

WHITE PAPER



# BIM FOR INFRASTRUCTURE IS CIVIL ENGINEERING FACING AN AGE OF EXTINCTION?

The risks and opportunities for the civil engineering sector



10 MINUTES READING



## THE GAME IS CHANGING

As public authorities in the UK and around the world begin to demand BIM, it is clear that model-based civil engineering is here to stay. The sector needs to wake up to the fact that if it is to thrive, it needs to embrace BIM for infrastructure. Now is the time to ask what is the impact of doing nothing? And what are the opportunities for those that choose to innovate?

## Are we entering an Age of Extinction?

The global construction supply chain needs to become BIM ready to align to an ever increasing number of Public Sector BIM Mandates and Requirements or it risks being excluded from project opportunities.

- **The European Union Public Procurement Directive in 2014 encouraged all member states to adopt BIM** to increase value on public projects
- **The UK BIM Mandate will be in force in the Spring of 2016** for all centrally funded public projects in England
- **France have appointed a Digital Construction lead for the Ministry of Housing** and announced a National Digitisation Plan including promotion of BIM
- **Germany's Construction Reform Commission has established a BIM Working Group** to develop a BIM strategy for Germany and increase BIM adoption on projects
- **Austria has a published National BIM Standard**





Infrastructure owners in Europe are seeing increasing pressure to better maintain and improve their assets. BIM can help address these challenges thanks to the large number of pilot projects and BIM data definition efforts now underway:

Under the UK Government BIM programme, Highways England and a number of other Departments are involved in Early Adopter projects which are demonstrating the benefits of BIM.

- **The Environment Agency (EA) in the UK is determining its supply chain BIM data requirements** throughout project delivery. It is doing this so it is in position to confirm progress is going according to plan, and can ensure accurate and better information is collated for improved asset management.
- **Highways England is running a number of BIM pilot projects** to improve design coordination, project team collaboration, stakeholder engagement and project delivery. The resulting superior structure and quality of information may in turn stretch the required capabilities of its new asset management environment.
- **Finland's road authority has stipulated supply chain data submissions will be in LandXML InfraModel 3** (a structured data format for civil engineering) to enhance asset data records.
- **The Swedish and Dutch transport agencies** (Trafikverket and Rijkswaterstaat) have initiated a European Commission **funded project 'V-Con' on BIM for roads standardisation and implementation.**

It's important to realise these public sector requirements are not simple undertakings that can be addressed 'last minute'. Implementing the guidance and changing organisational procedures needs planning, investment and patience. For example, the UK BIM Level 2 requirement is supported by eight guidance elements that cover aspects such as:

UK BIM Level 2 guidance documents:

<http://shop.bsigroup.com/Browse-by-Sector/Building--Construction/Building-Information-Modelling-BIM/>

<http://www.bimtaskgroup.org>

- Capital project delivery with BIM
- Operational data management
- Commercial implications of BIM
- Data exchange format
- Stakeholder readiness
- Security implications of BIM



