BIM IMPLEMENTATION PRACTICES OF CONSTRUCTION ORGANISATIONS IN THE UK AEC INDUSTRY

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Introduction

- The UK construction industry: a loosely-coupled system

- Building Information Modelling (BIM): a tool to ease the complexity of the partnering or collaborative process in the delivery of a project.

- BIM: a collaborative platform to bridge the information loss associated with handling a project from the design team, to the construction team, and the building owner.

Literature Review – RIBA Plan of Work (PoW)

- RIBA PoW: Most widely used Plan of Work for BIM implementation in the UK.
- Incorporates the principles of sustainability, provides a platform to support and facilitate the BIM processes and technology
- Enhances effective collaboration amongst project participants
- Provides a template for the adoption of all forms of procurement routes (DBB, DB, CM@R, IPD, etc.)
- Gives room for adjustments in the timing and application of municipal planning procedures (RIBA, 2013).

Literature Review – Process Flow of RIBA PoW

- Process flow involves a collaborative project team with stakeholder responsibilities throughout the project lifecycle (Sinclair and Eynon, 2013).

- Overall process flow of the RIBA Plan of Work:

PREPARE → DESIGN → CONSTRUCT → USE

- Can be classified into 8 project stages as follows (RIBA, 2013).

Literature Review – RIBA PoW Stages 0 - 3

- **Stage 0** – the Strategic Definition stage
- **Stage 1** – the Preparation and Brief stage
- **Stage 2** – the Concept Design stage
- **Stage 3** – the Developed Design stage

Literature Review – RIBA PoW Stages 4 - 6

- **Stage 4** – the Technical Design stage
- **Stage 5** – the Construction stage
- **Stage 6** – the Handover and Close Out stage

Literature Review – BIM Elements

- BIM: a superset of elements (Miettinen and Paavola, 2014)

i. A common database system;

ii. The interoperability of data-sharing between several BIM design tools;

iii. Utilisation throughout the project life span;

iv. Enhancement of the effectiveness, efficiency and overall productivity of the AEC industry.

Literature Review – BIM Definition

- BIM: "A digital representation of a building to facilitate interoperability and exchange of information with related software applications." (Miettinen and Paavola, 2014).

- Not just a software tool, but a technology and a process, embedded into a Plan of Work, chosen by the Client, to meet project requirements throughout the project life cycle.

Methodology – Introduction

- Adoption of Interview method for the following reasons:

i. Access to In-depth information;

ii. Greater flexibility than the questionnaire method to rephrase questions for better clarity and information;

iii. Access to additional information about the interviewee's personal experience in the work environment, which may greatly enrich the interpretation of results (Kothari, 2004).

Methodology – Case Study Approach

- Adoption of the "how" and "why" questions to uncover contextual conditions relevant to the phenomenon in question (Yin, 2009).

- Adoption of multiple-case study design to enable researcher to explore differences between and within cases.

- A literal replication of 2 cases to achieve a greater degree of certainty and validation of the research study.

