

Collaborating with BIM

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The Building Information Modelling (BIM) process of creating digital representations of built assets in a common data environment is intrinsically collaborative. This paper provides a high level overview of how the various parties involved work together in the BIM process, and the changes that are required to conventional project delivery to realise the significant productivity gains BIM can deliver.

From Co-ordination to Collaboration

We have the latest software and have trained our staff in its use. Our leaders attend BIM conferences and engage with global discussion forums. So why aren't we seeing the productivity gains and return on investment promised by BIM?

We can no longer blame our tools, IT networks or training for the lack of progress towards BIM nirvana. We all (clients, consultants and contractors) need to ask ourselves some hard questions:

- Am I engaging the team on the basis of shared beneficial outcomes or am I trying to remove all risk for myself?
- Am I treating the wider team with respect and looking for how we can collectively add value to the project?
- Am I prepared to do things differently, or am I going to repeat what I did yesterday and hope for a better outcome?

Our procurement strategies, contracts, scope demarcations and timeframes all need to be reviewed. When we get these aligned, we will be able to work in a collaborative way and start to realise the true benefits that BIM offers.

Coordination vs Collaboration

Two of the biggest benefits of following a BIM approach are improved "coordination" and "collaboration". So what is the difference between these two processes?

In simple terms, coordination requires two things to be understood:

- Design interdependencies between systems. What needs to be in place before another action can be completed?
- The order of precedence of systems. What can and what can't be moved?

How BIM changes the value equation

Coordination: $1+1 >0$

Cooperation: $1+1 = 2$

Collaboration: $1+1 >>2$

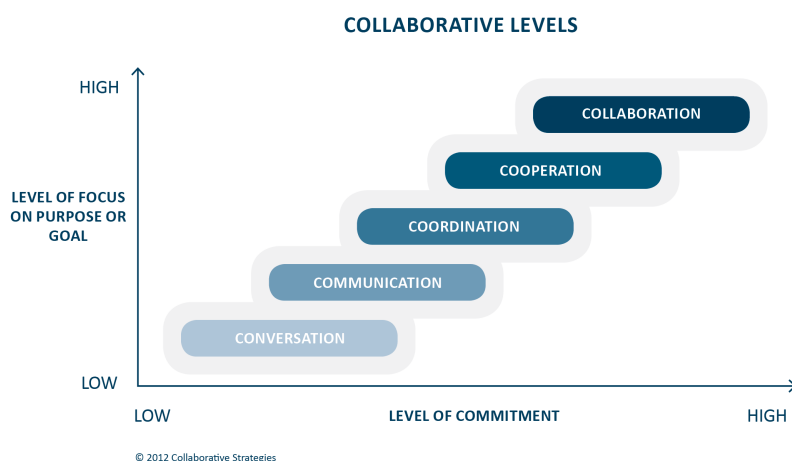
The value gained via collaboration is greater than the sum of its parts.

To be successful these require:

- A design/documentation programme that allows for the precedence and interdependencies to be achieved.
- An audit/checking system.
- Someone to manage the process and “referee” between the designers/trades where there is conflict.

Collaboration is a step up from coordination. It requires all of the above but also needs:

- Early involvement of all project team members and a shared, detailed understanding of the needs, drivers and abilities of all key participants in the process.
- A willingness to challenge the status quo of who does what and when.
- Value-based procurement with commercial arrangements that avoid adversarial contract terms.
- A more holistic approach to risk allocation and management.
- A high level of communication between all project team members.
- A high level of trust between all participants leading to long term relationships.



The Problem with the Old Way

Traditionally, in the 2D drawing world and the unconnected and siloed 3D model world, designers, contractors, subcontractors and vendors focus on what they need to produce. With parties working to their own timelines within their own systems, coordination is done after the documentation is almost complete. While major issues might be resolved on the documentation, minor clashes are left to be resolved on site. This situation is not the fault of any one party, it is the environment created by the procurement strategies employed for engaging consultants and contractors.

