

BIM & Design: **From Architects to** **Subcontractors –** **Who does what?**



Design for life

We're often told how BIM will revolutionize the design and build process and that collaboration is key. We're also frequently reminded that BIM is less about technology than it is about people and processes. What isn't always immediately clear, though, is where each of us as people sit in the BIM process.

One of the most valuable additions BIM offers the AEC industry is an opportunity to work together more closely and concurrently than ever before. Historically, there has – all too often – been a perceived divide between architects and contractors, engineers and subcontractors. BIM can play a significant role in promoting collaboration between all project stakeholders, improving efficiency and profitability for all concerned – including clients. However, not every contractor and subcontractor feels yet inclined to assume the responsibility for promoting and championing BIM.

Instead, there's a degree of buck-passing among major stakeholders with each tending to view BIM implementation as the responsibility of someone else in the supply chain.

Here we outline where each key stakeholder sits within the BIM design and build process, what impact BIM will have on the way they work and how everyone, at every stage, can benefit from working in a BIM environment.

Importantly, we also ask: who has responsibility for promoting BIM to other parties involved in the process?

Imagine if you will: Funding for a project is firmly in place and, during the pre-design process, it was decided that BIM will play a significant role at every stage of design and construction.

Now, the architect begins working on their model. When complete, the architectural model is then presented to the owner. They undertake a walkthrough of the model, during which the owner suggests a number of changes and offers their thoughts on the architect's vision of the finished project.

Equipped with the owner's feedback the architect can begin the design phase in earnest. As explained in [BIM a definition](#): 4D BIM involves time-related data, such as information about scheduling (including lead times, installation and build phases) being added to the model and 5D BIM is, principally, about the inclusion of information that helps facilitate accurate cost estimates.

In short, 4D BIM ensures that the building can be built on time while 5D, and its intrinsic requirement for including estimating data, means the cost of the project can always be tracked.

How does this work and why?

The success, or otherwise, of BIM in design, relies heavily on how well BIM models are set up from the get-go. The more thought applied to the model at this stage, then the more likely it is to prove of real benefit to all stakeholders involved in the project.

If the architect thinks about scheduling when the model is created – for example setting up the floors in the order they're to be poured or ductwork in the order it is to be added – then 4D BIM becomes much easier to implement. Also, setting project parameters at this stage will prove invaluable in ensuring the estimating capability supplied by 5D BIM pays real dividends.

If schedules aren't considered or added properly then they simply can't be used as a basis for estimates. Furthermore, each element involved in the project needs to have quite a lot of detail applied to it. Without knowing what type or size of element they are estimating, estimators won't be able to make particularly accurate estimates.

The more complex a project, the harder it is for estimating to even count the elements from a 2D plan.

As well as improving accuracy and precision, this saves considerable costs in time and manpower. Far from making estimators less valuable to projects, it's likely to make them more valued for their skill and precision in working with data to achieve hard, fast and tangible results. Their roles become more focused on identifying cost savings (both OPEX and Capex). Essentially, they become cost engineers.

While that explains much of why BIM is valued by architects, as well as how it can inform and simplify overall project costs, it doesn't necessarily clarify why, or how, everyone else might benefit from BIM processes.

We go beyond the architect's studio and look at BIM in design for all those involved in the process from clients through to subcontractors.



The Client

When a client commissions a building they are primarily concerned with how the building will serve their needs after the project's completion. They own and may well manage the built asset and, naturally, they will prioritize their business needs above all else. With this in mind, one might assume that BIM – and its potential to save money through reduced lifecycle costs – may be of considerable appeal to clients when commissioning projects. However, one of the most frequent objections to BIM adoption, raised by designers and engineers, is a lack of client demand.

Although clients and their Facilities Management teams are likely to be the single biggest users of BIM models and the data they contain, they probably wouldn't regard themselves as BIM experts. In fact, survey results reveal that clients are often confused by BIM terminology and have a tendency to view it as overly 'techy.' Typically, clients view the construction process simply as a means to an end. Why would they understand BIM and why would they want to commission a process they might view as additionally complex or – on occasion – incurring additional expense.

