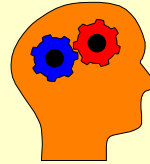


MECH3023: Building Energy Management & Control Systems

<http://www.hku.hk/bse/mech3023/>



Intelligent Buildings



Dr. Sam C M Hui

Department of Mechanical Engineering

The University of Hong Kong

E-mail: cmhui@hku.hk

Contents



- Defining Intelligent Building
- Components of an Intelligent Building
- IB @ Work
- IB @ Home

Defining Intelligent Building



- Intelligent building (IB)
 - First coined in USA in early 1980s
 - Its definition/model is evolving
 - Automated buildings (1981-85)
 - Responsive buildings (1986-91)
 - Effective buildings (1992-)
 - Development of IB
 - Closely linked with computers and information technology (IT); high-tech related
 - But, IB ≠ high-tech building

智慧型大廈
智能建築

Defining Intelligent Building

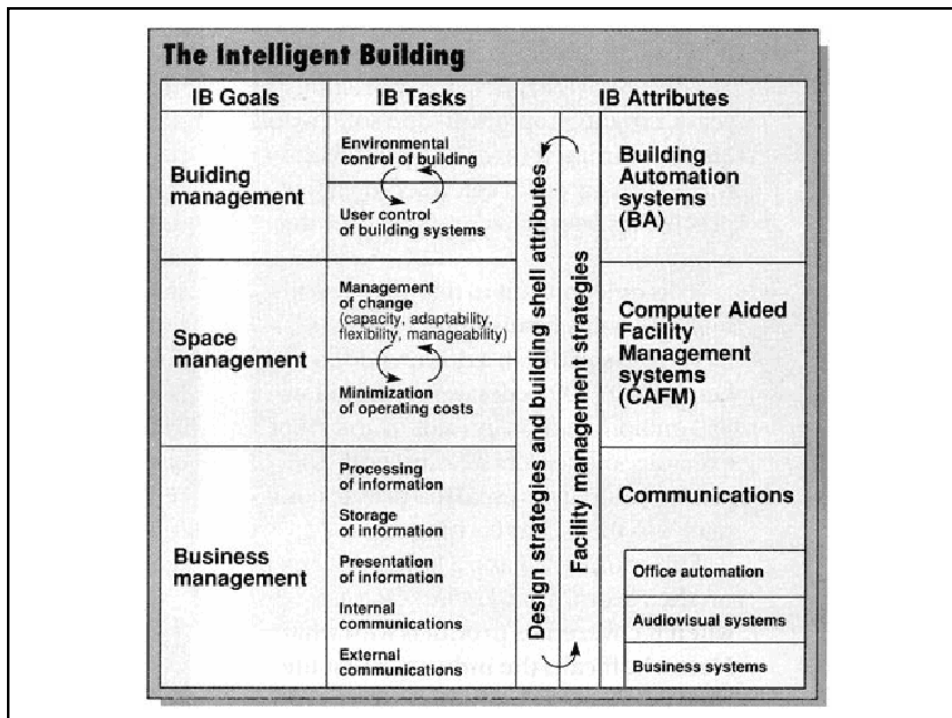


- IB in Europe study (early 1990s)
 - IB “... provides a responsive, effective and supportive intelligent environment within which the organization can achieve its business objectives.” -- DEGW (1992)
- 3 main goals:
 - Building management
 - Space management
 - Business management

Defining Intelligent Building



- Building management:
 - Building automation and the physical environment
- Space management:
 - Building's internal space & operating costs
 - Capabilities & flexibility of the building to accommodate changes, personal moves & connectivity
- Business management
 - Management of the organization's core business

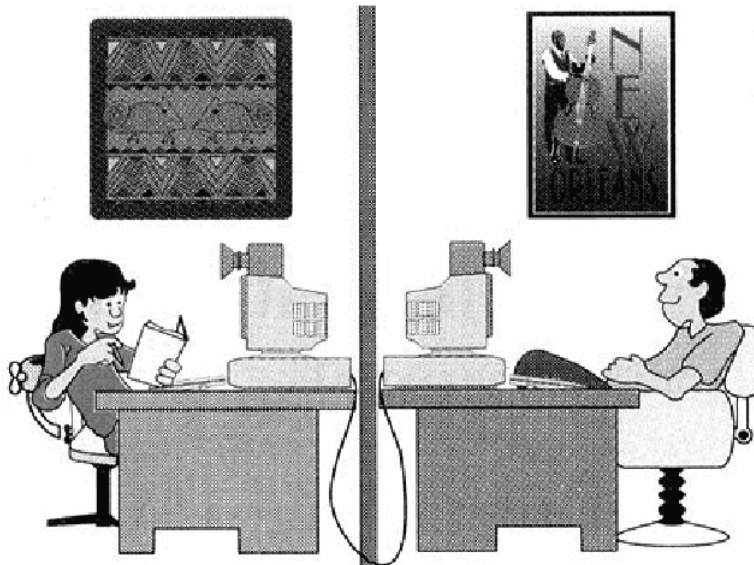


Defining Intelligent Building



- Major IB features
 - Automatic reactions (adjust internal conditions)
 - Effective communication & IT management
 - Responsiveness to changes
- Integrated pyramid
 - Single function/dedicated systems
 - Multifunctional systems
 - Integrated systems
 - Computer integrated building

Effective Communication ?



