

Smarter Buildings: Using data to drive optimised building performance

Commercial buildings utilise more than 42 percent of all electricity produced, yet waste up to 50 percent of it. Now, more than ever before, we need Smarter Buildings.



Businesses need to “prepare for this century, not the last. Turning the oldest building stock in Europe into the most improved, with a nationwide commitment to energy efficiency”.

— Secretary of State for Energy and Climate Change, 2011 Annual Energy Statement¹



It is clear that there is an immediate requirement to significantly and urgently change the way buildings are managed if organisations are to achieve their own internal financial targets and meet current and future environmental legislation requirements.

Building operations are often cited as one of the most significant costs to any business, second only to headcount. Facility investments and operating costs can be more than 30 percent of the annual corporate spend² for an organisation. Add to this the cost of implementing environmental legislation, such as the UK Climate Change Act, along with the need to ensure the ongoing reliability of buildings, and the costs to operate and maintain building stock looks set to rise even further.

Many companies have been executing energy and facility management strategies for a number of years and yet, worldwide, commercial buildings are still utilising more than 42 percent of all electricity produced – and wasting up to 50 percent of it³.

It is time for change.

In Ireland in 2010, the recession resulted in the economy contracting by 10 percent compared to 2007. However, over the same period, spending on building energy use rose by nine percent⁴. This increase came about due to the unseasonably cold weather experienced at the time, forcing companies to work harder to maintain comfortable internal temperatures. This brings into focus the impact inefficient buildings and weather have on energy demand in spite of restricted budgets.

Why is progress slow?

What are the reasons for such high energy use, and the associated wastage, in buildings?

And why, when there has been such a focus on operational expenditure, are companies experiencing huge and ever increasing building operational costs?

One explanation is that processes and practices have remained largely unchanged since companies began closely managing their energy use and operational costs, and are no longer meeting the increasing demands of building management and legislation. From the outset, businesses have executed “low hanging fruit” energy reduction projects, which have driven significant savings in cost and energy use, at very little cost. These include the simple actions of turning off lights in areas that are no longer used, or reducing the temperature by degrees – enough so as not to affect working conditions, but still reduces costs. Once these projects produce results, companies have looked for further energy reduction through replacing older plant equipment with new energy efficient kit, even though this comes at a more significant cost.

However, what is usually lacking is a robust management system and toolset that underpins these practices and projects, and ensures that no matter who is managing the buildings, best practices are not only implemented but also maintained. These toolsets also mean that capital projects are scoped based on fact rather than speculation. Without a robust management system and toolset, best practices are prone to slip and a company can find itself reverting to picking the “low hanging fruit” which was, in reality, already picked a few years previously, but hadn’t been maintained.

Another reason that we still see such high costs in building operation relates to the management and control systems that are in place. Whilst potentially extremely effective at controlling the building to its commissioned state, these are often not agile enough to inform end users of factors that impact energy use, such as equipment operation and performance. Nuances such as set point drift, which begin to occur immediately after the building goes live, and increases at a rate of approximately 20 percent per annum, along with the variations that occur within buildings as its use profile begins to change, are typical factors that controls systems generally do not track and are not designed to highlight.

How can we exploit building data to drive improvements?

How do we go beyond the current practices and drive down operational and energy costs?

Understanding how a building is performing through the continuous monitoring of its energy using equipment, is clearly an important approach to keep operational and energy costs to a minimum. But achieving this and ensuring issues are corrected in a timely manner, to maximise and maintain cost savings, is a challenge.

Building services equipment and devices, installed and commissioned to provide the desired environmental conditions within buildings, are becoming more and more intelligent. Sensor and metering devices associated with each individual plant device enable the control and monitoring of the internal building environment. This plant equipment produces huge amounts of data – and it is this data, combined with other external and disparate sources, that hold the future to Smarter Buildings.

Data from these devices, including meters, weather stations and security systems, is a valuable yet under-utilised resource. In larger buildings, much of this data is used to control the devices via the Building Management System (BMS) but tends not to be used for much more. By extracting the data and applying analytical tools, such as the TRIRIGA® Energy Optimization (TEO) solution, it is possible to uncover previously hidden systemic energy waste and performance inefficiencies. This information can provide maintenance teams with knowledge to help them understand and demonstrate that equipment is performing efficiently and ensure that base-line energy use is driven down.

