# 10TH ANNUAL BIM REPORT

2020

NBS

We would like to thank the following organizations for supporting this report by circulating the survey on our behalf:

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**Richard Waterhouse**
Chief Strategy Officer, NBS

# Introduction

*In 2010, we carried out a survey into an emerging new way of working: 'building information modelling'. We published the results in spring 2011, noting that it was the first time that 43% of the 400 people who took part in that survey had heard of BIM.*

In my introduction to the first report, I set out our intention to track changes in attitudes towards BIM, as well as its implementation. We have done this annually, consulting with you, sharing your thoughts and experiences and providing case studies, knowledge and guidance from industry experts and practitioners.

The industry has made great strides over the last ten years. We have gone from limited to almost universal awareness and use by 73% of professionals in 2020. It has required substantial change to workflows but has brought benefits: improved coordination of information, reduced risk, improved productivity, greater efficiency, and operation and maintenance savings. These improvements are helping to create a more efficient, transparent industry that makes fewer mistakes. The Government's response to the Hackitt Report (announced in April) and the new regulatory framework sets out a role for BIM and digital in establishing a 'golden thread' of information. Survey respondents agree that digital technology can help here, with 70% saying that it will improve health and safety; 69% see its potential to address sustainability; and 81% anticipate improvements in productivity.

It is hard to dispute that digital tech and BIM have changed the industry, and that the benefits are real. Repeat clients and construction team members are likely to be the proficient users, gaining the benefits listed above. But scratch the surface and it is not the resounding success that it should be. Even now, only 40% report that BIM is the norm, with a similar figure using the BS and ISO standards processes: a true test of BIM and connected information. Almost two thirds of small practices yet to adopt BIM state that their projects are too small for BIM, and over half that it is not relevant to them, a lack of client demand remaining the most common barrier. Whilst we do need to share these benefits more widely so that one-off clients also request BIM, surely these SMEs should recognize the benefits and promote them to their clients? The challenge now is to make BIM work for all parts of the industry.

But progress is being made. Use of common data environments to share project information is becoming increasingly prevalent, and shows how the industry has moved from being predominantly paper-based. Aligned to this, the last decade has seen a major shift from the production of 2D drawings to 3D digital models. The industry has also made huge progress in developing standards and guidance for BIM with the UK playing a key role, and we're delighted to have articles in this report on the new UK BIM Framework, the RIBA Plan of Work and the successful application of Uniclass 2015 in Australia.

At NBS, we firmly believe that well-structured digital information can help us address the challenges we face. Our new cloud-based solutions, NBS Chorus and NBS Source, support the industry by connecting data between specifications, models and manufacturer components – and create a digital environment within which all members of the project team can collaborate. As more people use platforms like these, more technological solutions emerge and familiarity with the standards grows; we hope to see a further shift in the industry with benefits for all.

Ten years ago, the UK Government's challenge to the industry was to deliver efficiency through digital transformation. The challenges we face now seem even greater than in 2011. COVID-19 has driven changes in living and working conditions; economies and construction are experiencing the largest falls in output seen in decades, and there are significant risks to people's health and wellbeing. Before this crisis, the industry needed to respond to the Grenfell Tower tragedy and life outside of the EU, as well as responding to the increasing urgency of keeping rises in global temperature below 1.5 degrees Celsius. These have huge implications for design and construction in the UK and globally. As we reflect on ten years of BIM, digital transformation and the progress that the industry has made, we may want to cast an eye to 2030 and the greater changes needed to meet these challenges.



**Emma Hooper**
Digital Information Specialist,
Bond Bryan Digital

BOND BRYAN
DIGITAL

# The UK BIM Framework

*Many of you will be aware of the work that the UK has progressed over the past decade in relation to building information modelling standards, and the 1192 series in particular. The 1192 series became popular not just here in the UK but overseas as well, as clients saw the benefit of its adoption. Following on from this, the decision was made to start to elevate the British Standards to an international level, and this process began in 2014.*

## The ISO 19650 series

December 2018 saw the first release of these International Standards in the form of:

- BS EN ISO 19650-1 – the concepts and principles of information management using building information modelling.
- BS EN ISO 19650-2 – the delivery phase of information management using building information modelling.

These standards build upon the groundwork of some of the 1192 series, as BS 1192:2007+A2:2016 and PAS 1192-2:2013 have now been superseded. It is now much clearer that we are focusing on the management of all information (whether it's a report, a drawing or a model, etc.).

Parts 3, 4 and 5 of the 1192 series are currently going through the same process of being developed into International Standards. The current timetable for publication is as follows:

- ISO 19650-3 – due for publication in Q4.
- ISO 19650-5 – due for publication in Q2.
- ISO 19650-4 – currently in the early stages of development.

In this age, information underpins everything we do. We require more information than ever before, and our technology creates more than ever before. However, these two developments aren't in sync, and our exchange of information is often executed poorly.

The new International Standards combat this by providing a framework where information is considered from the outset of a project, using the following principles:

- Information requirements are defined before information is created, to aid selection of delivery teams.
- The delivery of information to meet the requirements is planned and tested.
- The delivery of information is carefully managed within a common data environment.
- The delivered information is checked against the original requirements, and either accepted or rejected accordingly.

These measures are there to help reduce the risk and waste associated with information – which is commonplace throughout the design, construction, operation and maintenance of an asset.

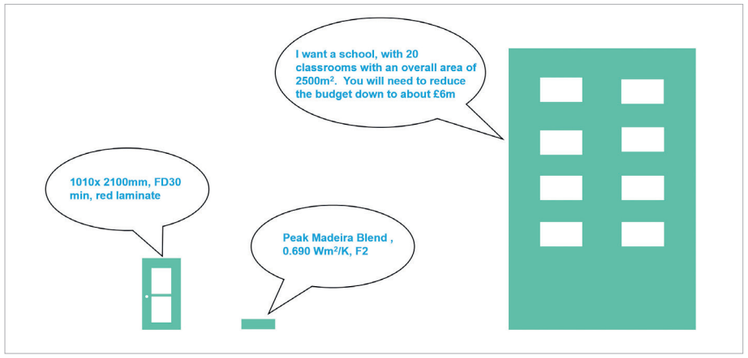
Going forward, the ISO 19650 framework provides the foundations to enable machine-interpretable information to be exchanged by technology in a much more efficient way, improving interoperability.

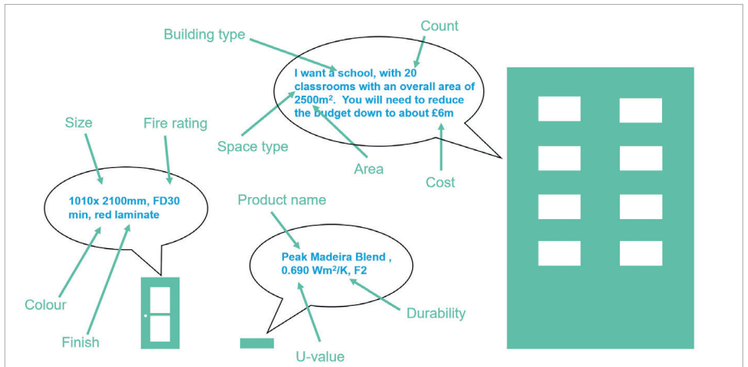
***Andy Boutle, Head of BIM***
*Kier Construction (guidance author)*

*'It is a real privilege being a contributing author to this guidance, to be able give back to industry and help to facilitate the consistent practical implementation of the ISO 19650 series across the built environment. We have a fantastic team of practitioners from varying roles and disciplines working on a pro-bona basis. My hope and belief is this ongoing guidance will help industry to reach a business as usual state for modern day information management practices, building the vital foundations for the path ahead to digital transformation'.*

*In this age, information underpins everything we do. We require more information than ever before, and our technology creates more than ever before.*

***Top left:*** *Physical assets need to be specified.*
***Bottom left:*** *Information is also an asset, and therefore it needs to be specified.*




***John Ford,***
***BIM & Digital Delivery Director***
*Galliford Try (guidance author)*

*'Not too many people are familiar with ISO 19650. It's now the responsibility of those few to help expand and explain ISO 19650 into a digestible, contextualised guide that everyone can understand. This is where the collaborative guidance comes in published on the UK BIM Framework website, where dozens of contributors offer their time for free to help industry grasp ISO 19650`s information management and modelling principles so that we can all move forward, together!'*

## The UK BIM Framework

Learning from the many interpretations and contradictions of the 1192 series, the UK BIM Alliance, the Centre for Digital Built Britain (CDBB) and the British Standards Institution (BSI) have collaborated to provide one joined-up approach and one unified message across industry. As a result, the UK BIM Framework (***ukbimframework.org***) was launched in October 2019.

The UK BIM Framework should be the first stop for anyone who is responsible for specifying, delivering or managing information throughout an asset's life (which includes the design and construction activities). This applies to those of you who are familiar with the 1192 standards, and those of you who may be new to the subject.

The UK BIM Framework website sets out the concept of the information landscape, as well as providing links to all the relevant standards and freely available guidance.

It also plays an important role in dispelling the myths and rumours about building information management and modelling which have caused confusion so far.

The UK BIM Framework replaces the term 'BIM Level 2'. It is no longer to be used – the reason being that it was stated as the information requirement on many projects. On its own, BIM Level 2 is a vague reference: it doesn't specify precisely what information is required, when it is required or which party should generate it.

Let's put this into context. We understand how to specify the performance outcomes required for physical assets like a door, brick or even an entire building.

However, when it comes to the associated information, this is an asset in its own right too, and should be specified with similar attention to detail.

However, we are less certain on how to specify information, then to manage, deliver and check it. These standards are so important because they give us a platform from which to do this.

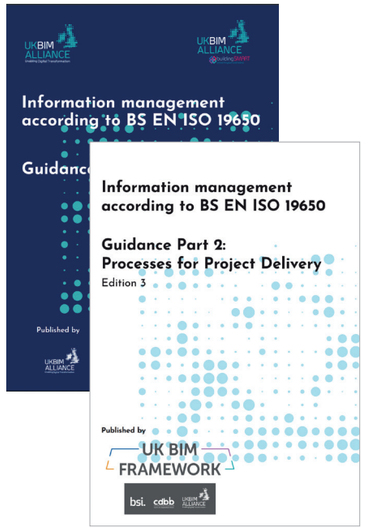
**Information is the one true asset to rule them all**

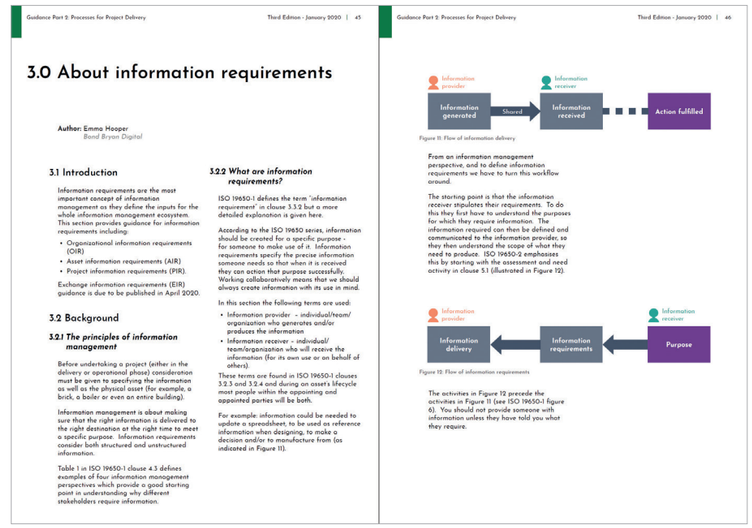
The UK BIM Framework replaces the bim-level2.org website and consolidates the knowledge resources in one place. This includes:

- Links to all the standards which make up the UK BIM Framework.
- Guidance for those transitioning from the superseded 1192 standards to the ISO 19650 series.
- Soft landings information.
- The ISO 19650 guidance.



