

# BIM ADOPTION IN EUROPE

CURRENT STATE, CHALLENGES AND A VISION OF TOMORROW



A WHITEPAPER BY



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# INTRODUCTION

The implementation of BIM in the building industry has accelerated quickly in recent years and both public and private sector actors are increasingly recognising the benefits to be gained with a transition to digital technologies. In this white paper we investigate the current status and recent development of BIM adoption in Europe, examine the BIM journeys of selected key countries, as well as address some existing challenges that may still be holding BIM adoption back for specific sectors. We then discuss future developments in BIM adoption and technology and the role of digitalisation in creating a more sustainable future.

Current drivers for BIM include both public and private sector actors, as well as independent industry organisations.

Private sector companies have clear fiscal interests in transitioning to the latest digital technologies. Digitalisation is generally seen to respond to the combination of declining profitability with existing methods and the business potential from increasing urbanisation. The overall business impact of BIM is apparent in industry figures. The estimated value for the European BIM market was 1.8 billion EUR in 2016, and it is expected to grow up to 2.1 billion EUR by 2023.<sup>1</sup> As such, the building industry has clear financial incentives to make a digital transition, in addition to benefits, such as improved efficiency, reduced waste and better project management.

Public sector actors may not have an equal financial pressure for digitalisation; however, it is seen as key in reaching better social outcomes to the challenges of urbanisation and population growth. As the owner of public built environment and new public projects, governmental interest in digitalisation is driven by many factors, including building quality and efficiency, management of built environment, sustainability and budgeting. BIM implementation responds to a pressure for more efficient public spending, more sustainable development of shared public spaces, and improved management of public buildings. Additionally, governmental interest in advancing digitalisation supports the welfare of a major industry, which in turn benefits overall economic growth.

Industry organisations play an important role in helping bring together government and business interests in BIM. The organisations often include participants from both the public and private sector and, thus, are well-equipped to represent and facilitate a convergence of interests. They have also had an important role in awareness building and standardisation work.

Public sector efforts to encourage BIM implementation are considerably more effective when combined with private sector initiatives and, in fact, coordination between the two sectors increases in importance as the BIM maturity level in the industry increases. Public sector initiatives and governmental support are very important at an early stage of BIM adoption, but efficient expansion and upscaling of BIM use in the industry requires complementary buy-in and leadership from private sector companies. This cooperation is best achieved when the public and private sectors are able to identify shared interests in BIM adoption.<sup>2</sup>

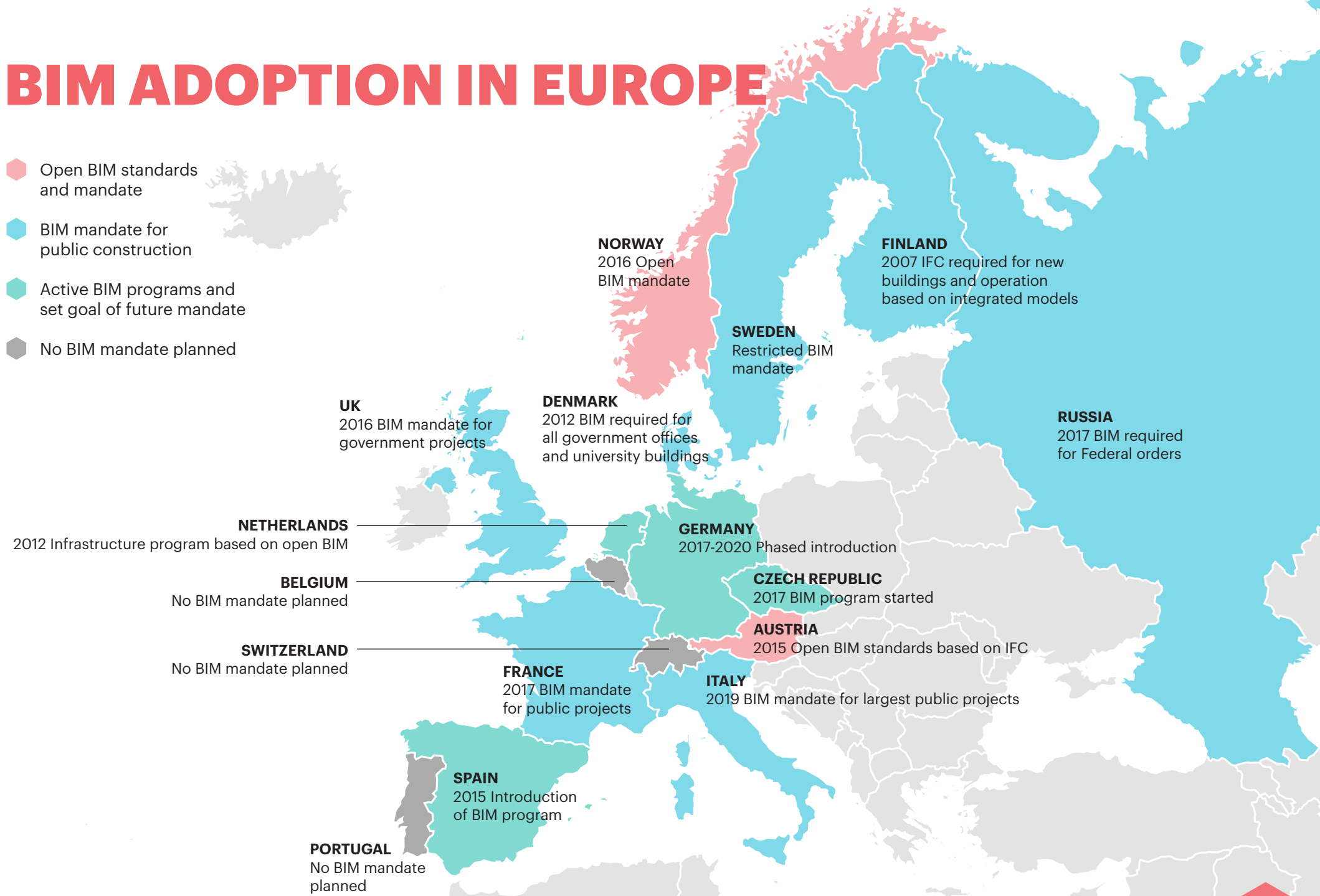
N BIM ADOPTION

## CURRENT STATE OF EUROPEAN BIM ADOPTION

BIM has had a transformative impact on the building industry. Implementation of the latest digital technologies and introduction of national BIM programs is advancing rapidly. However, BIM adoption has not progressed concurrently across the various European nations. In fact, the pace, drivers, and strategies of BIM adoption in different countries vary greatly and may often reflect national industry tendencies. In this chapter we take a closer look at the current state of BIM adoption in Europe.

# BIM ADOPTION IN EUROPE

- Open BIM standards and mandate
- BIM mandate for public construction
- Active BIM programs and set goal of future mandate
- No BIM mandate planned



# BIM ADOPTION IN EUROPE

**Austria and Norway** were the first countries to establish open BIM standards and an open BIM mandate, requiring level 3 BIM on public projects. **Other Nordic countries, the UK, France and Russia** also have established level 2 BIM mandates in place and have different schedules for moving to level 3 BIM.

Reflecting the current surge of interest in BIM, many other countries have in recent years introduced BIM programs with a view towards an eventual BIM mandate. **Italy** already has a mandate for public projects exceeding 100 million EUR and full implementation is expected in 2022 for all public procurement projects. **Germany, Spain and the Czech Republic** have active BIM programs with varying schedules, but all of them are expected to establish a BIM mandate within a few years' time.

