

HOCHSCHULE  
KONSTANZ  
UNIVERSITY OF  
APPLIED SCIENCES



# Lake Constance 5D-Conference 2012

## Challenges in design and construction of Buildings & Infrastructure

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BOUYGUES Travaux Publics

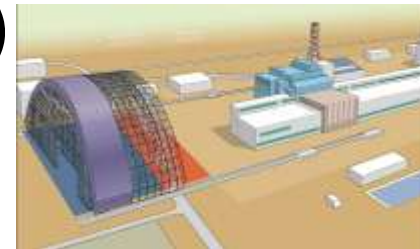


## Challenges in design and construction of Buildings & Infrastructure

### State of the Art



- **Gautrain High speed railways**  
(South Africa / 2.5Bn€ / 54 month)
- **Barwa Towers** (9 towers incl. 5\* hotel)  
(Qatar / 950M€ / 42 month)
- **Chernobyl arch** (steel shelter)  
(Ukraine / 850M€ / 96 month)
- **Flamanville EPR** (Nuclear Power Plant)  
(France / 300M€ / 54 month)



## Challenges in design and construction of Buildings & Infrastructure

### Ambitions beyond 3D

→ Time: 4D

→ Other needs: 5D

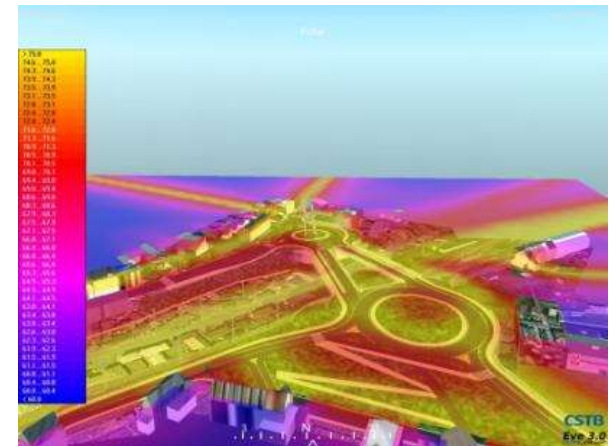
Simulation of bridge erection



Realistic rendering / Vegetation development



Sound / Noise  
Simulation

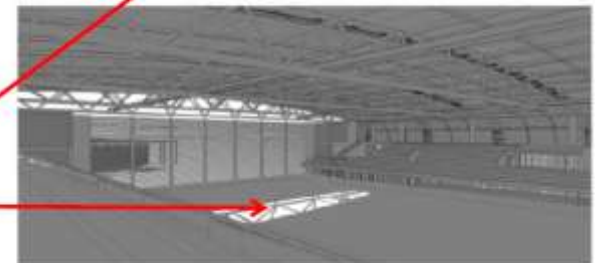
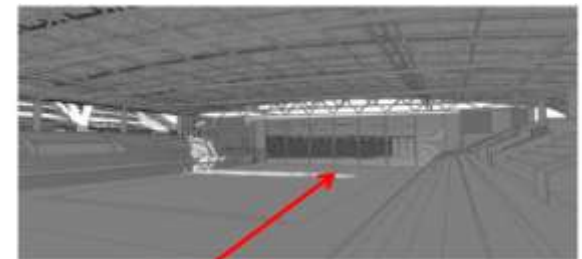
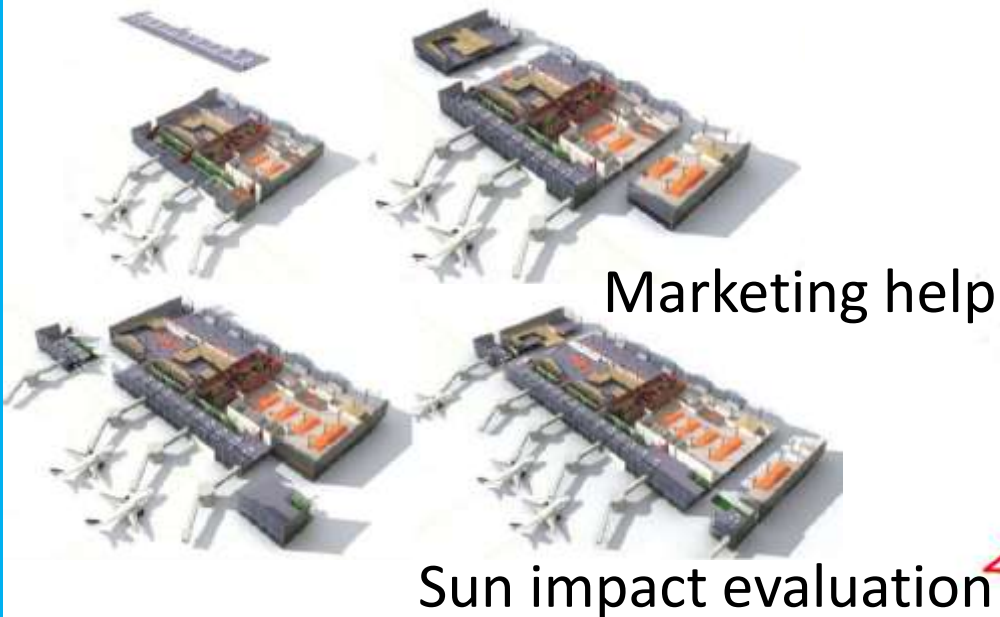


