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CSIC Cambridge Centre for Smart Infrastructure and Construction

EPSRC Engineering and Physical Sciences Research Council

Innovate UK Technology Strategy Board

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Agenda

- Project overview
- Problems leading to information loss
- Defining info futureproofing
- Information futureproofing approach
- Case studies

Project Overview

- **Aim:**
  - the 'what, why and how' of *information futureproofing*.
- **Challenges** of information loss in longer term:
  - Longer infrastructure lifecycles but shorter lifecycles of IT
  - Information is lost due to technological and organisational changes in longer term
  - Where information is retained for long term, it might not be retrievable or reusable
- **Methodology:** literature analysis, industrial workshops, interviews, case studies
- Intended **Outputs**: an assessment tool, publications

Information loss issues

Unreliable old information from unknown resources

Information loss due to various file formats used

Hardware and technology failures leading to information loss

Multi-stakeholder nature of the infrastructure projects

Longer infrastructure life cycle and rapid technological changes

Current Practice in Infrastructure Domain

RIBA Plan of Work 2013

RIBA

The RIBA Plan of Work 2013 organises the process of briefing, designing, constructing, maintaining, operating and using building projects into a number of key stages. The content of stages may vary or overlap to suit specific project requirements. The RIBA Plan of Work 2013 should be used solely as guidance for the preparation of detailed professional services contracts and building contracts.

www.ribaplanofwork.com

Tasks / Stages	0 Strategic Definition	1 Preparation and Brief	2 Concept Design	3 Developed Design	4 Technical Design	5 Construction	6 Handover and Close Out	7 In Use
Core Objectives	Identify client's **Business Case** and **Strategic Brief** and other core project requirements.	Develop **Project Objectives**, including **Quality Objectives** and **Project Outcomes**, **Sustainability Aspirations**, **Project Budget**, other parameters or constraints and develop **Initial Project Brief**. Undertake **Feasibility Studies** and review of **Site Information**.	Prepare **Concept Design**, including outline proposals for structural design, building services systems, outline specifications and preliminary **Cost Information** along with relevant **Project Strategies** in accordance with **Design Programme**. Agree alterations to brief and issue **Final Project Brief**.	Prepare **Developed Design**, including coordinated and updated proposals for structural design, building services systems, outline specifications, **Cost Information** and **Project Strategies** in accordance with **Design Programme**.	Prepare **Technical Design** in accordance with **Design Responsibility Matrix** and **Project Strategies** to include all architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with **Design Programme**.	Offsite manufacturing and onsite **Construction** in accordance with **Construction Programme** and resolution of **Design Queries** from site as they arise.	Handover of building and conclusion of **Building Contract**.	Undertake **In Use** services in accordance with **Schedule of Services**.
Procurement *Variable task bar	Initial considerations for assembling the project team.	Prepare **Project Roles Table** and **Contractual Tree** and continue assembling the project team.	The procurement strategy does not fundamentally alter the progression of the design or the level of detail prepared at a given stage. However, **Information Exchanges** will vary depending on the selected procurement route and **Building Contract**. A bespoke **RIBA Plan of Work 2013** will set out the specific tendering and procurement activities that will occur at each stage in relation to the chosen procurement route.			Administration of **Contract**, inclu… site inspections … of progress.		
Programme *Variable task bar	Establish **Project Programme**.	Review **Project Programme**.	Review **Project Programme**.	The procurement route may dictate the **Project Programme** and may result … stages overlapping or being undertaken concurrently. A bespoke **RIBA Plan … 2013** will clarify the stage overlaps. The **Project Programme** will set o… the specific stage dates and detailed programme durations.				
(Town) Planning *Variable task bar	Pre-application discussions.	Pre-application discussions.	Planning applications are typically made using the Stage 3 output. A bespoke **RIBA Plan of Work 2013** will identify when the planning application is to be made.					
Suggested Key Support Tasks	Review **Feedback** from previous projects.	Prepare **Handover Strategy** and **Risk Assessments**. Agree **Schedule of Services**, **Design Responsibility Matrix** and **Information Exchanges** and prepare **Project Execution Plan** including **Technology** and **Communication Strategies** and consideration of **Common Standards** to be used.	Prepare **Sustainability Strategy**, **Maintenance and Operational Strategy** and review **Handover Strategy** and **Risk Assessments**. Undertake third party consultations as required and any **Research and Development** aspects. Review and update **Project Execution Plan**. Consider **Construction Strategy**, including offsite fabrication, and develop **Health and Safety Strategy**.	Review and update **Sustainability, Maintenance and Operational** and **Handover Strategies** and **Risk Assessments**. Undertake third party consultations as required and conclude **Research and Development** aspects. Review and update **Project Execution Plan**, including **Change Control Procedures**. Review and update **Construction** and **Health and Safety Strategies**.	Review and update **Sustainability, Maintenance and Operational** and **Handover Strategies** and **Risk Assessments**. Prepare and submit Building Regulations submission and any other third party submissions requiring consent. Review and update **Project Execution Plan**. Review **Construction Strategy**, including sequencing, and update **Health and Safety Strategy**.	Review and upd… **Sustainability S…** and implement … **Strategy**, includi… of information re… commissioning, … handover, asset … future monitoring … maintenance an… compilation of '**A… constructed' In…** Update **Constru… Health and Safe…**		
Sustainability Checkpoints	**Sustainability Checkpoint – 0**	**Sustainability Checkpoint – 1**	**Sustainability Checkpoint – 2**	**Sustainability Checkpoint – 3**	**Sustainability Checkpoint – 4**	**Sustainability Checkpoint – …**		
Information Exchanges (at stage completion)	**Strategic Brief**.	**Initial Project Brief**.	**Concept Design** including outline structural and building services design, associated **Project Strategies**, preliminary **Cost Information** and **Final Project Brief**.	**Developed Design**, including the coordinated architectural, structural and building services design and updated **Cost Information**.	Completed **Technical Design** of the project.	**'As-constructe… Information**.		
UK Government Information Exchanges	Not required.	Required.	Required.	Required.	Not required.	Not required.		

*Variable task bar – In creating a bespoke project or practice specific RIBA Plan of Work 2013 via www.ribaplanofwork.com a specific bar is selected from a number of options.

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Typical delivery of information in handover phase

