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CITA Centre for Information Technology and Architecture

A Domain-driven Approach to Digital Curation and Preservation of 3D Architectural Data

- Stakeholder Identification and Alignment in the DURAARK project -

Archiving 2014
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Brief introduction to DURAARK

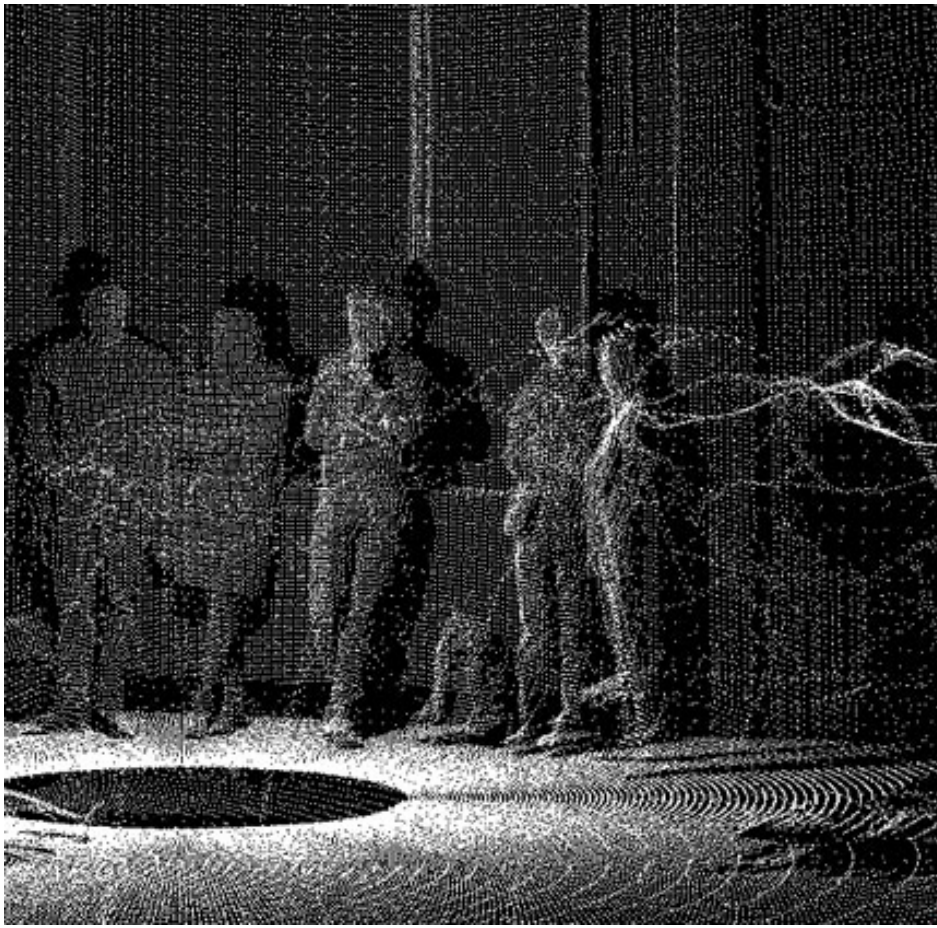
- to 3D scans
- to BIM

Stakeholder Identification

- why?
- different models used
- results for 6 stakeholder
- the „stakeholder preservation“

Use Cases

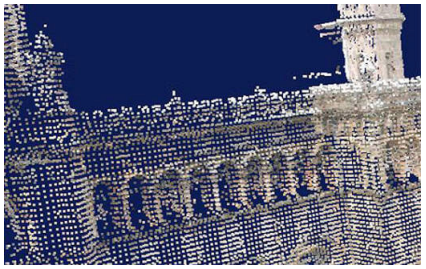
Outlook



DURAARK (DURAble Architectural Knowledge)
FP7 – ICT – Digital Preservation (STReP)
February 2013 – January 2016

Goal

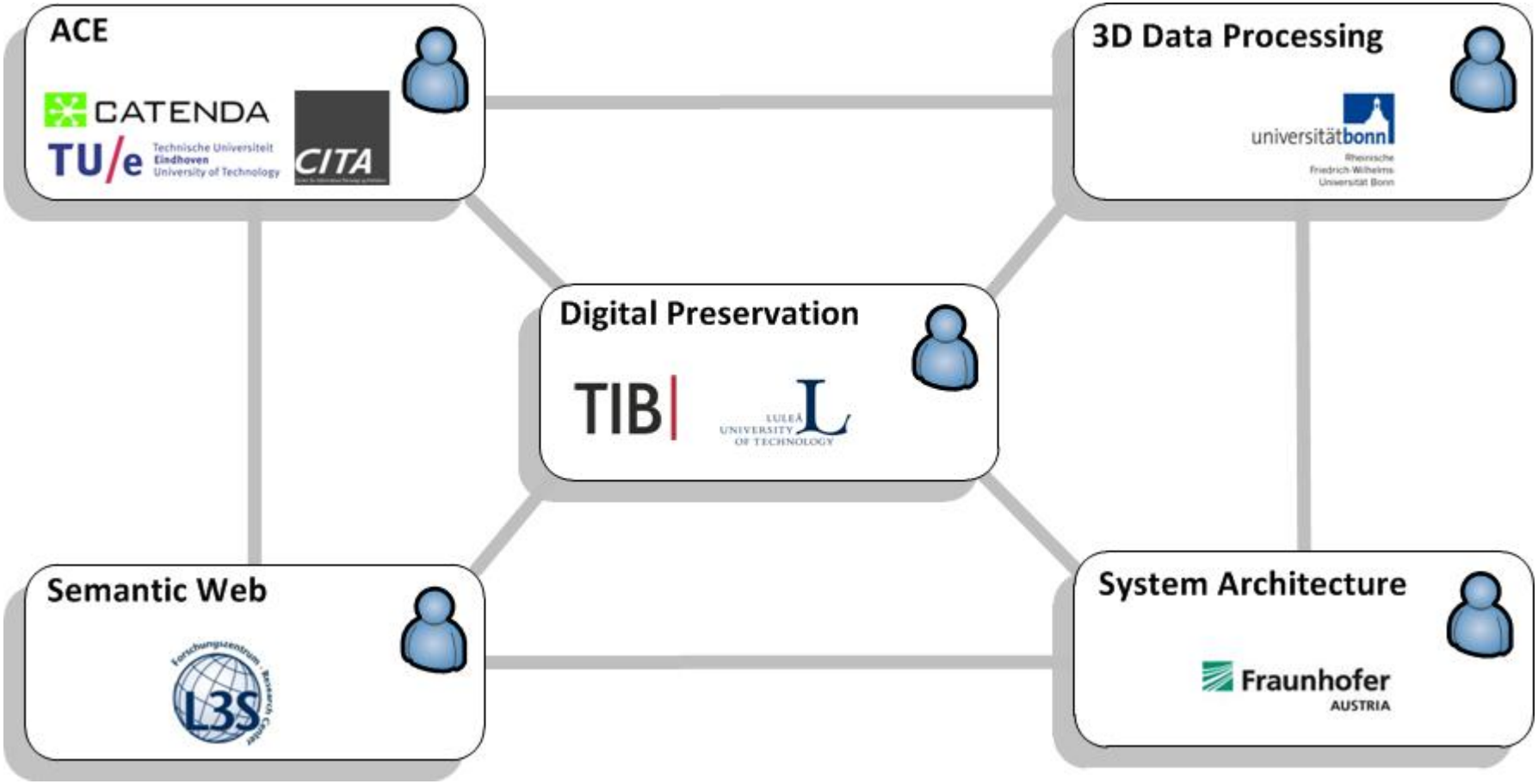
Develop methods and tools for **digital preservation** and **curation** of **3D building data**, metadata, related knowledge & web data)



