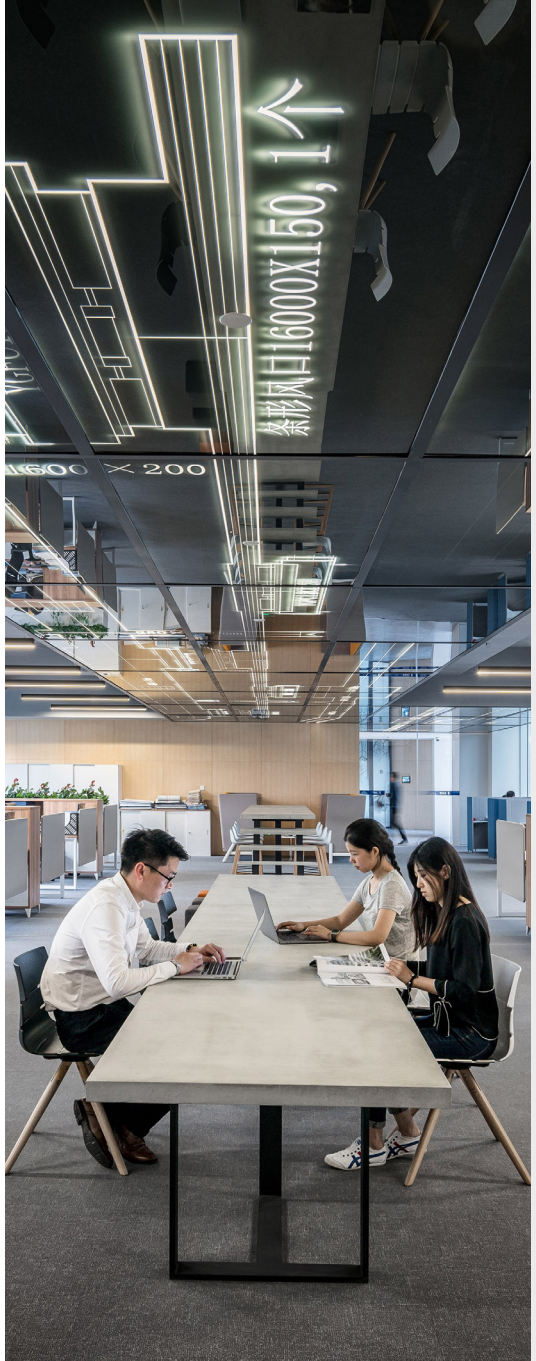
OPPORTUNITY AWARENESS

Creating Interdisciplinary Dialogue

The most important work an organization can do to enable successful Smart Buildings projects is to be committed to Level One of the Smart Building Implementation Model© (SBIM). This requires allocating resources for the initiative from both information technology and facilities management, which creates an environment where interdisciplinary dialogue can take place. Because Smart Buildings represent a unique integration of information technologies (IT) and operational technologies (OT), input from both stakeholder groups is critical to developing a holistic and realistic vision for your Smart Building. Attempting to execute Smart Building projects without collective buy-in from both IT and OT stakeholders will reduce that project's impact and chance of success.

In Level One of the SBIM©, interdisciplinary dialogue in your organization should be used to define three objectives:

1. **Why your organization wants to adopt a Smart Building**
2. **The experience you want a Smart Building to deliver to building occupants**
3. **Your goals for optimized building performance**



Defining why

Business objectives and industry dynamics will drive Smart Building adoption, but it is important for an organization to identify why they are making the investment. Some examples of the drivers for Smart Buildings are:

Business Driver	Industry Example
Financial	Manufacturing facility implementing sensor technology and artificial intelligence to limit product defects and optimize production
Customer Focused	Retail store connecting mobile applications to sensor technology to enrich the in-store shopping experience
Talent Retention	Responsive technology creates experiences for employees in the workplace that are more personalized and engaging
Energy Efficiency	Integrated Building Automation Systems, sensor technology, and machine learning/data analytics optimize building performance

The availability of technology for Smart Buildings is vast and diverse. Organizations that have not clearly defined their driver(s) for Smart Building adoption will lack a foundation on which they can evaluate technology in a meaningful way. More importantly, defining the objectives behind Smart Building adoption allows organizations to clearly communicate why new technology is being deployed throughout the built environment. This clear, meaningful communication will reduce apprehension and resistance from staff, customers, and stakeholders.

