Building Information Modelling (BIM) implementation from the perspective of building product manufacturers

Analysis, benefits and challenges of manufacturer specific BIM objects

Master Thesis Presentation
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Background

- Architects and contractors create BIM objects themselves, although the data could come directly from the manufacturers (Thesis Interviews, 2014; East, 2014)
- The clear value of the BIM objects is perceived differently by project participants (Thesis Interviews, 2014)

Research Question

How do manufacturers, architects and contractors benefit from manufacturer specific BIM objects and what challenges are confronted while creating and using the objects?

Research Question

Fullfilled tasks:

- Evaluate the current state of **BIM maturity** of involved actors
- Determine the main **benefits and challenges of creating** the BIM objects for manufacturers
- Determine the main **benefits and challenges of using** the objects by architects and contractors
- Provide **suggestions** for overcoming the confronted challenges

Methodology

- Qualitative research method
  - 10 interviews

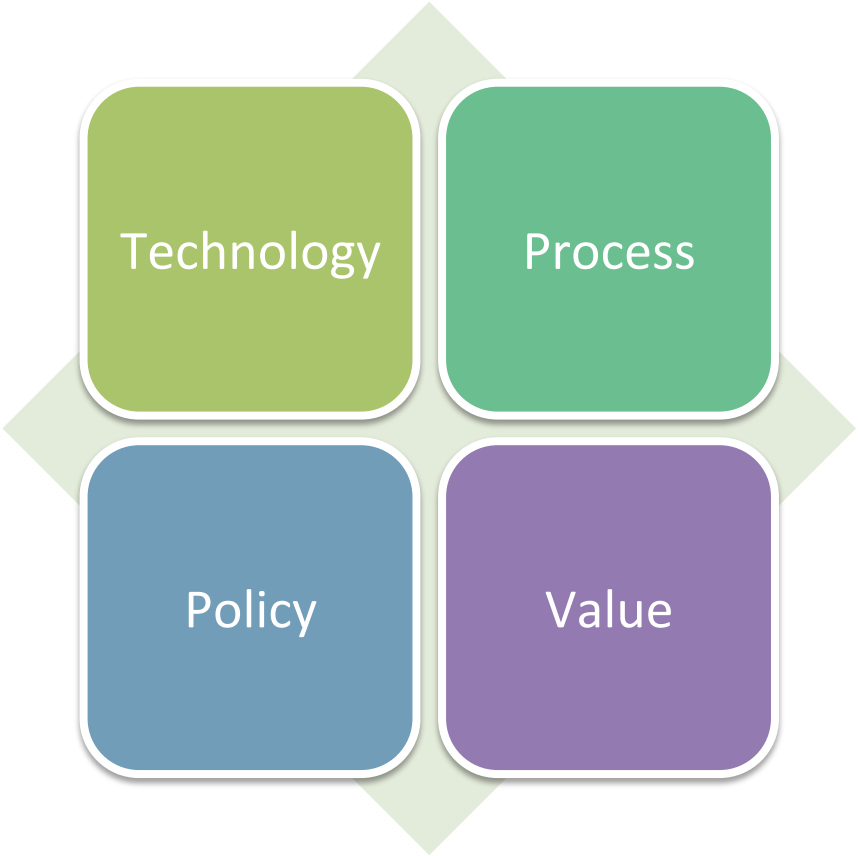
5 Manufacturers

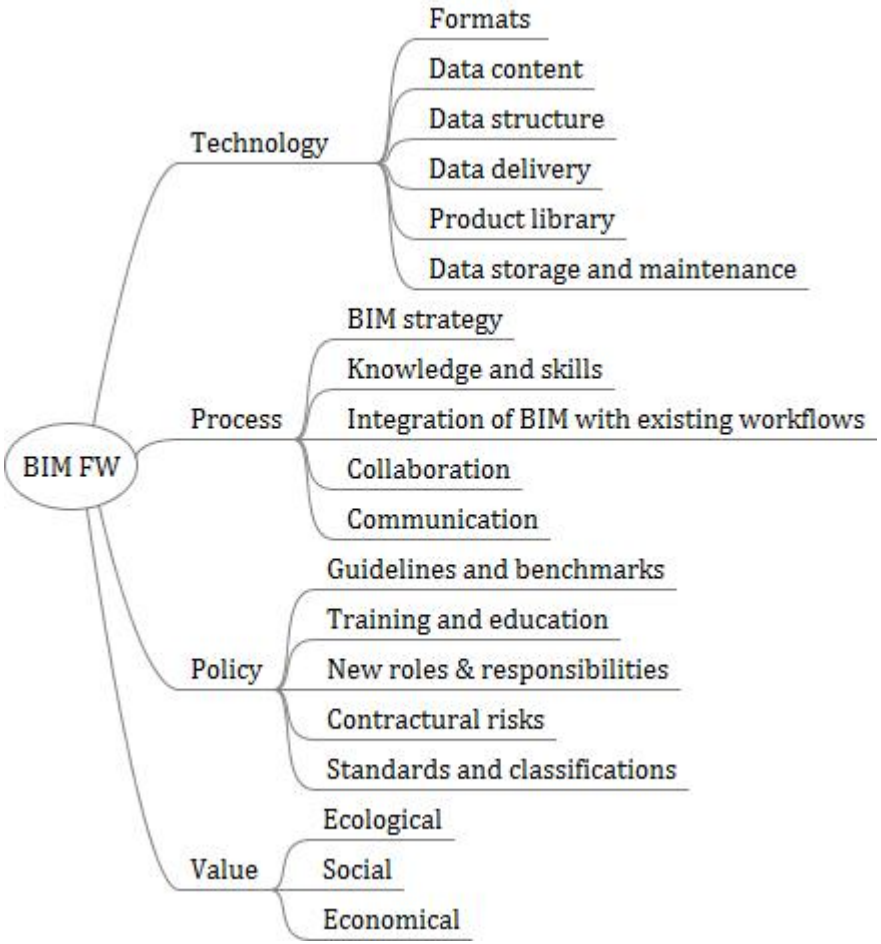
3 Contractors

2 Architects

Methodology

BIM Framework





BIM Maturity model