Even though **the Netherlands** do not have an official BIM mandate in place for the building industry, they introduced a BIM requirement for infrastructure construction already in 2012 and have one of the highest levels of BIM maturity and implementation. **Switzerland, Belgium and Portugal** currently have no BIM mandate planned; however, this is not indicative of a lack of BIM interest as each country has active BIM organisations and initiatives.

The rapidly accelerating pace of BIM adoption illustrates the importance of the new technologies, while the multitude of approaches and schedules for national implementation are indicative of the fragmented nature of BIM development. While the

early adopters are already reaping the benefits of established BIM programs, BIM implementation remains in an exploratory phase in many countries. Regardless of individual country timelines, it is evident from an overview into BIM adoption that BIM will help shape and define the construction of today and tomorrow throughout Europe.

Considering the amount of separate national BIM initiatives, countries in Europe face risks related to a lack of coordination. While the independent national programs do allow countries to tailor their BIM development according to local preferences, it may also slow down BIM adoption.<sup>3</sup> European level BIM collaboration took a promising step forward with the foundation of the EU BIM Task Group, a collaborative project co-funded by the European Commission. The goal of the group was to support European BIM public sector BIM adoption with a common aim of improving the cost effectiveness and quality of public construction and the sustainability of the industry in Europe. In order to support national BIM policy developments and to address issues surrounding the multitude of local programs, the EU BIM Task Group published in 2017 their Handbook for the Introduction of Building Information Modelling by the European Public Sector, which collected insights from public actors in over twenty European countries.

It is evident that BIM will help shape and define the construction of today and tomorrow throughout Europe.

## NATIONAL BIM PROGRAMS, OR GOVERNMENT ORGANIZATIONS IN CHARGE OF A BIM PROGRAM

### Germany

Planen Bauen 4.0 (Germany's BIM Task Group)

### France

Plan Transition Numérique dans le Bâtiment (Plan for Digital Transition in Construction)

### Finland

Senaatti (Senate Properties)

### Netherlands

Rijkswaterstraat (Ministry for Infrastructure and the Environment)

### Norway

Statsbygg (Norwegian Directorate of Public Construction and Property)

### Spain

Comisión para la implantación de la metodología BIM (Commission for the implementation of BIM methodology)

### UK

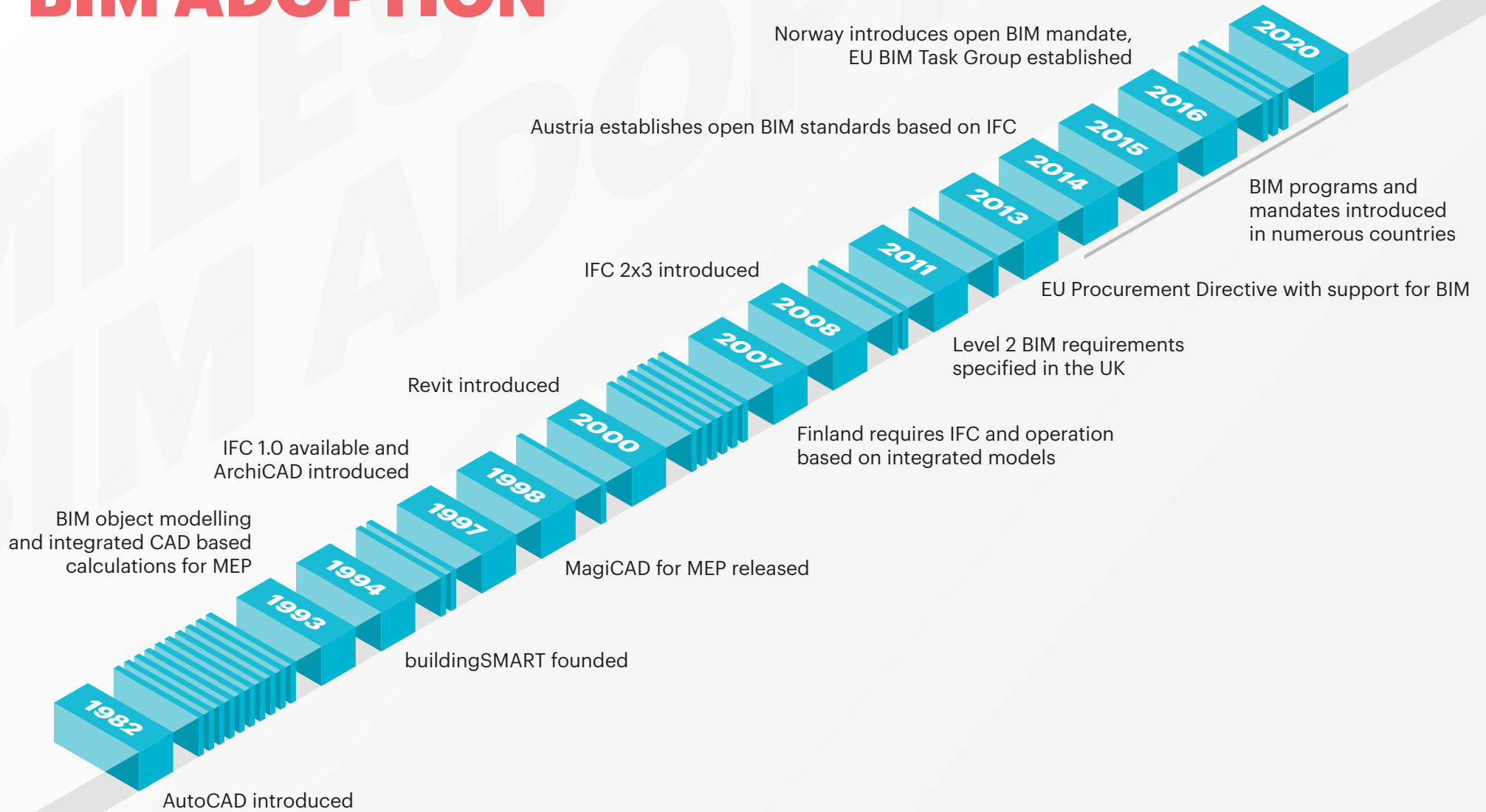
Centre for Digital Built Britain

### Denmark

Bygningsstyrelsen (Danish Building and Property Agency)

<sup>3</sup> Roland Berger (2017). Disruptive impact of Building Information Modelling. Turning point for the construction industry.