Scope

- interlinked curation and preservation workflows
- focus on two open file formats: IFC and E57
- incorporate existing OAIS compliant digital preservation system

(a) 3D model. (b) Example laser scan.



DURAARK – an interdisciplinary project

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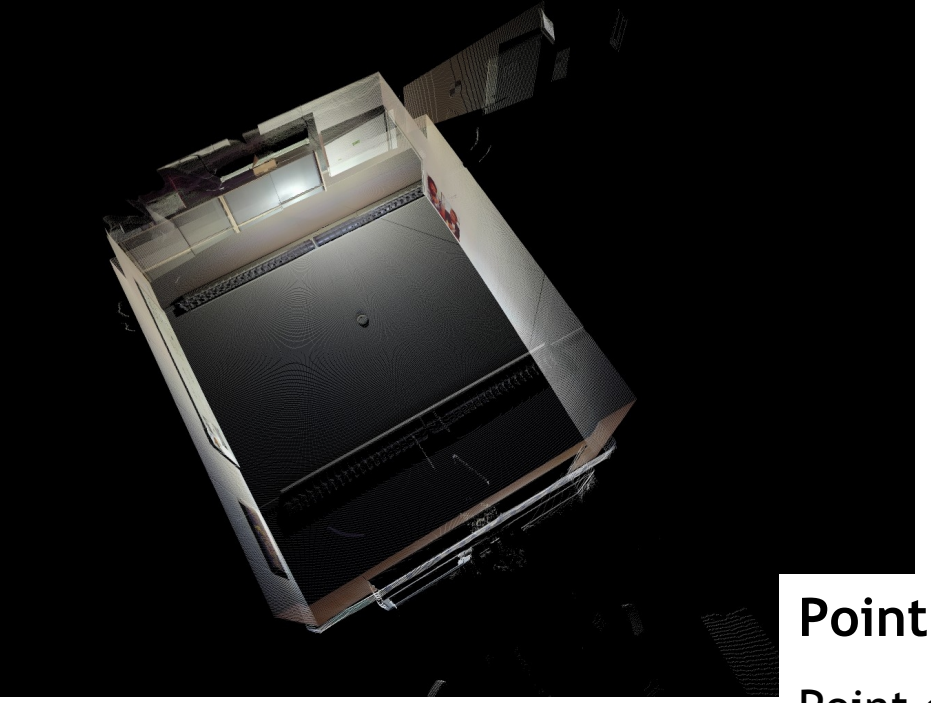
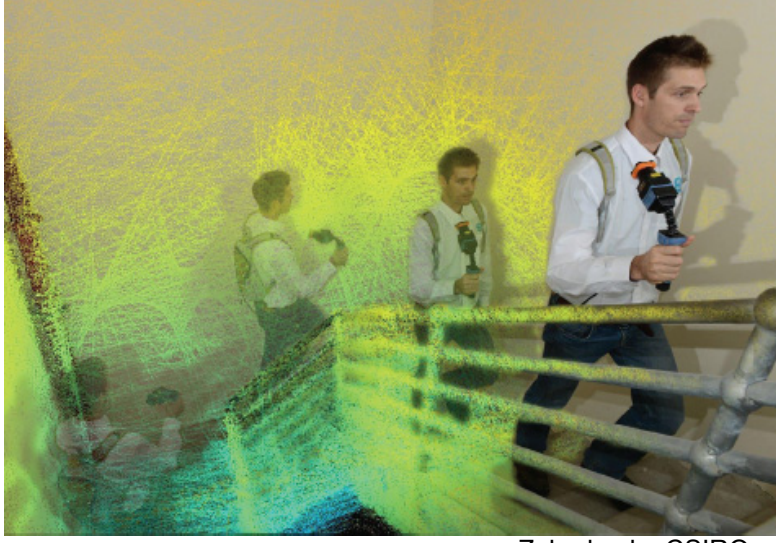




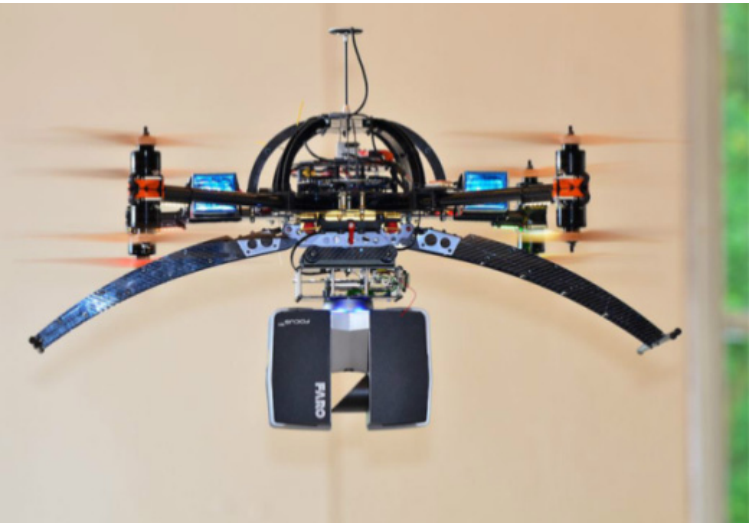
Zebedee by CSIRO

Point clouds

Point clouds are a set of points in a 3D (X, Y, Z) coordinate system which describe the external surfaces of a scanned object.

While other domains may use post-processed NURBS models or 2D slices as the 3D scan reconstruction, the architectural and construction domains work directly with point clouds.

