Using Smart Building Strategies to Meet Energy, Sustainability Goals

Executive summary: Many organizations are taking steps to make buildings more energy efficient and more sustainable. At the same time, many are implementing smart building measures. The results of a new survey of facility executives demonstrates that smart building measures are being used to improve energy and sustainability performance, and that those measures have in fact proven to boost performance in those areas. But a more strategic approach to smart buildings, combined with even wider use of smart building measures, represents an important opportunity for facility executives to drive further gains in energy efficiency and sustainability.

This white paper examines facility executives' experiences with smart buildings and shows how smart building measures can enable other key organizational goals.

Topics addressed include:

- Synergies between smart buildings, energy efficiency, and sustainability
- Facility executives' plans for smart building upgrades
- Value of a broad-based team to develop smart building strategies
- Role of people in smart building strategies
- Integration as a key to a smart building strategy

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White paper

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It's a rare facility executive who doesn't devote significant effort to improving energy efficiency or sustainability. These two issues are now priorities for many organizations. Increasingly, organizations are also seeing the benefits of implementing measures to make their buildings smarter. And as those smart building strategies have been implemented, experience has shown they are key enablers for meeting energy efficiency and sustainability goals.

The synergy among sustainability, energy efficiency, and smart building strategies suggests facility executives should address all three in combination, rather than each separately. For example, smart building strategies can help facility executives ensure good indoor environmental quality leading to occupant comfort, a key sustainability goal, while hitting energy efficiency targets. Indeed, smart building strategies should be seen as key ways to achieve energy efficiency and sustainability goals.

Today, however, the fact is many organizations have failed to take advantage of key smart building opportunities that can not only improve operational efficiency, but also reduce energy costs and buttress sustainability efforts. Many organizations have also failed to link smart building strategies with strategies for energy efficiency and sustainability. But the next few years should see a significant increase in the implementation of important smart building measures.

These are among the key findings of a survey of facility executives conducted by Siemens Industry, Inc., and *Building Operating Management* magazine, as well as discussions with facility executives and other experts in the field. That research points the way to the wider use of smart building technology to help achieve energy efficiency and sustainability objectives.

Smart Building Strategy Defined

Although there is no single, universally accepted definition of a smart building, widespread agreement exists about some of the

Widespread agreement exists about key elements of the concept of smart buildings: The consensus is that smart building strategies improve the productivity of people and processes in buildings and lead to better decisions, based on actionable information, for improvements to the facility.

Medical Center Uses BAS for Smart Energy, Sustainability Strategies

Located in central Texas, Dell Children's Medical Center is part of the Seton Family of Hospitals. The 503,000-square-foot medical center has achieved LEED Platinum certification for new construction.

Acting as the heart of this accomplishment is a building automation system (BAS) that efficiently integrates numerous facility systems and devices. From a single workstation, technicians can monitor and control indoor air quality, HVAC operation, and utility distribution. An energy management system also integrates the fire alarm system and provides air handling system control.

Alan Bell, Seton's director of design and construction, reports that "with our building system we've been able to achieve about 17 percent better efficiency than ASHRAE standards, which was the target for our LEED rating."

The medical center's BAS supports complex smart building strategies for energy conservation and sustainability. For example, integration with variable frequency drives in combination with underfloor systems drives energy costs down. In addition, chilled water consumption is monitored, kilowatt-hour use is calculated, and run time on all pumps is managed by the BAS.

To learn more about why developing a smart building strategy (accompanied by wider use of smart building measures) can drive improvements in energy efficiency and sustainability, check out the webcast, *Leveraging Synergies: Smart, Energy Efficient, Sustainable Buildings.* Go to **https://tradepressevents.webex.com/tradepressevents/onstage/g.php?t=a&d=663460939**

key elements of the concept. A key part of the consensus is that smart building strategies improve the productivity of people and processes in buildings and lead to better decisions, based on actionable information, for improvements to the facility.

