CDBB
Capability Framework and Research Landscape Scoping Workshop

Workshop: Capability to govern, manage and optimise digital built Britain, through-life, across multi-stakeholder interfaces down the SUPPLY CHAINS in building assets and delivering services

Centre for Digital Built Britain

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UNIVERSITY OF CAMBRIDGE

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Centre for Digital Built Britain

This document captures the working notes from the workshop "Workshop: Capability to govern, manage and optimise digital built Britain, through-life, across multi-stakeholder interfaces down the SUPPLY CHAINS in building assets and delivering services", held at Churchill College Cambridge on 10-11 April 2018

The summary sheets are assembled from the separate working groups from each of two streams; Research and Applications.

The details of the outputs from the individual working groups are captured in turn.

This material was used as a starting point for the creation and development of the Capability Framework and the Research Landscape. It is provided as source material for the interested reader.

Govern, manage and optimise across interfaces - Research Summary

Rank order	Topic title	
1	Process based management (Define DBBe D/B; O; I)	- Investment - Cost benefit analysis - Policy
2	Roles / Agile workforce / Professional skills	
3	Nexus of Governance / Risk / Value / Accountability	
4	Procurement (Contracts, IPQ etc.)	
5	Define Purpose (clarity)	
6	Digital Platform (Single/ distributed etc?)	
7	Role of Contracts	

Research Topic: …	
Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Scope:

Scope - In	Scope out	What sub-topics might overlap with other topics?
- Finding a baseline for optimisation - Framework to evaluate management effectiveness - Standards, regulations and policies - Optimise - who/to what end: Multiple optimizations: What does and optimised DBB look like/what does it mean? - Governance/Management "structure' (what are the main components?) - To identify where+ when DBB is the best approach -->and value. We cannot assume DBB will always + in all situations add value - Define management information - Intellectual properties protection - Does DBB include data + info interpretation (as well as creation + collection)? - Data capture mechanism - Ethics of blanket data capture - Boundaries of DBB and its interfaces with other systems - Condition and Understanding - How the brain prioritises information processing - Data (value) visualization and communication (to stakeholders to inform decision makers)	- Not everything should be optimised	- All (in DBB framework)

Step 2. Scope change by thinking about stakeholders

- Can DBB be optimised on its own? Optimise jointly with investments, health , environments etc. - How to optimise processes with Digital Tech? Processes arising from Domains, sectors + such like - Power of Self-Determination - Transparency	- Rethinking value propositions = business models of sharing + transparency is the norm. What are the frameworks? - Not to be selfish - Managed response system for Asset managers (e.g. bridges) - Incentives - Define and develop required skills

Step 3. Scope change by thinking about spatial differences

e.g. National/Regional	e.g. City/local	e.g. Asset specific
- Collaboration vs. Competition	- Investment portfolio optimisation: Risk vs. Return - Residents,/visitors feedback and evaluations - Ensembles of buildings jointly optimised - Develop transport infrastructure capacity in cities	- Redevelopment, renovation, maintenance optimisation - Optimisation by end uses - How to optimise the services we receive from digital assets

Step 4. Scope change by thinking about the lifecycle of assets and services

Articulate user needs and requirements	Conceive, plan and design (including optimisation and integration)	Build and commission (including optimisation and integration)	Manage and Operate (refine and enhance, optimise and integrate)	Provide valued services to users (and minimise downsides for non-users)	Retrofit / Renew / Decommission (with attention to the whole cycle)	…Assess, feedback and optimisation
- Framework to facilitate formal discussions between key stakeholder		- Manage uncertainty				

Research Topic: ...	
Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Scope:

Scope - In		Scope out	What sub-topics might overlap with other topics?
- Dept. of energy and public works --> broken up - need for dept. information systems - Understanding the relationship between leadership + decision making + governance Cheap educated, suppressed labour foundations for growth - Skills gaps/ Technicians on the ground missing digital technology/systems - Engineering and technology integration by professional organisations (e.g. IET) - Construction not using digital information - don't have the capabilities - Developing local suppliers on work with global partners?	- Governance of purposes - Legacy infrastructure vs. new infra - "Altruism" today for sustainable future - Affordability is critical to governance - Platform approach to buildings (e.g. a car is product why aren't building seen the same way?) - Land planning market - What about taking market out of the loop? - Governance and management - Knowledge transfer e.g. from civil engineering to construction e.g. IET - Treat infrastructure as a product e.g. car		- Risk investment - Risk investment value - Value -->SDGs (Sustainable development goals) - Inter country governance (Brexit?/ China?) - Data sharing (open?) - Data governance - Data structures - Role of professional service firms in governance