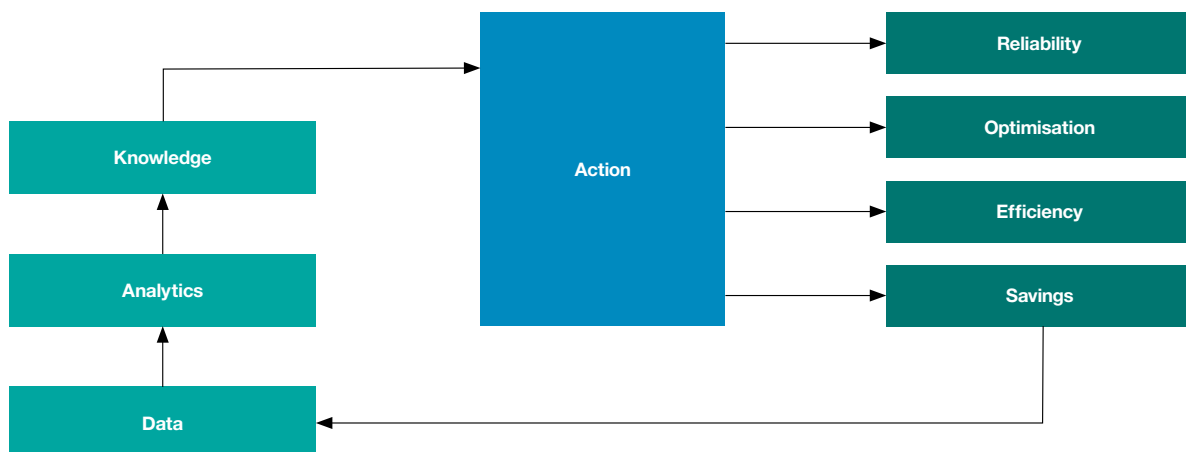


Figure 1: Data and analytics provide new information or knowledge, but without action, companies will not achieve any benefits

What has IBM done on its own property portfolio?

In 2010, the TEO solution was deployed at one of its most energy-consuming locations⁵: a 3.3 million square foot campus that is extremely well-managed and has achieved consistent year-on-year energy reduction of between five percent and seven percent for the past 10 years. Within a year, where the TEO solution had been deployed, the site operations manager realised additional energy savings of up to 15 percent across the plant equipment. All the energy savings observed were new to the team and had not been highlighted or delivered previously.

With the help of the TEO solution, one European company recently completed a proof of concept in their most tightly controlled building environment. They uncovered energy saving benefits estimated to be approximately EUR 57,000 per annum – equating to a decrease in energy costs of 14 percent for the equipment monitored.

In addition to the above, maintenance operational savings were also achieved. The TEO solution identified a number of underlying problems in the building services equipment, for example, a number of work orders were raised relating to air handling units. Following an initial bow wave of work, the number of reactive maintenance work orders was reduced by 16 percent for the air handling units alone (Figure 2). This reduction was achieved by providing new information on underlying issues along with the identification of the route cause in sufficient time to prevent the “cold calls” that usually drive reactive maintenance. This decrease in reactive maintenance is set to continue as more assets are covered and assessed by the solution and more analytics deployed. Future savings are also expected as the solution helps the team replace “planned-based” maintenance with “performance-based” maintenance.