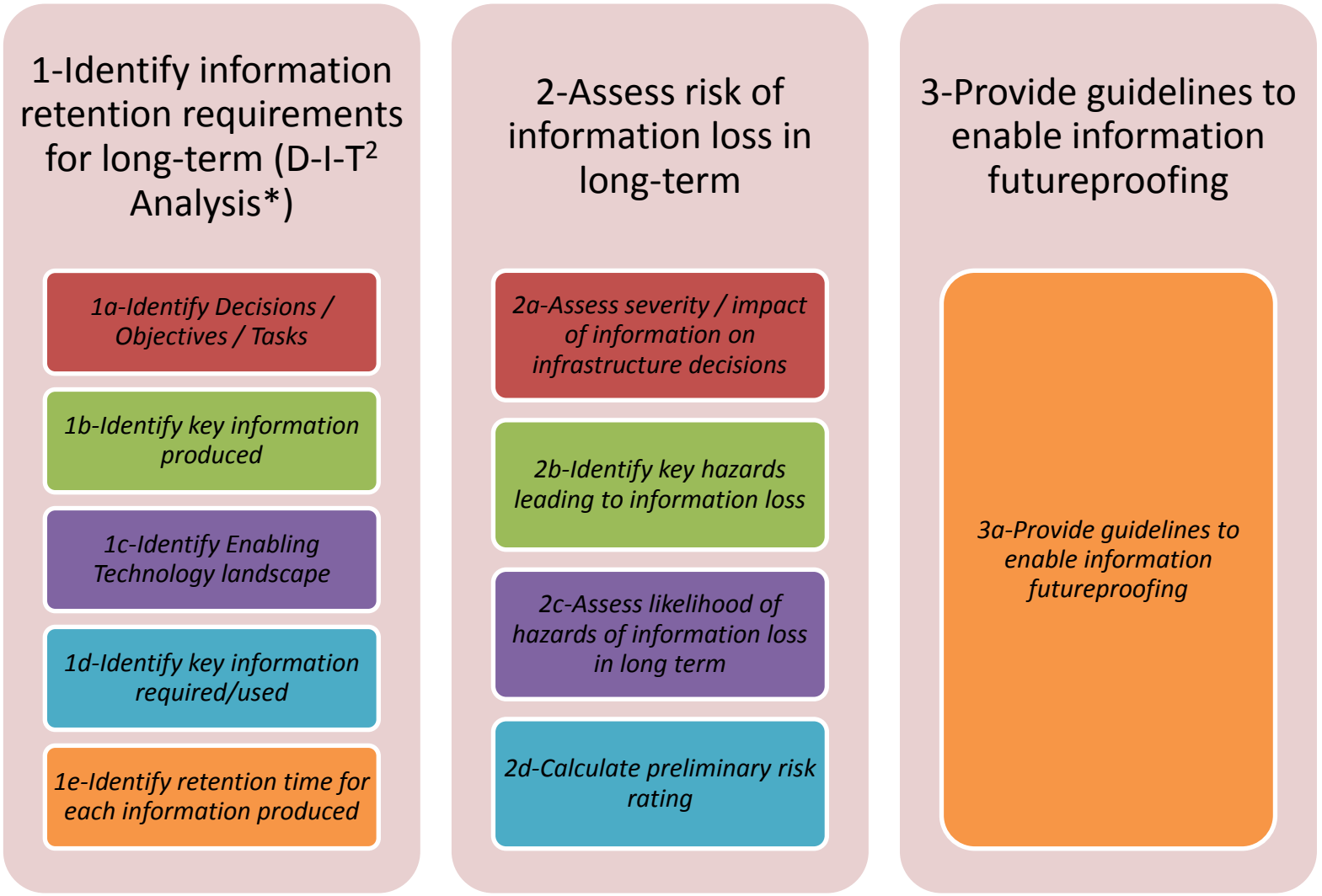
What is Information Futureproofing?

«The process to select or identify technologies and services that would enable long term storage and retrieval of infrastructure information.» *(Masood et al 2013).*

Key characteristics:
To make better decisions for futureproofing infrastructure, information which has ***key characteristics,*** should be available in the ***long term***.

5-The information can be used for different purposes beyond its creation purpose.
4-Once the information is created, it can be used multiple times.
3-The information is searchable.
2-The information is stored in a place and can be opened .
1-The information is available, and stored somewhere.