There are exceptions: In countries like the UK (where BIM Level 2 became a mandatory requirement on all publicly

procured projects in April 2016) Central Government clients have been briefed for a number of years on BIM and its benefits. While there are private sector clients who are keen advocates of BIM, they are typically larger companies who fall under the umbrella of early adoption. For the most part, clients who are using BIM are doing so passively and with little or no awareness of the direct benefit to them.

Undoubtedly, if the true value of BIM is to be fully harnessed, then this needs to change. Clients can save considerable expense on projects at every stage using BIM. From design to lifecycle management (and even renovation), time and up front expenditure can be minimized. However, until they are made aware of these savings and benefits in terms they understand, it's unlikely that client demand will skyrocket in the short term.

Over a longer period, though, it's likely that the benefits of BIM for facilities management will become increasingly apparent. Coupled with clearer – client-focused – communication about the long term cost yield of reliable costing and lifecycle data, it's likely this will usher in a sea change. As client demand grows, it's more important than ever that everyone involved in the design process is already embracing BIM practices.



The Project Manager

Arguably, one of the roles in the supply chain subject to the most change as a result of BIM, is that of the Project Manager. Whereas, previously, Project Managers may have been less involved in the process of detailed design, BIM makes it vital that they take a far more active role in ensuring the right questions are asked in order to keep the project in line with the common standards BIM demands.

One example of how BIM impacts project management is how it changes workflows. Previously, these relied upon multiple file formats and disparate procedures that often became disjointed, BIM ensures these are much more streamlined and facilitates a much more dynamic approach to project management. However, it also means that the design process becomes – if anything – a little longer and more detailed than before BIM. Ultimately, this adds value to the project because, the more information is embedded into the model, the more cost and coordination issues can be addressed prior to construction. Consequently, the need for back to the drawing-board re-workings are dramatically reduced (if not eradicated) and subsequent phases of the build should proceed far more smoothly.

What is vital to the success of a BIM project is that processes and standards are clearly defined and rigidly adhered to throughout the project. This is where the role of an informed, and BIM literate Project Manager proves invaluable.

Experience and an understanding of BIM standards and protocols are imperative for checking that everyone is working within the agreed parameters and to agreed standards at every stage. In order to maximize the potential BIM offers project management, it's important to get involved as early as possible.

Unlike CAD, when multiple people were required to generate the many detailed drawings required pre-con, BIM means fewer – albeit more skilled – personnel can reach this stage more rapidly. It is, therefore, vital that Project Managers develop their BIM skill-set independently and proactively. A solid familiarity with standards and protocols will result in more effective standardization and collaboration from the outset. The effect of such an approach at the design stage cannot be overstated. It will have a direct and tangible outcome for the time and expenditure associated with the project and plays an important role in demonstrating the value of BIM to clients.



The General Contractor

It's inarguable that contractors fulfill an extremely demanding role in the construction process. The pressure is always on to work faster, save money and to bring the vision of the architect to life more effectively than their competitors.

Tight deadlines, stringent rules and regulations and complex calculations further add extra steps in the journey towards fulfilling client demand. In addition, contractors sometimes act as a sort of middle-man between architects and subcontractors. In assuming this position, they are also generally held liable for economic losses incurred further down the supply chain.

For this reason, contractors stand to benefit a great deal from BIM. By using BIM, contractors are able to predict errors before they occur making it easier to plan budgets and orders right from initial tender. At this point, the contractor benefits from being able to demonstrate,

visually, exactly how he intends to construct the project and how the design and cost reflect the needs of the client. In addition to this, detailed preparation and scrutiny of the model at tender stage enables the contractor to better understand and – where appropriate – challenge the architect's original design.

Pivotaly, BIM also provides an opportunity for the greater supply chain to get involved at an earlier stage. They can each analyze and input ideas and suggestions prior to detailed design.

Despite this, many smaller contractors are not, as yet, sold on the viability and bonuses of BIM compliance. Once again, surveys suggest that two key barriers to BIM adoption among small and medium sized contractors are a lack of client demand and a dearth of clear, concise and practical information explaining the pros and pitfalls of BIM with specific relation to the contractor's role.