# MILESTONES IN BIM ADOPTION

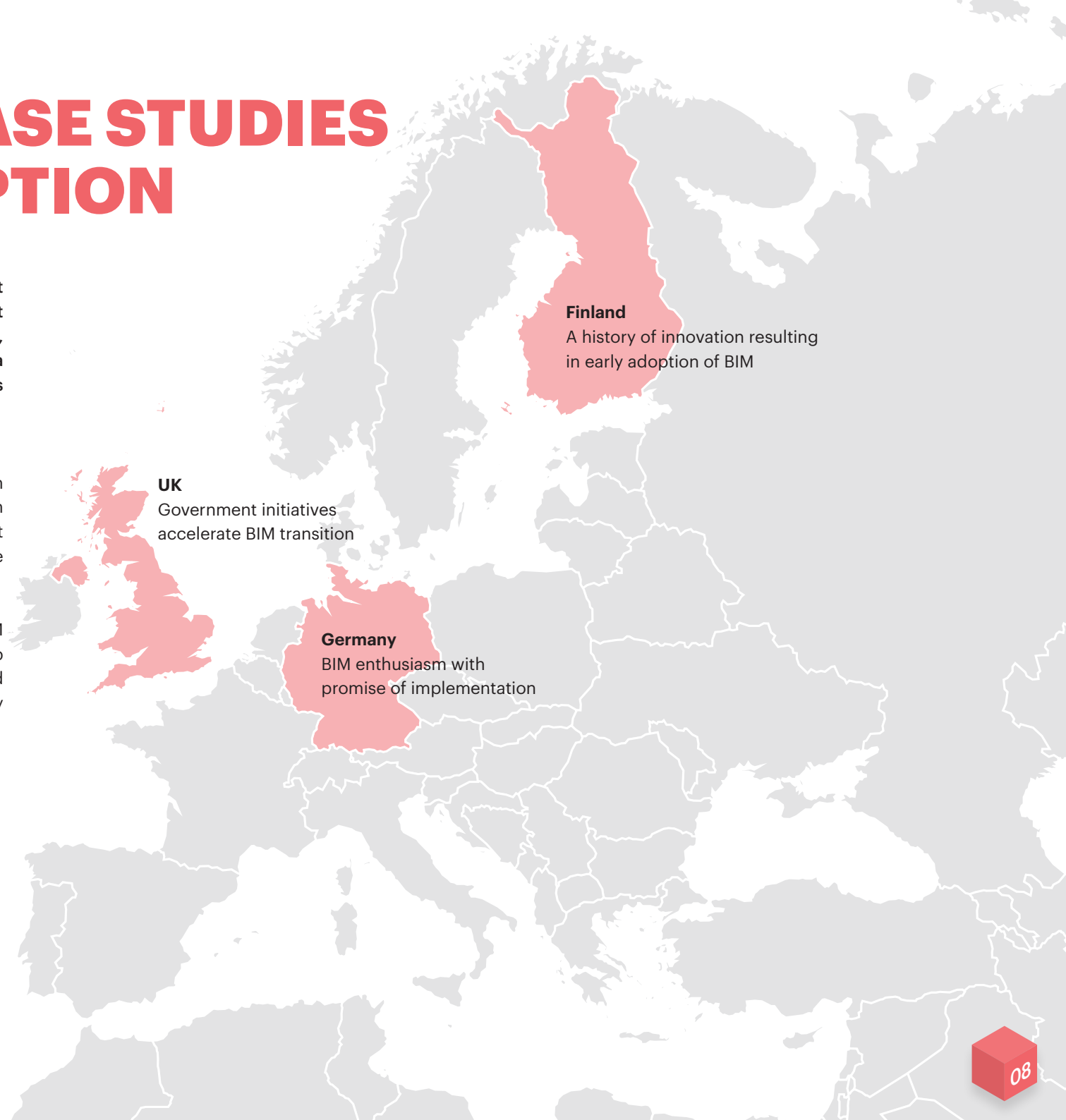


# COUNTRY CASE STUDIES OF BIM ADOPTION

An overview of BIM adoption makes it evident that countries are proceeding on very different paths towards national BIM programs. However, certain shared qualities between countries in a similar stage in the BIM standardisation process can be discerned.

Early adopter countries for BIM are defined by certain key common characteristics: early engagement with new technology, a focus on innovation, and consistent government support. These all contribute to effective BIM development on a national level.

In the following we will take a closer look at the BIM journey of selected example countries. This will help illustrate how countries that are relatively advanced in BIM standardisation may have taken considerably different roads to get where they are.





# FINLAND

## A HISTORY OF INNOVATION RESULTING IN EARLY ADOPTION OF BIM

**Finland has long been one of the forerunners and innovators in construction ICT. Part of the reason for this can be found in a national focus on innovation and an openness towards new solutions.**

The first seeds for Finnish BIM success were actually planted already in the 1950s. Granted, modern BIM solutions and modelling were pure fantasy at that time, however, it was already then that a government supported innovation unit was founded for construction. This was the initial moment in a continuous decades-long focus on innovation within construction and reflects a sustained emphasis on exploring the potential benefits of new technologies.

From 1983 to 2015, ICT development in the construction sector was supported by the public funding agency for research funding Business Finland (formerly TEKES). The period saw Finland engage heavily in the development of technology in construction, and after 2003 many of the technologies that first surfaced during this period have begun to be implemented officially.

Currently, a strong emphasis in Finland has been placed on establishing international standards for BIM. Overlapping international and local standards for information management have proven challenging for Finnish stakeholders and have complicated cooperation between organisations, which is, in turn, reflected in weaker productivity. International standards are estimated to improve the efficiency of information management in Finland's built environment by up to 50%<sup>4</sup>.

Currently, a strong emphasis in Finland has been placed on establishing international standards for BIM.

THE ROADMAP FOR FINNISH BIM STANDARDISATION PROGRAM CAN BE FOUND ON PAGE 10

## EXAMPLE OF BIM REQUIREMENT CONTENTS

The Common National Requirements for Building Information Modelling (COBIM) R&D project was completed in 2010 as a coalition of public and private enterprises to extend Senate Properties' guidelines transforming them into national BIM guidelines. COBIM involves the entire value chain throughout the whole lifecycle of the construction sector. Today, the COBIM requirements are commonly referred to in the appendices of public and private construction contracts.<sup>5</sup>

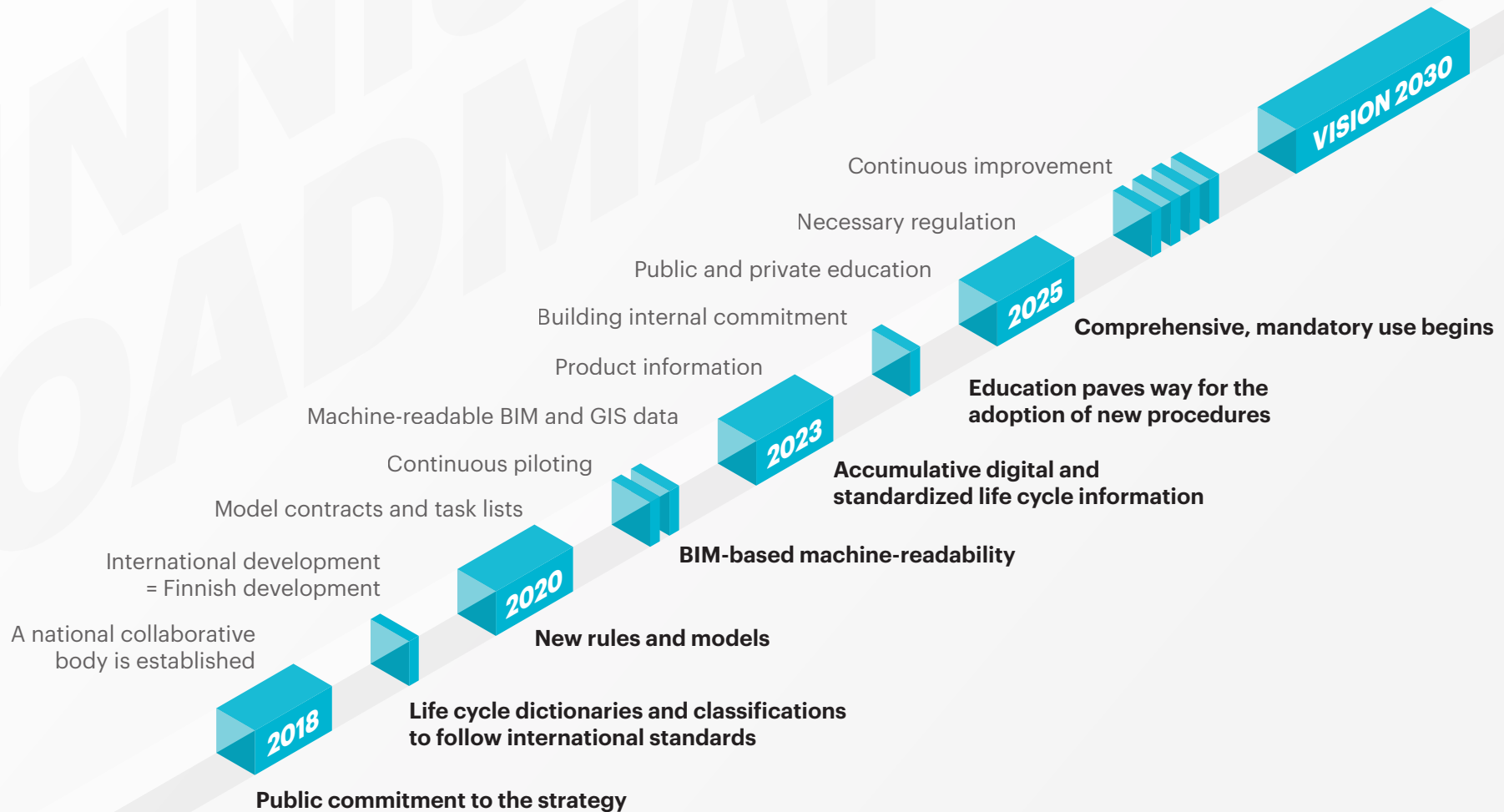
### COBIM requirements cover the following:

- General BIM requirements
- Modeling of the starting situation
- Architectural design
- MEP design
- Structural design
- Quality assurance
- Quantity take-off
- Use of models for visualization
- Use of models in MEP analyses
- Energy analysis
- Management of a BIM project
- Use of models in facility management
- Use of models in construction
- Use of models in building supervision

<sup>4</sup> <https://rastiprojekti.com/en/the-rasti-project/>

<sup>5</sup> Policy Measure Fact Sheet Finland by The European Construction Sector Observatory of the European Commission (2016).

# FINNISH STANDARDISATION ROADMAP 2030

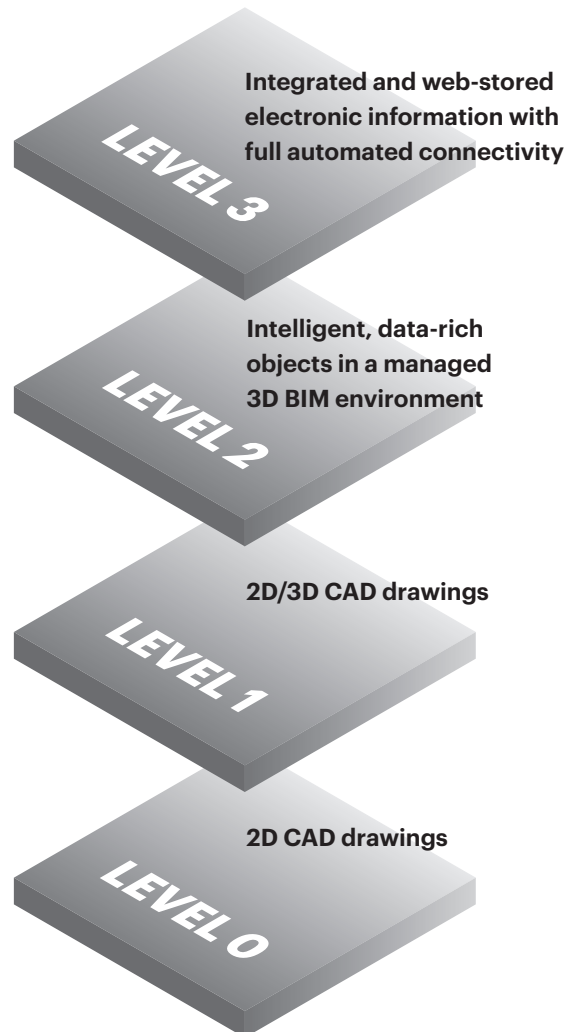


BIM development in the UK is a case study in how government initiatives can effectively drive industry change. The transition to a BIM oriented environment received a major boost in 2011 with the specification of Level 2 BIM requirements in the Government Construction Strategy, a government-led program designed to harness the potential of new technologies in order to plan, build and maintain infrastructure more effectively.

A key feature of the program is BIM development for the digitalisation of the built environment and operations management industries. By 2015 the program had developed BIM Level 2 and was estimated to have saved £2.2 billion across government.<sup>6</sup>

The goals of the Digital Built Britain program were assisted in 2011 by the definition of BIM maturity levels by the UK BIM Task Group.

### BIM MATURITY LEVELS – UK DEFINITION <sup>7</sup>



The official definition of these BIM levels provided a boost to the transition towards BIM as they enabled proper assessment of current status and provided specific goals for further development. The official codification of BIM levels resulted in accelerated development as parties had a clear idea of their current level and could plan concrete steps in order to attain the next one.

Overall, the UK has executed a well-structured and managed BIM action plan within the building industry and by 2016, achieved BIM Level 2 use on all public sector projects. The program has since begun the next ambitious step of moving towards BIM Level 3, which will cover the entire building lifecycle. This work will include advanced standardisation work, creation of commercial models and identification of technologies that will result in a complete digital economy for the built environment.

The case of BIM adoption in the UK is an example of how governmental efforts and standardisation can effectively drive change. When the concept of BIM is advanced from a conceptual level to a regulated practice, people have more incentive to implement changes and a better understanding of the requirements and results of said changes.

<sup>6</sup> <https://www.gov.uk/government/publications/strategic-business-case-for-the-digital-built-britain-programme>

<sup>7</sup> <https://www.gov.uk/guidance/creating-a-digital-built-britain-what-you-need-to-know>

# GERMANY

## BIM ENTHUSIASM WITH PROMISE OF IMPLEMENTATION

Germany had long taken a conservative approach towards new digital construction technologies. However, the turning point of BIM adoption in Germany was in 2013 when Germany's Federal Ministry of Transport and Digital Infrastructure founded a Reform Commission for building management aiming to develop concepts and politics in this field.

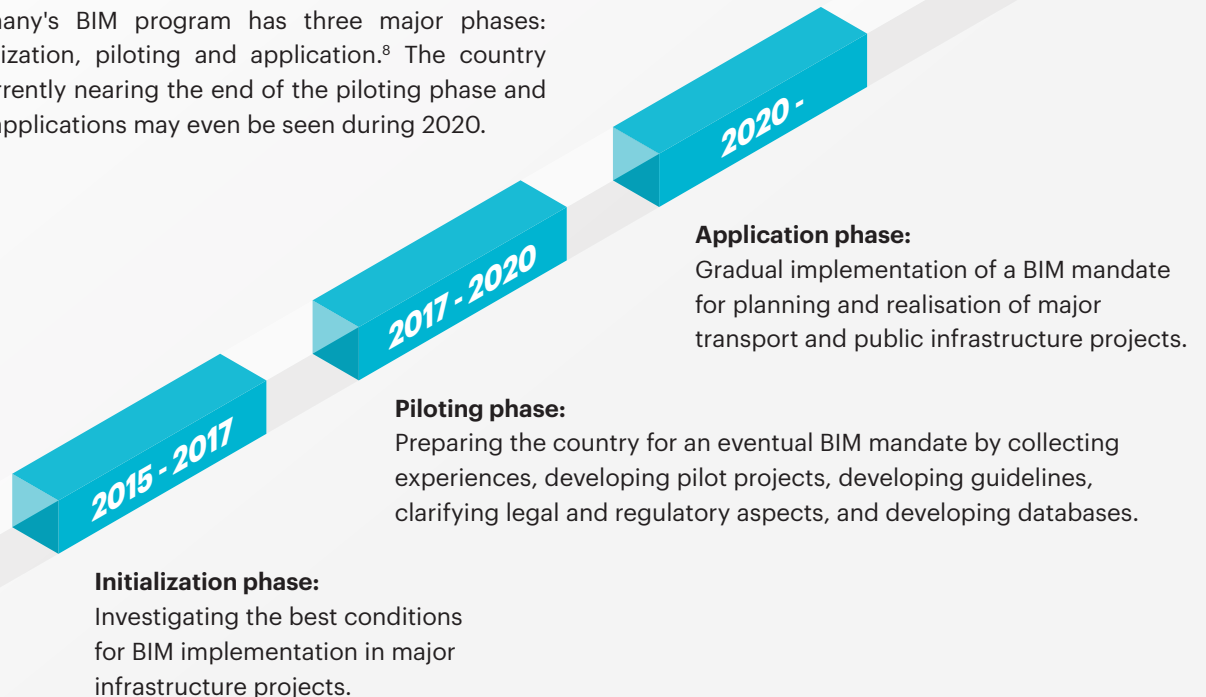
BIM enthusiasm has since grown rapidly and the current excitement surrounding BIM is evident in the sheer number of BIM events that are organized on a seemingly weekly basis throughout Germany. Among the most notable of these are events organized by buildingSMART Germany and BIM World.