***Below Left:*** *Guidance Part 1. Guidance Part 2.*
***Below:*** *Section 3, about information requirements.*




## The ISO 19650 guidance

The development of the ISO 19650 guidance is a live project which started 18 months ago. It's supported by a team of passionate individuals from different industry sectors and organizations, volunteering their time and sharing their experience and knowledge. The guidance project is open to anyone who is willing to help, and I've been fortunate to work on the initiative from the start.

The aim of the guidance is not to replace the standards but to add insight, clarity and tips for practical implementation. It's therefore helpful to read the guidance and the standards side by side.

Like the standards, the guidance is split into two parts:

- '**Guidance Part 1**: Concepts'.
- '**Guidance Part 2**: Processes for Project Delivery'.

The first part was first released in April 2019, and is a high-level overview of all the key activities and principles associated with information management in the ISO 19650 series. It should be read by anyone within the industry, to gain a general understanding of the standards and the wider digital transformation of the built environment.

The second part, now in its third edition, is much more detailed. It currently contains these sections:

1.0 'About ISO 19650 parties, teams and resources'.
2.0 'About the common data environment (CDE)'.
3.0 'About information requirements'.
4.0 'About the BIM execution plan'.
5.0 'ISO 19650-2 clause 5: analysis and activities'.
6.0 'Information management process summary'.
7.0 'Summary'.

*The UK BIM Framework replaces the term 'BIM Level 2'. It is no longer to be used – the reason being that it was stated as the information requirement on many projects. On its own, BIM Level 2 is a vague reference.*

***Sarah Davidson,***
***Associate Professor***
*University of Nottingham*
*(guidance co-editor)*

*'Progression of the ISO 19650 guidance is wholly reliant upon a dynamic collaborative team and feedback from industry. Guidance co-editors Dr Anne Kemp, David Churcher and I are incredibly grateful to the individuals who have been involved and to their organizations for supporting them. They have been sharing their knowledge and expertise and volunteering their time in the creation of the guidance thus far. We are looking forward to its ongoing development as more insight is gained, more feedback is shared and more standards within the ISO 19650 series are released. It is also great to see the UK BIM Alliance, CDBB and BSI working in partnership to facilitate the development of the UK BIM Framework'.*

In addition, there are some key messages which are addressed through the standards and guidance, as follows:

- Information management activities are, in the main, appointment-based, not project work stage-based.
- The client has a significant (and arguably the most important) role to play within the information management ecosystem.
- Understanding and defining the purpose for each piece of information is fundamental to determining information requirements.
- Exchange information requirements (EIRs) are a means of specifying what information is required, and are one of the resources used to aid the selection of delivery teams. They are appointment-specific, so there can be many EIRs across one project.
- The common data environment (CDE) is a combination of technical solutions underpinned by workflows. The workflows should be planned first, and the solutions selected to facilitate them.
- The outputs of the information activities are resources and not separate, unconnected documents.

The message is very much about managing information like we've done previously, whilst recognizing that we need to use structured information where possible to enable technology to understand it. This means being more systematic and precise in our approach, and understanding that information needs to be broken down in different ways around a consistent framework.

The guidance is an evolving resource. It is updated every quarter, with more sections being included. In the future, additional guidance will be released to support the publication of new standards.

There are also plans to make the guidance much more interactive and connected, so that it is easier to navigate.

I started my digital transformation journey a decade ago. I remember spending hours scrutinizing standards and publications – only to find that they would contradict each other.

We don't want you to be subject to the same experience, and hope that, through the guidance, you have a useful and reliable point of reference.

The guidance is available to everyone. It's jam-packed with useful information, and above all it's free. All feedback is welcomed and encouraged. If you have ideas for content, or you want to contribute, please complete the feedback form on the UK BIM Framework website. We want to make this guidance the best that it can be, and we all need to work together to achieve it.

To download/ view the guidance, go to ***ukbimframework.org/standards-guidance***

*Emma is a digital information specialist at Bond Bryan Digital. She is also part of the BSI committee that develops the standards for digital construction, an author of the ISO 19650 guidance, an ambassador for the UK BIM Alliance and on the buildingSMART UK & Ireland committee.*

*The guidance is an evolving resource.*
*It is updated every quarter, with more sections being included.*
*In the future, additional guidance will be released*
*to support the publication of new standards.*



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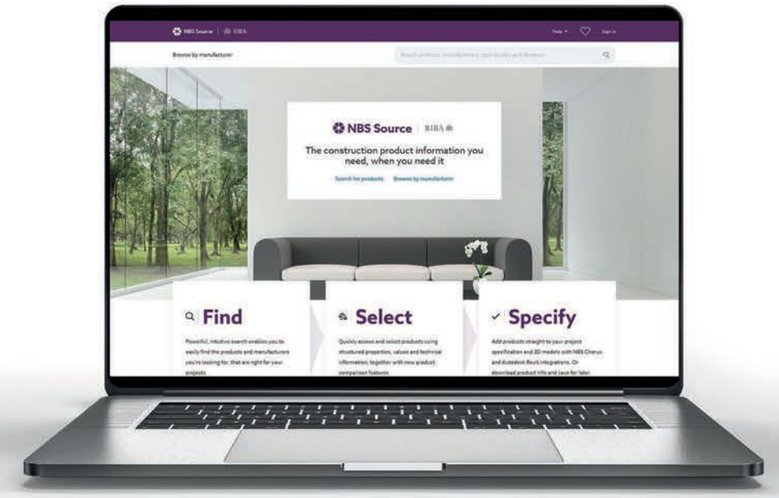


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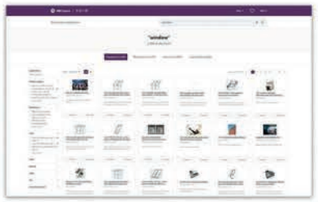

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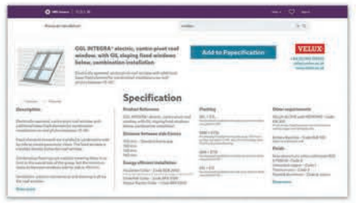

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Change starts here

**source.theNBS.com**






**Dale Sinclair**
Director of Technical Practice, AECOM

AECOM

# RIBA Plan of Work 2020 and specification

*The specification is the backbone of any project. Products must be researched, selected and agreed with the client, with finishes and facades requiring careful consideration and discussions with clients, planners and other stakeholders.*

The specification drives the look and feel of a project, and heavily influences its cost plan. New design review tools such as virtual reality (VR) place even more importance on illustrating the right products at the right time.

With this in mind, the RIBA Plan of Work 2020 (reproduced overleaf and highlighting the requirements for exchanging specification information) places emphasis on the role of the specification during the design and construction stages. The outline specification is a crucial design tool during stages 2 and 3, allowing specification decisions to be captured in a document that can be shared with and agreed on by all.

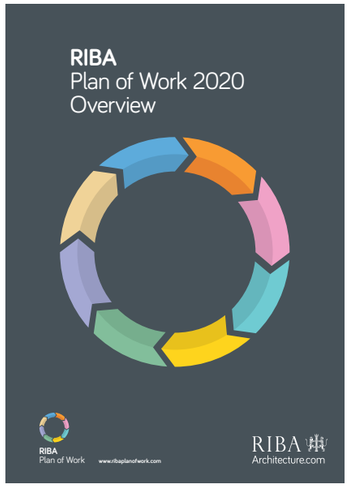
A key inclusion in the RIBA Plan of Work 2020 is the acknowledgement that the stage 4 information from the design team needs to be geared to manufacturing or construction for each building system, with this information being descriptive or prescriptive, depending on the approach. With the former, a specialist subcontractor will pick up the design baton, completing the information for manufacturing and/or construction; with the latter, the design team will issue the information used on-site for construction. For descriptive specifications, design responsibility lies with the contractor, although this responsibility is likely to be passed on to a specialist subcontractor carrying professional indemnity insurance.
On a design and build contract, design responsibility rests with the contractor, regardless of who designs: whether the design team or a specialist subcontractor.

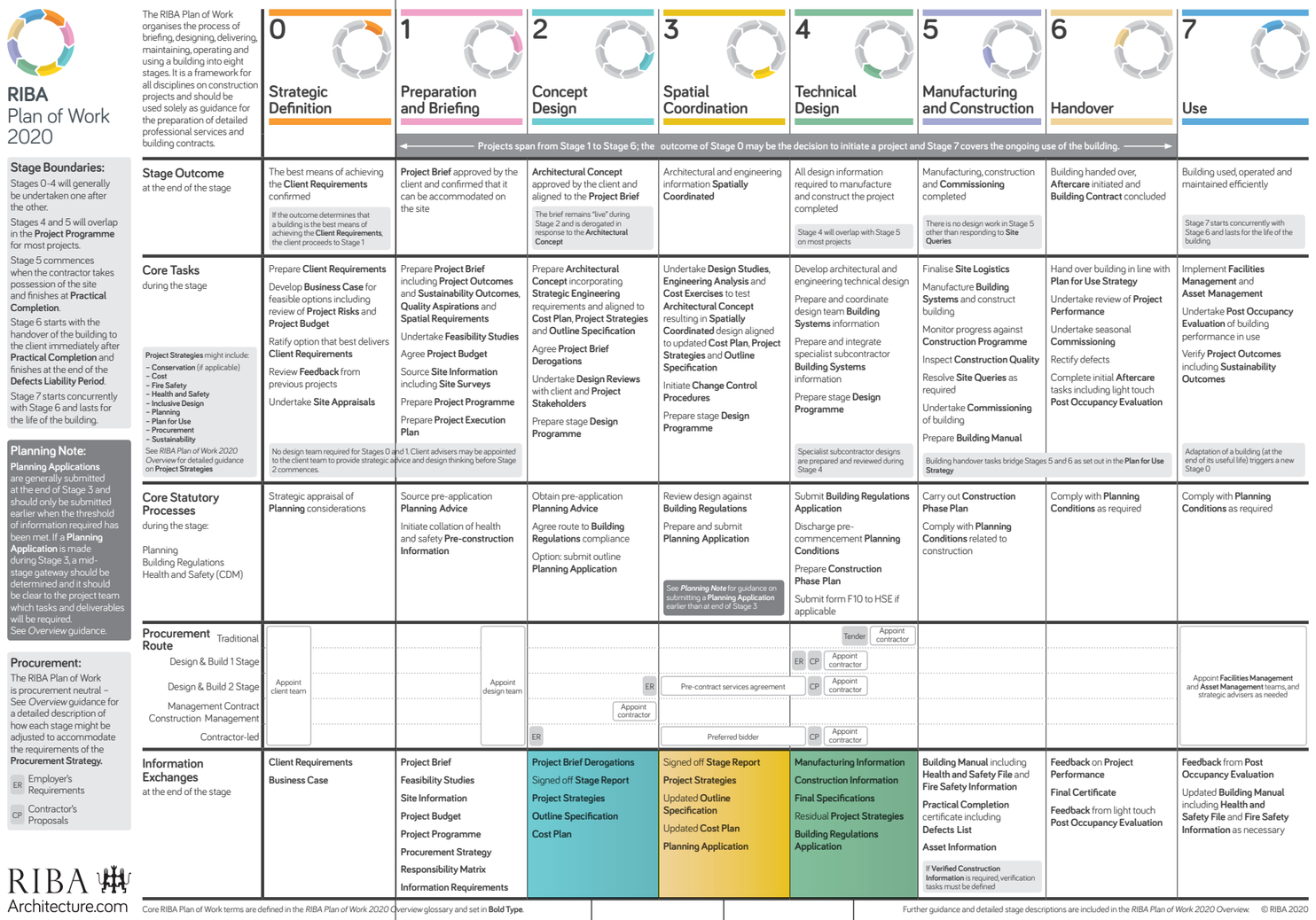
A common misconception is that procurement drives this decision-making. This is not correct: specifications can be prescriptive or descriptive, regardless of the procurement route. Traditional contracts have had the ability to facilitate descriptive specifications, via the contractor design portion (CDP), for years. Similarly, prescriptive specifications can be used where a planning consent has stringent conditions relating to materials, or where the client wishes to ensure that specific design aspects will be provided as imagined by the design team, meaning that they are commonplace on design and build contracts.

