



**Christopher Groome**  
*buildingSMART*

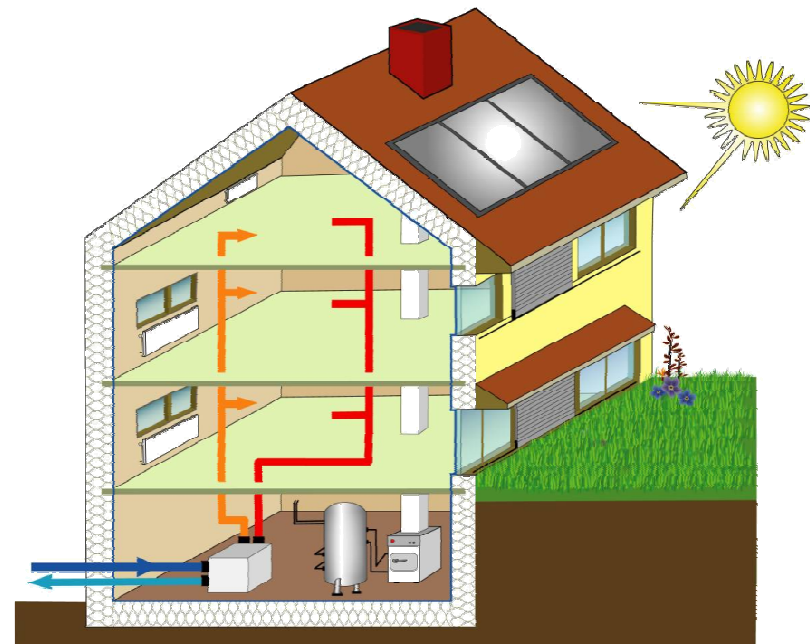
*Evolving towards Integrated  
Project Delivery: Standards*

# CONSTRUCTION: EUROPE'S LARGEST INDUSTRY SECTOR

- *30% of any country's GDP*
- *26 million jobs in the EU*
- *2.5 million firms*
  - ***2.42 million SMEs (97%)***
  - ***2.32 million) SMEs with less than 10 employees (93%)***
  - ***Only 100 companies with more than 2000 employees (0.004%)***
- *Public procurement represents 40% of contracting*

*”Globally, smart building technologies could save 1.68 Gt CO<sub>2</sub>”*  
SMART 2020 Report

- 40% of all emissions
- 40% of material and energy consumption
- 30% of waste production