Technology is also critical. For example, smart buildings tap building automation systems (BAS), allowing facility executives to have the building's core systems seamlessly integrated. And smart buildings often leverage advanced technology to make their properties as efficient and sustainable as possible.

A smart building strategy "works to ensure that a building can provide timely, integrated systems information to building owners, managers, and tenants so that they can make intelligent decisions regarding operations and maintenance," explains Ronald J. Zimmer, president and CEO of the Continental Automated Buildings Association (CABA). This plan "evolves with changing user requirements and technology, ensuring continued and improved optimization," Zimmer says.

Smart buildings are comfortable buildings for occupants. "Ideally, such a strategy leads to a building that uses both technology and process to create a facility that is safe, healthy, and comfortable and enables productivity and well-being for its occupants," says Zimmer.

Tom Shircliff, co-founder of Intelligent Buildings, LLC, a real estate professional services company, points out that "strategy is about what is happening to you and what to do about it." And what Shircliff sees happening involves material changes in building controls technology. Given that perspective, he says there should be three basic outcomes to a smart building strategy:

"1. The Hippocratic Oath: 'First, do no harm' when spending capital and operational budget money by avoiding proprietary solutions and disconnected building systems.

"2. Lower Cost Structure: Create a base strategy that lowers your overall and ongoing capital and operational cost structure. This aligns all planned projects and spending with a smart building strategy.

"3. Data-Driven Decisions: Move your organization to a data-driven decision making culture. Big data and the cloud have finally come to real estate, and there are millions of data points that can provide insights, risk reduction, and lower costs."

Figure 1. Which of the following improvement measures has your organization taken in the past three years? R=821

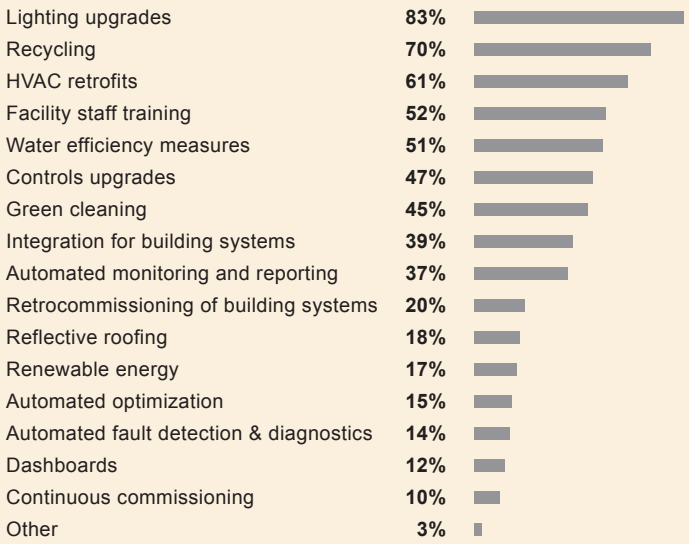


Figure 2. What are the obstacles to development and implementation of smart building strategies in your organization? R =469

Improving and Enabling

According to the Siemens/*Building Operating Management* survey, many organizations are taking steps to make their buildings smarter, more energy efficient, and more sustainable. (See Figure 1.)

The top two items on the list are measures that often have a very rapid payback or are very low cost — not surprising, given the economic conditions of the past three years. But the survey indicates smart building elements have been under-deployed in comparison to how important facility executives say those elements are.

Among facility executives who have implemented smart building measures, a large majority has found that those measures aid efforts to increase energy efficiency and sustainability.

The survey asked whether a range of measures were important for achieving energy and sustainability goals. Sixty nine percent of respondents say "integration for building systems" is an important smart building strategy to meet energy and sustainability goals, yet only 39 percent of respondents report having implemented integration in the past three years. Similarly, 52 percent say "automated monitoring and reporting" is important, yet only 37 percent report having implemented it. A similar situation holds for "automated fault detection and diagnostics" (31 percent say it's important but only 14 percent implemented it), "automated optimization" (30 percent vs. 15 percent) "continuous commissioning" (24 percent vs. 10 percent), and "dashboards" (21 percent vs. 12 percent).

