



PERFECTING PRECONSTRUCTION: The Early-Stage Advantages of 5D BIM

INTRODUCTION

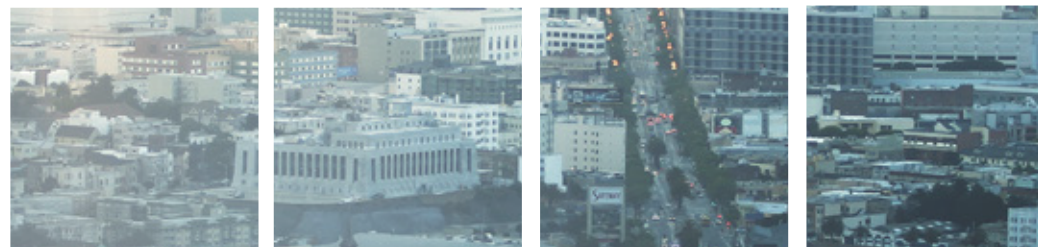
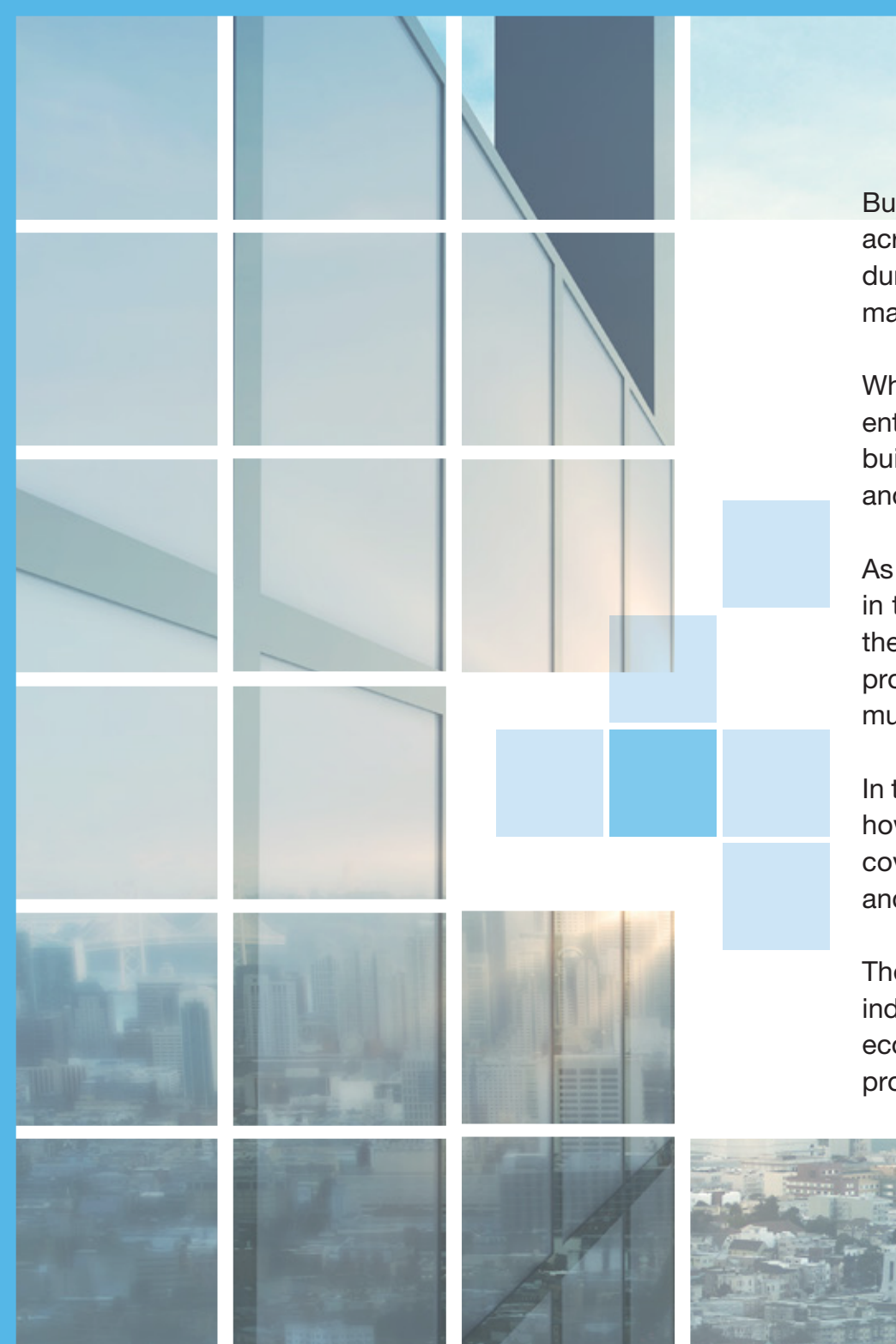
Building Information Modelling is rightly lauded for its ability to improve outcomes across project lifecycles. The methodology is widely used as a reference point during the construction phase, and even as a key driver of long-term asset management.