## Challenges in design and construction of Buildings & Infrastructure

### Ambitions beyond 3D

→ Time: 4D

→ Other needs: 5D



## Challenges in design and construction of buildings & Infrastructure

### **“Constructing before building”**

#### **New challenges to cope with ?**

Digital construction

Modelization and Simulations

Software packages integration

Data Management

→ Bouygues Initiatives / Internal R&D Projects



→ European & National Projects contribution

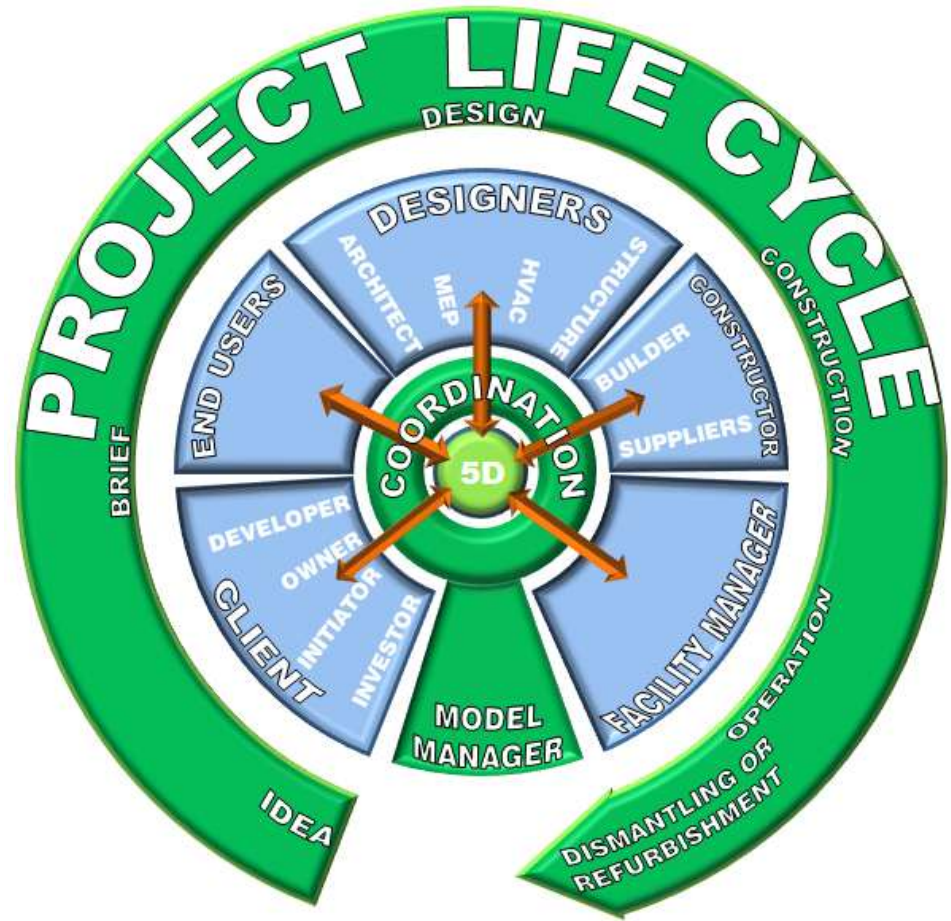




## Challenges in design and construction of buildings & Infrastructure

### The main Goals

- Project Life Cycle
- Data structuring for:
  - Data sustainability
  - No re-keying
  - Quality check
  - No information loss  
(during exchanges)

