FM Magazine May 07 P30-32, 34-35

INTELLIGENT BUILDINGS

The intelligent solution

MARK PHILLIPS REPORTS ON THE SOMETIMES MISUNDERSTOOD NATURE OF SO-CALLED 'INTELLIGENT' BUILDINGS, AND FINDS THAT AMONG ALL THE HOOPLA AN INTELLIGENT BUILDING IS STILL BEST SUMMED UP AS ONE THAT IS FULLY LEASED. WITH PROPER MARKETING, THERE IS LITTLE QUESTION THAT INTELLIGENT BUILDINGS WILL LEASE UP MORE EASILY, AND AT HIGHER RATES, BY VIRTUE OF THE SERVICES OFFERED. THE REAL QUESTIONS ARE HOW CAN YOU EFFECTIVELY MEASURE A BUILDING'S INTELLIGENCE, AND WHAT CONSTITUTES BEST PRACTICE IN THE PLANNING PROCESS?

There is broad consensus that the concept of a so-called 'intelligent' building was established in 1982 by AT&T, when the Informart building was erected in Dallas to demonstrate how advanced IT from different suppliers could be used to create a building that was, supposedly, intelligent.

Twenty-five years later, however, exactly what separates an 'intelligent' building from a 'dumb' one is often misunderstood. People confuse intelligent buildings with high-tech buildings. At least from a facilities management perspective, an intelligent building is not necessarily gadget-oriented. You don't have mail carts that wander through the building on their own. Rather, an intelligent building must be designed to economically accommodate whatever the near-term and long-term future might bring, and also suit the present needs of occupants. It should have its basic elements integrated into a synergetic whole, and above all, be cost-effective.

One definition, which derived from an international symposium in Toronto as far back as May 1985, described an intelligent building as "combining innovations, technological or not, with skilful management, to maximise return on investment". Little wonder that one developer once said that it's "a building that is fully leased". It follows, then, that any feature helping to lease a building fully could be considered intelligent. That said, of course, in the context of today's high technology needs, the features themselves are inevitably based on high technology.

In both corporate and private property, this has resulted in improved security and greater convenience. In commercial buildings, automation and the networking of different applications lead to enormous cost savings being made in areas such as heating and security guard services.

Take, for example, the recent launch in the US by Isonics Corporation of a dedicated intelligent building security management system, offering a single point of integration for all physical security systems and components.

The open architecture system can coordinate multiple disparate alerts, biometrics, intelligent video, sensors and access points and provide complex event-driven responses. Such responses automate the first tier of responses normally provided by security personnel. Isonics' Intelligent Building System can open and close valves and switches; unlock and open doors for evacuations; shut down energy, water and electricity; and send multiple notifications via landlines, the internet, cell phones, SMS, PDA devices and emails.

"We believe that the launch of the Intelligent Building System meets a major unmet need in the commercial building sector," says Isonics chairman and CEO, James Alexander. "Its versatility, which can be deployed by both enterprise level and smaller operations, allows venues to quickly respond to security breaches in a manner that is completely automated, ensuring a high degree of reliability and eliminating the need for costly security personnel."

Historically, the down side of increasingly complex building innovations has been a corresponding requirement for an ever-increasing amount of cabling.

In response, facility managers are turning to GSM/GPRS technology more and more frequently, as it enables them to keep control of the functions in use and manage them

BUILDING INTELLIGENCE RESULTS IN HIGHER BUILDING VALUE, IMPROVED COMFORT, SECURITY, FLEXIBILITY, AND RELIABILITY WHILE REDUCING COSTS AND INCREASING PRODUCTIVITY. LOWER COSTS AND HIGHER PROPERTY AND LEASE VALUES CAN RESULT IN AGGRESSIVE RETURN ON INVESTMENTS AND CLEAR JUSTIFICATIONS FOR MAKING BUILDINGS MORE INTELLIGENT.

centrally. There are a large number of advantages to doing this: cabling is no longer necessary in order to network fire alarms, fire doors and lifts in an optimal manner, and heating and security systems can be activated, deactivated or monitored remotely. Needless to say, many other functions are possible as well, but the overriding advantages are:

- Relatively simple networking and automation without the need for cabling
- Central management of applications used in the building
- Relatively low insurance premiums as a result of greater security
- Easy to operate and manage – for example, via a mobile phone
- Prevention of vandalism and theft in the property.

BUILDING INTELLIGENCE QUOTIENT

In a potentially significant development, facility managers interested in taking steps toward 'intelligent building' status have access to a new resource, the result of Continental Automated Buildings Association (CABA) having commissioned a consortium of three firms, Sustainable Environmental Solutions, ECD Energy and Environment Canada and IBI Group, to develop the CABA Intelligent Building Ranking tool. CABA is a not-for-profit industry association that promotes advanced technologies for the automation of buildings, primarily in North America. The organisation's membership comprises some 400 companies that share an interest, products, or services in building automation intelligence.

