Smart buildings: energy efficiency at what price?

February 21 2017, by Sam Edwards

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Automating heating and other environmental controls can bring huge savings to commercial buildings. To what extent is it possible to achieve the same results in residential homes? What is the difference between so called domotics and inmotics?

Smart buildings appear to respond to a range of energy challenges found in Europe today. Improved efficiency would help consumers reduce income spent on energy consumption, reduce greenhouse emissions and also help EU countries meet the goals of the 2030 energy strategy. But how does home automation, also known as domotics, work? Can it really deliver on its promises of efficiency?

"[Domotics] is a system that controls automation, everything that is installed in a building. Based on orders, the system ensures comfort and energy efficiency," says Jordi Sabaté, secretary of the Spanish Automation Systems Association (CEDOM).

This encompasses a whole range of tasks, from automating blinds, letting in more or less sunlight depending on the season, to programming appliances, running at the user's preferred time or when electricity costs are lowest, to simply scheduling when heating or air conditioning systems turn on or off throughout the day.

According to Sabatè, inmotics is currently the principal market for automation. "It is the application of domotics to non-residential buildings, such as offices or hotels. Installing automation here can have significant advantages due to the greater scale of energy usage in commercial buildings."

While the increased scale of energy consumption in non-residential buildings means there is greater scope for savings, the potential for reducing energy through smart home technology is less clear-cut.

Several studies have shown that consumers are largely ignorant of their domestic energy consumption, says Dario Bonino, researcher at Institute Mario Boella (ISMB), Italy. In this context, a review carried out by the Oxford University's centre for the study of environmental change, outlines "the importance of feedback [mostly via display monitors] in

making energy more visible and more amenable to understanding and control".

Home automation systems increase awareness of how energy is used in the home and can lead to a reduction in consumption. However, installing a full automation system could be prohibitive for many consumers, making smart solutions less attractive.

"It is heavily dependent on the place where you are applying the technology," says Bonino. "For example in southern Europe, in countries like Italy, Spain, probably there is actually not much gain that you can achieve for high energy saving. Because, for example, at the residential level, the consumption level [for heating] is so low that when you get to the numbers and see how much you can save, you will probably spend more on the home automation system than what you could save in a lifetime."

Another important issue is the user interface, and the requirement that it should be accessible to the layperson, and also efficient. "Most of the current home automation systems are more or less assuming that everything should be controlled through a smartphone or something similar, which might not be the most efficient solution in many cases," says Bonino.

"There are well-known interaction paradigms that are hard to replace with smartphone-mediated interaction. Think for example to the light switch, is it really more efficient to have to grab your phone, open a dedicated app and touch a button to switch-on a light? Probably other interactions, e.g., gesture or automatic operation depending on habits and context could be better."

Automating systems in [residential homes](#) can provide other challenges, such as integrating devices produced by different manufacturers.

Consumers who purchase a variety of different smart devices produced by a range of developers will likely face problems when they try to get these solutions to work together, or to respond to a single unified command system, says Bonino. Meanwhile, other challenges include guarding against security risks in the form of malicious hackers attempting to gain access to the system.

Sabate argues that these problems are all reduced when applying an integrated home automation system, rather than a series of so-called smart devices with Internet of Things (IoT) functionality (the capacity to connect to cloud services on the internet and report usage, receive instruction from these services).

However, the IoT market is growing dramatically, 3.3 billion devices are expected to be in use by 2018, so questions of integration look set to remain important in the coming years.

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