Information Futureproofing Approach

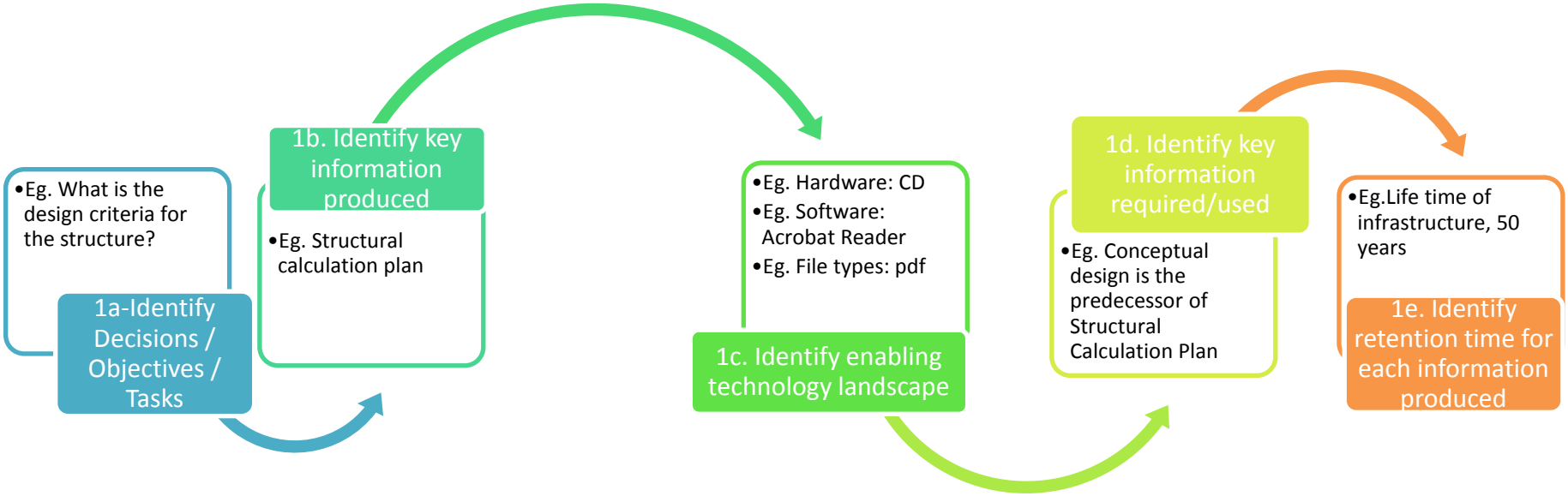


* D-I-T² Analysis = Decision – Information – Technology – Time Analysis

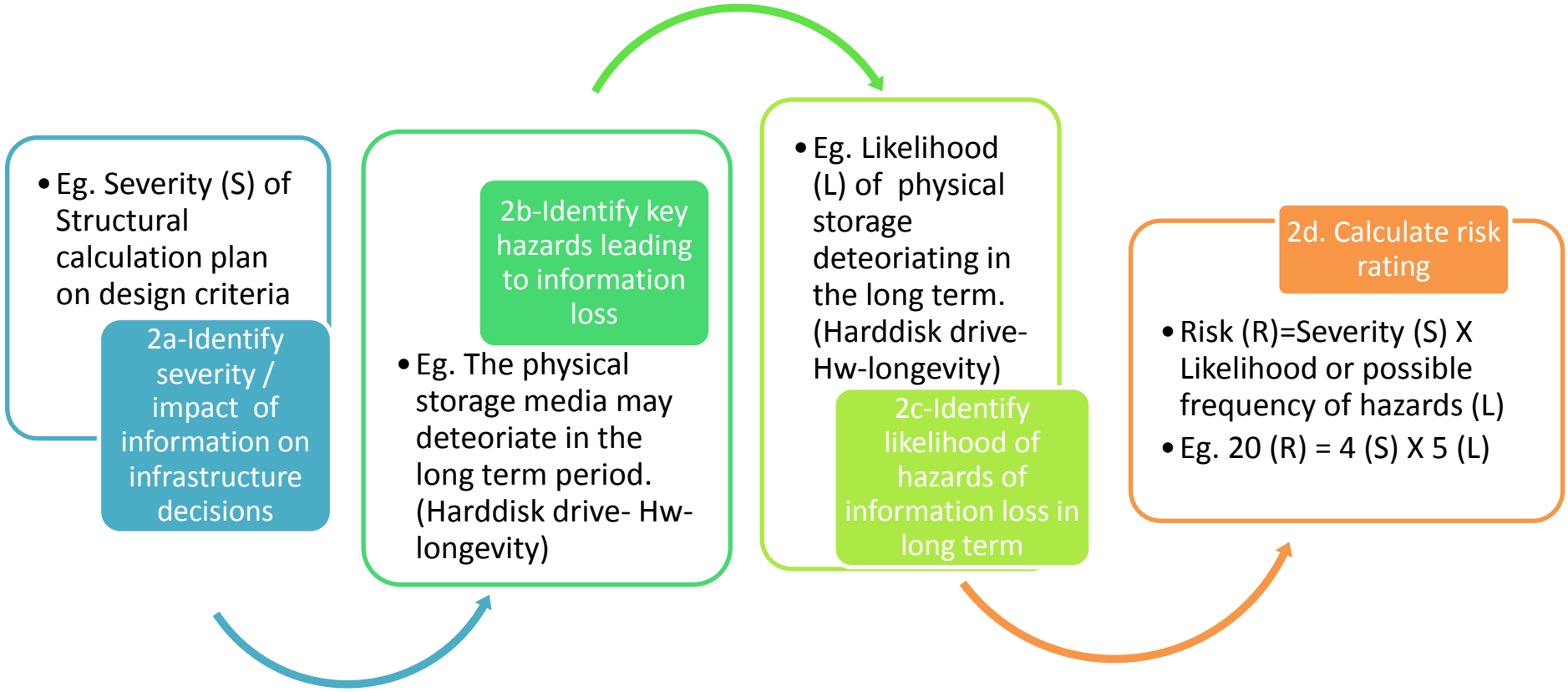
Stage 1: Identify Information Retention Requirements

Decision – Information – Technology – Time (DIT^2) Map										
S. No.	Infrastructure Decisions / Objectives / Tasks	Information produced	Severity / impact of information loss (1-5)*	Documentation / database	Enabling technology			Predecessors	Keep for (years)	Used when
					Software application	File format	Storage media			
1.										
..										
n.										

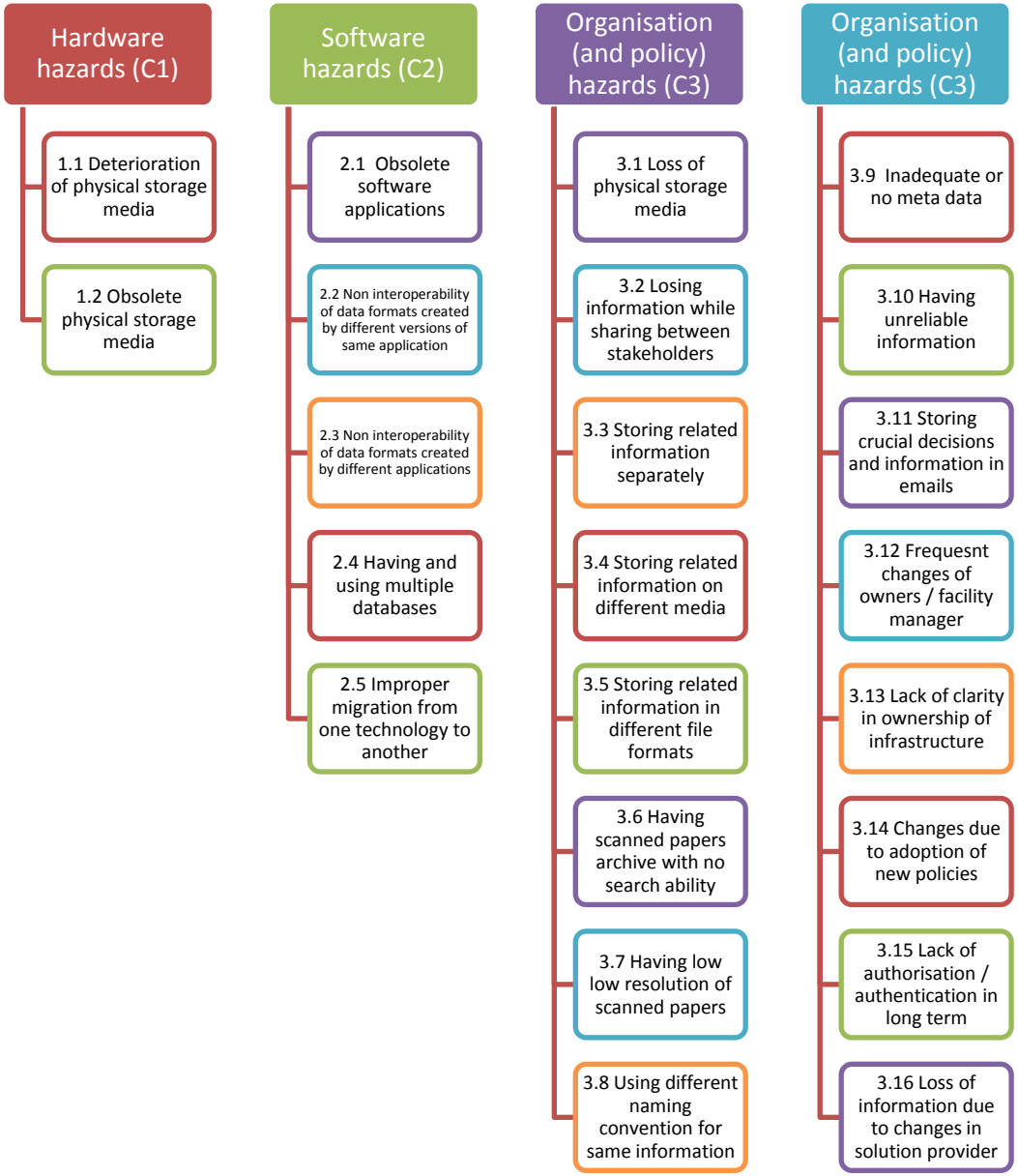
*Severity column is related to risk assessment



Stage 2: Assess Risk of Information Loss



Information Futureproofing Hazards



Risk Rating Matrix and Definitions

Likelihood	Information loss requiring minor internal intervention e.g. to find information from other sources (1)	Information loss requiring internal intervention e.g. spending additional time to regenerate information from other sources (2)	Information loss requiring external interventions e.g. surveying to regenerate information (4)	Cant regenerate information, too costly or regenration will take too long (8)	Information loss resulting in bridge or structure collapse, ending the project/contract, and bringing bad repute to the project (16)
Will invariably happen - could occur repeatedly (5)	5	10	20	40	80
Highly probable - could occur several times (4)	4	8	16	32	64
Possible- could occur sometime (3)	3	6	12	24	48
Possible, might happen though unlikely (2)	2	4	8	16	32
Remote possibility/negligible (1)	1	2	4	8	16

Severe	The consequences will have a severe impact on the decision/objective/task and comprehensive management action is required immediately.
Significant	The consequences of the risk would be significant, but not severe. Some immediate action is required plus the development of an appropriate action plan.
Moderate	Consequences of the risk are not significant and can be managed through contingency plans. Action plans can be developed later to address the risk.
Minor	Consequences of the risk are considered relatively unimportant. The status of the risk should be reviewed periodically.