Step 2. Scope change by thinking about stakeholders

- Role of regulation --> party political - Citizen engagement - Framework approach to drive innovation in supply chain (or in a relationship) - Contract clauses	- Suppliers - Control vs. Coordination contract clauses - contract vs. Trust - Local vs. Systems view - Competing local political interests	- Devolution effect on stakeholder expectations - Short term (local) political time scales - Political silos lack of interface between political/ expert knowledge - Visibility as a threat rather than optimality - Consistency/predictability in infrastructure service provision

Step 3. Scope change by thinking about spatial differences

e.g. National/Regional	e.g. City/local	e.g. Asset specific
- What is the right scale for regional governance of data? - Governance across / Inter regions - Developing local supplies	- City leader delegation	- Common standards language - Interaction between governance of assets and perverse outcomes

Step 4. Scope change by thinking about the lifecycle of assets and services

Articulate user needs and requirements	Conceive, plan and design (including optimisation and integration)	Build and commission (including optimisation and integration)	Manage and Operate (refine and enhance, optimise and integrate)	Provide valued services to users (and minimise downsides for non-users)	Retrofit / Renew / Decommission (with attention to the whole cycle)	...Assess, feedback and optimisation
			- Design for maintenance			

Research Topic: …	
2Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Scope:

Scope - In		Scope out	What sub-topics might overlap with other topics?
-"illusion of competition - Contractual "traditions" - Digital platform - Modularisation (standard design) - How do we procure for what we want/ need? - Process in procurement - Mandate systems engineering not BIM	- Government as regulator - Building regulations review - are there constraints on politics / politician (big vs. Small) - IPI - Integrated Project Insurance		

Step 2. Scope change by thinking about stakeholders

- Government as an investor
- Belief in investment (benefits)
- The role of Government as a facilitator
- Professionals vs. Role
- Architectural education and training tradition
- Siloed nature of undergraduate education

Step 3. Scope change by thinking about spatial differences

e.g. National/Regional	e.g. City/local	e.g. Asset specific

Step 4. Scope change by thinking about the lifecycle of assets and services

Articulate user needs and requirements	Conceive, plan and design (including optimisation and integration)	Build and commission (including optimisation and integration)	Manage and Operate (refine and enhance, optimise and integrate)	Provide valued services to users (and minimise downsides for non-users)	Retrofit / Renew / Decommission (with attention to the whole cycle)	…Assess, feedback and optimisation

Research Topic	
Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Step 1. What are the major research clusters/themes?	**What are capabilities and research that will be needed as DBB matures from 'deliver' to 'operate' to 'integrate'?**					
	Deliver *(create the built asset)*		***Operate*** *(manage asset through life and deliver the services that derive from and depend on the asset)*		***Integrate*** *(deliver services and benefits based on integrated systems and organisations)*	
	What capabilities and enabling research?	***Which people / institutions are working on this?***	***What extra capabilities and enabling research?***	***Which people / institutions are working on this?***	***What extra capabilities and enabling research?***	***Which people / institutions are working on this?***
- Definitions of DBB - Structure (s) of governance (what are the main components?) - Structures of management (what are the main components?)	- Upskilling - Professionalism - Collaboration		- Life - cycle - Parameters		- Innovation - Engagement	
Maximise the potential of DBB investments	- Estimate Asset specific risk using DBB	- Developers should be working on this (but don't)	- Estimate / minimise operating expenditures	- WSP: Developing visualisation tools for Bridge asset owners	- Valuation & benchmarking of buildings or portfolios	- Hypercat : IoT standard
- Policy (regulations, standards) incentives - Ethics of data capture	- Incentives	- BSI - developing standards				
Information classification			- Data capture / manipulation / visualisation solution - Data security		- Benchmarks	
How to enable stakeholders to maximise the potential of the digital revolution: - Open data and info - Regulator structures - Lynch pin stakeholders (ID them) - Early adoptors - ID intervention points - where + when - What are the value propositions for investments and business models - Where do needs align?	- Transparency of the process	- Open BIM building smart	- User engagement			- Organisational learning - Political economists - Research projects (Iclf, Ibuild) - Data science / Big data - Information science - Ethics - Engineers