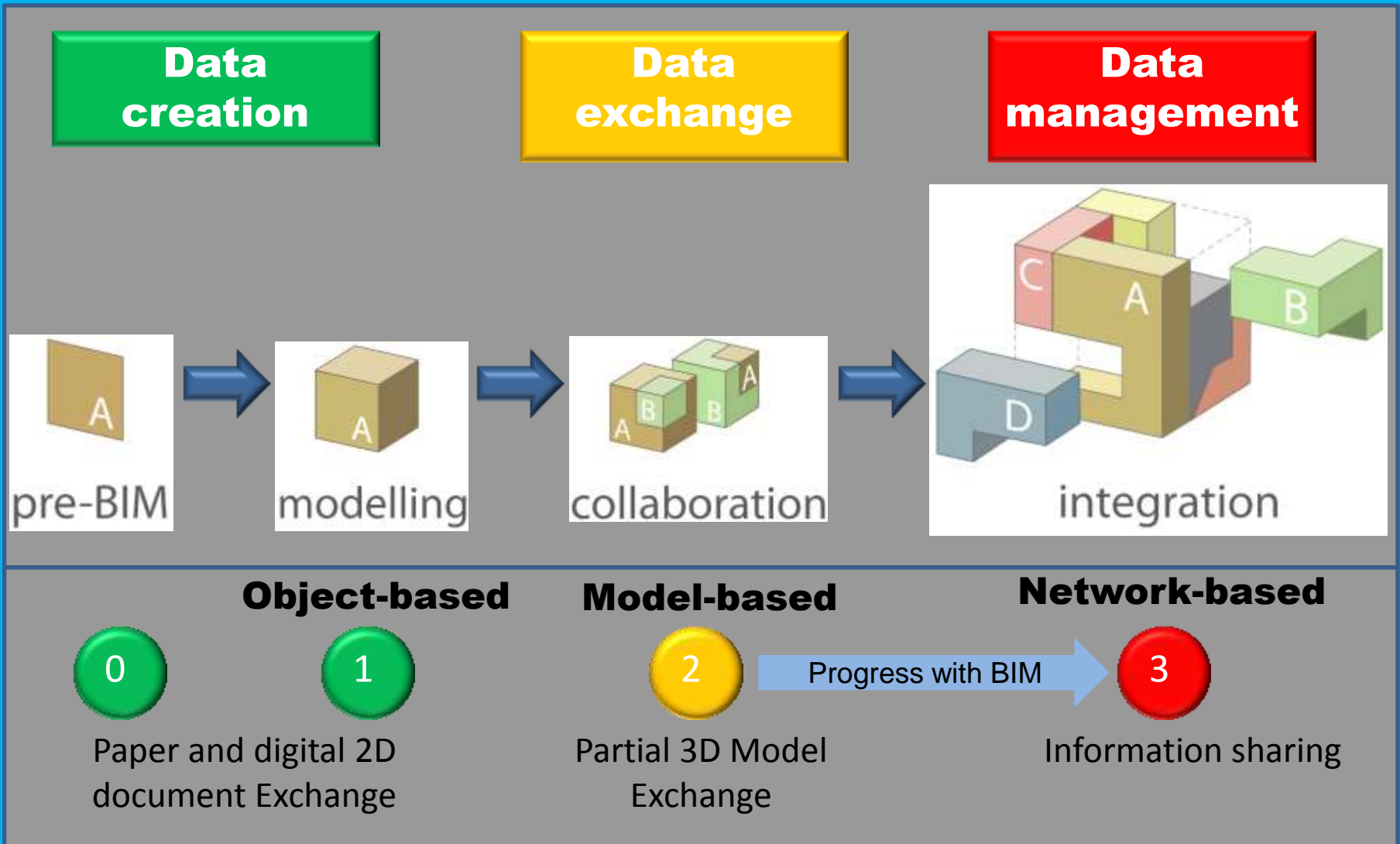


## Challenges in design and construction of buildings & Infrastructure

### **Project evolution**

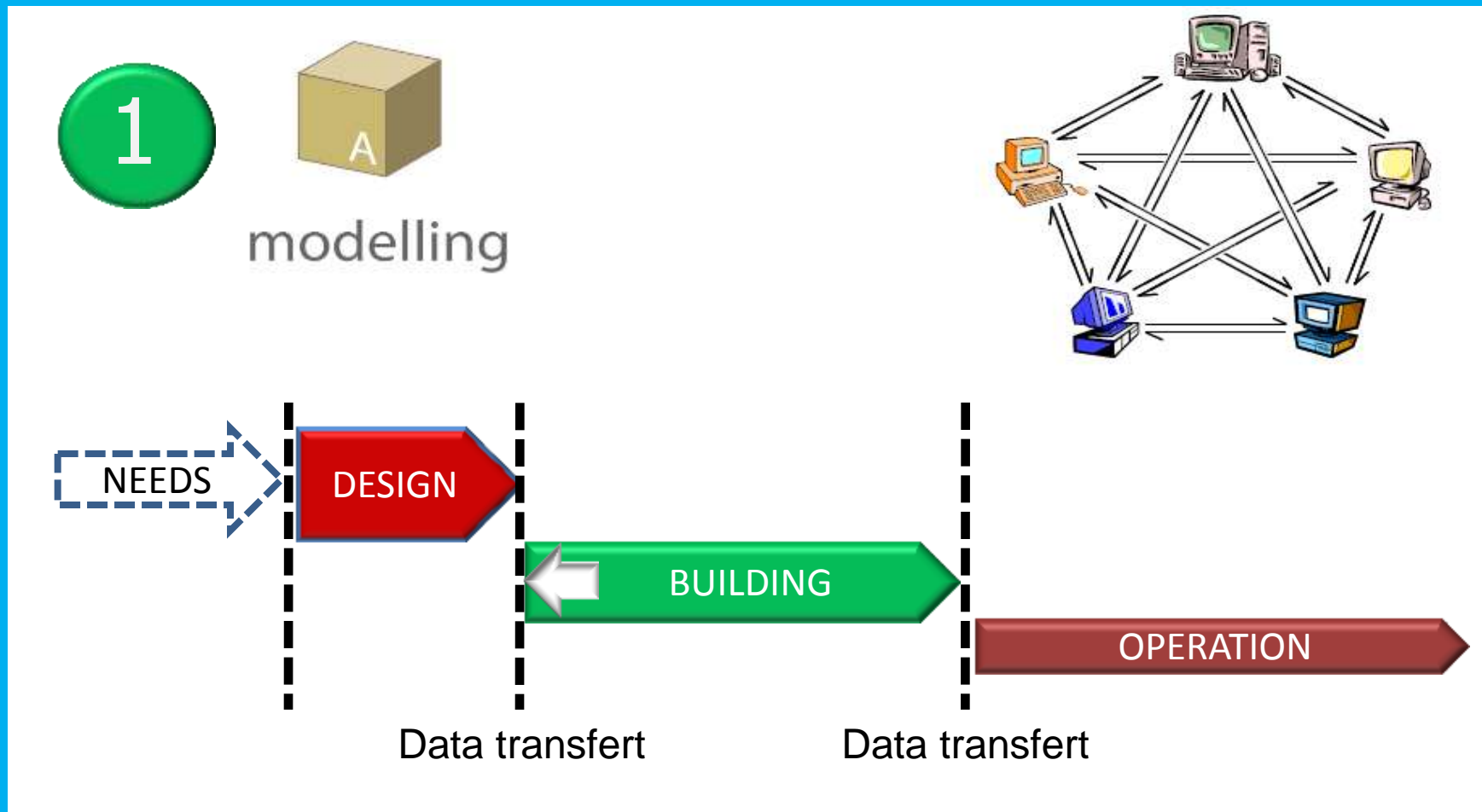
- Public Private Partnership Project (PPP – PFI)
- Increasing Complexity
- Decreasing Completion time
- Overlapping of Design and Construction phases
- Partnership development:
  - Benefits and Risks sharing
  - Extended Company development

