**INTELLIGENT BUILDINGS**

**DEFINITION**

Intelligent building (IB) is the future of our building industry. All new commercial buildings and probably luxurious domestic buildings are designed with a common goal - to become intelligent buildings. However, the official definition of IB has not yet been standardised around the world. In the USA, an IB is categorised by four basic elements, namely building structure, building systems, building services and building management. In Europe, the emphasis is on information technology and the genuine need of the user. In Singapore and China, it appears that the term “automation” has been dominating with a great emphasis on high technology. It is our view that a proper definition of IB should be based on users’ needs instead of the image of the building itself.

**ENVIRONMENTAL DESIGN CONCEPT TOWARDS INTELLIGENT BUILDING**

An intelligent building starts with an environmentally friendly design. Creating a project that is environmentally friendly and energy efficient ties in closely with many of the intelligent attributes. Intelligent buildings are designed for long-term sustainability and minimal environmental impact through the selection of recycled and recyclable materials, construction, maintenance and operations procedures. Providing the ability to integrate building controls, optimize operations, and enterprise level management results in a significant enhancement in energy efficiency, lowering both cost and energy usage compared to non-intelligent projects.

Intelligent buildings are intended to be the preferred environment for occupants. This requires focused attention to environmental factors that affect occupants perception, comfort, and productivity. An intelligent design finds the balance, providing a superior indoor environment and minimizing energy usage and operating labor. This is where the technology becomes valuable. Using integration and automation we are able to implement solutions that both provide a superior environment and minimize energy

## HISTORICAL OVERVIEW

There is a short history for the concept of intelligent building. It occurred initially in early 1980s. The definition of intelligent building has been evolving with different emphasis, mainly driven by the development of relevant technologies and the changing needs for the built environment. The short history is summarized below:

* to 1985: intelligent buildings are buildings automatically controlled to function.
* 1986 to 1991: intelligent buildings are buildings capable of responding to the changing needs.
* 1992 to present: intelligent buildings are buildings with features effectively satisfying the changing needs.

**WHY INTELLIGENT BUILDINGS?**

**Comfort**

* Thermal
* Visual
* Ergonomic

**Economy**

* Energy
* Work efficiency
* Other resources

**Safety**

* Health
* Data
* Equipment

## INTELLIGENT BUILDING

Due to the developing of the electronic devices we live the age of the intelligent solutions. The devices around us have intelligence for instance cars, washing machines, microwave ovens, entertainment electronics. We can enjoy the advantages of the automatic and adaptable operation of our devices of use. And not just in the case of the devices of use.

Beside making our routine tasks easier (watering, putting up-down the shutters, etc) and operating different systems, the main aim of an intelligent home is to increase our safety and the energy-saving (in case of activating the security alarms the consumers are cut-powered, etc). The intelligent home is not a utopia nowadays but due to the drops in prices in the last decade they have become an available reality.



###### The complex intelligent solutions control the operation of the following sub-systems:

* security technology
* video monitoring system
* entertaining electronic devices
* lighting
* heating, cooling
* information technology
* telephone, intercom
* shutter, gate, Venetian blind
* sprinkling system
* sauna, Jacuzzi, other devices

The simplest way of the intervention is to use the wall switches. The advantage of this is that the system remains controllable for them who want to use the house in the normal way. Using a remote control is more comfortable. (The number of them is not limited so every member of the family can have one.) The applicable remote controls can range from the simple one without a display to the one with back-lighting and touch-screen or with high-definition colour touch-screen. The spreading of WIFI networks has made the use of PDAs (palmtops) possible. The other way of controlling is the touch-screens fixed on the walls. They are available in black, white, or other colours with even SVGA-definition. It is a convenient solution to control the devices on the floor plan of our house in this way.



The solutions described above are of local character, the control with these devices is possible in door or from the close environment of the house. In many cases controlling or checking our homes from other places can be advantageous. Popular possibility is to control something or checking its state with an SMS. In this way we can activate the heating or the air conditioner before arriving home. The high technology is the control via the internet. We can create defined lighting-pictures by pushing a button as a part of basic service of the many-sided lighting-control. Imagine how lovely it is if we can create romantic subdued light in our homes by pushing a button. Beside this we can adjust the light intensity according to the outer light. Furthermore the lighting can be activated by moving.



