Getting Started with BIM

This NATSPEC BIM Paper provides guidance to Architectural or Engineering organisations wanting to implement Building Information Modelling (BIM) within their organisation.

It is directed at organisations that have already made the decision to implement BIM and are now asking the question 'So what do we do next?'.

NATSPEC//
Construction
Information

NATSPEC
BiM

NATSPEC BIM Paper NBP 002
Getting Started with BIM
First published 2014

Copyright

Disclaimer

Comments

NATSPEC thanks the many people and organisations that have assisted in the development of this document.

NATSPEC welcomes comments or suggestions for improvements to its documents and encourages readers to notify us immediately of any apparent inaccuracies or ambiguities. NATSPEC also encourages users to share their experiences of applying its documents on projects with us.

Contact us via email at bim@natspec.com.au.

Formatting conventions used in this document

In addition to the text formatting conventions used for Section headings, Clause titles, etc., other conventions are summarised below:

Text type	Example	Indicates
Normal italicised text	*NATSPEC National BIM Guide*	The name of a specific document or standard.
Grey bold text	**Data Reuse**	A cross reference to a Section, Clause, Table, Diagram, etc. that can be found in this document.
Blue text	www.natspec.com.au	Hyperlink/web link

Contents

Introduction

One might ask: "Can I just buy the BIM software and get on with it?"

The short answer is "No". This paper spells out the issues you need to be aware of to make sure your organisation's transition to BIM takes place with the least problems and best results.

The process and experience of implementing BIM within an organisation is likely to be different from one organisation to another. This paper provides some generic guidance that will need to be adapted to suit the particular needs of your organisation.

EXECUTIVE SUMMARY

The key points necessary for a successful implementation of BIM are:

Preparing for change

- It is important to get everyone on board with the implementation decision.
- The team must fully understand the reasons why the organisation is making the transition to BIM.
- Support and commitment from principals is essential.
- Giving overall responsibility for managing the implementation to one person is preferable.
- Seek external assistance, for the initial period, if the skills required are not available internally.

Planning

- Fully understand your current situation to set benchmarks for implementation.
- Analyse current costs, protocols, work methods, resources, technology, documentation timeframes.
- Identify your requirements for implementing BIM and define the goals you wish to achieve.
- Set clear assessment criteria and an implementation programme to allow you to monitor your progress.
- Document your BIM implementation plan.

Execution

Execution considerations include:

- Team selection.
- Software, hardware and IT infrastructure.
- Office standards.
- Office procedures.
- Training: allow adequate funding and time.

Roll out

- Don't try to utilise the full capability of your new BIM software on your first project - progress to the more advanced capabilities when you are proficient with the less complex uses.
- Do not to oversell your BIM capabilities to external parties whilst in the process of implementing BIM. This could lead to demands being made for efficiencies or additional services which the organisation may not be ready to deliver.
- Audit and review the process, possibly with input from an external expert, making revisions to your plan where necessary.

Key decisions

Guidance is provided on some of the key decisions that have to be made regarding an organisation's BIM implementation, including the following:

- Which software will be used?
- Which elements of BIM will be implemented first?
- Will the implementation be trialled as a pilot on a previously completed project or rolled out on a live project?
- Which project will be used as the first BIM project?
- Who will be in the first BIM project team?
- Will dedicated non-billable hours be provided for training or will it be included in job fees?

1   INTRODUCTION

1.1   FOCUS

This paper has been written to provide guidance to architectural or engineering organisations wanting to implement BIM. It assumes that the business case for BIM and the decision to implement it within the organisation have already been made and that a basic knowledge of the uses and benefits of BIM is understood. This paper aims to answer the question 'So what do we do now?'.

Therefore, the paper does not focus on general BIM issues and the potential uses and benefits of BIM. Neither does it focus on the project specific issues related to implementing BIM; however information on these topics and useful resource documents can be found at the *NATSPEC BIM Portal*, accessed via the following address, www.natspec.com.au.

