DCC

Significant Properties of Digital Objects

The DCC SCARP Project

Digital working and disciplinary factors in the definition of context and significance.

Colin Neilson

UKOLN and DCC

University of Bath, UK

Funded by: JISC

Digital | Curation | Centre

Presentation Outline

- Purpose of the SCARP project
  - Background
  - Concepts and Approach
  - Activities to be undertaken
  - Deliverables
  - Expected Outcomes
- Domains of knowledge, disciplines, research fields
  - Factors in understanding the variety of curation practices
  - Researchers and Practitioners, Applied Research
  - Economic / Industrial sectors, Architecture as example

Presentation Objectives

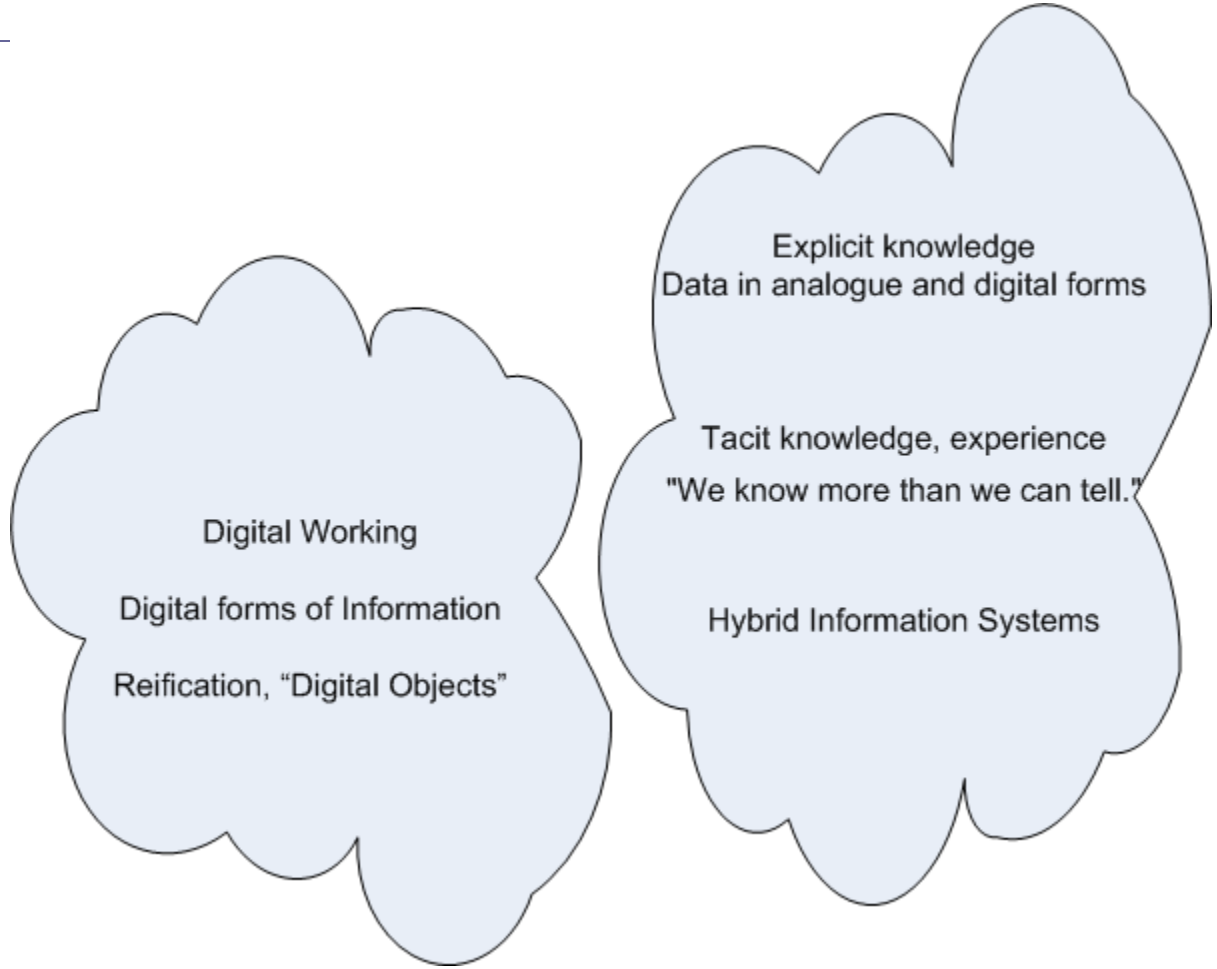
Some explanation of what digital curation is, understanding of limits and usefulness