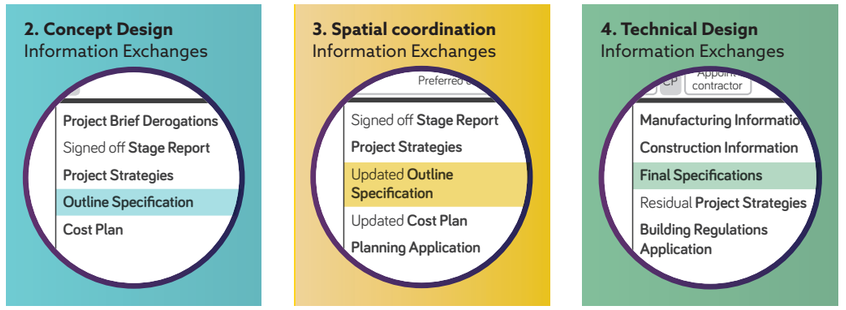
To phrase this another way, the decision to use a prescriptive or descriptive specification is driven less by procurement and more by topics such as the value proposition. The descriptive-to-prescriptive journey on any project will vary. Some clients may have a range of products used throughout their portfolio of projects, which might be included in the project brief. Other clients may wish the design team to specify anything that is visually important, allowing the contractor to select concealed products. There is no right or wrong decision; however, it's essential to recognize that the decision must be made at the outset of the project. This allows appointment documents and the building contract to be prepared accordingly, and procurement discussions to be framed appropriately. The RIBA Plan of Work 2020 has, however, been designed in a manner that helps ensure that the complexity of this crucial project interface is clear from the outset.

*The specification drives the look and feel of a project, and heavily influences its cost plan.*

***Above and right:*** *RIBA Plan of Work 2020 Template, reproduced courtesy of the Royal Institute of British Architects.*




***Left:*** *Highlighting the points where specification information needs to be exchanged during stages 2, 3 and 4.*

In some instances, descriptive specifications are used to clearly assign design responsibility to the contractor – specifying the fire, acoustic and durability criteria for partitions, for example. However, the design team might specify products agnostically, taking design responsibility but allowing the contractor to propose a supplier for certain products. For example, the architect may specify a certain type of brick that is referenced in the planning consent whilst allowing the contractor to select walls ties and lintels, or specify a specific partition build-up, allowing the contractor to propose an alternative.

For some aspects, a descriptive specification can be the key to unlocking design innovation. For example, by issuing design intent information and a descriptive specification, the design team allows the cladding contractor to propose a unique design proposition that meets the goals of a project cost-effectively. The other notable anomaly to the prescriptive specification process is the preparation of shop drawings. For example, a supplier might produce drawings for toilet cubicles or a roller shutter which aids manufacturing, and would be based on the design team's prescriptive information. In many instances, it is not issued for comment.

Another important stage 4 decision is the point at which stage 4 information is produced. Design and build procurement may draw down stage 4 information for inclusion in the employer's requirements, with residual stage 4 information being completed by the contractor's design team or the novated design team. This interface needs to be considered carefully at stage 1. The client must decide whether the information issued by the design team will be descriptive or prescriptive, and whether this information will be produced before or after the building contract is signed.

Finally, during stage 5 and construction, the final specifications continue to be of importance as they are used to determine whether work is being undertaken to the required quality and that any testing and certification to confirm this is received.

*Dale is director of technical practice at AECOM. He is also an RIBA Ambassador for Collaboration and Technical and is on the Construction Industry Council (CIC) Board.*



**David Bain**
Research Manager, NBS

# Summary of findings from the tenth annual BIM survey

*This survey marks the tenth consecutive year that we have asked design and other construction professionals about BIM. During that time, there has been much discussion about: the benefits or otherwise of BIM; what it is; what it isn't; and (in particular) how many people are 'doing' it.*

Even after almost ten years of carrying out this survey, people are still keen to share their views on BIM: we have had one of the largest responses, with over 1000 people completing the survey. We thank them all very much for taking the time to do so.

Over the years, we have also seen growing interest from professionals working in countries around the world – looking at what the UK has been doing. In recent years, this has resulted in a considerable number of responses from people based outside of the UK: the majority come from within the UK, but this year we have people representing every continent (except Antarctica!). We highlight some interesting differences, depending on whether or not people are based in the UK. Within this summary you will find three inserts where we focus on some differences in findings by respondents' location, age and organization size.

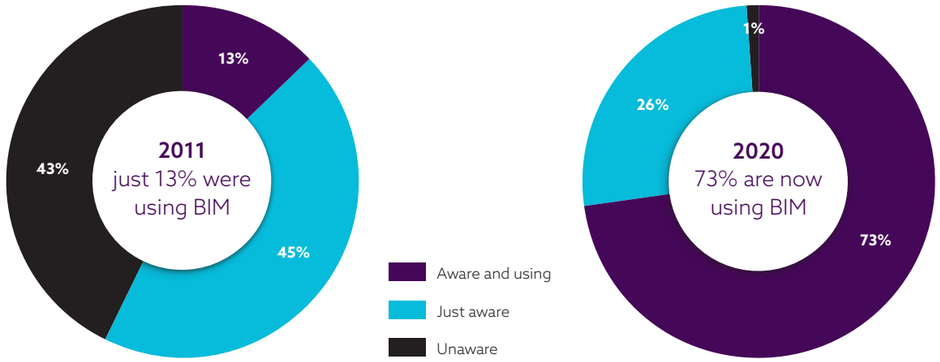
In this summary of the results, we present this year's findings – alongside some comparisons with previous years. We revisit the first survey that we carried out at the beginning of the last decade, which highlights some interesting changes. Over the time that BIM has become part of our industry, and partly because of BIM, many new technologies and ways of working have emerged. Some of these provide an insight into what the future of construction might be like, and help us look ahead to the next ten years.

For this survey to be a success, we rely on the support of the many organizations that help to promote the survey. These organizations are listed on the inside front cover of this report, and we thank them for working with us.

On a final note: we began gathering responses for this survey in December last year. No one had heard of COVID-19, and the survey closed well before the lockdown began in the UK. It's unlikely that the pandemic has affected the results of this research much, if at all. We report the results as we find them, but are very much aware of the virus' huge impact on people working in construction, and on society as a whole. We hope that what we learn from this research can provide some useful knowledge to help support the industry working during this unprecedented time, and in the recovery that follows.

*Over the years, we have also seen growing interest from professionals working in countries around the world – looking at what the UK has been doing.*

**BIM awareness and 'use' 2011 vs 2020**



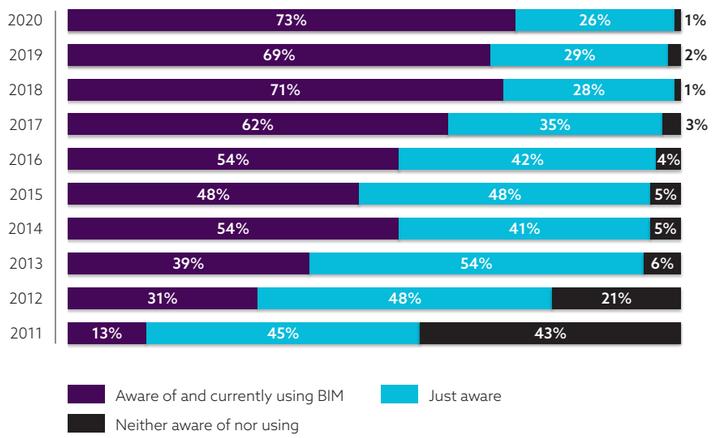

## BIM adoption: then and now

We first carried out this survey in 2010/ 2011, publishing the inaugural report in spring 2011. So, almost a decade later, have things changed? Back then, 43% of respondents were not aware of BIM and 13% said that they had adopted it. Using the same metric as that used in 2011, our survey indicates that 73% of the industry is now aware of and using BIM: 60 percentage points higher than at the beginning of the last decade. This is also an increase on 2019, and marks the highest level of adoption that we have seen to date.

Almost a quarter (23%) of those 'using' BIM state that they do so on all projects. Additionally, almost half (46%) do so for the majority of projects so, for those that have adopted BIM, it is becoming part of how they work.

Last year, we reported a slight drop in BIM adoption. This may have reflected a loss of momentum from government, following its 2016 mandate for BIM. There were also changes in the support framework, such as the Centre for Digital Built Britain taking over from the BIM Task Group to support the delivery of the Government's Digital Built Britain strategy. In addition, BIM is perhaps typical of other innovations and ways of working in that once a majority of people have adopted it, the uptake then slows. The reasons for this slowing can perhaps be found by analysing the characteristics of the people and organizations yet to adopt BIM. In this section, we explore these three themes.

**BIM adoption over time**




To pick up the first point: lack of momentum following the Government's BIM mandate. This year, we asked a new question to find out whether there were differences in the adoption of BIM in terms of the sector or type of work being carried out. Here, we see that survey respondents are as likely to have adopted BIM on private sector projects as on those in the public sector. In fact, if we total up new build and refurb projects (for repeat and one-off clients, for each sector), we find that more respondents have used BIM on private projects (77%) than on public (62%).
BIM is more commonly used by repeat clients, especially in the public sector.
In the private sector, BIM projects are also more common among repeat clients, but respondents report that they are more likely to have applied BIM to projects for one-off clients in the private sector than in the public sector. BIM is also more likely to be used on new build projects as opposed to refurbishments.

Therefore, the most common types of projects using BIM are:

- private sector new building projects for repeat clients (62% of those doing private sector new building work used BIM with repeat clients); and
- public sector new building projects for repeat clients (67% of those doing public sector new building work used BIM with repeat clients).

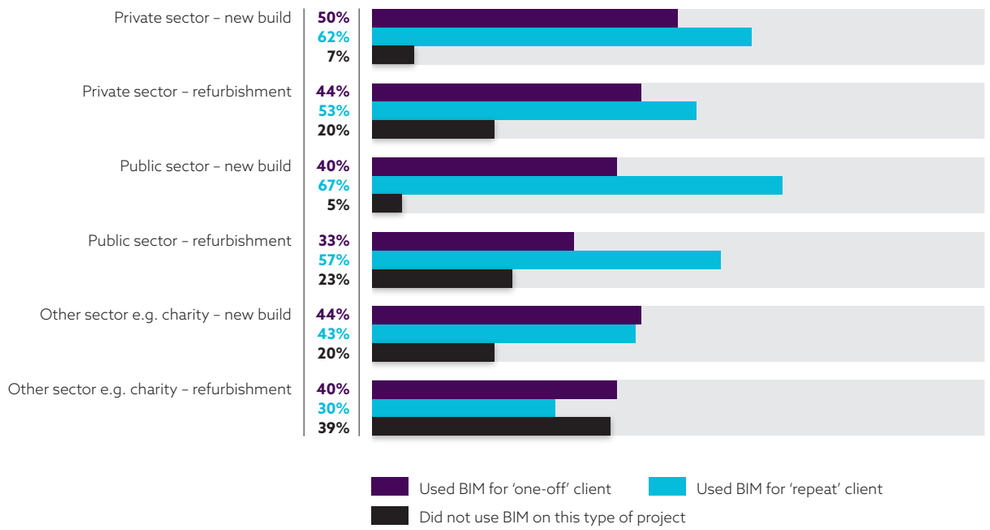
50% of professionals working on private new builds said that they had used BIM on these types of project for one-off clients. The equivalent figure in the public sector was 40%. Refurbishment BIM projects for one-off clients were slightly less likely in both sectors: 44% for private jobs and 33% for public sector.