One exception to this pattern: 54 percent of respondents call controls upgrades important and 47 percent say they performed controls upgrades in the past three years.

Obstacles to Smart Building Strategies

Facility executives say that money often is the biggest obstacle to smart building strategies. Tom Walsh, chief engineer for Transwestern Commercial Services, stresses this includes not just first cost, but also return on investment (ROI). "We prefer ROIs in two to three years," Walsh explains. He also looks for energy improvements that will increase the value of the building.

The survey results bear out the extent to which a lack of financial resources can be an obstacle to smart building strategies. While only 3 percent of respondents say smart building technology is not available today, 69 percent say they don't have a budget for smart building strategies. What's more, having staff resources — another budget issue — is an obstacle for roughly half of respondents. (See Figure 2 on page 3.)

Thomas F. Smyth, director, facility services at Cobbleskill Regional Hospital, also believes another obstacle is education and training. "How much quality training is available from the company that sold you that system?" Smyth asks. "Sometimes the training is free. Sometimes training is so expensive you cannot afford it." On the topic of training, Smyth also believes refresher courses are valuable both for existing facilities staff and for new hires.

Kristina Moores, an associate at Arup, an engineering and design firm, thinks the biggest obstacle to smart building strategies is not all building systems are tied into the building management system, followed closely by the lack of user education. "There are many vendors selling smart equipment and programs, but the new software may not allow for coordinated systems and points reporting from existing building systems," Moores points out.

'Many vendors sell smart equipment and programs, but the new software may not allow for coordinated systems and points reporting from existing building systems.'

Figure 3. Have steps you've taken to make your facilities smarter also improved energy efficiency outcomes? R=826

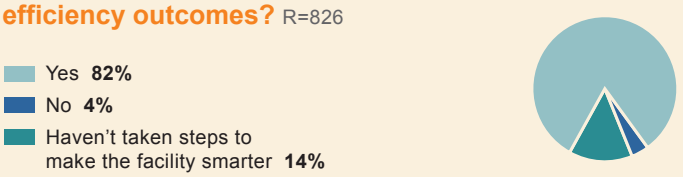
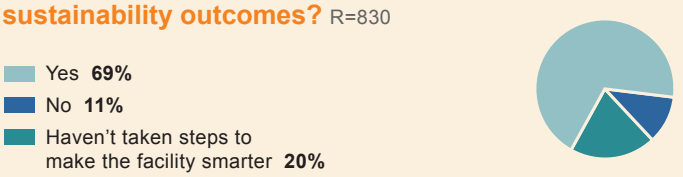


Figure 4. Have steps you've taken to make your facilities smarter also improved sustainability outcomes? R=830



Experience With Smart Building Systems

Although funding has posed a hurdle to wider implementation of smart building measures, the survey shows that those measures have paid off with gains in energy efficiency and sustainability. Among facility executives who have implemented smart building strategies, a large majority has found that those measures aid efforts to boost energy efficiency and sustainability. (See Figures 3 and 4.)

It's worth noting that fairly significant numbers of facility executives say their organizations haven't taken steps to make the facility smarter. When those organizations are factored out, the vote for the value of smart building measures is even stronger. Looking strictly at respondents who have taken smart building measures, 96 percent say those steps improved energy efficiency, and 86 percent say they improved sustainability.

These results are in line with the experiences of those who are familiar with smart building strategies. Facility executives and independent experts alike have seen that smart building strategies can improve building performance, increasing overall energy efficiency and assisting in sustainability efforts. In addition, the savings in energy costs can improve the bottom line.

According to CABA statistics, advanced smart building strategies can reduce energy use as much as 50 percent compared to unimproved buildings, "with the most efficient buildings performing up to 70 percent better than conventional properties," says Zimmer.