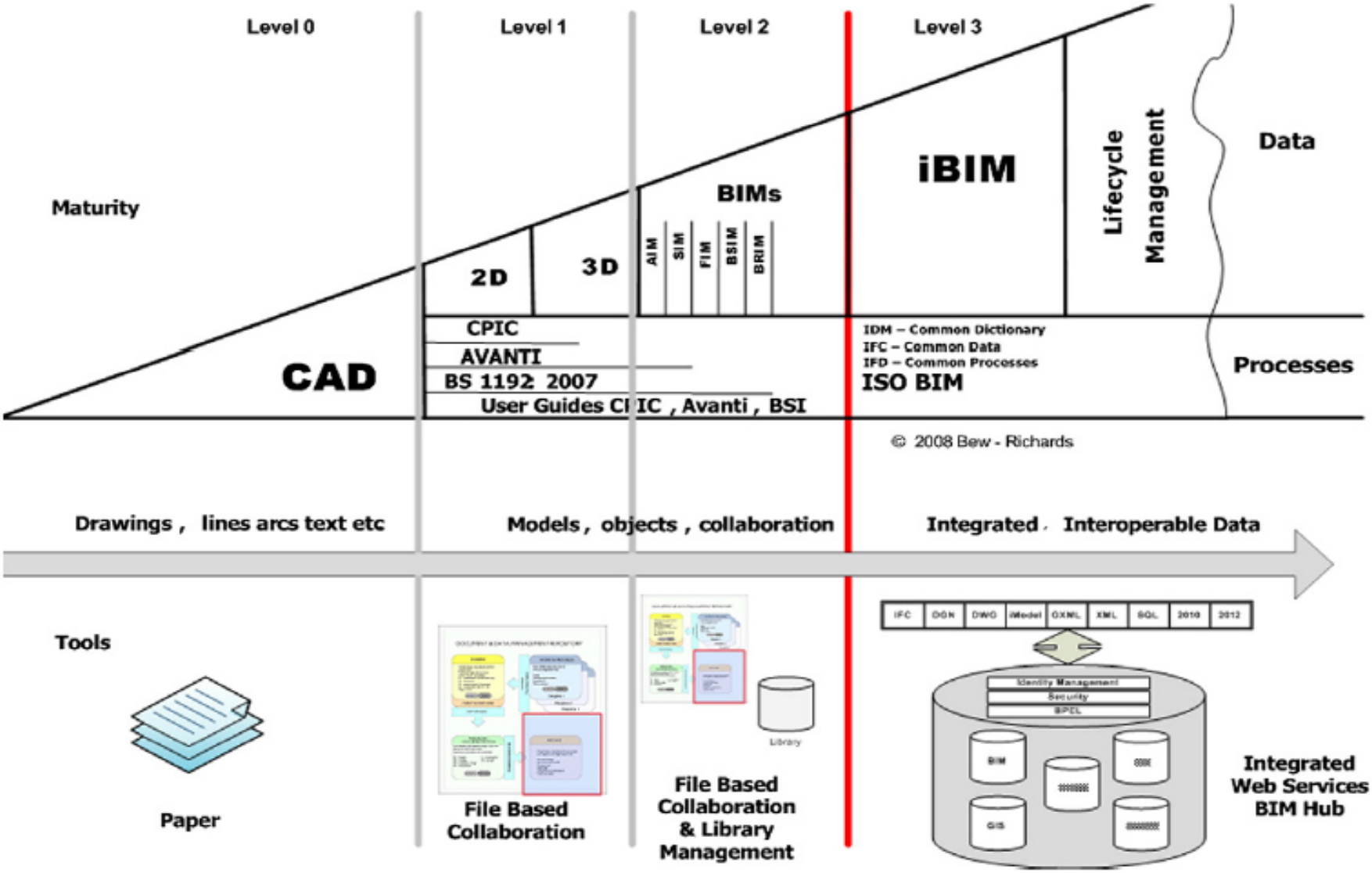


Figure source: Bew – Richards' BIM maturity model

Interview findings

BIM Maturity

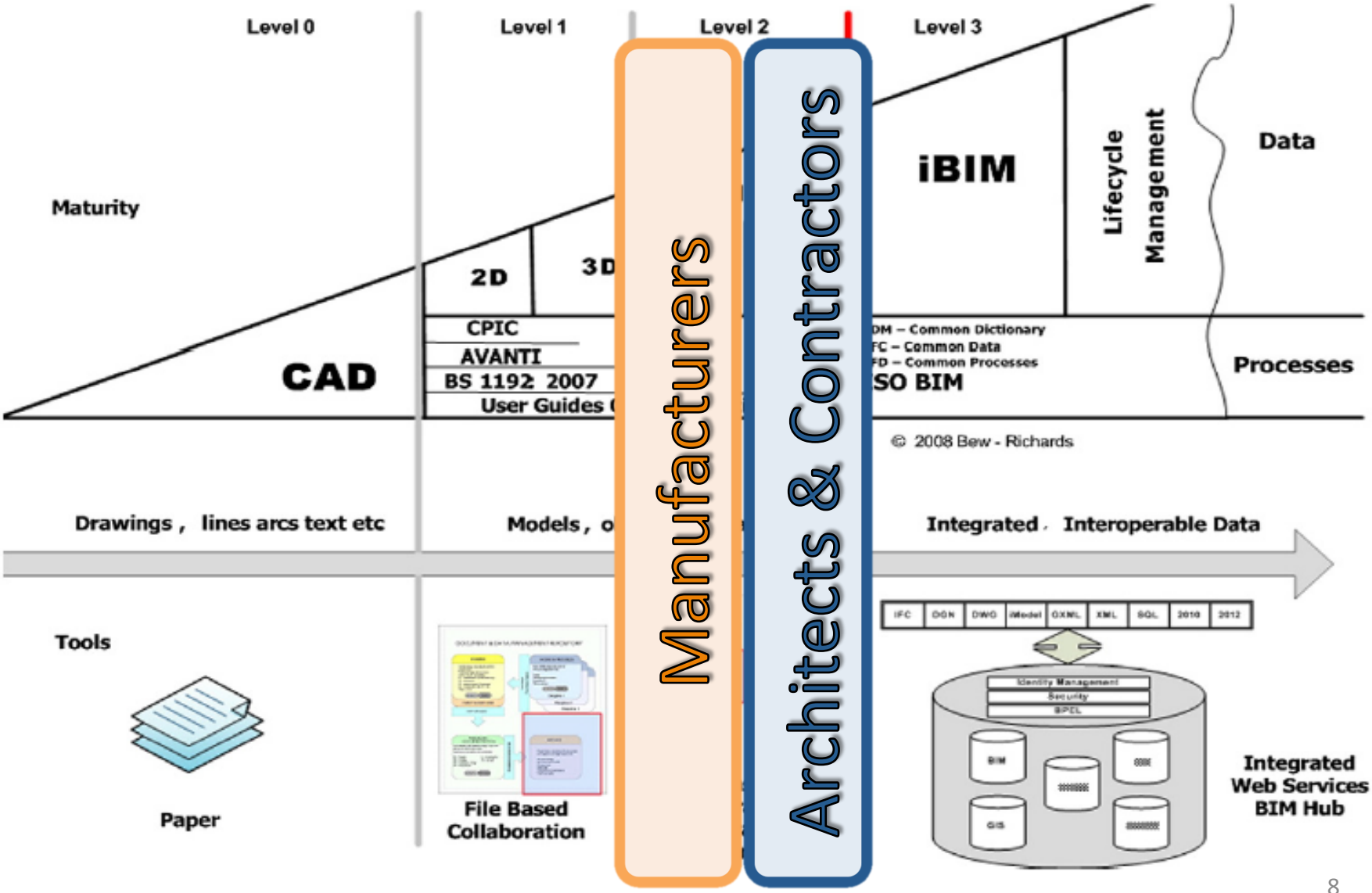


Figure source: Bew – Richards' BIM maturity model

Findings

	Benefits	Mentioning frequency
B_M1	Having BIM objects available on internet will create lead to the products	M1,M3,M5
B_M2	In the long term BIM objects will generate automation of process which will decrease the level of mistakes	M1,M2,M4
B_M3	Innovative company image; benefit of being in front of the object development	M1,M3
B_M4	Create a chance to be specified early and increase the probability that the real product is being chosen for the	M2,M4
B_M5	Visualisation and data integration of the ob overview of the product	
B_M6	Create lead to the organization	
B_M7	Generate long term cost efficiency	
B_M8		
B_M9		

	Benefits	Mentioning frequency
	r objects would save time and reduce costs	C3, A1
	epresent the real product. The client will know and way how the building is being constructed	C1, A2
	process. It can be seen how the object interacts odel in design phase	A1, A2

B_M1	Having BIM objects available on internet will create lead to the products	M1,M3,M5
B_M2	In the long term BIM objects will generate automation of process which will decrease the level of mistakes	M1,M2,M4

	Challe	
CH_M1	To engage people from external or	