BIM principles were also applied in work for other sectors, such as charities. They were slightly more likely to be used for one-off clients: 44% on new build and 40% on refurbishment projects.

These findings suggest that the industry has developed its own momentum for driving BIM forward: with projects in the private and third sectors being commonplace, it is not just about people adopting BIM to meet the requirement on central government projects.

*'I can see the benefits of BIM when working with new-build projects when using fairly standard details (as in BIM objects, wall types and roof types which are available within the software without user configuration) however for renovation works or smaller domestic schemes, the additional time spent modelling existing buildings or working out how to model non-standard details (such as complex existing roof details or unusual bay windows) undermines any potential productivity gains, especially when there would be a loss of productivity associated with learning the software and an increased liability of mistakes are made'.*

**In the last 12 months, on which of these types of project, and with which types of client, have you used BIM?**

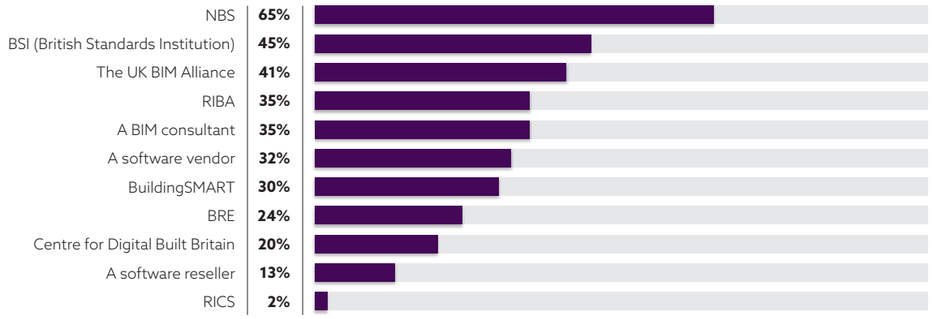



***Note:*** *Percentages in the above chart are based on the number of respondents doing that type of work, e.g. out of the number of respondents said they did private sector new build, 50% used BIM for a 'one-off' client. See page 29 for a breakdown of respondents by project type. Considerably more respondents carry out private or public sector work, compared with work in other sectors.*

In terms of the second theme introduced above (the BIM support framework): there is now a highly developed, cross-industry network of support organizations, experts and reference documents to help people adopt BIM in a consistent way. We look at the standards in the next section, but in terms of support and information sources about BIM, we see a similar picture to last year. The organizations that people are most likely to turn to are NBS, BSI, the UK BIM Alliance and the RIBA. Considerable numbers of people also mention BuildingSMART (especially those outside the UK), BRE and the Centre for Digital Built Britain (although these results suggest that CDBB still doesn't seem to be as well known as the BIM Task Group was). These organizations are working to provide practical advice on BIM to the whole industry.

In October last year, the UK BIM Alliance, BSI and CDBB launched the UK BIM Framework (***ukbimframework.org***), designed to be the first stop for anyone who is responsible for specifying, delivering or managing information for an asset. Initiatives like this should make it easier to find out about BIM and to facilitate construction professionals adopting it on their projects.

**Which of the following are you likely to turn to for information about BIM?**




In terms of the third point (why momentum has slowed now that the majority state that they have adopted BIM): we can take a look at those who have not yet done so. Logic would dictate that they have not adopted BIM either because there isn't a real need to do so or because the barriers are too great. We have previously highlighted the differences between larger and smaller organizations, where BIM adoption has been much greater among the former.

This is the case again this year, with 80% of organizations that have more than 50 employees having adopted BIM, compared to 62% of those with 15 staff or fewer. We also find this year that younger professionals are more likely to say that they have adopted BIM than older respondents. We explore these themes further in the insert opposite and on page 21. We also see above that while many refurbishment and one-off projects have been carried out using BIM, these are still less common. To manage information digitally for an existing building, there are costs associated with scanning it to gather that data. As a key benefit of BIM is to improve the supply of information over an asset's lifetime, it is unsurprising that repeat clients who have been able to review past projects are more likely to recognize the benefits of BIM and to ask for it.

*The organizations that people are most likely to turn to are NBS, BSI, the UK BIM Alliance and the RIBA.*



## Focus: too small for BIM?

Over the years that we have been carrying out this survey, we have heard about the particular challenges that smaller practices face in adopting any new ways of working or new tools. This is reflected in their use of BIM: 62% of practices with 15 members of staff or fewer have adopted BIM, compared with 80% of those with over 50 employees. The figure for small practices has improved compared to last year, where it was 56%. The group most affected are the smallest micro-practices: only 45% of those with one or two staff state that they have adopted BIM.

However, the small practices that are using BIM are as likely as bigger organizations to recognize its benefits, reporting that it has made them more productive and that they have adopted it successfully – although those small practices yet to adopt BIM are less convinced of its benefits than larger companies. Despite this, among the smallest practices who have not adopted BIM, over half (55%) do intend to do so.

When we explore the barriers stopping small practices from moving ahead with BIM, there are some differences compared with larger companies. Almost two thirds (66%) of small organizations say that their projects are too small (compared with 26% of large organizations) and, similarly, 52% say that BIM is not relevant to their projects (compared with 17% of large organizations). This is a bigger issue than cost, although the latter is more likely to be a challenge for small practices (49%, compared to 39% of medium and 44% of large organizations). Small practices are no more likely to cite lack of training and expertise as a barrier; in fact, more of the larger organizations highlight this.

So, a lot of this is about small organizations' perceived suitability of BIM for small projects. Can the success stories from the smallest practices be shared with their contemporaries to help them realize the benefits of BIM? And can BIM be applied in such a way as to improve information management on small projects?

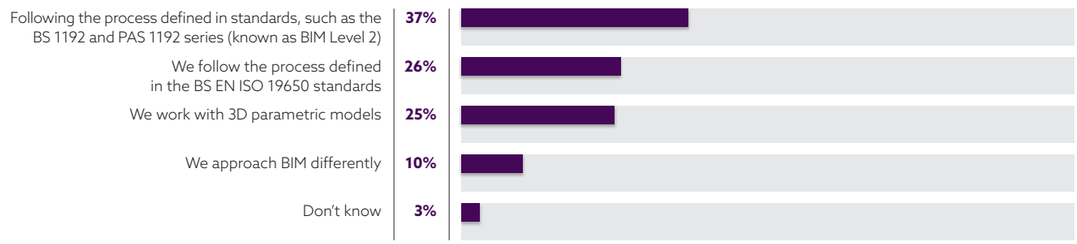
'*Nothing I have ever seen about BIM overcomes the barriers to very small companies using it i.e. – no client demand, unsuited to small projects, time, cost and lack of interest and ability for small contractors to use it'.*

## But what does 'doing' or 'using' BIM really mean?

There has been much debate about what BIM is in practice, and the extent to which people are implementing it consistently. Sometimes people have confused BIM with simply creating 3D models. We asked those who said that they've adopted BIM to select the one listed statement that best describes their organization's overall approach to BIM. A quarter do still think of BIM as working with 3D parametric models; however, the majority describe it as a standardized process: either following the BS and PAS 1192 series, previously known as BIM Level 2 (37%), or the newer BS EN ISO 19650 standards (26%). If we just take those respondents in the UK, the figure associating the use of BS and PAS 1192 with 'doing' BIM rises to 41%. This is encouraging, in that more people identify with BIM as a process rather than using a particular type of technology.

*'BIM is still seen by many as just 3D models used by designers, PMs and construction teams must get on board for BIM to be a success, it is the biggest blocker in our business'.*

**Thinking about your organization's overall approach to BIM, which of the following would you say best describes what you do?**



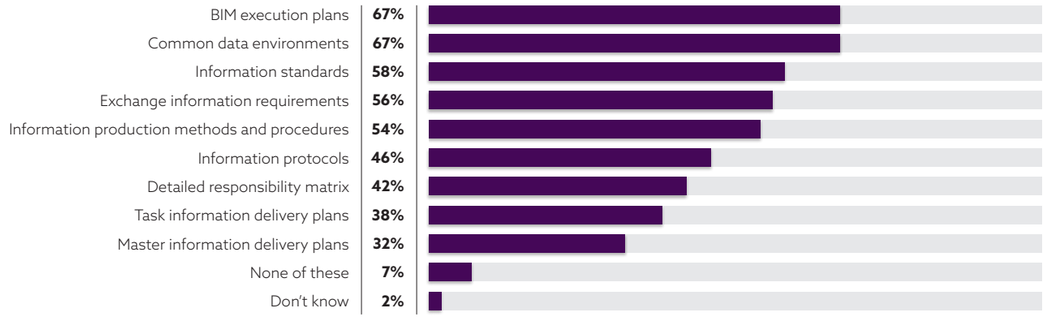
However, anyone can tick a box to state that they adhere to the latest standards. What does this mean in practice? We dug a little deeper by asking which tasks or documents (as outlined in the BS EN ISO 19650 series) respondents have been involved in. We find that many of these things are common on BIM projects in particular: BIM execution plans (67%), common data environments (67%), information standards (58%), exchange information requirements (56%) and information production methods and procedures (54%). Some of these things seem to be happening less often, such as master information delivery plans (32%); therefore, perhaps, one might argue that the full BIM process as outlined in the BS EN ISO 19650 series isn't happening all the time.

However, this is evidence that a number of the tangible things that are part of the BIM process are taking place. And if two thirds of organizations are using BIM execution plans, this should bring some consistency and standardization as large numbers of people become aware that this is 'how to do BIM'.

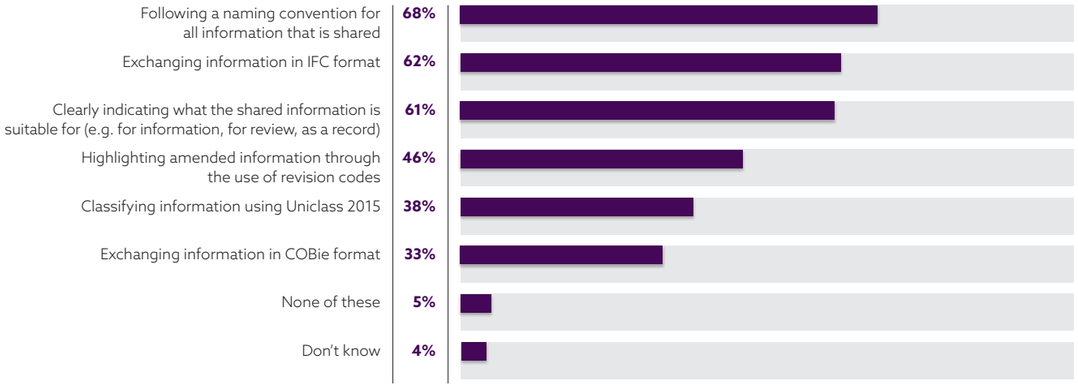
BIM is about managing information and doing so in collaboration with others. The way that information is shared is therefore important, and it needs to be done in a way so that all parties understand what they are reviewing or working on. It's encouraging to see that over two thirds (68%) follow a naming convention for all information that is shared. Almost as many are clearly indicating what the shared information is suitable for (61%), and nearly half are highlighting amended information through the use of revision codes (46%).

The use of BIM should not be dependent on having particular software platforms but should enable interoperability between them, using data formats such as Industry Foundation Classes (IFC) and Construction Operations Building information exchange (COBie). 62% stated they exchanged information in IFC format and a third in COBie. Finally, we see that over a third (38%) of those using BIM are classifying information using Uniclass 2015.