With smart building strategies, energy efficiency isn't achieved at the expense of occupant comfort. "If you put the

effort and brainpower into your BAS, you can get what you are looking for in controlling the comfort level and also keeping a handle on the energy side of things," says Smyth.

Provided senior management buys into the smart building strategy, implementation and execution are thought out, and accountability exists, "smart building strategies can significantly lower operational costs through optimizing building functionality across different systems such as lighting, HVAC, security, elevators, etc.," says Rob Murchison, co-founder of Intelligent Buildings, LLC. Murchison also points to the importance of retrocommissioning and continuously commissioning the building, as well as monitoring and measuring progress.

Key strategies that enable energy efficiency and sustainability ideally use BAS and building energy management systems from building inception, suggests Zimmer. On-going commissioning also is critical. "Through the use of these technologies and techniques, building owners and managers can realize many financial benefits, including lower energy costs, lower maintenance costs, and lower repair and replacement costs," he explains.

It's important for facility executives to present a complete picture of the economic value of smart building measures when seeking funding. "Building managers can use life-cycle costs analysis to calculate the cost of a building system over its entire life span," notes Zimmer. The life cycle process analyzes the long-term impact of construction and infrastructure costs on forecasted operational costs throughout the expected life of the property.

Importance of People in Smart Building Strategies

Experts agree that people play a crucial role in smart building strategies. For Shircliff, the three pillars of a smart building strategy are buildings, people, and technology. "The buildings must be enabled and the people, including process, aligned to best leverage newer technologies and basic information technology (IT)," he says.

Role of the BAS in Smart Buildings

Basic control over building functions is essential to smart building strategies. Building automation is generally the cornerstone because its aim is to optimize energy performance while enhancing occupant comfort. Employing sensors, controllers, actuators, and software, a building automation system (BAS) may serve many functions, including:

- Optimizing start/stop functions on various building systems and subsystems.
- Scheduling maintenance.
- Employing predictive fault detection.
- Detecting abnormal operating conditions.
- Alarming and preventive actions to minimize damage in case of emergency.

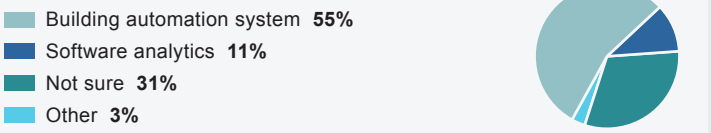
Depending on the BAS chosen and the preferences of the organization, decisions can be made manually by building operators, or facility staff can use embedded intelligence algorithms to automate actions.

The range of capabilities of a BAS makes it well-suited to be the basis of a smart building. And the survey shows that most facility executives do identify the BAS as the foundation of smart building strategies. (See chart below.)

The University of Southern California (USC) has a smart building strategy that allows facilities management to see what's happening in every campus building, according to Andrew Reilman, associate partner at Syska Hennessy Group.

"They know what's going on in operations and maintenance across building systems, down to the filters and their product numbers," Reilman notes.

Which do you think should be the foundation for smart building strategies? R=795



USC's building management system has a facilities management system layer that allows sophisticated control strategies. "But you could also treat a 50-story high-rise building as a 'campus,'" says Reilman, to accomplish similar smart options.

Almost by definition, many BAS functions make a building smarter. For example, Thomas F. Smyth, director, facility services at Cobbleskill Regional Hospital, believes the advantage of a building automation system is "less human error. The BAS lets you create setpoints and parameters for temperature in a specific space, for instance, so that is not left to someone's memory. It also does monitoring functions so that we don't have unhappy surgeons in the operating room. Of course, the BAS is only as good as the people operating the system."

Tom Walsh, chief engineer for Transwestern Commercial Services, believes another excellent use for BAS in smart building strategies is "trending data, particularly watching how and when temperatures rise and fall. This is invaluable information to use for planning energy use."