Stage 3: Provide Guidelines to Mitigate Risk

- Techological solutions
  - Hardware e.g. Backup solutions (Networked backup, Cloud based backup)
  - Software e.g. Using interoperable data file formats (XML)
  - Standards e.g. CoBie, IFC
- Organizational solutions
  - Standards e.g. Building Information Modelling (BIM)
  - Information futureproofing strategy e.g. Backup strategy, Data migration strategy
  - Roles, responsibilities, skills

Information futureproofing case studies

Hertfordshire County Council
Information map and risk assessment for existing bridges and structures

Crossrail
Information map for new underground rail infrastructure

London Underground
Identification of hazards of information loss for existing underground rail infrastructure

Institute for Manufacturing
Information map and risk assessment for Alan Reece building

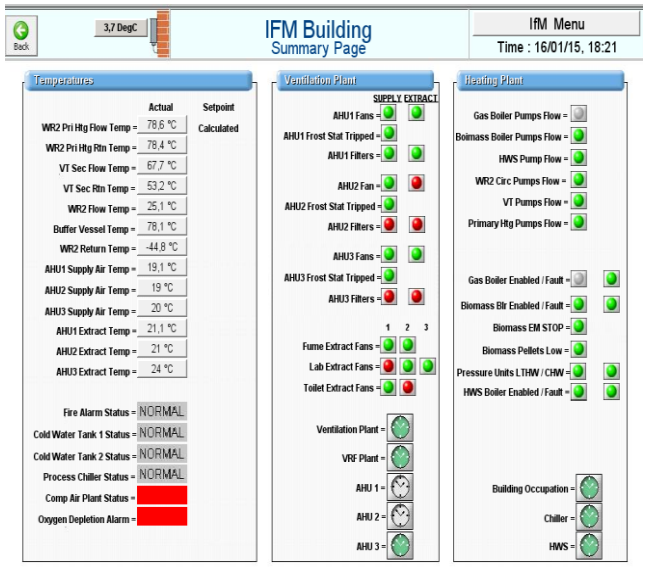
Cambridge Institute for Manufacturing Building – Info futureproofing assessment case study 1

The building we are in!

Case Study - University of Cambridge,IfM

Roles	Company
Client	Institute for Manufacturing (Department of Engineering-Div. E)
Client Representative	Estate Management
Employer's Agent/Project Manager	Hannah Reed & Associates
Architect	Arup Associates
Structural Engineer	Arup Associates
Services Engineer	Arup Associates
Quantity Surveyors	Davis Langdon & Everest
CDM Co-ordinator	Hannah Reed & Associates
Principal Contractor	Marriott Construction
M&E Components Contractor	CRC
Authority Planning	Cambridge City Council
Building Control	Cambridge City Building Control Services

Stage 1: Information kept in IfM



Company	Contact Details	Equipment	Location in Building	Service Contract
CRC Beacon Controls	Steve Poole Ian Johnson 07828002928	Control System (for what?)	Building Plant Room Inner Roof	Yes EMBS 2 Visits
CRC Flow Mech	Steve Poole	Water Booster Set?	Plant Room	Yes EMBS 1 Visit
CRC Rural Energy	Steve Poole Howard Towns 01664 454989	Bio Mass Boiler	Plant Room	Yes EMBS 2 Visits
CRC Ciat	Steve Poole	Dry Cooler	Plant Room Inner Roof	Yes EMBS 2 Visits
CRC Arrow Valves	Steve Poole	RPZ Pressurisation units	Plant Room	Yes EMBS 1 Visit
CRC - RS Air Conditioning	Steve Poole	VRF Plant (Water side of the Air-conditioning)	Plant Room Inner Roof Outer Roof	Yes EMBS 2 Visits
Rodol Limited	Keith Millard	Closed Captive Water System	Plant Room	Yes EMBS 1 Visit

Handover Information

Handover information is being kept in 3 CDs and composed of equipment manuals, drawings, Health and Safety (H&S) Files, and Operation and Maintenance (O&M) Manuals.

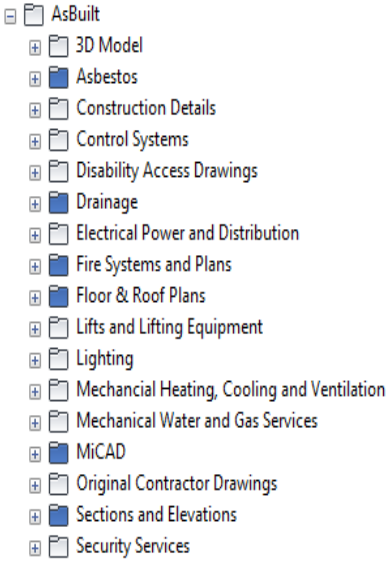
Building Management System

Data is collected from sensors which are specific to critical assets and summarized in BMS. It is being used to to control if assests are working properly.

Service Activities

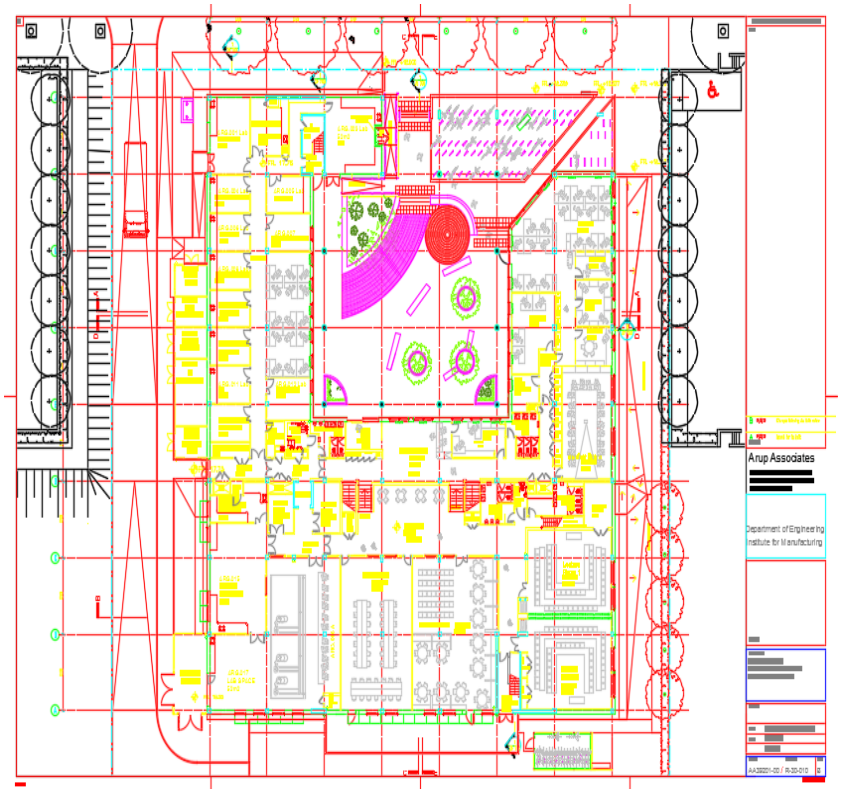
Planned maintenance activities are in «Service activities document» and reactive maintenance is in Evernote.

Information kept in Estate Management



File structure of each building in Autodesk Vault
3D drawings are being kept inthe Autodesk Vault. It has version control.