CH_M2	To engage people internally inside the company	M1,M3
CH_M3	To have more BIM objects available for users	M2,M5
CH_M4	To implement BIM and BIM tools in the company	M2,M4
CH_M5	To provide objects for the right software	M1
CH_M6	To add different levels of data about environmental certification systems into the BIM objects	M4
CH_M7		

	C2, A2	
	are too heavy	C3, A1, A2
	quality manufacturer objects with good level of detail d data	C2, A2
	ultants to deliver BIM models from now on	C1
	acturers tend to perceive object creation as another as the industry changing project.	C1
	thinking in construction, when only the manufacturers are used in majority of	C2

	How to overcome the confronted challenges?	Mentioning frequency
S_M1	Increase the level of knowledge about BIM in the company and industry	M1,M2,M3,M5
S_M2	Integrate BIM more with company's work processes	M2
S_M3	Hire a BIM manager and create a BIM strategy	M3
S_M4	Have determined requirements by the governments.	M5

		ing frequency
	ure software and hardware solutions	C1, A1
	es and share positive object creation experiences	C1
	vledge and education about BIM	A2
$S_{AC}4$	A product library with more simplified manufacturer objects. (E.g. with lower level of detail)	C3
$S_{AC}5$	Start using the manufacturer objects and deal with the challenges on the way	C2