**Thinking in more detail about BIM, in the last 12 months, which of the following things have you been involved with, in some way, on BIM projects you have worked on?**




**Thinking about the projects where you have adopted BIM, which of the following approaches has your organization adopted with respect to sharing information?**






## Why adopt BIM?

Over the years of carrying out this survey and speaking to architects, engineers, technologists, contractors and manufacturers, it's been clear that implementing BIM properly is a major task. It requires considerable investment of time and resources. Workflows and processes need to change. So why do it?

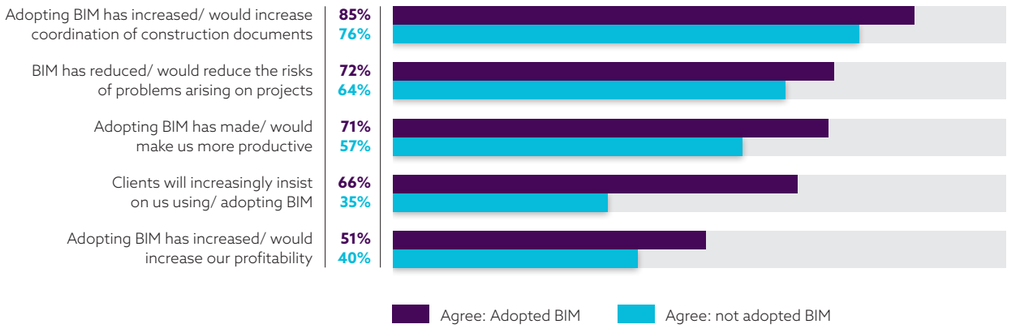
While adopting BIM is challenging, it provides benefits to the organizations that use it. The majority (71%) of those who have adopted BIM report that it has made them more productive. Over half (57%) of those yet to adopt BIM also agree.

More than half of BIM users have experienced increased profitability due to BIM, with 40% of non-users anticipating this if they were to adopt it. As well as benefiting individual organizations, BIM can aid the management of projects: the vast majority of users and non-users say that BIM increases coordination of construction documents (85% and 76%, respectively). 72% of BIM users and 64% of non-users agree that it reduces the risk of problems arising. These are all positive outcomes for the companies completing construction projects, and also for the clients commissioning them.

It is unsurprising, therefore, that almost two thirds of BIM users (66%) expect clients to insist on BIM. Here, though, there is a disconnect between those who have adopted BIM and those who have not. Only just over a third of non-users say that clients will insist that they adopt BIM.

*'BIM methodologies are incredibly useful in terms of co-ordination between different disciplines. It speeds up the process and aids in communication as well as production of information'.*

**From your understanding of BIM, how strongly do you agree or disagree with the following statements?**



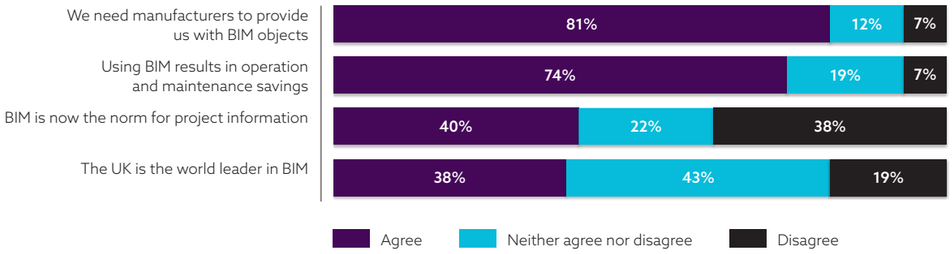

### Focus: is it an age thing?

It can be tempting to assume that the older someone is, the less likely they are to embrace new ways of doing things. Sometimes this is unfair, and there are many examples of experienced professionals who are innovators, and see the potential in new technologies. However, the more experienced generations have to actively change how they do things, whereas many 'millennials' who began reaching adulthood around the turn of the century have grown up with the internet, mobile devices and touchscreens. Working with digital information is what many have always known. So, one could argue that embracing BIM (which has at its heart well-managed, digital information, and uses a range of digital tools) is more straightforward for younger professionals.

The survey data bears this out: 80% of those under 35 state that they have adopted BIM, compared with 75% of those aged between 35 and 54, and 60% among those over 55. Among those who have yet to adopt BIM, only 7% of under-35s say that they will never do so; this rises to 19% for over-55s. There are some links between age and other factors. Younger professionals are more likely to work in larger organizations, and they are also more likely to be in architectural technologist or BIM manager roles. This suggests that decisions about BIM adoption are influenced by a combination of things.

There is a more mixed picture in terms of use of new technologies: age appears to have limited influence on things like cloud computing. However, in some cases, younger professionals are more likely to use new technologies: for instance, 46% of under-35s use virtual, augmented or mixed reality, compared with only 25% of those over 55. Attitudes to the transformative potential of digitization also differ considerably by age. This time, the difference is most pronounced between those under 54 and those over. Over 80% of the former believe that digitization will transform the whole construction industry, compared with just 63% of the latter.

**How strongly do you agree or disagree with the following statements about BIM?**




While it is clearly a good thing that BIM leads to more productive and profitable organizations and projects, it also needs to contribute to improved outcomes for those who own, manage and use the asset. This is the case: respondents to this survey have consistently agreed that BIM results in operation and maintenance savings, with 74% saying so in 2020.

*'I see BIM improving efficiencies significantly when an asset is in use. There will be good communication and clear task briefing between facilities managers and operatives who carry out repairs and maintenance of the assets'.*

*'I think a major benefit is the accuracy and reliability of our information'.*

*'The evolution of the construction industry has been accelerated by BIM processes and technologies'.*

Interestingly, many of these figures have not varied greatly since we started asking the industry about BIM in 2010. Back then, many felt that BIM improved productivity, profitability and coordination of documents. The challenge for many has been to make the investment of adopting BIM and there being a sufficient driver from clients to encourage this. More on this in the next section.

Some things have changed, however. Over the last decade, we have seen manufacturers providing their information as digital objects. The use of these objects has grown to the point where 81% of respondents to this survey now state that they need manufacturers to provide them.

Does this requirement for digital objects and the increase in adoption of BIM mean that it's now the norm? 40% think that it is (three percentage points higher than last year) but a significant proportion (38%) still disagree. So, while many organizations are familiar with BIM, have adopted it and are seeing benefits, it does not affect how all projects are managed all of the time.

Despite the UK being a key player in developing the standards for BIM globally, it isn't always business as usual here. This might go some way to explaining why only 38% see this country as the world leader in BIM (although this is an increase from 30% last year). The insert on page 25 explores some of the differences in findings depending on whether or not people are based in the UK. Now, though, let's address some of the reasons why BIM isn't further embedded after ten years of the Government and others promoting its use.

*'Perhaps more focus on the main benefits of BIM would lead to its more widespread adoption i.e. clash detection/clash avoidance, the coordination between the disciplines and the 3D visualisation. The rest is either box ticking or showing off. It is a shame that there are not graduated standards for small works, medium works, large works, and mega works. It does not appear right or necessary for all the standards to be applied in the same manner over different scale of works'.*

*Despite the UK being a key player in developing the standards for BIM globally, it isn't always business as usual here.*

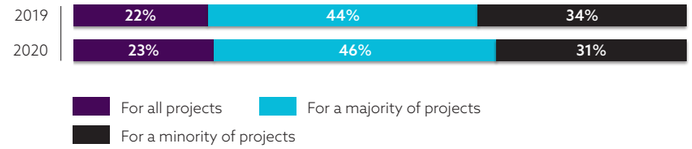
## Intent to adopt BIM

In 2020, the proportion of those who have adopted BIM for all or the majority of projects is slightly higher than it was last year. And over 90% do expect this to increase so that, in the next five years, they are using BIM for all or the majority of their work.

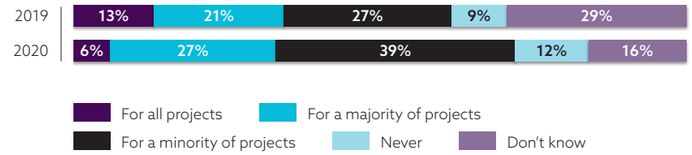
*'BIM will form the basis of all large construction projects in the next few years, and most construction projects within 5 years'.*

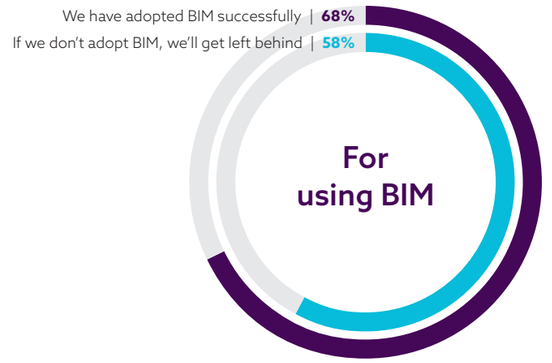
However, ever since we started asking this question almost a decade ago, much of the profession has been saying that it will adopt BIM for more projects within the next five years. The stated intention and what is actually achieved can be quite different. Also, when we look at those yet to adopt BIM, there remains a significant group of professionals who do not intend to use BIM (12%) or are unsure (16%).

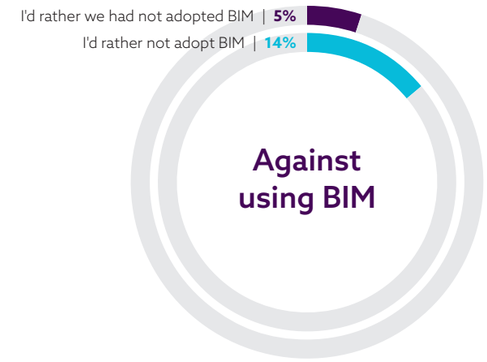
**Currently use BIM**




**In five years' time, we will use BIM... (those NOT using BIM)**




Of those who have embraced BIM, over two thirds (68%) report that they have done so successfully, up from 63% last year, and only 5% wish that they hadn't. Over half (58%) of those yet to adopt BIM are concerned that they'll get left behind, but 14% do still say that they would rather not do so.

In the past, we have seen that lack of in-house expertise, lack of training and cost have all been significant barriers to organizations that might wish to adopt BIM. They still are, but the number citing them has dropped for each of these. Since last year, lack of expertise has fallen from 63% to 56%, training from 59% to 48%, and cost from 51% to 46%. More people are aware of BIM, what it means and which tasks are involved.

The support network, standards, guidance and training programmes that have grown up around BIM would appear to be making a difference, as people's knowledge has increased. While cost remains an issue, many will now have made investments in new technology platforms (even if they are not all using them to apply BIM principles).

Lack of client demand, cited by 64% of this year's respondents, remains the greatest barrier among those yet to adopt BIM. Aligned to this, 45% say that the projects they work on are too small (this figure has actually increased since last year), or that BIM is not relevant to their projects (36%).

There may be several explanations for this perceived lack of impetus from clients. Our BIM surveys over the last few years have highlighted a loss of momentum from government in driving forward and enforcing the mandate for BIM on central government-procured assets. This has likely reduced the demand for BIM on projects in the public sector. Secondly, smaller practices have highlighted the difficulties of juggling day-to-day business development and project delivery with upskilling and investing in BIM. While it is encouraging to see signs that the gap between large and small practices' uptake of BIM is decreasing, there is still a big difference. Finally, project size and type continues to play a role. While we see this year that BIM is used on many refurbishment projects, it is not as straightforward as in new builds. And for small projects, the BIM outputs need to be simple and applicable to smaller jobs; otherwise, small clients, developers and builders are unlikely to view it as an improvement in managing information.

