In this guest post, **Ralph Montague** (*Managing Partner of ArcDox, a BIM consultancy practice based in Dublin, Ireland*) offers his insights into the changing role of the project manager in the UK following the Government's BIM requirements and rapidly-changing market landscape. I'm sure you'll find his insights very useful:

Introduction

In 2011, the UK Government implemented an ambitious construction strategy intended to reduce construction cost and waste; improve the quality and performance of buildings; reduce carbon emissions; improve the competitiveness of the UK construction industry in a global market; and drive economic growth in the sector. With a clear vision and Task Group leadership, they set out to implement this strategy from the cabinet office down through all government departments. Part of this strategy was to make Building Information Modelling (BIM), an information production and management process, mandatory on Government's projects by 2016. To implement this strategy and mandate, the Government supported the development of standards and protocols that would enable BIM processes.

This approach resulted in significant BIM-related discussions and developments. From among all these discussions and chatter, it is important to isolate the BIM issues that are important to project directors, leaders, and managers. It is also important to identify the *project manager's BIM role*.

BIM is discussed across numerous documents with lots of terms and acronyms. Many of these can sound overly technical, complicated and overwhelming. This article will hopefully provide project managers with some clarity and identify the documents that facilitate managing BIM projects more effectively. After a brief introduction, the post will provide five *basic questions* that each project manager will need to ask the project team, and then ensure proper responses are received. At the end of the post, a checklist is provided for project managers to use during project meetings and team workshops.

The Problem

To the uninitiated, BIM can seem both complicated and overwhelming. This is typically because we, as an industry, are attempting to do something quite novel; bring together a diverse range of professionals, consultants, contractors and sub-contractors; encourage them to work together in a collaborative and coordinated way; ask them to use new industry standards; and adopt innovative digital workflows. However, although these changes may appear overwhelming, at its essence, it is simply about improving the way we currently work. Even if it takes some initial additional effort to adopt all these changes, there are significant improvements to be gained in design coordination, construction quality, and information accuracy. As demonstrated in the UK government BIM pilot projects (refer to www.bimtaskgroup.org), there are measureable reductions in construction waste as well as time-savings across the construction programme.

Keeping this in mind, when all these changes seem too complicated and overwhelming, try to remember *why* you want BIM in the first place, or in other words, identify the many benefits of using BIM tools and workflows, which include:

- Better communication and understanding of the project (the 3D virtual building is far easier to understand than 2D documents)
- Better analysis of building structure, energy, cost, and project programme
- Better information flows through digital transfers, reduced duplication of effort, etc.
- Improved design coordination allowing better tenders, and a reduction in construction cost/waste
- Improved building performance leading to reduced operation costs
- Improved cost/time certainty and a reduction of risk
- Effective project delivery
- Better information capture, storage and sharing across project stages, particularly for 'handover' from design to construction, and from construction to operation.

BUT, a word of caution…

It is important to remember that the benefits of BIM cannot be fully realized without a clearly defined and well managed BIM processes which project participants are required to adhere throughout the project. Without such processes, the use of BIM on a project may cause unnecessary costs and delays. This is where a well-informed project manager, armed with knowledge and experience in industry protocols and standards, will shine! To ensure the implementation of BIM has a positive impact on the project programme, cost and outcomes, a project manager needs to ensure that (a) clearly defined and well managed BIM processes are in place; and (b) check that every project participant will be making the necessary contributions into the project.

As part of its BIM mandate, the UK Government has supported the development of a suite of documents and standards that would support widespread BIM implementation (Figure 1). BS1192, the British Standard for managing the production, distribution and quality of construction information, has been extended to include four additional Publically Available Specifications (PAS). These are PAS1192:2 specifies requirements for achieving building information modelling (BIM) Level 2 during capital delivery phase, PAS1192:3 specifies information management for the operational phase of assets using BIM, PAS1192:4 specifies employers' information exchange requirements using COBie, and PAS1192:5 specifies security-related matters for BIM and smart asset management. Obviously all these *parts* are important, but from a project manager's perspective, PAS1192:2 is the key document.

