Building Automation and the Web

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Introduction

The widespread use of the Internet is opening up new possibilities for businesses, from supply chain improvements to enhanced customer service. Organizations that manage buildings also have their eye on new applications using the Internet. One promising technology being introduced to the marketplace is web-based building automation systems.

Most building systems have been automated for some time. Heating valves and air conditioning equipment are commonly connected to a local area network, with controllers distributed throughout the building, along with a "front end" computer station.

What hasn't been available (until last year) is a means of interfacing these control systems with the Internet TCP/IP communication channel. While building automation designers role out these web-based systems, facility managers need to assess the merits of each system, and decide if they provide sufficient value to their organization.

This report provides a review of current web-based building automation control technology, and gives recommendations on how to select these systems from a management perspective.

Building Automation Systems

Buildings have a variety of systems that are controlled and monitored. Heating, ventilating and air-conditioning (HVAC) systems are typically connected to what is referred to as a DDC system – direct digital control. These systems have followed a development path similar to the Information Technology (IT) industry. Early DDC systems used a single processing unit (a large microprocessor panel, typically located in a

mechanical room), with all controllers and sensors wired to this control unit. More recent systems use a distributed arrangement, consisting of a local area network (LAN) with small controllers located throughout the building.

Besides HVAC systems, buildings also have lighting controls, fire alarm and security systems. Until recently, these systems were designed, installed and operated independently. Integration wasn't happening because different engineering disciplines and building construction trades were responsible for each system. No one felt confident in any one supplier being able to put all these systems together effectively. Unfortunately this meant that a building operator had to learn two or three separate monitoring and control systems, and would need to look at multiple video screens.

In just the last few years, lighting and security systems have begun to be integrated with building HVAC control systems. Fire alarm systems have however remained independent, largely at the insistence of fire department authorities and insurers.

Most of today's building automation systems have a LAN independent of the building IT infrastructure. A central workstation is commonly used to interface with the control system. Remote monitoring and control has historically been achieved through dial-out connections. However, a number of control system manufacturers have begun advertising web-based access to their systems.

The Facility Management Industry

Buildings are physical assets. Some organizations own and operate their own building stock, such as public schools. Other organizations own several buildings (as investments), but often contract out the management of these properties. These property management firms negotiate tenant leases and carry out routine maintenance. Most specialty services, such as repairing air conditioning equipment, measuring indoor air quality, etc., are contracted out.

The facility management industry can be segmented by building function. Traditional categories include commercial (offices), hospitality (hotels and restaurants), institutional (municipal, education and health care), and industrial. The industry can also be broken down by function – building owners, managers and operators.

In the past, building automation systems have concerned building operators the most, since these people are responsible for maintaining the building environment. Building

managers however have come to realise that temperature control is the number one tenant concern after lease price.1[1] Managing the thermal environment therefore can be a critical means of tenant retention.   Building automation systems therefore play a significant part in facility management.

Building Automation and the Web

The Internet is a global network of interconnected computers plus the media (wire, fibre optics, wireless) and devices connecting them. It is a technology-enabler, not a solution provider. Yet, it is a critical system through which new kinds of solutions can become possible.

One of the Internet's most useful services is the World Wide Web, a globally distributed information system. Information on the Web can be accessed anywhere there is a computer running a "browser".

By connecting a building automation system to the Internet, control system information can be accessed anywhere. Whereas dial out modem connections allow only one person to access the system at any one time, Internet connections permit simultaneous connections.

Some of the benefits that could be derived from Web-based automation systems include the following:

- Building operators could more easily access system information while away from the building. This could reduce staffing levels, especially where staff are responsible for multiple building sites.

- Security guards could monitor HVAC systems at night, and look after simple alarm conditions.

- Specialists could access building information. Engineers, for example, could review historical information such as temperature trend logs.

- Financial departments could extract utility consumption data.

1[1] <u>What Office Tenants Want</u>. Building Owners and Managers Association, www.boma.org

- Building occupants might be given the ability to directly request temperature set point adjustments, request extended HVAC operation for overtime work, and register complaints.

- Occupants could access environmental control information, such as indoor air quality reports, temperature readings, etc.

- General building information could be also put on line, such as status of elevator repairs and even menus for the building's restaurant.