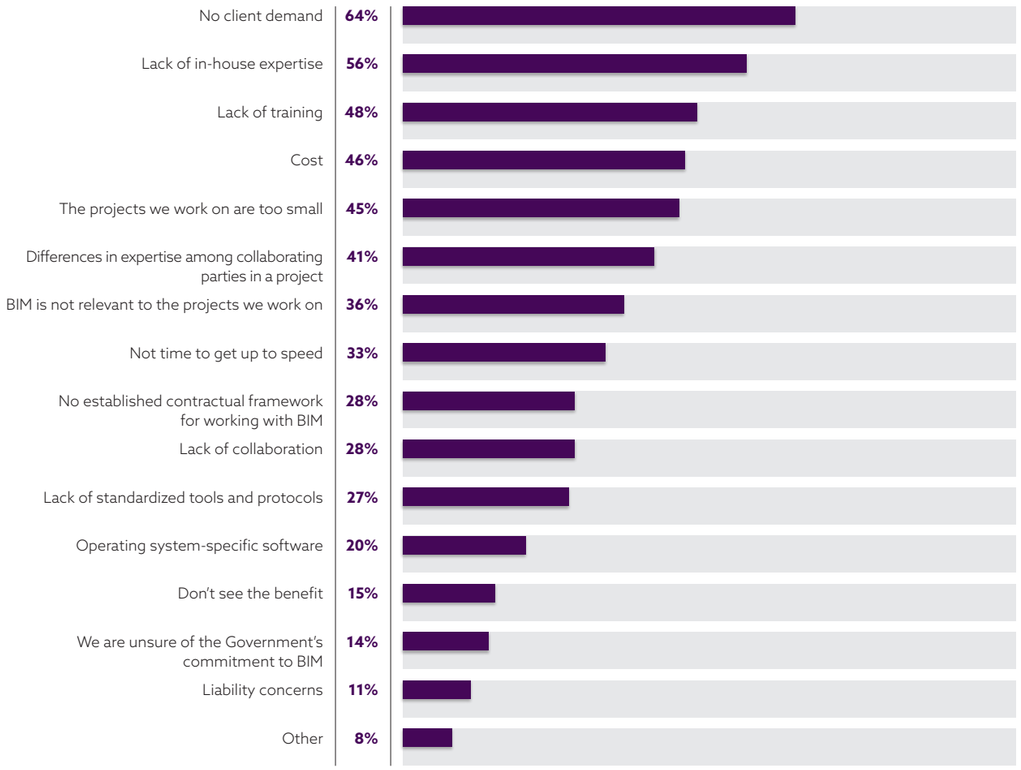
*'The real world is still built with actual materials which are described in 2D drawings which are published from the BIM models, printed on paper and read on dirty construction sites... models have serious limitations, and we must detail a great deal in 2D, even to the extent of transferring 2D views of the 3D model into purely 2D plans, sections and elevations, just so we can get the drawings to be published as reliable construction contract documents'.*

*'Clients are the main driver as main contractors and suppliers won't bear the increased cost just for their own benefit, despite the positive ROI BIM has shown to provide in recent years'.*

*'I work on a Government site and there is NO demand for it on projects. This isn't setting a good example'.*

*'I think the cost of BIM and the need for full collaboration is one of the main issues. Small firms cannot justify the expense, training, computers etc. and clients generally are not requesting it'.*

**What are the main barriers to using BIM?**






## Focus: outside looking in

Over the years that we have carried out this survey, a growing number of professionals based outside the UK have completed it. For the last two surveys, around a quarter of respondents were based in other nations. There could be various reasons for this. Some may well have strong connections to the UK, perhaps working for global companies with UK HQs. The UK's professional institutes, like the RIBA, are also active overseas.

The UK has played an active role in driving forward BIM adoption: through government initiatives, the strong support network that has developed, and its central role in developing standards such as the ISO 19650 series. Perhaps this has led to interest from professionals in other countries to follow the UK's progress and take part in the survey? Certainly, respondents outside of the UK are much more likely to think of the UK as the leader in BIM: 48% compared to 27%. The difference here is mainly accounted for by a high proportion of UK professionals neither agreeing nor disagreeing about the UK being a leader in BIM, or not knowing. It implies that those outside the UK have a clearer view about this.

Maybe those taking the trouble to complete a survey in other another country may well have a stronger-than-average interest in BIM. This may be true: adoption is higher among this group, with 82% of those outside of the UK stating that they use BIM, compared with 70% of UK professionals. However, non-UK professionals are more likely to describe BIM adoption as working with 3D models (34% compared to 22%) rather than as a process. Unsurprisingly, use of ISO 19650 is similar to in the UK, while following the process outlined in BS and PAS 1192 is lower: 26% compared with 41%.

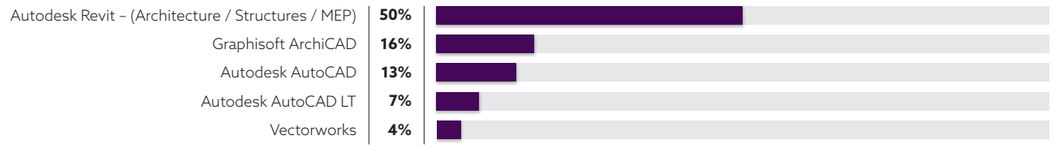
## The tools that enable BIM and digital transformation

As has been stated many times before, BIM is not a technology and not dependent on one technology provider. However, to enable BIM and further digital transformation, the industry needs effective tools. In recognition of this, we seek to understand which digital platforms construction professionals are using to help manage project information.

When we asked, at the beginning of the last decade, which main digital design tool people used, none of the tools geared to creating 3D models were used by more than 10% of respondents. Tools used primarily to produce 2D drawings were far more popular, with Autodesk's AutoCAD being used by 55% of those using design software.

In 2020, we see that things have shifted to the most popular tool being Autodesk's Revit: used by exactly half of this year's respondents. This is followed by Graphisoft's ArchiCAD, with 16% saying that this is their main design tool.

**Which of the following do you use as your primary design tool? ***




** The five most used design tools*

*When we asked, at the beginning of the last decade, which main digital design tool people used, none of the tools geared to creating 3D models were used by more than 10% of respondents.*

In 2020, there is now a whole set of new digital tools used to help construction professionals check, share and review models and associated project data. While vendors like Autodesk, Nemetschek and Solibri provide a number of solutions that are widely used, there are many other platforms that have entered the market. For instance, while Viewpoint is the most popular common data environment (CDE), cited by half of respondents, construction professionals collectively use at least 18 different providers. Also noticeable is the use of more generic solutions from the tech giants, with GoogleDrive and Microsoft's SharePoint and OneDrive featuring.

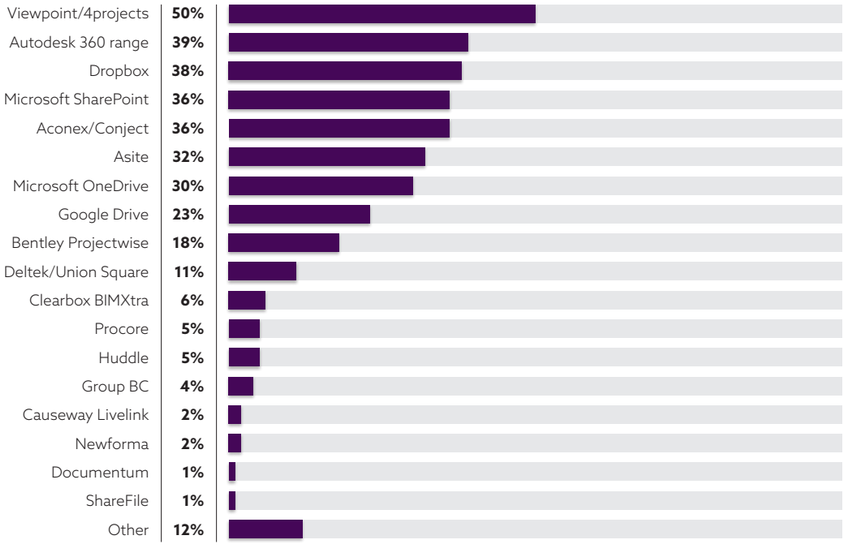
A key aspect of BIM is the information associated with the 3D model and the specification is a key part of this. A majority (59%) of users in the UK use NBS to develop specifications. Within NBS, there is also a move to the cloud with almost a quarter of NBS users already using NBS Chorus. From our own analytics we can see that, as of May 2020, there are over 1500 organizations subscribing to NBS Chorus, with this number growing each month.

Most of us work with word-processing documents and spreadsheets, and for many years the most common approach has by far been the use of Microsoft Office on a desktop or laptop. In 2020, for the first time, the use of Microsoft's online version of Office (365) is used by more people than its desktop counterpart. This marks a key moment in the progression towards cloud-based ways of working.

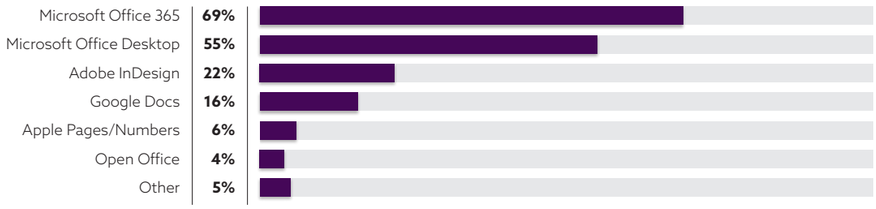
*'There are new and useful tools coming out every day to help us automate and create smart design through algorithmic programs and software. Exciting to watch as things progress'.*

*'I think the biggest problem is getting the smaller sub contractors on board. Once many of our own have been showed the physical benefits they are completely sold on the idea'.*

**Which project extranets or common data environments do you use?**




**What tool(s) do you use when working with documents and spreadsheets?**






## A digital future?

BIM and good information management are the foundations for the introduction of new digital tools and ways of working. These technologies go hand-in-hand with BIM to improve the visualization of designs for clients, the sharing of technical data with other project team members, and the connection of different types of data across the project and within an asset. The technologies used by most people now relate to cloud computing (42%) and immersive technologies, including virtual, augmented and mixed reality (38%). Cloud computing can include quite a range of things, such as carrying out major tasks like writing specifications or sharing models over the internet via a common data environment.

It can also include more straightforward tasks such as using online storage and file transfer, or online word-processing packages such as Microsoft Office 365. It is likely that people's perception of cloud computing varies: it is possible that some who may be using it in some way may not have classed themselves as doing so.

Architects and other designers have been using virtual reality to bring designs to life for clients for some time. Others, such as those managing buildings, have been applying augmented reality to do things like overlay instructions and maintenance data to assist those carrying out repairs.

*'New technology and innovations will always seek to improve the industry, I see BIM as the foundation to the technologies which are or will be available'.*

*'Absolutely agree that full integration of technology and BIM is essential but this needs momentum and someone to drive it'.*

This survey was carried out before the COVID-19-induced lockdown began in the UK. It would be reasonable to think that the use of these technologies has increased since then. Nonetheless, 80% of survey respondents anticipate using cloud computing within five years, and 78% immersive tech. We may now see the move towards these numbers accelerate.

