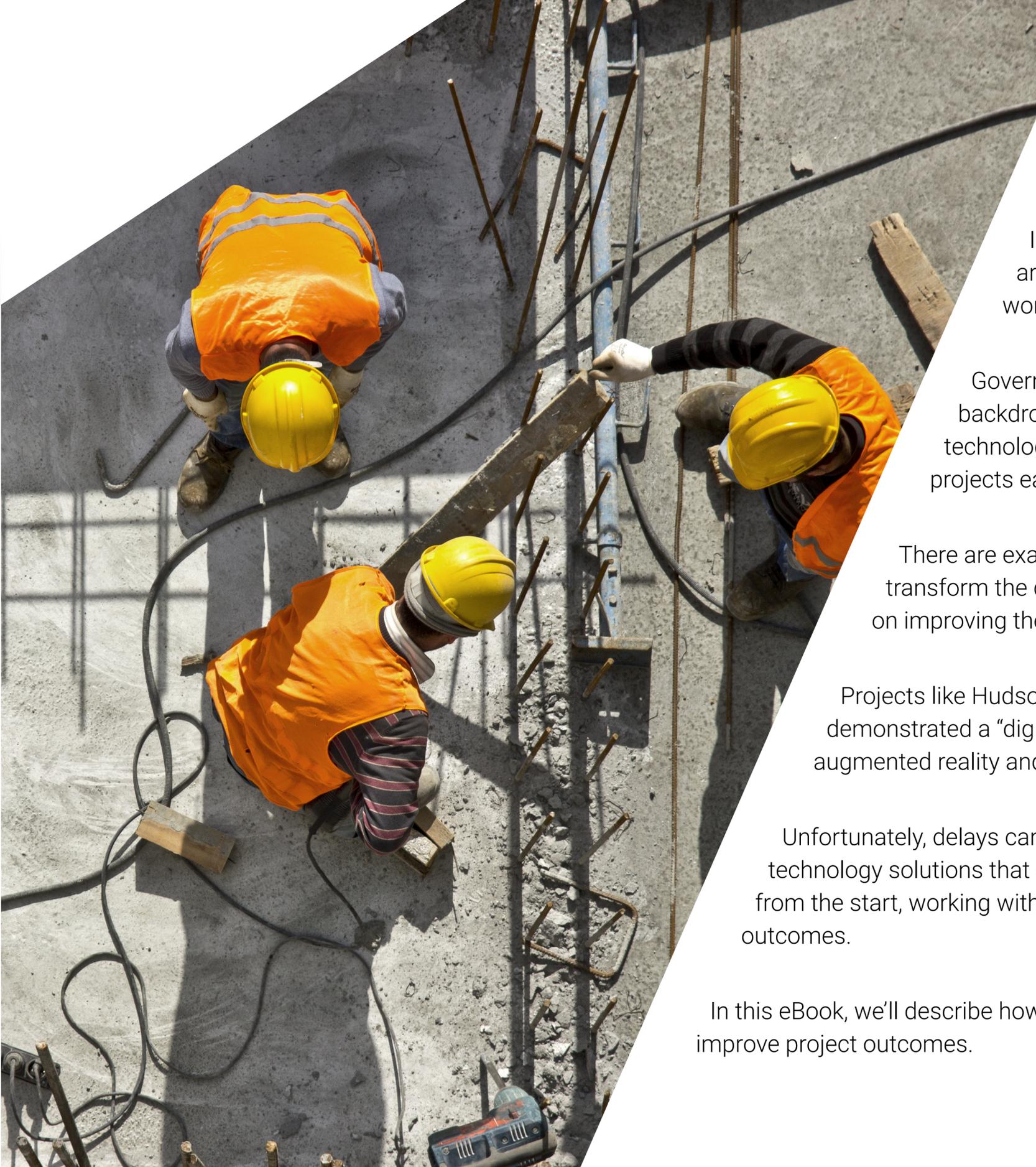


Making Infrastructure Happen

Using digital tools to improve the delivery of major projects.



 **BLUEBEAM**[®]
A NEMETSCHEK COMPANY



Introduction

Infrastructure plays a critical role in driving economic growth and prosperity, yet around the globe, much of it is aging and needs significant repair and maintenance work.

Governments have planned some much-needed investment in the sector, but a backdrop of budget and resource constraints will make delivery challenging. However, technology is transforming the sector, helping to make these complicated, high-profile projects easier to deliver.

There are examples of software tools being utilized to drive greater efficiencies and transform the delivery of these projects, often led by dedicated innovation teams focused on improving the construction process.

Projects like Hudson Tunnel Project and Gordie Howe International Bridge have demonstrated a “digital first” mindset, testing solutions that include artificial intelligence, augmented reality and Internet of Things (IoT)-driven technology such as real-time sensors.

