

The Evolution of the Intelligent Building

From BACnet Toward Next Generation Systems

It is impossible to predict the future. Understanding the evolution of the intelligent building, however, helps us to not only better appreciate how far our industry has come, but allows us to better foreshadow how far it will go. To best grasp this progress, one must first understand what is meant by the term “intelligent building.” Although it can be defined in multiple ways, the Intelligent Buildings Institute outlines it as, “one which provides a productive and cost-effective environment through optimization of its four basic elements: structure, systems, services and management and the interrelationships between them.”¹

Throughout the decades, the building automation industry has seen tremendous growth in terms of technology and innovation. What has remained, however, is a tendency to build these advances around various combinations of cost savings, energy efficiency, sustainability, and occupant appeal. By analyzing these pillars in light of the principle elements driving intelligent building progress, a better understanding can be gained with regards to what we were historically seeing in our industry, what we are seeing today, and what we will likely be seeing tomorrow.

Which elements are driving the evolution toward more intelligent buildings? The first such factor is underlying or enabling technologies. In our industry, this has primarily meant the introduction of communication standards and the reduced costs associated with microcontrollers. The second is the impact of fluctuating energy prices. Those who have been in the building automation sector over the past few decades have seen this, for example, in 2008 with the peak of oil prices at \$145/barrel versus when the average price was \$30/barrel throughout much of the 1990s. Another factor consists of challenges associated with running operations within ever expanding facilities. And finally – at least in recent years – the technological trends in the consumer market have had profound impact, particularly in terms of occupant expectations.

These elements help to determine the weight that the industry places at any given time on each of the intelligent building pillars. The following sections, tracing the evolution of the

intelligent building, outline this interaction and help to best predict the future of the industry.

Yesterday's Intelligent Building

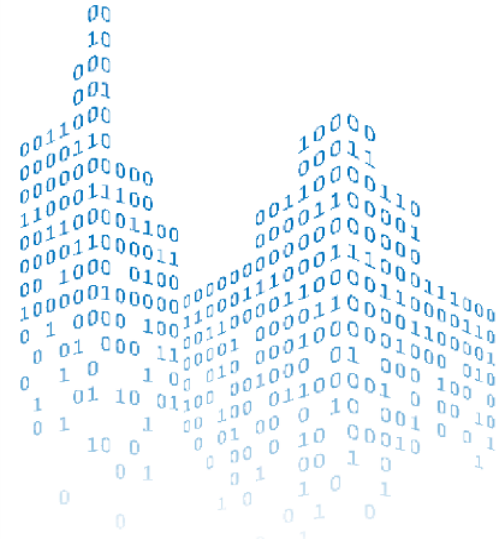
At its origins, the pursuit of an intelligent building was largely focused on cost savings, namely with regards to capital expenditure (CAPEX) and operational expenditure (OPEX). Building automation consisted of standalone systems for comfort-based temperature, access, lighting, and security. Each one of these systems operated in a silo, with their own respective trades, speaking their own protocols, and was serviced by different entities. Integrating these various standalone systems was often expensive and required gateway devices. With the cost of energy being relatively low, neither sustainability nor energy efficiency were of high priority.

Today's Intelligent Building

Today, the story of the intelligent building has grown and largely improved, but is not without its own set of challenges. Now automated and integrated at the building level, building automation tends to consist primarily of networked systems. The focus of the industry has developed beyond cost savings and comfort-based temperature to now include energy efficiency, climate control and, most recently, sustainability efforts.

Cost savings in relation to the intelligent building have successfully expanded to include operational savings via global logic and aggregated data. With the introduction of more sophisticated technologies and systems less likely to operate in silos, additional savings are now achieved due to less technicians being required. Intelligent buildings are also getting more sophisticated in terms of delivering services with exception base service (event driven), thus reducing operational costs.

Due to the increase in energy costs, energy efficiency has also become an important component in our pursuit of the intelligent building. The building automation industry has actively sought out ways to reduce energy wastage by finding synergies in a building's system. There has also been some progress in terms of unifying systems, primarily at the zone or room level, leading to an improved user experience



in terms of both comfort and convenience. This unification of systems has increasingly become part of today's conceptualization of the intelligent building as it has enormous benefits from an energy perspective. For example, a study done by Hannover University's Applied Sciences department determined that simply eliminating systems operating in silos could result in energy savings of up to 30 percent on HVAC applications and up to 60 percent when applied to lighting and HVAC as a single unified system.²

BACnet at the Forefront

With the increased momentum towards environmental responsibility, the concept of intelligent building now also tends to include one that minimizes its carbon footprint. Consequently, the building automation industry now offers technologies such as energy dashboards and additional tools to share sustainability initiatives.