## What does the BIM mandate mean for your business?

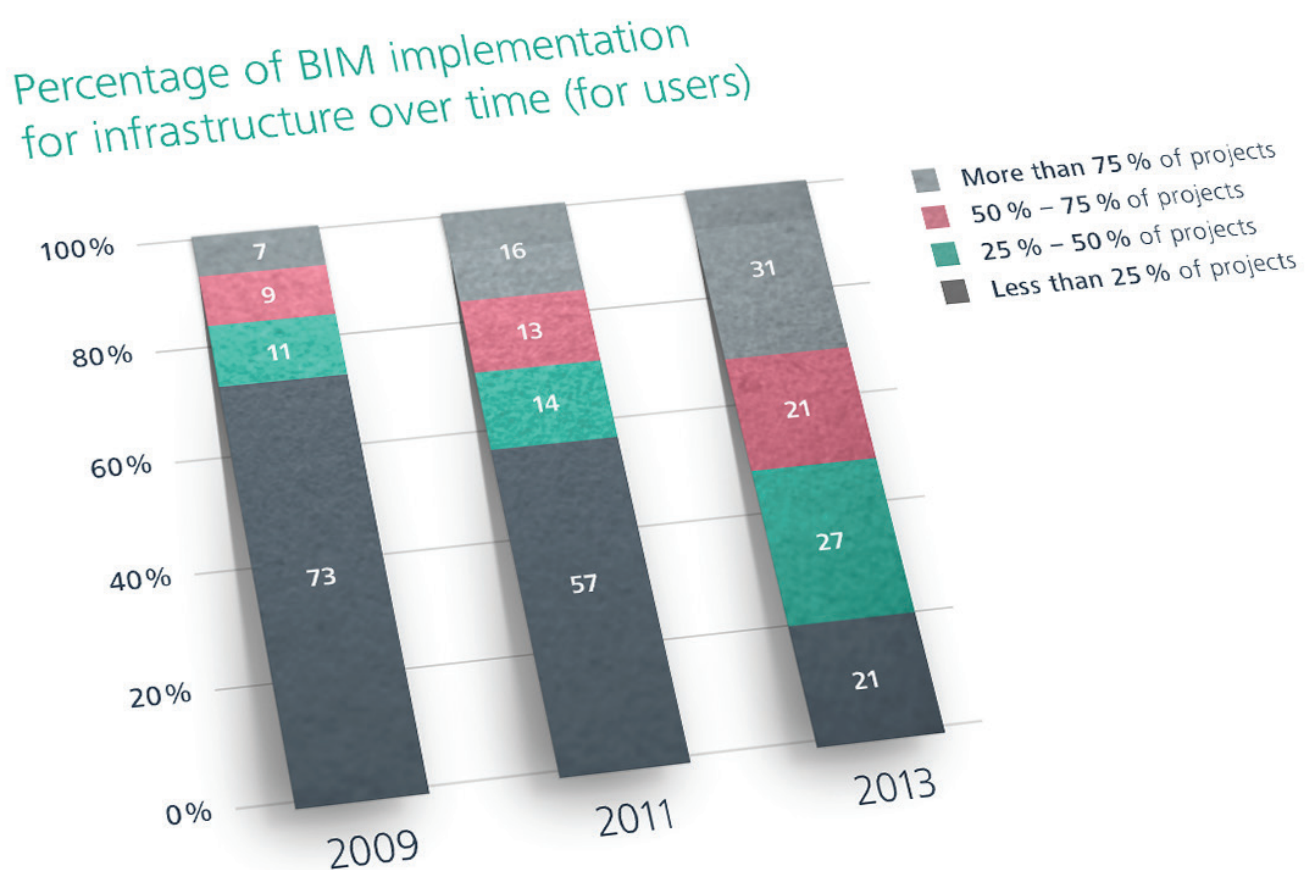
Clearly, if your business aims to win a high percentage of UK government projects for example, you will need to be BIM Level 2 compliant. The key thing here though is that the government mandate is the catalyst for the industry as a whole to modernise and improve its process, quality and efficiency. A growing number of private clients are now also asking for BIM on their projects. Therefore, implementing BIM will give you the ability to bid and win wherever and whenever public or private clients demand it. The alternative is competing for an ever decreasing market of non-BIM schemes.

"Public authorities are encouraging the use of BIM and sometimes make it a requirement. For example, the UK BIM Mandate will be in force in the Spring of 2016 for public projects."

**Around the world, the number of project owners requiring the use of BIM is also rising.** 39 % of general contractors say that developers frequently or always make BIM a requirement (Source: McGraw Hill Construction, 2013). Moreover, irrespective of BIM demands from clients, there is a momentum in the industry to embrace BIM to deliver benefits during design, construction and into operation for individual companies, whole project teams, and owners or maintainers. The technologies for the building sector tend to be well understood, but what are the opportunities within the civil engineering sector?

## Industry trends: rapid adoption of BIM

In this landscape, more and more civil engineering firms are turning to BIM for a competitive advantage and improved productivity. Numerous studies and surveys document the rapid adoption of BIM for infrastructure worldwide.



## What is BIM for Infrastructure?

BIM is a process to plan, design, construct, and manage infrastructure that involves creating and using intelligent 3D models. Compared to traditional 2D drawings, these models give stakeholders a better understanding of the project – leading to higher quality project outcomes.

BIM is not one technology but instead introduces a data-driven, rather than drawing-driven, approach to enable practitioners to execute work more efficiently and effectively; integrate contributions from others; make changes; explore alternatives and deliver more suitable solutions that address needs from all stakeholders.

“A BIM process is built around 3D models, and helps the whole team to better understand the project before and during construction. When you use BIM large, complex projects progress with fewer issues. There are numerous examples of problems being avoided and opportunities being recognised early in the design stages of the project, all which contribute greatly to cost savings.”

**Paul Heath**

BIM lead adopter  
Atkins Water Operations





Technologies applicable to infrastructure include:



Geospatial systems



Reality capture



Parametric civil modelling



Data management



Structural design and analysis



Advanced visualisation



Quantity take off

A BIM for infrastructure investment permits participants to gain immediate improvements to current workflows by adopting one or more of the technologies appropriate to their work. Provided the process uses and generates structured data, BIM technologies will accelerate the execution of work and improve accuracy irrespective of the technology employed.

Good BIM implementation also encourages using the right tool at the right time:

- **When planning a project**, participants are able to leverage existing data to create a comprehensive understanding of as-is state, prepare design options and engage stakeholders for feedback to select the most appropriate solution to take forward
- **During design**, preferred options can be fully engineered; essentially building the project in a virtual environment, developing advanced visuals and even simulating performance
- **In construction**, opportunities include quantification, sequencing execution, setting-out from models, automated machine control, field-based reporting and comparing as-built with as-designed
- **And for operation**, BIM can significantly improve and accelerate data transfer into asset management systems, provide spatially coordinated asset records for use in maintenance, and ensure complete data records for use in future extensions or modifications.

## Survival or Extinction?

Can a firm survive without BIM? The statistics, trends, and owner mandates, cited earlier all suggest the same answer: no. But this is good news ... even for firms that have not yet adopted BIM. Because moving to BIM can give firms substantial and long-lasting benefits, enabling more innovative design and engineering strategies and providing a significant competitive advantage.