Every organisation is different - this paper provides some generic guidance which will need to be adapted to your organisation's particular needs. **Figure 1** summarises the implementation process discussed in this paper.
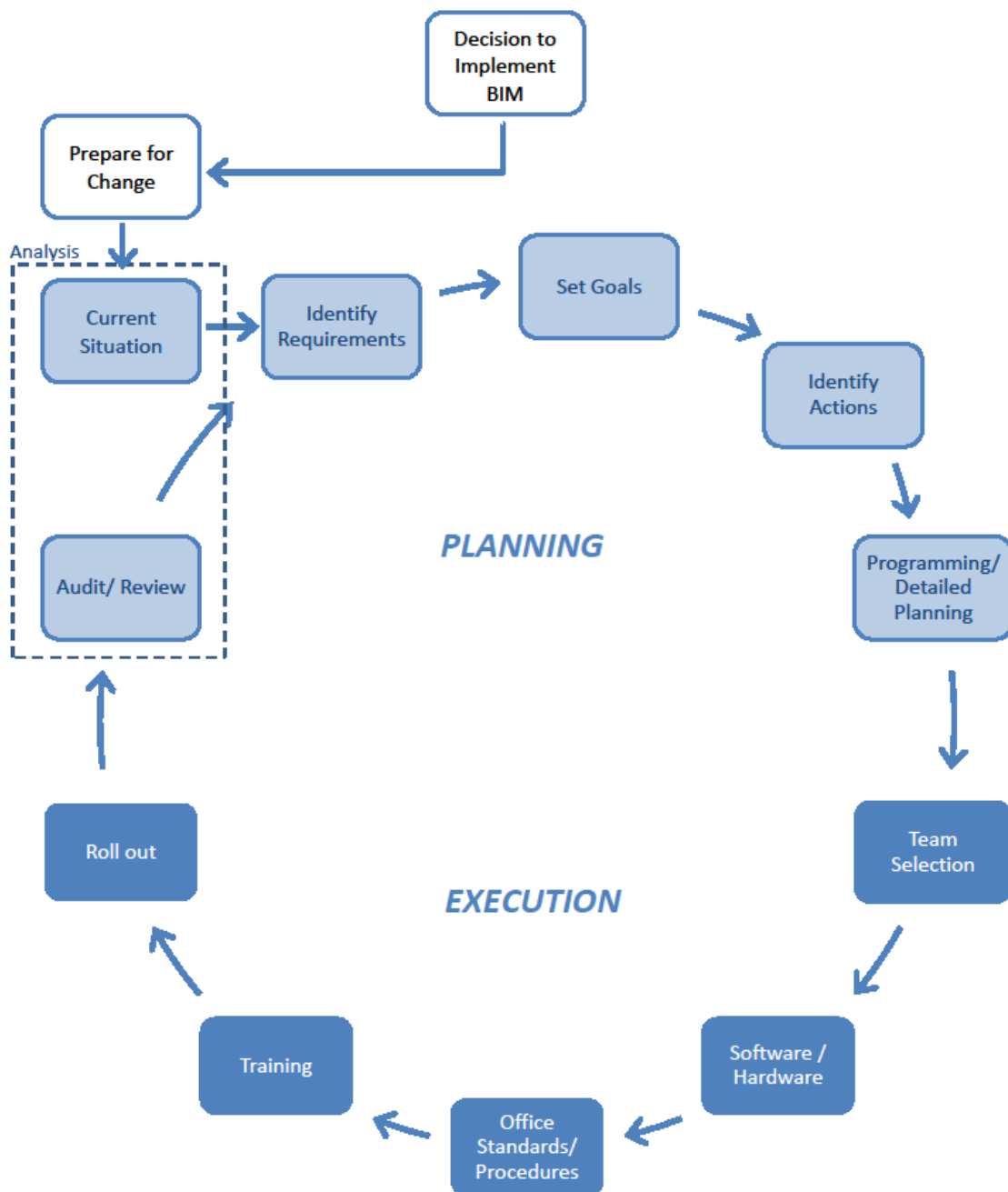
Figure 1. BIM Implementation Flowchart

2   PREPARING FOR CHANGE

2.1   GETTING EVERYONE ON BOARD

The first step towards a successful transition to BIM is to get all staff on board with the planned changes. If a member of the team is not enthusiastic about the implementation, the chances of success are greatly reduced as the easy option will always be to go back to the old way of doing things and abandon the implementation process when the going gets tough.

All levels of staff from high level management to non-technical support staff need to be engaged. The team must fully understand the reasons why the organisation is making the transition to BIM and some of the difficulties they are likely to initially experience.

BIM entails a collaborative approach and may be a significant departure from the way documentation is currently completed within your organisation. It's implementation will include new ways of working, new skillsets, standards, practices and procedures. Implementation needs to be viewed as a business investment - an initial decrease in productivity at the beginning can lead to large gains in the future. Without this perspective there is a risk that some members of the team will lose sight of the potential benefits and disengage from the process. Support and commitment from principals is essential.

It is likely that every employee will not agree with the transition to BIM, believing that the current way of working is much more efficient. Such concerns must be allayed before progressing with the implementation phase, so as to minimise any potential disruptions when inevitable difficulties arise.

2.2   SELECTING YOUR CHANGE AGENT

It is beneficial to give the overall responsibility of managing the implementation to one person, who could be titled the BIM Leader, or simply the BIM Manager. Identifying this person is your next task. They will be responsible for assessing your current situation, identifying your requirements, actioning the implementation plan and generally leading your organisation's transition to BIM.

The choice of person may initially appear difficult if there is no person within the organisation with a detailed knowledge of BIM. A current CAD manager or drafter may seem like the obvious choice, however it is essential that the person chosen is not just a software guru, they must also have a good understanding of project delivery, the business aspects of the implementation, a passion for the implementation to succeed and an open mind about changes to procedures and processes.

2.2.1   Selection options

The issue of selecting a suitable person with a detailed knowledge of BIM can be resolved in a number of ways:

- Train an existing team member to gain sufficient knowledge. However, without practical knowledge of using BIM, this may be difficult and time consuming.
- Hire a suitable person with BIM experience, possibly on a fixed term contract or part time.
- Hire a consultant who can work with a selected individual within your organisation to identify how you should proceed and what your requirements are. The selected individual would then manage the implementation after the consultant has identified the requirements. Having a thorough understanding of your existing situation (through the **ANALYSIS OF CURRENT SITUATION** exercise detailed below) will make this an easy job for a consultant or individual with a detailed knowledge and understanding of BIM.

3   IMPLEMENTATION PLANNING

It is essential to set out a plan for the implementation of BIM within your organisation. The plan will need to include clear goals, a schedule for implementation, training and how procedural issues such as changes to workflows and responsibilities will be managed. The plan should clearly identify what your organisation is aiming to achieve with the implementation of BIM and define criteria to measure the success or failure of its implementation. Having a plan in place will provide a clear direction and a point of reference in case things go amiss further down the track.