Other current trends include facilities integrating using gateways/protocol bridges or standardizing on a single control network protocol. However, it should be noted that these rarely cross disciplines, meaning that, even today, systems operating in silos still exist in new construction. Also pervasive in the industry are open protocols, with BACnet at the forefront of the movement towards standardized communications between building automation devices for more intelligent buildings.

¹ Caffrey (1985) Intelligent Buildings Institute, Washington DC

² Hannover University of Applied Sciences and Arts, Germany



Tomorrow's Intelligent Building

So, where does the story of the intelligent building go from here?

Although still unwritten, it is clear that the direction in which our industry is heading includes elements of profound change. Building automation will undoubtedly move even further towards a connected, single system approach, where the unification of HVAC, lighting, shades/sunblind, access control and CCTV will be considered standard. As the industry can no longer afford to focus on any one pillar, a holistic view of an intelligent building and its stakeholders will be required. The cost savings, energy efficiency and sustainability requirements of today will continue to be the key objectives of an intelligent building, as will occupant wellbeing and overall appeal.

Cost savings are likely to largely be pursued via a convergence between building automation systems and IT infrastructure. By leveraging a building's communication infrastructure, those in the industry will be able to take advantage of "free" wiring by eliminating fieldbus networks, as well as eliminate the costs associated with maintaining and upgrading multiple networks. This move towards a connected building will inevitably also facilitate integration with other building management functions over IP such as fire alarm, elevators, digital signage, parking access, etc.

In terms of energy efficiency, this movement towards IP-based solutions will mean a minimized impact on the envelope of buildings. The

use of existing infrastructure and the possibility of scalability using modern, connected solutions are also expected to gain traction so as to address sustainability concerns.


The focus of the intelligent building will likely further expand to include occupant wellbeing. Our clientele is changing, becoming more sophisticated. We must consider user cases for the system from the end user perspective and specifications for the building need to reflect this new clientele and what they are expecting from their indoor environment. In addition, expectations for user interface and experience are changing, where mobility is king. Many of the devices being employed by occupants are using standard web API's and commands rather than industry or building specific interfaces. With this comes additional data, a more complex user story and the need for a place/repository to store and manipulate the data to present to different stakeholders.

Doing More with Less

Building appeal, or the attraction and retention of occupants, will also continue to gain traction in our pursuit of the intelligent building. Although doing more with less has been the message to date, to do this while still satisfying occupants means that the building automation industry will need to re-tool the entire infrastructure of devices currently offered. Technologies from just a short time ago can barely handle the data exchange required to truly manage all of the disciplines within the next generation of facilities. The communication mediums currently being used are changing too, including connectivity options, IT standards and security.

Other important trends that we can expect to see is the further interconnectedness of the intelligent building concept with that of the Internet of Things (IoT) building, cloud computing, mobility, further system consolidation,

more applications and interconnectivity. Supporting this hypothesis are the results from the Economist which tells us that over 90 percent of business leaders expect to be using IoT technology in one form or another by 2016.

What makes the increasing speed of technological innovation so exciting – both in and outside of the building automation industry – is that anyone reading this article is truly poised to become the intelligent building expert of tomorrow. We are at a fascinating technological crossroads where those in our sector have the unique opportunity to define what our next generation buildings and systems will look like. So, yes, it is indeed impossible to predict the future. However, in the words of Abraham Lincoln, "the best way to predict your future is to create it." 

ABOUT THE AUTHOR

Trevor Palmer, having joined Distech Controls in 2014, leads the company's marketing, customer service, product management and engineering departments. For more than 20 years, he has brought innovative concepts and energy management know-how to the industry, having held leadership roles in contracting, manufacturing and technical sales. Recognized as a building automation expert throughout North America and Europe, Palmer is instrumental in positioning Distech Controls as an industry leader in building automation technologies, while guiding the company's strategic development, market expansion and product line diversification. Palmer is also a former member of the BACnet International board of directors.



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