Unfortunately, delays can still occur with these projects, but there is an increasing pool of technology solutions that can help. The important thing is to embed technology in projects from the start, working with the right partners, processes and functionality to deliver the desired outcomes.

In this eBook, we’ll describe how technology is starting to smooth these processes, reduce risk and improve project outcomes.

Coordinating major construction sites

Where software is helping to deliver infrastructure more effectively

The nature of major infrastructure projects often creates challenges from day one. Many are developed in more remote areas and are one of a kind. Think about major highways, railways, bridges – they all involve setting up a completely new site, which can cause logistical challenges with labor supply and accessibility.

Add in the specialist nature of this type of work, where labor with the right skill set and capability can be harder to find, and it is easy to predict where problems may occur. You need tools that can help you to keep track of a fragmented, highly skilled workforce that may only work on short phases of the project, alongside other logistical challenges around organizing plant, equipment and materials and minimizing impact on the local community and environment.

A digital-first mindset, with a fully integrated team working with the same systems and processes, can make a major difference in the successful delivery of these projects and can even help mitigate and solve those risks and challenges just mentioned.

So, how can companies get started?

When deciding on what technology to use, companies should focus effort on optimizing and streamlining key processes first. It is important to assign ownership for these new processes so there is someone to drive the successful implementation of any new tools and approaches. This is where the largest time and cost savings will be achieved.



A good place to start is on bringing people and documentation together. Effective collaboration paired with robust information management are crucial factors in improving project delivery and minimizing risk.

Tools like those from **Bluebeam** help with this, with teams able to work in a real-time, transparent environment. Working with a collaborative tool like this in a live environment increases the likelihood of identifying risks before the project even gets on site and allows teams to proactively manage potential problems.

Get this right, with the correct data standards and systems in place, and you can expect a much smoother project experience from design through to handover and operation and maintenance.

You will also want to create a digital database for projects. With so much data created during design and construction, it would be a waste not to generate a project information model (PIM) that can be leveraged during the asset management phase. The best-case scenario is an up-to-date digital twin of the project in question that puts information in the hands of the people who need it most: the owners and operators of the asset.

Once projects have been completed, this data can be used as a benchmark, helping companies to bid, win and deliver future projects more effectively.



Data standards and agreed workflows

At the procurement stage, organizations should outline how they expect projects to be delivered and suggest the principles for using technology and managing data. That includes agreeing on aspects such as intellectual property (IP) and confidentiality, ownership of data and models, file formats and security.

It is essential that data standards are open and that collaborative tools are used. This stops people from being locked into certain platforms, proprietary formats and solutions and allows flexibility and adaptability throughout both the project and lifecycle of the asset.

Always remember that it is the outcome that is most important, rather than the specific tool mandated. Construction technology is moving fast, and organizations must remain agile and adaptable.

Keeping track

One of the challenges with construction schedules on larger projects is that they can become unwieldy. There are often tens of thousands of activities to coordinate through a vast supply chain, and the logic behind how they are all sequenced can get very complicated and difficult to understand.

Software can make this information more accessible and visible throughout the supply chain. For example, new software like that from **SmartPM Technologies** has become available that makes understanding complex schedules simple and graphical in nature for non-experts, opening up insights into logistical problems and delays that would only be detectable through expert analysis before.

However, it takes more than simply having suitable software in place. It is about having the right information available, at the right time, for the right people. Investing time in getting the data collected accurately and via a clear, consistent process will pay dividends throughout the life of the project.

To ensure that you get good data in the first place, take the time to agree with the project team regarding what data will be exchanged, when

and why. There is an effective process for this outlined in the ISO 19650 standards intended to ensure that the purpose of each exchange is understood.

This process must ensure that customer requirements and desired outcomes are fully captured. Solutions like **dRofus** and **Allplan** allow these requirements to be documented in full and embodied in the building information modeling (BIM) process, creating a centralized reference point. This can be supported with automated validation tools like **Solibri**, which checks models for design errors, code and legislative compliance and constructability issues.

This checking does not have to occur solely in a desk-based environment. Tools like augmented reality, on-site sensors and mobile devices can all be easily integrated within construction sites and used to check real-world progress against design intent and the original schedule. For example, Reconstruct, Inc. combines reality data, schedules and models to provide a complete progress picture accessible from anywhere.



Day-to-day working

Teams need access to the latest data and drawings at all times, so connected working in the cloud is a must. This ensures that work is completed accurately and any changes or issues are flagged early.

The core principle should be that access to relevant technology and software is provided to as many people as possible. For example, digital capture of site progress using mobile devices can be used to raise questions about the project, drive decision-making in real time and help with quality management.