The plan should also consider if the implementation is to be trialled first on a completed project or implemented on a new/existing project. Each approach is discussed further in **TRAINING**. How the additional time required for the learning process of BIM implementation will be built into project programmes and ultimately project fees, must also be documented.

The plan must consider two primary aspects of the transition to BIM; Planning and Execution.

3.1   ANALYSIS OF CURRENT SITUATION

Analysis can be undertaken from three overlapping perspectives: people, processes and technology. See **Figure 2**. A good place to start is an analysis of current methods of organising, storing and communicating information within your organisation, current workflows and procedures, current timescales for producing different types of documentation and the costs associated with providing such services. The analysis should include a detailed review of how projects are currently being processed within your organisation, from initial marketing through to completion. This provides the context for examining how existing personnel skills and current software/hardware capability will need to be upgraded to support the proposed changes.
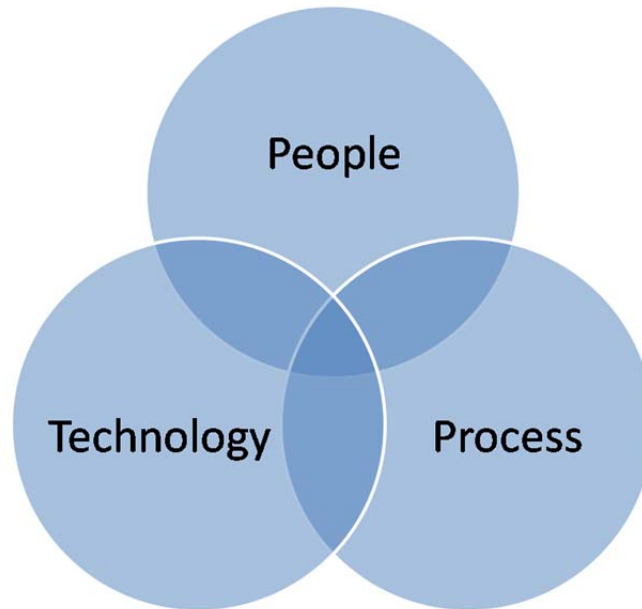
Figure 2. Requirements of Analysis

3.1.1   Benchmarking

Having a detailed understanding of the current situation provides a benchmark that will enable your organisation to accurately measure your progress in transitioning to BIM, highlighting the successes or potential failures of your BIM implementation. This will indicate the areas where future improvements can be made to reduce costs and improve productivity to surpass the existing situation. This is discussed further in **AUDIT AND REVIEW**.

3.1.2   People

When analysing current personnel and resources, the following questions should be considered:

- Which roles currently exist and what do they entail?
- Will there be a need for drafting (only) personnel in the future?
- Can current staff members be up-skilled to new roles, i.e. drafters to technical modellers?
- Which members of staff will require training?
- What level of training would be required? This is discussed further in **TRAINING**.
- How would the current internal teams/personnel need to be changed/reorganised to incorporate the skills required to implement BIM? This is discussed further in **TEAM SELECTION**.

3.1.3   Processes

When analysing current procedures protocols and methods, the following questions should be considered:

- What is a typical project for your organisation, including type, duration and cost?
- Typically, what information is required and when, during a project?
- For a typical project, what processes are involved in documentation and how long do they take?
- What are the current costs associated with training and education for current office procedures and protocols?
- What are the current bottlenecks or difficulties with your current processes?
- How is information communicated to team members on a project, both internally and externally?
- How is document management controlled at present?

- How is data management and data storage controlled at present?
- What office documentation standards are used and how effective are they?
- Are CAD libraries/templates currently used and to what extent?

3.1.4 Technology
When analysing existing software/hardware the following questions should be considered:
- What is the capability/technical specifications of existing hardware (workstations and network) and software?
- What are the costs of training and education for current software?
- What are the current software licensing costs?
- What costs are involved in keeping software and hardware up to date?
- How are CAD libraries/templates currently stored/accessed?

3.2 IDENTIFYING YOUR REQUIREMENTS
Having completed a thorough analysis of the current situation will make it easier for your BIM Leader to identify what may be required to start your implementation of BIM.

Key requirements that may be identified include:
- Staff training.
- Budget/costs.
- Technology (hardware / IT infrastructure) upgrades.
- New workflows.
- New roles/responsibilities.
- New information management processes.
- Personnel redeployment or hiring.
- Programme/Timeline for implementation.
- Greater support from upper management.
- New office drafting standards.

3.3 GOAL SETTING
It is essential to define the goals, milestones and objectives of your BIM implementation. Clearly define exactly what it is that your organisation is trying accomplish; the real reasons why you have decided to implement BIM. Goals will need to be balanced against your requirements and available resources.

3.3.1 Typical goals
Each organisation will have their own specific goals, however some generic long term and short term goals relating to the implementation of BIM may be to:
- Increase productivity.
- Reduce documentation costs.
- Increase fees and provide new services.
- Improve coordination and accuracy of design deliverables.
- Quickly identify the implications of design changes.
- Work with new clients.
- Streamline workflows.
- Simplify and improve the quality of communication.
- Improve staff skills.
- Increase client satisfaction.
- Be capable of competing in new business areas.
- Improve data management.
- Integrate different tasks, such as design and drafting.
- Stay abreast of the latest technologies and procurement methods.