In addition to controlling, monitoring, and trending strategies, a BAS can serve another valuable smart building function, says Gerald Cotter, associate director of engineering and project management for Connecticut State Colleges and Universities. "The BAS can show others what we are doing to save energy and encourage sustainability. When people can see the benefits, they are more willing to spend money on improvements."

Smyth believes a program that focuses on educating employees and hospital staff is essential. Communicating what smart building strategies are being implemented can be accomplished by an email that explains the precise situation, according to Smyth. "Let's say we want to turn off all computers when they are not in use," says Smyth. "So we show how many kilowatts per hour can be saved and how that adds up as we get more cooperation. Then we may show what that savings can represent. For instance, we may be able to add another piece of equipment for our patients."

Walsh also believes keeping building occupants informed helps in energy conservation and sustainability efforts. He uses a newsletter to tell building occupants how much paper is being diverted from landfills, the advantages of using automated faucets, and even the benefits of variable frequency drives.

Like Smyth, Walsh has found informing building occupants encourages them "to pitch in with everyone else. We also get more feedback and that is a good thing."

Zimmer sees a smart building strategy as combining IT, equipment, and the efforts of highly skilled people.

"The universe of technology solutions that create an intelligent building has evolved considerably over the last decade," says Zimmer. "Innovations in energy-saving solutions, smart sensing, remote monitoring, automated diagnostics, as well as a myriad of Internet-based solutions have made their way into the domain of intelligent building solutions. The solutions allow buildings to become more responsive to the needs of occupants. The solutions, however, do require oversight by professionals with a high level of expertise."

Smart Building Strategy

Despite the gains facility executives have seen from implementing smart building measures, less than half say that their organizations have developed an overall smart building strategy. (See Figure 5.) By comparison, most organizations have overall strategies in place for energy efficiency and sustainability.

Among organizations that do have energy efficiency or sustainability strategies, a majority of respondents say they rank smart building strategies as top priorities for those strategies. (See Figures 6 and 7.)

Survey results suggest many facility executives may be failing to integrate smart building planning, on a strategic level, with energy efficiency and sustainability plans.

Figure 5. Does your organization have an overall:

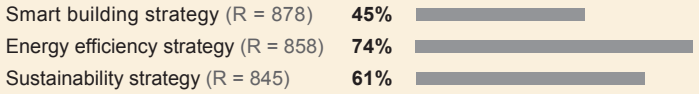


Figure 6. How important is a smart building strategy to your current energy efficiency strategy? R = 631

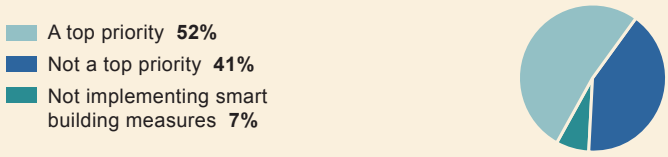


Figure 7. How important is a smart building strategy to your current sustainability strategy? R = 511

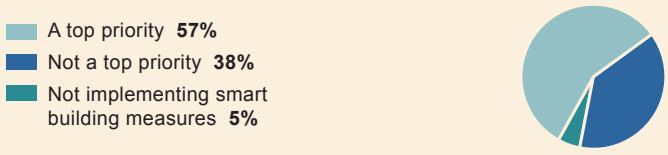


Figure 8. Which of the following steps do you anticipate your organization taking in the next three years? R=775

	Expect To Take Measures	Increase compared to implementation in past three years
Controls upgrades	47%	No change
Integration of building systems	41%	+5 percent
Automated monitoring and reporting	40%	+8 percent
Automated optimization	23%	+53 percent
Continuous commissioning	22%	+120 percent
Automated fault detection & diagnostics	21%	+50 percent
Dashboards	19%	+58 percent

Although a majority of respondents say smart building strategies are top priorities, the percentages are far smaller than the number that say smart building strategies have helped improve performance in energy and sustainability. This discrepancy suggests that many facility executives may be failing to integrate smart building planning, on a strategic level, with energy efficiency and sustainability planning.

