

1st Conference on Public Works

Conceptual Design for Smart Building

February 2007

Submitted by:

Noor Anwar Abu Sharkh
Architecture Engineer

Parsons Brinckerhoff International Kuwait

PO Box 1717
Salmiya 22018
Kuwait

Phone: 5311923/4
Fax : 53117927

Email: Noor@pbkuwait.com

Table of Contents

1.General.....3

2.HighTechnology.....3

3.FacilitiesManagement.....4

4.Information Systems.....5

5.System Infrastructure.....5

6.Summary.....6

7.Scenario.....6

1.GENERAL

Those outside the construction industry often wonder how an assembly of inanimate building materials can be intelligent - even with people in it. Industry insiders, especially developers and owners, see buildings stuffed with the latest technology as being intelligent. Both are wrong and both are right.

In the early 1980s, trade magazines began running stories on "intelligent buildings." Publications concerned with mechanical systems did articles on automation systems making buildings more energy-efficient. Magazines serving the communications industry told how advanced telecommunications systems made buildings more efficient and therefore more intelligent.

As a result of extensive press coverage and supplier advertising, there has always been pressure on owner/developers to build smart buildings. Intelligent buildings **that** are said **have to** be more attractive and easier to lease. Existing buildings, lacking the attractive features of the newer, more intelligent ones could lose tenants to their more intelligent competitors.

An intelligent building combines innovations, technological or not, with skilful management, to maximize return on investment. An intelligent building is one that provides a productive and cost-effective environment through optimization of its four basic elements - structure, systems, services and management - and the interrelationships between them.

Intelligent buildings help business owners, property managers and occupants to realize their goals in the areas of cost, comfort, convenience, safety, long-term flexibility and marketability.

2.HIGH TECHNOLOGY

The high technology concept **is** addressed **to** four groups:

1. energy efficiency
2. lifesafety systems
3. telecommunications systems
4. workplace automation

The ultimate dream in the design of an intelligent building has always been to integrate the four operating areas into one single computerized system.

All the hardware and software would be furnished by a single supplier who would use compatible equipment and common CPUs and trunk wiring.

Even today, such total integration is far from being realized, even on a small scale. Nevertheless, there are suppliers capable of packaging all four categories mentioned, all as part of a single contract.

Over time, the four categories have merged into two broader ones:

1. Facilities management (energy and lifesafety)
2. Information systems (telecommunications and workplace automation.)

In general, facilities management deals with the physical structure itself and how it is operated. The term information systems refers to the way information is handled (and therefore how business is done) within the building.

The general features of smart buildings are:

- Local area networks
- Raised floors
- Horizontal chases and vertical risers
- Audio-visual systems and intelligent cards.
- Office automation and energy efficiency in terms of:
 - Floor-mounted air supply ducts.
 - Floor supply and ceiling return systems.
 - decentralized environmental control systems and
 - Furniture integrated control systems.

3.FACILITIES MANAGEMENT

Facilities management implies a computerized system that oversees and controls building operations, generally energy and lifesafety. Although the potential exists to integrate all facilities management activities into one monstrous system, practical and economic considerations discourage this. What is more likely is an interface among the various systems - HVAC, lighting, fire, AND security - enabling essential communications.

Owners resist putting all their eggs in one basket. For some selfish reason, they want competitive bids from a number of qualified suppliers. Having everything wrapped up in a single integrated package could limit competition to extremely few bidders.

Since 1987, the American Society of Heating, Refrigerating and Airconditioning Engineers (ASHRAE) has worked on the development of an open data communications protocol called BACnet. This protocol enables control systems from multiple, competing manufacturers to communicate or "interoperate" with one another. In 1995, BACnet was formally adopted as ASHRAE/ANSI Standard 135-1995.

Strategies used by facilities management systems to reduce energy consumption in intelligent buildings include:

- Programmed start/stop
- Optimal start/stop
- Duty cycling
- Setpoint reset
- Electric demand limiting
- Adaptive control
- Chiller optimization
- Boiler optimization
- Optimal energy sourcing

Example of energy saving by using appropriate sensors and smart control algorithm shall be achieved through the following:

- Dim circuits
- Switching off lights when rooms are not occupied
- Switching off when not in use e.g. bathroom lights

- Setting back temperature and fan speed when room is not occupied
- Maintainance room temperature and air circulation so as not to cause staleness and condensation to furnishings and furniture

Intelligence with respect to lifesafety in an intelligent building consists of the use of high technology to maximize the performance of fire alarm and security systems while at the same time minimizing costs. Lifesafety factors involved in intelligent buildings include:

- reducing manpower dependence
- closing-circuit television
- card access control
- smoking detection
- intrusion alarms
- emergency control of elevators, HVAC systems, doors and
- Uninterruptible power supplies.

4.INFORMATION SYSTEMS

Information systems include telecommunications and workplace automation.

Intelligence with respect to telecommunications in an intelligent building consists of the offering to tenants of many sophisticated telecom features at a considerably reduced cost due to the fact that the equipment is shared by many users. Some of the telecom features involved in intelligent buildings are:

- Private telephone exchange systems
- Cablevision
- Audio-visual and video-conferencing
- Satellite communications and
- Electronic mail, Intranets and Internet access

5.SYSTEM INFRASTRUCTURE

The smart building infrastructure shall be supported and integrated with the following services:

- Multi-service Network (Infrastructure Cabling, Data, Voice – Telephony, Communications, Wireless and Video)
- Data (Networks – LAN – WAN – Internet – Intranet)

- Voice (Telephony – Communication – Remote connections)
- Building Management System (BMS)
- Integration with Safety and Fire Services
- Security (Surveillance)
- Access Control
- Audio-Visual
- Other Services: TV System – Public Address – central Clock
- Entertainment and promotional Services
- Financial and IT services for tenants including Payment gateway for M-commerce services
- On-line and real time integration with governmental services

6.SUMMARY

To summarize the above those are the smart building services which are needed before and after the construction

1. Services prior to the completion of the construction process:
 - Cabling.
 - Networking (wired/wireless).
 - Smart Building Solutions (CCTV, remote access, security, fire detection, management system, car park control, alarms, etc).
 - PBX with regular or IP telephony.

2. Services after the completion of the construction process:
 - Wi-Fi Internet, DSL Internet and Dial up Internet.
 - Hotspots Internet (Payable) for commercial venues such as Cafes, restaurants, Shopping Malls, Resorts, etc.
 - Hotspot Billing Management Systems.
 - Wireless Phones for the wireless enabled locations.
 - Outdoor links based on different technologies (Microwave, FSO, Wi-Max).
 - Full Multimedia and Digital Home Solution for Individual's or Hotel's usage.

7.SCENARIO

By having one convergent network the system integration can be viewed in different scenario:

- If the tenant forgets to switch the light, personal computer, telephone...etc. by just getting out from the building by access card the automation system will shutdown all electrical DB for power save.