Governmental involvement has also developed quickly with a series of pilot projects in infrastructure, the establishment of a government run BIM Competence Center in Berlin and the ongoing development of the first German BIM standard.

Germany may have remained conservative regarding BIM for a long time compared to some of the early adopter countries, however, once Germany began to embrace BIM, it has been done with full conviction. The rapid pace of development in recent years and general enthusiasm certainly point to an introduction of official BIM mandates and standards in the very near future.

### Germany's BIM transition

Germany's BIM program has three major phases: initialization, piloting and application.<sup>8</sup> The country is currently nearing the end of the piloting phase and first applications may even be seen during 2020.



<sup>8</sup>Road Map for Digital Design and Construction by the German Federal Ministry of Transport and Digital Infrastructure ([https://www.bmvi.de/SharedDocs/EN/publications/road-map-for-digital-design-and-construction.pdf?\\_\\_blob=publicationFile](https://www.bmvi.de/SharedDocs/EN/publications/road-map-for-digital-design-and-construction.pdf?__blob=publicationFile))

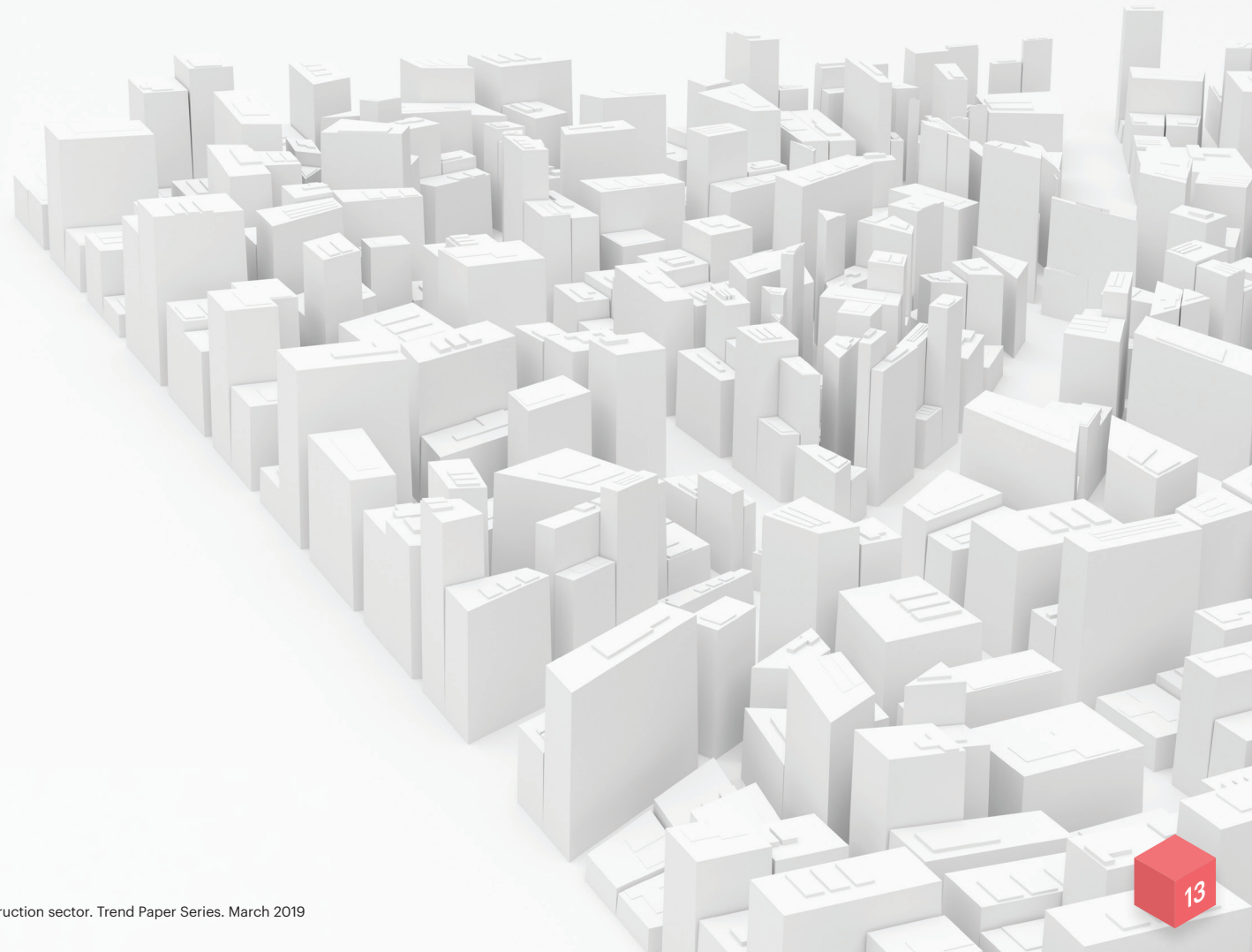
# COOPERATION BETWEEN PUBLIC AND PRIVATE SECTOR

## BEST PRACTICES FOR NATIONAL BIM PROGRAMS

As the previous cases illustrate, governmental efforts and public sector developments are a key driving force in BIM adoption. However, these efforts would be in danger of falling short without equal interest and participation from the private sector.

The European Construction Sector Observatory has also noted that while the public and private sector play different roles, their coordination is of utmost importance to build synergies and foster the effective implementation of BIM in the construction industry.<sup>9</sup>

Although the key incentive on the public and private side may be different—improvement of national industry standards and fiscal returns from new technology, respectively—it is evident that both sectors will find mutual benefits from concurrent development. Governmental efforts into BIM implementation can positively affect industry practices, while the role of companies in implementing policy and taking the technologies into actual use is equally important for the overall success of national programs.



# CHALLENGES

## CHALLENGES

BIM has several success stories among individual countries, yet the adoption of BIM methodology has clearly not progressed in the same pace in different countries and there are many countries still hesitant to take up national BIM programs. In its Trend Paper on the European construction industry, the European Construction Sector Observatory in 2019 outlined several key challenges to BIM adoption in different countries, including fragmented implementation, market structure and company size, lack of demand from project owners and lack of standardisation and centralization.<sup>10</sup>

<sup>10</sup>European Construction Sector Observatory: Building Information Modelling in the EU construction sector. Trend Paper Series. March 2019

## FRAGMENTED IMPLEMENTATION

BIM is not currently implemented to nearly the same level among the different phases of the building value chain. It has become commonplace for the design phase and makes an occasional appearance in construction. However, the operations and maintenance phases are notably lagging in BIM implementation.