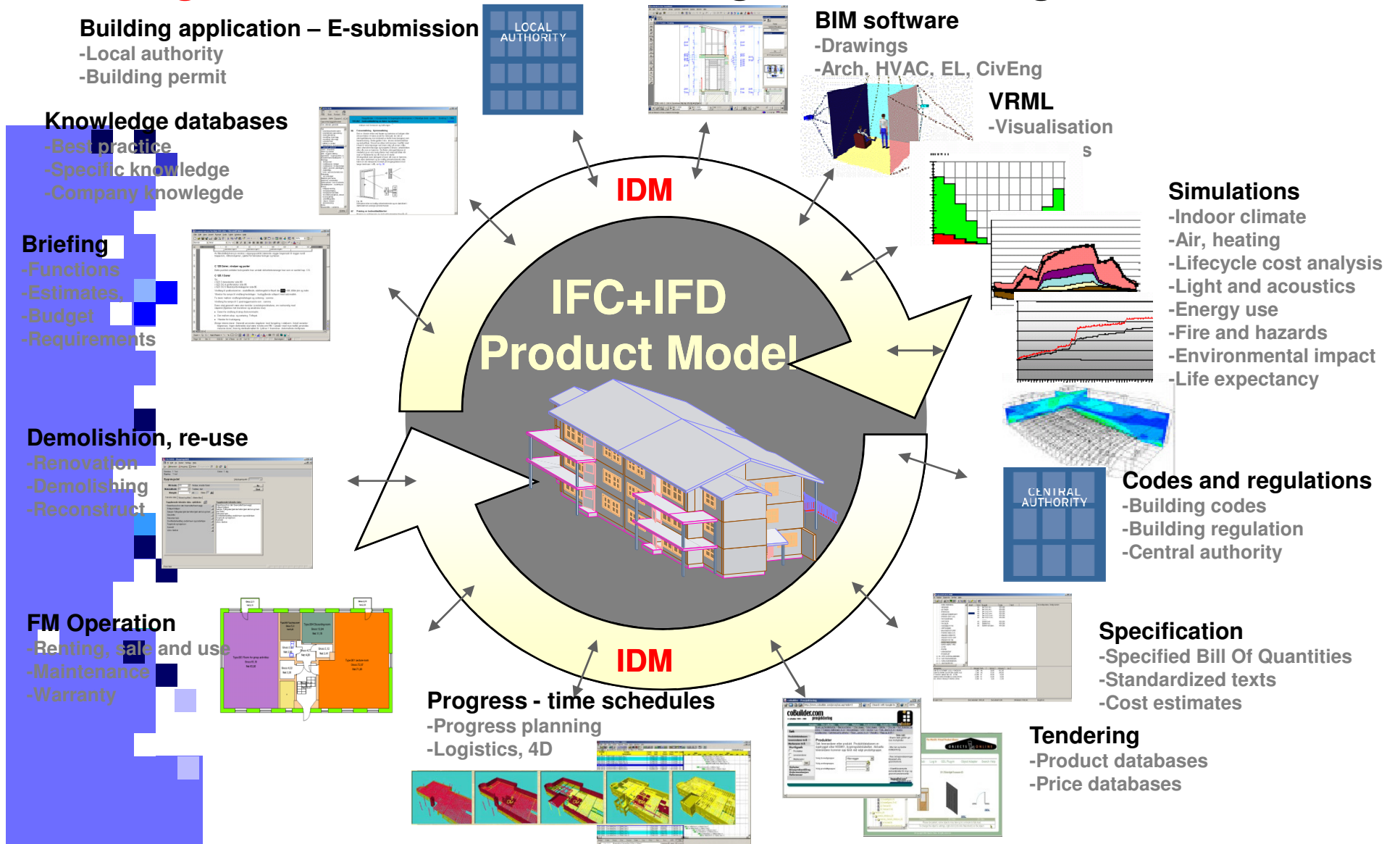


*“If airplanes were built like buildings, you would not fly in them.”*

*Stephen Selkowitz, LBNL*

- Communication errors lead to building damage (5% of investment)
- Process fragmentation and poor communication cause 25%-30% of total construction costs
- Inadequate interoperability costs USD15.8 billion/year (in the US)

# buildingSMART is about exchange and sharing of information



# Acronyms

**BIM** – Building Information Model (Modelling)

**IFC** – Industry Foundation Classes

IFC is an open international ISO standard (ISO/PAS 16739) for exchange of BIM data.

In IFC all objects are traceable with their own “birth-number” – GUID (Global Unique ID)

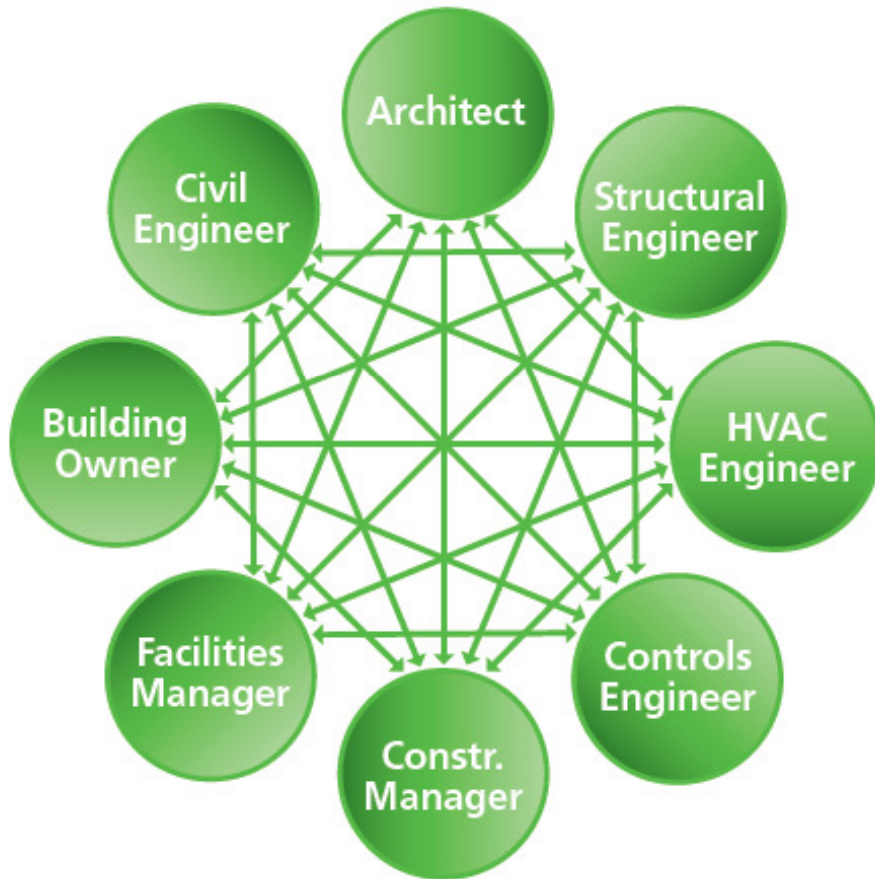
**BSI** - (BuildingSMART International) the not for profit organisation which develops the IFC standard