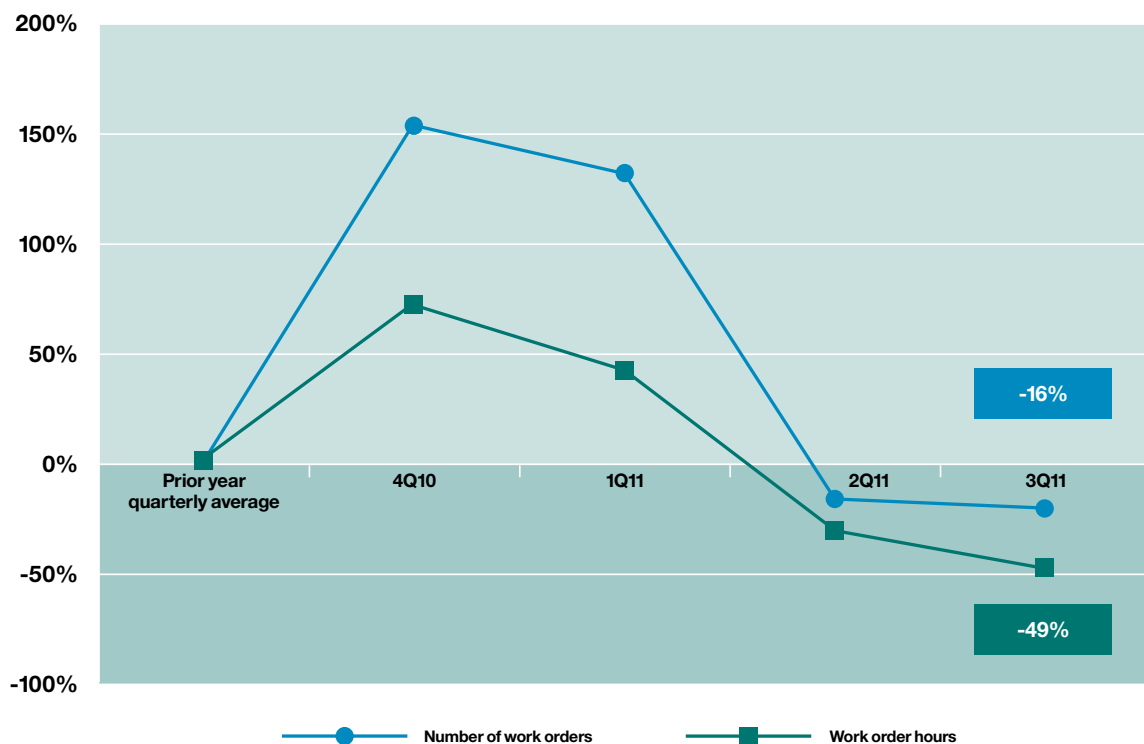


Figure 2: Air handling unit work order numbers and hours after TEO deployment

The time taken to execute each reactive work order, generated by performance issues of the air handling units, was reduced by 34 percent as a result of the solution. The total number of work order hours was also reduced by 49 percent within the first year of deployment. This fall in work order hours was due to the increase in relevance of information the solution provides to the maintenance team via the work order management system. The maintenance team is no longer responding to “cold call” situations, but to the performance of the asset, based on the business rules that the solution provides. Relevant, actionable information is given to the maintenance team detailing, for example, the location of the asset, the asset identification, warranty status, performance issue and part numbers, all before anyone has left their desk (see Figure 3).

Using building data in this way is driving a paradigm shift in the way buildings are managed. Combining with the control systems, data, analytics and automatic work order generation, it provides a new approach and allows building operators to address issues such as set point drift, in an actionable, timely way. Using the TEO solution, facility managers can take their building operations to the next level, significantly reducing inefficiency and cost, whilst improving the reliability, safety and comfort of all the buildings in their portfolio.