Understanding of what SCARP is about, its relevance, why context or significance is important to understanding the disciplinary landscape for curation

Gain your interest and any comments, views

Disciplinary approaches to:

SHARING
CURATION
AND
RE-USE
PRESERVATION



Definition, what is meant

Digital Curation

- … “is maintaining and adding value to a trusted body of digital information for current and future use; specifically, we mean the active management and appraisal of data over the life-cycle of scholarly and scientific materials” — DCC website.
- Digital Working has a history of development in the 1940s, 1950s, 1960s and up to the current date that is prior to explicit understanding of the need for, or formalisation of, “digital curation”.
- The variety of digital curation practises found in different domains of knowledge, disciplines, research fields require some historical understanding of how digital working developed in each.

Main Challenge

How can digital curation practise be promoted in a way that is appropriate to the different research cultures in the distinct domains of knowledge?

Can we identify common factors to illuminate an understanding of a disciplinary landscape as a setting for development of digital curation taking into account the observed variability in adoption of digital working throughout the distinct fields.

About the SCARP project

- JISC project funded for two years (Staff in post from April 2007)
- Looking at approaches to data deposit, sharing and re-use, curation and preservation across domains of knowledge (including disciplinary based and applied research)
- Looking for, and applying, best practice
- Employs four researchers (University of Edinburgh, University of Bath, STFC Rutherford Appleton Laboratory)
- A Digital Curation Centre project building on previous case study work as part of ongoing phase two activities

Approach taken

- Case studies within specific fields (disciplines) in relation to data creation, sharing and reuse, long term data survival, deposit, preservation looking at current practice, beliefs and attitudes, opportunities for uptake of digital curation.
- Immersive approach will include working alongside researchers and practitioners to reflect participants view of their endeavours and curation needs
- Literature survey of existing work in each field relevant to digital curation including organisational and professional compliance, regulatory and policy documents. Not repeating work by previous JISC projects. Taking care to include the work of the professional bodies special to each field.
- Seeking to include science and engineering based industries where digital curation can make a critical difference to knowledge based economic activity.