# Acronyms

**IDM** – Information Delivery Manuals supporting the information exchange requirements for business processes within the building construction industry

**IFD** – International Framework for Dictionaries based on the principles of ISO 12006-3

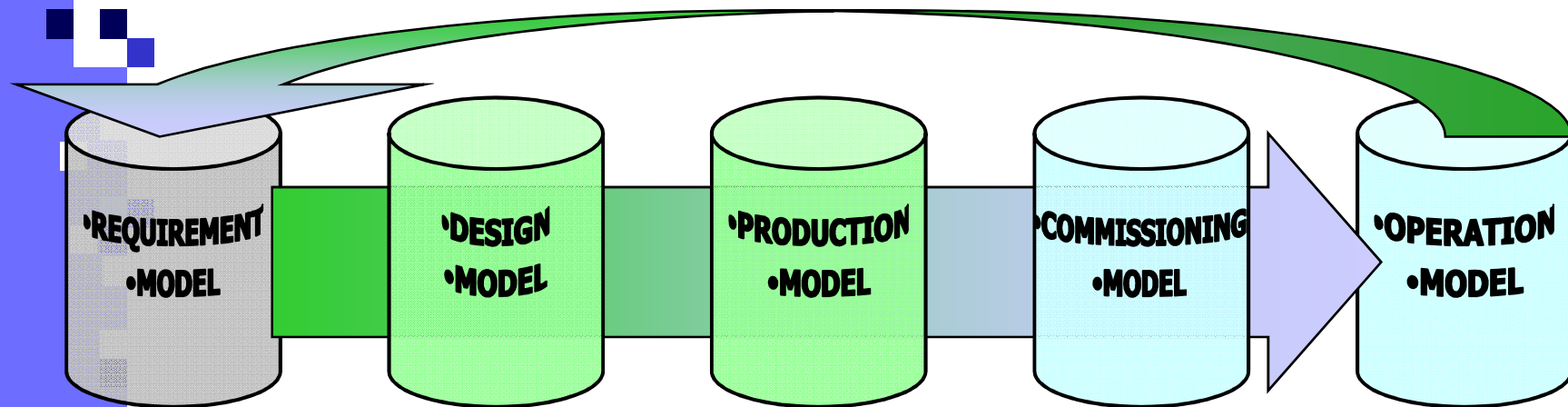