E57 – ASTM E2907-11 Standard



ScanCoptor by FaroLabs

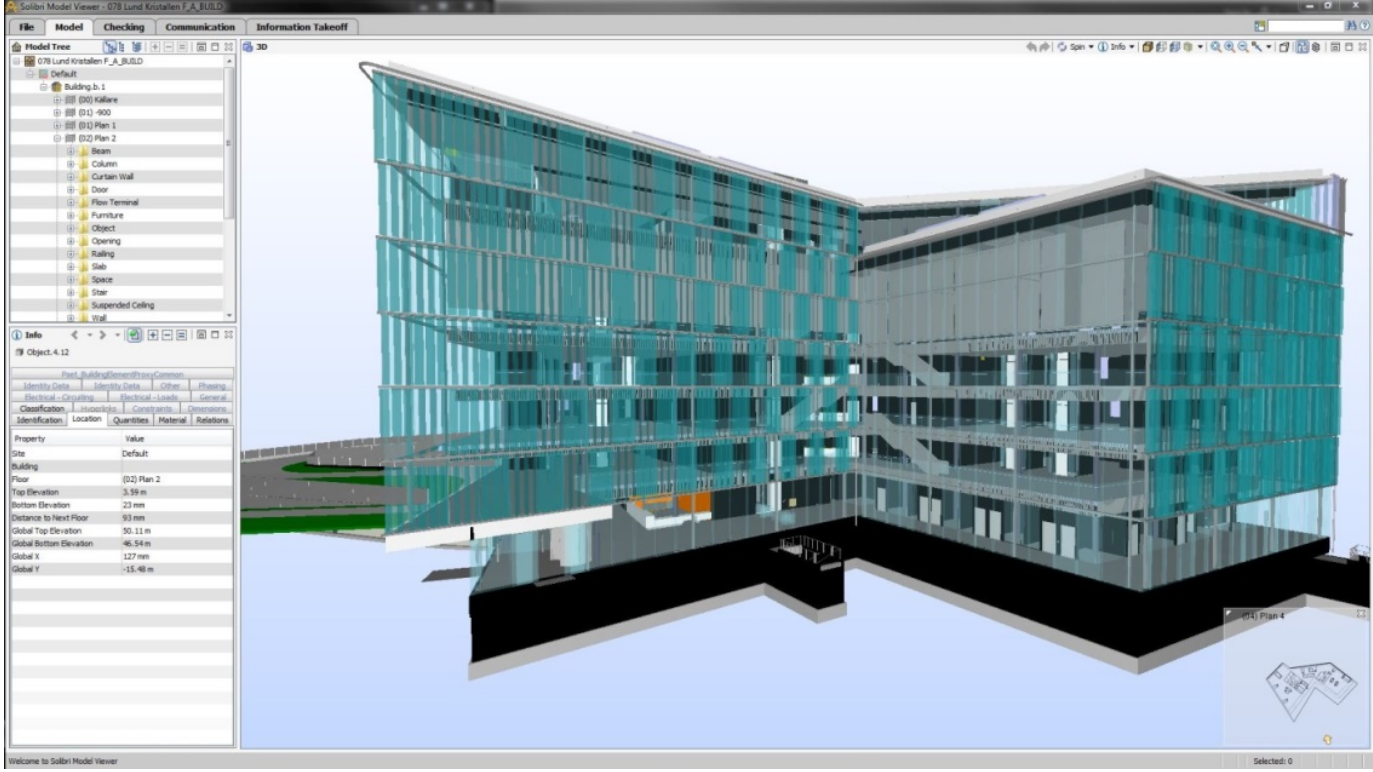
3D CAD
Geometry along X-Y-Z axes

4D CAD
Schedule time

5D CAD
Cost-related information

6D CAD
Energy and sustainability

7D CAD
Facility management



Lund Cristallen by DURAARK partner CCO architects

Building Information Modelling (BIM)

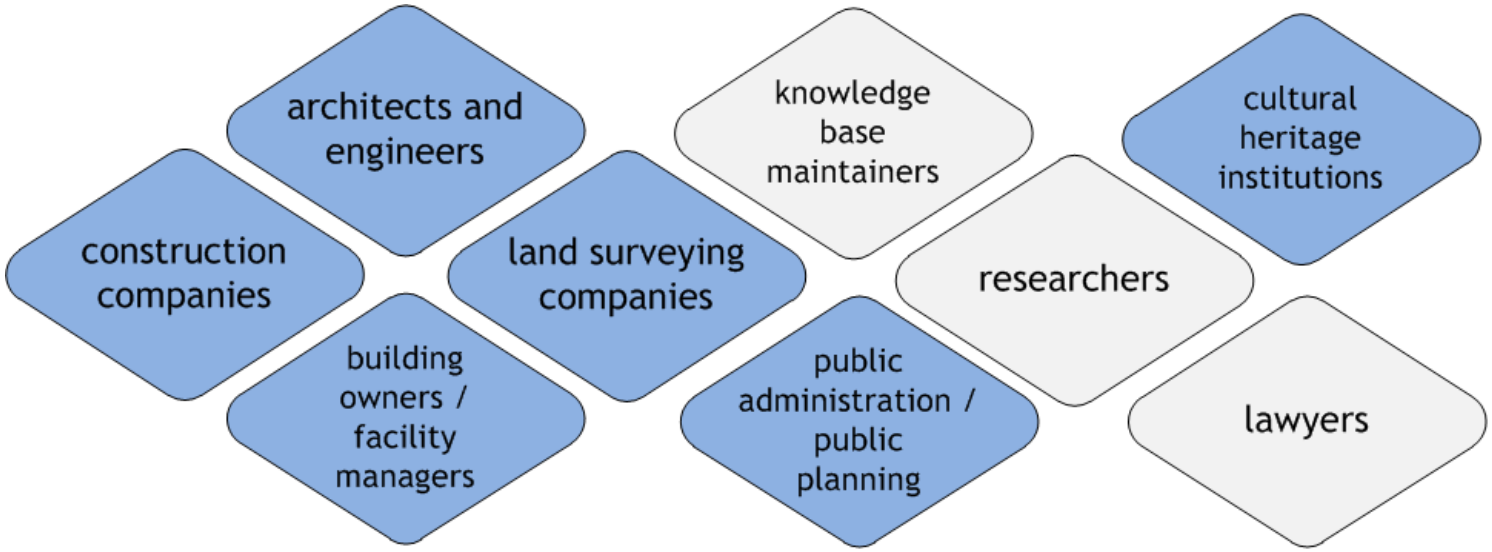
Moves beyond CAD by covering the entire design-to-construction process (including: project planning, cost, part specifications, construction time, …)

IFC – based on STEP standards (ISO 10303), ISO16739:2013

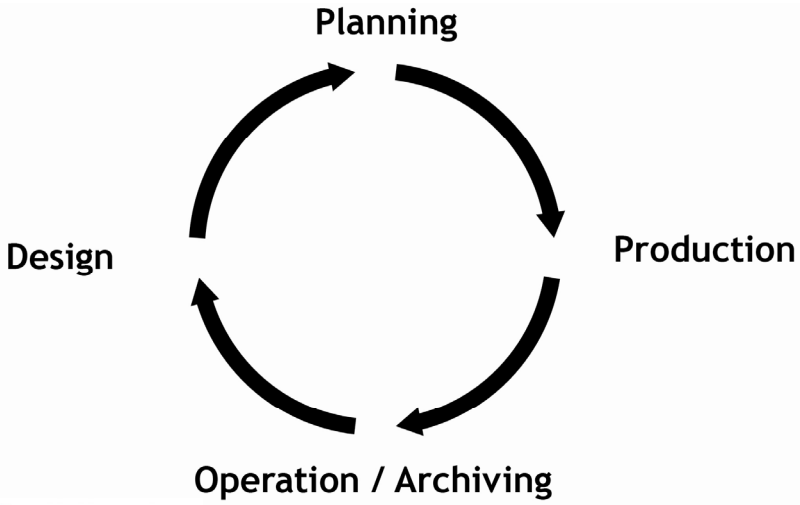
Why? Stakeholder need to be identified to understand …