 **TRUST improvement**

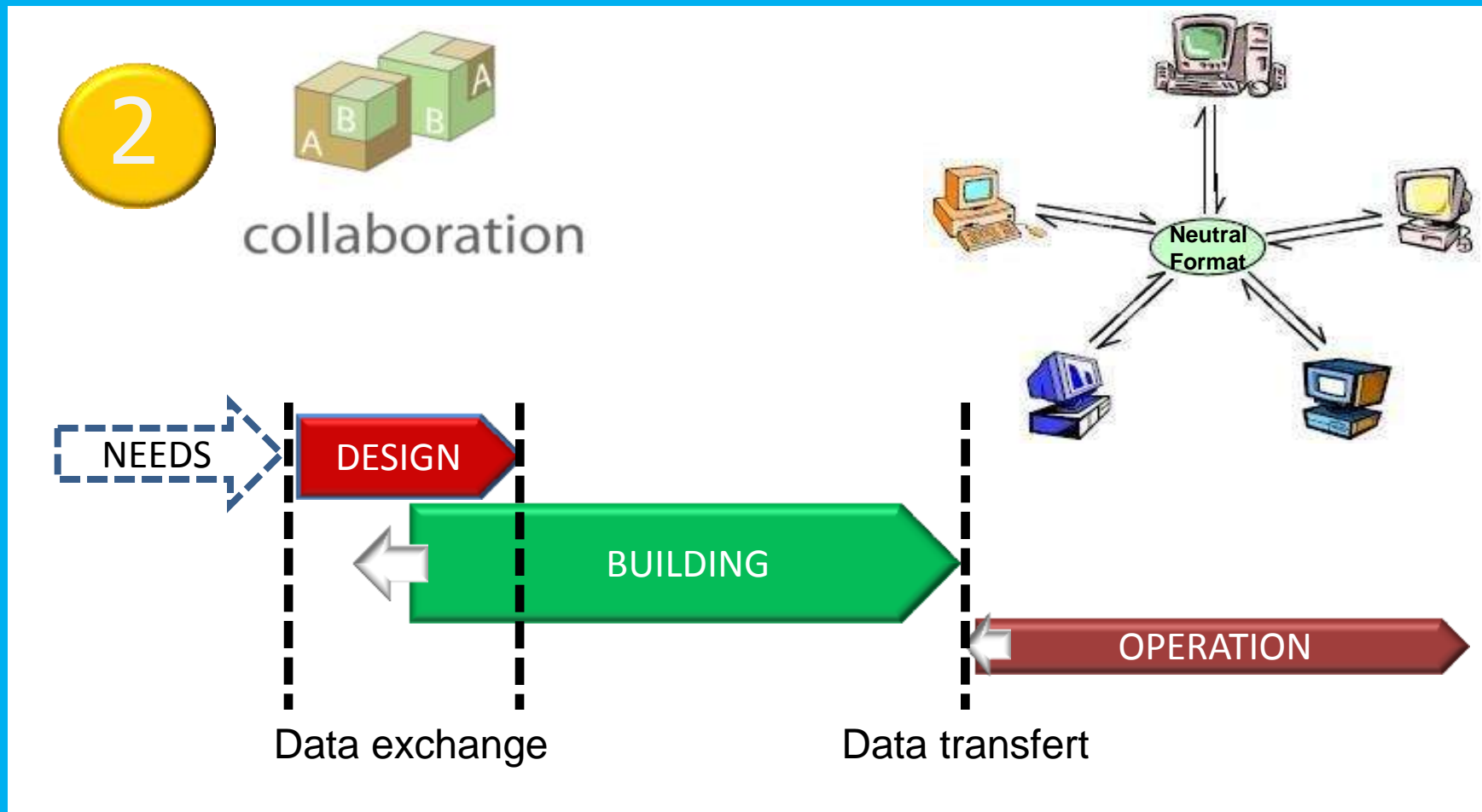




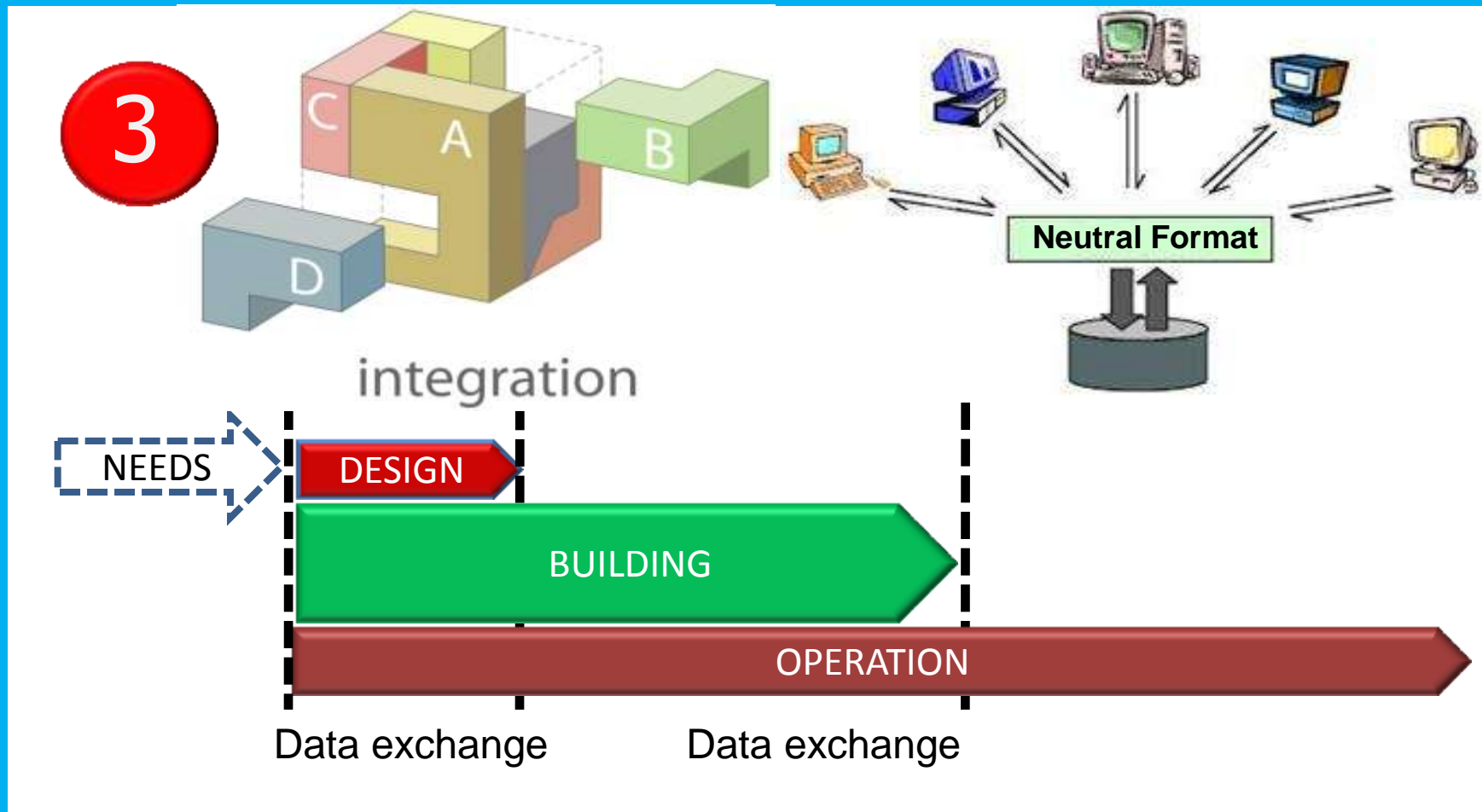
## Challenges in design and construction of buildings & Infrastructure