3.3.2   Assessment criteria

Setting measurable assessment criteria for your goals and objectives during the planning stage will make it easier to monitor the progress of your implementation and, ultimately, assess its success or failure.

3.4   PROGRAMMING/DETAILED PLANNING

Once you have identified your goals and significant milestones you will need to set them against a realistic timeline and schedule the resources – human and financial – associated with each stage of your implementation plan.

Identify how procedural issues such as changes to workflows and responsibilities will be managed. Defining a clear timeline with milestones that are to be met along the way allows you to monitor your progress and make changes to your plan if required.

3.4.1   Key decisions

Decisions will have to be made on the particulars of the implementation, including the following:

- Which software will be used?
- Which elements of BIM will be implemented first?
- Will the implementation be trialled as a pilot on a previously completed project or rolled out on a live project?
- Which project will be used as the first BIM project?
- Who will be in the first BIM project team?
- Will dedicated non-billable hours be provided for training or will it be included in job fees?

Guidance to assist in making these decisions is included in the following section.

4   IMPLEMENTATION EXECUTION

4.1   APPROACH

The approach to BIM implementation will need to be adapted to the size of your organisation and its particular requirements.

Large organisations may be able to transition teams one by one to BIM, whereas smaller organisations may have no choice but to commit all their resources. This does not necessarily mean that smaller organisations are at a disadvantage. In fact, the opposite may be true as smaller organisations can often be more agile, less bureaucratic and less resistant to change; therefore being able to quickly adapt and reap the potential benefits of BIM.

Figure 3 illustrates the relationship between some BIM implementation considerations. It highlights that software and hardware considerations alone do not drive BIM implementation and that their selection should be based on how well they support the goals of implementation.
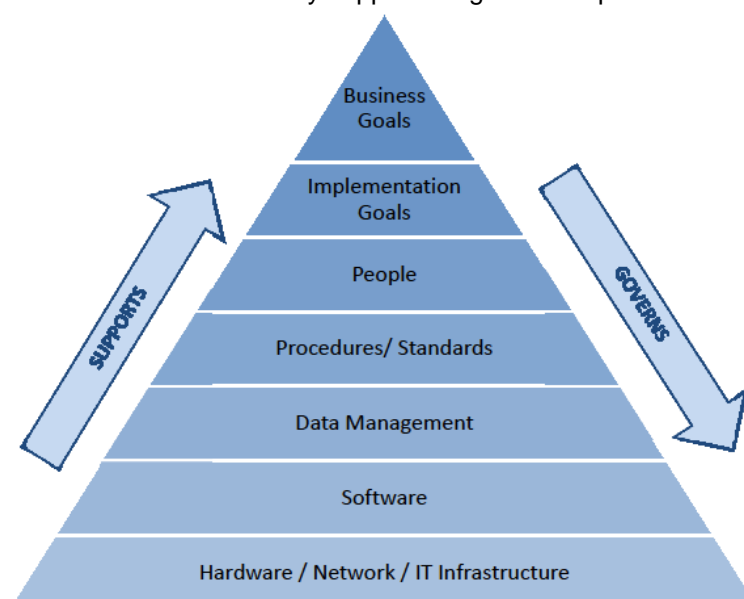

Figure 3. BIM Implementation considerations

4.2   TEAM SELECTION

The selection of the right team can be a key factor to a successful BIM implementation. This first team will be responsible for the first BIM project selected and for updating any office procedures, standard details and standard drawing templates. This team will be the first to receive formal BIM training and in the future will become support people for other staff as BIM is implemented throughout your organisation. Therefore, having people on the team who are communicative and happy to share their experiences with others is beneficial.

4.2.1   Team composition

It is suggested that the team is made up of representatives from across your organisation – from managers to drafting technicians – with complementary skills. Again, selecting a simple skillset of software gurus is not appropriate. The team should closely represent a typical project team within your organisation. Providing a mix of management and technical personnel on the team will ensure that all aspects of the implementation are considered and will provide a continuity of skills and knowledge over time. This can also allay any fears that senior personnel may get pushed out of the design process due to the implementation of new technology and design methods.

When this team have completed their first BIM project and experienced some of the benefits (and initial frustrations) of using BIM, they could be split up and become members of future BIM project teams, sharing their knowledge and experience throughout the organisation.

4.2.2   Selection criteria

It is important to select staff that are enthusiastic about BIM, willing to learn, flexible and open minded to change. Matching enthusiastic entry level technical staff with experienced management, will provide a broad foundation of skills and knowledge on which to build. Consider providing incentives for the extra effort and time this team will have to put in.

4.2.3   Working arrangements

It can be beneficial to place the desks of the team members in close proximity. Communication and collaboration are key elements of BIM implementation and staff being dispersed around the office will make this more difficult. It needs to be made easy for the team to share their experiences and queries.

4.3   SOFTWARE AND HARDWARE

4.3.1   Software selection

The selection of a BIM authoring software package may seem the most obvious aspect of BIM implementation, but in reality this is a very small part of your transition to BIM. There are various software packages available, which all provide slightly different functionality. Choosing a package that will assist you in achieving your documented goals and objectives is the key.

This paper will not detail the various options or the differences between software packages. It is recommended to discuss these issues with the various software vendors and your industry colleagues before deciding which software package will best suit your requirements. Discussing your requirements with other organisations that have already implemented BIM may give insight into the right package to choose. Also consider what packages your clients or consultants may already use.