While these latter-stage advantages are well established, more and more enterprises are implementing BIM long before breaking ground on a construction build. Everything from early scope planning and project conception to scheduling and procurement can be positively influenced by 5D BIM workflows.

As with many new technologies and methodologies, the key to extracting value lies in their implementation. When interdisciplinary teams are properly connected with the right information and digital tools, it is eminently possible to plan and deliver a project that mitigates risk, empowers confident scheduling and establishes as much design detail as possible at an early stage.

In this document, we will examine the preconstruction stages of a project to outline how smart 5D BIM workflows can help to deliver the best possible result. This will cover initial project discussions, actual design development, pre-build planning and more.

The pages ahead will demonstrate the value proposition offered by 5D BIM in an industry struggling to reach its productivity potential. With the right digital ecosystems at our fingertips, we can demolish the data silos that hold back projects and rebuild the global perception of our industry.



ESTABLISHING SCOPE AND STRATEGY

Fail to prepare, prepare to fail. Early-stage considerations have an enormous impact on a project's potential and delivery, and there has never been a greater focus on intelligent planning in construction than there is now.

This imperative is driven by eliminating avoidable rework, which has traditionally been a major factor on construction builds. A 2012 study by Navigant Construction Forum looked at 179 projects across a variety of applications, including industrial and infrastructure builds. The research found that the median cost of rework was approximately 9 per cent of total project cost, when both direct and indirect factors were taken into account¹. This highlights the potential benefits of a well-structured preconstruction phase, empowered by data-driven technology.

In the early days of preconstruction, the intention was to structure a 'frozen design', or a set of drawings that were not to be further developed. This design was to act as a reference point for future project stages. In reality, this would prove to be an imprecise workflow that often led to costly design changes at a latter stage. With the advent of 5D BIM, teams can design comprehensive models that are suitable for regular updates, with participants building upon and refining the initial design as required.

A well-implemented 5D BIM environment can be a useful facilitator when it comes to establishing scope and strategy. Model planning can begin based upon the owner's expectations for the project, with everyone from architects and designers to the owners themselves able to visualise and collaborate on early designs.

These meetings can encompass feasibility, revisioning plans, design alternatives, realistic timeframes, constructability, potential pitfalls and any other relevant consideration. This time spent in reconnaissance can set the tone for a project; all involved professionals can confidently apply their expertise, safe in the knowledge that there are no logistical issues that will impact the project, as verified by their peers.

Incorrect data and a lack of communication are often cited as major contributing factors on projects that fall short or require significant rework. With 5D BIM, these concerns can be effectively erased.

1. Navigant Construction Forum (2012), The Impact of Rework on Construction & Some Practical Remedies. Retrieved from <https://www.cmaanet.org/sites/default/files/2018-04/IMPACT%20OF%20REWORK%20ON%20CONSTRUCTION.pdf>



EXECUTING DESIGN AND DELIVERABLES

The design phase is where the data-driven value of 5D BIM comes to the fore. When the time comes for designers to construct full and detailed models that will form the basis of the project, extensive layers of data can be embedded.