When these decisions are made, an audit trail is automatically built to keep track of projects and refer to if needed. And, with AI assistants starting to be introduced in the market, we are seeing tools that can analyze huge amounts of data to make suggestions, raise issues and even compare on-site work with the original design brief and contract.



Supporting innovation

How technology is helping to drive change and improvement within construction projects

Focusing on your software tools, data standards and cohesive collaboration will improve project outcomes and open the door to more innovation. Beyond traditional construction, as offsite continues to develop, we will see these methods integrated into more and more projects, big and small. This will create a more efficient design and planning process and help to address problems around skills shortages, wastage and quality.

As offsite construction continues to mature, technology will help here, too, building the audit trails and helping to identify trends to enable better decision-making. With multiple means of reality capture available, such as laser scanning or drone-based or hardhat-based photogrammetry, the connection between design models and built assets will be closer than ever. Add in tools that can analyze this data and help to calculate carbon emissions in construction and operation, and it will help drive sustainability efforts. This all results in a more effective industry that is delivering better projects and outcomes.

The other aspect is health and safety. Technology is being increasingly used to monitor things like worker fatigue and tracking movements on sites to help manage potential risks. For example, **SiteDocs** seeks to reduce health and safety-related paperwork by adding automated forms, management and reporting functions into workflows.

This even feeds into the general well-being of the team. Technology is helping to make people more efficient and productive, reducing stress and improving job satisfaction. The adoption of technology has helped people to drive their career growth, develop new and existing skills and enhance digital readiness and understanding, providing transferrable skills for other job roles and even life more generally.

It's not just new projects

Technology is having a big impact with existing assets too. Point cloud surveys are being used to scope out and measure infrastructure to support ongoing repair and maintenance works. This data capture can be done from a distance, helping with health and safety and improving speed, delivering a digital version of the asset that can be used to guide projects.

The more efficiencies that can be gained here, the shorter the project delivery timescales. With existing infrastructure, this is particularly important, as any closures or restrictions tend to have an impact on the public. There will often be clauses in contracts relating to this, too, so speed can help to avoid potential fines if there is an issue with project delivery.

Making the change

With major infrastructure projects, technology needs to be embedded in at the start. Our top tips for getting started are:

- **Set out preferred workflows and processes at the procurement stage:**
This should include the principles for how information is to be stored and shared, the expectations around how teams will work together and report on progress, and how success will be measured against defined KPIs.
- **Ensure that the full supply chain can work with these systems:**
Open file formats, agnostic systems and data accessibility are all essential, ideally backed up via a robust, cloud-based system. This interoperability is a must. It makes information easier to review and compare, which also makes it more actionable.
- **Make relevant tools and software accessible to the whole team:**
This ensures that the information is available to everyone in real time, providing an accurate insight into project performance.

The key challenge in major projects is scale. The workforce is spread across multiple locations, different disciplines use different tools and many companies have their own workflows, some of which may still be paper-based. But, by getting the principles and technology right, companies can realize a wealth of benefits, delivering projects with better margins and improved outcomes.

See how technology can improve your planning and construction workflows

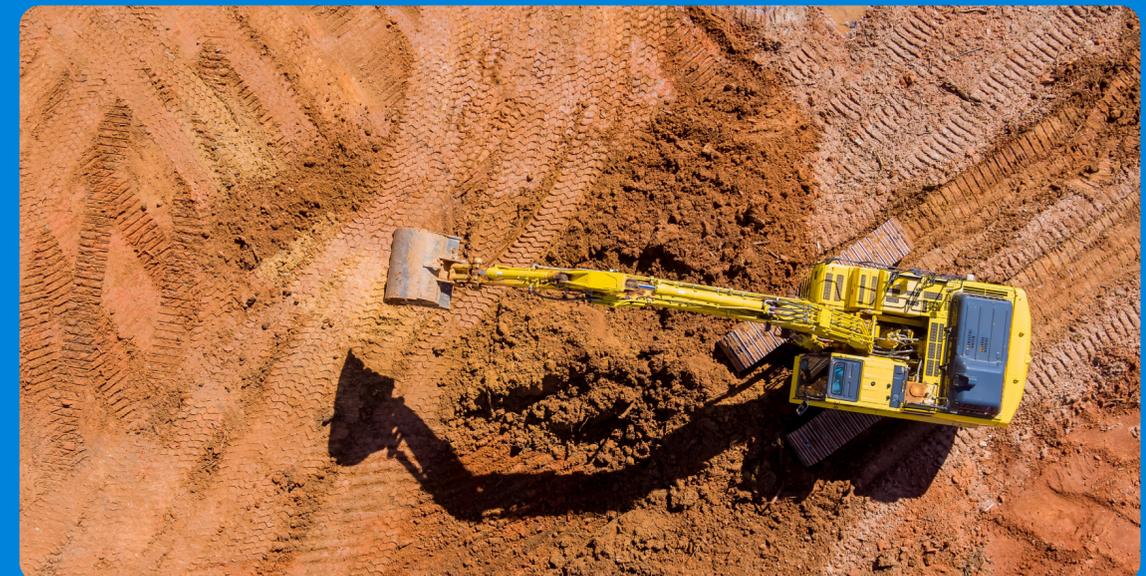
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Rolling out new software

Companies often underestimate the rollout process for new technology. Whatever the investment is in cost, you can usually expect to triple it when it comes to implementation, based on the time it takes to train teams, troubleshoot any issues and recalibrate workflows.