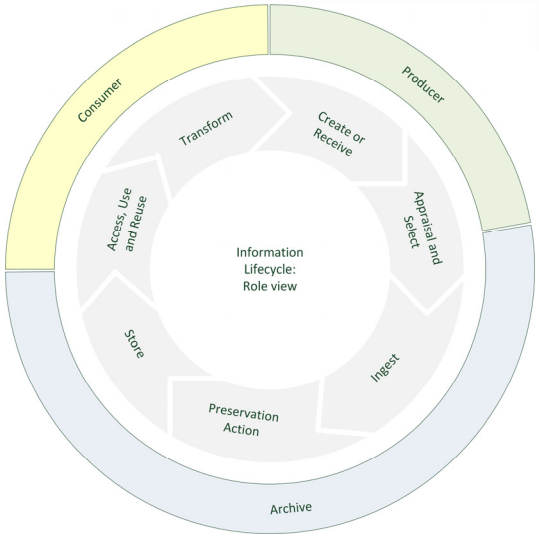
… how data is created, processed and used
… where data is already being stored / archived
… where data (long-term) availability would be beneficial, but is not in place
… what level of digital preservation knowledge / risk awareness can be assumed

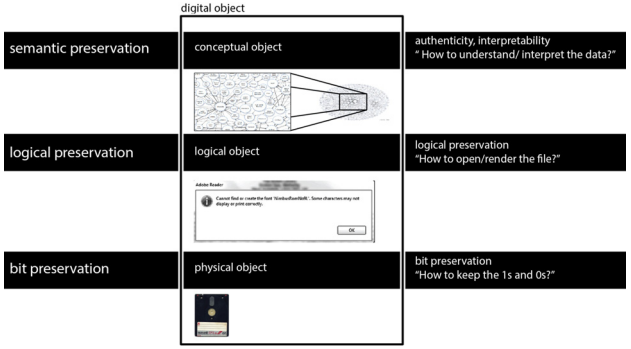
→ To identify gaps which need to be closed in curation & preservation practises for the respective data
→ (… and the OAIS says so …)



How do you explain digital preservation to your stakeholders ?