Findings
Main benefits

- Manufacturers
  - Lead to the products
  - Automation of processes in the future

- Architects and Contractors
  - Save time and reduce costs
  - Representation of real product
  - Better interaction in the BIM model will result in faster design process

Findings

Main challenges

- Manufacturers
  - Engaging people inside the company and from other organisations
  - Implementation of BIM and BIM tools inside the company
  - Lack of BIM specialists and knowledge
  - Cost and incompatibility of software solutions

- Architects and Contractors
  - Too few manufacturer objects available
  - Objects have too large file size

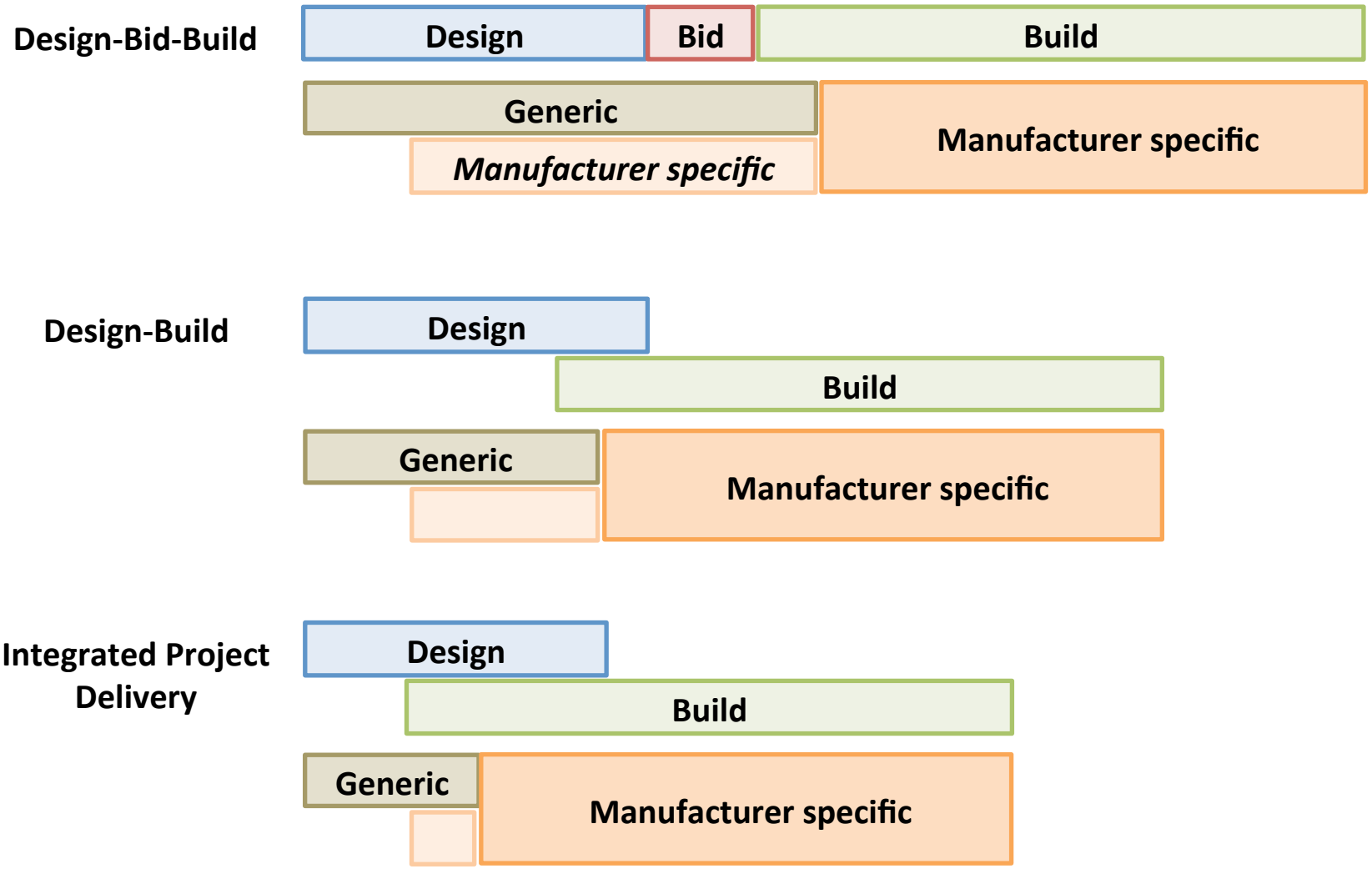
Product data update is the key activity!

Findings
Solutions

- Manufacturers
  - Further knowledge and education sharing between the industry participants

- Architects & Contractors
  - More “best practice” examples for manufacturers
  - Developments in software and hardware systems

Discussion


Design-Bid-Build
Design
Bid
Build
Generic
Manufacturer specific
Manufacturer specific
Design-Build
Design
Build
Generic
Manufacturer specific
Integrated Project Delivery
Design
Build
Generic
Manufacturer specific

Conclusions & recommendations

- More BIM knowledge and trainings

- How to solve interoperability issues & how to reduce the file size?
- How to integrate manufacturer objects into the current workflows and systems?
- How to measure the benefits? Metrics - Downloads?
  - Challenge: long cycle from specification to the order request

Building Product Libraries – what are the incentives for different actors in the building industry?