Buzzsaw is the project collaboration tool and is the mirror image of the Vault. It is used for data retrieving from different applications i.e. hand held devices



IfM Architectural General Arrangement Ground Floor Plan
Autocad Drawing in .dwg format. It is both in handover information in IfM and Autodesk Vault in Estate Management

Information kept in Estate Management

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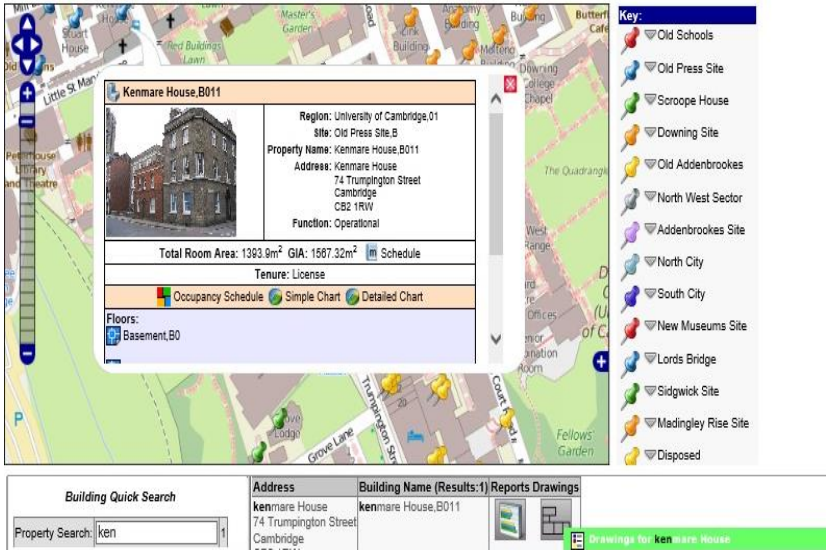


	Floor	Room	Asset	Description	Type	Serial No.	Active	Created	Description
19			17427	UL263 Independent Lift	LIFT		Yes	12/01/2010	LIFT MAINTENANCE / LIFT MAINTENANCE
20			17427	UL263 Independent Lift	LIFT		Yes	05/08/2010	LIFT MAINTENANCE / LIFT MAINTENANCE
21			17427	UL263 Independent Lift	LIFT		Yes	29/07/2011	LIFT MAINTENANCE / LIFT MAINTENANCE
22			17427	UL263 Independent Lift	LIFT		Yes	10/08/2012	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
23			17427	UL263 Independent Lift	LIFT		Yes	05/08/2013	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
24			17427	UL263 Independent Lift	LIFT		Yes	21/11/2013	Lights in lift
25			17427	UL263 Independent Lift	LIFT		Yes	09/12/2013	Fix lift after entrapment
26			17427	UL263 Independent Lift	LIFT		Yes	21/03/2014	LIFT STUCK
27			17427	UL263 Independent Lift	LIFT		Yes	07/04/2014	CHECK LIFT
28			17427	UL263 Independent Lift	LIFT		Yes	04/08/2014	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
29			17427	UL263 Independent Lift	LIFT		Yes	29/08/2014	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
30			17427	UL263 Independent Lift	LIFT		Yes	08/10/2014	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
31			17427	UL263 Independent Lift	LIFT		Yes	05/01/2015	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
32			17427	UL263 Independent Lift	LIFT		Yes	07/01/2015	Condition Survey
33			17427	UL263 Independent Lift	LIFT		Yes	02/02/2015	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
34			17427	UL263 Independent Lift	LIFT		Yes	19/02/2015	Omnicare alarm system in fault - UL263
35			17427	UL263 Independent Lift	LIFT		Yes	02/03/2015	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
36			17427	UL263 Independent Lift	LIFT		Yes	31/03/2015	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
37			17427	UL263 Independent Lift	LIFT		Yes	05/05/2015	LIFT MAINTENANCE UL263 / LIFT MAINTENANCE
38			18543	PIB 1170054	FIRE - PIB	CAT 2 (L)	Yes		

Micad Space Management system

It keeps the information about Location of the building, Space usage information, Building Condition survey reports, Asbestos management information

O&M activities kept in the Planet Asset Management System

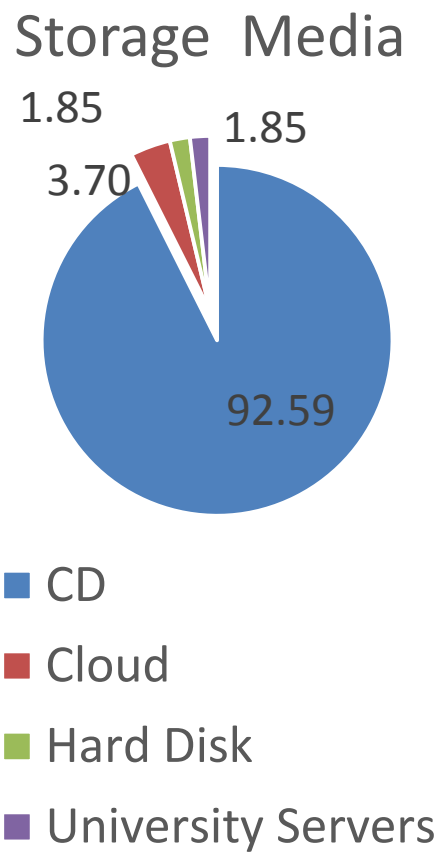
It does not have the detailed description of maintenance
work. Thus, asset maintenance history cannot be tracked.

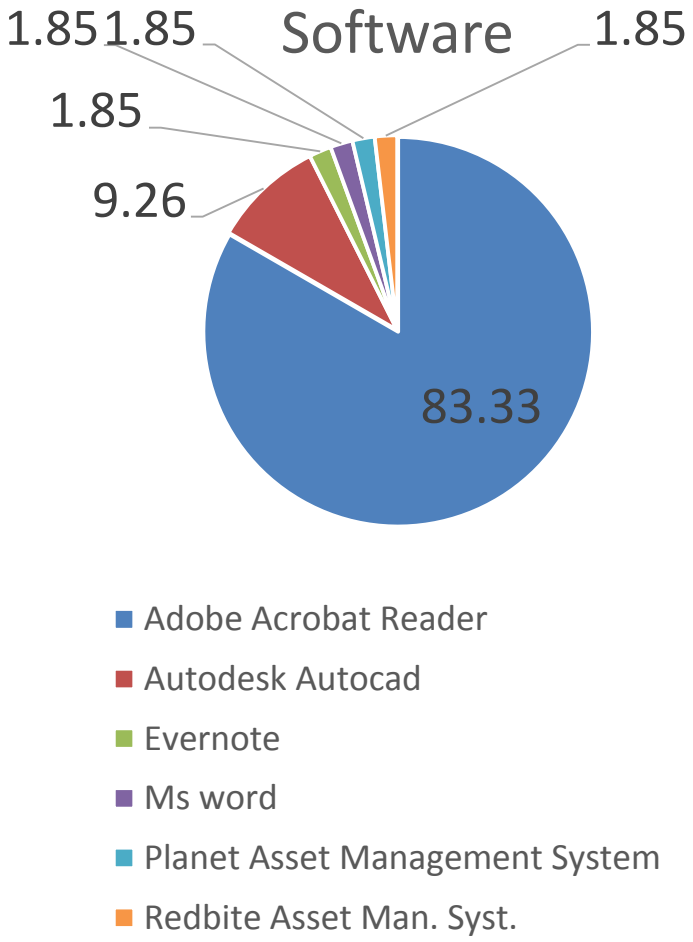
Information Map - IfM

(Information to be kept for the life time of IfM building)