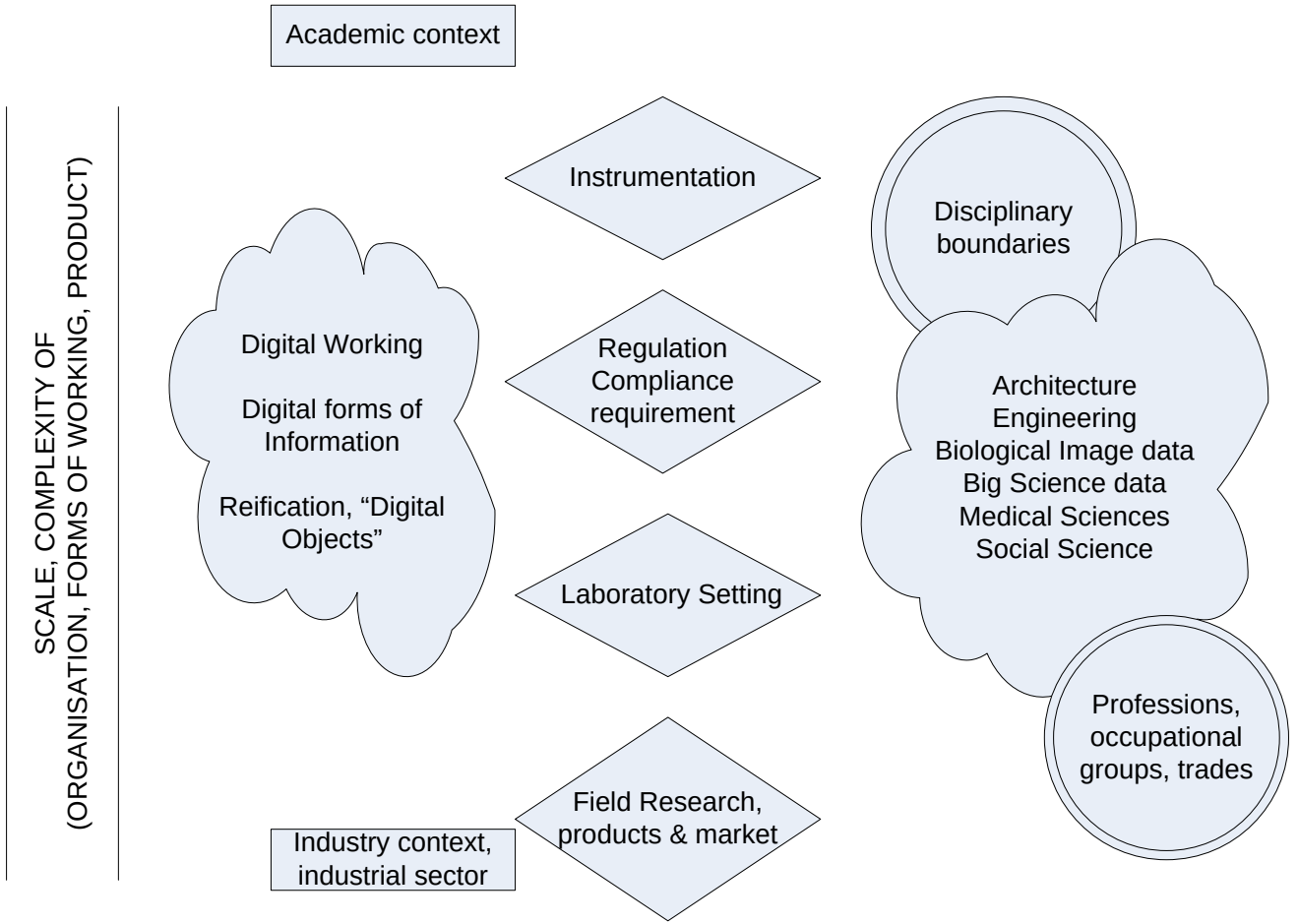
Deliverables

- Set of Case Studies : examples of digital curation practise and opportunities in each disciplinary area.
- Supporting landscape survey, literature review for each field.
- Final synthesising report : differences and common factors in explaining the variety of digital curation practises across disciplines. Any conclusions about approaches to development in each field.
- Plan to disseminate findings integrated with the work of the Digital Curation Centre, an “event” at the end of project such as a conference.

Activities in specific fields

- Architecture and Engineering
- Medical and Social Sciences
- Biology focusing on studies using biological images (“small science”)
- Scientific Data Sets and Archives, Rutherford Appleton Laboratory (“big science”)
- Currently list of 20 candidate case studies

Factors looked at by SCARP



Landscape

What is the disciplinary landscape for the Architecture profession?

- Architecture is inherently multi-disciplinary with the boundaries of architectural research based in Art, Design and Engineering disciplines with significant emphasis on practice-led research.
- Academic institutions within the UK have assessed architectural research as cognate with Built Environment; Art and Design; History of Art, Architecture and Design; Town and Country Planning
- The UK academic infrastructure (based on Edinburgh College of Art 2004 study by Jenkins, Forsyth and Smith) is based in 36 architecture schools with 18 in Universities established after 1992 (predominance of post-1992 universities). 17 schools are oriented to the visual arts, 13 to the built environment, 6 are social science humanities schools.

Architectural Research Outputs

- From 1996 to 2005 there were 81 Architecture PhDs awarded in UK
- In the period 1998 to 2006 there were 666 projects funded by the AHRC/AHRB research council in areas that include the practice of Art, Design or Architecture (total value of about 28 million pounds with average award value of 43,154 pounds)

SOURCE: Practice-Led Research in Art, Design and Architecture by Rust, Mottram and Till, 2007)

Practice-Led Research in Art, Design and Architecture by Chris Rust et al , Nov. 2007

… ADA subjects suffer from a lack of the kind of scholarly publishing infrastructure that is taken for granted in most disciplines and this is very clear from the RAE 2001 data for three “synthetic” disciplines:

Refereed Journal Outputs in RAE 2001

General Engineering	Built Environment	Art & Design
93%	**60%**	**9%**

This situation is underscored by analysis of journal articles submitted in Art and Design --- 820 papers were submitted from almost 500 journals. In one way this underscores

the interdisciplinarity of the research …

… Art and Design academics, and those Architects who seek to develop practice-led research, are not in control of their own destiny, especially as the gatekeepers for other forms of output --- exhibitions, products in manufacture, buildings etc --- are rarely motivated by research criteria.