## Fragmented construction process >



## Integrated project working and value-based life cycle management




# SUSTAINABLE CONSTRUCTION AND BUILDING INFORMATION MODELS

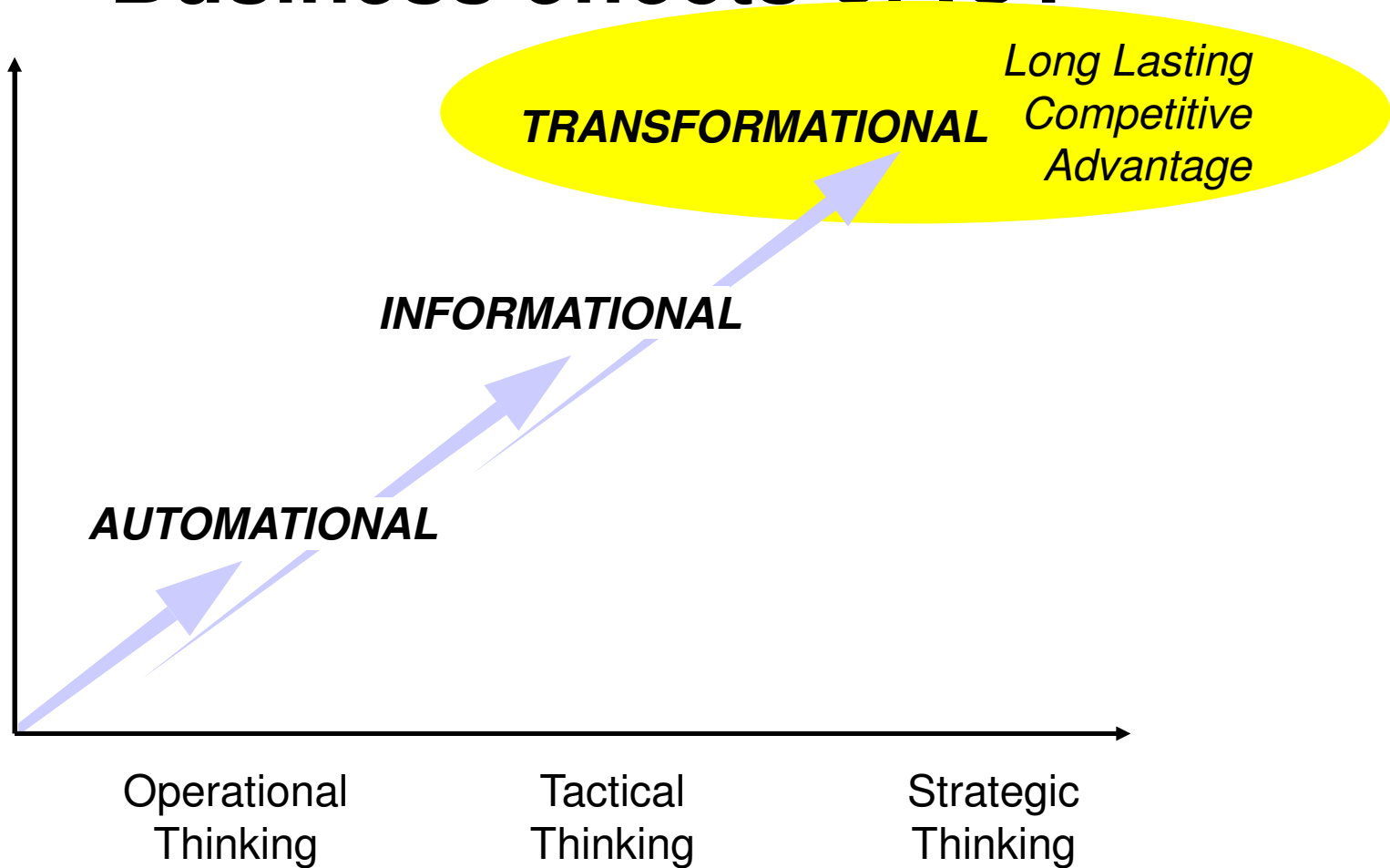
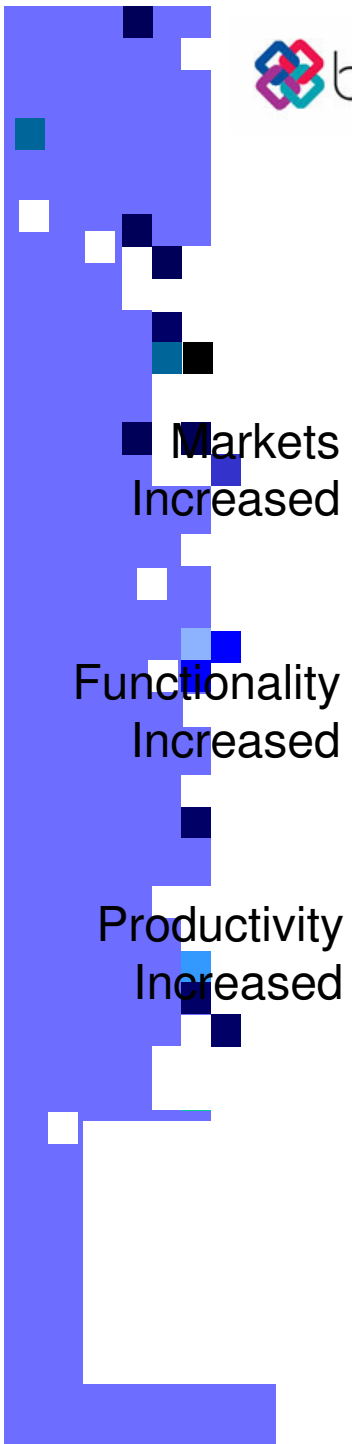


