Smart Buildings for Occupiers and Facilities Suppliers

Buildings and facilities are the second largest cost of an organisation after human resources, and have a large impact on the environment, typically contributing to 40% of total greenhouse gas (GHG) emissions. Despite the fact this significant cost has promoted some management focus on buildings, many of the systems that constitute a building and facilities, such as heat, water and waste, office services, and electricity, are managed independently and often inefficiently. By adding a layer of intelligence, elements of a facility can now be integrated for better management and control. Identifying these key causes brings key opportunities into focus. Instrumented buildings with thousands of sensors, enable monitoring and interconnection of everything from motion and temperature to humidity, precipitation, occupancy and light.

IBM, as part of its Smart Planet strategy, has developed a Smarter Buildings Framework to capture the major technological advancements required to link independent elements across buildings. A Smarter Building is a managed multi-system, operating environment involving all aspects of energy, waste and service systems, optimised at building or estate portfolio scale. “Smarter Buildings” integrate and optimise the physical and digital infrastructures in individual buildings and groups of buildings.

Smarter Buildings benefit both Occupiers and Facilities Suppliers, enabling them to:

- Improve property and asset management, supporting a broad range of corporate goals, including the operational, financial, environmental and social responsibility.
  - Reduce costs and improve operational efficiency
  - Open integration of building and resource data (energy, carbon emissions, water, waste, equipment) to support continuous improvement
  - Increase flexibility for managing in a multi-use building environment
  - Improve safety and security

- Optimise energy usage through Smart Building to Smart Grid integration
  - Enable participation in demand response programs and incentives
  - Integrate distributed energy generation into intelligent buildings

- Manage risk related to regulatory compliance
  - Enforce policies and drive behavior to reduce GHG emissions
  - Implement tools to manage energy and emissions data to achieve regulatory requirements

- Increase tenant satisfaction from lowered energy costs and an improved safety, security, and building environment

The Smarter Building enables real-time measurement, monitoring and active management of building systems through the development of new algorithms, analytics of real-time external events and building system state. Implementation of control mechanisms optimises the cost and operational performance of building and estate portfolios.
Technology advances enable new approaches to a range of problems. The world is now more:

- **Instrumented**
  We now have the ability to measure, sense and see the exact condition of almost everything. Sensors can be found in nearly everything from simple infrared motion detectors in security systems, to sophisticated sensors in engineering equipment, and even CCTV footage. We can measure many aspects of building performance in ever increasing detail.

- **Interconnected**
  Sensors and business systems can now be interconnected more easily than ever before. This enables the data to be integrated and transmitted long distances in real-time, removing geographic and organisational barriers in order to share data. Engineering data can be combined with business and commercial data using standard interfaces to provide a business-wide perspective.

- **Intelligent**
  By combining the data with modern analytical techniques, we now have the ability to make better decisions. We can analyse the growing volume of data in real-time, combined with improved algorithms to identify trends and patterns, and provide reporting tools to present data in useful formats.

**Implications of Smart Buildings**

By applying these three approaches to the issues faced by Occupiers and Facilities Suppliers, we can be smarter about how we manage, sustain and operate buildings and physical assets. Smarter Buildings’ outcomes can be categorised in the following three areas:

- Smarter Buildings are comprised of interconnected asset maintenance systems to optimise operations.
- Smarter Buildings identify and enable instrumented green solutions to reduce energy usage and environmental impact.
- Smarter Buildings provide intelligent management systems to enable a complete alignment between Facilities operational outputs and corporate objectives, including performance monitoring and reporting.
The vision of Smart Buildings is to help portfolio Occupiers and Facilities Suppliers to develop, manage and optimise a diverse building portfolio, including renewable energy along with interconnected and intelligent management systems – driving financial benefits and fulfilling corporate and social responsibility requirements.

**Smart Buildings for Interconnected Asset Maintenance Systems**

This is the first sign of an increasing use of smarter technology to support Facilities operations with automised and intelligent decision making. When implemented as part of a coordinated asset management strategy, such solutions can bring significant improvement to the effective use of the assets, resulting in cost reductions, as indicated in the following Return on Investment illustrations:

<table>
<thead>
<tr>
<th>Business Scenario</th>
<th>Illustrative ROI Returns</th>
</tr>
</thead>
<tbody>
<tr>
<td>Labour Utilisation</td>
<td>Up 10-20%</td>
</tr>
<tr>
<td>Asset Utilisation</td>
<td>Up 3-5%</td>
</tr>
<tr>
<td>Equipment purchases</td>
<td>Down 3-5%</td>
</tr>
<tr>
<td>Warranty recoveries</td>
<td>Up 10-50%</td>
</tr>
<tr>
<td>Inventory needs</td>
<td>Down 20-30%</td>
</tr>
<tr>
<td>Inventory carrying costs</td>
<td>Down 5-20%</td>
</tr>
<tr>
<td>Material costs</td>
<td>Reduced 5-10%</td>
</tr>
<tr>
<td>Purchasing labour</td>
<td>Reduced 10-50%</td>
</tr>
</tbody>
</table>

Source: IBM Research

Asset Management Solutions based on proprietary software offer a comprehensive view of the entire property portfolio management data set, containing both functional performance management and transactional asset management data. Access to information for decision making is optimised with the production of consistent and focused aggregated data. This is a key component of the Smarter Buildings offering.

**Smart Buildings for Instrumented Green Solutions**

By 2025, buildings could be the single largest energy consuming entity on our planet. Intelligent building solutions, smart metering, Radio Frequency Identification (RFID) and actuators are all available technologies helping facility Owners and Suppliers’ green credentials and targets. Asset monitoring and tracking capability of Smart Buildings can lead to identification and implementation of new capabilities not currently addressed by today’s commercially available systems, such as renewable energy, energy demand management and work management.

The IBM® Green Sigma™ consulting services, based on the Lean Six Sigma approach, helps clients reduce their energy and water usage. By combining IBM's experience with energy efficiency and carbon reduction and Lean Six Sigma processes and corporate social responsibility consulting, Green Sigma enables clients to apply this strategy to their operations and environmental practices to manage carbon output and reduce water and energy usage and associated costs.

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Connecting the instrumentation to asset management software enables immediate alerts for site operations teams when mechanical systems are not performing to a desired specification, leading to higher building reliability and faster response times that drive energy savings. This is specifically important for facilities with high energy consumption and risk, such as Data Centres. Given the increasing energy demand and complexity of such operations prompts a higher need to establish best practices of integrated service management, which results in improved service, lower energy costs and better risk management.

**Smart Buildings for Intelligent Management Information Systems**

*Intelligent management systems* enable a complete alignment between Facilities operational outputs and corporate objectives. Paired with asset management software, the solution architecture deploys advanced prognostics to identify patterns and forecast potential failures, including management scenario planning, which enables optimised management decisions across the Property and Facilities operation.
Data flowing from asset management software, operations, workplace and critical facilities, such as data centre operations, can now be stored in data warehouses with options to analyse them at any time using analytical models. These include data mining and interface models to relate the outputs to corporate management. This enables corporate executives to manage a strategically aligned organisation at all levels by instrumented, interconnected and intelligent systems.

Technology-enabled alignment between operational outputs and strategic objectives allows Facilities Suppliers and Owners to make more informed decisions about performance of service outputs, energy use and management of assets. Whether it is asset information, smarter energy use, or an intelligent management system, the use of technology allows the interconnection of these once disparate areas. The resulting information means that Property and Facilities Management Organisations can assert control and accountability over their operations where not previously possible.