This trend is reflected in an example from the UK. In a study by McGraw Hill Construction 90% of architectural design teams in the UK reported using BIM even without a specific request, whereas only 25% of trade contractors reported the same.<sup>11</sup> France is currently the only country where the rate of adoption by engineers (44%) is slightly ahead of the architects' (40%).<sup>12</sup> This statistic reflects the particular structure of the French building industry where, unlike architecture, the engineering segment is characterised by large companies with more resources to pursue business development opportunities with BIM implementation.

## MARKET STRUCTURE AND COMPANY SIZE

Larger companies have in general been faster to adopt BIM methods, while small and medium-sized companies have hesitated in making the transition. There are some evident reasons for this, including resources, project type, and demand. Implementing a complete BIM workflow can require considerable resources in terms of personnel training and capital investment and larger companies are better equipped to meet the resource demands incurred by the transition.

Larger companies are also more likely to be involved in large and complex projects where the extensive cooperation and coordination demands make the benefits of BIM more tangible. These large-scale projects may also often be public projects that include official BIM requirements. As a result, smaller companies across the building project value chain often have limited BIM experience further hindering their ability to participate in bids for major public projects.

## LACK OF DEMAND FROM PROJECT OWNERS AND LACK OF AWARENESS

The lack of demand for BIM from project owners, particularly in the construction, operation and maintenance phases reflects a lack of awareness of BIM benefits.<sup>13</sup> However, as an increasing number of public procurements include BIM requirements and national BIM programs continue their rapid development, it is becoming necessary for actors in less engaged sectors to investigate BIM. The shifting demand in both the public and private sectors towards BIM projects will also drive BIM interest for previously passive project parties.

## LACK OF INTERNATIONAL BIM STANDARDISATION

The initial development of BIM has its roots with industry professionals and commercial actors with governmental direction following at a later stage. This has partially contributed to the multiple expressions of BIM and to the lack of shared standards on an international level.

The fact that countries have essentially developed their own BIM standards and practices combined with the different levels of BIM adoption between individual countries, makes coordination on an international level understandably difficult. On the other hand, since no single international authority oversees BIM standardisation, governments have more leverage to guide BIM standards according to their domestic industry's requirements. This can also provide increased incentive for domestic companies to invest in BIM.

<sup>11</sup> McGraw Hill Construction (2014). The Business Value of BIM for Owners. [http://www.i2sl.org/elibrary/documents/Business\\_Value\\_of\\_BIM\\_for\\_Owners\\_SMR\\_\(2014\).pdf](http://www.i2sl.org/elibrary/documents/Business_Value_of_BIM_for_Owners_SMR_(2014).pdf)

<sup>12</sup> Galliano-Garrigos et al. (2018). Building Information Modelling (BIM) in Design, Construction and Operations II.

<sup>13</sup> European Construction Sector Observatory: Building Information Modelling in the EU construction sector. Trend Paper Series. March 2019

# RESPONDING TO THE CHALLENGES

AN INTERVIEW WITH PAULI KEINONEN, TECHNOLOGY DIRECTOR AT MAGICAD GROUP



## What do you currently see as the key challenges in BIM adoption?

The first one is convincing building owners of the benefits of BIM. Although each participant in a building project is of course free to adopt BIM for their specific needs, it is building owners who are able to establish demand project-wide BIM use and who also stand to gain most from the lifecycle benefits it produces. The second challenge is in getting more contractors on board. BIM has become well-established for the design phase, but its benefits could be extended into construction by involving the main contractor in an early phase and having the design be optimized for construction.

## Architects have been forerunners in 3D modeling. Have they also functioned as drivers for BIM?

Architects did start early with 3D modeling and other disciplines were able to benefit from their models. However, it has not been quite so simple.

The architectural 3D model may not always be done to the detail and data level required by subsequent BIM applications. For example, if Revit cannot find space information from the model then MEP designers are not able to fully use the model. This only goes to show that there is always a need for increased communication so that the initial model includes enough data and detail for subsequent disciplines. Everyone involved in the building process should understand what information they can provide for others and everyone should be ready to improve their work so that others have access to that information. In short, everyone should be working with the same quality level in BIM.

## What would be the key aspects that would convince other disciplines to adopt BIM, even on a smaller scale?

I think we need to consider the definition of BIM and what we want to achieve. In the big picture having building owners establish the demand for BIM would make it easier to implement it

throughout the process. However, there are distinct benefits to BIM technology even when implemented in a smaller part of the process. This could simply be having an architect develop their model with detail that allows an MEP designer to define MEP spaces and to calculate loads or having MEP designers and structural designers coordinate provisions for builderswork openings through BIM software reducing manual work and paperwork. For construction, an example of a small implementation could be using digital tools for construction site safety inspections, making it easier to share and document issues. This is a very small but still important part of the process and shows how implementing BIM for a specific task can still bring tangible benefits.

I would say that both project-wide and small-scale implementations are important. In many cases, smaller implementations help to introduce BIM and make it easier to later extend BIM methods to other tasks. However, in order to unlock full lifecycle benefits, the demand has to come from the building owner or main contractor.



**BIM adoption was driven in the UK by government initiatives and a BIM mandate. Are governments the key driver for BIM?**

I think they are for public projects. The drivers are slightly different for private projects. But when BIM tools and methods are taken into use for public construction then it is of course easier to also adopt them for private projects.

**BIM has been adopted faster by bigger companies in bigger projects, yet its benefits are not tied to company and project size. Is BIM suitable also for smaller projects?**

You have to consider the goals of the building project regardless of project size. Are you building for efficiency? Are you building so that the end-users will be happy and the building accommodates their specific needs? Even in a smaller project, for example, a kindergarten, BIM could help optimize the design of the spaces so that the kindergarten teachers are able to work in the most effective way possible. So, I would say that smaller projects can provide very good examples of the benefits of BIM in enabling end-users' particular needs to be taken into account in the design process.

Naturally, there is always the argument of potential extra cost. However, in many cases people are only thinking about the cost of construction. Lifecycle costs may be very different, when factoring in operation and the value of user experience over time. So when we are talking about costs we have to consider whether we are thinking of construction costs or lifecycle costs, including operation and end-user experience.

**In some countries BIM adoption has been slower simply due to a lack of awareness. What would be the best ways to increase awareness of the benefits of BIM?**

I think a key thing is having concrete examples. Case studies and realistic examples can have a big impact. It is important to support the proposed benefits with factual evidence and numbers, and also to have different project types and project sizes represented. This allows different companies to map out what BIM implementation could mean for their own projects.

**Sometimes project parties may be disappointed and fail to see the benefits of BIM due to deficient implementation. What would be the best practices to ensure proper BIM implementation?**

It is important that building owners who are in position to demand BIM have a good BIM implementation plan, otherwise the experience may be negative simply because the transition to a BIM project has not been planned properly. So having a good BIM implementation plan in place when starting a BIM project is essential. On a smaller scale proper training is always important with any BIM software when people are moving to new tools and new working methods. A bad experience may make a company hesitant to try again for a long time.

BIM is not just a technological change, but it is also a mindset change. An important element is communication between stakeholders. There may be items that have been delivered for years that are unnecessary for subsequent project parties and there may be items that would be helpful and easy to deliver

but they have never been asked for. Improving project quality and information exchange is much easier if all parties discuss what they need and what they can deliver.