Architecture Digital Working

- Schools of Architecture world-wide have adopted digital working (at various levels of maturity)
- Students create and submit work digitally including analyses of building and design projects, modelling exemplars and creating portfolio of work in digital form
- Teachers have developed learning materials, tutorials, presentations, case studies in digital forms. They use digital media labs for research and teaching.
- How can this output be measured, cited, shared and re-used as digital learning content beyond institutional boundaries?

Federated Digital Repositories for Architecture and Design

Example:

MACE (Metadata for Architectural Content in Europe)

http://www.mace-project.eu/

- European Union eContent+ programme project
- Aim: To create a common infrastructure for enriching and retrieving educational content about architecture in Europe
- Method: provide federated searching of existing repositories through enriched learning object descriptions (uses Open Archive Initiative Protocol for Managing Harvesting, OAI-PMH interface)
- Target Users: Academic schools of Architecture, students, teachers and researchers, Professional Architects, Architectural companies

Content Partners:

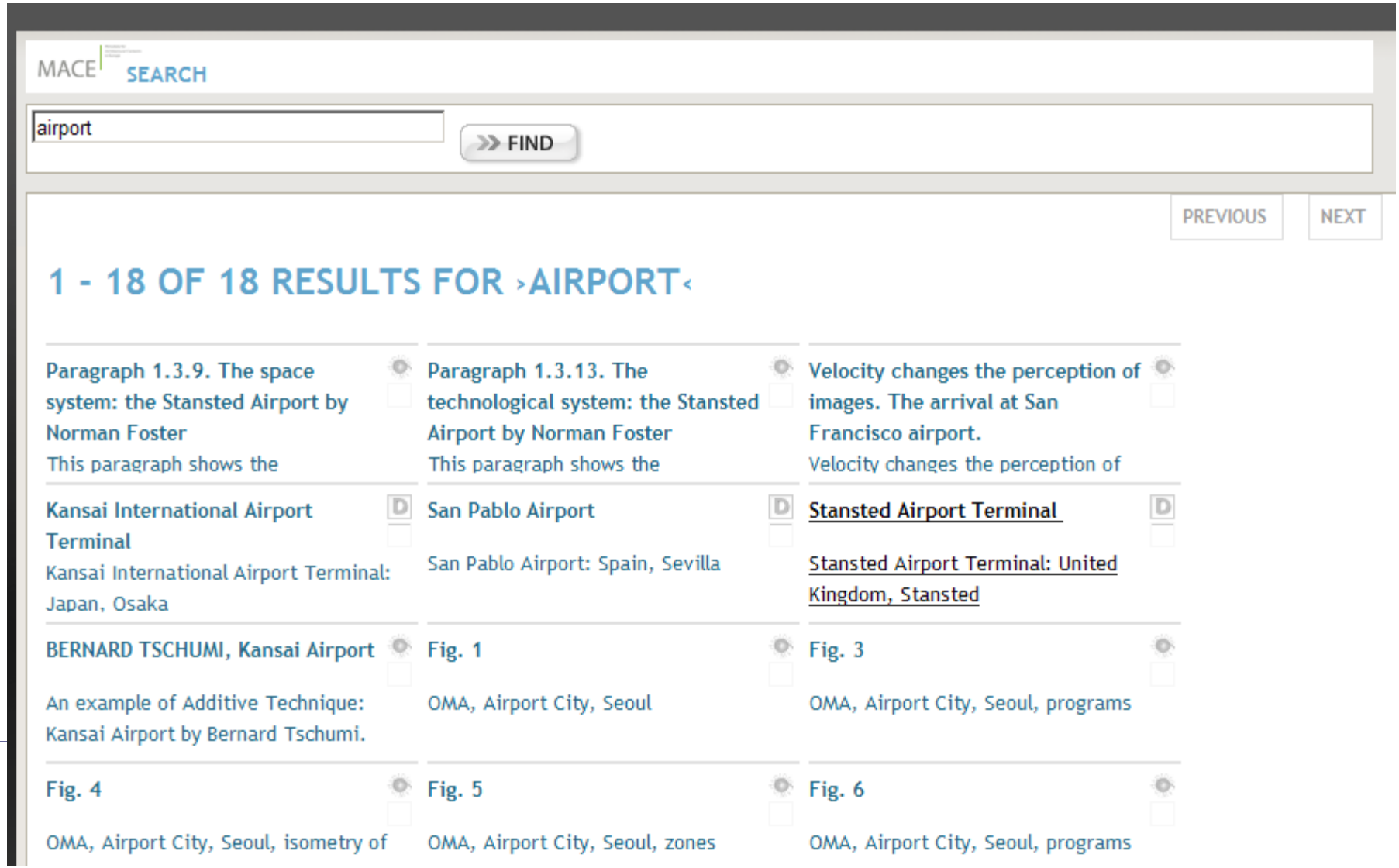
- University of Venice, Italy
- University of Milano, Italy
- University of Acaona, Italy
- University of Terrassa, Spain
- Fraunhofer IRB, Stuttgart Germany
- Department of Architecture at KU Leuven/EAAE, Belgium