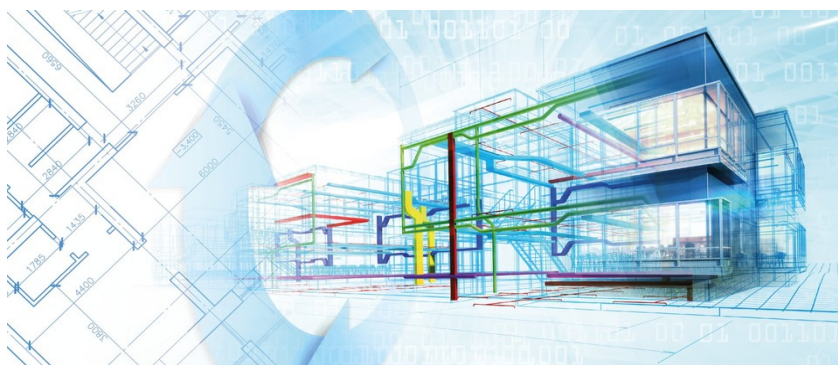
The lack of truly coordinated documentation is exacerbated on site with installers taking the attitude “the documentation is uncoordinated, so I can install it where I want” or “I’m here first others can install their stuff around mine”. While this may be an overly harsh representation of the problem, there is no question that the majority of coordination issues are sorted out on site, often resulting in re-work and waste.

Working in a BIM Environment

BIM provides the building and construction sector with the opportunity to work in a new way. The BIM process allows the finished “real” asset to be first “constructed” in a virtual, modelled world. Elements and systems are created in the model where it is intended that they will be installed. The result is more efficient and cost effective, with less waste.

“Achieving the productivity gains that can be delivered by BIM means working collectively, rather than in little islands.”
JON WILLIAMS, CHIEF SPECIALIST IN DIGITAL DELIVERY, BECA

The process of creating a shared digital data set requires designers, contractors and subcontractors to work together in a seamless team to common objectives to meet the client’s brief. All members of the project team are literally on the same digital page, sharing information in a common data environment. BIM produces joined-up thinking that enables collaboration to happen, with beneficial outcomes for all.



Just as in the real world, where multiple contractors cannot work in the same space at the same time, modellers cannot all be creating in the same space at the same time. Currently, most design programmes are at a fairly high level (Concept, Preliminary, Developed and Detailed). A collaborative approach requires detailed interaction far more frequently than at major milestones. A detailed modelling plan needs to be developed and documented within the BIM Execution Plan (see inset box).

The New Zealand BIM Handbook describes how the BIM process works in practice, with supporting resources. Two key BIM tools facilitate collaboration and underpin a smooth construction process:

- **The Project BIM Brief** – a document that defines the client’s requirements and expectations for a project with regard to BIM. It lists the BIM deliverables for the project and the format in which the information will be delivered.
- **The BIM Execution Plan** (or BIM Management Plan) – a detailed plan that defines how a project will be executed, monitored and managed with regard to BIM. It ensures that all parties involved have a shared understanding of objectives and responsibilities, and outlines how BIM will be used throughout the built asset’s life cycle. The BEP covers how the project team members will collaborate, including sharing project information, communication methods and the transfer and storage of records.

Intra and Inter-discipline Collaboration

There are two types of collaboration that can be leveraged to improve the performance and productivity of the building industry.

1. Intra-discipline or intra-trade collaboration. This allows members within a discipline team or specific trade to be located in different offices or locations and even be based in different organisations. The aim is to provide the most appropriate resource for each task. This may be directed by the requirement for specific skill sets, optimising labour costs or resource levelling (balancing peaks and troughs of workload across a business).
2. Inter-discipline or inter-trade collaboration. This looks at each interdependent activity and assesses who is best placed to undertake which task. For example, should the electrical designer or the architect locate the lights on the ceiling? The electrical designer has a responsibility for the lighting performance and the architect has the responsibility for the aesthetic. This can result in numerous iterations in design outputs between the two parties with “architects’ lights” and “engineers’ lights” in differing quantities and locations. There are similar examples with other ceiling and wall mounted services, set-downs in slabs and secondary structural supports.

Meeting the Challenges

Collaboration presents a number of challenges that can be addressed with a shared commitment to working in the client’s best interests. Following is an outline of common challenges encountered when collaborating with BIM and how they might be resolved.