Spatial and geometric data, colours and aesthetics, detailed specifications and even thermal and acoustic properties can be built into designs. With all relevant data embedded, updated in real-time and easily viewable in the one place, the risk of project teams engaging with outdated information is mitigated.

This detailed modelling allows for accurate cost predictions using parametric formulas, with cost consultants able to apply their expertise and forecast what impact any prospective design changes may have. Estimating processes are not only more accurate, but can also be much quicker as quantities are able to be easily extracted once new revisions are applied.

From a design perspective, one of the major benefits of 5D BIM modelling is the ability to identify constraints and detect potential clashes. For example, a structural engineer and a plumbing engineer could work on their design tasks in tandem, collaborating to ensure that there is no intersection of components that share the same space.

Once the designs are integrated in a 5D BIM environment, it's a simple process to validate the work that's been completed. This can help to avoid hard clashes (such as pipework running through a structural beam), soft clashes (such as insufficient buffer space between components), or even 4D workflow clashes (factors related to timing, such as contractor scheduling).

In the days before advanced digital modelling, the first evidence of a design clash may have occurred onsite, with contracting teams already gathered and materials ordered. Clashes of this type would necessitate hasty replanning and rework, often leading to logistical challenges and downstream impact on project delivery.

5D BIM will not revolutionise your design delivery in and of itself. The methodology requires project teams to be diligent, logical and open to collaboration in order to fulfil its potential. Advanced BIM technology empowers experienced professionals to deliver their best work, and for this reason alone it is well worth the long-term investment.



ENDORISING PLANS AND PROCESSES

The fourth and fifth dimensions of 5D BIM refer to time and cost factors, both of which play a significant role in the final stages of preconstruction.

4D sequencing allows for project schedules to be integrated with your information model, supporting step-by-step 3D visualisation of how the build will progress. This enables project participants to view schedules in a more accessible format than Gantt charts, which can be helpful for information retention. 4D sequencing aids progress monitoring as well as dispute resolution, given that all participants will have access to the same shared models for accountability.

The data-driven capability of 5D BIM has many applications for improving costing as well. Once contracting and other project teams are finalised, the next step in a project is often material procurement. This is where outdated methods can cause significant waste, with imprecise estimates leading to a 'better safe than sorry' approach to procurement. Excessive project materials are often purchased, negatively effecting overall budgets and compounding our industry's reputation for inefficiency and waste. Government research released in 2012 estimated that 13 million tonnes of unused material is discarded every year by the United Kingdom construction industry², which is untenable given the technologies we have at hand to better manage procurement.

Experienced quantity surveyors and estimators can excel within a 5D BIM environment, as they can be heavily involved in data exchange from the outset of a project, rather than working in isolation. This allows them to establish helpful costing processes and gain a holistic understanding of the project, improving the accuracy of produced cost plans and Bills of Quantities. The end result is greater cost certainty, more accurate measured quantities and granular detail that aids the material procurement process.

As the preconstruction phase nears its conclusion and physical construction approaches, the real-time data offered by 5D BIM will continue to yield dividends. All project participants can refer to the model for important progress tracking, data checking and collaboration, ensuring a smooth transition into the next project phase.

2. Osmani, M. (2012), Construction Waste Management in the UK: Current Pressures for Change and Approaches. Retrieved from https://www.researchgate.net/publication/257715686_Construction_Waste_Minimization_in_the_UK_Current_Pressures_for_Change_and_Approaches