Rollouts should be a fully interactive process that aligns the software with existing business processes and the ways that projects are delivered. This helps teams to understand what they need to do and what the benefits will be.

Without this investment of time and effort, the benefits of the software will not be realized – you will find that limited functionality is used, and adoption rates will be low.



CASE STUDY

ClearTech

ClearTech Engineered Solutions is a Dublin-based specialist engineering consultancy that offers structural engineering and post-tensioning solutions for bridges, buildings, roads and other civil/structural engineering projects. Here, CEO Feargal Cleary explains how they use Bluebeam to help them to deliver infrastructure projects more efficiently.

Why is cloud-based working and software that supports collaboration so essential on major infrastructure projects?

While ClearTech has been an early adopter in terms of innovation in engineering and welcoming new technologies, like many companies, COVID saw us explore and embrace cloud-based working.

With the development of key software, such as Bluebeam, it is now very clear that we can develop better processes that help us to quantify costs, set KPIs, reduce risk and offer a more efficient end solution on major infrastructure projects.



What are the biggest challenges that you face on infrastructure projects, and how does technology and software help?

Collaboration and coordination is by far the greatest challenge in any project. By having a cloud-based, 24-hour worldwide access system, it helps the many different disciplines that are involved on projects to work together effectively.

That said, with the level of data and information that is now available on a project, it can, in fact, create a headache, especially if coordination of all disciplines is required before a design is set to begin. We have found that the BIM coordination and project management has become a more important role in ensuring the success of the project. The right tools are crucial.

Where do things go wrong when implementing new technology on projects, including software?

In general, our experience has been positive when implementing new technology. [At] ClearTech we have always embraced new technologies and methodologies to enhance the speed, accuracy and efficiency of our projects. Bluebeam has been key to this journey.

It is, however, sometimes challenging to implement change where there may be resistance or where additional training is required, which can cause delays. It can also be challenging to ensure efficient dissemination throughout the team and coordination with the QA/QC system.

There is also, of course, a risk of GIGO (garbage in, garbage out), or as mentioned above, the risk of having just too much information! However, with good training and good management, these risks can be reduced and controlled, and overall, we have found the benefits greatly outweigh the risks.

In your view, where would you rate the industry on its digitalization journey?

I think the industry can be slow to change, and this has been the problem over a long number of years. However, now the industry has had to embrace digital transformation. Every industry is being impacted by Moore's Law, and the construction industry is no different.

We are also faced with the additional challenge of achieving net zero. This is being helped and amplified by the digitization of the industry. As construction professionals, we need to embrace this and accept the challenge. As we say in ClearTech, we need to "choose to compete." Innovation and digitization is our chosen way forward.



CASE STUDY

AECOM

AECOM is a global infrastructure and engineering consultancy. With over 51,000 staff members, it works on some of the world's most complex projects. Here, Chelsea Burkett, design and quality manager at AECOM, describes how Bluebeam helped streamline communication and reduce risk on a schools program involving 400 contributors and 100,000 design comments.

How did Bluebeam help with collaboration?

To be able to pull up a Bluebeam Studio Session in a meeting with the owner and search through various statuses that needed their input and provide responses and then formally close out comments in real time was truly incredible.

We were working on multiple sites, with every project having its own requirements, so there was a lot of information to deal with.

We wanted to make sure our design review process facilitated collaboration with ease across multiple stakeholders. We wanted to create clear standards across all project teams, ensure consistency and keep design teams accountable – that the commitments they made to the comments left in the technical review process were truly implemented in future design deliverables. And we wanted to capture comments across the lifespan of a project.

Sometimes the deliverable would have thousands of comments in it. We created customized Tool Chests that had Markup tools within it that all had customized subjects. The other level of customization that we did to meet our goals was customized statuses within the markup tables.

We really wanted to understand: comments are left, responses are given, now what? Are the comments going to be incorporated? Are there meetings needed to resolve this issue?

Bluebeam was an incredible tool. It's a great space for everybody involved to make their comments and give their thoughts.

Curious how technology can improve your planning and construction workflows?
Schedule a demo or start your free trial of Bluebeam today.

Try It Free