Generally the initial cost and ongoing licensing/training costs of BIM authoring software tend to be greater than a traditional 2D CAD package. This should not really come as a surprise, as a BIM software package tends to be a much further advanced and more powerful tool than traditional CAD packages. However, it is likely that your organisation already has significant costs associated with the drafting packages you currently use, so these existing costs can be offset against the additional costs associated with implementing the new BIM software.

4.3.2   Considerations

Some issues that may be considered when selecting which software package to adopt may include:

- Extent of training and support available.
- Availability of experienced users in the marketplace.
- Availability of product libraries and tools for use with package.
- Ability to link with other software packages and export information.
- Initial and ongoing costs.
- What software do your regular consultants or clients use?
- Can the software be used remotely (i.e. over the internet)?
- Can the software be used with your existing hardware?

4.3.3 Hardware

Many current CAD drafting packages can be operated on entry level PC's or laptops. However, BIM packages generally have higher demands on hardware capability. To accommodate the requirements of the more powerful BIM software it is likely that your hardware will require upgrading.

The capability of the workstations used will determine the size of model that can be worked on. It is essential that workstations are close to the recommended specifications required by the software vendor. It may be a case that you have one high-end workstation in the office to run the heavy processing exercises such as rendering or visual fly-throughs for presentation purposes.

BIM electronic file sizes are generally much larger than those which you may currently be working with using typical CAD drafting packages. Therefore consideration must also be given to increasing your data storage and back up capacities.

4.3.4 Network

It may be feasible to only upgrade your network when performance issues arise. It is prudent to be proactive for workstations but it may be possible to be reactive for networks. If work is shared remotely between offices make sure existing arrangements will work with your new BIM software.

4.4 OFFICE STANDARDS

Office standards refer to standard drawing templates, standard details, standard notes, styles and the like. Translating your existing office standards into a BIM format will take some time but is essential to get them correct before starting your first BIM project, otherwise the quality and style of the drawing output from the model is unlikely to be satisfactory to other staff members or to the quality usually expected by external project team members.

Something as simple as a Principal not being happy with the way a drawing looks, or not having the same clarity as those produced previously, can derail the implementation process and mean that BIM is abandoned. Much of the success of BIM implementation can depend on having good office standards and libraries in place.

4.4.1 Translation

This process gives you an opportunity to update your standards if required, however if you are happy with the style and production of your current CAD drawings, re-use what is suitable. Items such as line weights can usually be transitioned quite easily, as well as legends, symbols, schedules, logos and title blocks.

It is important to note however that some changes to existing standards are inevitable. Don't try too hard to replicate existing standards if it is too difficult. With standard drawing layouts, for example, use the opportunity to utilise some of the new features of having a 3D model, such as including isometric details, 3D cutaways or shaded elevations.

The chosen project team could complete this translation exercise with some initial training in software use. However, utilising an experienced BIM user to translate your standards for you is likely to be quicker and would allow all training for the project team to be undertaken using your office standards from the start. This is an item for consideration and training requirements are discussed further in **TRAINING**.

4.4.2 BIM manual

Creating an office BIM manual, either as an intranet wiki or as a hard copy manual, is also a worthwhile exercise. This can document the procedures to be followed when undertaking a BIM project. The manual can be a live document which will grow throughout the training and initial roll out period, being updated or amended as processes become apparent. The document can be reviewed and finalised during the audit and review process, before rolling out to the rest of the organisation. The manual can then be used as a basis for training future BIM project teams and any new personnel who may join the organisation.

4.5 OFFICE PROCEDURES

Office procedures in this context relate to the work methods, practices, document management/filing procedures, and the like, used in your office. BIM is a new way of working and requires a much more collaborative approach than may have been required for your traditional work practices. This will mean that your current procedures are likely to require adaptation to suit the new BIM environment in which you will be operating. For example, it is usual for more information to be exchanged between project team members at an earlier stage on a BIM project, requiring greater resources and using more of the project fees at an early stage than may traditionally have been the case. This is likely to mean that your typical project resources allocation and billing structure will require revision.

4.5.1 Adaptation

How you approach the following items will need to be considered and, whilst the majority of items will really only need to be determined by the time you fully implement BIM on live projects, having an understanding of how you will approach them will be beneficial early on. Making decisions on these items as early as possible will mean that the selected BIM implementation team can include the updated procedures as part of their training process.

Items for consideration include:

- Digital filing structure – storage and retrieval.
- Co-ordination of consultants / team members information.
- Use of online document repositories.
- Incoming and outgoing documentation and data exchange.
- Information sharing both internally and externally.
- Project creation and procurement strategies.
- Project programming, resource allocation and billing structure.
- Marketing and services provided.
- Checking procedures.
- Responsibilities of personnel and permissions / access rights to information.
- Which classification system will you use to organise project and/or model information.

4.6 TRAINING

Training is an essential requirement for the successful implementation of BIM and all levels of staff should receive some form of BIM training so that they are fully aware of the changes that will take place within the organisation. In smaller size organisations everyone may receive the same training, but in larger organisations the training could be split up as follows:

- Senior management (non-users) – A presentation demonstrating the capabilities and advantages of using BIM and explaining why BIM implementation is an essential business decision.
- Project leaders (occasional users) – Training on what the new software is capable of and how to navigate the model, create views, check dimensions, plot drawings, add notes, etc.
- Technical staff (everyday users) – In-depth training on how to use the software and create working BIM models.

Initially training should be focussed on senior management and the selected BIM project implementation team. Training for the remaining staff members should take place after the first BIM project has been completed and the audit and review process finished.