Prof. Väino Tarandi

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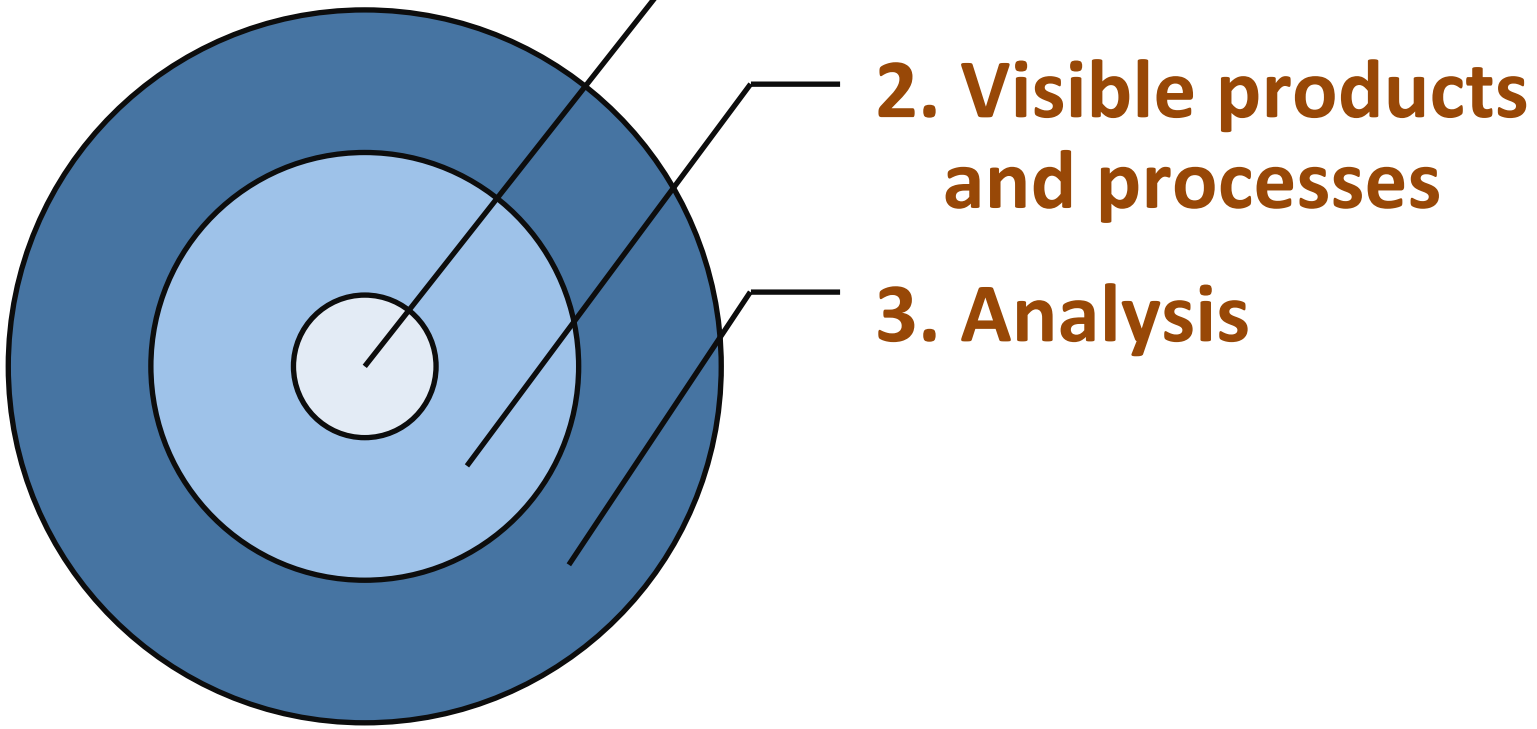
Research Engineer

Forming a Research Question

- **What are the incentives for different actors in the building industry?**
- What is the current state-of-the-art of product libraries and how they correspond to (open) standards?

