BIM & LEAN
BUILDING INFORMATION MODELLING

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DIGITAL DESIGN | CONSTRUCT | OPERATE
About ArcDox

About the Presenter

- **Ralph Montague** BArch MRIAI
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  - Chair, National Standards Authority of Ireland (NSAI) BIM Mirror Committee
  - Board Member, Construction IT Alliance (CITA)
  - Coordinator, CITA BIM Group
  - Chairman, RIAI Practice Sub-Committee for BIM
  - Architects Council of Europe (ACE) BIM Working Group

- **ARCDOX** | Enabling & Supporting BIM
  - Consultancy, Production, Support & Training
  - 20+ years Industry Experience
  - 8+ years Experience with BIM
  - 100+ Projects in BIM
  - 1000+ People Trained in BIM Tools
BIM (Building Information Modelling) & LEAN Construction

- How BIM supports LEAN?
- What is BIM?
- Why is it important?
- How to do it properly?
Why BIM?

**INFORMATION** (about Buildings or Built Infrastructure)

- It is **Important**, it has **Value**, it is an **Asset**
  - **Reliable** Building Information is Required for:
    - Business Decision Making (Agreeing Design & Contracts)
    - Effective Delivery of Construction
    - Daily Operational Tasks
    - Preventative, Reactive & Emergency Response
    - Transactions (lease/sale & service charge)

- The **Quality** of Information affects Performance & Outcomes

- How do we define **Quality** Information?
  - Digital
  - Searchable
  - Accessible (easy to get to)
  - Accurate (current and up-to-date)
  - Useful (timely, ready-to-use)
Why BIM?

Building Information As We Know It Today

Why BIM?

A Digital Future in Construction - Better ways to Access & Interact with Information

- Cloud/Mobile Computing, Digital Fabrication, Virtual & Augmented Reality, Robotics
**Why BIM?**

**The Information Asset**

**Digital Information Strategy** (ISO55000 / PAS1192-3)

- **OIR** – Organisation Information Requirement (Global)
- **AIR** – Asset Information Requirement (Sites / Buildings)
- **EIR** – Employers Information Requirement (Projects)

**Information Degrading Depleting**

**Information Upgrading Increasing**

**Asset Information Model (AIM) Lifecycle**

- **Documents**
- **Non-Graphical Data**
- **Graphical Data**

**Value** of Implementing an Information Strategy

**Cost** of Implementing an Information Strategy

**When?**

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8 March 2017
Why BIM?

The Problem - Challenges of Current Building Information “Systems”

- How is it Produced
  - Analogue (Paper-based)
  - Multiple Documents
  - Manually Produced
  - Manually Coordinated
  - Labour Intensive
  - Time Consuming
  - Costly
  - Slow
  - Duplication of Effect
  - Abortive Work
  - Excessive Checking
  - Prone to Human Error
  - Coordination Problems

- How is it Used & Managed
  - Difficult to Assess
  - Difficult to Query
  - Difficult to Analyse
  - Confusion
  - Misunderstanding
  - Costly Administration
  - Delays
  - Variations
  - Rework
  - Abortive Work
  - Cost-Overruns
  - Disputes
  - Litigation

Over 30% of Cost of Construction is Waste

Lean Construction Institute
What is BIM?

Object-Based Modelling (not line-based drawing)
- Virtual Buildings Assembled from Objects with Intelligent Building Data – Digital Prototyping

### Building Elements
- Floors
- Walls
- Building Elements
- Doors
- Windows
- Bathrooms
- Kitchen

### Structural & Core Elements
- Roof
- 3D Components & Assemblies

### Furniture & Fittings
- Furniture

### Tables
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<th>Model No.</th>
<th>Finish</th>
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What is BIM?

**Fully Coordinated Drawings and Information Schedules**
- Information or “Documents” Derived or Extracted from the Information Model/Database
What is BIM?

**Traditional Methodology**
Intellectual / Productive Input into Multiple Disconnected Documents

- Time Consuming / Costly
- Prone to Human Error
- Problematic

**BIM Methodology**
Intellectual / Productive Input into a Virtual Building Information Model

- More Efficient
- Better Quality Documentation
- Better Outcomes

Documents Derived from BIM

Change Anywhere = Change Everywhere
**What is BIM?**

**Level 2 BIM - Sharing Models for Coordination Review**

- **Site/Civil Model**
- **Architectural Model**
- **Structural Model**
- **Services Model**
- **Federated Model**
- **3D Coordination**

- **4D Sequencing**
- **5D Cost Control**
- **6D Sustainability Analysis**
- **7D Facilities Management**
Why BIM?

What Do Clients Want?

BETTER PROJECT OUTCOMES

What are we Building?
Will it suit our needs, our image?