But the survey suggests the next few years could see a significant upswing in the implementation of smart building measures. While the percentages of those who expect to take the two most common measures, lighting upgrades or recycling, decline compared to what was done the past three years (lighting upgrades down from 83 percent to 62 percent; recycling down from 70 percent to 39 percent), many smart building measures show an increase. (See Figure 8.)

The increase for "integration of building systems" is particularly noteworthy for two reasons. One is because it comes after three years of integration improvements in many facilities. The other is because integration is vital as the underpinning of a smart building strategy.

"Systems integration is central to a smart building strategy," Zimmer points out. "By integrating individual systems and buildings into a common user interface, operational activities in the various subsystems can be monitored to detect inefficient operating conditions, allowing corrective action in order to achieve high levels of systems optimization."

Moores believes all building systems should be accessible through the building management system and well interfaced for Internet access. Facility executives and others "should have access to pertinent information via dashboards," says Moores.

Gerald Cotter, associate director of engineering and project management for Connecticut State Colleges and Universities, believes systems integration has to make smart building strategies "as simplified as possible."

That's not to say that systems integration guarantees a smart building. "Systems integration is an important element but will not in and of itself create value," says Rob Murchison, co-founder of Intelligent Buildings, LLC. "There are many high-tech, integrated systems that are set on override or that don't use interoperability."

"Smart building strategies need to be easy enough for everyone to understand," says Moores.

It's essential to have a strategy for systems integration, rather than simply integrating systems for the sake of integration. "A systems integrator may come in and offer an overlaying control system that will monitor every system and subsystem in the building through one interface," says Andrew Reilman, associate partner at Syska Hennessy Group, a consulting engineering firm. Reilman doesn't believe that is an appropriate strategy for every building. "The question is, why are you doing it?" Gigabytes of data that no one uses or knows how to extrapolate are useless. "The facility executive needs an easy way to extract and collate data to verify energy model results."

Analytics is emerging as an important area of smart building technology. The survey showed that about one in five respondents are now using analytics to improve energy efficiency while another one in three are considering that option. (See Figure 9 on page 8.)

'All building systems should be accessible through the BAS and well interfaced for Internet access, with access to pertinent information via dashboards.'

University Taps Smart Building, Water Strategies for LEED

Portland State University (PSU) earned LEED Gold certification for its Northwest Center for Engineering Science and Technology by tapping both smart building technologies and smart water strategies. The building features natural lighting, natural ventilation of its five-story atrium, a rainwater harvesting system that supplies water for toilets and urinals, and geothermal heating and cooling from underground springs.

The facility's building automation system (BAS) controls geothermal water flow and the rainwater harvesting system's water flow applications, as well as controlling the motorized operable windows and providing indoor air quality measurements. The BAS also is integrated with building systems for fan controls and shutdown operations for life safety.

Rainwater from the roof goes into a sediment tank to allow large particles to settle out. A sump pump transfers the untreated water from this tank into the storage tank. Water samples from the storage tank are pumped through a flow cell where the automated controller monitors and compares oxidation-reduction potential to a target setpoint, pumping in sodium hypochlorite as needed.

Two ultraviolet systems disinfect water as it is pumped to its usage points and as a sidestream treatment for the storage tank. During the rainwater system's first eight weeks of operation, no city water was used for flushing toilets and urinals.

By combining smart energy and water efficiency technologies, PSU uses 45 percent less energy than Oregon code and nearly 40 percent less water than it did in the past, according to the university.

Facility Executive's Role

If smart building strategies are to see even wider use, particularly in achieving energy efficiency and sustainability goals, the facility executive will play a key role. "The facility executive should be a catalyst for developing and executing smart building strategies and determining their effectiveness," says Zimmer.

Walsh believes the role of facility executives requires that they constantly be alert to new technologies and refinements to see if they might offer smart building strategies that are applicable to their facilities.