Along with these benefits, there are costs of implementation. Existing automation software will need upgrading (and in some cases, processing units replaced), and the system's LAN must be connected to the Internet via a router. Is this expense worth the undertaking?

Choosing a Web-Based System

Facility managers will not only be faced with deciding whether to upgrade existing automation systems to work on the Internet, they will also have to choose between different web-based systems for new facilities. Though many facility managers have some familiarity with information system (IS) infrastructure (largely from dealing with competitive local exchange carriers), they seldom take part in IS decisions. This means facility managers can lack the experience and framework to evaluate IS decisions.

How can these managers tackle this rather complex technology issue, and even end up feeling confident that they made the right business decision for their organization? The following guidelines will help.

Apply a Strategic Perspective

Before getting immersed in the technical and cost issues of web-based automation systems, it is essential to define what the organization's business strategy is. While automation systems are a critical component of a building, they may or may not be a critical part of an enterprise's strategy. This can only be determined by understanding the overall business strategy of the firm.

Sample strategies include differentiation through price, value, growth, service, and reputation. Each of these strategies should define the direction the organization, and even individual business units, should take.

Align Technology Goals with Strategy

Companies work best when the various facets of their organization operate in sync with each other. Marketing, customer service, and research & development departments contribute most effectively to the organization when their goals line up with the organization's overall strategy.

For this reason, an organization's strategy should be translated into a series of appropriate goals. For example, if a property management firm has a strategy of value differentiation through exceptional customer service, goals might be set for response time to temperature complaints.

Possible goals relating to web-based building automation systems are as follows:

Low Price Leadership. For new buildings, web-based systems may not end up costing any more than dial out systems, especially if the IT LAN can be used. However, converting existing systems will require some form of capital outlay. Any upfront costs might quickly be recouped through operational savings from remote monitoring. This needs to be evaluated with some care, as management might be restricted by union agreements or regulatory requirements. It should also be kept in mind that dial up services do allow remote access – just not as fast, and without simultaneous use.

Customer Service. If a firm is striving for exceptional customer service, web-based technology might help achieve customer satisfaction goals. Just having the technology available won't be enough however. It will be necessary to have a plan on how to effectively use this technology.   A good place to start would be surveying tenants on their perceived value of interfacing with building management through the Internet, and potential reduced response times.

It is dangerous to assume that connectivity will enhance customer satisfaction by itself. Appropriate owner to tenant ("business to customer") software and management response will need to be developed to realize any success.

Evaluate Technology based on these Goals

Once technology goals have been set, various web-based alternatives can be evaluated. Obvious choices include deferring implementation (in converting existing systems), or

converting using the existing manufacturer's technology. These and other alternatives should consider the following issues:

Security	• Is an acceptable encryption method offered? • Can multiple levels of access be provided (by individual passwords) to restrict control of systems? • Can alarms be accessed and prioritized through the browser?
Reliability	• Has the system been proven through operation at other facilities?
Accessibility	• Is any software required at remote computer locations to operate the system? • Are multi-lingual services provided (simultaneously)? • Are all operating features available through the browser?
Ease of Use	• How easy is the system to learn?
Connectivity	• Can the server communicate with industry protocols such as BAC Net2[2] and Eschelon LonWorks3[3]? • Does the server software component support major database servers, such as Oracle and DB2?
Speed	• Will the addition of building automation system data exchange slow down the IT system?

The importance of these issues will vary from corporation to corporation, and from building to building. Owners with a relatively small building stock and unsophisticated tenants might place little value on speed and ease of use. Strategic managers in competitive rental markets however might see significant importance in ease of use.

2[2] Refer to www.bacnet.org and www.bacnetassociation.org

3[3] See www.eschelon.com

Conclusions

The use of the Internet for building control will become prominent over the next few years. Web-based access to automation systems will provide opportunities for facility managers to enhance tenant services and reduce monitoring costs. While it is easy to get caught up in the excitement of the technology, facility managers need to assess options based on their organization's strategic goals, rather than nifty features. Technology must be aligned with strategic vision.

Web-enabled technology is insufficient to realize goals such as increased client satisfaction. Supporting applications in areas such as managing customer complaints and evaluating energy use must be developed, with associated human interaction designed and implemented.