The Subcontractor

The construction industry is facing a skills shortage and subcontractors seem to be on the harsh end, particularly. It's increasingly difficult to recruit the properly trained and experienced staff needed to complete highly skilled work on time and within budget.

At the same time, there is a definite training deficit within the industry. Increasingly, subcontractors are required to take on fewer projects due to a lack of highly-skilled labor and the knock on this has to resources. Consequently, there's a reluctance to invest in training while financial and infrastructure targets are in grave danger of not being met.

Undoubtedly, successful BIM implementation requires an investment in 'skilling-up' existing manpower or in taking on new staff. As a result, there's a widely held perception that BIM is an inconsiderable financial risk. Alongside this, there exists a resistance to changing long-held working practices in favor of what is often seen as a process driven by technology.

However, handled well, BIM offers a great deal to subcontractors, not least the opportunity to win newer and bigger contracts by offering a broader portfolio of skills and expertise. That said, there's still a decision to be made about whether any investment made is going to achieve ROI.

Subcontractors can feel like they have little influence in determining project strategy and outcomes. Instead, they often feel at the whim of the Architect, Contractor and/or Project Manager. There's also a concern among subcontractors about their role within the BIM process, particularly when it comes to design. For example, MEP designers face a number of unique challenges when it comes to BIM adoption.

While architects usually work in building models they've created themselves, MEP designers typically need to work on an existing model created by a third party. One of the biggest challenges they face are changes made to the model in response to the requirements of clients. Sometimes it's just a door stop that has changed but sometimes entire installation voids are modified. As a result, whether the MEP

The Subcontractor Continued

designers need to rework their designs or not is also subject to change and the workload associated with it is variable. As a result, a request to do BIM can appear to make matters more complex than they already are.

Once again, these issues can be resolved by the incorporation of properly standardized and collaborative BIM at an early stage in the project. Far from proving an inconvenience, a proper BIM strategy, strategically implemented should help prevent a situation whereby contractors can pass risk down the supply chain.

Furthermore, when BIM is properly integrated into a project there needs to be an orderly pre-construction process, prior to design, and that requires subcontractors to be involved. This should provide a valuable opportunity for them to add value at an early stage. As well as helping subcontractors win more work, this will facilitate savings – in both time and money – through the avoidance of costly rework that might, otherwise, prove unavoidable.

Who should be promoting and regulating BIM in design?



This is a question with a very simple answer. However, it's not necessarily a popular one.