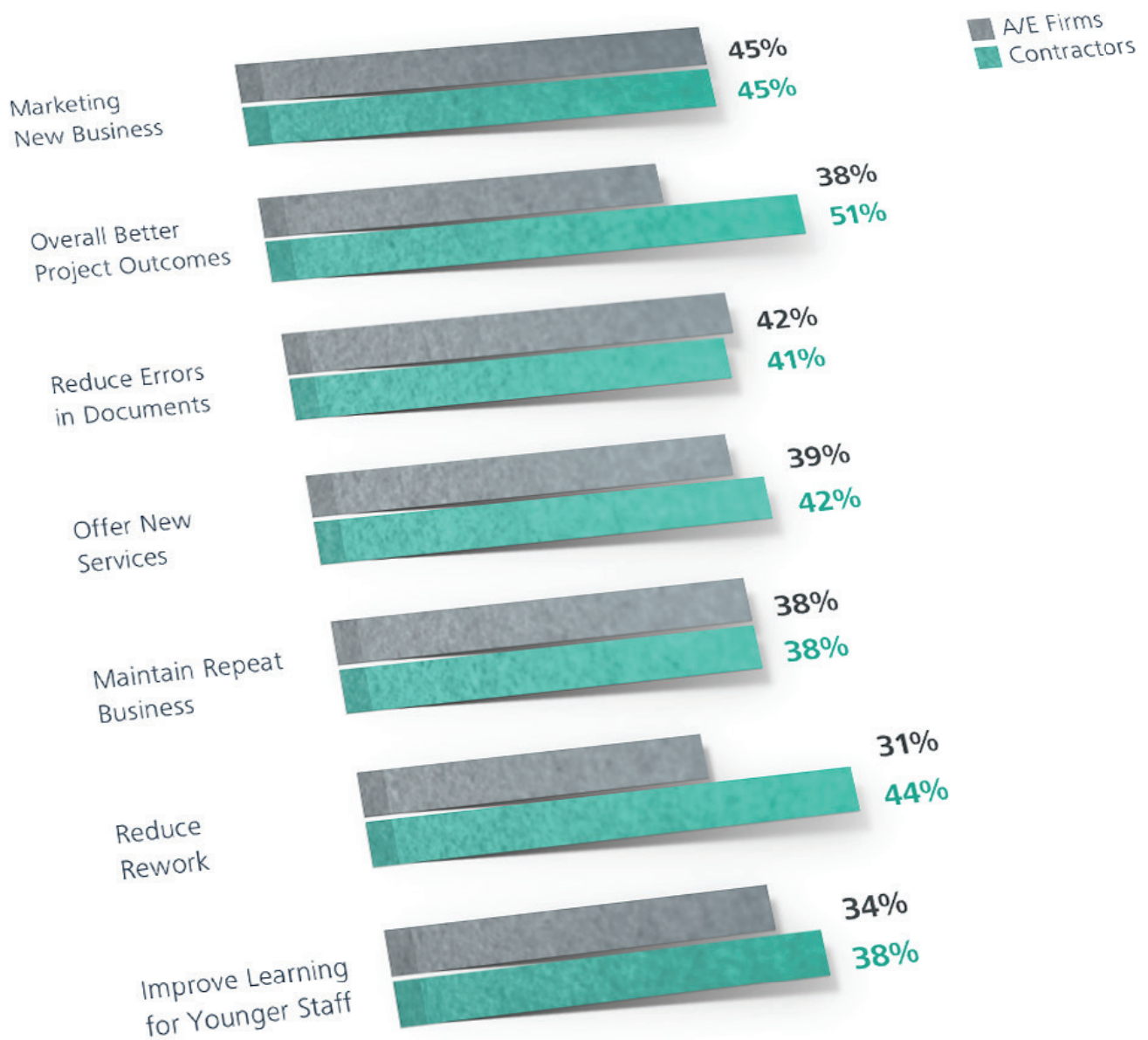
"A few years ago BIM had not been considered; today BIM is integral to our strategies for improving project delivery and ongoing asset management performance."

**Karen Alford FCCA**  
BIM/GSL Programme Manager  
Environment Agency

Surveys of infrastructure professionals who have already moved to BIM consistently list several top business values of BIM, such as:

- Ability to win new and repeat business
- Reduced document errors and omissions
- Reduced rework
- Reduced project duration and risk
- Attract young talent into the organisation
- Increased profits and reduced costs

Percentage of top internal business benefits of using BIM  
for infrastructure projects at A/E firms and contractors





## Summary

As model-based civil engineering grows – and intersects with new technologies, new delivery methods, and new business models – the nature of the industry is changing. The degree of collaboration, the kind of information flows, the risk-management scenarios, and the alternate project delivery approaches are all manifestations of this change. To survive, firms must strategically position their use of technology – starting with Autodesk BIM for Infrastructure solutions.

### With BIM you can:

- Win more business
- Analyse and simulate your design
- Mitigate risk of delays
- Reduce material waste
- Provide greater clarity to stakeholders



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