	<b>REQUIRED SUSTAINABILITY</b>	<b>DESIGNED SUSTAINABILITY</b>	<b>CONSTRUCTED SUSTAINABILITY</b>	<b>DELIVERED SUSTAINABILITY</b>	<b>ACHIEVED SUSTAINABILITY</b>
<b>PERF</b>	<ul style="list-style-type: none"> <li>targeted performance in use</li> </ul>	<ul style="list-style-type: none"> <li>designed technical solutions</li> </ul>	<ul style="list-style-type: none"> <li>constructed building</li> </ul>	<ul style="list-style-type: none"> <li>validated conformity</li> </ul>	<ul style="list-style-type: none"> <li>performance in use</li> </ul>
<b>LCA</b>	<ul style="list-style-type: none"> <li>estimated life cycle environmental impacts + social &amp; cultural...</li> </ul>	<ul style="list-style-type: none"> <li>estimated environmental impacts over the life span</li> </ul>	<ul style="list-style-type: none"> <li>construction impacts, estimated impacts in use</li> </ul>	<ul style="list-style-type: none"> <li>estimated environmental impacts in use</li> </ul>	<ul style="list-style-type: none"> <li>environmental impacts in use</li> </ul>
<b>LCC</b>	<ul style="list-style-type: none"> <li>estimated life cycle costs</li> </ul>	<ul style="list-style-type: none"> <li>estimated life cycle costs</li> </ul>	<ul style="list-style-type: none"> <li>construction costs, estimated operation costs</li> </ul>	<ul style="list-style-type: none"> <li>estimated operation costs</li> </ul>	<ul style="list-style-type: none"> <li>operation costs, demolition costs, value of building</li> </ul>

# The journey to integrated working

	Increasing levels of collaboration, process alignment and technical capability		
			
<b>People:</b> team integration	Separate organisations	Co-ordinated project teams	Fully integrated project teams
<b>Process:</b> compatible approaches	Sequential, independent project processes	Co-ordinated project processes	Concurrent project processes
<b>Tools:</b> technical capability	Exchange of paper, 2-D design representation	Simple 3-D design representation	Information-rich object modelling based on open standards

# Business effects of ICT



# The buildingSMART way courtesy Norway

## 3. Business development

- International business development
- National business development

### Activities

- Export of knowledge
- Investigate new business models
- The "Nordic model"

## 2. Implement/deploy buildingSMART

### eCollaboration & eProcurement

- Electronic collaboration
- Product information
- Changes in business processes
- eGovernment

### Activities

- Pilot projects
  - HITOS
  - AHUS
- Pilot groups
- User requirements

## 1. Develop buildingSMART

### Semantic technologies

- IFC-IDM (data model and information exchange requirements)
- IFD (ontology project) International Framework for Dictionaries

### Activities

- Standardisation
  - IAI
  - ISO TC 59/ TC 184
- EU's FP7 programme

## 4 Knowledge based systems

Active and Smart building Knowledge platforms

[www.buildingsmart.no](http://www.buildingsmart.no)



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