BIM Management Plans

P2 What should be addressed within a BIM Management Plan?

P2

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P BIM Management Plans

P1 What is a BIM Management Plan and why should we use one?

P2 What should be addressed within a BIM Management Plan?

P3 How should you prepare and apply a BIM Management Plan?

P2 What should be addressed within a BIM Management Plan? [Version 1 – August 2012]

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INTRODUCTION

The BIM Management Plan (BMP) addresses how all the key elements of a project – people, program, tools, processes and protocols – will be organised and managed to achieve the project goals. Even though all projects have these elements in common, a plan should be prepared specifically for each project. The particulars must respond to the client requirements, project needs, team capacity/skill/expertise, procurement method and other project-specific circumstances.

There are various template documents available within the public domain that include the items that should be addressed in a BIM Management Plan. The list below is a good representation of items found in many. These templates are listed in the document **P3: How should you prepare and apply a BIM Management Plan?**

CONTENTS OF A BIM MANAGEMENT PLAN

The listing order and grouping of the following items does not imply a hierarchy of importance or a fixed order of consideration. Many are closely interrelated and addressing one can often entail making decisions about another. Whatever the nature of the project – its size, complexity, duration and the like – tailor the list to suit as appropriate.

1. *Agreement*

The extent to which project participants agree to the BIM Management Plan (regarding its contractual status) should be clearly defined. In addition, the expectations and methods for future amendments of the agreement should be stated. It would be highly unusual for the first iteration of the BIM Management Plan to remain unchanged by the end of the project.

2. *BIM Management Plan overview*

The BMP overview should state the purpose of the document, overview of scope, and expected applicable duration (eg, design only, design/construction).

3. *Project particulars*

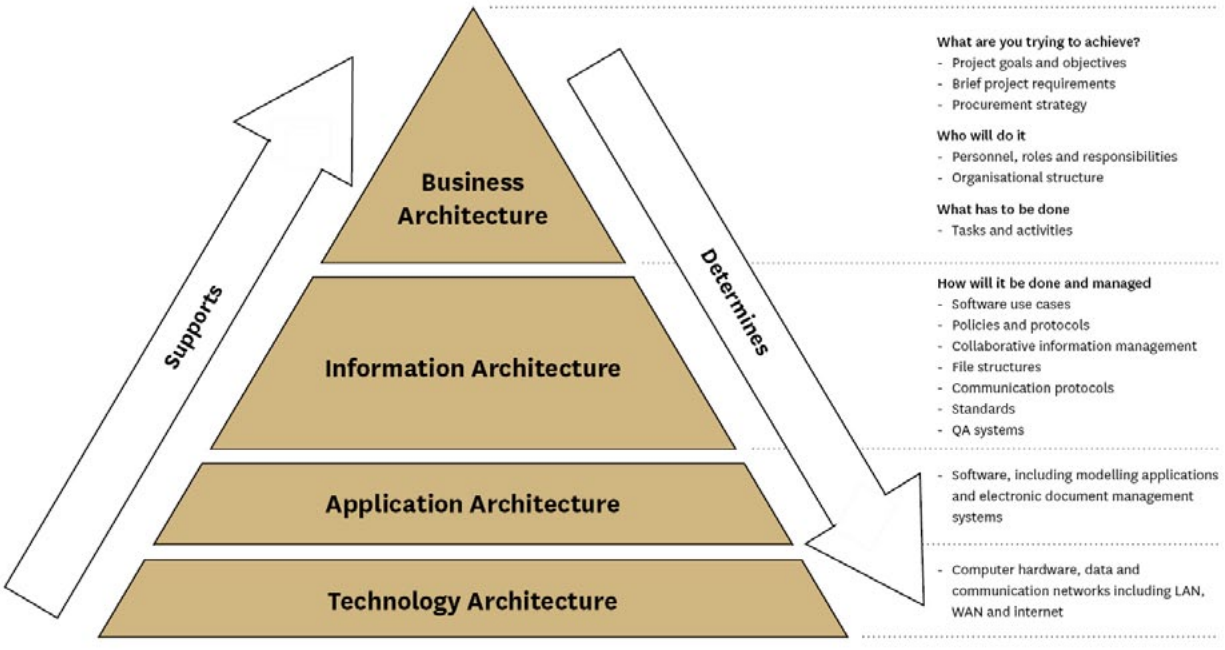
a. Project identification

Project title, description, address, client etc

b. Project team & contacts

Where this information is already recorded in a readily accessible form, such as in an online project collaboration/document management system, it may be more sensible to reference it there rather than replicate it in the BIM Management Plan. This saves maintaining duplicate records and reduces the risk of errors.

Monitor changes to the project team for their contractual implications. In some instances it will also be appropriate to record changes in an addendum to the contract or renegotiate the contract.