Research Topic	
2B Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Step 1. What are the major research clusters/themes?	**What are capabilities and research that will be needed as DBB matures from 'deliver' to 'operate' to 'integrate'?**					
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Nexus of Governance - Risk - Investment - Value	- Interdisciplinary skills - Sector mapping - identify nexus for different stakeholders / sectors	- Andy Sterling doing the nexus method	- Operational concepts to drive building needs		Alignment of: - accountability - responsibility - authority	
Shared purpose clarity (evolves over time) Interplay of contract vs. relationships	- Engagement with different stakeholders (e.g. inclusivity)		- Study of governance of mega projects	- HPC Supply Chain innovation lab - UCL	- Integrating skills to understand shared purpose	
Govern, manage, optimise of: NEW vs LEGACY buildings	- Identification of differences and responsibilities for alternative forms of governance			↑ Regulators ↓	- Capability enhancements, education of supply chain	
Public vs. Market governance interface	- Gap analysis - Risks and liabilities		- Brexit effect		- Risk management	
Tools for Control vs. Collaboration in DBB?	- Distributed ledger technology (DLT) skills needed	- Cranfield - ARUP - UCL - HPC Supply chain innovation Lab				

Research Topic	
2B Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Step 1. What are the major research clusters/themes?	**What are capabilities and research that will be needed as DBB matures from 'deliver' to 'operate' to 'integrate'?**					
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Standardisation - Government role						Innovation studies community
Digital Platform	- Block chain - BIM enrichment - Shared datasets: -> Access -> Security	CAD software companies		- Robots / Automation - TFL as and example "CITY MAPPER"		Industry 4.0
- Procurement - Smart control	What are the barriers related to "Traditional Procurement Models"?			Google Street View		- Construction management
Professional roles (Education)	What needs to change in Professional education in Built Environment?	Accreditation Bodies (?)				
Learning from elsewhere						

Govern, manage and optimise across interfaces - Application/Demonstrators Summary	
Rank order	Topic title
1	Exploring interfaces of public rights of ways
2	Build demonstrator to test design, operate and integrate framework through public housing / housing ass. study (Tackle totex vs Capex + Opex)
3	Building feedback systems w/Passiv Haus, Building validate pre construction, post construction + 1 year later
4	Establishing pathways of how the regulatory system is cascaded when we "go digital"; role of automation + IoT are monitored
5	Investigate performance gap difference between as designated + as built over life of assets. Validation of models + limits of modelling

Application Topic: …	
Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Step 1. Scope: What topics should we include in this part of the framework – and what demonstrators would illustrate / stretch the boundaries?

Scope - In			Scope out	What sub-topics might overlap with other topics?
- Who will: Regulate / Govern / Manage / Optimise? - What are the defined aims for governance/ management and optimisation? - AI impacts over the next 20~years. How will we allow these to happen? - Barriers outside of technology: Procurement (exclusivity, not sharing); Insurance (has liability grown?) - How does DBB relate to small assets owners who have little to commit to it? > How can they be equal participants? > How can they influence DBB development vs. large players > Inclusive DBB ? > How do we frame this? > Affordable inclusivity? - DBB holds: > What we know > What we believe is uncertain (what we don't know) > Give us tools to explore + use this knowledge - "Design Consultation" - should be co-creation earlier / more often in design process	- How do we ensure that individual citizens can access + derive benefits from DBB? - The use of automation in construction industry - Integrated tool-chain - Who pays for governance? - Open procurement frameworks to be inclusive of SME's - Establish a Governance framework - Determine pathways to client and establish as two-way - Co-creating between regulatory authorities and citizens to define the built environment - Planning system: > under resourced --> delays > Needs research update/input (time/staff to do this) > Hard sell for small-scale interests to participate - Meeting climate change Act 2008 targets must underlay all infrastructure models and interventions. Not to prioritise this not only endangers our way of life, it incurs double jeopardy of fines as well	- Do we understand the importance of flexible mind-sets to governance? (e.g. Bristol is also the South West) - Examples from other countries not necessarily relevant as much more land is available (e.g. USA, Germany)		- "Enforcement of Governance" (Resources from where? - very detailed area) - What current laws and guidance already present boundaries or enablers? - What similar challenges of Governance have been solved elsewhere (e.g. NHS)? - How to operate and persist with an egalitarian environment? - Optimise how to collect feedback on what is actually working?

