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KIM, ERIM and the Silo of Doom

Lessons from two long-lived data projects

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Funded by **JISC**



Digital Curation Centre

Who are we?

- ▶ UK-based centre of expertise in digital curation.
- ▶ Partnership between Universities of Bath, Edinburgh and Glasgow.
- ▶ Primary (but not exclusive) focus on research data.

What do we do?

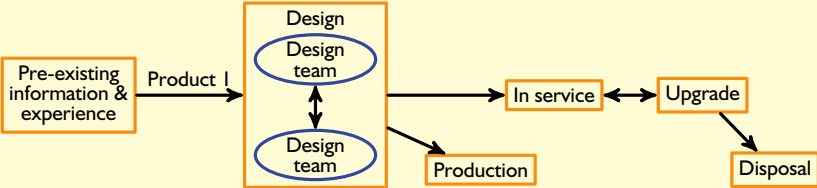
- ▶ Develop curation tools, resources and learning materials.
- ▶ Provide training and other events.
- ▶ Build communities of data curators and foster good practice.
- ▶ Collaborate in projects demanding digital curation expertise.

KIM Project

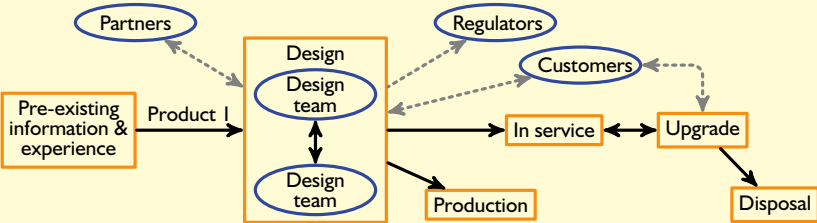
- ▶ £5.5 million Grand Challenge project.
- ▶ Funded by EPSRC and ESRC.
- ▶ 80 industrial collaborators.
- ▶ 13 partners across 11 universities.
- ▶ Strategies and tools for the emerging product service paradigm:
 - ▶ Advanced product representation.
 - ▶ Learning throughout the lifecycle.
 - ▶ Managing the lifecycle.
 - ▶ Environment, Groups, Individuals, Practices, Tools.