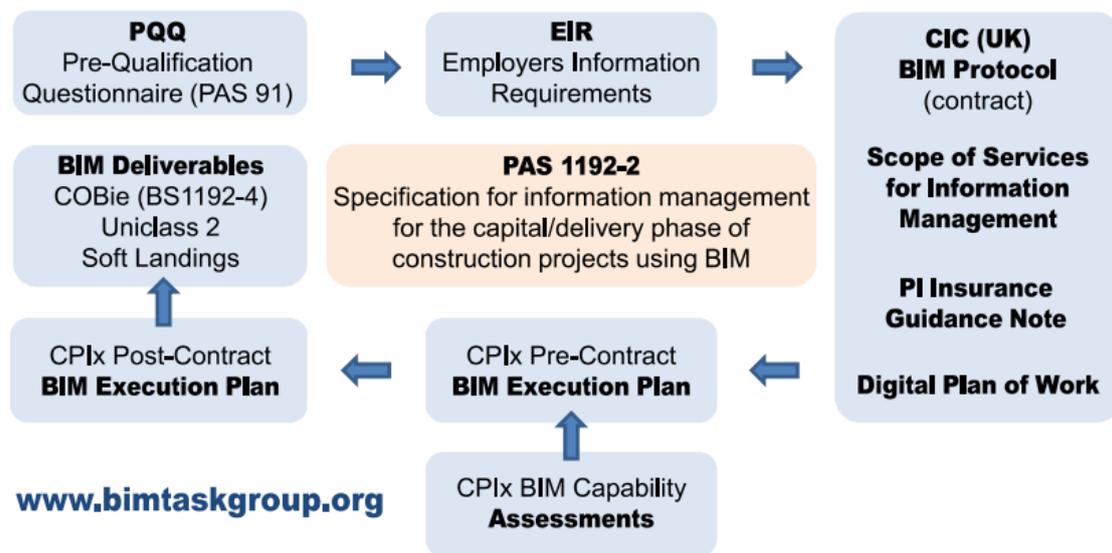## PAS1192 - Level 2 BIM Process - Agreed Protocols & Standards

Figure 1. PAS1192- Level 2 BIM Process Protocols and Standards.

To achieve success across BIM projects, project managers need to *ask the right questions* and ensure *key standards* are implemented in a *timely fashion*. While the responsibility for dealing with these questions can be delegated to other parties – e.g. the legal team, commercial contracts team, consultants, contractor, and sub-contractors, it is the project manager's role to ensure they are properly answered.

To assist project managers to fulfil their BIM role, below are five *basic questions* that they need to consistently ask in every meeting:

Question 1: is all required *BIM documentation* - as set out in PAS1192:2 – in place?

Question 2: are all participants aware of the *BIM-related requirements* for producing, managing, and exchanging project information?

Question 3: is all *project information* being generated, managed, exchanged using the right BIM-suitable formats?

Question 4: is the *federated model* being used and shared at design coordination and stakeholder meetings?

Question 5: is the information content within models being regularly checked for *complianc*e with employers' information requirements?

Let's address each of the five basic questions in some detail:

Question 1

Is all required BIM documentation - as set out in PAS1192:2 – in place?

The below table clarifies a number of sub-questions and provide reference material to answer each:

	SUB-QUESTION	REFERENCE MATERIAL
1.1	Have Pre-qualification Questionnaires (PQQ)s covering BIM capability been included in tender requests for both design and construction services?	Refer to Table 8 in PAS91:2013 (Link)
1.2	Have all appointed designers/contractors agreed and signed the BIM Protocol (as an addendum to their appointment/ contract)?	Refer to CIC BIM Protocol template: (link)
1.3	Is an Employers Information Requirements (EIR) provided as part of tender requirements? *Note that the EIR is a document setting out the client's BIM objectives and deliverables, including a preliminary Model Information Delivery Plan (MIDP).*	Refer to Core Content and Guidance from UK BIM Task Group (link) The NBS also has BIM Toolkit to help prepare the EIR & MIDP https://toolkit.thenbs.com/
1.4	Have all tendering designers/contractors provided a Pre-Contract BIM Execution Plan (BEP) as part of their tender submission, in response to the EIR? *Providing a template to guide tenderer's response is very useful when trying to assess multiple suppliers submissions*	*Refer to CPIx template Pre-Contract BEP* (link) including BIM Capability Assessments for BIM Projects, Staff & IT Resource (link)
1.5	Has the lead designer signed up to the role of Project Information Manager (Design Stage)? Has the main contractor signed up the role of Project Information Manager (Construction Stage)?	Refer to CIC (UK) Outline Scope of Services for Information Management (link)
1.6	Have all parties - involved in design - informed their PI insurance brokers that they are participating in a BIM project?	Refer to guidance from CIC (UK) (link)
1.7	Has the Project Information Manager (for both the design and construction stages) provided a coordinated Post-Contract BIM Execution Plan (BEP), detailing how the team will deliver the Employers Information Requirements (EIR)?	Refer to CPIX template Post-Contract BEP (link)
1.8	Is there a Common Data Environment (CDE) in place for the design and construction stages, in compliance with PAS1192:2, and acting as a central repository for all project information (graphical and non-graphical)?	Requirements need to be specified within the tender documents to outline who will provide the CDE, and what features/functions the CDE needs to include.

Note: BS1192 & PAS1192-2 are currently being considered as a base for ISO 19650, and may well become international best-practice in the future.

Question 2

Are all participants aware of the BIM-related requirements for producing, managing, and exchanging project information?

According to UK Level 2 BIM documentation, each discipline need to generate, manage and exchange their project information in a digital format. This requirement must be clearly communicated, highlighted and accounted for in tender prices. Such digitisation is important in order for different work elements to be federated into an overall coordination model for review and eventual handover to the client. Where documentation has not been derived from models, it needs to be clearly highlighted and agreed upon. By requiring every participant to provide their pre-contract BEP and BIM capability assessment, and participate in preparing the post-contract BEP, we can be certain that each member of the project team is aware of their respective role and responsibility.