Elements of a BIM Management Plan
(Adopted from the NIST Enterprise Architecture Model)

c. Project roles & responsibilities

Define roles and responsibilities by reference to existing industry documents (and any contracts in force) and adjust the roles/responsibilities or documents to suit the requirements of your project through documented amendments.

Monitor changes to roles and responsibilities for their contractual implications in the same way as noted for changes in project personnel. This may vary from simple edits to names and contact details, to creating induction protocols and providing BIM-related education and/or training.

The NATSPEC BIM Management Plan Template[1] refers these details (and a number of others) to a 'Project BIM Brief' where they have been recorded earlier. It also requires all additional changes to be recorded there so that they are consolidated in a single location.

The role of 'BIM Coordinator' (alternatively known as 'Project BIM Manager') should be defined. Their responsibilities should be clearly articulated. Necessary traits of the BIM Coordinator are leadership skills, good communication ability, and BIM experience[2]. They should be committed to upholding the project's informational integrity, purpose and related processes. In this capacity, they should be able to hold the project participants accountable to what is established within the BIM Management Plan.

d. Project team member BIM capability & maturity statement

Inclusion of this in the BIM Management Plan will be influenced by factors such as prior working relationships between team members and the project's history. Generally, assessment of each team member's BIM capability and maturity should be done as part of the selection process, i.e. before development of the BIM Management Plan begins.

Regardless of contractual appointment a measure of accountability is necessary. If a statement of team member BIM capability and maturity is included here it will be more for purposes such as the following:

- assessing the most appropriate allocation of roles, responsibilities and authorities
- balancing aspirations against available capabilities and capacities
- assigning working relationships so that less experienced team members are teamed with more experienced members for support and mentoring
- identifying training requirements

e. Project procurement strategy

The procurement model to be used has a fundamental influence on the project, the responsibilities of team members, their relationship to one another, whether there will be one or a series of BIM Management Plans and what will be recorded in them.

For traditional design-bid-build project procurement, involvement by contractors does not occur until the design is largely complete, preventing them from making a contribution or setting any expectations. Project design team members may be shooting in the dark if they attempt to anticipate the needs of someone who has yet to be appointed.

For design-and-construct or managing contractor procurement models, the same applies but to a lesser degree. The contractor typically assumes most (if not all) of the responsibility for the design and program. Design and value management decisions are made subject to their agreement, meaning their interests can tend to dominate, rather than a collective pursuit of what's best for the project.

Integrated project delivery (IPD) is an emerging procurement method, intended to avoid the problems of the others mentioned, and provide for better project outcomes.

4. *Project definitions/terminology*

Definitions and terminology can be extremely important at a practical and contractual level, so it is best if key terms are defined clearly at the outset of the project. The Australian Institute of Architects and Consult Australia have published a **Glossary** of definitions as part of the: **'BIM! What is it?'** document that is part of this series. Additional industry definitions can be found in document **P3: How should you prepare and apply a BIM Management Plan?**.

5. *Project objectives*

Start with the end in mind, considering the objectives of all stakeholders involved. Assess how tangible and valuable each objective is, and who it will benefit. Include measures by which the achievement of each of those objectives will be recognised.

Objectives should be selected while taking into account the capabilities of the team as a whole. Identifying priorities among options being considered will also help clarify appropriate objectives.

Examples might be:

- completion of the project by no later than a given date
- provision of a world-class sporting facility with unmatched flexibility (further definition on some objectives may be required for them to have any practical meaning)
- achieving a Six-Star Green Energy Rating
- building to be carbon-neutral and built using local materials and suppliers

1 *NATSPEC National BIM Guide v1.0*, NATSPEC Construction Information Systems, September 2011.

2 *bimM: A practical look at Building Information Model Management*, C3 Consulting Solutions, 2009 http://c3consulting.com.au/newsletter/infocus-october-2009.html.

Note: *The Penn State BIM Project Execution Planning Guide*[3] sets out a method for defining project goals and objectives, and provides tools such as worksheets to help make use of it.

6. Project BIM uses

The client may not know (or care about) BIM uses – this is more about methodology than outcomes. Where a client does stipulate a BIM use as a requirement, it should be included, but also clearly defined. It is important to set clear expectations and determine downstream process/modelling impacts as a result of the BIM uses.

Client level of engagement with regard to BIM uses may vary based on their experience, enthusiasm or other vested interest in BIM applied to the project.

Among many possible BIM uses are: Design visualisation, Structural modelling and analysis, Code checking, Quantity take-off and cost planning, 3D clash detection, 4D construction sequencing etc. Several of the BIM Management Plan template documents (listed at the end of this document) provide detailed lists and explanations for each BIM use.