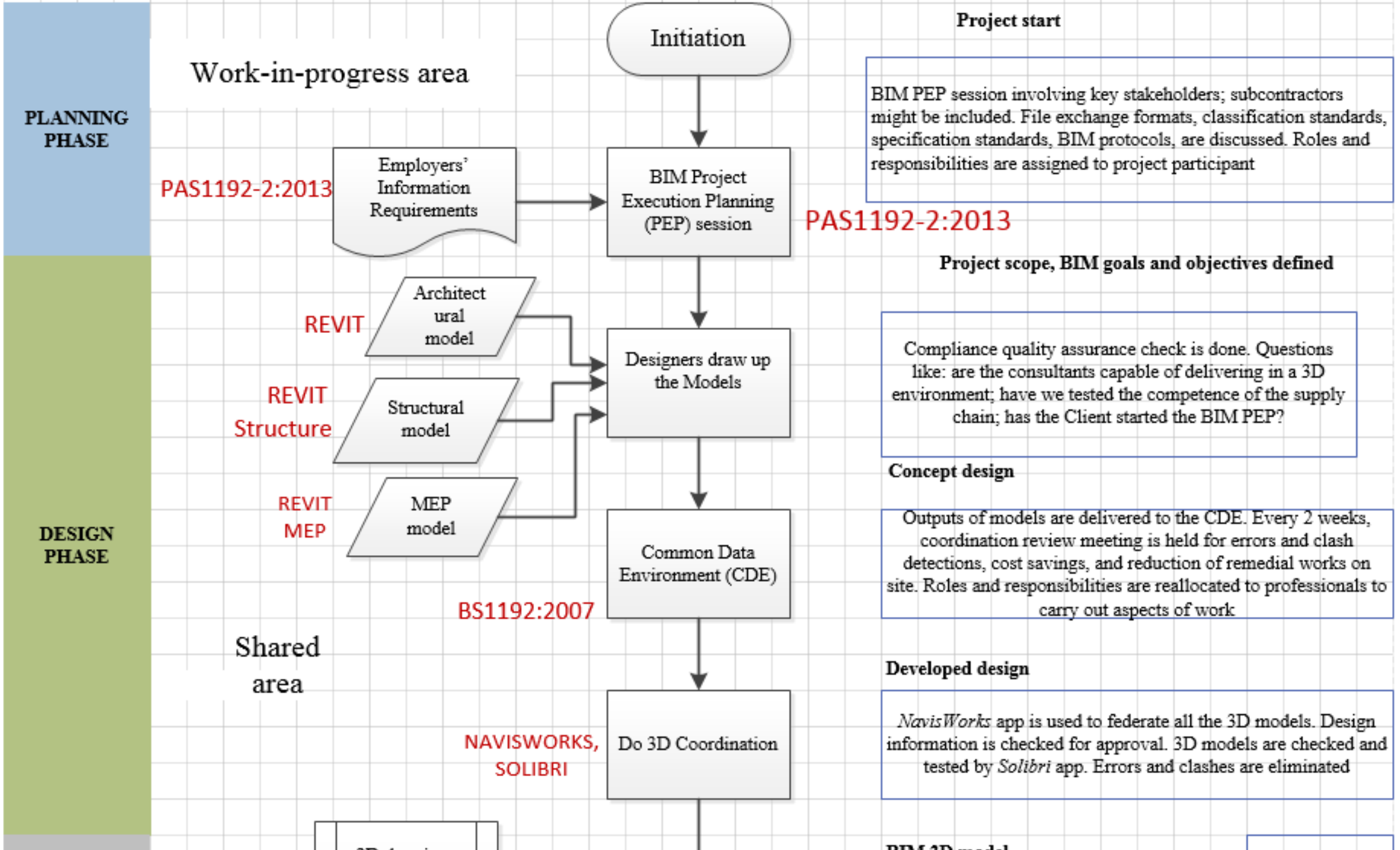
Methodology – Target Population

- Choice of construction organisations involved in BIM project delivery;
- Selection of experienced respondents (BIM Experts);
- Drawn from the Manchester and London metropolitan cities of England.

Results and Discussion

- Suitability of a process map to describe the BIM implementation practices of construction organisations across the project phases in the UK.

- Hence, the Process Map incorporating the case study findings was developed and is illustrated below:


PLANNING PHASE
DESIGN PHASE
Work-in-progress area
Shared area
Initiation
Project start
BIM PEP session involving key stakeholders; subcontractors might be included. File exchange formats, classification standards, specification standards, BIM protocols, are discussed. Roles and responsibilities are assigned to project participant
PAS1192-2:2013
Employers' Information Requirements
BIM Project Execution Planning (PEP) session
PAS1192-2:2013
Project scope, BIM goals and objectives defined
REVIT
Architectural model
REVIT Structure
Structural model
REVIT MEP
MEP model
Designers draw up the Models
Compliance quality assurance check is done. Questions like: are the consultants capable of delivering in a 3D environment; have we tested the competence of the supply chain; has the Client started the BIM PEP?
Concept design
Common Data Environment (CDE)
BS1192:2007
Outputs of models are delivered to the CDE. Every 2 weeks, coordination review meeting is held for errors and clash detections, cost savings, and reduction of remedial works on site. Roles and responsibilities are reallocated to professionals to carry out aspects of work
Developed design
NAVISWORKS, SOLIBRI
Do 3D Coordination
NavisWorks app is used to federate all the 3D models. Design information is checked for approval. 3D models are checked and tested by Solibri app. Errors and clashes are eliminated

CONSTRUCTION PHASE

2D drawings extracted from 3D models for contract information and construction on site

3D model update

NAVISWORKS

Do 4D modelling

SYNCHRO

Learning Requirements

Published area

Do 5D modelling

COST X

Construction of BIM model

BIM 360 FIELD/ DESKTOP

Construction on Site

NAVISMANAGE

BIM 3D model

NavisWorks app is used to federate the architectural, structural, mechanical-electrical-plumbing models

Synchro app is used for visualisation and real-time sequence of construction works