**Please tell us about your current and expected use of the following technologies**




*This survey was carried out before the COVID-19-induced lockdown began in the UK. It would be reasonable to think that the use of these technologies has increased since then.*

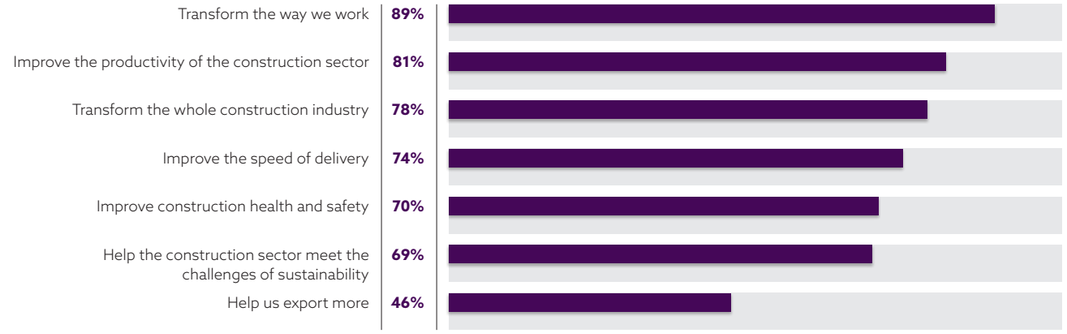
Almost a third of respondents are using drones for surveying and scanning sites for instance, especially for difficult-to-reach places such as bridges. Around two thirds expect to use drones within five years. A similar proportion of professionals (30%) report that they are designing for off-site construction. The advantages of these technologies, as well as 3D printing, may come into play during a time where physical distancing needs to be maintained, allowing fewer people to spend less time on-site. Big data, digital twins and artificial intelligence are at the early adopter stage at present, although around half expect to be utilizing these in five years' time.

Most respondents to this survey (89%) believe that the digitization of the construction sector will transform the way they work. 78% believe that it will transform the whole construction industry. They see real potential and new ways of working in digital transformation, improving: productivity (78%), speed of delivery (74%), health and safety (70%) and ability to meet sustainability challenges (69%). These are some of the major challenges of our time.

*'I believe the biggest barrier to adopting these technologies are attitudes and a lack of sharing the benefits to the client. If these are overcome, we already know the other benefits in terms of time, cost and quality and I think it will significantly improve the way we work and the assets we produce'.*

We have posed similar questions to designers and other construction professionals in recent years, and the response is consistent: they see digitization as a means of improving the way that people work and achieving better outcomes for the built environment.

**Thinking about the digitization of the construction sector, how far do you agree or disagree that digitization will do the following?**




## Final thoughts

The growth in the awareness and use of BIM is indisputable. Its benefits are widely recognized: it increases productivity; it improves the operation and maintenance of buildings; it reduces risk; it can help make organizations more profitable. There are internationally recognized standards for people to follow, and cross-industry organizations ready to provide advice and training. Product manufacturers are increasingly providing information in digital formats, moving away from printed literature and trade shows towards standardized, structured data delivered in the cloud. All of this seems to suggest significant progress. There is a plethora of new tools to aid digitization, and these have made a significant difference to how people work compared to ten years ago. The industry has definitely changed.

But only 40% say that BIM is the norm for project information. While many recognize the benefits, and plan to adopt BIM and to use new technologies, there are challenges holding people back. Key themes that continue to be present each time we carry out this survey are: the role that clients have to play in encouraging BIM use on projects; and (aligned to this) the need to enable BIM in a way that improves outcomes for all types of project. Many professionals state that it is not appropriate for small projects. For BIM to be truly universal, and to be business as usual across the industry, these issues need to be addressed.

So, fast-forward another ten years: what will things look like in 2030? Perhaps the new UK BIM Framework will have helped to provide the practical guidance that organizations of all sizes need to move ahead.

ISO 19650 will also have been in use and helping to standardize BIM processes for over a decade.

The industry's leaders will be digital natives, with an approach to information management that is likely to be 'digital first'. The attraction of using exciting digital tools will mean that organizations will need to structure their data in digital formats. External legal, economic and environmental drivers will continue to exert their influence, such as the new regulatory framework for building safety, which stipulates the establishment of a digital thread of information. These sorts of drivers make it ever more likely that the adoption of BIM and of digital technologies will only continue to increase over the next decade but processes and tools need to be applicable to all project types, organization sizes and roles across the industry.



## How we did the research and who took part

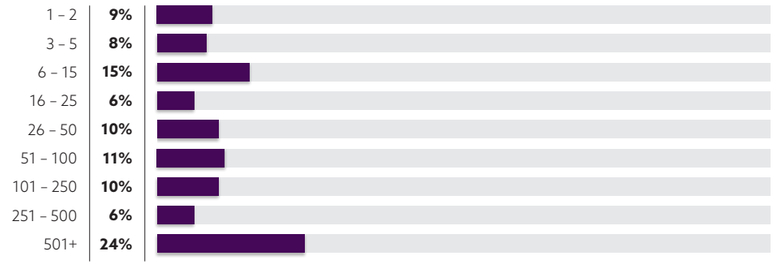
We carried out an online survey between December 2019 and the beginning of March 2020. We received responses from 1061 construction professionals. All organization sizes were represented, from micro-practices of one or two people to large practices with over 500 staff. As previously, responses came primarily from the design community, with 27% being architects. Engineers were also well represented. Over a quarter were architectural technologists or BIM managers.

However, other members of the project team also participated, including: contractors, project managers, cost consultants, manufacturers, surveyors and clients. Those doing private, public and work in other sectors were well represented, as well as those doing new build and refurbishment work.

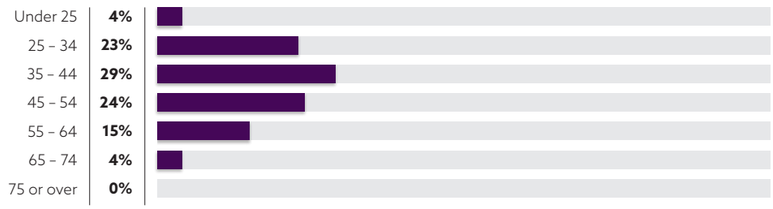
Respondents came from across the UK, and almost a quarter were working outside of the country. There were respondents based in six of the world's continents.

People of all ages were well represented. Individuals were engaged in a variety of roles that covered tasks from developing drawings and models to writing specifications, coordinating information and sourcing or creating digital objects. Working with digital information has become commonplace, with almost two thirds viewing models, 55% creating drawings or models using 3D tools, over half checking models and 41% producing digital objects.

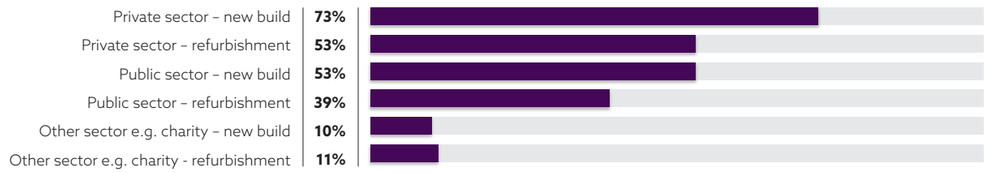
**Including yourself, approximately how many people are employed in your organization?**




**Which age range do you fall into?**




**In the last 12 months, which of the following project types have you been involved in?**






**John Gelder**
University of South Australia

University of South Australia

**Introduction from NBS**

*Since the launch of Uniclass 2015, we at NBS have been delighted with its adoption by industry. We have updated the system quarterly now for the last five years, and have received thousands of new classification suggestions from industry. We are grateful for the engagement and suggestions from large clients such as Highways England, Transport for London, the Environment Agency and the Metropolitan Police. A recent interoperability report by the Centre for Digital Built Britain recommended continued use of Uniclass 2015 within the UK.*

*Furthermore, it has been fantastic to see its adoption internationally. This article from John Gelder explores how Uniclass 2015 is becoming the classification of choice across Australia. It is either recommended or required for work for the Office of Projects Victoria, Transport for New South Wales, the Rail Industry Safety Standards Board and Austroads.*

*Clearly, the industry needs support in terms of working with and producing well-structured information. At NBS, we have been working through all of the specification and manufacturer product content that we publish and classifying it to the Uniclass 2015 structure. We are pleased to say that this exercise is now complete, and users of the NBS Chorus specification platform and the NBS Source manufacturer product platform can now benefit from it.*

*A number of different countries around the world are following the UK's approach to BIM. It will be interesting to see how many follow Australia by also embracing Uniclass 2015 for classification.*

# The adoption of Uniclass 2015 in Australia

Classification is needed in the construction industry. It was needed in a pre-BIM environment (an early example being the Swedish Samarbetskomittén för Byggnadsfrågor, SfB, which was launched in 1950), and it is needed even more in a BIM environment where the benefits of digital interoperability are likely to be huge.

Over the years, this need for classification has resulted in a multitude of classifications – in different countries, across different disciplines, and even for the same purpose in the same place. This has reflected and reinforced professional and other information silos, frustrating efforts to coordinate, and now stymying digital integration.

Classifications have three levels of use. There are those who design, develop and maintain the classifications. There are those who apply the classifications to information about particular objects, such as manufacturers and model software developers. And then there are designers, specifiers, builders, maintenance workers and others who use the classifications assigned to the objects that they are dealing with without knowing or caring where they came from. The author has operated at all three levels. But for most, object classification is 'under the hood'. That does not mean that it is not important, and that an appreciation of it isn't useful.

*A classification system is needed – one comprising multiple tables, each for objects of different classes. Just one table, covering one object class, is not enough to serve many needs along the project timeline and across the various disciplines.*

**Table 1: ISO 12006-2 and three classification systems**

| ISO 12006-2 | OmniClass | CoClass | Uniclass 2015 |
|---|---|---|---|
| A2, Construction information | Information | - | Form of information |
| A3, Construction products | Products | Components | Products |
| | Materials | - | - |
| A4, Construction agents | Organizational roles | - | Roles |
| | Disciplines | - | - |
| A5, Construction aids | Tools | - | Tools and equipment |
| A6, Management | Services | - | Project management |
| A7, Construction process | Phases | - | - |
| A8, Construction complexes | - | Construction complex | Complexes |
| A9, Construction entities | Construction entities by function | Construction entity | Entities |
| | Construction entities by form | - | - |
| User activity[14] | - | - | Activities |
| | - | Maintenance activities | Process activities (in development) |
| A10, Built spaces | Spaces by function | Built space | Spaces/locations |
| | Spaces by form | - | - |
| A11, Construction elements | Elements | Functional systems | Elements/functions |
| | - | Constructive systems | Systems |
| A12, Work results | Work results | Work result | Redundant in Uniclass 2015 (see below) |
| A13, Construction properties | Properties | Property | - |

## Classification tables

Individual unrelated classification tables are not enough. Current classifications in use in the Australian construction industry include:

- The National Classification System (2019), published by NATSPEC.[1]
- The classification used to structure the ANZ Standard Method of Measurement of Building Works (2018), published by AIQS and NZIQS (Australian and New Zealand Institutes of Quantity Surveyors, respectively).[2]
- The North American OmniClass, Table 22, 'Work results' (2012), used by SpecPack.[3]
- The project phases classification used in the Australian Institute of Architects 'Client architect agreement (2019)'.[4]
- The property classification used to structure the Australian Building Codes Board 'National Construction Code' suite.[5]
- The property classification used to structure the Green Building Council of Australia 'Green Star' suite.[6]
- The buildings classification given in the ABCB's NCC (2019).[7]

All seven classifications were developed independently of each other and do not align – they were not intended to be interoperable. The first three concern the same object class; on a given project, it is possible that all three could be used. In particular, it would have been useful if the first two aligned (NCS and the ANZ SMM), so Australian specifications could 'talk to' bills of quantities, and vice versa. This was the case in the UK some years ago. The NBS and NES national building specification systems and the RICS standard method of measurement used the same classification (Uniclass 1997, Table J, 'Work sections for buildings'), enabling interoperability.[8] But this has never been the case in Australia and, since RICS (the Royal Institution of Chartered Surveyors) released the NRM (New Rules of Measurement) in 2012, it is no longer the case in the UK.[9]

[1] *NCS is free online at: www.natspec.com.au/resources/national-classification-system.*

[2] *ANZ SMM is available to purchase online at: www.aiqs.com.au/imis/AIQS_Website/Shop/Books/AIQS_Website/Public/Shop/Books.aspx.*

[3] *SpecPack is available to purchase at: https://specpack.com.au.*

[4] *These are: Concept Design; Design Development; Town Planning/Development Application; Construction Documentation; Contractor Selection; and Contract Administration. Also in use for project phases is the RIBA Plan of Work 2020.*

[5] *The NCC Volume 1 structure is: Structure; Fire Resistance; Access and Egress; Services and Equipment; Health and Amenity; Ancillary Provisions; Special Use Buildings; and Energy Efficiency.*

[6] *The Green Star 'Design & As Built' structure is: Management; Indoor environment quality; Energy; Transport; Water; Materials; Land use & ecology; Emissions; and Innovation.*

[7] *NCC 2019 Volume 1 is free online at: https://ncc.abcb.gov.au.*

[8] *NES (the National Engineering Specification) has since shut down. UK services engineers have largely moved to the services engineering content produced by NBS and first published in 2004.*

[9] *The three volumes of RICS NRM are available to purchase online at: www.rics.org/uk/upholding-professional-standards/sector-standards/construction/rics-nrm-new-rules-of-measurement/.*



## Classification systems

A classification system is needed – one comprising multiple tables, each for objects of different classes. Just one table, covering one object class, is not enough to serve many needs along the project timeline and across the various disciplines. The NCC's partial 'Entities' classification is useful at certain stages and to certain users (e.g. architects and other designers, building control authorities), but not to manufacturers and installers. The NCS is, likewise, useful at certain stages and to certain users (e.g. specifiers, quantity surveyors, subcontractors) but is not of much interest to planners or manufacturers.