- how do we orchestrate a transformative mind-set across all stakeholders
- See DBB as tool that helps us do things better
- What will motivate people to invest in maintaining the data?
- Joint responsibility for risk across all stakeholders
- Everyone See DBB as tool that helps us work out the right things to do and then to do them right
- DBB is a learning + collaborating framework
- How do we assess the value of the DDB data? - Is it worth £trillions therefore is it worth spending billions on scaling it around the UK?
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- Who are Governing and Who are Governed?
- Stakeholder vs. Influencer vs. Enforcer vs. User (terminology)
- how do impacts on Stakeholder change against their individual desirable outcomes?
- Highest Priority is to build the People Pipeline who know to use DBB
- How do uninvolved stakeholders see value from their investment (via Government) into DBB at large?
- NHS customer feedback an exemplar demonstrator?
- "Representatives" of stakeholder groups come forward as a result of dissemination f information about a proposal. All need a chance to comment, but reps 'self-select' by commercial participation

Step 3. Scope change by thinking about spatial differences (e.g. to consider how can scale make a difference to the demonstrators we would propose)

e.g. National/Regional	e.g. City/local	e.g. Asset specific
- How to Govern where there is not internet (work)? - Cyber - Physical system for integrated services not affected by spatial differences - Spaces (International / National / Regional / Local) - the interdependencies+ fragmented governance + delivery --> how can DBB deal with this challenge?	- Building regulations need research update / input - "Cuts" have limited the stability of local government to play a role - therefore, review budgets - Planning portal online access exists - It needs to be integrated an improved - Shared digital knowledge between domains	- Fixed vs Mobile / Real vs. Virtual / Assets

Step 4. Scope change by thinking about the lifecycle of assets and services: Are there new / different aspects of the topic and its demonstrators if we think through the lifecycle of the assets and the services?

Articulate user needs and requirements	Conceive, plan and design (including optimisation and integration)	Build and commission (including optimisation and integration)	Manage and Operate (refine and enhance, optimise and integrate)	Provide valued services to users (and minimise downsides for non-users)	Retrofit / Renew / Decommission (with attention to the whole cycle)	…Assess, feedback and optimisation
- What material presumptions other than skills should be considered? (labels are usually not helpful) - How does DBB capture human + ecological behaviours? - "We" individual persons should own our own data + sell it to digital interests. data security is a vexed issue	- Can we embed the true co-production through DBB?	- Are the skills within Silo's (as presumed) really there? - Fears at the interface - what are they really? >Liability? >Data protection? >Revenue? >Intellectual property? >infrastructure costs?	- DBB targets greater efficiency, freeing £££ for better causes - Is there a need for some kind of certification to operate?	- What will ensure all voices are heard? > Processes to be designed > How to avoid creating "difference" - NHS patient records security as demonstrator for protection?	- Infrastructure + buildings 80% are existing and need retrofit: Need criteria for demolition and case studies for successful retrofit	- Do we need social economists? - Governing a system is different to applying the rules? (circumstantial ethics issues?)

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Application Topic: …	
Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Step 1. Scope: What topics should we include in this part of the framework – and what demonstrators would illustrate / stretch the boundaries?

Scope - In	Scope out	What sub-topics might overlap with other topics?
- Feedback loos for knowledge transfer / capture / representation - Benchmarking for optimisation - Govern / define: inside and outside formal relationship - Prescribe data standard not software - Citizen contribute and collaborate - Manage consequences: Scope / Use / Impact - Where is power + control coming from and connecting through? - Challenge of all requirements are: Openness / Assume incompleteness - Agile working - Who is the data supply chain? (stakeholders) - Interfaces - seek input from new entrants: insurers, legal, software, client - Assume and expect --> change feedback loop - Standards assumes 2-3 year refreshment by CDBB - Informed client or client team greater openness on data - Down the supply chain?? Not up	- Outside What is going on is how it happens - Not detail of how to communicate - Behavioural specification interoperability not restrictive	- Aligned with horizontal blocks as enablers - 42

Step 2. Scope change by thinking about stakeholders (Are there new / different aspects of the topic and its demonstrators?)

- Bullocks
- EIR's need to be able to checkable data structures
- Data needs to be usable across the asset all life-cycle
- Secured shareable data available

- Stakeholder: How do I feedback that the data is not fit for my purpose e.g.
  --> Adaptable
  --> Relevant interface
  --> Only see my data format

Step 3. Scope change by thinking about spatial differences (e.g. to consider how can scale make a difference to the demonstrators we would propose)

e.g. National/Regional	e.g. City/local	e.g. Asset specific
- Network rail - 8 national routes e.g. East Coast - Foul Water systems - Public footpath network (ONS)	- Local authority landowner / National trust / Waterways - Private ownership - connected drainage - Surfers against sewage - Connections between cities consider boundaries	- Beaches and coast line - Split out requirements (work packages) e.g. sections of track - Rambling association community groups. Bridleways, Fix my street, Cycling network

Step 4. Scope change by thinking about the lifecycle of assets and services: Are there new / different aspects of the topic and its demonstrators if we think through the lifecycle of the assets and the services?