Different models

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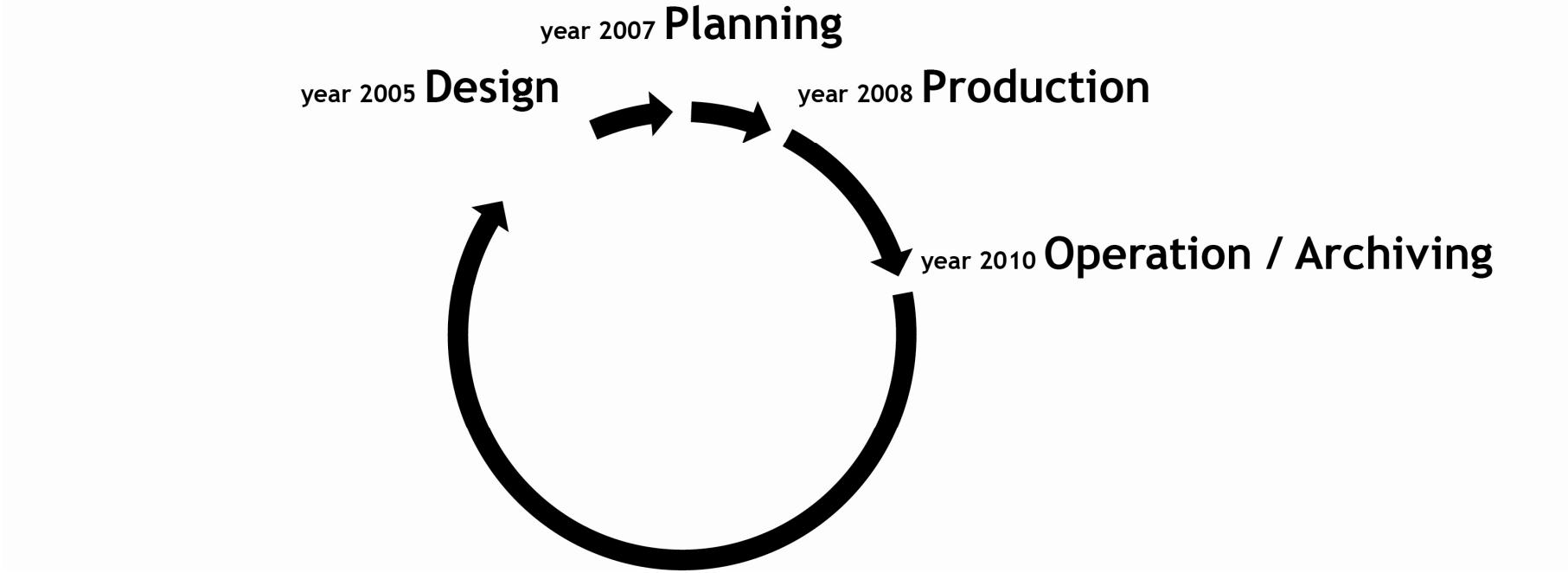
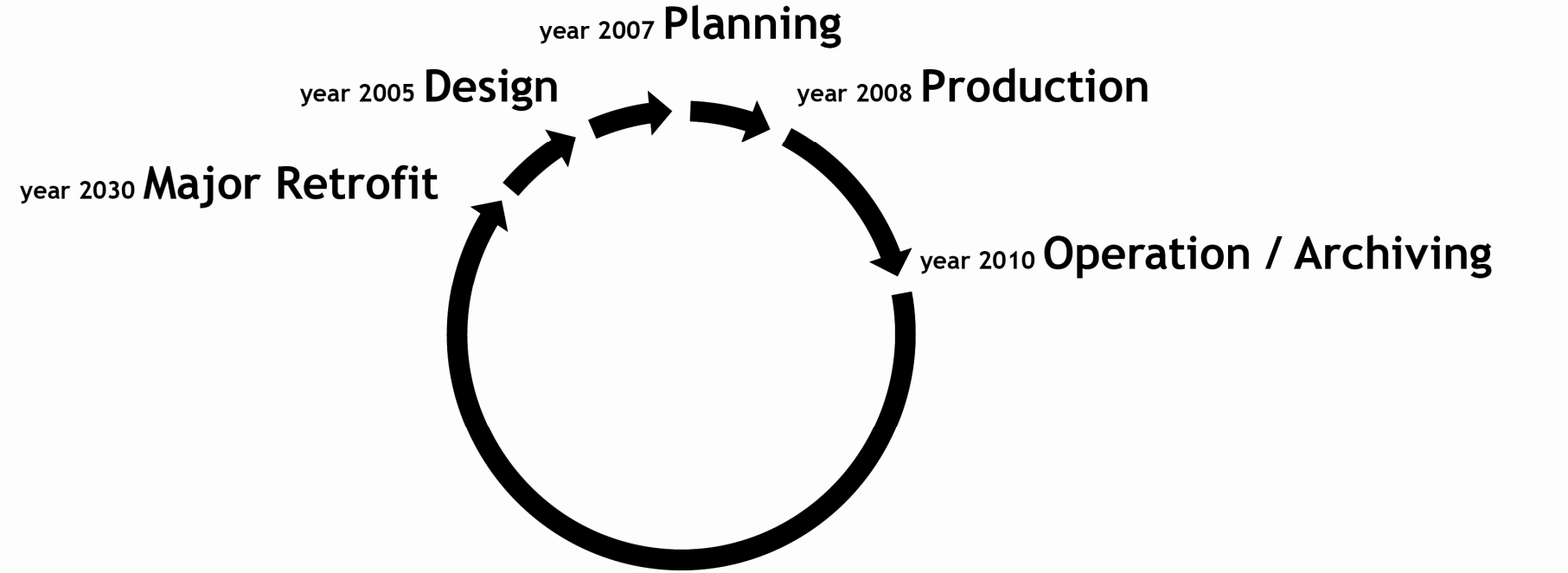
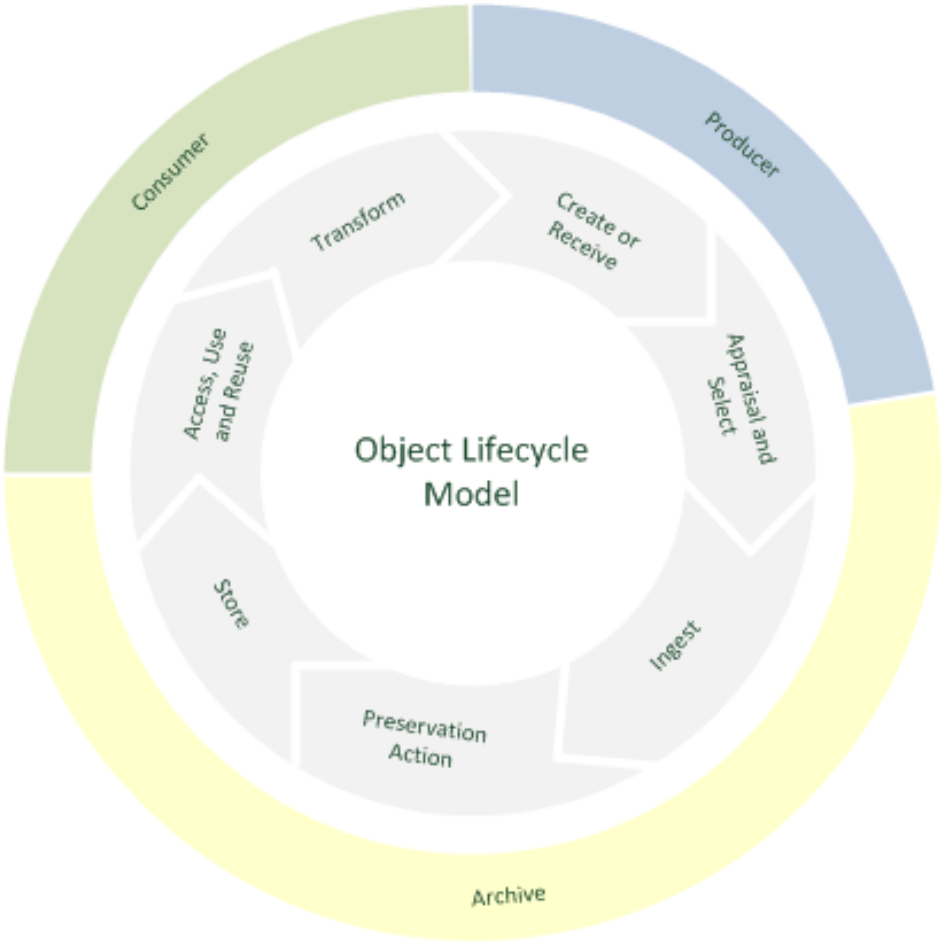


Design-to-Construction-to-Retrofit Model



Design-to-Construction-to-Retrofit Model



Based on DCC Digital Curation Lifecycle Model

Digital Object Lifecycle Model

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Land surveyors and 3D scanning companies

- Interface with all other parties in the building industry and at all points of a building process
- Exclusive user of 3D scanners in AEC
- Challenged by BIM → need to adapt their practice to provide project and client specific data
- Little incentive for long-term archiving

Typical software:
Faro Scene, Bentley Pointools, Trimble RealWorks, AutoCAD, Revit

Stakeholder results (1)

Architects and engineers

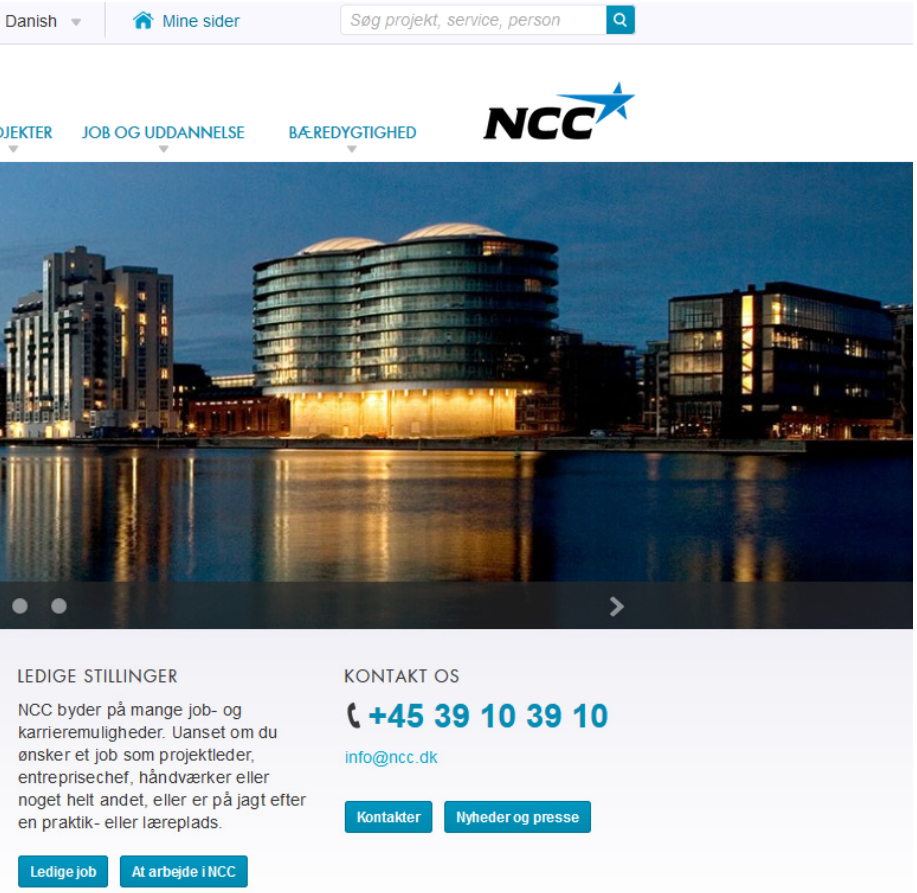
- Interface with all other parties in the building industry
- Embrace BIM
- BIM is hard to integrate in retrofitting
- Flexible business processes
- Little incentive for long-term archiving