The CABA Building Intelligence Quotient (BIQ) is a web-based online ranking tool accessible on demand. A core objective of the tool and its proposed incumbent certification program is to increase market penetrability of intelligent building technology with building owners, operators, managers and designers by demonstrating value and providing guidance.

The ranking tool has three functions, serving as:

- A means to evaluate and measure the 'value' of intelligent building performance
- A design guide for integration of building intelligence in new building projects
- A building automation retrofit action plan tool.

The modular assessment initially generates a report that provides benchmark rankings as well as recommendations for improvements in the following categories: communication systems; building automation; annunciation, security and control systems; facility management applications; and building structure and systems.

"The Building Intelligence Quotient is designed to paint a clear picture of your building intelligence performance against best practices for design, installation, and operation," says Ronald Zimmer, CABA president and CEO. "It gives practical advice for improvements, offers resources for making the upgrades, and provides additional information on relevant strategies and technologies."

As more and more buildings are BIQ verified, point scores will be aggregated in an anonymous database, enabling users to analyse how their building intelligence design performs in relation both to the median and to buildings that are similar in terms, type, and region. Because the assessment is completely online, owners and managers have the ability to change input up to a year, with an option to extend. This allows users to keep their assessment up-to-date as the building intelligence changes through the project-delivery stages as buildings are retrofitted.

"Building intelligence results in higher building value, improved comfort, security, flexibility, and reliability while reducing costs and increasing productivity. Lower costs and higher property and lease values can result in aggressive return on investments and clear justifications for making buildings more intelligent," Zimmer says.

Adds BIQ Consortium project manager, David Katz: "Building professionals are increasing their acceptance of ranking systems for a building's energy performance, environmental attributes and emergency preparedness. When complete, the CABA BIQ will complement these systems and be the pre-eminent certification and ranking tool for building intelligence."

In its current form, however, the BIQ is more qualitative than quantitative. It generates ratings and recommendations, but does not provide payback or cost information related to the enhancements it suggests. But through linkage with another new, CABA-developed tool, the BIQ may

soon offer facility managers financial analyses as well. It will work in tandem with the BIQ.

The primary drawback of a self-reported web tool, of course, is that the results are not verifiable. So to the extent that facility managers hope to leverage their facilities' BIQs for favourable financing or leasing purposes, the tool may be only moderately useful in its current form. Down the road, however, CABA hopes to implement a verification program whereby trained inspectors corroborate and certify the results of an online analysis. This may represent an important step towards two of CABA's other goals: building a system for measuring building intelligence that complements other rating systems for facilities, and advocating for an increased awareness of the operational and environmental impact of building intelligence measures.

MODELLING

Needless to say, an intelligent building design needs to start with a complete model. This model begins early on with CAD designs that evolve into project renderings. Information can readily be shared with HVAC and other system models but, importantly, modelling of an intelligent building will be used not just in design, but will continue into construction and operation.

In the past, building modelling has been widely used as a design tool and often for construction as well. Increasingly, in an intelligent building this model is used by new sophisticated tools that are actually able to use the original modelling information to make decisions about optimisation and continuous recommissioning of critical building systems. Ideally, the model will follow through the lifespan of the building, be updated as necessary and serve as a digital document of the building.

SYDNEY OPERA HOUSE

An excellent example of modelling in action can be found at Australia's most iconic building – the Sydney Opera House. Staging some 1500 performances per year, the Opera House is one of the world's busiest performing arts centres and is now leading the way in the use of digital tools to integrate its management practices.

A new report published by the Cooperative Research Centre for Construction Innovation, a leading research body for property, design, construction and the facilities management industry, clearly demonstrates that data on the physical structure of a building can be integrated with facility management functions to provide more effective ways of managing the building's operation, maintenance and strategic functions.

"Our research has shown that a digital model of a section of the Sydney Opera House which provides a 3D representation of the building and the relationship of objects such as lifts, ventilation and fire systems within the building, can also integrate FM functions like condition reporting, energy consumption and room bookings," says Construction Innovation CEO, Professor Keith Hampson.

The uniqueness and complexity of Sydney Opera House, which attracts an estimated 4.5 million visitors per year, was used as the model for a two-year FM research program to build FM innovation and expertise in Australia. The project was undertaken with support from the Department of Industry, Tourism and Resources and a project team comprising the Facilities Management Association of Australia, the Sydney Opera House, Rider Hunt, Transfield Services, Woods Bagot, Brisbane City Council, Queensland Government of Public Works, CSIRO, University of Sydney and Queensland University of Technology.