Question 3

Is all project information being generated, managed, exchanged using the right BIM-suitable formats?

The project manager needs to ensure there is no *pseudo-BIM* being provided or [BIM wash](#) being committed. If team members are not generating their information in a BIM-suitable digital format, it is imperative to ask them to justify that and – if no valid reason is given – request they provide it as soon as possible. It may be reasonable that some work elements do not require the use of BIM tools and workflows, and that this may change at later stages of the project. This is perfectly acceptable *if* this is documented and agreed upon by the project team, *and if* duplication and additional costs are avoided. This is why the [Master Information Delivery Plan](#) (MIDP) is an important document to complete as it details the building elements that need to be modelled, at what stage, by whom, and at what Level of Definition (Level of Model Detail and Level of Model Information). This would provide clarity and transparency and manage team expectations.

Question 4

Is the *federated model* being used and shared at design coordination and stakeholder meetings?

The project team should use *federated models* through a [Model Viewer](#) to facilitate communication and information sharing at every meeting. The use of these federated models allow enhanced visualizations and understanding, and can facilitate better analysis and multiple [Model Use](#)s such as [Clash Detection](#); programme analysis and sequencing ([4D](#)); cost analysis and quantity take-off ([5D](#)); [Structural Analysis](#); [Energy Use](#); [Lighting Analysis](#); [Egress and Ingress](#) analysis; [Safety Simulation](#); quality control/snagging; [Commissioning](#); operational cost; [Life Cycle Assessment](#); and multiple uses in FM/operations. That is, if the project team are investing their efforts in creating models and populating them with information, it makes sense to leverage these models to benefit the project and better inform the project team.

Question 5

Is the information content within models being regularly checked for compliance with employers' information requirements?

As a project manager, you need to ensure that a *model checking procedure* is included in the EIR, and is documented/implemented through the BEP. It is also important that, at key project stages - particularly before handover - all project information is *accurate* and *assessed for*:

- ▪ **Compliance** with the COBie standard BS1192:4 by checking data integrity;
- ▪ **Continuity** by detecting the addition/removal of objects and attributes between data drops; and
- ▪ **Completeness** by assessing information against object properties/attributes expected at the completion of each project stage (as detailed in the EIR/MIDP).

A Checklist for BIM Project Managers

Based on the above discussions, please find below a *quick BIM Level 2 checklist for project managers* to be included into project' meeting agendas. This checklist reflects the *five basic questions* and ensures related matters are being considered and addressed:

☐ Identify high-level BIM objectives and benefits for the project;

☐ Appoint the employer's representative and technical advisor;

☐ Agree on BIM standards for project delivery (refer to BS1192, PAS1192, BS8541, Uniclass2015);

☐ Define the BIM questions to be used in pre-qualifying the supply chain (refer to PAS91 Table 8);

☐ Define the Employer's Information Requirements (EIR) (refer to BIM Task Group Guidance and PAS1192-2);

☐ Assess the BIM Capability of the supply chain (use CPIx templates);

☐ Pre-appointment the supply chain by asking them to respond to the EIR by completing a Pre-Contract BIM Execution Plan (use CPIx pre-contract BEP Template);

☐ Ensure the supply chain is informed about Professional Indemnity Insurance implications (refer to CIC Guidance);

☐ Ensure the BIM Protocol is part of all appointments and contracts (use CIC BIM Protocol)

☐ Appoint a Project Information Manager for the Design and Construction stages (refer to CIC Scope of Service for Information Management);

☐ Ask the Project team and the Information Manager – once appointed – to draft the Post-Contract BIM Execution Plan (refer to CPIx post-contract BEP Template);

☐ Agree-on and set-up a Common Data Environment (CDE);

☐ Develop a Digital Plan of Work or MIDP including responsibilities, stages, and levels of definition (consider using the NBS BIM Toolkit);

☐ Define the Digital BIM Deliverables including file formats, COBie, Uniclass2015 and IFC;

☐ Establish a training and support programme to address any capability issues; and

☐ Facilitate workshops and induction meetings until information management roles are well established.

Conclusion

Project managers play a vital role in a project's programme and outcomes. With the wide-spread adoption of BIM, digital Information Management has become a key part of that role. That is, project programme and outcomes are now – more than ever – directly impacted by the quality and timeliness of information generated and shared by all project participants. Receiving the correct information, at the right time, and in a usable format is critical for decision makers to keep each project moving in the right direction, and to avoid decision reversals, wasteful delays, and abortive work. While project managers do not generate 3D models themselves, it is important they understand all critical BIM-related technologies, workflows and protocols, so they can adequately manage the BIM process and achieve successful project outcomes. While the use of BIM on projects can yield great benefits to project stakeholders, these won't be achieved without a clear plan, the right technologies, a committed project team, and – most importantly – a well-informed project manager.

Further Reading

- Understanding BIM in a project management environment (link)
- CIOB Project Managers' Guide Updated for BIM Era (link)
- The Design Manager's Handbook (link)

Guest Author

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Editor's note: all questions about the article's contents need to be directed to the article's author using either the online commenting feature, or by contacting the author using the email provided above.

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