

Smart Building

Overview

High performance buildings today are complex structures with sophisticated controls to manage lighting, heating, ventilation, air-conditioning, computers, fire alarm, security, elevators and other special systems. At a minimum a smart building is expected provide occupant comfort, safety and security at the lowest operational cost and minimal environmental impact by integrating all building systems by effective use of information technology.

A smartly designed building enhances the performance of the building and ease of operation over its life-cycle. Some other aspects of Smart buildings are data analysis, open protocols, flexibility of use, adaptability to changing requirements, enhanced user experience, fault detection, diagnostics, energy efficiency and sustainable operations. The primary goal for a higher performing building is to minimize the long-term costs of facility ownership to owners, occupants and the environment. For a smart building to be operated optimally, choosing the right engineering design solution, software, knowledge of all systems, training and capabilities of building operators are essential.

Challenges in existing buildings

Though Building Automation System (BAS) in many buildings have moved on from pneumatic systems to direct digital controls technology, building management improvements have not kept up with the technology due to various reasons.

- It is not uncommon to find multiple BAS systems in one campus. Furthermore functionality of the BAS is not configured to meet building operational needs. Similar buildings may have different systems and different operational sequences.
- Many building systems in existing buildings such as building automation, security, fire alarm, power management, elevators, and lighting systems are disparate; whereas facility management systems typically include work order management, preventive maintenance and utility analysis. Most of these existing systems are in standalone mode and have proprietary software systems.

Challenges in new construction buildings

To meet requirements of stringent energy codes and mandates, design engineers plan for complex operational strategies. In many cases, buildings designed to meet high ratings were found to have higher energy consumption. Some of the reasons are;

- Operational challenges: Many systems are set in over-ride mode not following design intent due to inadequate training provided to the operators.
- Limited performance measurements and controls; Many design projects only include minimum instrumentation which results in not being able to isolate problems.

Overcoming challenges

The challenges faced by facility management are, for the most part, same as business world challenged with doing more with less.

1. Organizational skill set analysis: Since smart building solutions involve an investment in technology before an investment is made, existing staff skill sets should be evaluated. Based on this evaluation, training requirements, missing skill sets, or necessary realignment of organizational structure should be formulated to capitalize on the technological investment.
2. Work process documentation: Facility management work processes as they relate to key goals and objectives should be documented. Automating or optimizing these work processes provides the best opportunities to reap the benefits of smart building solutions.
3. Building systems evaluation: Correctly selected, sized, and implemented building systems are critical in terms of energy efficiency and operational efficiency.
4. Technology evaluation: Technological evaluation of existing systems can reveal easy opportunities for improvements in operations and energy management. Existing technology evaluation should also include determination of instrumentation required for performance measurement. Having the right data set allows for optimal use of energy management tools and fault detection and diagnostic-type solutions.
5. Use case development: When selecting systems for integration, automation of work process should be considered paramount. If more processes integration can be automated, the payback will be faster.
6. Business case development: Economic value should be determined by evaluating net savings, savings-to-investment ratio, internal rate of return, net present value, and lowest life cycle cost.
7. Specifications development and implementation: Once objectives, goals, and requirements are assessed, a detailed set of specifications can be developed and implemented.

Business world solutions can be applied to solve facility management solutions. These solutions can be applied to both new and existing buildings. Systems integration and data analysis can help facilities be more operationally and energy efficient. Return on investment for smart building solutions is getting increasingly attractive and will become more so as efficiencies of scale emerge in the era of big data.

Reference:

1. <http://www.csemag.com/single-article/smart-building-integration/e7c6fe5e5c3ecc35fe6992cb0871b442.html>
2. <http://www.institutebe.com/smart-grid-smart-building/What-is-a-Smart-Building.aspx>