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### A Paradigm Shift

Files → Objects → Products

Electronic Data Management System

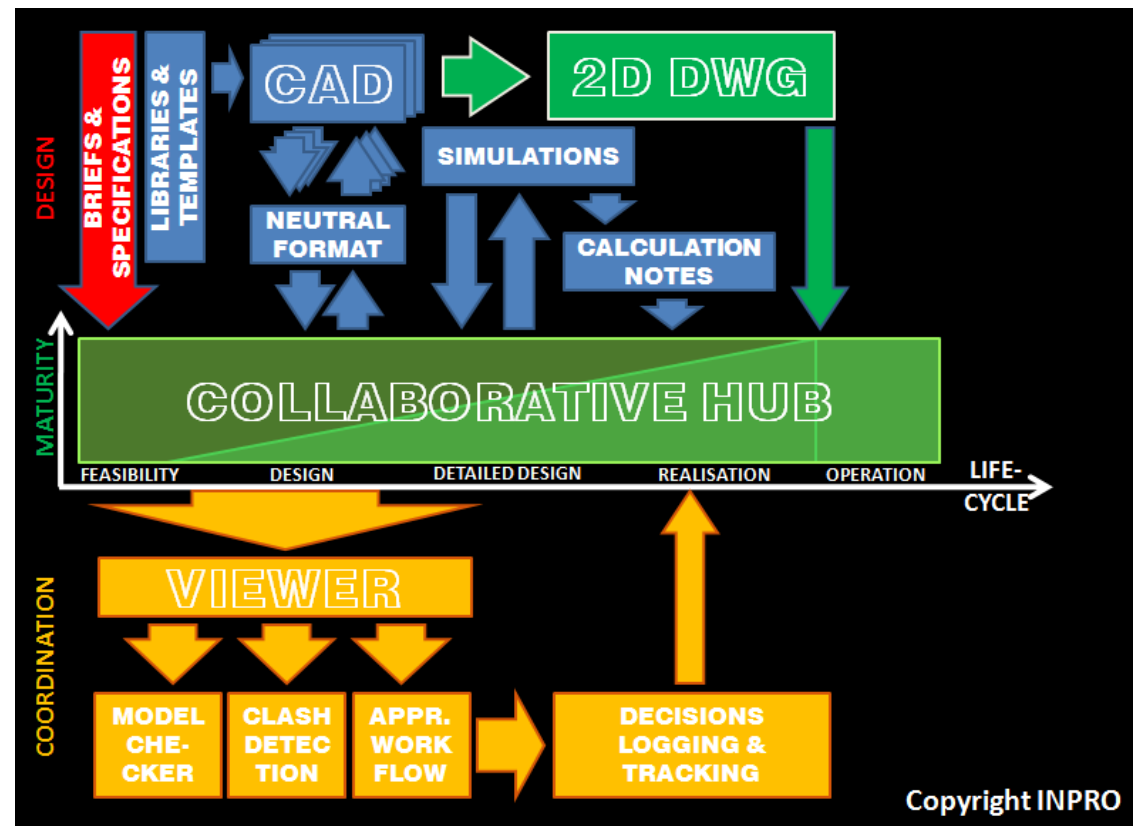
→ Product Lifecycle Management

Exchange platform → Collaboration HUB

## Challenges in design and construction of buildings & Infrastructure

### Architecture of The 5D Model Environment

**Collaboration HUB  
+ Neutral format**



## Challenges in design and construction of buildings & Infrastructure

### Change Management

**Remove bolts at all  
organization levels !**





## Challenges in design and construction of buildings & Infrastructure

### Tools

- Authoring tools
- Viewers
- Model checkers
- Simulation tools / Interoperability
- Storage / Archiving
- Technology



## Challenges in design and construction of buildings & Infrastructure

### Methods

- Training
- Modeling protocol  
& Graphic charts
- Breakdown structures
- Libraries & Families
- Specific developments



## Challenges in design and construction of buildings & Infrastructure

### Processes

#### - Data Management

- Validation
- Drawing generation
- Data Exchange
- Quality check
- Level of project Development

#### - Collaborative work organization

- Change mgmt / Versioning
- Alternative mgmt
- Decision tracking

#### - Legal aspects



## Challenges in design and construction of buildings & Infrastructure

### Organizational Structure

- Know how
- Responsibility
- Client needs
- Project quality
- Training
- Model Manager



## Challenges in design and construction of buildings & Infrastructure

### Corporate Culture

- Contracts
- Partnership
- Commitment
- National Regulation
- International Regulation