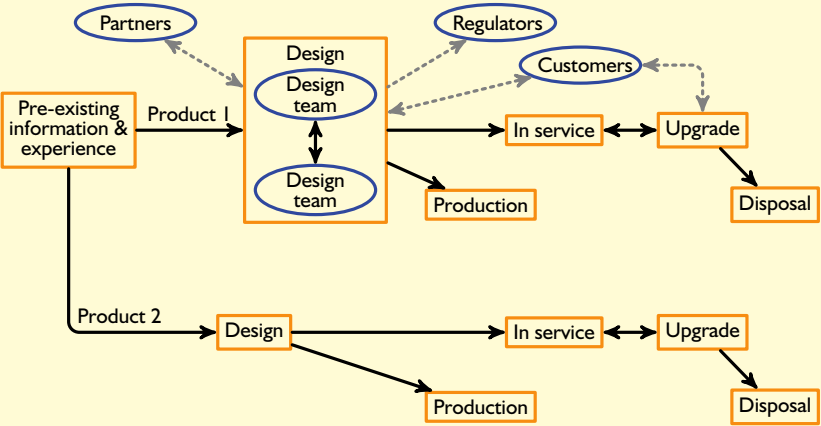
Engineering information flows



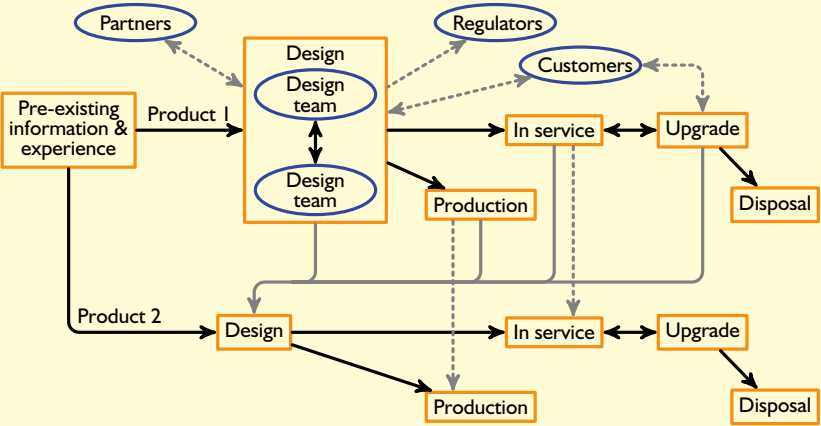
Engineering information flows



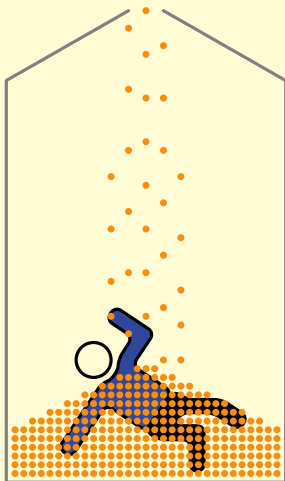
Engineering information flows



Engineering information flows



No, not *this* kind of Silo of Doom



Information silos

CAD
models

CNC
models

Service
records

Performance
data

FEA
models

Process
models

Rationale
reports

...

Integrating silos

Curation problems:

- ▶ Integrating product information with **current** lifecycle systems.
 - ▶ Computer-aided manufacture
 - ▶ Computer-aided engineering
 - ▶ Product lifecycle management (PLM) systems

Integrating silos

Curation problems:

- ▶ Integrating product information with **current** lifecycle systems.
 - ▶ Computer-aided manufacture
 - ▶ Computer-aided engineering
 - ▶ Product lifecycle management (PLM) systems
- ▶ Integrating product information with **future** lifecycle systems.
 - ▶ STEP (ISO 10303)
 - ▶ ???



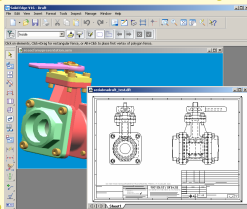
Limitations of CAD models



No direct feedback



Locked into proprietary software



Multiple viewpoints



Format quickly obsolete



Big file sizes

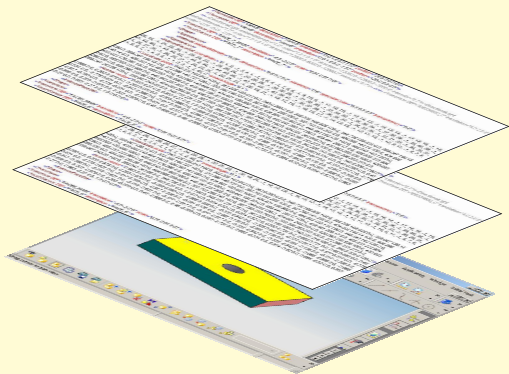


Commercial secrets

Lightweight Models with Multilayer Annotations

Different annotation layers
for different **viewpoints**
(design, manufacture,
service) and for different
security levels (internal,
public)

Geometry layer



Registry/Repository of Representation Information for Engineering

The screenshot displays the RRoRIFE v0.4 application window. On the left is a sidebar with the RRoRIFE logo and a vertical stack of buttons: File Format Explorer, File Format ReplInfo Editor, File Format Picker, Converter Explorer, Converter ReplInfo Editor, Conversion Path Finder, and Conversion Path Wizard. At the bottom of the sidebar are logos for UKOLN and the University of Bath.


The main window is titled "RRoRIFE v0.4" and contains a "Conversion Path Wizard" dialog. The wizard has a "Start format" dropdown menu set to "ACIS version 13.0". Below this is a section for "End format properties" with a "Weight" field set to "1" and radio buttons for "Required", "Desired", "Irrelevant", and "Forbidden", along with a "Clear" button. The wizard is divided into two main tabs: "2D Geometry" and "Construction". Under "2D Geometry", there are sub-tabs for "Compression & ID" and "Metadata". Under "Construction", there is a sub-tab for "3D Geometry". A list of 3D geometry types is shown in a scrollable area, including Helix, Plane, Ellipsoid, Cylinder, Cone, Cuboid, Torus, Mesh of surface segments, Lofted surface, Translation surface, Normal swept surface, and NIIRS surface. At the bottom of the wizard, there is a "Max. no. of stages" dropdown set to "4", "Search" and "Legend" buttons, and a prompt: "Please make your selection and then press 'Search'."