Objectives/Decisions / Tasks	Information produced	Severity/Impact of losing the information on		Documentation / Database	Enabling Technology		
					Software Application	File Format	Storage Media
Strtegic Definition							
Where is the building located and how long will take to build it?	Project duration and location information (It only gives the duration and location of the project by text does not give any other detail)	1	1	Project Particulars- Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Are the consents and approvals complete?	Full planning permission	3	3	Authorities' consents and approvals- Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Are the consents and approvals complete?	Approval of Reserved Matters	3	3	Authorities' consents and approvals- Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Are the consents and approvals complete?	Building Regulation Approval-Full Plans Approval	3	3	Authorities' consents and approvals- Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Are the consents and approvals complete?	Building Control Completion Certificate	3	3	Authorities' consents and approvals- Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Concept Design							
How does the building look like? Which components does it have?	Overall building design including client's requirements, conceptual design	3	4	Building Log book and Description of the Project-Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Technical Design							
Arup-Structural Engineering Design decisions- What is the design criteria for the structure and standards and methods to justify the design?	Structural Calculation Plan (It is a basis for justifying the calculations associated with the structural engineering design.It has design	3	4	Structural Calculation plan-Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Structural Engineering Design decisions- What are the specific information related to finishes of the buildings such as colour codes of the wall	Finishes, Door & Ironmongery information (The list of specific information such as cloor codes and material of doors.)	4	3	Finishes, Door & Ironmongery Schedules-Principal Reference Document	Adobe Acrobat Reader	pdf	CD
Marriott Constrcution-Structural Engineering Design decisions- Does the building have any air leakage?	Airtightness test results (The airtighthness tets results in numbers and graphs and photos)	2	2	Building pressure test-Principal Reference Document	Adobe Acrobat Reader	pdf	CD

Enabling Technology Analysis





Stage 2: Risk Assessment-Hardware Related Hazards

Likelihood of occurence of the hazard (1,2,3,4,5) / Severity of the Information (1,2,4,8,16)		C1-Hardware Related Hazards: The physical storage media may	The physcial storage media may be	Lack of storage space when disposed of old	May cause information accessibility
		4	5	3	3
Full planning permission	1	4	5	3	3
Approval of Reserved Matters	4	16	20	12	12
Building Regulation Approval-Full Plans Approval	4	16	20	12	12
Building Control Completion Certificate	4	16	20	12	12
Overall building design including client's requirements, conceptual design	4	16	20	12	12
Structural Calculation Plan (It is a basis for justifying the calculations associated with the structural	4	16	20	12	12
Finishes, Door & Ironmongery information (The list of specific information such as cloor codes	4	16	20	12	12
Airtightness test results (The airtighthness tets results in numbers and graphs and photos)	8	32	40	24	24
Non-destructive electronic testing of the hot melt waterproofing membrane on the terace	2	8	10	6	6
Noise measurements of the installed plant items (It has noise	2	8	10	6	6

Severe
Significant
Moderate
Minor

Risk Assessment - Software Related Hazards

Severe
Significant
Moderate
Minor

Likelihood of occurence of the hazard (1,2,3,4,5) / Severity of the Information (1,2,4,8,16)		C2-Software Related Hazards											
		May cause compatibility problems if file 2	May casue interoperability problems if 2	May cause information loss if the file is 2	May cause complexity if simple file 2	May cause interoperability problems if 4	May casue accessbility problems if 2	May cause conflicts when same 4	May casue information loss if 2	May cause accessibilty problems if 4	May cause information loss if 4	May cause accessibility problems if 2	May cause ubiquity problems if the 4
Full planning permission	1	2	2	2	2	4	2	4	2	4	4	2	4
Approval of Reserved Matters	4	8	8	8	8	16	8	16	8	16	16	8	16
Building Regulation Approval-Full Plans Approval	4	8	8	8	8	16	8	16	8	16	16	8	16
Building Control Completion Certificate	4	8	8	8	8	16	8	16	8	16	16	8	16
Overall building design including client's requirements, conceptual design	4	8	8	8	8	16	8	16	8	16	16	8	16
Structural Calculation Plan (It is a basis for justifying the calculations associated with the structural	4	8	8	8	8	16	8	16	8	16	16	8	16
Finishes, Door & Ironmongery information (The list of specific information such as cloor codes	4	8	8	8	8	16	8	16	8	16	16	8	16
Airtightness test results (The airtightness tets results in numbers and graphs and photos)	8	16	16	16	16	32	16	32	16	32	32	16	32
Non-destructive electronic testing of the hot melt waterproofing membrane on the terace	2	4	4	4	4	8	4	8	4	8	8	4	8
Noise measurements of the installed plant items (It has noise	2	4	4	4	4	8	4	8	4	8	8	4	8

Risk Assessment - Organizational Hazards

Severe
Significant
Moderate
Minor

Likelihood of occurence of the hazard (1,2,3,4,5) / Severity of the Information (1,2,4,8,16)		C3-Organizational Hazards													
		Loss of device - portable storage media	May cause information incompletenes	May cause ambiguity if too many	May cause information retrieval	May casue reusability problems if	May casue ambiguity if different	May cause information retrieval	Unreliable information when source of	May casue ambiguity if owner/facility	May cause ambiguity if there is lack of	May cause information loss when new	Operator error - delete folder by mistake,	May casue information loss if data	May cause information loss if data
		4	5	2	5	4	2	4	5	4	4	4	4	5	2
Full planning permission	1	4	5	2	5	4	2	4	5	4	4	4	4	5	2
Approval of Reserved Matters	4	16	20	8	20	16	8	16	20	16	16	16	16	20	8
Building Regulation Approval-Full Plans Approval	4	16	20	8	20	16	8	16	20	16	16	16	16	20	8
Building Control Completion Certificate	4	16	20	8	20	16	8	16	20	16	16	16	16	20	8
Overall building design including client's requirements, conceptual design	4	16	20	8	20	16	8	16	20	16	16	16	16	20	8
Structural Calculation Plan (It is a basis for justifying the calculations associated with the structural	4	16	20	8	20	16	8	16	20	16	16	16	16	20	8
Finishes, Door & Ironmongery information (The list of specific information such as cloor codes	4	16	20	8	20	16	8	16	20	16	16	16	16	20	8
Airtightness test results (The airtightness tets results in numbers and graphs and photos)	8	32	40	16	40	32	16	32	40	32	32	32	32	40	16
Non-destructive electronic testing of the hot melt waterproofing membrane on the terace	2	8	10	4	10	8	4	8	10	8	8	8	8	10	4
Noise measurements of the installed plant items (It has noise	2	8	10	4	10	8	4	8	10	8	8	8	8	10	4

Stage 3: Solutions to Mitigate Risks

- An information futureproofing strategy is needed.
- Information kept in different information management systems is required to be linked e.g. Planet Asset Management System, Micad.
- Current information systems are needed to be improved or new system are to be adopted due to inadequate tracking of activities. E.g. Evernote, Planet Asset Management system
- Having information backup strategy especially for the information stored on CDs.