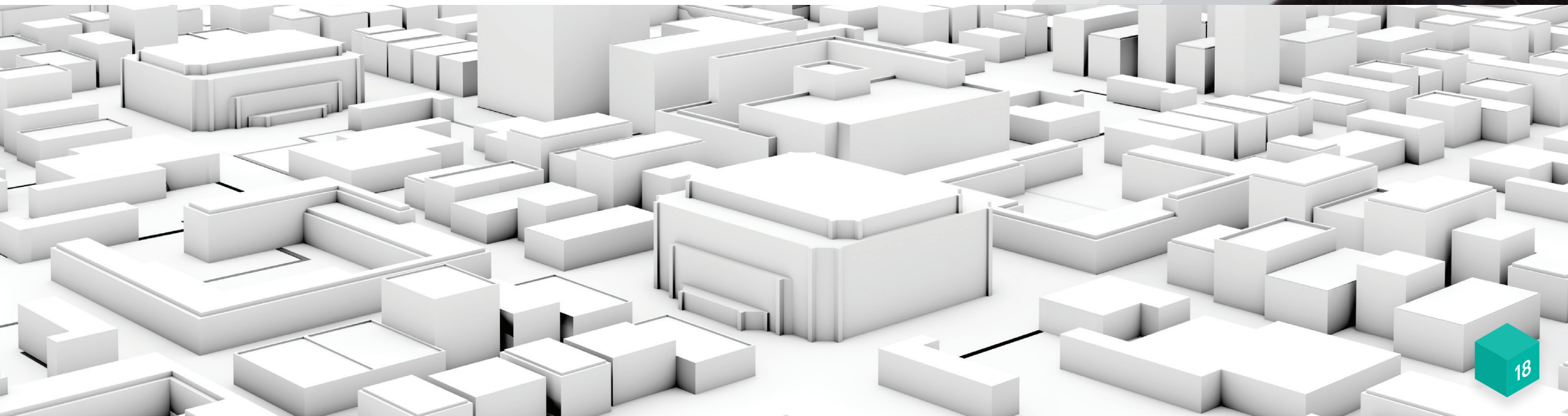
**Is there a need for an international BIM organization?**

In some ways it would be easy if there was one organisation that would simply say that 'this is the way to do it'. However, this is not likely since developing and defining common standards that everyone would agree on is such a heavy process. Realistically, every country will continue to develop their own practices, but this does not mean that they are doing this completely separately. Countries do follow each other and often find mutual benefits in aligning their practices more closely.



# VISION OF TOMORROW

AN INTERVIEW WITH DR. ARTO KIVINIEMI  
HONORARY RESEARCH SENIOR FELLOW AT THE UNIVERSITY OF LIVERPOOL



# VISION OF TOMORROW

## DEVELOPMENT OF BIM ADOPTION

**Countries are currently in very different stages of BIM adoption. What do you see as the next step in the expansion of BIM?**

I see three levels of increasing BIM adoption in the near future.

1. Geographical expansion led mainly by the governmental or other official mandates. This is often the first step and it is happening at the moment all around the world. UK's BIM mandate has been the main driver for this. For example, it led to forming the EU BIM work group, and thus the development of BIM requirements has been strongest in Europe, but it is also a global phenomenon.
2. Business driven adoption driven mainly by large global construction companies who have seen the benefits of integrated BIM in their projects and want their suppliers to start adopting it. This is already a reality in many companies, and it is now expanding to smaller and more local enterprises. In my opinion this will become the main driver, as in the long term the business benefits are more feasible driver than the public mandate.
3. Improving interoperability is also a strong driver for the BIM adoption. The main driver are the demands from companies which are sharing the BIM data and the implementation is naturally dependent on software providers.

**How do you see the standardisation of BIM developing? Will it continue to be driven by national programs or can you see the emergence of an international cooperative body?**

Standardisation is an absolutely crucial part of integrated BIM and sharing data, but there are two main layers of standardisation. The classification systems are local and so deeply rooted in the AEC industry that I don't think we can change them into a global standardisation. However, this is not in contradiction with the need to global development of data interoperability because the data structures can have a placeholder for the local classification systems – as is already the case with IFC.

The data interoperability must be an international effort because of the nature of software industry. Most software providers are committed to Open BIM standards, because it is in their business interest and their customers demand it. I don't see any reason why it could not be developed and maintained by buildingSMART International (bSI) also in the future. bSI is currently going through significant changes which in my opinion will make their role and contribution much stronger. The main reason are the increased resources, which is in my opinion currently the second most important development in this area after the governmental BIM mandates.

## ABOUT BUILDINGSMART INTERNATIONAL

buildingSMART is the international authority for a set of standards known as the Industry Foundation Class (IFC) which deal with process, data, terms and change management for the specification, management and effective utilization of assets in the built asset industry.

buildingSMART Compliance provides guidance and governance for certification of software, people, and organizations through compliance training and testing. The User program supports communication and collaboration among a global community of members, chapters, partners, and sponsors through a variety of online communication properties and through ongoing meetings, webinars, and biannual summits.

Additionally, buildingSMART provides support for advancing BIM and the implementation of standards through a variety of services, including technical websites, developer documentation and support groups, the buildingSMART Data Dictionary, and methodologies, such as the BIM Maturity Assessment.

Collectively these programs drive the development and active use of open internationally recognised standards, applications, training and certification procedures. This helps to support the wider uptake of Building Information Modelling (BIM) by owners, operators, the architecture, engineering, construction, and operations (AECO) and facilities management (FM) industries across the buildings and infrastructure sectors.

# VISION OF TOMORROW

## TECHNOLOGY

### **What are the next stages in the development of BIM software?**

The development of BIM software is a commercial issue and therefore very much dependent on the client demands. The current, rapidly growing BIM adoption is naturally creating a good business environment for the software vendors, and based on my experiences the AEC industry will want software interoperability based on Open Standards, so that every company can continue using the tools that are best for their business. Of course, also internal platforms, such as BIM360, are a possible and in some cases also faster solution if they cover all necessary tools. However, personally I am a strong supporter of Open Standards, as the open environment makes the data sharing more versatile and enables the participation of small or specialised vendors in the integrated environment.

Unfortunately, IFC has at the moment a somewhat bad reputation especially in some market areas, partly because of its complexity, but even more because of the quality problems in its implementation in the past. However, it has been widely used for example in Finland, Norway and the Netherlands, so there is sufficient evidence that it works already now. Nevertheless, to become more widely trusted and used, it must become more reliable and easier to use. I have often used the mobile technologies as the example; very few people understand how mobile networks and phones work, and if such understanding would have been required

to start using the technology, there would still be very few users of mobile phones. Therefore, we must stop talking about complex standards – such as IFC – to typical end-users. They simply want to share data, and the inevitable complexity must be left for the software developers.

Interoperability is a very complex issue and the standardisation must move beyond the current IFC which is based on very old STEP technologies. In my opinion the most promising direction is Linked Data in Architecture and Construction (LDAC) which was introduced in a project by Tekla in 2012. It is already on bSI's agenda, but of course its development will be a significant effort and it will take years before it can be implemented into practical tools for the AEC industry. This means that in the short term the current IFC is the best option we have.

### **Is the development of BIM software going to reflect the expansion of BIM to construction and management to cover the entire project lifecycle?**

At the moment BIM is mainly used in design and construction processes and the benefits of BIM in those activities are relatively well understood, although there is still a lot to improve also in these areas. However, there are still very limited examples of the use of BIM in facility management and operations despite of the

constantly presented claim of its lifecycle value. In fact, most owners, especially on the private sector, are not at all interested in BIM as they see no value in using it in their activities. However, this does not mean that BIM would not have value in the FM and operation phases. The problem is more related to the lack of concrete evidence of benefits, insufficient research of the area and wrong type of communication. Most BIM experts have either design or construction background and they cannot communicate or even understand the FM and operation benefits of BIM. We need to analyse the daily activities and problems of the owners and operators in detail before we can understand the specific value of technology in their processes. I am sure that the lifecycle value of BIM will become a crucial part of the technology, but it will require both time and efforts.