4.6.1 Resources

Dedicating time and budget for structured formal training will provide much better results in a shorter time period than staff simply trying to teach themselves how to use the software, as may have been possible with a 2D CAD package. Following some initial formal training, staff members will be able to expand their knowledge by self-study, because they will have a base understanding of how to use the software.

4.6.2 Key decisions

Decisions will have to be made as to how training is performed, which will include:

- Will training be in-house or external?
- Will a previously completed project be used as a pilot for training purposes, or will training occur on a live project?
- How many non-billable hours can be provided for training, particularly if training is not on a live project?
- Will current designers be trained to model their designs in BIM?
- Will current drafters be up-skilled to take on technical modelling responsibilities?

There are no right or wrong answers to the questions posed above, you will need to decide what is suitable for your organisation. It can be argued that training on a previously completed project (or part of a project) as a pilot provides the opportunity to compare new methods with old, to compare the drawing sheets created from the model with those previously created, to iron out any bugs in the new office standards and would also mean that the only learning curve is that of using the BIM software. However, using a live project is likely to mean less non-billable hours and provides the benefit of being

able to apply what is being learned immediately – questions and queries that arise can be related to the work being completed.

Another option may be to carry out initial training on the development of a BIM object library, for use on your BIM projects, similar to a CAD object library that you may already use.

4.6.3   Continuity

Once training has been carried out, it is essential that the users continue to work in a BIM environment for the next month or so. Stepping away from BIM, even for a week, to go back to 2D CAD drafting will mean that a lot of the skills learned during training will be lost and possibly forgotten. The skills learned need to be implemented and practiced to really take hold and be remembered.

It is important to remember that time and costs associated with training are an investment, the productivity paybacks of BIM should quickly offset the initial costs required for training once the team is proficient in BIM.

4.7   ROLL OUT

When it comes to the point of implementing BIM on a real project it is prudent not to oversell your BIM capabilities to external parties until your organisation is proficient in producing BIM deliverables. This could even include not informing members of the same project team, such as the contractor or client that you are currently using BIM. Making bold statements about the benefits of BIM and your BIM capabilities can lead to demands being made for efficiencies and services that you might not yet be able to deliver. Worse still the client may even request a reduction in fees due to the apparent efficiencies you should be experiencing by using BIM.

4.7.1   BIM uses

The BIM process should start slowly – don't try and do everything at once – aim for 'little' BIM (predominantly 3D modelling). It is important that the team concentrate on the task at hand, which in the first instance should be to produce a coordinated set of construction drawings using BIM software. Give priority to uses of BIM which give the greatest return on effort and are the least disruptive to existing workflows. This will depend on your typical deliverables and the level of coordination required. See **Appendix C** for a list of potential BIM uses categorised by complexity and mapped against project phases.

As your organisation's BIM skills increase you can move on to 'bigger' BIM (more data intensive) activities, such as performance analysis, simulations, data entry for facilities management, etc. It is important to keep it simple at first to increase the likelihood of success. It is very easy at this early stage to be distracted by the advanced features of your new software and waste precious billable hours on things such as rendered views and simulations.
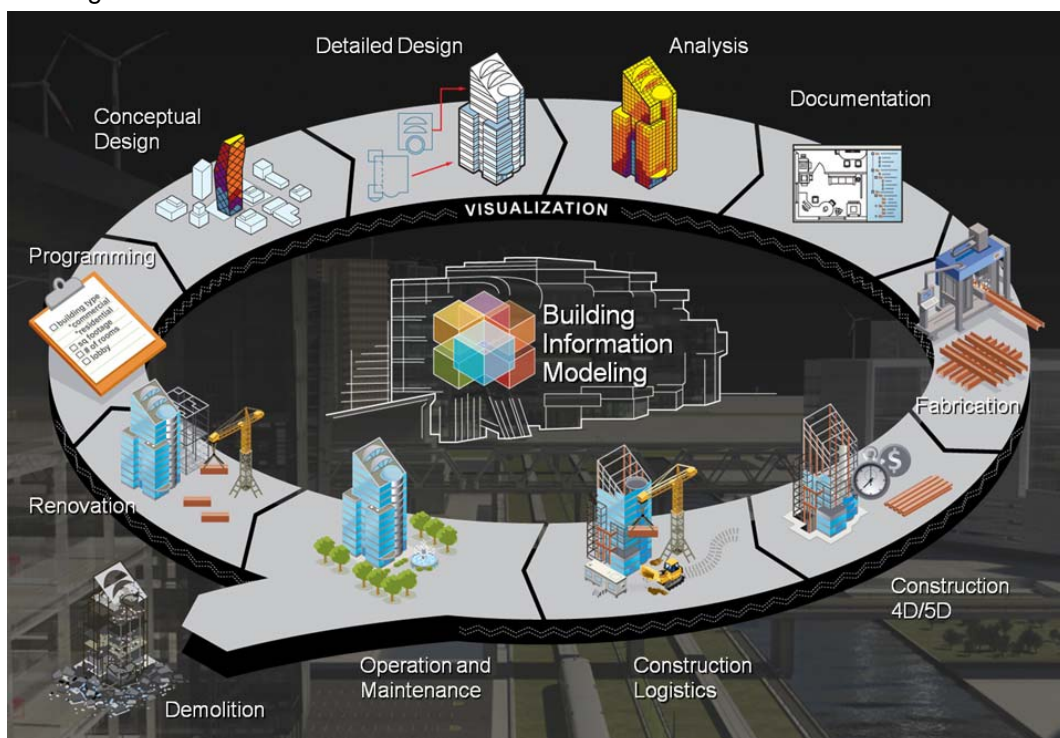

Figure 4. Generic BIM uses (image courtesy of buildipedia.com)

4.7.2   Project selection

Select a project that is typical for your organisation, preferably a simple project where the only learning curve will be BIM, and the programme allows time to accommodate the learning process. The ideal project is likely to be a project where the scheme design is already complete and the detailed design is about to begin. You may decide to only use BIM for certain parts of the project, concentrating on specific BIM deliverables. When proficient, your organisation will use BIM from the very start of a project, including scheme design.