Articulate user needs and requirements	Conceive, plan and design (including optimisation and integration)	Build and commission (including optimisation and integration)	Manage and Operate (refine and enhance, optimise and integrate)	Provide valued services to users (and minimise downsides for non-users)	Retrofit / Renew / Decommission (with attention to the whole cycle)	…Assess, feedback and optimisation
					- New projects start here!	

Application Topic	
Govern, manage and optimise DBB, through-life, across multi-stakeholder interfaces down the supply chains in building assets and delivering services	

Step 1. What are major demonstrators that are required?	What capabilities / functionalities of the demonstrators illustrate the maturing of DBB from 'deliver' to 'operate' to 'integrate'?					
	Deliver *(create the built asset)*		***Operate*** *(manage asset through life and deliver the services that derive from and depend on the asset)*		***Integrate*** *(deliver services and benefits based on integrated systems and organisations)*	
	What would be the big challenges?	***How?***	***What would be the big challenges?***	***How?***	***What would be the big challenges?***	***How?***
- Pathway design **- Engagement and collaboration platforms** **- Need a sequence of demonstrators that engage early adopters it to later adopters who cannot adopt early. Model validation of:** > Performance > User behaviours > Decision / action behaviours > Value creation / realisation > Regulation > Evolve the market place with model validation development	Breaking through Silos and culture	Ensure regulatory authorities are aligned	Building IoT and telemetry into assets	Regulation compliance done by machine	Developing data 'analytics'	Regulated date compared with IoT consistency
Create and ideal start-point model for governance	How to engage and defend against 'gaming' legitimately within the system	- Pilot targeting 2 or 3 variables need to take place - findings publicized				
- **Project to determine the optimum value from Governance** (How closely coupled are the valve outcome and governance - what cannot be governed?) - **Impact assessment analyzing precedents of poor governance** (e.g. where data has gone missing)	Fully flexible and adaptable model		Missing information	Engage with portfolio operators		
Mandatory baselining (etc) creates a market for baseline tools / models **- Tool/model providers then incentivize to make the learning available** **- Exemplars of existing even traditional building methods to be researcher for performance and result be made available (Passive Haus EnergyPHit)**	- Agile Project management for developing the model					
- Model Validation - **[Create Supply]** we need to create segmented market places that will justify the development investment + **[Create demand]** then motivate users to pay for the benefits - **Design electronic 3D model** is possible, capture is diminishing (?) but it is still expensive	- Cost - Value realised	Passiv Haus demonstrator using historical data + approach to check design pre build + post occupancy - Clifton Suspension Bridge test bed: > Digital model of structural behaviours > User behaviours > Decision actions > Value created > Measured behaviours > Validation of models > outcome - know how to validate				

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	What would be the big challenges?	***How?***	***What would be the big challenges?***	***How?***	***What would be the big challenges?***	***How?***
- Rights of way - exploring the interfaces - Delivering Public good	- Formal land registry for: informal, un-adopted, unregistered - Identify sources of info, not digital - Fragmented data sets not available to all	- Planning - Recognise the interfaces e.g. forests, waterways etc. - Narrative definitive survey (polygon parcel)	- Individuals right to roam - Bridleway, cycle way and shared surfaces	Rebalance private vs. Public maintenance - Readily available from HMLR	- Integration with Public health - Travel patterns (commute) - Can use to encourage people away from cars [2030 plan] - Saving bees [ecology + environment]	- Democratic crowd sourcing from all - Evidence of the amenity value of the assets
- Through life demonstrator - Test CDBB framework - Housing association --> Serve the tenant	-Identifying end user + their collaboration - Lifestyle evolving: Community and Design 4 life - Generic data + information needs but not at asset level	- Funding models measure TOTEX value - Risks + trade offs need to be evidenced - Build stakeholder engagement	- Info student accommodation hotels - Design and operate for well being	- flexibility of asset to accommodate lifestyle changes - Community facilities e.g. gardens	- Council tax / Stamp duty / Bedroom tax - Community + cohousing understanding - Trust in data-> home to self-manage - Link to Alexa/Google (privacy and security) Future proof space + connectivity online/off line GenZ	- Collaborative space to envisage new financial models - Sensors >Apps (Mine craft) >maps > Lego (non-digital) - Security access controls for data using governance - Negotiate privacy / security of data risk based - GDPR for personal data