Conclusions for IfM case

- Organizational problems- the most important problem is finding the responsible person for O&M activities related to IfM.
- Technological problems - the information resources are diverse. They have information in different places and it is not very easy to access them. The related information is not being kept together. Since they are separate in different places and formats, combining those information and making a decision/judgement is very hard. They do not have a supply chain control in the state of who did what.
- The organizational challenges may be adressed by technological solutions or vice versa.

Hertfordshire County Council Bridges & Structures – Info futureproofing case study 2

(Hertfordshire County Council 2011)

Hertfordshire County Council Bridges Infrastructure

1020 - Six Hills Way Shephall

*

1469 - Kingsmead Viaduct

0023 - Roxford Bridge

2164 - Marsh Lane Culvert

0877 - Mount Pleasant

0140 - Broxbourne Nazeing

1942 - Springwood Footbridge

Case Study – Hertfordshire County Council

Identify information retention requirements

Information Futureproofing Problems:

Information does not exist

- Not being able to find as-built drawings
- Issues around availability of updated information, and limited or no sharing of information by third parties after completion of maintenance work

Information exists but not retrievable

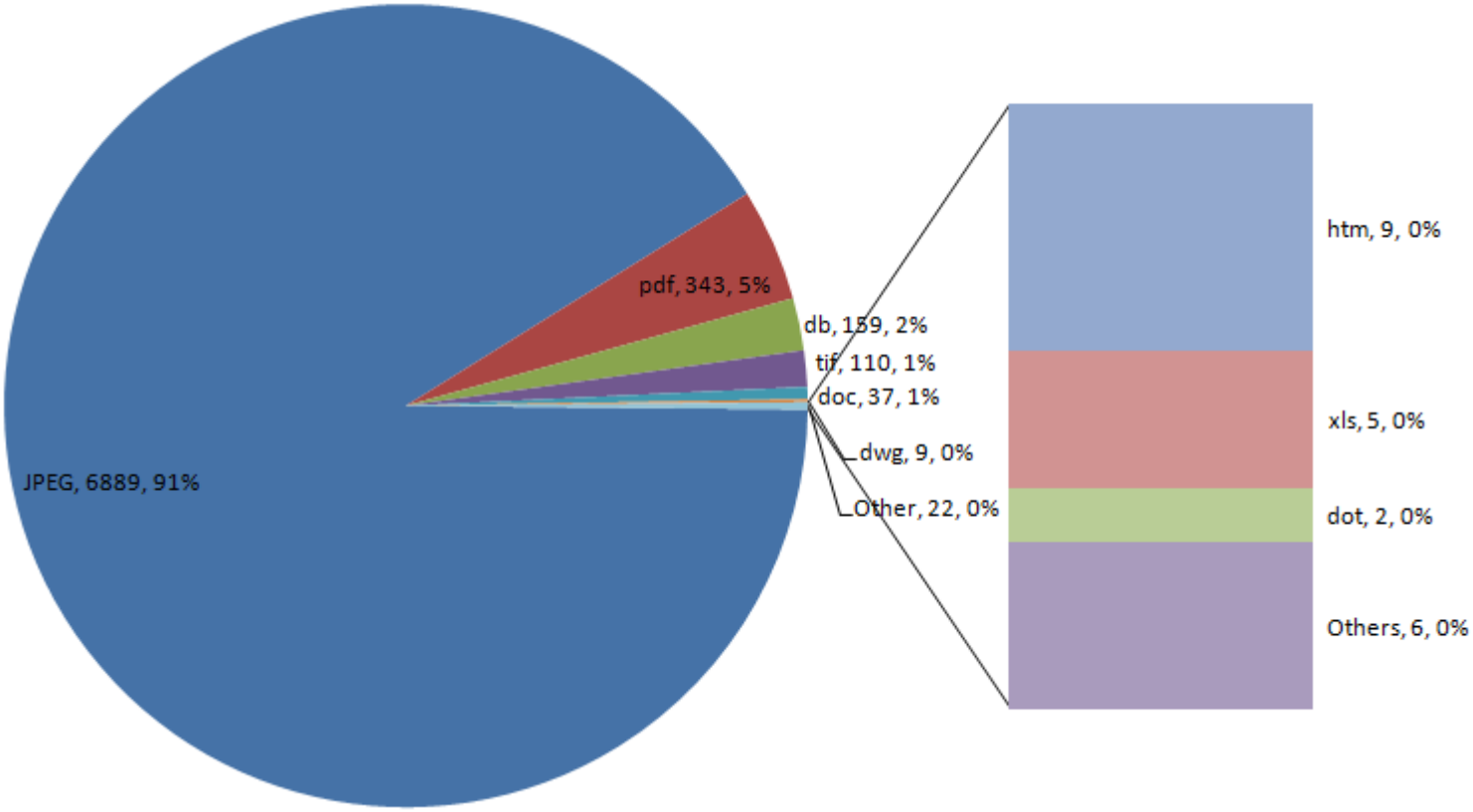
- Bad filing – storage of information
- Meta data is missing – don't know what is retained
- Information archived on paper (~5,000 archived boxes) – don't know what's in the boxes, difficult to find when information is required
- Information retained in emails is not accessible and search able – this includes decisions, legal files, etc (especially important when people move or contractor is changed)

Information is retrievable but not useable

- Un reliable data in CONFIRM db – a large no. of fields are unchecked
- Problems with scanned files – tiny images, low resolution
- Integration issues – information is retained in various different databases making it hard to access, link and use information when required

File Type Analysis - HCC Selected Bridges

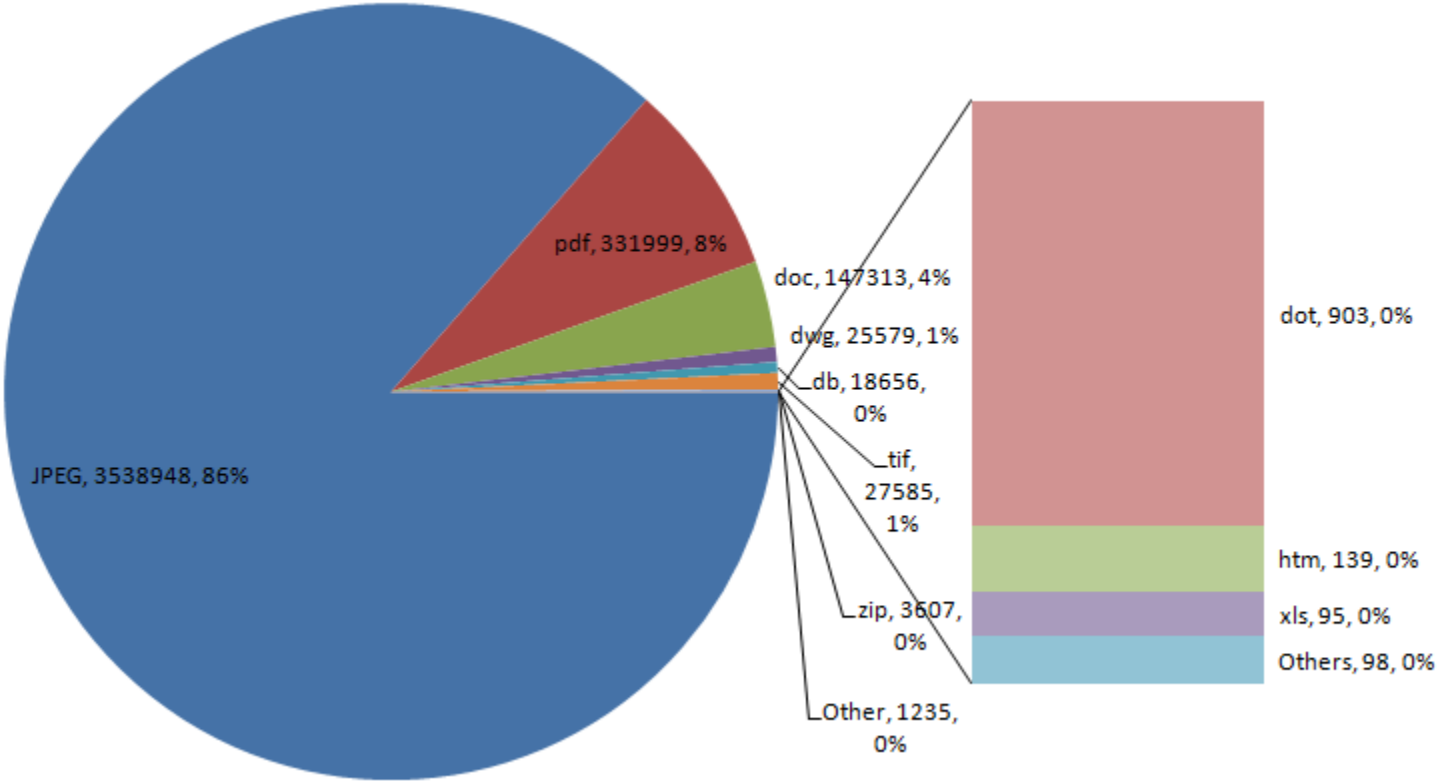
Pictures and Documents make 98% of retained information by numbers!