Don't scrutinise the team too closely during this phase as it will be a tough learning curve and at times things will get very frustrating. Leave thorough scrutiny and review until the project is complete. This is discussed further in **AUDIT AND REVIEW**.

Don't spread your resources too thin or it may get to the point that you decide to drop the implementation and complete the project in traditional 2D CAD, as it will be quicker to do so during this learning period. Once you stop the implementation process, it is less likely that you will return to it.

4.8   AUDIT AND REVIEW

A good time to carry out an evaluation of the implementation process is when the construction documentation for the selected project is complete. Adjustments to processes and procedures can then be made for implementation on the next project. However, processes can be reviewed and adjusted at any time during the implementation process if it is felt that they are simply not working.

Having selected a project that is typical to your organisation allows for easier comparison between BIM and traditional documentation methods. The implementation process should be reviewed in terms of the assessment criteria defined during the planning stage. The following questions should be considered:

- Have your goals and objectives been achieved?
- Where were the gains and where were the losses?
- What needs to be changed and where can improvements be made?
- What aspects can be capitalised on?
- Is the team satisfied with the process?
- Does the team still believe that BIM is the correct solution for your organisation?

When the review is complete the BIM manual should be updated to reflect any issues that arose. A review of your BIM manual by an independent external expert at this stage may be beneficial and provide you with further guidance which you may have overlooked. A long term strategy for phasing BIM into other projects and training other staff members should also be developed at this stage.

5   CONCLUSION

As noted previously, the process of implementing BIM within an organisation will be different from one organisation to another. The guidance provided in this paper should not be taken as absolute requirements, but should be considered and adapted to suit the particular requirements of your organisation. Following the principles discussed in this paper will give your organisation a better chance of a successful transition to BIM.

5.1   KEYS TO SUCCESS

Whilst you will be able decide which aspects of this paper are suitable to your organisation's requirements, the following are the key points necessary for a successful implementation:

- Get everyone on board with the decision to transition to BIM - a positive perspective is required.
- Seek external assistance, for the initial period, if the skills required are not available internally.
- Fully understand your current situation - costs, protocols, work methods, resources, technology, documentation timeframes.
- Identify your requirements for implementing BIM and define the goals you wish to achieve.
- Set clear assessment criteria and an implementation programme to monitor your progress.
- Provide adequate funding and time for training.
- Don't try to utilise the full capability of your new BIM software on your first project - progress to the more advanced capabilities when you are proficient with the less complex uses.
- Audit and review the process, making revisions to your plan where necessary.

5.2   OUTCOME

Finally, it must be remembered that BIM implementation needs to be viewed as a business investment - an initial decrease in productivity at the beginning can lead to large gains in the future. As your organisation's BIM skills develop you will be able to enjoy the benefits of BIM with less of the suffering experienced during the implementation process. Ultimately your organisation's documentation practices will become more productive and you will have the ability to offer new services and new deliverables using the full capability of your new BIM software.

6   APPENDICES

6.1   APPENDIX A – BIM IMPLEMENTATION CHECKLIST FOR ORGANISATIONS

Item	Considerations	Decision
Getting everyone on board	How will this be achieved?	
Selecting your change agent	Do you have someone suitable? If not will you:	
	- Train someone?	
	- Hire someone?	
	- Hire a consultant?	
Goal setting	What are you trying to achieve by implementing BIM?	
Execution	Will implementation be phased in teams or organisation wide?	
Team selection	Who will be in the first BIM project team?	
	Will you provide incentives for the extra effort required by the team?	
	Will you revise the office layout to place team members beside each other?	
Software	Which BIM software package will you select?	
Hardware	What upgrades will you provide to your workstations and network?	
Office standards	Will you get your office templates/styles translated to BIM before training commences?	

Office procedures	Will you use online document repositories?	
	Which classification system will you adopt?	
Training	Who will receive training?	
	Will training be on a live project?	
	What resources will you provide for training (financial and non-billable hours)?	
	Will training be in-house or external?	
Roll out	What uses of BIM will you utilise on your first BIM project?	
	Which project will be selected for your first BIM project?	

6.2   APPENDIX B – ANALYSIS CHECKLIST

Item	Specifics	Answer
People	Which roles currently exist and what do they entail?	
	Does any staff members have any BIM skills?	
	Can current staff members be up-skilled?	
	Which staff members would require training?	
Processes	What is a typical project for your organisation?	
	What information is required and when during a project?	
	What processes are involved in documenting a project?	
	What are the current costs for training and education?	
	What are the current bottlenecks and difficulties?	
	How is document management and the flow of information controlled?	
	What documentation standards exist and how effective are they?	
	Are CAD libraries and templates used and to what extent?	
Technology	What is the capability / technical specifications of current software and hardware?	
	What are current costs for software training?	
	What are current licensing and update costs?	
	How are CAD libraries currently stored and accessed?	