Smyth says that keeping up with new technologies and processes for smart building options in energy savings and sustainability is a crucial aspect of his job. Smyth is constantly on the lookout for new technology information or innovations that he might be able to use in his hospital. "Then I look at the payback period or return on investment to see if it's worth applying in our situation," he explains. With that information, he can be a salesperson for the latest technology that offers his hospital viable applications for energy conservation and sustainability.

Cotter says when it comes to smart building strategies, the job of the facilities executive "is to get the best quality for the price."

Moores believes smart building strategy "begins and ends with facilities management." She admits the facility executive sometimes is the last person involved in smart building design, but they are the first to respond to anything that happens. And facility executives are the most savvy when it comes to actual building energy use and all the building's systems. So she likes to work with facility executives from the initial concept stage of smart building design. "They understand their buildings best."

Zimmer says, "The facility executive's knowledge about facility-related smart building strategies is critical to successful real estate management."

The survey shows that, in a large majority of organizations, facility executives are taking the lead, not only in smart building strategies, but also energy efficiency and sustainability strategies. (See Figure 10, 11 and 12.) When facility executives are not in the lead role, they are generally still involved; it is rare to see organizations where facility executives are not involved in developing strategies in those three areas.

Involving IT

Facility executives who are leading efforts to develop smart building strategies should make it a point to involve IT in those efforts. For example, when the smart building strategy needs to operate on the hospital's infrastructure, Smyth makes sure IT is involved in the process. "I want IT to know what we are trying to accomplish with this strategy and to understand

Figure 9. Are you currently using or considering analytics software to improve energy efficiency in your buildings?

R = 797

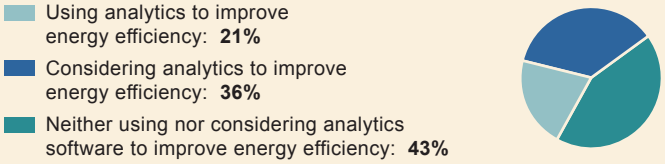


Figure 10. Which departments in your organization are involved in developing smart building strategies?

Departments	Leads effort	Has a role but not leading role	Not involved
C-suite executives R=627	23%	47%	30%
Facility management R=780	71%	23%	7%
IT department R=636	6%	51%	43%
Sustainability department R=555	25%	28%	47%
Other R=175	16%	11%	73%

Figure 11. Which departments in your organization are involved in developing facility energy management strategies?

Departments	Leads effort	Has a role but not leading role	Not involved
C-suite executives R=606	20%	50%	30%
Facility management R=773	75%	20%	5%
IT department R=584	5%	46%	49%
Sustainability department R=529	24%	27%	49%
Other R=161	10%	7%	83%

Figure 12. Which departments in your organization are involved in developing facility sustainability strategies?

Departments	Leads effort	Has a role but not leading role	Not involved
C-suite executives R=609	23%	47%	30%
Facility management R=764	68%	24%	8%
IT department R=573	6%	41%	53%
Sustainability department R=533	30%	25%	45%
Other R=170	11%	10%	79%

'The facility executive should be the catalyst for developing and executing smart building strategies and determining their effectiveness.'

that it is a good use of IT resources to save energy," Smyth explains.

Walsh relies on his BAS vendor's IT department, particularly when he wants to tie another piece of equipment into the system. "When it comes to building management concerns, their IT is really good," he observes.

But the survey shows that IT departments in 43 percent of the organizations are not involved in efforts to develop smart building strategies. (See Figure 10 on page 8.) By getting IT involved in the process, facility executives can help ensure that specific IT concerns are addressed early and do not become an obstacle to implementation of smart building strategies. Murchison points out the make up of today's controls systems includes "servers, networks, protocols, firmware, software, remote Internet access, and other IT elements." As a result, IT involvement is "undeniably critical," according to Murchison. "Whether it's an internal or external resource, IT is a fact of life in building controls and smart buildings."