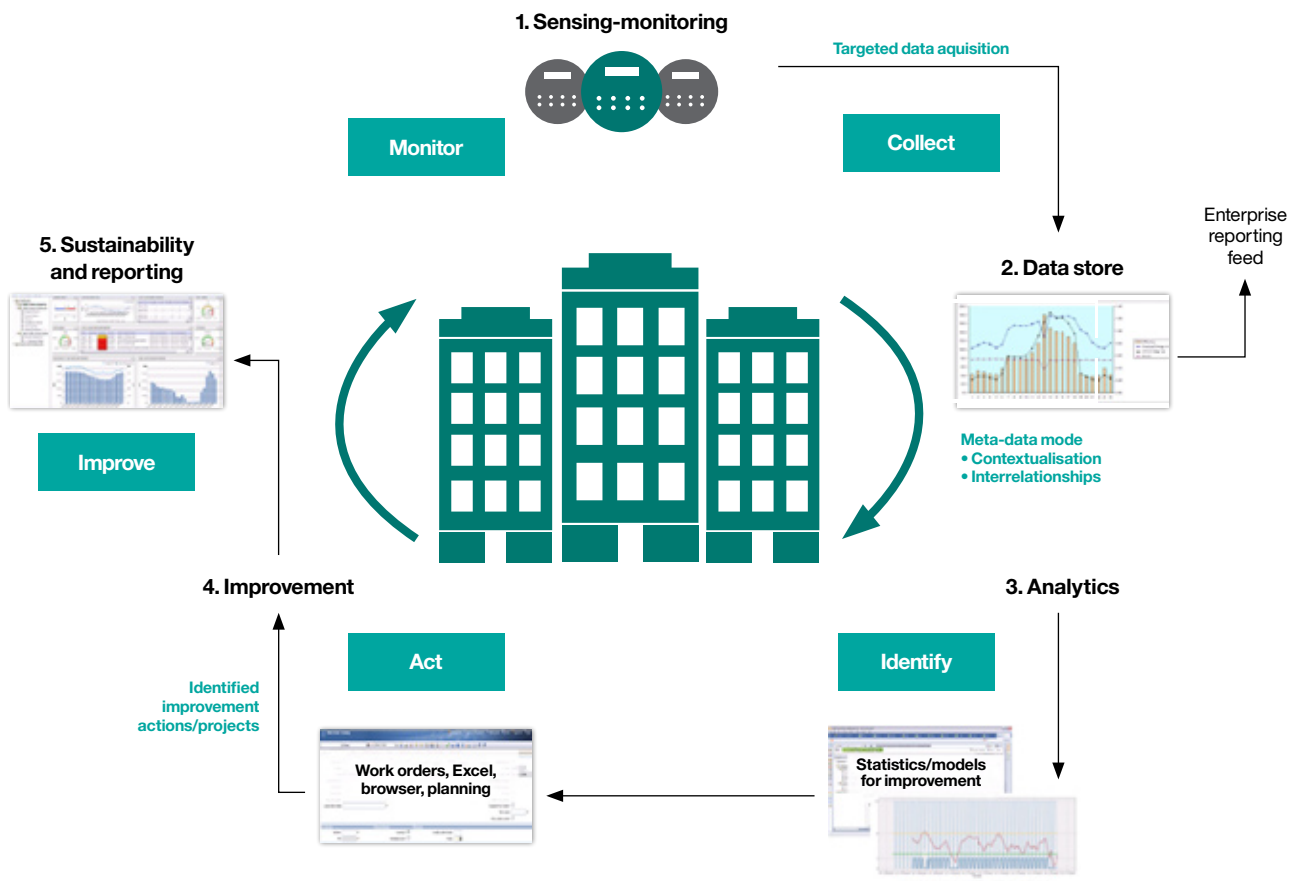


Figure 3: Data flow within the TEO solution and illustrating how data is transformed into actionable knowledge

Convergence and working in partnership

In recent years, the building management industry has started converging with the IT world. However, this convergence is still in its infancy, with many companies still not fully integrating the two departments. This means that we are only at the beginning of the TEO journey, with a few progressive companies embracing these new technologies.

But these are exciting times as a new era for building operations opens up. To be able to take advantage of this, all stakeholders need to be aligned, particularly in relation to technology and product capability. For example, access to data is critical and standards are required for Building Management Systems to ensure the truly 'free' movement of data from the BMS to intelligent solutions, as already observed in the products they control. As such, partnering to align requirements within the industry is crucial. A partner network, including equipment manufacturers, BMS providers, analytical software, asset management, information management and service providers, is critical to providing solutions that harness data and drive efficiency, energy reduction, and reliability for building owner and operators.

In 2009, the IBM Green Sigma™ Coalition was launched, bringing together like-minded companies to drive the Smarter Buildings agenda.

This coalition is run by its members and, by combining their capabilities, competencies and experience, helps other organisations meet their Smarter Buildings needs by, for example, reducing energy and water use and minimising the production of waste.

Analysts and commentators welcomed the initiation of the Green Sigma Coalition:

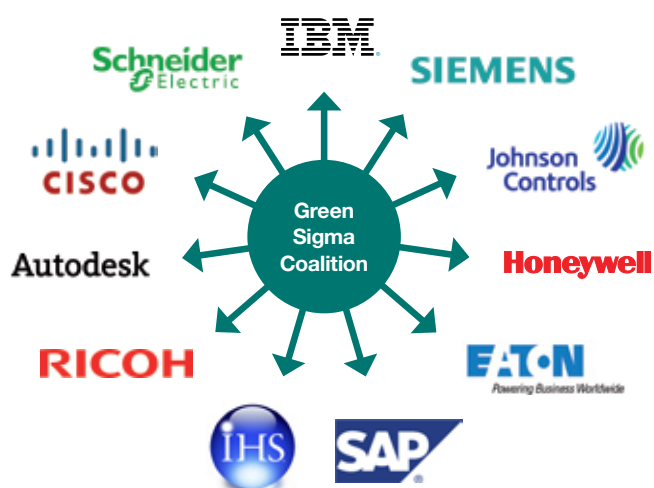
“IBM have mapped the new value networks, recognised the boundaries of their internal core competencies and decided to seek out alliances and partnership. The result is a virtual ‘dream team’ of companies invited to come together to form the Green Sigma Coalition.”⁶

“This is the beginning of a formalised relationship among a set of manufacturers that 10 years ago would not have necessarily worked together. This is about building a system where information can be analysed across buildings and across different (and multi-vendor) building automation systems.”⁷

“Overall, an impressive step for IBM and its partners toward positioning information technology suppliers to help customers address the broad array of environmental challenges and efficiency opportunities across the entire enterprise.”⁸

There has never been a bigger need, nor a better time, to improve the way buildings are managed. We can no longer expect what we did in the past to meet future needs, as costs to operate buildings are increasing, as is the need to be compliant. While companies are continually changing their business models, rationalising and changing the use profile of their real estate portfolio, the requirement to be able to react effectively and in real-time to the demands and challenges of creating Smarter Buildings, has never been more important.

There is now an urgent need for all stakeholders to embrace change and deliver the technology solutions and services that drive Smarter Buildings.



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- 3 <http://www.bfrl.nist.gov/buildingtechnology/documents/FederalRDAGendaforNetZeroEnergyHighPerformanceGreenBuildings.pdf>
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- 7 IDC Manufacturing Insights, IBM’s Green Sigma Coalition: An Integrated System from Manufacturers, Doc # IcUS21903909, Kimberly Knickle, June 2009
- 8 The Forrester Blog – Green Sigma coalition: a dream team of vendors for sustainability solutions Chris Mines, June 29, 2009



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