## Challenges in design and construction of buildings & Infrastructure

### The BuildingSMART initiatives



- **IFC** for Buildings
  - Success stories
  - Certification
  - Object management (PLCS ?)
- **openINFRA**: data model for Infrastructures
  - Almost a Blank page, but
    - IFC-Bridge & IFC-Tunnels
    - LandXML



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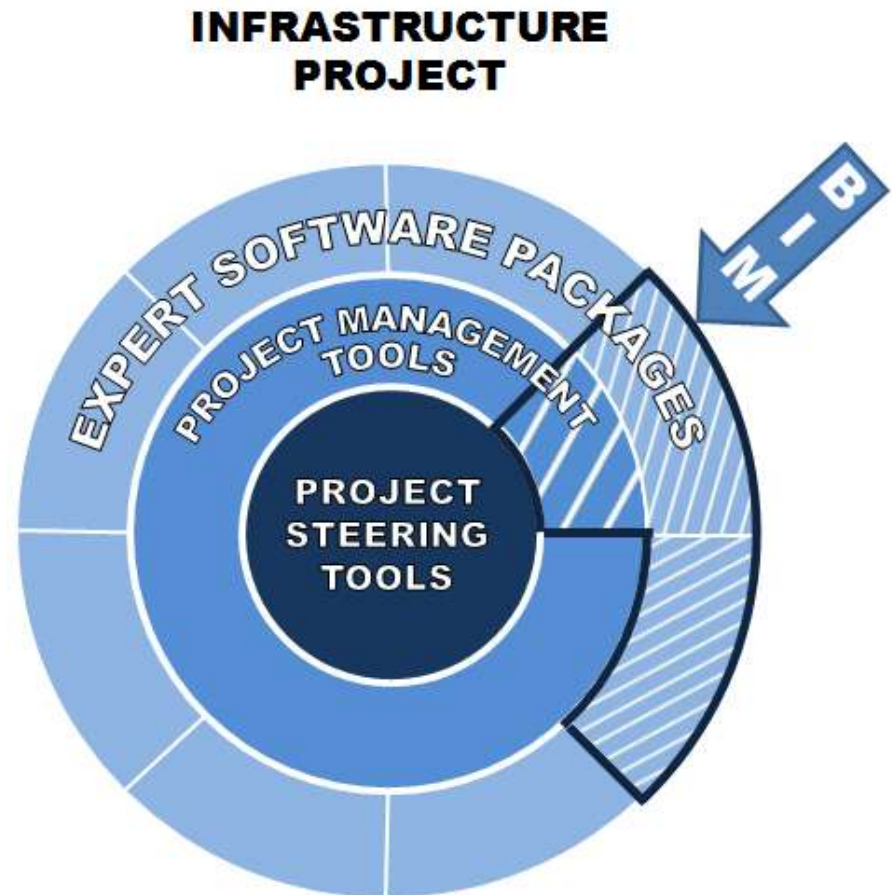
### The openINFRA scope



Comparison between the scope covered by BIM using IFC and the scope to be covered by openINFRA

The full circles represents the building and civil works scope.

Under dash lines, the scope covered by BIM with IFC.



## Challenges in design and construction of buildings & Infrastructure

### Initiatives linked to openINFRA



- IFC-bridge and IFC-tunnel:
  - Real experimentation
  - Software integration
- Inspire: European regulation
  - Ready to be applied for new projects
  - All geographical domains including
    - Transport networks
    - Lands ownership



## Challenges in design and construction of buildings & Infrastructure

### **GIS Evolution**

- Need for Environment (sustainable design)
  - Infrastructures (in or outside Towns)
  - Buildings (Networks, supplies, impacts...)
- 2D Data management & 3D Geodesign
- Simulation tools (Alternatives, planning schedule...)

## Challenges in design and construction of buildings & Infrastructure

### **Conclusions /**

#### **Greatest challenges of the construction sectors**

- Collaborative works implementation
- Neutral format definition
- GIS evolution
- Regulation adaptation
- Trust improvement

## Challenges in design and construction of buildings & Infrastructure

### Next steps

- Not wait
- Look at Industry sector
- Experimentations / POC
- Lobbying of Software editors
- Lobbying of Governments
- Research and Development projects:  
at National, European, International levels