MACE repositories
Architecture digital content

- Started with 35,000 structured pieces of digital information

Archive	Partners	# Objects	# Metadata	Metadata level
WINDS	IUAV, UPC, POLIMI	5529 compound objects, 10542 single content blocks (text, image, multi-media)	1744 index terms (text)	3521 of 5529 objects enriched with content metadata
ARIADNE	KUL	5000+ objects, of which several hundreds can be used for MACE	technical metadata, keywords, annotations	almost all objects have mandatory technical metadata, some content metadata, no context and a few social metadata
DYNAMO	EAAE	623 architecture projects, 9387files (text, image)	2222 index terms (text)	High level of content metadata
MONUDOC	IRB	15,000 Facts and Literature Reference covering preservation of monuments and historic buildings	bibliographic description, Index terms, classification	All units with classification, bibliographic data and index terms based on intellectual indexing
BAUFO	IRB	13,000 descriptions of building research projects	Index terms, classification	All units with classification and index terms from intellectual indexing

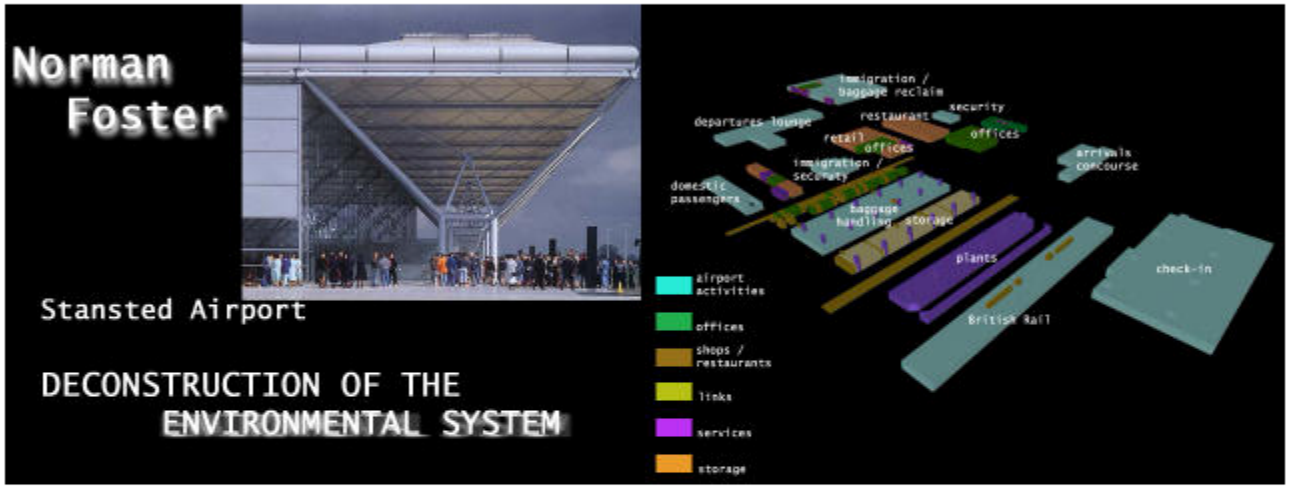
Example MACE search



Paragraph 1.3.9 . The space system : the Stansted Airport by Norman Foster

Introduction

This paragraph shows the deconstruction of the space system of the Stansted Airport by Norman Foster .