7. Project deliverables

Examples might be:

- hard-copy or digital drawings
- model-based schedules and quantity take-offs
- model-based fabrication files
- room data sheets
- data-rich as-built models

These may change as the project progresses.

8. Project procedures & protocols

- Project schedules (programs)

  Define project stages/milestones, and how they impact on BIM and vice versa. Note that contrary to popular misconception, Levels of Development (LODs) are not project stages.

  A variety of meetings and workshops may be required for project kick-off, project inductions, model coordination and resolution, model exchange, software testing/review, site inductions etc. Ideally, any schedule for a particular meeting type should also be incorporated in the overall project program so that they can be seen in context.

- Information exchange

  i. Informational requirements

     Modelling scope: The relationship between the model and the drawings should be established to set common expectations within the project team around issues such as how much will be modelled, where and to what extent detail should be addressed, will particular areas be modelled ahead of others (based on project conditions, anticipated construction sequence, or because they are typical)?

     Data requirements: (usually focused on Operations and Maintenance – O&M) should be identified, as well as who they're required by and when. COBie[4] (Construction Operations Building information exchange) or SPie[5] (Specifier's Properties information exchange) are two information standards that may be useful for reference here.

     Any data added to the models over and above what is documented in the BMP is theoretically unnecessary – therefore potentially abortive – given the challenges in 'guessing' the data requirements of others. It is better to accommodate their requirements via amendments to the BMP after they have been formally established.

  ii. Information exchange matrix

     Who will provide what to whom, when and in what format?

     Issues to be addressed include file preparation (prior to issue/sharing), distribution methods and timing, terms of use and receipt and quality control.

     An informational exchange matrix can be used to map out what formats are required to be shared when and between which project participants.

  iii. Collaboration procedures

     BS 1192[6] and BIP 2207[7] (a related guide) document recommends practices for the collaborative production and management of information. These could be adapted to suit project needs where necessary.

- Information generation

  i. **Model element authoring** (including levels of development)

     It is necessary to establish who is responsible for what elements in the overall aggregated model. Agreeing and documenting modelling methodology is important for a cohesive collaborative team effort. Various documents assist in mapping this out – chiefly the AIA E202 BIM Protocol Exhibit[8]. It establishes a metric that "describes the level of completeness to which a Model Element is developed", called a *Level of Development* (LoD), of which there are five levels identified: LOD 100, 200,

3 *BIM Project Execution Planning Guide Version 2*, Computer Integrated Construction Research Program (CIC) at the Pennsylvania State University, July 2010 http://bim.psu.edu/.

4 Construction Operations Building information exchange (COBIE), Dr E William East, PE, PhD, http://www.wbdg.org/resources/cobie.php.

5 http://www.buildingsmartalliance.org/index.php/projects/activeprojects/32.

6 BS 1192:2007 *Collaborative production of architectural, engineering and construction information – Code of practice*, British Standards Institution, 2007.

7 BIP 2207 *Building Information management – A Standard Framework and guide to BS 1192*, British Standards Institution, 2010.

8 *AIA Document E202 – 2008 Building Information Modelling protocol Exhibit*, American Institute of Architects 2008.

300, 400 and 500 (refer to AIA E202 for a definition of each). They should be defined very clearly for each element category. Even subtle ambiguities can easily lead to misunderstandings and disputes.

Note: Initiatives are under way[9] to address the confusion around the application of LODs and to provide more detail on the requirements for each element category, with respect to model, cost and time requirements.

A record of these variables is also known as a Model Progression Specification (MPS) or a Model Collaboration Matrix. Questions that will assist in establishing this include:

Who authors what information and when? Responsibilities for particular items within the model(s) may be exclusive or shared, temporary or permanent. Some items may not be modelled until a particular stage is reached (eg, hand-drawn sketches or modelled 'placeholder objects' may suffice for a time).

Who takes custody of that information, when and why? Some elements may change hands at particular times – perhaps multiple times. For example, a ceiling might be the responsibility of the architect, but not the elements that affix to the ceiling. (How) are those elements added to the ceiling, when and by whom? Does the architect provide the ceiling to that party for that purpose? If so, does the recipient become responsible for the ceiling? The same issue applies for floor slabs or walls – the architect might model them first, but if it's structural, should it be passed to the structural engineer for continued development, and if so, at what stage?

ii. Model-independent information (data)

How will data be added to the model? There may be a need for project participants other than model element authors to contribute information to the project, such as equipment datasheets, warranties, service agreements etc. (How) does this information get added to the model, and if so, by whom and when?

Standards such as COBie describe how information can be formatted and recorded throughout the planning and construction processes, in order to provide useful data managing the entire building lifecycle.

iii. Model-independent information (drafting/detailing)

This relates to what is to be detailed (created in two dimensions – 2D only – rather than modelled in three).