Kentucky's Morehead State University is implementing a smart building strategy over its existing IT infrastructure. That work is part of an effort that is expected to curb carbon dioxide emissions by more than 8,000 tons annually. Among the improvements are replacing a coal-fired boiler plant with a natural gas boiler plant; facility upgrades for many campus buildings' HVAC and electrical systems; replacing older fan motors and belts with variable speed drives and, where necessary, dampers, valves, and cooling coils; digital energy monitors to track electricity consumption on a per-building basis; and new lighting controls, including occupancy sensors. Digital control upgrades are being networked over the university's existing IT infrastructure.

"IT departments should advise on security and provide assistance with installation of network infrastructure," Zimmer says. The reason he sees that increased involvement is because "with the migration of BAS and building energy management systems onto Internet-enabled networks, security becomes a paramount concern."

Other Departmental Buy-ins

In big complex programs involving broad goals like smart buildings, energy efficiency or sustainability, it's important to get wide support across the organization, say facility executives and other experts.

Building a broad-based team can help ensure the success of individual smart building, energy efficiency, and sustainability measures.

Environmental Center Uses BAS for Natural Ventilation

Located on Chesapeake Bay near Annapolis, Md., the Philip Merrill Environmental Center is the Chesapeake Bay Foundation's 32,000-square-foot headquarters building. The office building is LEED Platinum certified.

The building automation system (BAS) optimizes energy use by taking advantage of natural ventilation, controlling pump speeds, and optimizing geothermal heat pumps and lighting use.

When air temperature and humidity sensors inside and outside find the climate suitable, the BAS shuts down or scales back mechanical systems, actuates windows open, and turns on "open window" lights to signal employees. Natural ventilation is used more than 30 percent of the year. The natural ventilation system was reprogrammed so it can be used on a "zoned" basis.

In addition, when the doors leading to an outside deck on a glass-enclosed conference room are opened for more than five minutes, the BAS shuts off air conditioning. Employees take advantage of the naturally cooling bay breezes instead.

Walsh believes management, tenants, architects, and LEED engineers should be involved when designing smart building strategies for energy conservation and sustainability.

Cotter wants the president, upper management, and environmental clubs and committees on campus involved in smart building strategies for energy conservation and sustainability.

"Today, corporate sustainability and recycling departments need to be involved," says Moores. "Also, whoever is responsible financially for paying the bills."

The survey shows that many smart building, energy efficiency, and sustainability strategies are developed with input from a cross-section of functions within the organization. (See Figure 10, 11, and 12 on page 8.) For facility executives, building a broad-based team can help ensure the success of individual smart building, energy efficiency, and sustainability initiatives. What's more, involving key stakeholders can help facility executives link smart building strategies to goals for energy and sustainability, making those efforts more successful while reinforcing the value of the smart building steps. ■

Methodology

The Siemens/*Building Operating Management* survey was sent via email to a random sample of 14,000 *Building Operating Management* subscribers on June 13, 2013. Reminders were sent to non-respondents on June 18, June 21, June 26, and June 28, 2013. A total of 257 subscribers chose to opt out of the survey or failed to respond due to an invalid email address, yielding a final sample of 13,743.

The survey was closed for responses on July 2, 2013. With 889 qualified responses returned and with a net sample of 13,743, the rate of response for the email survey was computed to be 6.5 percent. The overall estimated margin of error for this study is +/- 3.27 percent at the 95 percent confidence level.

Which of the following best describes your organization?
R=886

37% Commercial Office
24% Educational: K-12/Colleges/Universities
11% Medical/Healthcare
10% Government/Military (Local/County/State/Federal)
8% Industrial
3% Multi-family/Mixed use
2% Retail/Stores
2% Hospitality (Hotels/Motels/Resorts/Recreational)
3% Other

How many square feet of space are you responsible for?
R = 869

41% 100,000 to 499,999 square feet
25% 500,000 to 999,999 square feet
25% 1 million to 4,999,999 square feet
9% 5 million square feet or more

Siemens Industry, Inc.
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Buffalo Grove, IL 60089

Subject to change without prior notice

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