6.3   APPENDIX C – BIM USE BY PROJECT PHASE AND COMPLEXITY CATEGORY

PLAN	DESIGN	CONSTRUCT	OPERATE
Modelling existing conditions			
Quantity take-off & cost Planning			
Planning construction scheduling & sequencing			
Space & equipment validation			
Site analysis			
Design visualisation & review			
	Design authoring		
	Energy analysis		
	Structural analysis		
	Lighting analysis		
	Mechanical analysis		
	Other Eng. analysis		
	Sustainability evaluation		
	Code checking		
	Clash detection/ coordination		
		Site utilisation planning	
		Construct. systems design	
		Digital fabrication	
		Lift planning	
		Digital setout	
		As-built model	
			Maintenance scheduling
			Building syst. perf. analysis
			Asset management
			Space management/tracking
			Disaster planning

CATEGORY DESCRIPTIONS

Category 1:   **Geometry plus basic data**

Uses based largely on modelling geometry and basic data which can be manipulated using the in-built features of model authoring software, e.g. scheduling, or through basic add-ons/plug-ins. These uses can be undertaken by most modellers with general skills. Data exchanges are usually confined to one or two disciplines and involve less management effort than higher categories. These fundamental uses offer the greatest short term return on investment and represent the low hanging fruit or 'no-brainers' of BIM.

Uses include:

- Modelling existing conditions
- Site analysis (geometry only, e.g. sunlight and shading studies)
- Spatial and material design models
- Design visualization for communication and functional analysis
- Drawing production
- Clash detection/coordination (Basic hard clashes using in-built features of authoring software)
- Site utilisation planning for construction
- Construction system design
- Lift planning
- Space and equipment validation (simple space scheduling and room data sheets only)
- Schedule production

- Coordination of model elements with specification information through keynoting, etc.
- Basic quantity take-off
- Simple code checking (deemed-to-satisfy geometry-based rules only)
- Basic security assessment and disaster planning (spatial planning for access, egress, etc only)
- Digital fabrication
- Digital on-site setout

Category 2:   **Geometry plus extended datasets for simulation, analysis and record-keeping**

The larger datasets associated with these uses require more interpretation of software outputs. The have to be undertaken by practitioners with specialist training using purpose-made software and generally involve more modelling iterations than Category 1. As they are likely to require more data exchanges and the use of multiple software packages, a greater capacity to address interoperability issues is usually required. Data management needs to be coordinated between a number of disciplines and involve significant effort.
Uses include:
- Site analysis including simulation of solar radiation and wind flow patterns
- Space and equipment validation using purpose made software
- Clash detection/coordination using purpose made software
- Model checking using purpose made software
- Linking model elements with specification information using purpose made software
- Quantity take-off and cost planning
- Structural modelling and analysis
- Energy analysis
- Virtual testing and balancing
- Lighting analysis
- Other engineering analysis, e.g. Fire engineering, Computational Fluid Dynamics (CFD)
- Planning construction scheduling and sequencing – 4D
- As-built models
- Security assessment and disaster planning including simulation of fires, explosions and crowd behaviour

Category 3:   **Large shared datasets requiring management over extended periods**

Uses in this category are generally associated with a facility's commissioning, operation and maintenance. They are often hampered by a lack of definition of client requirements in the early stages of a project and a lack of established workflows across disciplines. They require the coordination and management of large datasets by numerous stakeholders over extended periods of time. The data often needs to be in a specified format compatible with the building operator's facility management or building management system software. Requirements can vary significantly.
Uses include:
- COBie
- FM datasets for other uses including:
    - Maintenance scheduling
    - Emergency response and repairs
    - Building services performance monitoring and management
    - Sustainability monitoring and management
    - Real estate/property and tenancy management
    - Space planning, tracking and management
    - Asset management
    - Move management

Category 4:   **Constrained by current issues**

Uses are similar to those in Category 2 but the lack of readily available datasets customised for local requirements impose constraints on their use in practice. They require specialist practitioners trained in the use of purpose-made software and (currently) a significant investment of resources by organisations to create, maintain and update their own datasets from scratch. This may change with time.
Uses include:
- Sustainability evaluation including Lifecycle Analysis (LCA)
- Code checking including non-geometric and performance-based assessments

6.4   APPENDIX D – RESOURCES

The following documents may provide further guidance on the topic of BIM implementation and were reviewed during the process of writing this paper:

- *A Trainer's Perspective: Key requirements for a successful BIM implementation* – Cyril Verley 2009.
- *BIM Demystified* – Steve Race, RIBA Publishing 2012.
- *Building Information Modeling* – infoComm International.
- *Getting the most out of BIM: A Guide for Clients* – AECOM / Davis Langdon.
- *Introducing BIM into a Small-Firm Work Environment* – Autodesk 2007.
- *Revit Implementation Part 1: An implementation overview* – David Driver 2006.
- *Revit Implementation Part 2: An ideal revit implementation outline* – David Driver 2006.

Further information and resources on BIM, including the *NATSPEC National BIM Guide*, the *NATSPEC Project BIM Brief* and the *NATSPEC BIM Management Plan Template*, are freely available from the NATSPEC BIM Portal, which can be accessed by clicking on the BIM logo on the NATSPEC homepage at www.natspec.com.au.