Fact

Example

< *http://dpce.ing.unipa.it/winds/pub/foster_stansted_envdec.avi*>
<*http://dpce.ing.unipa.it/winds/pub/wrl/foster_stansted_envdec.wrl*>
Deconstruction of the Stansted Airport by Norman Foster : the *environmental system*

It is necessary to install the DivX 4.0 codec in order to view the animations . It is available at the following location :
< *http://dpce.ing.unipa.it/winds/pub/software/DivX4CodecInstaller.exe*>

It is necessary to install a VRML viewer in order to use the VRML models . The Cosmo viewer is available at the following location :
< *http://dpce.ing.unipa.it/winds/pub/software/cosmo_win95nt_eng.exe*>

Please notice that the available applications (codec + viewer) are Windows (TM) binaries .

<

Why Architecture matters

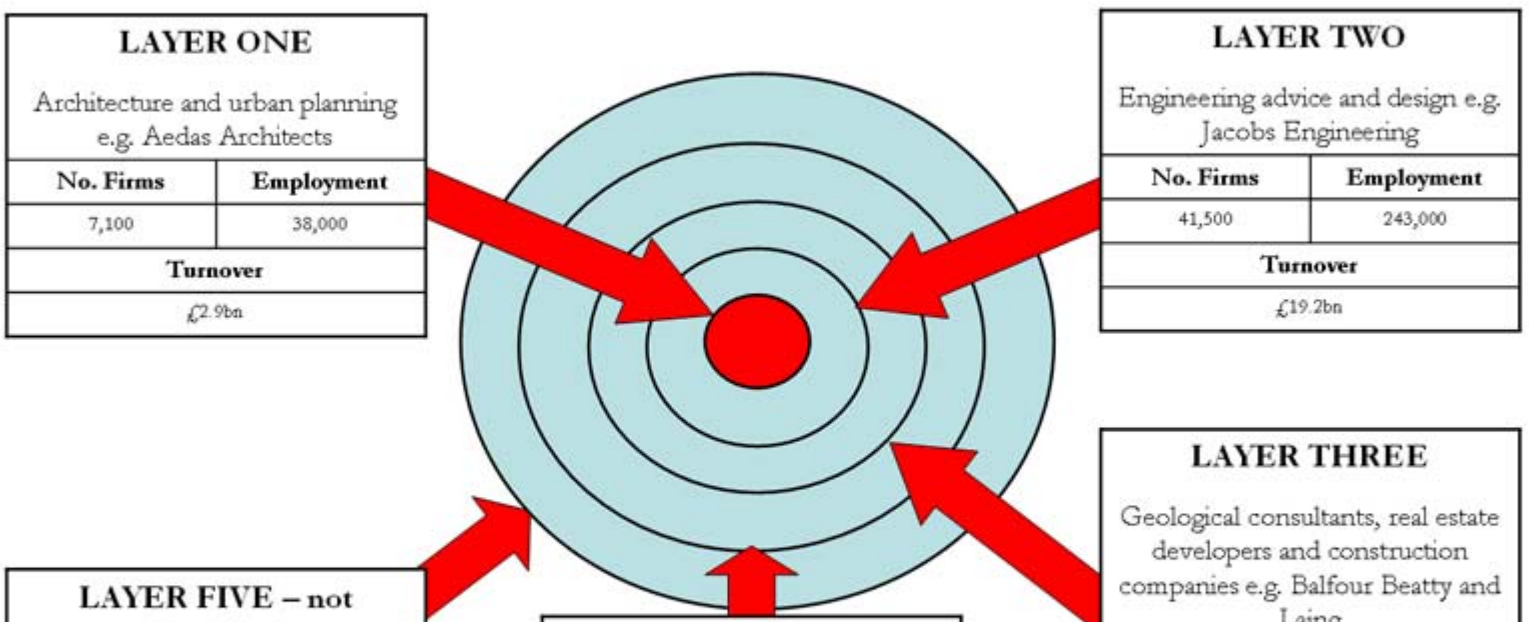
INDUSTRY STRUCTURE

- Department for Culture Media and Sport (DCMS) defines the Creative industries as: advertising; architecture; art and antiques; craft; design; designer fashion; film and video; interactive leisure software; music; performing arts, publishing; software; television and radio.
- The Architecture industry is one of the smallest of the Creative Industries employing 38,000 or 5% of all Creative Industry employees in 2005
- It had the fourth smallest turnover out of the Creative Industries (2.9 billion pounds or 3% of the Creative Industry turnover in 2005)
- There are 7100 firms in the Architectural industry with 1000 firms accounting for 80% of turnover (top 8 firms generate 20% of turnover)

SOURCE: Creative Industry performance : a statistical analysis for the DCMS.

Frontier Economics Ltd, London

The Architecture supply chain



LAYER ONE

Architecture and urban planning e.g. Aedas Architects

No. Firms	Employment
7,100	38,000
Turnover	
£2.9bn	

LAYER TWO

Engineering advice and design e.g. Jacobs Engineering

No. Firms	Employment
41,500	243,000
Turnover	
£19.2bn	

LAYER THREE

Geological consultants, real estate developers and construction companies e.g. Balfour Beatty and Laing

No. Firms	Employment
5,600	46,000
Turnover	
£6.6bn	

LAYER FOUR

Construction material wholesalers, quantity surveyors and building finishers e.g. Tyco Fire Solutions

No. Firms	Employment
16,500	167,000
Turnover	
£27.6	

LAYER FIVE – not identified

52 Frontier Economics | 31 March 2008

Centre

Tools supporting digital working