Is it well-designed, well-constructed, and durable?

What will it cost to Maintain, Manage & Operate?

What will it cost to
Maintain, Manage & Operate?

50% BETTER SCOPE
50% QUALITY
33% CHEAPER
33% COST
50% BETTER

3D BIM

6D BIM

5D BIM

4D BIM

7D BIM

UK 2025 Construction Strategy Targets

When will it be Delivered?

How much will it Cost?

Are we getting good Value for money?
Are our Risks being effectively managed?

Better Buildings, Built Quicker & Built Cheaper
BIM for Lean Construction

BIM is a “Lean” method of **Producing, Managing & Exchanging** Information

- No matter what your role...
  - you need some **information** to do your job,
  - in doing your job, you produce **information** that others need to do their job
  - good decisions & performance requires **good quality information**
    (digital, searchable, accessible, accurate, timely, ready-to-use)

- **Transport** - digital exchanges vs “paper exchanges” avoids duplication of effort
- **Inventory** – storage & reuse digital information vs storing static “paper” documents
- **Motion** – virtual design & construction, immersive web-meetings vs physical meetings
- **Wait** – quick digital changes/updateres vs slow manual “drafting” processes
- **Over-processing** – digital “consumption” vs processing “paper-based” documents
- **Over-production** – too much information too early. Rework. Late contractor involvement
- **Defects** – digital 3D coordination vs on-site coordination. Build it twice.
- **Skills** – Better use of peoples skills & time resolving problems vs mundane manual paper-based tasks

- Can LEAN work properly without BIM?
BIM for Lean Construction

**BIM (Better Information) supports key principles of Collaboration**

- **Early Engagement**
  - Collaboration within the virtual building environment
  - Improved understanding & engagement with stakeholders
  - Easy exchange of information for testing & analysis

- **Assessment of Value vs Price**
  - More detailed analysis of operational performance & lifecycle cost
  - More thorough review or assessment of digital proposals

- **Aligned Business Objectives**
  - More transparency in information assessments
  - More certainty, less risk, less adversarial relationships

- **Common Processes & Tools**
  - Focus of International BIM Standards (not “your way” of doing things)
  - Sharing information (the Common Data Environment)

- **Focus on Measurement, Performance & Outcomes**
  - Structured digital information supports assessment & measurement
BIM Requirements

BIM IS A PROCESS

- the benefits of BIM won’t be realized unless there is:
- a clearly defined & managed BIM Process (requirement) that
- every participant is required to adhere to during their contribution to the project

WHAT’S THE CATCH

We Need a Standard
**BIM Standards**

**UK Guidance & Standards**
- **BSi**
  - Pre-Qualification (PAS 91:2013)
  - Information Management (BS 1192 parts 1-5)
  - Design for Performance (BS 8536 Soft landings)
  - Design Management (BS 7000)
- **BIM Task Group**
  - Employers Information Requirements (EIR)
- **CIC**
  - BIM Protocol (contract)
  - Scope of Services for Information Management
  - PI Insurance Guidance Note
- **CPIx**
  - BIM Capability Assessments
  - BIM Execution Plans
- **RIBA**
  - Digital Plan of Work
  - NBS BIM Toolkit (Digital Plan of Work)

**International Standards**
- Asset Management (ISO 55000)
- Collaboration (ISO 11000)
- Adopted by EU (CEN TC 442):
  - Data Schemas (ISO 16739 - IFC)
  - Data Classification (ISO 12006 - IFD)
  - Data Exchange (ISO 29481 –IDM)
- Currently in Draft (ISO TC 59):
  - Information Management (ISO19650)
BIM Requirements

**PAS1192 - Level 2 BIM Process - Agreed Protocols & Standards**

- **Client**
  - EIR Employers Information Requirements

- **Commercial**
  - CIC (UK) BIM Protocol (contract)

- **Suppliers**
  - Pre-Contract BIM Execution Plan
  - PI Insurance Guidance Note

- **BIM Deliverables**
  - COBie (BS1192-4)
  - Uniclass
  - Soft Landings

- **Post-Contract BIM Execution Plan**

- **CDE** Common Data Environment

- **PQQ** Pre-Qualification Questionnaire (PAS 91)

- **BIM Deliverables**

- **PAS 1192-2** Specification for Information Management for the capital/delivery phase of construction projects using BIM

- **Digital Plan of Work** (NBS BIM Toolkit)

- **bim-level2.org**
BIM Requirements

Running a BIM Project

1) Document the Requirements and Responsibilities (EIR / DPoW)
2) Document “How” the team are going to deliver requirements (BEP)
3) Make it “Contractual” (BIM Protocol)
4) Put someone in charge (appoint an overall Project Information Manager & Task Team Information Managers for each discipline/supplier)
5) Check that everyone is capable (BIM capability assessments & PIP)
6) Keep all information in a central, well-organized place (CDE)
7) Make sure the “Data” is well structured (COBie, IFC, Uniclass, LOD/LOI)
8) Rule No.1: “NO PSEUDO BIM” (Documents derived from Models/Data)