Typical software

Revit, Navisworks, Velux Daylight Visualizer, Bentley Microstation CAD and BIMAutoCAD, SketchUp, Revit, NavisWorks, Dalux Model Checker, Ecotect Analysis, Vasari, Flow Design, AutoCAD, Revit, Solibri

Stakeholder results (2)

Construction companies

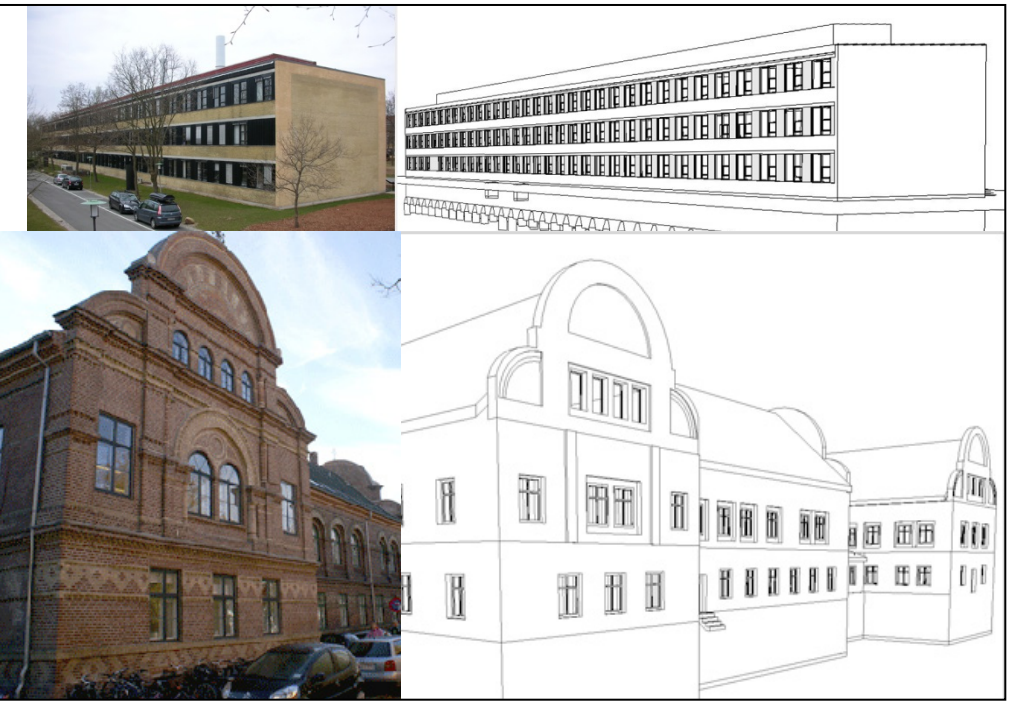


- Interface with all other parties in the building industry
- Enforce BIM on partners and demand enriched data
- Data quality is major concern
- Fixed business processes
- Incentive for long-term archiving until 5 year building review

Typical software
ArchiCad, Revit, Tekla, NavisWorks, Solibri

Stakeholder results (3)

Building owners / facility managers



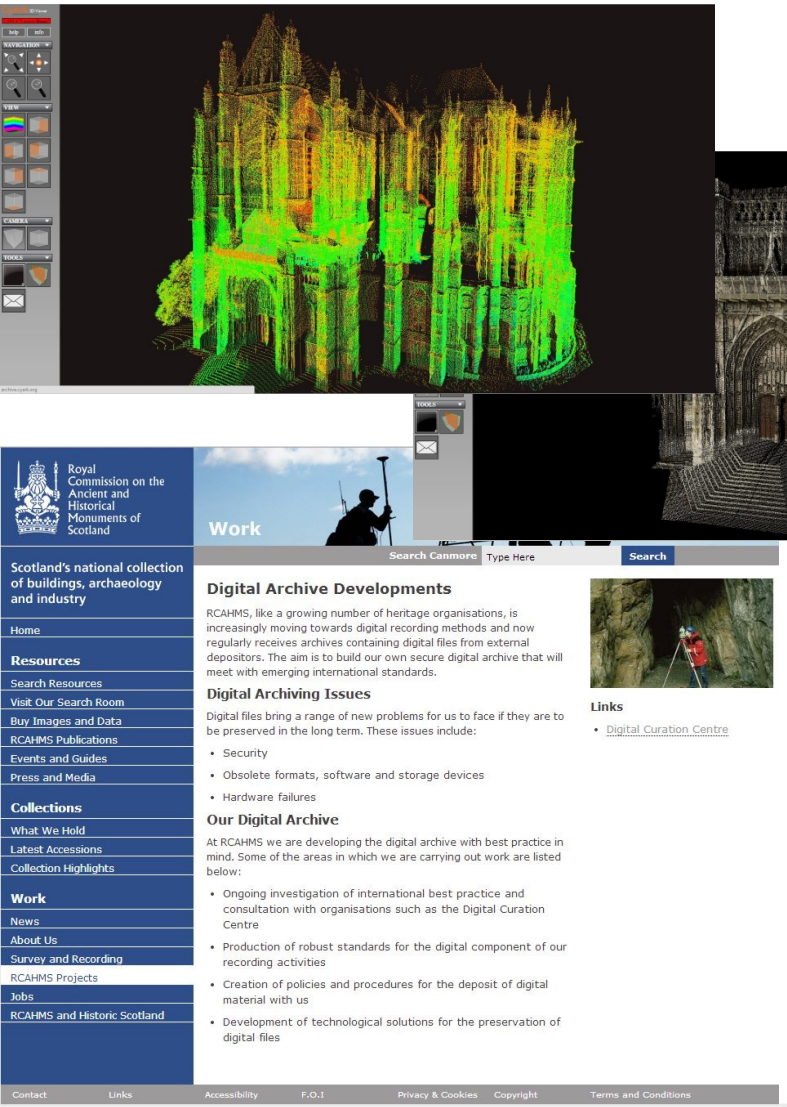
- Interface with all other parties in the building industry
- Major driver for BIM
- Enforce BIM on partners and demand enriched data
- Data diverge from building data
- Establish currently 3D based facility management systems
- Strong incentive for long-term archiving

