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SMART CAMPUS HERNING PRIZE 2019

THE INTELLIGENT CAMPUS

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Smart Campus Herning Prize 2019

Submission deadline: 1 February 2019

Document language: English is mandatory

Submission guidelines: five pages including the cover page (Times New Roman 11 pt. at default margins); it is recommended that you use at least one page per main heading.

Submit your document in a PDF format before 1 February 2019 to Head of Secretariat Mikkel Nørgaard (mikkeln@btech.au.dk).

Publishable Abstract

This section will be published as part of the Smart Herning Campus Prize.

Title of the submission	The intelligent campus
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Abstract	**Unlock your building's potential** An open IoT operating system is connecting the physical infrastructure to the digital world. Sensors in buildings and energy systems share their data on secure cloud. By analysing data outputs and utilising intelligent algorithms and applications to optimize sustainable building management. Hereby, these datasets can, for example, be combined with a digital twin of the building and, using applications, analyzed to optimize building operation. This can result in customers' advantages such as in higher energy and equipment efficiency, better space utilization as well as enhanced user efficiency, comfort and safety.
One picture (optional)	

Excellence (maximum score: 5)

Whether a new development or an existing building, intelligent building solutions encompass an enormous variety of technologies, across commercial, industrial, institutional and domestic buildings. Their purpose to control, monitor and optimise building services: lighting; heating; metering, security, CCTV and alarm systems; access control; ventilation, filtration and climate control. Modern-day control systems are made possible by integrating IT infrastructure into the design of the building, enabling monitoring and management by intelligent applications and sensors.

A range of hardwired and wireless network technologies have historically been used to deliver the intelligence within an intelligent building, including Ethernet, WiFi, Bluetooth and ZigBee. More recently, with the emergence of the Internet of Things (IoT) we are seeing the emergence of open standards Low Power Wide Area Network (LPWAN) technologies such as LoRaWAN being used to provide secure low speed wireless connectivity within a building.

Existing buildings are often facing a financial dilemma with the need or desire to improve customer experience, lower operational costs and become more sustainable – without incurring substantial investment costs. One approach to help achieve this is to leverage existing “data”, where you can analyse and act on previously untapped data through intelligent analytics. An intelligent building has many potential ‘data points’ capable of generating information including HVAC, lighting and metering systems which can be analysed to identify faults, inform you what needs repairing and where further improvements in energy and operational efficiency can be made.

Impact (maximum score: 5)

The ability to easily deploy open standard sensors and gather information relating to the building systems and environment is fundamental for an intelligent building. The emergence of the Internet of Things (IoT) has provided the ability to complement the existing wired connectivity resulting in ubiquitous coverage throughout a building.

Intelligent buildings integrate sensors, ramp up temperature controls when needed, dim or turn off lights when nobody's around and alert maintenance crews to resolve any issues or faults as soon as they happen. There are numerous advantages, here are just a few examples:

- Heating - Standard time-based controls turn on and off the heating system (and/or water heating) at pre-selected time and day periods. The number one office complaint is that the workplace is too hot. Number two is that it's too cold. People start using fans or space heaters which can be costly and inefficient. Intelligent solutions measure and react to the conditions and take control to make sure the building is at the desired temperature when occupancy starts. The aim is to provide an acceptable level of temperature and humidity and safeguard against odours and indoor air pollutants.
- Lighting - Different control systems exist, time-based control to a pre-set schedule, or zonal where lights are switched on for a particular area avoiding having to light a much larger area if not required. The introduction of smart solutions with sensors that detect occupancy in areas which are occupied intermittently, and then switch the light on or off accordingly. Light level monitoring is also available, consisting of switching or dimming artificial lighting to maintain a light level measured by a photocell.
- Energy - Previously, energy efficiency has been a relatively low priority to building owners and investors. Today, with the dramatic increase and awareness of energy use concerns, and the advances in cost-effective technologies, energy efficiency is fast becoming part of buildings management, facilities management and operational strategy. The aim is to intelligently control when a building's energy systems such as heating or hot water are switched on, therefore avoiding wasting energy when no one is around to use it.

Ultimately, intelligent and smart buildings leverage available data and information via sensors and other data sources to drive intelligent decision-making. This approach can reduce operational running costs, help identify immediate and future risks, improve monitoring and management of the building making it more efficient and sustainable.

Implementation (maximum score: 5)

Moves to implement smart building management systems are substantially motivated by concerns regarding the environment, sustainability and energy prices. According to figures from the US Green Building Council, quoted by the Environmental Protection Agency (EPA), buildings account for 36% of total energy use and 65% of electricity consumption.

With the emergence of energy-saving technologies, some in the building industry suggest that energy is the largest controllable operating expense in a building. As an example of the level of savings that can be made over time, the California Energy Commission claims to have trimmed more than $74 billion from end-users' energy bills since 1977 in California alone, through building-related efficiency initiatives such as its Title 24 regulations.

Some 70% of the electricity supplied to buildings is believed to be consumed by lighting and Heating/Ventilation/Air-Conditioning (HVAC) systems. Smart management of these services can help reduce electricity consumption by saving energy normally wasted due to excessive heating or ventilation, or lighting unused areas. Alongside the opportunity to make savings, smart building systems can also help property owners increase the value of their assets by offering greater comfort for occupants. Corporate customers looking to rent office space can understand the link between a comfortable working environment and better productivity, and may also find it easier to recruit skilled employees who expect pleasant working conditions.

Intelligent building systems can improve comfort for occupants by ensuring that rooms and spaces are not over-heated or over-ventilated, and by optimizing light levels in specific areas as needed to support the tasks or activities being carried out. Smart, adaptive controls such as these can be used in conjunction with an intelligent approach to building design that maximizes use of natural resources such as daylight and atmospheric pressure to assist the building's lighting, ventilation and cooling systems. The orientation of the building and its windows can significantly influence the amount of natural light available during normal working hours. In addition, engineered building products such as adjustable fanlights or solar light pipes can be used to manage daylight and top up light levels in targeted areas.