**Design and Building Management Systems**

The field of Intelligent Buildings and Building Management Systems (BMS) encompasses an enormous variety of technologies, across commercial, industrial, institutional and domestic buildings, including energy management systems and building controls. The function of Building Management Systems is central to 'Intelligent Buildings' concepts; its purpose is to control, monitor and optimize building services, e.g., lighting; heating; security, CCTV and alarm systems; access control; audio-visual and entertainment systems; ventilation, filtration and climate control, etc.; even time & attendance control and reporting (notably staff movement and availability). The potential within these concepts and the surrounding technology is vast, and our lives are changing from the effects of Intelligent Buildings developments on our living and working environments. The impact on facilities planning and facilities management is also potentially immense.

**Control Theory**

The essence of Building Management Systems and Intelligent Buildings is in the control technologies, which allow integration, automation, and optimization of all the services and equipment that provide services and manages the environment of the building concerned.

There are numerous methods by which building services within buildings can be controlled, falling broadly into two method types:

* **Time Based**
* **Optimizer Parameter based**

Heating - Time-Based Control

Time-based controls can be used to turn on and off the heating system at pre-selected periods.

**Lighting Control Methods**

Different control systems exist, again time-based control and optimizer parameter-based where a level of illuminance or particular use of lighting is required (Zones, Time control, Passive Infra-Red (PIR) Occupancy sensing and Light level monitoring).

 **Energy Savings**

Until recent years, energy efficiency has been a relatively low priority and low perceived opportunity to building owners and investors. However, with the dramatic increase and awareness of energy use concerns, and the advances in cost-effective technologies, energy efficiency is fast becoming part of real estate management, facilities management and operations strategy.

For lighting, energy savings can be up to 75% of the original circuit load, which represents 5% of the total energy consumption of the residential and commercial sectors.

Energy savings potential from water heating, cooling, or hot water production, can be up to 10%, which represents up to 7% of the total energy consumption of the domestic residential and commercial sectors.

 **Environmental and Greenhouse Gas Benefits**

Greenhouse gas emission reductions depend on and correlate to reductions in energy use. Intelligent Buildings contribute directly to the reduction in energy use, in commercial, industrial, institutional and domestic residential sectors.

Legislation and environmental standards; health and safety regulations; and global trends towards improving indoor air quality standards are all significant drivers of Building Management Systems and the Intelligent Buildings technologies.

**Practical Benefits**

Energy-effective systems balance a building's electric light, daylight and mechanical systems for maximum benefit.

Enhanced lighting design is more than an electrical layout. It must consider the needs and schedules of occupants, seasonal and climatic daylight changes, and its impact on the building's mechanical systems.

Lighting Systems

Adding daylight to a building is one way to achieve an energy-effective design. Natural daylight 'harvesting' can make people happier, healthier, and more productive. And with the reduced need for electric light, a great deal of money can be saved on energy. In addition, by reducing electric lighting and minimizing solar heat gain, controlled lighting can also reduce a building's air conditioning load.

Mechanical Systems

The HVAC system and controls, including the distribution system of air into the workspaces, are the mechanical parts of buildings that affect thermal comfort. These systems must work together to provide building comfort.