Smart building management systems

Tuomas Koskenranta
Agenda

1. Customer needs and enablers
2. Viewpoint of information management
3. Current process, separate building management systems
4. Electronic process, integrated building management systems
5. Financial impact
1. Customer needs and enablers
Optimal surroundings at home.
Superior indoor comfort, ultimate security and significant energy savings:
Control of building technology based on needs and situations.
Customer needs

1. **Optimal surroundings at home.**
   Superior indoor comfort, ultimate security and significant energy savings:
   Control of building technology based on needs and situations.

2. **Easy usage. Reliability.**
   Easy local and remote usage, availability of cost-efficient quality services:
   Easy and secure access to building functionality through Internet.
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3. Easy to buy.
   One stop shopping.
   Complete HVAC solution.
   Easy to understand what you are buying.
   One contract.
The solution

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**Integrated building technology**
Complete HVACE integration using open standards and cost-optimized technologies.
Horizontal integration of all building management systems.
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Secure Internet connection of integrated building technology
Efficient access rights management: COBA
Value chain stretches to different users and service providers.

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**Networked business ecosystem**
- Mass-customization through product modeling.
- Efficient pull mode process.

**Easy to buy.**
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2. Viewpoint of information management
Business Process Development Principles – Data Management Viewpoint

Old way = prevailing way in building industry

New way = interoperable programs

Project / Draft / Design / Cost calculations / Constructing / Facility Management
3. Current process, separate building management systems
Building management systems form 5-6% of the investment in office buildings.
Today: implementation process of building management systems

**Design**
- ArchiCAD (Architectural design)
- xyz (Simulation tool)
- MagiCAD (HVACE design)

**Implementation**
- Proprietary tools and processes

**Usage and maintenance**
- Facility mgmt application x
- Operation & maintenance manual y

- Manually tailored interface (depending on case, system, manufacturer, etc)
- Several separate systems and user interfaces
- UI(s)
- Control network(s)

**Data format**
- Not available / depends on case
- Data availability: NA / depends on case
- Applications require plenty of manual work

**Design data**
- in electronic format (in best cases only!)

**Implementation data**
- in paper format – if such data even exists
Building management system market: from vertical to horizontal

<table>
<thead>
<tr>
<th>In the past</th>
<th>Building automation</th>
<th>Lighting control</th>
<th>Consumption measurement</th>
<th>Alarm solutions</th>
<th>Access control</th>
<th>Operation &amp; maintenance manual</th>
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<td>Owners and users</td>
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<td>UI software, control servers</td>
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Today’s Separate Facility Management and Security Systems

Proprietary Systems - each having its own, unique user interface

- Hardware based products
- Analogue technology
- Independent system design based on own proprietary center units
- Locally used and managed
- Proprietary cabling/networks to each system
- Fragmented value chain
Systems today: no integration
4. Electronic process, integrated building management systems
The smooth, electronical process

**Design**
- Standard tools (IFC definition)
  - Architectural design (ArchiCAD)
  - HVACE design (MagiCAD)
  - Simulation (IDA ICE)

**Implementation**
- Project Creation Tool (PCT)
  - XML definition

**Usage and maintenance**
- Applications use the standard interface
  - Facility management applications
  - Maintenance manuals
  - User interface applications
  - ...

Feedback to design and simulation
Design and simulation data to applications

*Design data in standard electronical format*
*Implementation data in standard electronical format*
*Dynamically updating data available in one place, in standard electronical format*
Building management system market: from vertical to horizontal

### Today

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<td>ISS, ABB, SOL</td>
<td>VTT</td>
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<td><strong>Field bus technologies</strong></td>
<td>Bacnet, Modbus, Dali, EIB, Lon</td>
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<td>LON, M-bus, nn</td>
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<td><strong>Modules</strong></td>
<td>Lonix</td>
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<tr>
<td><strong>Sensors and actuators</strong></td>
<td>Pro dual, Belimo, Releco, Stromfors</td>
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Note! The companies mentioned in the figure are examples only.
Total Facility Management & Security System Service Concept

One common graphical User Interface

Optimal integration of all systems with standard technologies

Open systems with one common graphical user interface

• Software based products
• Digital technology/common IT trends
• Integrated open system architecture (building management & security)
• Local and remote use & management
• Common cabling, standard networks, TCP/IP, LON
• From devices to services - take care of the whole value chain

In co-operation:

Securitas Systems Oy

Lonix
What if systems were integrated?

- Building maintenance
- Access control
- Fire alarms
- Energy consumption
- Burglar alarms
- Electricity consumption
- Water consumption
- Consumption & benchmarking

Internet
What if systems were integrated?

Trusted local service provider

Building maintenance and security services

Internet
Wrong way

Customer

Selling  Selling  Selling  Selling  Selling  Selling  Selling
Installation  Installation  Installation  Installation  Installation  Installation  Installation

Heating  Ventilation  Cooling  Electricity and lighting  Security  Automation

Totally inefficient, separate processes from 70’s and huge amount of labour work in every step
Shift to pull mode

- Whole package in one
  - Easy to buy
  - Easy to sell

- Automation is an essential and inseparable part of common HVAC-systems
5. Financial impact
Cost of different systems vs. integrated solution in office building, eur

36% REDUCED INVESTMENT

45% REDUCED MAINTENANCE COSTS
Costs of usage and maintenance, €/m²/year

Average annual costs in office buildings 39,50 €/year = 3,3 €/month

(Sources: Rakli, Instakon, Securitas)
# Process

Typical costs (design and implementation = 100):

<table>
<thead>
<tr>
<th>1.1 Needs</th>
<th>1.2 Goals</th>
<th>1.3 Alternatives</th>
<th>1.4 Decisions</th>
<th>2.1 Design preparation</th>
<th>2.2 Design</th>
<th>2.3 Implementation design</th>
<th>2.4 Implementation</th>
<th>2.5 Purchasing maintenance and services</th>
<th>3. Usage and maintenance 50 years</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
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<td>0,1</td>
<td>0,6</td>
<td>8</td>
<td>1</td>
<td>90</td>
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<table>
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<tr>
<th>Cost change-%:</th>
<th>+25%</th>
<th>-5%</th>
<th>-20%</th>
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<tr>
<td>Cost change:</td>
<td>+2</td>
<td>-4,5</td>
<td>-28,2</td>
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=> Savings over life cycle of a single building: 30,7% of design and implementation costs
Preliminary Conclusions

However, to achieve the potential net benefits arising from Virtual Building Environments it is essential to set targets and work towards them.
Impact now

Lice cycle cost, €/m²

Separate sub-optimized building management systems vs. Integrated optimized building management systems, produced through electronic process, with simulations

Note! Does not include basic renovations
Path towards networked homes

1. Integration of building management systems
2. From A/V devices to integrated digital entertainment systems
3. Integration of 1 and 2
4. Household appliances (i.e. white goods) get connected to standard platforms