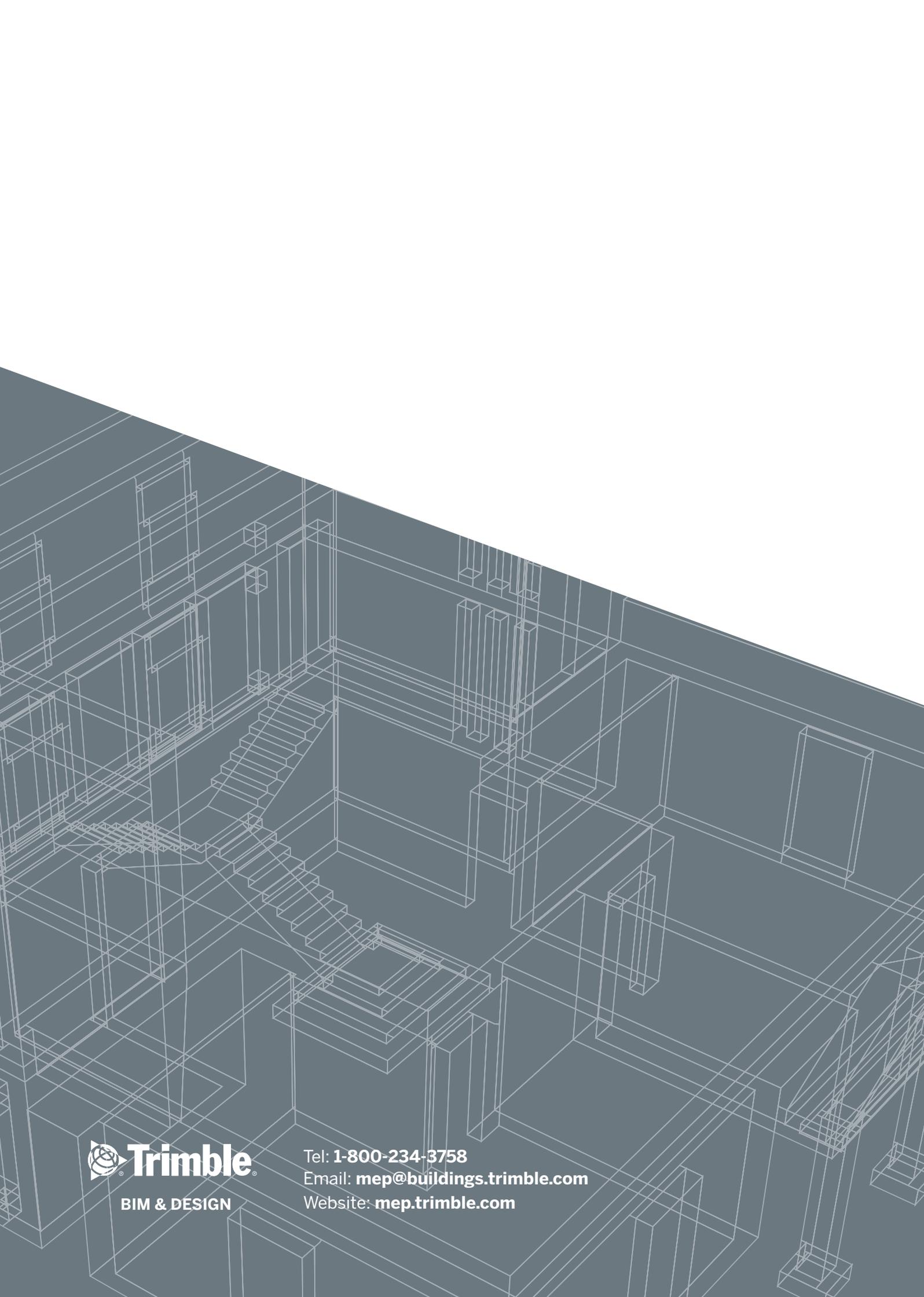
Quite simply, everyone in the supply chain, with the – perhaps surprising – exception of the client should be becoming increasingly involved with the promotion of BIM.

While a lack of client demand may well be cited frequently as a reason not to engage with BIM, there's an argument that it's up to supply chain stakeholders to actively push for properly standardised and regulated BIM to be used more widely. Predominantly, BIM is about processes. It involves the sharing of information towards a collaborative way of working that benefits everyone involved with the design/build process. It should not be the case that any stakeholder feels justified in waiting until client demand imposes BIM – in a downward trajectory – through the supply chain.

Not only does this place the burden of responsibility on the shoulders of the party often least well-versed in what BIM actually means, it also sows the seeds for all parties to fall foul of a poorly regulated and badly implemented BIM strategy.

Specifically, if everyone is just capitulating to client demand for BIM then it's highly unlikely that true collaborative aims will be met or that the supply chain will be able to fully realize the potential BIM offers them for greater profitability. Nor does a top down approach, where either just the Architect, Project Manager or Contractor take responsibility for BIM implementation work. Again, this can lead to a poorly implemented or deregulated BIM plan whereby no one fully benefits from the potential gains the process offers. However, the idea that everyone involved in a project has an understanding of BIM and how (and why) to implement it, relies upon the notion that everyone involved fully understands both the benefits it offers and the practicalities of its adoption. As seen repeatedly in surveys, alongside a lack of client demand, a dearth of case studies and knowledge sharing, couched in understandable terms, are responsible for putting up barriers, particularly among SMEs.

What is imperative is that communication is improved and openness increased. Only then will the whole industry be able, fully, to reap the rich rewards of what is – undoubtedly – an evolutionary step-forward in promoting better building design.



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