Building Product Libraries

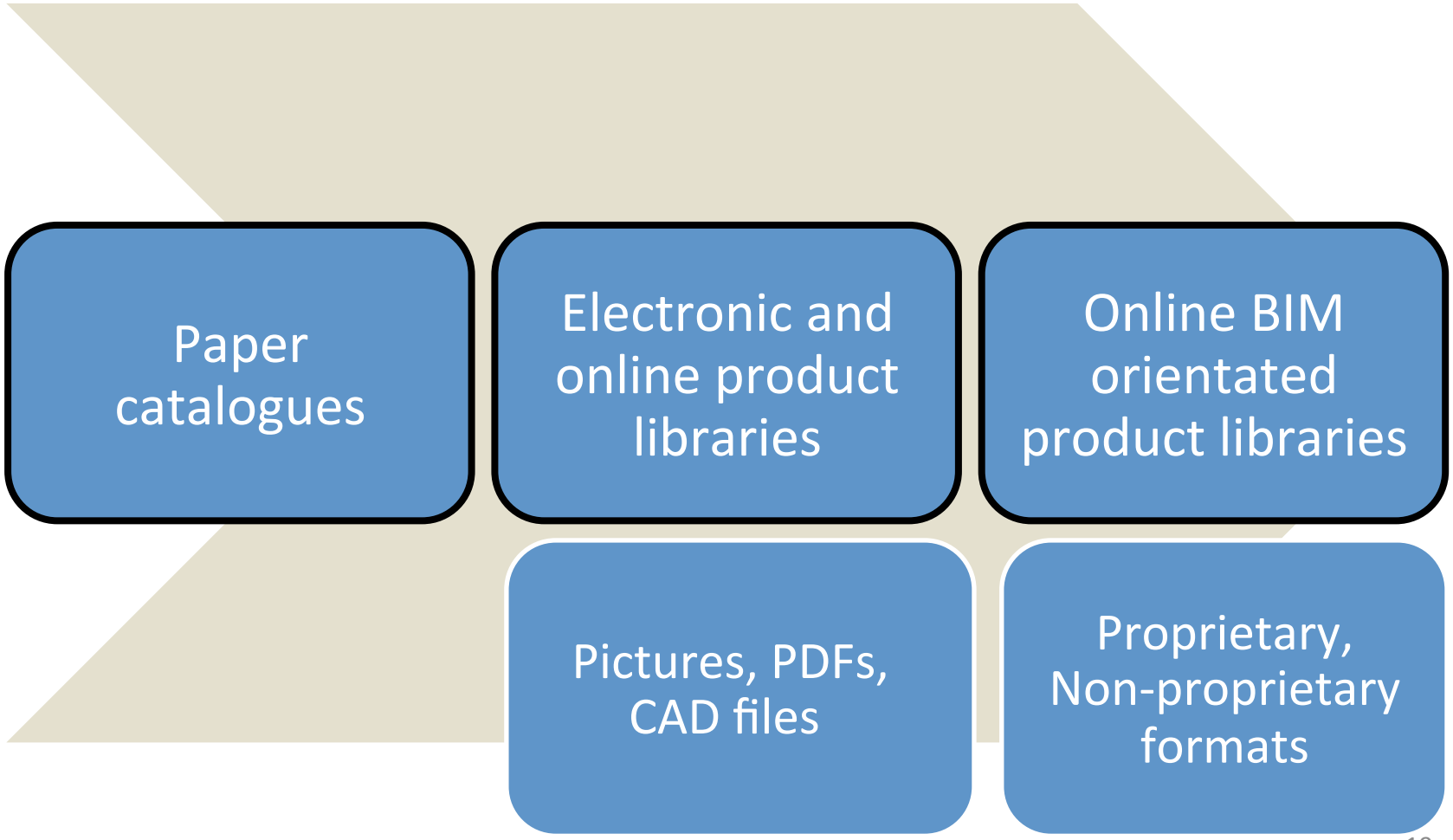


1. Supporting Standards

- Classifications
  - *How libraries are supported by classification systems?* – Omniclass, Uniclass
- BIM standards
  - Data dictionary
    - *What properties are required?* – bSDD
  - Data model
    - *How to hold and exchange data?* – IFC

2. Visible products and processes

Development of Product Libraries (PLs)



