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The role of ICT in creating intelligent, energy efficient buildings

Rohan Rawte^{a,*}

^a*IESVE Singapore Pte Ltd., 30, Cecil Street, #19-08, Prudential Tower, Singapore 049712*

Abstract

We need to radically change the way we think with respect to how we can substantially reduce our carbon emissions. Starting with ensuring we can create energy efficient, but still comfortable ‘Smart Buildings’. These Smart Buildings need to be the foundation of making Smart Cities. This will involve clustering Smart Buildings into practical groups of buildings to take advantage of larger scale opportunities such as district heating and cooling or microgrids. Smart Buildings will require different solutions, for example a residential solution may be different from a large hospital compared to a university campus.

Innovative Information and Communication Technologies (ICT) is the key enabler to achieve and maintain the effectiveness of all existing and novel approaches to energy efficient buildings throughout the life cycle of a Smart Building. Without substantial advances in ICT our buildings will continue to be inefficient and perform poorly.

Today most ICT related technology is called 'Smart'. Unfortunately, most of the current technology in most of our current buildings is not Smart in terms of what is required to achieve energy efficient buildings. Consequently, innovative ICT is necessary to deliver the significant breakthroughs required for better control and operation of buildings. Without this capability all other innovative technology under development will be rendered ineffective. ICT is the key to Smart Buildings which can be aggregated into neighbourhoods, campuses, districts, cities and countries to provide a truly sustainable built environment.

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* Corresponding author. Tel.: +44 141 945 8500.

E-mail address: rohan.rawte@iesve.com

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1. Introduction to the role of ICT

This paper will address what is required to enable the role of ICT in making our buildings energy efficient and truly sustainable. Innovative Information and Communication Technologies (ICT) is the key enabler to achieve and maintain the effectiveness of all existing and novel approaches to energy efficient buildings throughout the life cycle of a Smart Building. Without substantial advances in ICT our buildings will continue to be inefficient and perform poorly. ICT is the key to Smart Buildings which can be aggregated into neighbourhoods, campuses, districts, cities and countries to provide a truly sustainable built environment.

An overview of the enabling role of ICT is provided in the figure below.

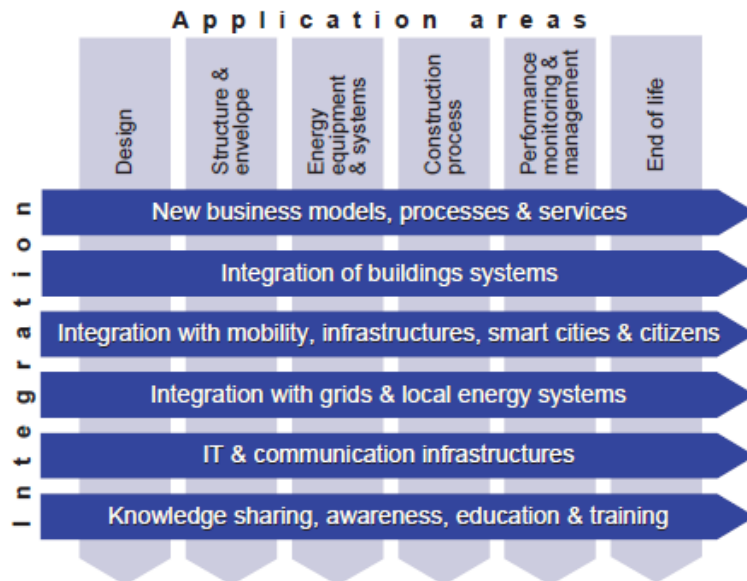


Fig. 1. Overview of the enabling role of ICT.

2. Achieving the vision

To achieve any significant part of this vision demands a more holistic and integrated approach to building design and operation which would incorporate the appropriate use of ICT. For example consider a building that was being retrofitted with a facade with motorised window blinds, daylight dimming capabilities, energy efficient electrical lighting and motorised window openings which are all synchronised to minimise energy consumption but maintain a high level of occupant comfort. This system would be extremely effective but it would be challenging for current technology to make this work efficiently. Whilst we have a number of the components to perform some of these individual tasks we require additional innovative ICT equipment to help optimise the synchronisation of this process to minimise energy consumption throughout the whole building operational life.

In this simple scenario, without better ICT capabilities, it is unlikely we could achieve the energy efficient potential of the proposed system.

Furthermore, as we make our buildings more sustainable then obviously less energy will be used. However, as shown in the previous example, to preserve this lower energy usage will involve a greater ICT capability, not less. In

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