Defining Smart Building Experience

The combination of interconnected building systems, sensor technology, artificial intelligence, and mobile devices provides organizations with the ability to deliver an immersive technology experience to building occupants. Defining the extent to which that experience will be delivered is a critical step in the Smart Building adoption process and begins with using simple language to describe the capabilities you want occupants to have in your facility. This capability set will then be used in subsequent levels of the SBIM© to design a path to Smart Building adoption.

In an office building use-case, some example smart building experiences that an owner can define for their staff are:

Use Voice Assistant to:

- Book conference room or hot desk
- Add items to to-do list
- Notify facilities management of building issue
- Control conference room equipment
- Submit a visitor request form
- Call a ride-sharing service
- Initiate calls in conference rooms

Use a Mobile Application to:

- Check waiting periods at company ride sharing pickup lot
- Find other staff members in facility and provide directions to find them
- Connect to any digital signage display turning any TV into an impromptu meeting space
- Direct user to available parking space
- Receive desk assignment optimized for user's daily schedule
- Adjust HVAC and lighting settings in office or conference room

The desired occupant experience will vary by industry and application, which is why Level 1 of the SBIM© is important. Organizations that attempt to begin their Smart Building deployment at higher levels of the model risk implementing a disconnected set of technology and building systems that do not reflect a clear purpose for how it will benefit the user or the business.

Optimizing Building Performance

Smart Buildings have the unique capability of improving the occupant experience (i.e. - employee engagement, customer retention) while also decreasing cost to the facility owner through optimized building performance. Just as it is critical to define the type of experience you wish to deliver to building occupants, it is equally important to define what it means for your organization to optimize the performance of your facility.

Most facilities have centralized control of their critical systems (HVAC, lighting, security, etc) through a Building Automation System (BAS). The additional step owners need to take to create a Smart Building is to combine the capabilities of their BAS with the capabilities of modern computing, like data analytics and artificial intelligence.

Computing is a necessary component to a Smart Building because it enables organizations to move from *automation to autonomy* in their building operations. Today, BAS systems provide a certain level of automation, like the ability to turn lights on/off based on occupancy, adjusting shade control based on daylight sensors, changing HVAC settings based on the total number of people in a conference room. However, all these examples require technician programming. If a change needs to be made to the BAS sequence of operations, a technician must physically log in to the system and adjust it. This type of operation provides building automation, but not building *autonomy*.

Autonomy is the condition of your facility where you can automatically enact change to the program of its building systems without human intervention. For example, if your facility has an all-hands meeting at 12PM on the south side of the facility during summer months, a Smart Building will recognize that based on the facility calendar, the location, and weather data that that HVAC preferences need to be adjusted to accommodate the unusual spike in occupancy in that area. In the opposite scenario, a Smart Building would recognize if a department has a scheduled off-site meeting and automatically adjust the HVAC and lighting settings to their most energy-efficient state.

Owners will increase their autonomous building capabilities as they move up the Smart Building Implementation Model©. For organizations beginning the process of Smart Building deployment, it is recommended that they first define how to make meaningful use of building data. A benefit of computing and data analytics in a Smart Building is that reports can be generated that enable owners to make informed decisions about building operations. Simple examples of this are:

- Delaying scheduled preventative maintenance to HVAC systems based on actual run hours
- Changing facility cleaning schedules based on occupancy data from the previous day/week
- Adjusting restocking schedule of kitchen or office supplies based on actual usage data and patterns
- Making HVAC setting changes to maximize energy efficiency based on historical usage data and occupancy patterns

In each of these cases, human intervention will be required to interpret the data provided in the reports and make the necessary Building Automation System adjustments to recognize savings or improved building performance. However, because the change to more autonomous building operations represents a large culture shift for most organizations, it is recommended that owners beginning the Smart Building adoption process begin by increasing their availability, reporting, and meaningful use of data.