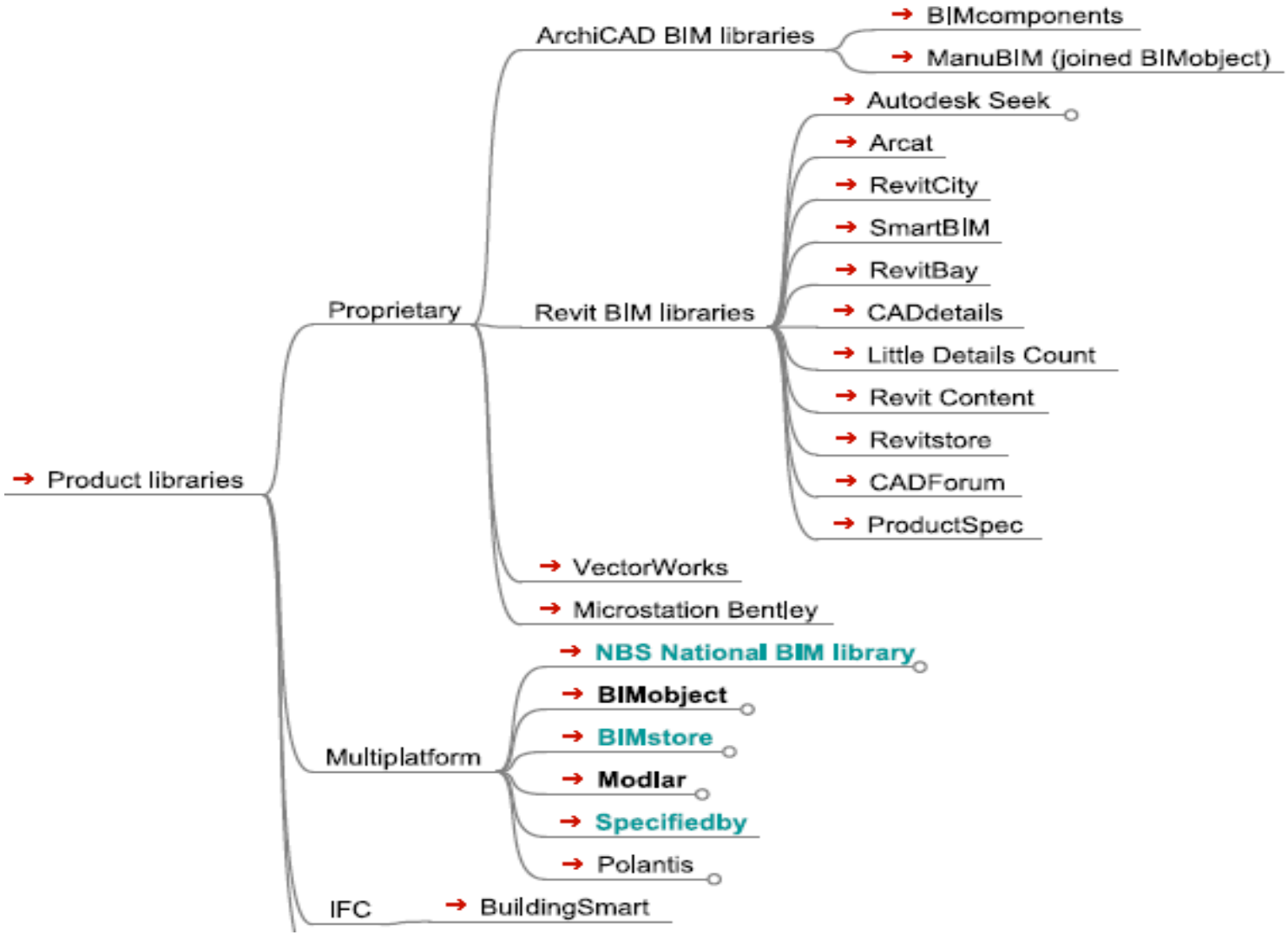
2. Visible products and processes

- What are different types of PLs?
- How to categorise the PLs?
  - By content
  - By content's format
  - By different providers

Different types of PLs

- By content
  - Products (objects) can be generic or manufacturer specific
- By content's format
  - Libraries containing PDF sheets and/or 2D drawings
  - Proprietary PLs (2D&3D CAD and BIM software specific)
  - Open standard PLs (IFC and bSDD)
  - Multiplatform PLs (proprietary and open formats)

Different types of PLs



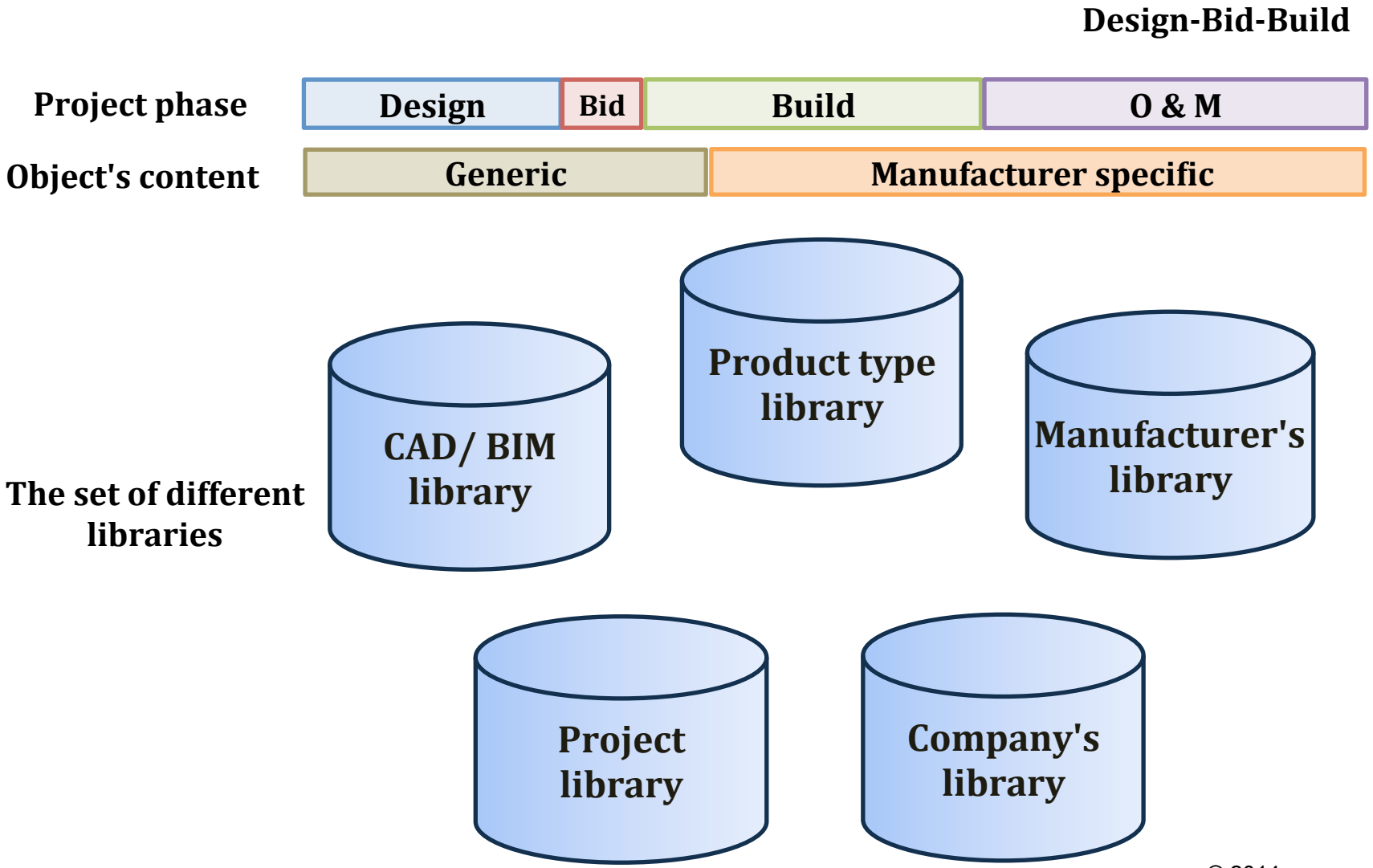
Different types of PLs

- By different providers
  - Software vendors
  - Associations
  - Commercial providers- manufacturers, suppliers, wholesalers
  - Companies – in-house libraries