Defining Intelligent Building



- “An intelligent building is one that doesn't make the occupants look stupid.”
 - Maximizes the *efficiency* of its occupants and allows *effective management* of resource with minimum life costs
 - More *responsive* to user needs and has the ability to *adapt* to new technology or changes in the organizational structures

Components of an IB



- Integration of various building systems
 - Energy management system
 - Lighting management system
 - Security systems & fire safety
 - Telecommunications & office automation
 - Local area networks (LANs)
 - Cabling management
 - Intelligent maintenance mgt. system (IMMS)
 - Computer aided facility management (CAFM)

Components of an IB



- Four main aspects:
 - **Facility management**
 - Take care & maintain various functions for occupant comfort & operation
 - **Information management**
 - Office automation (OA), LAN, wiring
 - **Communication**
 - Tel/Fax, e-mail, video telecommunication
 - **Control**
 - DDC, building automation system

Components of an IB



- Major categories:
 - **Energy efficiency**
 - Energy management and control
 - **Lifesafety systems**
 - Fire alarm and security
 - **Telecommunications systems**
 - PABX telephone, videotext, cablevision, e-mail
 - **Workplace automation**
 - Data processing, word processing, CAD, information services

Components of an IB



- Common needs of intelligent building tenants:
 - Built-in Internet wiring
 - LAN/WAN connectivity
 - Conduits for cabling
 - High-tech HVAC
 - Wiring for high-speed networks

Components of an IB



- Critical performance qualities
 - Functional or spatial quality
 - Thermal quality
 - Air quality
 - Aural quality
 - Visual quality
 - Building integrity

IB @ Work



- Office space and commercial buildings
 - Speculative offices (USA or European)
 - Organizational/functional requirements
 - Impact of IT and business strategy
- Objectives
 - Responsive (to user needs / to climate)
 - Efficient (building design & systems)
 - Effective (operation & management)
 - Better integration (with IT & within systems)

IB @ Work



- Current and future development
 - New ways of working
 - More interaction
 - More collaboration (physically or electronically)
 - More individual autonomy
 - New patterns of space use
 - More group spaces
 - More shared spaces
 - More space for concentration
 - More intermittent space use

IB @ Work



- Major systems
 - Building automation system (BAS)
 - Office automation system (OAS)
 - Communication automation system (CAS)
- Criteria
 - Business value/benefits
 - Efficiency
 - Effectiveness

IB @ Work



- Examples in Hong Kong (see notes)
 - Citibank Plaza (1992)
 - Hongkong Telecom (PCCW), Quarry Bay (1995)
- Major areas
 - Site
 - Shell
 - Building skin
 - Services
 - IT infrastructure



Future office spaces

IB @ Home



- Present technology
 - Phones and intercoms
 - Home automation
 - Audio distribution (e.g. hi-fi speaker)
 - Video distribution (e.g. TV)
 - Video surveillance (e.g. security)
 - Structured wiring
 - Home theater, game station



IB @ Home



- Future home
 - Home networking
 - Internet appliances
 - Webcam, web phones
 - e-books, video walls
 - Home office
 - Virtual clinic/hospital
 -



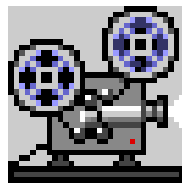
Surf the web without wires!

INTEGER = Intelligent + Green
<http://www.integer.com.hk/>

The screenshot shows the homepage of the INTEGER website. At the top, there is a navigation menu with links for 'INTEGER', 'PAVILION', 'FUTURE', 'EDUCATION', 'RESEARCH', and 'MEDIA ROOM'. On the left side, there are links for 'What's New?', 'Live at Pavilion', and 'Online Survey'. The main content area features a 3D rendering of the INTEGER Hong Kong Pavilion, a large circular structure with a central tower. A speech bubble above the pavilion says 'Tickets available'. Below the rendering, there is a 'Welcome to INTEGER' section with a brief description: 'The INTEGER Hong Kong Pavilion, situated on the Tamar site in the heart of Hong Kong Island, is an exhibition demonstrating how intelligent and green technologies can deliver better value and performance in housing. Its main themes are innovation in construction, technology and environmental performance.' At the bottom left, there are four icons representing different concepts of INTEGER: a lightbulb, a leaf, a gear, and a person. The text '4 CONCEPTS of INTEGER' is displayed next to these icons.



House_n: MIT Home of the Future
(http://architecture.mit.edu/house_n/)



Video Presentation:
“Modern Offices are ...”