# VISION OF TOMORROW

## GLOBAL ISSUES

### **How do you see the role of BIM in the face of today's environmental challenges?**

Environmental assessment is a complex issue and requires a lot of data. BIM can help the assessment process significantly, as on some level it already does. The issue is that the models must contain sufficient, correct and reliable data. The main challenge is to produce such data and make it easily available for end-users. The product manufacturers should take a crucial role in providing such data, but unfortunately the existing product libraries are often focusing more on visualisation than the useful data content for different phases of the building lifecycle. However, there are some exceptions, such as MagiCAD product libraries which make the products functioning components of the technical systems. Regarding the whole industry, the data structures and content should also be verified by impartial third parties so that the data of different projects will be comparable.

### **Will digitalisation be able to contribute to a greener future for the construction industry?**

Digitalisation is definitely able to contribute to the greener future for the construction industry. Partly it happens already now, but as said above, to get further requires more reliable data which is easy to use without specific knowledge of environmental

assessment, because we cannot educate all designs and construction professionals to environmental experts.

### **How can BIM help us reach less waste in construction and less consumption during building lifecycle?**

Simulation of energy consumption is already relatively widely used in the design process and if the models are correctly built and used, the quantity take-off can already help to reduce waste significantly. There are a number of good examples of both, but in my opinion, we are still just scratching the surface, so there is still a lot of unused potential in using BIM for environmental purposes. The utilisation of full potential also requires that the decision making will be based on the environmental impacts rather than the lowest investment costs, which means that many owners and operators must change their mindset.

### **World Green Building Council set a goal to achieve net zero emissions buildings by 2050. Can the construction industry reach these goals?**

I think we must start producing net zero emissions buildings more or less immediately, and therefore the

goal, 2050, is in my opinion too far. The recent WMO's report shows that the global warming has already been faster than the recent models have predicted.<sup>14</sup> This means that we are running out of time and therefore I would rather put the goal to 2030 for all new buildings. If we cannot reduce the emissions of built environment quickly, we will face huge environmental problems as we can already see in many parts of the world. We must also reduce carbon emissions of the existing buildings, because in many countries the clear majority of the buildings we will have in 2050 are already existing, e.g. in the UK the estimate is that 80% have already been built. This means that we must move to sustainable energy production, because renovating existing buildings is simply too time consuming and expensive.

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READ MORE ABOUT THE VISION OF WORLD GREEN BUILDING COUNCIL FOR 2050: [WWW.WORLDGBC.ORG](http://WWW.WORLDGBC.ORG)

<sup>14</sup> [https://library.wmo.int/doc\\_num.php?explnum\\_id=9936](https://library.wmo.int/doc_num.php?explnum_id=9936)

# VISION OF TOMORROW

## ROLE OF BIM IN CITIES OF TOMORROW

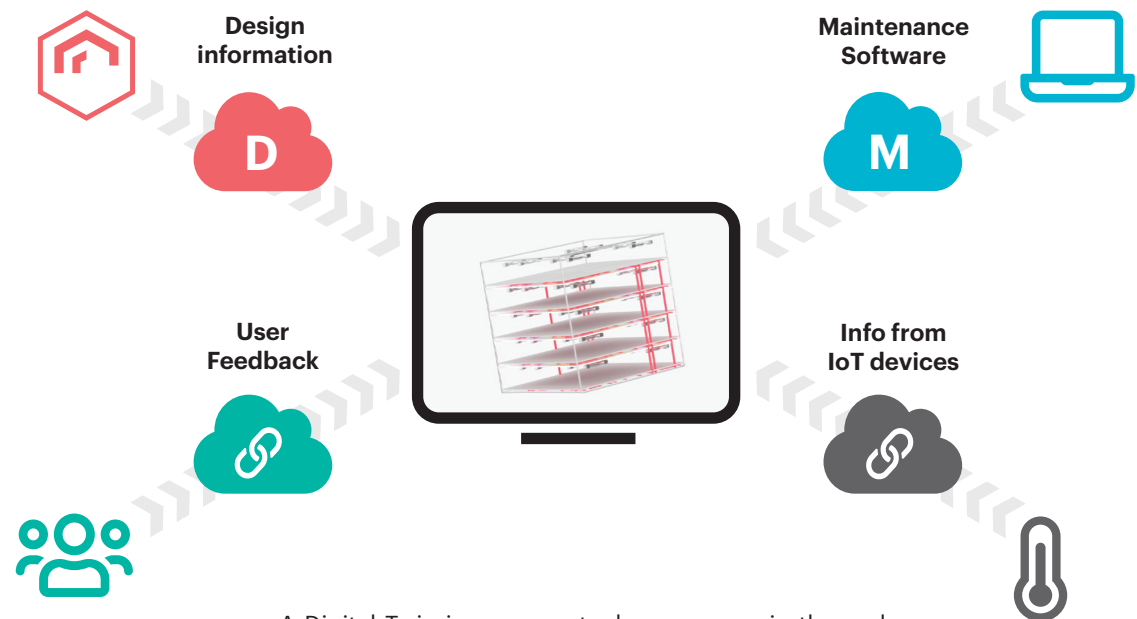
**Urbanisation is not going to slow down in the future. Will the role of BIM be even more important in the built environment of the future?**

BIM is already expanding beyond individual buildings. For example, the UK vision of BIM level 3 has moved to cover the whole built environment. This means that BIM will have to develop to enable connections between different models. As I said earlier, the LDAC project is currently in my opinion the most promising project in that aspect.

**In addition to smart buildings, many visions of tomorrow's built environment introduce the concept of smart cities. How do you see the role of BIM in the urban landscape of tomorrow?**

There is currently a lot of discussion about Digital Twins as the solution to connect the virtual and physical worlds. I believe that this connection will be crucial part of smart cities. However, we must remember that a model is an abstraction of a reality for a purpose. This means that we must always define the purpose before we can define and build the model, and that there will always be several models for different purposes. Those can – and must – be linked to each other so that we can keep them updated and use their data efficiently, but we cannot build one model that would cover everything and be usable for practical purposes.

**DIGITAL TWIN IS THE USER INTERFACE:**  
INFORMATION COMES FROM MANY SOURCES



A Digital Twin is a concept where sensors in the real building are used to connect to the cloud, and ideally, all is connected to the BIM. Building Information Models feed the FM environment, including sources like energy usage data, service requests, and preventative maintenance. The future potential involves linking BIM to FM on a city-wide basis, not just on an individual building level.

# CONCLUSION

For such a massive industry with deeply rooted established practices, the recent pace in which new technology and practices have been adopted by private and public building industry representatives is quite remarkable. After the positive experiences of the first countries to embrace BIM, the approach truly took off in the 2010s and continues today.

As demonstrated by the case examples in this white paper, governmental push towards BIM adoption directly influences private sector companies small and large. The swift development of national BIM programs, whether in countries that have an existing BIM mandate, or in countries that are just catching up to the institutionalization of digital approaches, clearly shows that BIM is quickly becoming the defining approach in the construction sector.

As much as the official institutionalization of BIM has progressed, the actual adoption of BIM practices, methods and tools by the construction industry remains slightly limited. That there remains a slight gap between implementing policies and implementing practices is paradoxical, as, in addition to end-users who will benefit from more functional buildings, and the environment that is less affected thanks to more efficient operation and less wasteful construction processes, the industry and its players are direct beneficiaries of digitalisation.





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Our online BIM library enables access to over 1,000,000 manufacturer-verified BIM objects from 300 globally renowned manufacturers. Each BIM object is complete with accurate dimensions and comprehensive technical data of real manufacturer products.

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