BLOCKCHAINS IN CONSTRUCTION & INFRASTRUCTURE
DISTRIBUTED DATABASES

SUPPLY CHAINS,

WHOLE LIFE COSTING & ASSET MANAGEMENT
KEEPING COST OS UPDATED FOR NEW STANDARDS

COST OS NRM 3 MODULE, RELEASED MAY 2016
WHOLE LIFE COST MODULE ADDED
The Government BIM Working Group has identified two key variables that will matter most in terms of overall built asset performance:

- Whole Life Cost; and
- Carbon Performance
Where The Whole Life Costs Are

1 : 10 : 100
Design : Construct : Own
To meet targets, all project and asset information, documentation and data has to be in electronic format for use across the life time of the built assets.
5.5 Improved Information Handover

In order to improve the measurement and management of public assets, it is recommended that public clients request that specific information be delivered by the supply chain. **The specified information set, called COBie, delivers consistent and structured asset information** useful to the owner-operator for post-occupancy decision-making.
As custodians of cost performance:

– what is COBie and why does it matter?
COBie IS THE META DATA FOR ALL DIGITAL BUILT ASSETS
BS 1192-4:2014 defines expectations for the exchange of information throughout the lifecycle of a Facility. **The use of COBie ensures that information can be prepared and used without the need for knowledge of the sending and receiving applications or databases.** It ensures that the information exchange can be reviewed and validated for compliance, continuity and completeness.
COBIE = META DATA OF BUILT ASSETS FOR OPERATING AFTER CONSTRUCTION COMPLETION

Form & Function

DESIGN → BUILD → IN USE

OPERATE & MAINTAIN

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<th>Example</th>
<th>Notes</th>
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COBIE META DATA IS CURRENTLY HELD IN A SPREADSHEET

COBie is currently spreadsheet based so that everyone in the supply chain can populate it with their O&M data.

Spreadsheets:
- Are Grey IT
- Cause version control problems
- Prone to errors
- Can be easily lost
- Can be emailed to anyone

Template examples:
http://www.bimtaskgroup.org/cobie/A-Z.html#C
COBIE META DATA NEEDS TO BE IN A DATABASE
BUILT INFORMATION MODELLING (BIM)

1. DECISION TO BUILD
2. DESIGN TEAM
3. FABRICATE
4. CONSTRUCT
5. IN USE
6. RENOVATE
7. END OF LIFE

The cycle of BIM involves decision making, team design, fabrication, construction, use, renovation, and end of life.
DESIGN TEAM – SEQUENTIAL DATA FLOW & MAIN COMMUNICATION CHANNEL

EMAIL

- ARCHITECT
- COST
- PROJECT MANAGEMENT
- SUPPLIERS
- ENGINEER
- SPECIALISTS
- MEP
BIM INTRODUCES COMMON DATA ENVIRONMENT TO SHARE PROJECT DATA
CDE ENABLES MULTI-PARTY ON DEMAND DATA PUSH & DATA PULL
DISTRIBUTED LEDGERS INTRODUCE MULTI-PARTY
META DATA SYNCHRONISATION TO WORK WITH CDE
COST

REVIT

TEXT DATA EXCHANGE TEMPLATE / IFC INTEGRATION

BLOCKCHAIN DATABASE LEDGER

P6

PRISM G2

UNIFIER

TEKLA

REVIT

BENTLEY

UNIFIER

TEKLA

SAP

TEXT DATA EXCHANGE TEMPLATE
DISTRIBUTED LEDGERS RETAIN BUILT ASSET META DATA WHEN CDE IS GONE & BUILT ASSETS GO THROUGH A WHOLE LIFE CYCLE JOURNEY
DURING PROJECT DELIVERY BLOCKCHAIN LEDGER DATABASES PROVIDE
LIVE REAL TIME UPDATES OF SUPPLY CHAIN TRACKING OF MATERIALS, PLANT, LABOUR & CONSUMABLES
DISTRIBUTED LEDGERS TURN COBIE INTO A WHOLE LIFE TOOL THAT CAN BE CONSTANTLY UPDATED. THE SPREADSHEET IS REPLACED WITH BLOCKCHAINS.
DISTRIBUTED LEDGERS TURN THE SUPPLY CHAIN INTO AN ERP SYSTEM

- DECISION TO BUILD
- DESIGN TEAM
- END OF LIFE
- FABRICATE
- RENOVATE
- IN USE
- CONSTRUCT

BLOCKCHAINS ARE ENTERPRISE RESOURCE PLANNING TOOLS
Practical completion triggers:

- Retention
- Ending contractors liability for liquidated damages
- Start of defects liability period
- Draft of O&M to client
- Built asset user guide
- Health and safety file
- Building log book
- Construction stage report
- Start of commissioning cycles

Related to completion - Blockchains could introduce:

- Smart contracts for standard legal procedures that require basic legal input and are mostly procedural
- Trigger start or end of simple insurance contracts
- Trigger warranty start and finish dates and trigger push notices on start or finish dates
- Trigger start and finish dates for collateral warranties and details of parties
- Trigger notices of change of company name / ownership / bankruptcy pushed via blockchain during ownership
- Commissioning cycles reporting
• Blockchain databases are free* (cheaper than Excel)

• Blockchain technology is free (you can change it)

• Blockchain technology is being used by banks, so it is very secure

• To make it work for everyone in construction and infrastructure – a common set of COBie data structure interfaces are needed so that software providers can push and pull text data in and out of their applications

• When there is a common set of standards, everyone in the supply chain can use Blockchain technology, including a self-employed painter and decorator

• Not tied down to any company, software vendor or cost commitment
• Blockchain software will be based on Hyperledger Composer
  • Linux Foundation & IBM influenced
• Cross industry specification and requirements will be coordinated through Helium Alliance:
  • a not for profit committee to agree and vote on standards
  • Coordinate effort across similar sectors, such as oil & gas, mining, utilities
  • Coordinate effort across software vendors
• Two year R&D programme for Blockchains within construction and infrastructure
  • Year 1 – specifications and requirements
  • Year 2 – test builds