1. WHO MANAGES THE BIM PROCESS?

The Design Manager and BIM Manager must work very closely with each other to create an environment where the needs of all project participants are heard and “best for project” decisions are made.

Each project participant (including the client) needs have someone responsible for ensuring what they produce aligns with the agreed standards and processes. The power of BIM is that both graphical and non-graphical

elements of the design can be viewed and analysed very easily. The BIM Manager should review what has been produced by the team and, if information is lacking or is in the wrong format, discuss this directly with the relevant parties. Where a change in design is needed, this conversation should be coordinated with the Design Manager.



2. WHAT SOFTWARE PLATFORM TO USE?

The systems and software being used must be agreed at the start of the project. Collaboration is much easier when the same software packages and versions are used by project team members. However, collaboration between disparate systems is possible using open formats such as Industry Foundation Class (IFC). A key part of the BIM Manager's role is to ensure the smooth flow of data from each system into a central repository or common data environment (CDE). The CDE may be hosted by the client or the BIM Manager or may be cloud based. The New Zealand BIM Handbook does not provide specific guidance on software tools and systems. Further information can be obtained from vendors or specialist suppliers.

3. WHO OWNS WHAT?

As previously noted, there are elements within a project that may be associated with the work of two disciplines. In the example given, the engineer is responsible for the performance and the architect is responsible for the aesthetic.

A collaborative workflow for this process could be:

- i. The architect models the internal spaces.
- ii. The engineer undertakes the analysis to determine the number and type of lights in each space.
- iii. The engineer places the lights in to the spaces in approximate locations and then gives ownership of the lights to the architect.
- iv. The architect makes any changes required to the spaces, sets out the ceiling grid and locates all lights within the grid. Ongoing iterations of the space, ceilings and lights are made by the architect. When finalised, the architect passes ownership of the lights back to the engineer.
- v. The engineer indicates the circuiting for the lights and completes their documentation.

4. WHERE DO RESPONSIBILITY AND LIABILITY FALL?

When design teams or construction trades are collaborating to a high level, it can become less clear as to who is responsible for what. As the industry matures, we are observing changes in the scope of the consultant design and contractor design roles (including the technical input of specialist trades) and where these overlap. Depending on the project's objectives, procurement strategies may need to be adapted to take into account increasingly collaborative workflows and maturing industry practices. Examples of collaborative workflows where the input of specialist trades is starting to occur earlier in the design process are: seismic bracing of secondary structural elements, vertical transportation integration and façade engineering.

Three things need to be addressed and understood by all parties at the start of a project:

- Clear contractual obligations – who does what, when.
- Clear list of deliverables and how these are to be used/relied on.
- Appropriate risk allocation.

Models are just the virtual representation of a design. True value is created by the designers interpreting the client's brief and deciding what to model. Good design management is essential to a good outcome. The best BIM processes in the world will not fix a bad design (although they may make the faults more visible!).

BIM Collaboration Checklist

Go through this checklist together at the start of a project to agree a collaborative working process with all key participants. This will also assist with the development of the Project BIM Brief and BIM Execution Plan.

- ✓ **Agree key objectives for the project. Collaboration starts with trust and a shared vision for what you want to accomplish.**
- ✓ **Decide how achievement of these objectives will be measured.**
- ✓ **Clarify roles and responsibilities, including who is leading the BIM process.**
- ✓ **Agree accountability/liability for key project deliverables.**
- ✓ **Confirm and document the scope of work with a clearly defined timeline.**
- ✓ **Decide the most effective way to communicate with each other.**
- ✓ **Agree how decisions will be made and communicated.**
- ✓ **Discuss different team members' specific interests, needs and values so these are clear and understood by all parties.**
- ✓ **Agree on meeting protocols that empower everyone to participate. There can be hidden bias towards the most senior person's ideas. True collaboration ensures that all voices are heard and diversity of thought is valued.**
- ✓ **Identify challenges and obstacles, and agree a process for addressing them.**

Have important conversations early and regularly.

Remember, collaboration is an essential part of how we need to operate to be successful in today's world. It's time to change for the better.

Further Information:

www.biminnz.co.nz/bim-tools/

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