AUTONOMOUS
Intelligent decisions made without human intervention

AUTOMATION
Decisions set and controlled by humans

GAP ANALYSIS

After completing Level One of the Smart Building Implementation Model©, organizations will have identified why they wish to implement a Smart Building and the objectives they hope to achieve for occupant experience and building performance. Level Two of the SBIM© begins to identify how an organization can move toward Smart Buildings by identifying the gaps in technology, skills, and culture required to meet their Smart Building objectives.

Completing the Gap Analysis level of the SBIM© is important to the success of a Smart Building project because it clarifies where resources – both financial and personnel – need to be allocated in order to make a Smart Building project successful. Again, cultural factors can be the largest barriers to successful Smart Building implementations, and the Gap Analysis process forces owners to consider how those cultural barriers can be addressed before new technology and systems are deployed.

The categories of a Gap Analysis will vary by industry and the owner's portfolio of real estate, but a simplified example of one that addressed technological, cultural, and skills barriers are:

Goal	Gap Categories	Notes & Adoption Risks
Develop mobile application for building occupants	Financial, Cultural	F - Need to quantify capital outlay and recurring costs of mobile application. C – Staff not accustomed to utilizing app for building interaction
Deploy analytics on HVAC system performance to improve decision making & reduce cost	Financial, Skills, Cultural	F – Adds operational cost to building systems. Expect that it will be offset by savings S – Staff not trained on interpreting and making meaningful use of data C – Changes current process of operating building systems
Add Voice Assistants in Conference Rooms	Financial, Skills, Cultural	F – Increasing per sqft cost of conference room space S – Requires training on integration of voice assistant with audio visual system and staff training on operation C – New experience for staff and visitors. Possible privacy concerns over recorded meetings.
Use Augmented Reality to provide walking directions to staff and visitors in 3D	Financial, Cultural	F – Development costs for application and updates based on building/ personnel changes C – Creates additional point of technology focus for occupants, possible to reduce unplanned person-to-person interaction

When properly planned and implemented, Smart Buildings will increase occupant engagement and decrease building operational costs. Owners who fail to equally consider the financial, skills, and cultural barriers to adoption risk user resistance and failed investments. By completing a Gap Analysis and committing to addressing all adoption barriers, owners will be well-positioned to implement Smart Building technology that will be impactful and enduring.

TECHNOLOGY SELECTION & SYSTEMS INTEGRATION

The first two levels of the Smart Building Implementation Model© establish an important foundation upon which technology, infrastructure, and building systems decisions are made. Owners that completed the first two levels of the SBIM© are now in a position to conduct an informed evaluation process for Smart Building technology.

Both information technology and facilities management teams have long histories of evaluating products and new technologies for their organization. What makes Smart Building technology unique is that is requires interdisciplinary evaluation. Engaging stakeholders that represent both Operational Technologies (OT) and Information Technologies (IT) in the solution evaluation process is necessary to validate that interdependencies between systems are identified and are capable of interoperability.

The first two levels of the SBIM© helped identify the functionality you desire from a specific technology, which will assist in developing a list of possible solutions. During the review process, it is important that owners look beyond functionality to understand if the systems they are choosing to deploy are interoperable.

The rise in available technologies in Smart Buildings has also precipitated a rise in the different communication protocols on which those technologies communicate. Facilities management and OT teams have traditionally used protocols like BACnet and Modbus through their Building Automation Systems. Information Technology teams in most industries leverage Ethernet and WiFi as the primary means of connecting to the network. However, new Smart Building and Internet of Things (IoT) devices leverage many different protocols, including examples like LoRa, NB-IoT, ZigBee, Bluetooth, and more.