This system can make our entertainment more comfortable and enjoyable. Using the home cinema function the lamps set in the given intensity, the DVD player switches on automatically, the projector comes out from the ceiling, the screen comes down and the film starts. If in the garden watched by a camera moving can be observed the picture of the camera appears on the TV screen. In this case -if we are away- the video or a digital recorder stores the picture, or we can get an SMS or MMS about the event. Wherever we are in the world we can watch in our house via the internet. The garden-sprinkling system can be activated -beside the time-program- by a telephone call. After our leaving the system cut-powers our home (of course just the wanted sockets and electric circuits). We do not have to worry about the iron forgotten switched on. After leaving the security alarm gets activated, the cameras change into watching-mode and after sunset the presence-simulator starts working. It creates the appearance that we are at home by switching the lights on/off or changing the volume level of the TV.

**Differentiating an Intelligent Building**

In short, this is a focused view of buildings as a system of systems with controls and integration being used to deliver a higher level of efficiency and an improved set of user interface tools. So what differentiates this from traditional building automation? In some ways the whole concept is just an extension of building automation to cover more systems and functions, but in other ways it is completely different. Here are some specific examples:

* **Improved Building Systems Control** -The concept of the intelligent building starts with the design and selection of the right building system controls. These systems need to be designed to be properly optimized for efficiency, provide the data needed for efficient operations, and be selected to be IP compatible and use open standards so that they can be readily integrated. In addition to properly specifying and designing these systems they also need to be properly installed and, most importantly correctly commissioned. Building systems are often selected so that they can be competitively acquired from “best in class” suppliers and often will include a set of software tools for setup, troubleshooting, and limited operations.
* **Systems Integration** - The second tier of an Intelligent Building is the integration layer. This often is based on a “middleware” package that allows for systems to be readily interconnected using a combination of protocols and to provide user interface typically using a series of web pages. At the integration layer information can readily be shared between systems for additional optimization. Web based user interface allows for a single view of all of the building systems and can allow for operations and monitoring on site, from handheld devices such as PDA’s and smart phones or remotely from a web connection.
* **Enterprise Management** -The final layer of an Intelligent Building system is Enterprise Management. This is clearly a departure from more traditional building automation. Enterprise management provides connections between the building systems and business systems. Examples of this include using information from a scheduling program, such as Microsoft Exchange server to schedule lights and air conditioning in spaces such as conference rooms. Other examples include bringing information up to management dashboards that allow for easy analysis of building performance including energy, sustainability, and productivity at a high level. Enterprise management also provides tools for managing large groups of buildings as one virtual campus or enterprise. It furthermore allows for ready connection to outside services including utility demand response programs and analytic services that can readily assess building performance and provide recommended improvements.

Used together these three levels of an Intelligent Building system can result in a significant improvement of system operations, operational efficiency, and high level tools for facility assessment and optimization. Keep in mind, however, that the pyramid or hierarchy is only as good as the quality of its base. It starts with a solid design and delivery of the building systems and their associated controls, then builds with integration and connectivity. At a high level the tools provide the ability to recognize and improve on system problems, but for an Intelligent Building to work, all of the underlying systems must be properly designed, implemented and commissioned.

**ADVANTAGES FROM AN INTELLIGENT BUILDING DESIGN**

* The built environment should be productive, safe, healthy, thermally, aurally and visually comfortable.
* The building has potential to serve future generations: sustainability, or adaptability over the life cycle of the building and safeguarding the earth and environment resources.
* Financial aspect: the building can be built within some cost constraints whilst retaining market value.
* Higher levels of security and safety.
* Simplified operation for users and administrators.
* Simpler staff tracking.
* Reduced administration costs.
* Smartcards - single card for security and cash transactions.
* Reduced system costs by sharing infrastructure.
* Easier integration into university systems (e.g. HR and scheduling databases).
* Information can be delivered to all interested parties in the manner they need.
* Increased mobility - not tied to a specialist workstation.
* Training is minimised, use standard operating environments.

**SUMMARY**

* **Reduce operating costs:** Staff becomes more productive and efficient when they can control multiple systems and devices from one computer with a central set of command software tools.
* **Reduce installation costs**: Single-seat control eliminates the cost and complexity of maintaining multiple front-end interfaces.
* **Optimize energy efficiency:** Interoperability means the latest technologies for energy storing, load shaping and load shifting, and you can micro-manage energy usage.
* **Improve maintenance and trouble-shooting**: Acquire and manage immense amounts of data so forecasts are more accurate. Avoid the high costs of unscheduled repairs.
* **Improve information management**: Manage data better with a centralized database and data compilation.
* **Increase flexibility:** You can choose the best solutions for the future of your facility, subsystems and equipment. You are not limited to a single manufacturer or protocol.