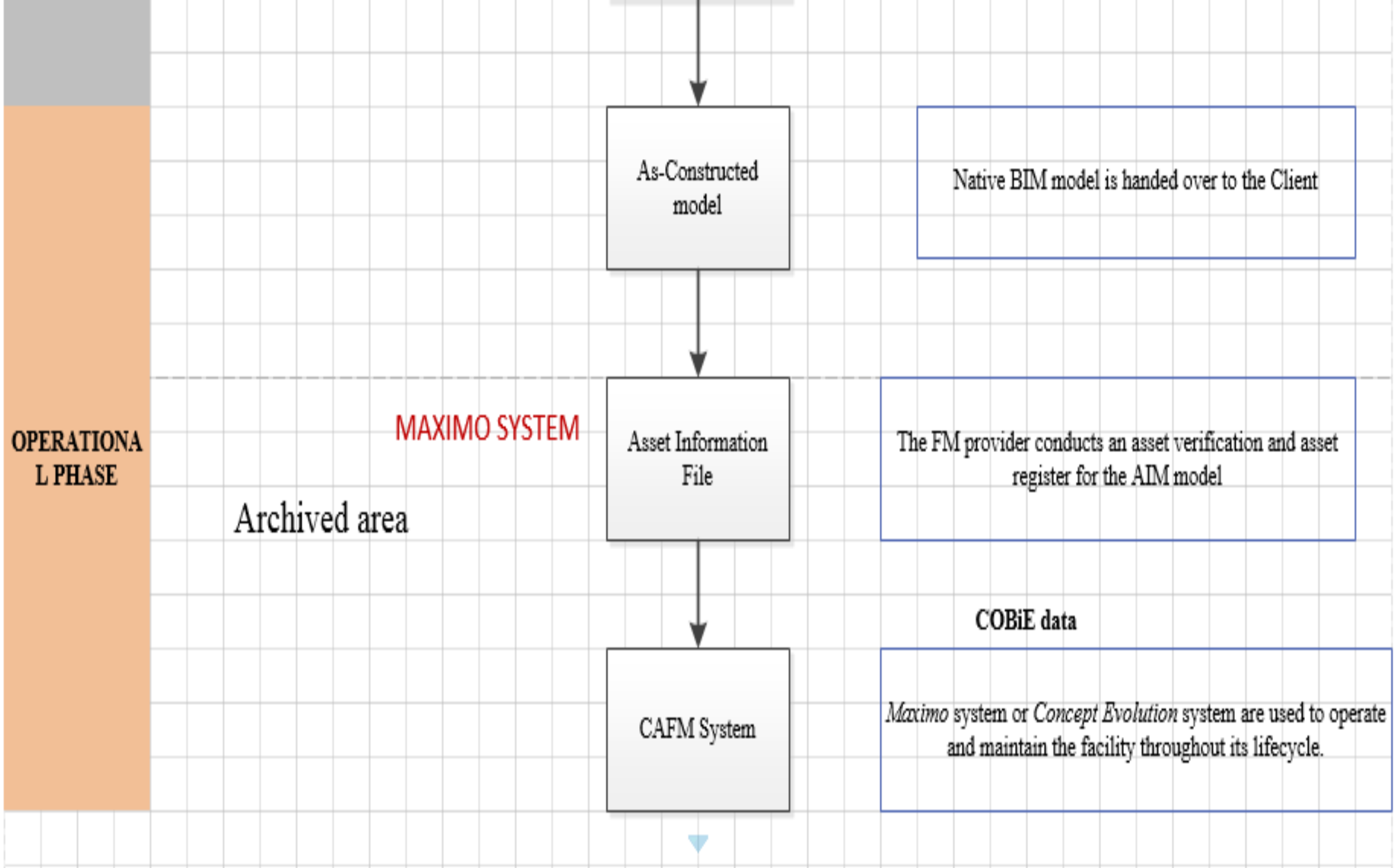
CostX app is used to extract cost estimate of the facility

3D, 4D, 5D BIM models

Hand-held BIM on iPad, *BIM 360 Field* app used to review 2D & 3D models on site. It is used to check if the physical item or element has been installed properly on site, sending the info to the office desktop.

NavisManage app federates and interrogates the 3D,4D, 5D models

Construction simulations, showing several scenarios and alternatives of the models to choose from.


OPERATIONAL PHASE
MAXIMO SYSTEM
Archived area
As-Constructed model
Native BIM model is handed over to the Client
Asset Information File
The FM provider conducts an asset verification and asset register for the AIM model
COBiE data
CAFM System
Maximo system or *Concept Evolution* system are used to operate and maintain the facility throughout its lifecycle.

Conclusion

- Extraction of BIM activities at each phase of projects managed by the case study organisations;
- Information inputs fed into the BIM activities at the project phases;
- Illustration of information outputs at the end of each project phase in the process map.
- Development of a process map, linking all BIM activities in the project life cycle;
- Process Map represents the BIM implementation practices of UK construction organisations, for enhanced collaborative working, thereby improving BIM planning and implementation across the project life cycle.

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Thanks for listening.

Any Questions, please?

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