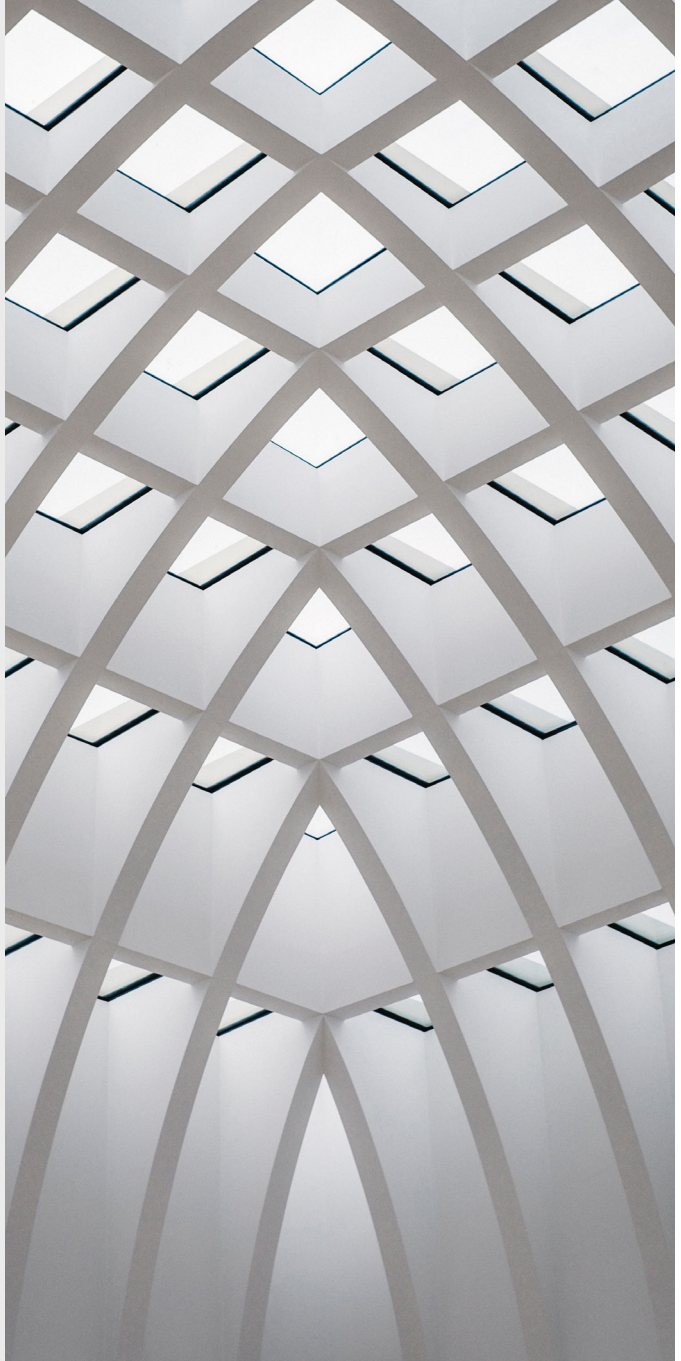
When selecting a Smart Building technology, it is critical that owners work with the vendor to understand their communication protocol and to validate how that protocol will communicate with other systems and technology in your facility. In some cases, this integration requires gateways that translate different communication languages so that two different technologies can effectively transmit data back and forth.

The risk owners seeking to create Smart Buildings should avoid is deploying systems independently. While those systems may provide some individual value, the overall effectiveness and longevity of a Smart Building will be limited if technology, systems, and infrastructure do not all communicate. Being mindful of interoperability, varying communication protocols, and interdisciplinary evaluation processes will lead to successful technology selection, deployment, and ongoing operations.

CONCLUSION

The promise of Smart Buildings is here. The technology exists today, and powerful innovations will continue to come to market to transform the built environment forever.

As with any industry-based technology adoption, organizations can choose to be early adopters or drag their feet with the laggards. For progressive organizations, it is time to gather leaders, break down cultural barriers, and get to work using the Smart Building Implementation Model to define what a smart building means for the organization and who will benefit from it. Most organizations will be surprised at how long the list of beneficiaries is, propelling them to take the critical steps to initiate a Smart Building planning and deployment process.



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LEDG provides solutions that shape the way we live, work, learn, and heal. We plan, design, and build data centers and technology systems for the built environment that help our customers deliver services with speed, resiliency, and scale. We are a diverse team of subject matter experts committed to listening and collaborating to create authentic client partnerships.

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