- Many of the software systems used in the Architectural supply chain are commercially driven and use proprietary formats with trade secret approaches to algorithms. This creates barriers to the use of techniques such as geometrical modelling in Computer-Aided Design (CAD) and Computer-Aided Manufacturing (CAM) when applied through the parties working in the supply chain. Communicating and providing for the long term survival of digital assets is made more difficult.
- The concept of Product Lifecycle Management (PLM) systems is to provide for long term survival of product information in forms that permit use and re-use throughout the whole life of the product.
- The development of Building Information Management (BIM) models in sectors like the Construction Industry requires the delivery of the digital assets in an organised usable form over the life of the design and construction into the use of the built structure during its lifetime by the owner.
- Software tools such as CATIA (Computer Aided Three Dimensional Interactive Application) developed by French company Dassault Systemes, have moved between industrial sectors (e.g. from aircraft manufacturer to construction sectors) producing new possibilities of forms of architectural design through digital working methods.

dte
Desktop Engineering

Tel: +44 (0)1993 883555
Email: info@dte.co.uk

Home | Solutions | Products | Services | Company Profile | Case Studies | Contact us | News

- Newtecnic
- SPC Design
- Panorama Group
- Allies & Morrison Architects
- Space Cryomagnetics
- FBM Marine
- PDE Geesink
- Cambridge University
- London Taxis (LTI)
- Prodrive
- GKN Westland Design Services
- SOM
- Frank O. Gehry & Associates, Inc.

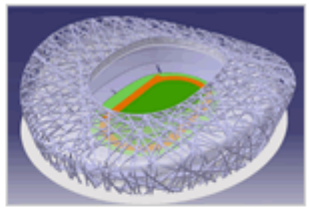
Arup

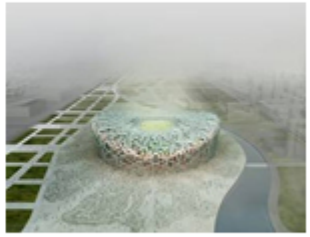
Arup harnesses aerospace software for stadia design

Advanced aerospace software is being used to help design the dramatic Beijing Olympic stadium in a virtual 3D world. Design consultant, ArupSport* , has applied the software to help solve the stadium's complex geometric form.

It is understood this is the first time aerospace software has been applied to such a large and complex building engineering project, thus transferring highly developed digital technology from the aerospace industry to the construction sector.

The software programme being applied to the development of Beijing stadium is called CATIA - a programme well known in the aerospace and automotive sector for its ability to solve complex geometrical problems in an accurate and user-friendly way. ArupSport used CATIA Generative Shape Design and





Curation at what cost?