Typical software

Revit, Da Rufus, Da Tia, Dalux FM, Dalux BIM Checker, Solibri,Caretaker FM, AutoCad

Stakeholder results (4)

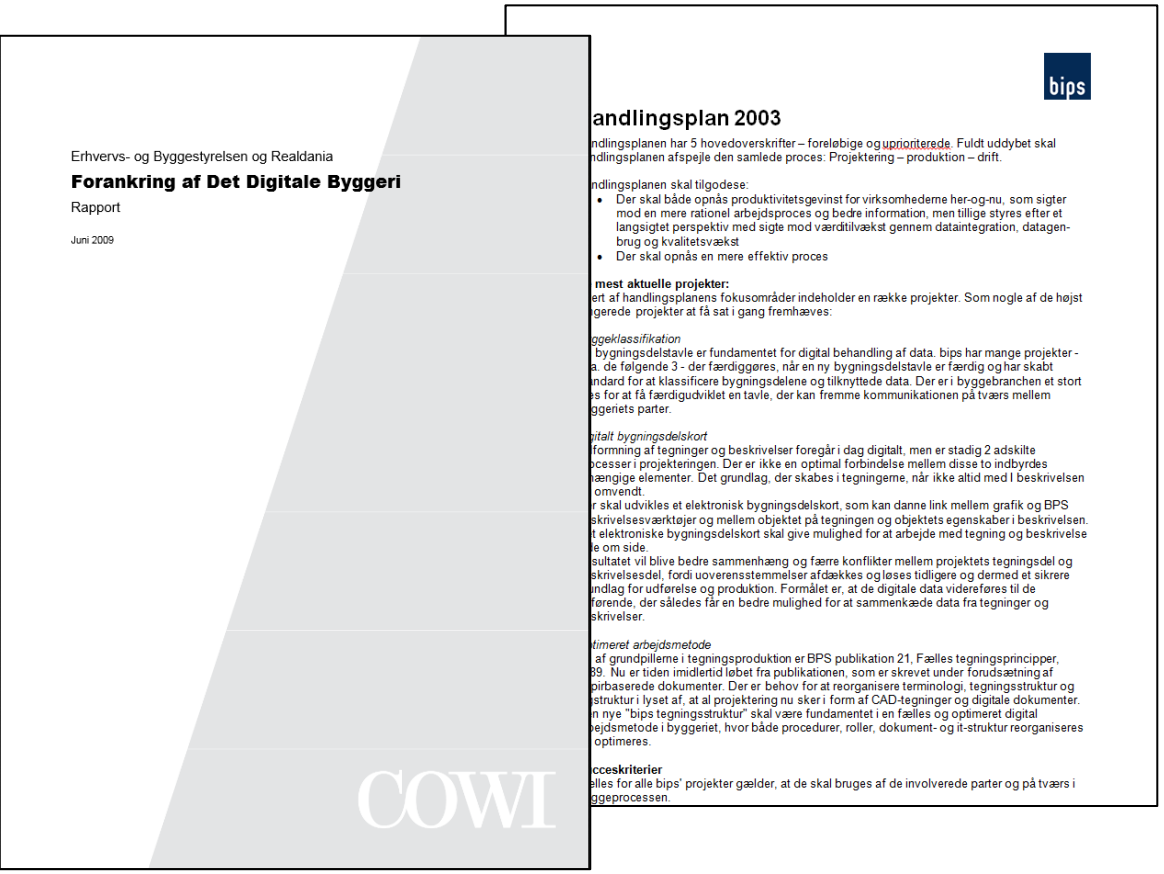
Cultural Heritage Institutions



- Preservation of current state of building in focus
- Preservation of records of older stages for historical value (but with what selection & appraisal criteria?)
- Hardly operate with 3d objects or BIM
- Strong incentive for long-term archiving

Stakeholder results (5)

Public Administration / Public Planning



- Major driver of BIM
- More for efficiency and cost reasons, than for long-term preservation reasons
- In the following countries BIM is mandatory for (some) publically funded buildings: Denmkark, Finland, Hong Kong, Netherlands, Norway, Singapore, UK, USA

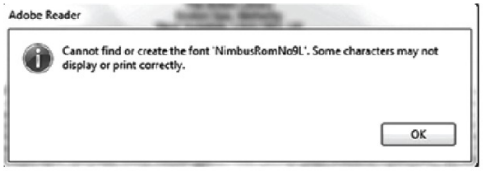
  → out of those only Hong Kong does not require BIM in IFC
- These objects will be reaching archives / libraries in a few years !

Stakeholder results (6)

We now know **who**, **what** and **why**.

But **how** can the objects be preserved ?

digital object

semantic preservation	conceptual object	authenticity, interpretability " How to understand/ interpret the data?"
		
logical preservation	logical object	logical preservation "How to open/render the file?"
		
bit preservation	physical object	bit preservation "How to keep the 1s and 0s?"
		

The 3 [preservation] layers of a digital object

Bit preservation

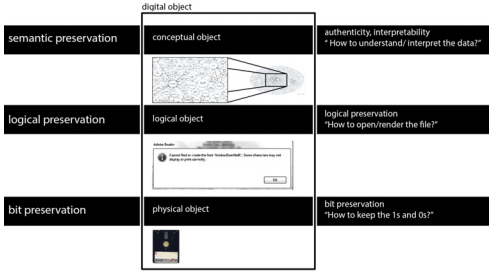
- integrity checks
- storage choice and location
- storage montitoring (including monitored redudancy) and desaster recovery planning
- organizational implementation of good IT practise

Logical preservation

- file format description, e.g. in registry
- Identification, technical metadata extraction, validation
- file format sustainability

Semantic preservation

- metadata capturing at all levels
- enrichment on ingest with additional information
- montioring of sources
- Tracing and capturing changes in semantic information



The 3 [preservation] layers of a digital object

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Bit preservation

„good information technology practise“ needs to be addressed at organizational level