Not everything graphical may need to be modelled. It is entirely valid to ask the question: "What (areas, elements or categories) will we draft and not model?". This may vary by project stage.

It is important to consider the impact of not modelling such items on 'downstream' use of the information – hence the need to be clear on what BIM uses are applicable and when.

iv. Model assembly/file structure

The proposed assembly needs to accommodate additional project participants' models over time. It should explain what files are created (and their primary contents), by whom, and their relationship to other models within the project. Do they constitute part of the overall project model (also known as the federated model or aggregated model), and at what stage? Are they a means to an end (eg, design intent model), or an end in themselves (eg, as-built model)?

v. Project coordinates

Achieving a common series of coordinates is important to ensure that project models link into each other as seamlessly as possible. This is typically established by (or with the assistance of) a civil engineer or surveyor. Reconciling inconsistent project coordinates after model generation and sharing has occurred can be problematic for some.

9. *Project policies & standards*

– Modelling standards

As a general rule, use existing standards (preferably industry-recognised ones) rather than trying to formulate them from scratch. Modify them to suit the requirements of the project if necessary. At the very least, industry standards will provide a framework for discussion.

Rather than prescribing something for the entire project team, it may be sufficient to run the project allowing multiple standards, so long as those standards are consistently applied, and clearly communicated to others within the project team. That said, each should be assessed for potential conflicts and adjustments implemented accordingly.

Note: there may be other types of modelling standards that are not mentioned here, but two main items to consider are:

i. Modelling nomenclature

Establishing naming/numbering conventions introduces a consistent approach which greatly assists the exchange and interpretation of models. This may apply to models (files), elements (components), views, materials, properties/parameters, rooms/spaces, work-sharing/team-sharing assignments etc.

9 http://www.vicosoftware.com/mps-history-and-evolution/tabid/297475/Default.aspx.

ii. Object/component standards

This may determine what criteria must be met by objects/components before they are permitted for use within the project. ANZRS (www.anzrs.org) has been developed toward this, and other related organisations such as BIM-MEP^{AUS} (www.bimmepaus.com.au) may provide standard content for project use.

- Quality control

  Principally this is about validating information: how information revisions are managed, how the model is coordinated, quantities verified, information exchange transmittals, model audits etc.

- Documentation standards

  Line styles, line patterns, line weights, fill/hatch patterns, colour assignments and other display representation that is based on hard-copy printed output.

- Intellectual property and warranty of use of information

  This should define what constitutes IP, and how it is to be treated. Any restrictions on its use should be clearly stated.

  The extent to which the model may be warranted for particular uses (and constitute a contract document) should be determined. Also the contractual precedence of the drawings, schedules and the model should be determined to help resolve any potential conflicts. Theoretically, the drawings (and schedules) may be a direct derivative from the model, but this does not mean they are *guaranteed* to be the same.

  Ideally, this should be established prior to any model exchange within the project team, and most certainly should be established early so as to guard against mismatched expectations concerning deliverables and permitted uses of them by others.

  Please refer to **L1 - Intellectual Property** paper for more information.

10. Technology infrastructure

- Software, hardware and network environments

  Options include: project website, FTP (file transfer protocol)/EDM (electronic document management), project server/domain and cloud-based services. Hardware requirements such as laptops, desktops, tablets, smartphones, smartboards, television displays and projectors should be identified.

- Communications

  The method of communication should be established. Methods may include face-to-face meetings, phone, instant messaging programs and teleconferencing (audio and/or visual). The technological and environmental capacities of each project participant should be considered. For example: Can teleconference participants 'remote in' (if necessary), or do they need to be in an office to participate?

- Data storage (including archiving) & information access

  Many projects today have project websites or similar (electronic document management systems), such as Aconex, ProjectCentre etc.

  How will archiving of data occur? Who will be responsible? Who manages provision of access to the project team? Will the models be stored on this system, or does it pertain only to documents? Can the models be accessed directly, or only uploaded/downloaded?

CONCLUSIONS

There is a great deal of information generated over the life of a project. The BIM Management Plan seeks to identify from that information what is most important to achieving the project objectives. The document itself should be well structured, clear, and respond to the needs of the project and project team. Although even the contents list of a BIM Management Plan might appear overwhelming, not every item needs to be addressed from the outset. This is discussed in more detail in document **P3: How should you prepare and apply a BIM Management Plan?**.

Summary

A good BIM Management Plan should address:

- Who and what the document is for?
- Who is involved, and in what capacity?
- What is sought for the project (objectives)?
- What approach will be taken (both generally and specifically)?
- How will the project be designed/built/managed?
- How will the project information be developed, exchanged, validated, used and re-used and over what period?
- What tools (software) and processes (BIM uses) will be used toward this purpose?
- How will those tools/processes be employed, by whom and when?