ERIM Project



- ▶ Funded by JISC.
- ▶ Research Data Management Programme, Research Data Management Planning for Research Funders' Projects strand.
- ▶ University of Bath: IdMRC and UKOLN/DCC.
- ▶ Managing data produced by
 - ▶ KIM Project;
 - ▶ other IdMRC research.

Silo of Doom strikes again



Storage

Silo of Doom strikes again

Storage

Confidentiality

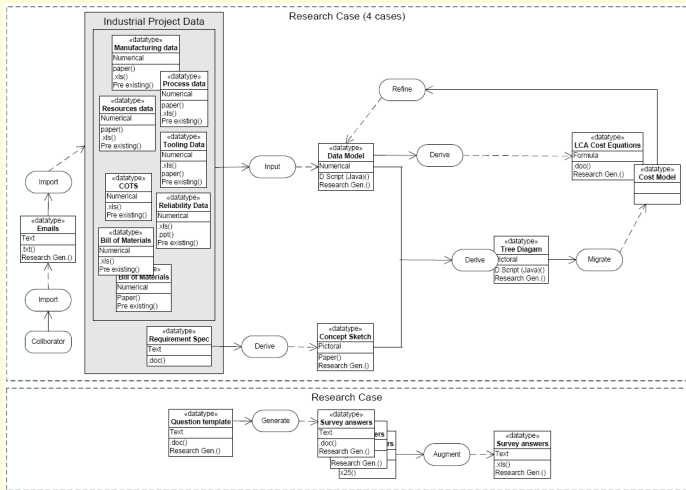
Silo of Doom strikes again

Storage

Confidentiality

Context

Data processing flows



Conclusions

- ▶ STEP where possible.
- ▶ Simple solutions elsewhere.
 - ▶ Identify the information needed.
 - ▶ Identify a simple way of storing that information.
 - ▶ Find a way of getting information there that arises from a natural workflow.
- ▶ Avoid creating new silos.
- ▶ Manage the silos you have carefully.

Further information

Ding, L. et al. (2009). Annotation of lightweight formats for long-term product representations. *International Journal of Computer Integrated Manufacturing*, 22(11), 1037-1053. DOI: 10.1080/09511920802527616

Ball, A. (2010). Review of the State of the Art of the Digital Curation of Research Data. (ERIM Project Document erim1rep091103ab12). University of Bath. <http://opus.bath.ac.uk/19022>

Other work

FACADE (Future-proofing Architectural Computer-Aided DEsign)

- ▶ Archiving architectural CAD models in DSpace.
- ▶ <http://facade.mit.edu/>
- ▶ Smith, M. (2009). Curating Architectural 3D CAD Models
International Journal of Digital Curation, 4(1), 98-106.
<http://ijdc.net/ijdc/article/view/105>

SHAMAN (Sustaining Heritage Access through Multivalent ArchiviNg)

- ▶ Enabling preservation in PLM systems
- ▶ <http://shaman-ip.eu/shaman/>
- ▶ Brunsmann, J. & Wilkes W. (2009). Enabling product design reuse by long-term preservation of engineering knowledge.
International Journal of Digital Curation, 4(3), 17-28.
<http://ijdc.net/ijdc/article/view/131>

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- ▶ Slide 8: Lian Ding.
- ▶ Slide 9: Images by Lian Ding.
- ▶ Slide 13: Tom Howard.

- ▶ KIM Project: Lian Ding, Manjula Patel, Jason Matthews, Chris McMahon, Glen Mullineux, and many others. . .
- ▶ ERIM Project: Mansur Darlington, Tom Howard, Chris McMahon, Steve Culley, Liz Lyon.



D | C | C

Because good research needs good data

Thank you for your attention

DCC Website: <http://www.dcc.ac.uk/>

Alex Ball: <http://www.ukoln.ac.uk/ukoln/staff/a.ball/>