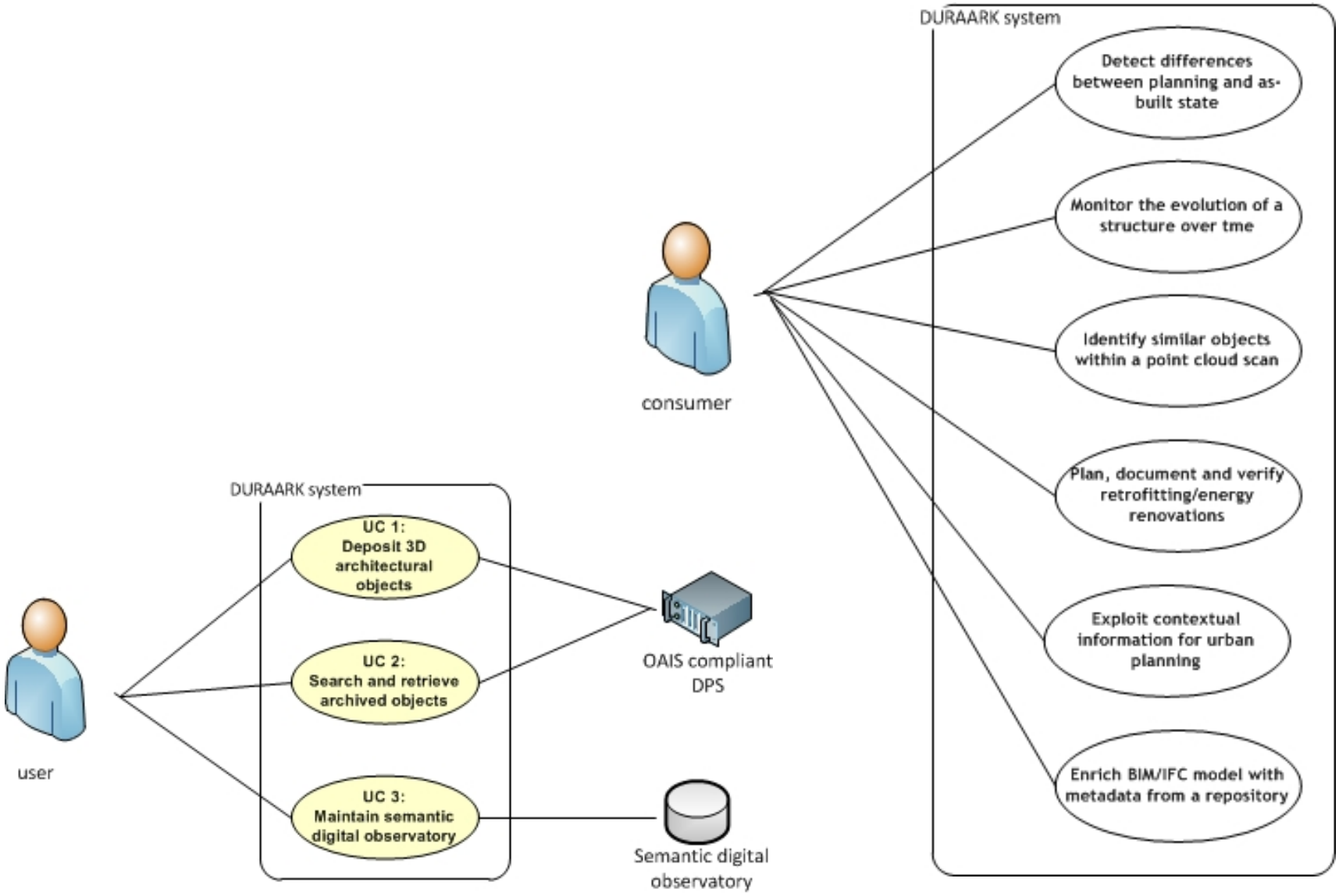
Logical preservation

gaps relating to lack of tool support for identification, technical metadata extraction and validation; risk of dependency on external information

Semantic preservation

gaps relating to identification of knowledge bases, methods to monitor changes and to monitor the impact of entity changes within chosen graph; gaps relating to lack of methods to capture and preserve changing concepts

→ *Within the project we are currently working on closing these gaps.*



DURAARK Use Cases

New object may be created

2013: Producer A creates plan

2016: Producer B creates scan

Information matching building in plan to building in scan needs to be available

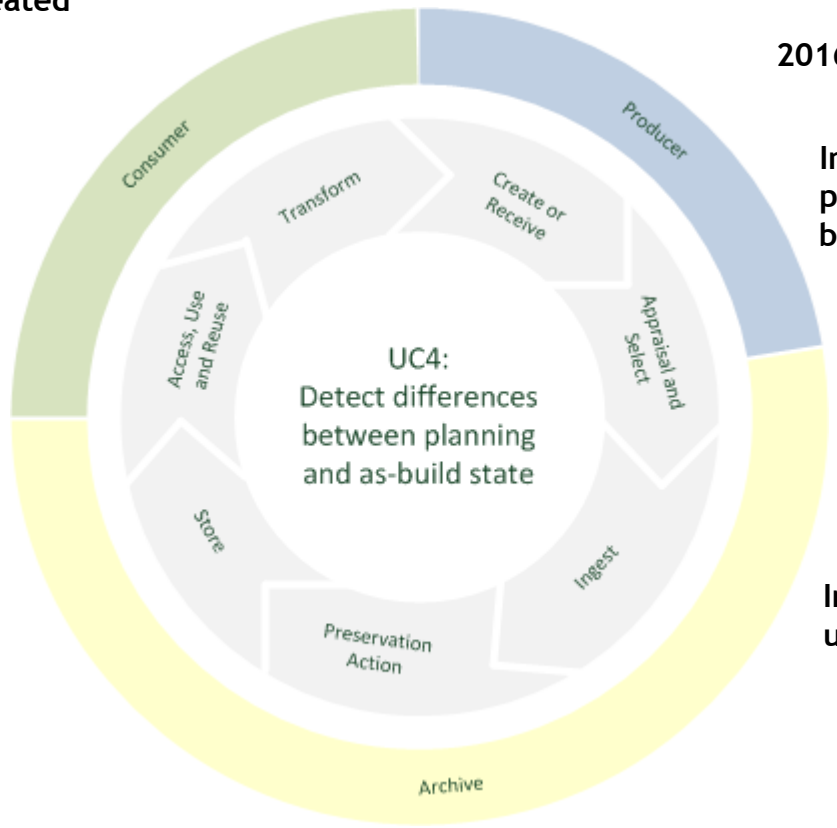
Geometric enrichment needs to be conducted

Ingested objects can support the use case (needs to be documented)

Executability of use case needs to be kept over the course of preservation action (needs to be checked)

Accessability of digital object needs to be kept (and checked)

Consumer C accesses the objects → use case scenario
(UC needs to be fullfillable, digital objects
need to be accessible)



Use case awareness in preservation processes

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Fall workshops

- targeted at stakeholders with a long-term interest or mandate in 3D architectural data (as per stakeholder definition)
- includes demonstration of / feedback round on tools developed in the project so far (e.g. 3D-scan quality checker, registration tool of scan and plan, first draft of semantic digital observatory / semantic enrichment, metadata schema for descriptive metdata,…)
- proof-of-concept ingest into existing digital preservation system

Metadata work

- almost completed is „buildm“ schema for 3D-scans and plans
- technical metadata is currently ongoing

Tools

- technical metadata extraction
- quality checker for E57
- semantic digital obervatory for pre-Ingest enrichment

Outlook - the DURAARK vision

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Outlook – no more handovers like this !

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Do you have architectural 3D data? Contact us!

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Thank you. Questions? Suggestions?

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