Smart Data, Efficient Schools, Improved Performance
By George Adams and Liam Rock

Data management has gained more pertinence over time because of how valuable this information can be when used for developing action plans to improve the energy performance levels of buildings. Consequently, “big data” has grown in popularity, especially in the built environment.

Big data goes further than storage and availability. The aim is to analyse the data, understand it, and extract value from it by collating several data sets in order to create a more complete picture of building performance. This activity is especially productive in the operation and delivery of educational facilities.

So, how can we best manage the reams of data created every day in our schools, colleges and universities? It involves measuring things, technical reviews, auditing, behavioural change and applying a collaborative approach to reducing energy waste, while not impacting the comfort of the occupants; this necessitates expert knowledge.

First, simple metrics for monitoring performance must be identified and compared to benchmarks and data from a range of buildings. One example is the carbon per pupil metric. This can vary in schools, (around 180kg to 500kg per pupil for primary schools and 400kg to 900kg for secondary schools) as size, building shapes, and fabrics can differ.

Fundamental to any energy strategy, is to assess the capability of the building’s technical systems alongside performance targets set. This also correlates to training and competency of on-site maintenance teams who operate and maintain the system.

Yet, how control systems work and how to maximise the use of control parameters, whilst safeguarding the comfort conditions for the occupants, isn’t always well understood in schools. Under the maintenance contractor’s responsibility, the task of the control system maintenance is often sub-contracted out which can lead to a lack of single-point ownership. This can result in control sensors being out of calibration and can be overlooked from the planned preventative maintenance (PPM) scheduling. In turn, leading to inefficiency, increased disruption and wasted energy.

This is complicated further as energy use can sometimes increase over the weekends and evenings, outside of traditional school hours. Therefore, the targets for the facilities need to be structured accordingly. Behaviour of the occupants in relation to the energy use can be part of the big data picture, when the occupancy levels, the management of doors, windows and lights, and the usage of areas are evaluated. Hence, engineering and control expertise are needed for building management system (BMS) monitoring/management activities.

Overall, the best way to improve energy performance is undeniably a remote monitoring and management capability that operates on a few facilities. Environmental conditions in different room types, such as gymnasiums, classrooms, and, circulation spaces must also be managed to tight criteria with financial penalties if performance targets are not met.

The amount of data acquired becomes meaningful after it has been analysed, processed and acted upon, and the results are clear. Because of utilising this big data, carbon emissions related to energy consumption have dropped from 603 tonnes per pupil in the first-year post benchmarking to 497

tonnes per pupil. Reduction rates of around 18%, in addition to data exposing further opportunities means that emissions are predicted to decline. We are working towards improving integration between maintenance, systems, energy use and expert diagnoses to realise our performance goals.

The potential of big data is unbounded. In the future, we anticipate the creation of predictive models totally integrated into building operations which will have the capability to automatically adjust systems, so that the best performance possible can be achieved.