How Smart Do Intelligent Buildings Need to Be?

Intelligent building technologies (IBTs) enable communication between devices, equipment, building systems, and business systems within the local area network of the building and connected through the internet (i.e., the cloud) to provide:

- **Communication** across the cloud allow remote monitoring, communication, and management by property management and contracted service providers.
- **Integration of the operation** of building systems such as IT, lighting, HVAC, security, fire/safety, etc. to provide more efficient building operation and improved user experiences.
- **Energy savings of up to 30–50%** savings in existing buildings that are otherwise inefficient where savings can reach 2.37 kWh/sq. ft[1].

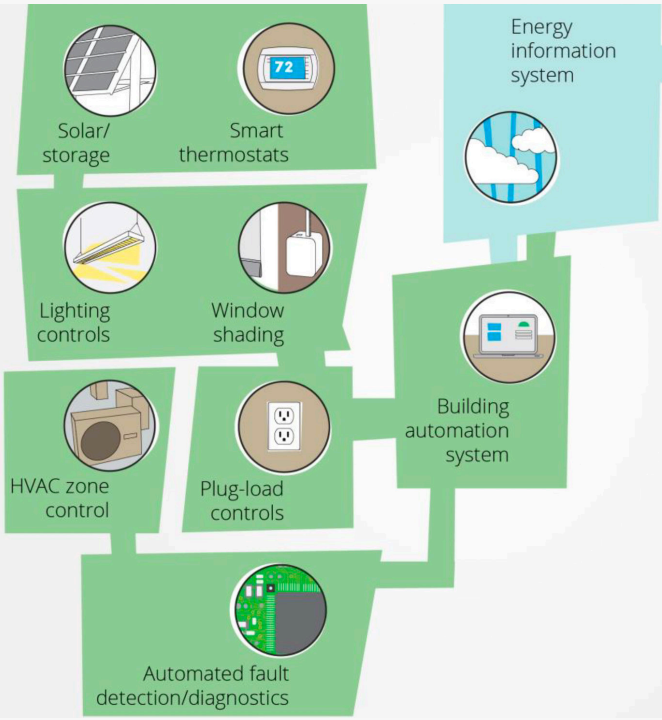

Figure 1. Elements of Smart Buildings (King and Perry).

Project Objectives

Center for Energy and Environment (CEE) performed a market analysis to examine important implementation issues of IBTs:

- **Are the power requirements of IBTs understood?**
- **Do the design, implementation, and use of IBTs justify the additional costs and complexity that IBTs carry?**
- **Given the need and timeline for the transition to a non-carbon energy future, can private and public measures be administered that will accelerate market forces to promote and sustain a tipping point?**

[1] J. King and C. Perry. Smart Buildings: Using Smart Technology to Save Energy in Existing Buildings. American Council for an Energy-Efficient Economy. Report A1701, February 2017

cee Center for Energy and Environment

COMMERCE DEPARTMENT ENERGY RESOURCES

The Hidden Energy Cost of Building Intelligence

The operation of IBTs imposes a hidden energy penalty because:

- sensors and network devices that bring intelligence are operating continuously as part of the system's baseload power.
- components when not in use remain in standby mode, continuing to draw power 24/7.

For example, the intelligence that comes with the networked lighting system requires that the sensors (occupancy and daylighting), controllers, gateways, servers, and network switches will be drawing power whether the lights are on or off. The benefits brought by greater building intelligence must offset the energy required to power these IBTs; otherwise, these systems are simply adding to the building's capital and operations and maintenance (O&M) costs.

Optimization of Intelligent Technologies to Building Space Use

To understand how smart a space should be, the following details need to be understood:

1. How will the space be used and what are the needs of the space's occupants?
2. Within that context, what building systems are needed in the space and what level of intelligence could optimize the performance of those systems?
3. What sensors and controls are needed to provide that intelligence?
4. Can the sensors and controls be integrated with the other systems serving the space?
5. How are the IBTs serving the space expected to operate in concert with the intelligent systems serving other spaces and with the services provided to the entire building?

The Role of IBTs in the Energy Transition

Intelligent buildings will play a significant role in the transition to a non-carbon energy future as greater interaction of buildings with the grid are required to allow effective use of distributed energy resources like solar, wind, and storage. Innovations will not be adopted purely for the technical advantages that are offered. A tipping point is needed to move the market toward wider demand for IBTs.

The results of this market analysis are available in the final report, "How Smart Do Intelligent Buildings Need to Be?" which can be viewed here: **https://www.mncee.org/how-smart-do-intelligent-buildings-need-be**.

Learn More?

For more information, contact project manager **Adam Zoet**, **adam.zoet@state.mn.us** or CARD program administrator **Lindsay Anderson**, **lindsay.anderson@state.mn.us**.

cee Center for Energy and Environment

COMMERCE DEPARTMENT ENERGY RESOURCES

This project was supported by a grant from the Minnesota Department of Commerce, Division of Energy Resources through the Conservation Applied Research and Development (CARD) program.