The FM Exemplar Project focused on three key areas of interest to the FM industry – services procurement, performance benchmarking and, of course, digital modelling. The outcomes of these three research areas were then aligned within the broader context of Sydney Opera House's strategic asset and maintenance plans to support the organisation's business enterprise.

The need for alignment of services, performance criteria and supporting information with an organisation's business goals was a key finding of the research project. It was also shown that digital modelling technology could be used as an effective tool for assisting in this process.

Other findings of the research included the value of ensuring contractors understood the facility's organisational culture and the need to use performance benchmarking to develop effective key performance indicators that integrated with organisational objectives. According to the report, the key benefit of digital modelling is its accurate geometrical representation of the parts of a building in an integrated data environment. Related benefits are:

- Faster and more effective processes – information is more easily shared, can be value-added and reused.
- Better design – building proposals can be rigorously analysed, simulations can be performed quickly and performance benchmarked, enabling improved and innovative solutions.
- Controlled whole-of-life costs and environmental data – environmental performance is more predictable, lifecycle costs are understood.
- Better production quality – documentation output is flexible and exploits automation.
- Automated assembly – digital product data can be exploited in downstream processes and manufacturing.
- Better customer service – proposals are understood through accurate visualisation.
- Lifecycle data – requirements, design, construction and operational information can be used in FM.
- Integration of planning and implementation processes – government, industry and manufacturers have a common data protocol.

The report notes that since 2002, a number of projects in Finland, Norway, Germany, France, Singapore, UK and Australia have demonstrated the capacity of digital models to represent and process data across a range of integrated applications, including:

- Amalgamation of architectural, structural and buildings services design information

SMART SOLUTIONS FOR THE BUILT ENVIRONMENT

FEATURE	BENEFIT
Dimmable fluorescent lighting integrated with sun blind control.	Optimal lighting level and quality can be determined by the occupants.
Lighting control with motion sensors integrated with security.	Only provide lighting as needed. Reduces energy use and increases security.
Natural and displacement ventilation.	More efficient and effective distribution of ventilation.
Use of economisers for free cooling.	Energy efficiency.
Individual temperature and lighting control.	Improved comfort is shown to improve productivity. Addresses the number-one concern of tenants as found in BOMA surveys.
Radiant heating and cooling.	Improved comfort, reduced energy use.
Optimised control algorithms.	Reduce energy use with little or no impact on comfort.
Combined heat and power plants.	Improved energy efficiency and sustainability.
After hours control of lights and HVAC integrated with security.	Improved security while reducing energy use.
Monitoring of IAQ and contaminants.	Improved comfort, safety, and productivity.

- Automated building code checking
- Automated manufacturing of components
- Construction programming, including visualisation
- Thermal performance calculations
- Automated take-off of material schedules
- Facilities management.

Significantly, however, the report emphasises: "The ability to integrate data from a number of software packages is dependent upon 'interoperability', defined as the seamless sharing of building data between multiple applications (or disciplines) over any or all lifecycle phases of a building development project. Although digital modelling may be considered as an independent concept, in practice, the business benefits of digital modelling are dependent on the shared use and value-added creation of integrated model data."

As such, the report says to access model data requires an "information protocol", and although several vendors have their own proprietary database formats, the only open global standard is that published by the International Alliance for Interoperability (IAI) known as an industry foundation class (IFC) – a standardised form of digital modelling developed to support architecture, engineering, construction and FM domains.

"The FM Exemplar Project has established that a digital model is an appropriate and potentially beneficial technology enabling storage and retrieval of integrated building, maintenance and management data for Sydney Opera House," the report continues. In particular, it notes that there are many advantages in using an integrated digital modelling approach, such as consistency in the data, intelligence in the model, multiple representations, an integrated source of information for existing software applications, and integrated queries for data mining.

"The standardised building model acts as the main data structure which can be extended with other data sources as each element (wall, furniture, room, grouping elements) has a unique identifier. This unique identifier can be used to correlate different datasets, opening up query capabilities across different datasets," the report says.

It adds: "The IFC open building exchange standard provides comprehensive support for FM functions, and offers new management, collaboration and procurement relationships based on sharing of data. The major advantages of using an open standard are:

- Information can be read and manipulated by any compliant software
- Reduced user 'lock in' to proprietary solutions
- Third party software can be the 'best of breed' to suit the process and scope at hand.

"Standardised digital model solutions consider the wider implications of information exchange outside the scope of any particular vendor. Information can be archived as ASCII files for archival purposes, and data quality can be enhanced as the now single source of users' information has improved accuracy, correctness, currency, completeness and relevance."

The report summarises: "As a result of digital modelling's clearly demonstrated benefits in the support of FM processes, asset management applications and broader organisational objectives, the FM Exemplar Project team support and endorse the adoption of IFC by the FM industry as an integral information management tool in supporting FM as a business enabler." **FM**