Processes and discussion points

- Project phases
  - *How the model is populated over time?*
  - *Can the same library be used in different project phases?*
  - *Are there any phase specific requirements?*
- Level of Development
- Contract types

Project phases and PLs



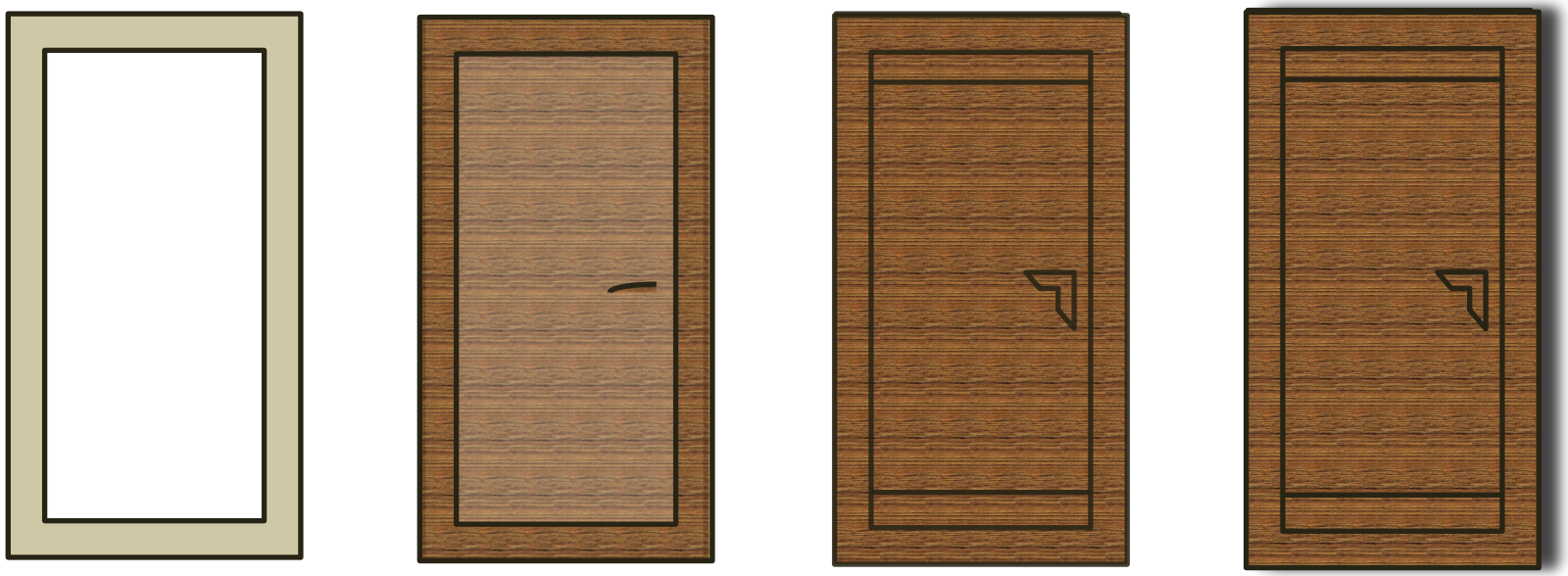
Forming a Research Question

- How is the **transition** between generic and manufacturer specific libraries been realised?
- Who are the **users** of product libraries? What are the **benefits** for different actors?
- What are the interdependences of different **contract types** and different types of product libraries?
- What is **needed to be developed** further in product libraries? (format, size, content, availability etc.)
- What **information** exists in current libraries and what is requested in the **future**?

Level of Development (LoD)

- *Level of Development – geometric and non-geometric information are equally important* *(van Berlo, 2014)*
- *How is transition between different levels of development for BIM object realised?*
  - *What information exists in current libraries?*
  - *How information is delivered? – Templates for manufacturers. E.g. SPie, CIBSE Product Data Templates (PDTs)*

The process of determination of an object



Element | **Design element** | **Specified element** | **Production result**

3. Analysis

- *How current product libraries support the performance analysis and supply chain management?*

- Energy and life cycle analysis & simulations
- Logistics
- Cost estimation

Additional discussion

- Product libraries and...
  - ...BIM maturity of an organisation
  - ...engineered-to-order (ETO) building components
  - ...facility management
  - ...energy analysis
  - ...life cycle assessment

PLs and Open standards

- *"Only few product libraries provide IFC-compatible library objects"* (Palos et al., 2014)

- The link between LoDs and bSDD would provide great value
  - "*At the moment there is no reference from objects and properties to their equivalent in the IFC standard"* (van Berlo, 2014)

3D issues

- How to support LoDs?
  - Level of Detail, Level of Development
- How to include connection points?
  - Ports with orientation for connectors
- Use for 3D in FM and operation?
  - Need for correct representation
  - Other actors needs in the built environment

Thank you

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