What is the economic value of digital curation in different fields?

How do industrial world cases compare with academically based research cases?

Example: US Capital Facilities Industries (Construction Industries)

US Dept. of Commerce NIST report calculated costs of inadequate inter-operability of $15 billion per year (In 2002 about $374 billion spent on new construction on capital facilities)

Interoperability

TABLE FROM: Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry / Michael P. Gallaher et al. U.S. Department of Commerce

Table ES-2. Costs of Inadequate Interoperability by Stakeholder Group, by Life-Cycle Phase (in $Millions)

Stakeholder Group	Planning, Design, and Engineering, Phase	Construction Phase	Operations and Maintenance Phase	Total
Architects and Engineers	1,007.2	147.0	15.7	1,169.8
General Contractors	485.9	1,265.3	50.4	1,801.6
Specialty Fabricators and Suppliers	442.4	1,762.2	—	2,204.6
Owners and Operators	722.8	898.0	9,027.2	10,648.0
Total	**2,658.3**	**4,072.4**	**9,093.3**	**15,824.0**

Source: RTI estimates. Sums may not add to totals due to independent rounding.

Lightweight representation in Product Lifecycle Management (PLM)

Example of a curation approach to problems of Interoperability

Worked on by Colleagues Alex Ball and Manjula Patel of UKOLN and researchers at the Engineering and Physical Sciences Research Council (EPSRC) Innovative Design & Manufacturing Research Centre at the University of Bath

The aim is to support the different kinds of users at the different stages of the product lifecyle through lightweight representation.

Risk of loss of information in “lightweight” representation

- The “lightweight” is derived from 1) compaction of image data through for instance domain-specific compression or by use of open graphics compaction algorithms 2) integrating markup languages for cross-platform support and integration of added information significant to the different stages of the product lifecyle.
- There is a requirement for multi-views of the product information since at each stage of the lifecyle different aspects of the information is significant for the different users e.g. manufacturers view different to marketing staff.
- Persistent representation information registry/repository to store the information needed to decide which formats and views of information would be most suitable for particular users and purpose and which tools to used for different types of processing.
- The definition of significance is not simply in relation to a type of digital object but is in relation to the stage in product information lifecycle and to the role of the designated user who wants to view information.

Conclusions

- The disciplinary context and structure of industrial sector is crucial to understanding how digital working has developed to generate forms of digital information and realised “digital objects”.
- The significant characteristics of digital objects are defined by the use to be made at each stage of lifecycle for which the object was created. Significance needs to include the different perspectives (roles) of the different designated users.
- Techniques of digital curation can be used to produce added value, including economic value, for bodies of digital assets.

DCC

http://www.dcc.ac.uk/scarp

Colin Neilson
UKOLN, University of Bath
c.neilson@ukoln.ac.uk
http://www.ukoln.ac.uk

Sources and References

- DCC web site http://www.dcc.ac.uk
- Research in UK architecture schools – an institutional perspective**.** Paul Jenkins, Leslie Forsyth and Harry Smith*. A*rchitectural Research Quarterly. vol 9 . no 1 . 2005 http://journals.cambridge.org/download.php?file=%2FARQ%2FARQ9_01%2FS1359135505000060a.pdf&code=3187eafcce1275cca8274c4fdfabca59
- RUST, C., MOTTRAM, J. and TILL, J., 2007. AHRC research review: practice-led research in art, design and architecture [online]. London : Arts and Humanities Research Council. http://www.ahrc.ac.uk/apply/research/sfi/ahrcsi/research_reviews.asp
- MACE project web site http://www.mace-project.eu
- Cost Analysis of Inadequate Interoperability in the U.S. Capital Facilities Industry / Michael P. Gallaher et al U.S. Department of Commerce Technology Administration. National Institute of Standards and Technology http://www.bfrl.nist.gov/oae/publications/gcrs/04867.pdf
- Creative Economy Programme, CEP Evidence Publication 2007. http://headshift.com/dcms/index.cfm?fuseaction=main.viewBlogEntry&intMTEntryID=3104
- Product Representation in lightweight formats for product lifecycle management (PLM). Lian Dian, Alex Ball, Jason Matthews et al. http://www.ukoln.ac.uk/projects/grand-challenge/papers/DET2007_Ding_Paper.pdf