* Results are based on data provided for selected seven bridges of Hertfordshire County Council

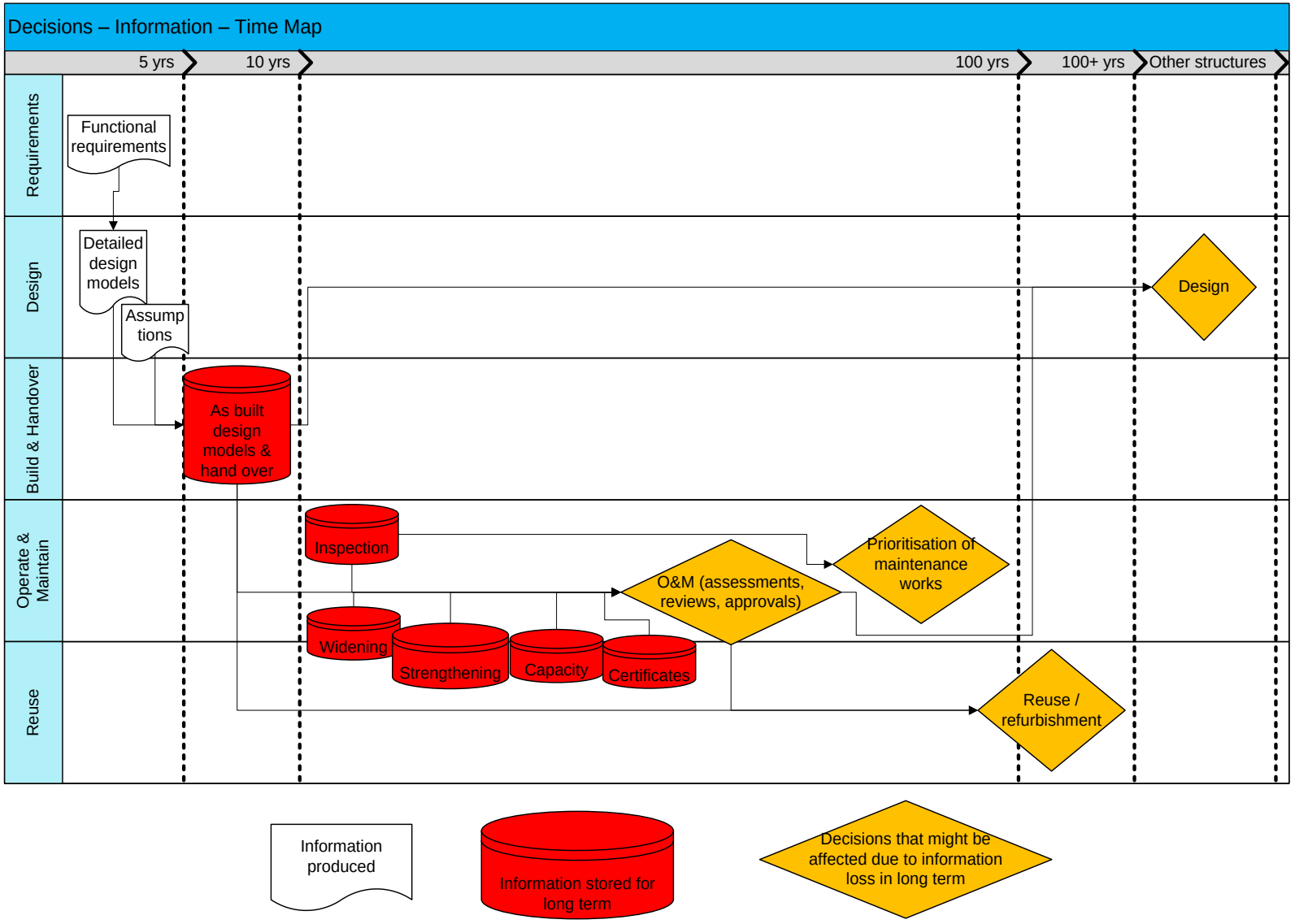
File Size Analysis - HCC Selected Bridges

Pictures and Documents make 99% of retained information by size!



* Results are based on data provided for selected seven bridges of Hertfordshire County Council

Hertfordshire County Council Bridges & Structures – Info futureproofing case study 2



Crossrail Tunnels & Pumps – Info futureproofing case study 3

(Crossrail 2014)

Impact

A paper presented and published during IET/IAM Asset Management Conference 2013, held in London (11/2013).

Another paper is accepted for presentation in IET/IAM Asset Management Conference 2015, to be held in London (11/2015).

Poster presentations at various industrial workshops and INDIN 2015 conference

Conclusions

Strengths / usability	***Weaknesses***
• A strategic approach to dealing with information loss issues in the long-term. • Identification of decision-information-technology dependencies is helpful in visualising the futureproofing challenge • Risk assessment process is helpful in highlighting hazards and assigning risk ratings based upon information loss	• The assessment approach is dependant on personal judgements. • The assessment approach is labour intensive requiring commitment and time.
Opportunities / usefulness	***Threats***
• Usefulness (where does this fit well?) • Creation of an information futureproofing strategy for each infrastructure • Creation of an enhanced set of asset information requirements (AIR) • Enhanced risk assessment / management processes	• Information technologies change rapidly over time, so the information futureproofing assessments might also become outdated soon

What's next?

- Additional case studies
  - Via academics/researchers
  - Via students (a PhD Visiting Student has worked on the project during 2014/15; and is continuing her PhD on the subject)
- Consultancy via IfM ECS
- Further research proposals (e.g. EPSRC, Innovate UK, Industry funded)

Acknowledgements