CONCLUSION

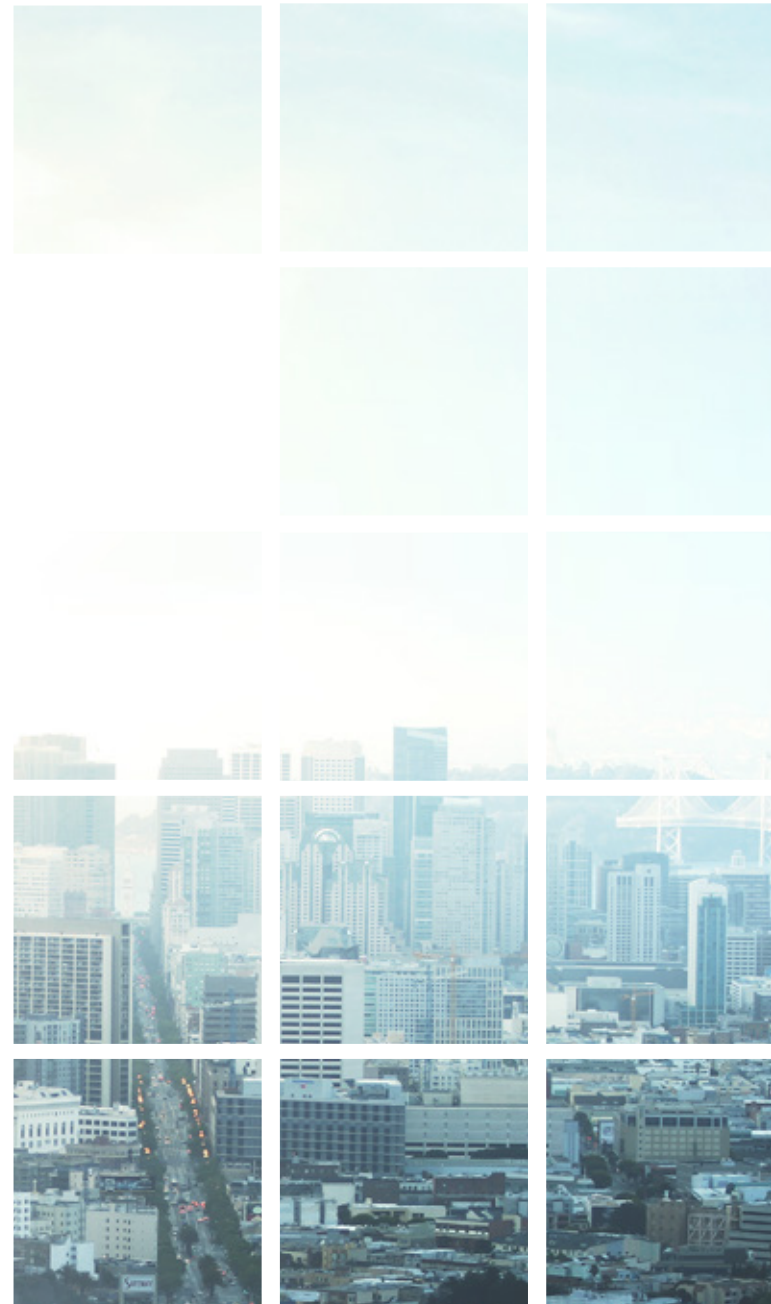
Our industry is at a crucial juncture, and many construction enterprises are at odds over how to best navigate the future. Some are opting to persevere with their established methods given financial uncertainty related to the COVID-19 pandemic, while others are taking proactive steps to secure their competitive future through 5D BIM technology.

5D BIM can act as a useful facilitator throughout preconstruction, a golden thread that validates good ideas while detecting potential issues. While it is clear that this phenomenon allows for an unprecedented level of planning confidence, many enterprises are still unwilling to dive in and unlock the considerable potential of BIM workflows.

One factor that cannot be contested in 2021 is the need for construction productivity to improve. Our industry has famously lagged behind others on the path to digital transformation, and there is no doubt that BIM can play a defining role for businesses looking to enact new strategies and establish their long-term potential. Project managers, contractors, designers, quantity surveyors and other disciplines can all get involved with the data-driven and collaborative benefits offered by 5D BIM.

As established in this piece, the benefits of BIM are not just limited to model design, physical construction and long-term asset operation. 5D workflows can provide actionable insights from initial scope planning through to scheduling, procurement and other vital preconstruction phases. Risk factors can be reduced, schedules can be streamlined and collaborative workflows can be championed given the right digital environment.

To achieve our unrealised potential as an industry, it is integral that all professionals working on any given project are afforded access to the right digital tools. The value proposition of connected project teams within a BIM environment is plain to see; for our industry to step into the next generation, it is vital that as many enterprises as possible choose to adopt this platform for success.



For more information on the advanced 5D BIM technologies offered by RIB, visit www.itwocostx.com



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