Know your BIM Acronyms

- EIR: Employers Information Requirement
- DPoW: Digital Plan of Work
- BEP: BIM Execution Plan
- PIM: Project Information Managers
- TIM: Task Information Manager
- PIP: Project Implementation Plan
- CDE: Common Data Environment
- COBie: Construction Operations Building Information Exchange
- IFC: Industry Foundation Classes
- LOD: Level of Detail
- LOI: Level of Information

KEEP CALM! It's not ROCKET SCIENCE
BIM Requirements

**BIM Tools** (documents to achieve BIM Process)
- RIAI Employers Information Requirements (EIR)
- RIAI BIM Execution Plan (BEP)
- NBS BIM Toolkit (Digital Plan of Work)
- Construction Industry Council (CIC)
  - BIM Protocol (Addendum to Appointments / Contracts)
  - Scope of Service for Information Management
  - Guidance on PI Insurance
- Construction Project Information Committee
  - Pre-Contract BIM Execution Plan (BEP)
  - Post-Contract BIM Execution Plan (BEP)
  - BIM Capability Assessment Forms
BIM Requirements

BIM Level 2 Compliance Checklist

- Pre-Qualification Questions (PAS91 Table 8)  
- Employers Information Requirements (EIR)
- BIM Execution Plan (CPIx pre-contract / post-contract BEP)
- BIM Capability Assessments (CPIx templates)
- CIC BIM Protocol (addendum to contract)
- CIC Guidance for Professional Indemnity Insurance
- CIC Scope of Service for Project Information Manager
- Common Data Environment (CDE)
- Digital Plan of Work (Stages, Level of Detail, Level of Information)
- Digital BIM Deliverables (COBie, IFC, Uniclass2)
- BIM Standards BS1192 / PAS1192 / BS8541 / BS8536

- Ability to receive, open, navigate, query, analyse, review BIM data
- Ability to produce, manage, exchange BIM data
BIM for Lean in Summary

Building Information Modelling

- A Process (not software) – Creating & Sharing Information
- Streamlined Workflows & Improved Collaboration/Communication
- Production of Coordinated & Reliable Quality Documentation
- Reduced Uncertainty, Waste & Risk = Better Outcomes
- All About the Information – the “i” in BIM
- Used by All Stakeholders throughout the Projects Lifecycle
BIM in Europe

European Union BIM Initiatives

  All 28 EU Member States may encourage, specify or require the use of BIM for publicly funded construction projects in the EU from 2016.

- **EU Government Policies & Initiatives**
  UK, Netherlands, Denmark, Finland, Norway, Sweden, France, Germany etc require BIM for publicly funded construction projects.

- **EU BIM Task Group**

- **EU BIM Standards**
  CEN TC 442 - EU Standards for BIM being adopted or developed
  ISO TC 59 – International Standards for BIM

Opportunity

- Threat
- Skills
- Efficiency
- Productivity
- Innovation
- Competitiveness
BIM in Ireland

CITA BIM Group - The “Meeting Place” for BIM in Ireland

- 20+ Industry Stakeholder Organisations Officially Represented
- 7000+ Members, Discussions & Free Resources on LinkedIn
- 2011-2017 CITA Smarter Building Series
- 9 Regional BIM Groups
  - Dublin, Cork, Waterford, Tralee, Limerick, Galway, Athlone, Sligo, Letterkenny
- BIM Gathering Conference (23-24 Nov 2017)
- BIM Innovation Capability Programme (BICP)
- National BIM Council
- NSAI National Mirror Committee for BIM Standards

www.CITA.ie
www.BICP.ie
www.NBCireland.ie
BIM Consultancy - How Can ArcDox Help?

Enabling & Supporting BIM

- Specialist BIM Consultancy Services to Project Teams
- Access to Professional Expertise on “As Required” Basis

- **BIM Consultancy**
  - Implementation Advice, Execution Plans, Project Setup & BIM Workshops
  - Documentation, Standards, Templates & Libraries

- **BIM Production**
  - Stay Lean – Access Expert Resources for Workload Demand Peaks
  - Outsource Non-Design Work (2D–3D Conversion)

- **BIM Training**
  - Revit Architecture, MEP & Structure, Navisworks, 3D Max Design, etc
  - Autodesk Authorized Training & Certification Centre, RIAI CPD Links

- **BIM Support**
  - Online, On Call or In-House – Keep Team Members Productive
  - Technical Advice, Model Management, Review & Quality Control
QUESTIONS