The system must be coherent. An integrated sequence of coordinated tables is needed to create a coherent object hierarchy. This is especially the case for BIM, in which modelling essentially maps big things to little things. For example, it maps buildings to elements, elements to systems, and systems to products (and vice versa). Since each of these object classes will have its own classification table, it would make sense if they were designed with each other, and modelling, in mind. An incoherent collection of unrelated tables is not good enough.

None of the tables mentioned are part of a classification system of the kind outlined in ISO 12006-2:2015.[10] Current classification systems include OmniClass from North America,[11] CoClass from Sweden[12] and Uniclass 2015 from the UK.[13] Table 1 shows how they correlate to the ISO and to each other. Only two might be regarded as coherent – CoClass and Uniclass 2015.

Since Australia has no such system of its own, the question is which of these classification systems should be adopted here, if any? The answer so far has been Uniclass 2015, although this adoption is in its early stages. Among major clients, the Office of Projects Victoria recommends it.[15] Transport for New South Wales (TfNSW) requires it, and is actively engaged with NBS in its ongoing development.[16] The Rail Industry Safety Standards Board (RISSB) recommends it.[17] The use of Uniclass 2015 was recommended to Austroads in 2018.[18] Client adoption means that their supply chains will also use it for civil works and for architectural works. However, most States have no requirements for classification in their BIM implementation guidelines. For example, SA does not stipulate an approach to classification, leaving this to the contractor.[19] The relevant Queensland document makes no mention of classification.[20]

As for Australian BIM tools, NBS Chorus uses Uniclass 2015 as its 'native' classification system (others can be used).[21] The new NBS Source product – for proprietary objects, their geometries and properties – also uses it as the 'native' classification system.[22] Autodesk Revit, Graphisoft ArchiCAD and Vectorworks 2020 SP3 embed Uniclass 2015 for objects linked to NBS Chorus.[23] Both NATSPEC and NZ Masterspec included a requirement that 'BIM objects shall have a Uniclass 2015 classification assigned' in the 2018 draft of the Open BIM Object Standard (OBOS), but this has been dropped in the published version.[24] However, its use is supported (after a fashion) in the NATSPEC BIM 'Properties Generator', along with OmniClass and the NCS.[25]

[10] *ISO 12006-2:2015, 'Building construction – Organization of information about construction works – Framework for classification', ISO, Geneva.*

[11] *The OmniClass tables, including Table 22 mentioned above, are free online at: www.csiresources.org/standards/omniclass.*

[12] *CoClass tables are free online at: https://byggtjanst.se/tjanster/coclass.*

[13] *Uniclass 2015 tables are free online at: www.thenbs.com/our-tools/uniclass-2015.*

[14] *Identified in the ISO, but outside of its scope.*

[15] *Office of Projects Victoria (2020), 'Victorian Digital Asset Strategy', Part C Application, pp. 71-73: ' The VDAS recommends using Uniclass 2015, as it is ISO certified and a globally recognised and consistent system'.*

[16] *TfNSW (2019), 'Application of Uniclass 2015 for Transport for NSW', 6.2, 'Our decision': 'TfNSW has selected Uniclass 2015, developed by the NBS... as the preferred classification system. The choice to adopt Uniclass 2015 follows comprehensive analysis of the current state, and comparative research of available classification systems, industry-wide, against ISO 12006.2:2015'.*

[17] *RISSB (2019), 'Digital Engineering: Code of Practice', part 6.3, 'Project data classification': 'This Code of Practice recommends the use of Uniclass 2015 as the adopted classification of assets and locations during the project lifecycle'.*

[18] *Austroads (2018), 'Asset data harmonisation Stage III: BIM IFC alignment review'.*

[19] *Department of Planning, Transport & Infrastructure (2019), 'Project controls: Master specification – PC-EDMS Digital engineering': 'The DEXP [Digital Engineering Execution Plan] shall include the Contractor's approach to... Asset Classification Matrix'.*

[20] *Department of State Development, Manufacturing, Infrastructure & Planning (2018), 'Digital enablement for Queensland infrastructure: Principles for BIM implementation'.*

[21] *NBS Chorus (Australia) is available to purchase at: www.thenbs.com.au.*

[22] *NBS Source launched in the UK in April 2020: www.thenbs.com/nbs-source.*

[23] *For the various NBS plug-ins, see: www.thenbs.com/our-tools/nbs-plug-in-for-autodesk-revit.*

[24] *OBOS is free online at: https://bim.natspec.org/documents/open-bim-object-standard.*

[25] *The 'Properties Generator' is free online at: www.propgen.bim.natspec.com.au/pages/178534.html.*

## Why Uniclass 2015?

OmniClass is comprehensive, but it is not current – the most recent official tables are dated 2012. The tables are not coherent – they were developed independently (e.g. MasterFormat and UniFormat) and then combined to make OmniClass. Terminologies, sequences and groupings are different where they could be the same, making them difficult to use together in an integrated BIM environment.

CoClass is not comprehensive – it only has nine tables. These are quite small, so do not allow for the classification of many objects. The 'Components' table, for example, could classify 17 576 objects if full. The 'Constructive systems' table could hold 67 600 objects. This sounds a lot, but as they could never be anywhere near full, for all sorts of practical classification reasons, it is quite a restriction on its future development.

Why are Australian organizations adopting Uniclass 2015? In terms of tables, Uniclass 2015 is more comprehensive than CoClass but less so than OmniClass, although other tables are planned (several have been drafted). The tables themselves serve all sectors and disciplines – since 2014, NBS has been working hard to expand the original architecture focus to deal with transport and other sectors. Uniclass 2015 is current (most tables were updated in January 2020) and dynamic updates are regular, as the NBS team liaises with users, which is important to organizations such as TfNSW and VDAS. The tables in Uniclass 2015 are as coherent as they can be. For example, 'Complexes', 'Entities', 'Activities' and 'Spaces' all use the same basic classification – hence Co 45, 'Residential complexes'; En 45, 'Residential entities'; Ac 45, 'Residential activities'; and SL 45, 'Residential spaces'. Finally, there is plenty of room within each of the tables for future expansion as required by industry for current and future needs. The 'Products' table, if it was full, could classify $10^8$ objects, although it currently classifies around 6800.

The Systems table could also accommodate $10^8$ objects, and it currently classifies around 1500. All this room is needed to ensure adequate space around each object for the addition of further objects in the future. CoClass does not have this space for expansion.

One point to note for those who have looked carefully at Table 1 is that the 'Work results' table is considered redundant in Uniclass 2015 and will not be included. Mapping between object classes (e.g. 'Complexes' and 'Entities') is properly done in BIM tools such as Autodesk Revit and NBS Chorus. Conventionally, 'Work results' (or work sections) are used for mapping from 'Systems' to 'Products', which is done in the 'Systems' within NBS Chorus. Separate 'Work results' sections would only duplicate this mapping. In NBS Chorus, future mapping from 'Complexes' to 'Entities' would be done in the 'Complexes' 'sections' of what would be a 'lifetime' specification… and so on.

Perhaps a significant omission in Uniclass 2015 is the 'Properties' table. Readers' views on the need for this would be welcome. This would have to serve all the other tables, e.g. classifying properties for 'Products' and 'Activities'. The properties assigned by BIM tools (geometric and otherwise) would all be classified, facilitating digital searching for compliant proprietary objects, or against attributes of interest such as flammability. Work on this table has commenced. Proposed tables beyond the ISO include 'Districts' (or 'Precincts') and 'Regions' (both in draft). These would allow Uniclass 2015 to be used to support Smart Cities initiatives.[26]

Where users insist on retaining an existing classification table or system but others in a project are using Uniclass 2015, then two-way mapping will be needed. For the purposes of BIM, this digital management should be possible, which requires simple 1:1 mapping. This means that an object in the existing table corresponds exactly to an object in Uniclass 2015, e.g. they both have 'clay bricks'. However, for many objects this will not be the case. Instead, we will find 1:many, many:1, 0:1, 1:0 and many:many mappings. All require human intervention for resolution, which is anti-BIM.

To avoid this, ultimately everyone will have to use the same classification system, to ensure full interoperability and to maximize the benefits of BIM. National adoption of a single classification system is good, and international adoption is better.

## Conclusion

A coherent classification system for construction is essential if we are to realize the full benefits of BIM. This is why the UK Government ran a competition for the development of such a system in 2014, which was won by NBS with Uniclass 2015. As a result, Uniclass 2015 is now an official component of the UK BIM Framework, and promoted in BS EN ISO 12006-2:2020 (National Foreword). In turn, ISO 12006-2:2015 is mandated by ISO 19650-2:2018 (clause 5.1.7c), which has been adopted in Australia.[27] When we began this work, we thought that it might only be used by NBS. But now we see the classification system being adopted very much more widely, including in Australia. The tables have been copied thousands of times worldwide. The adoption and implementation of Uniclass 2015 will expand into the future.

*John is lecturer at the University of South Australia and, while working at NBS in the UK, was instrumental in the development of Uniclass 2015. He was also on the Working Group for ISO 12006-2:2015.*

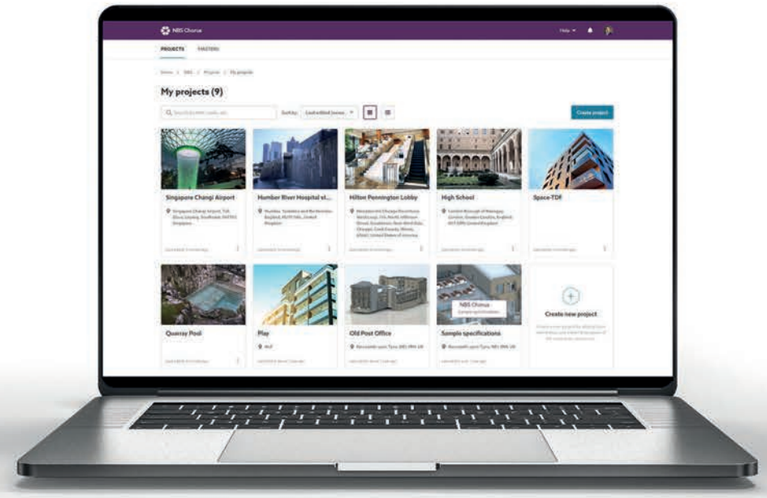
[26] *The Smart Cities Council ANZ is at: https://anz.smartcitiescouncil.com.*

[27] *AS ISO 19650.2:2019: 'Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling – Delivery phase of the assets', Standards Australia.*

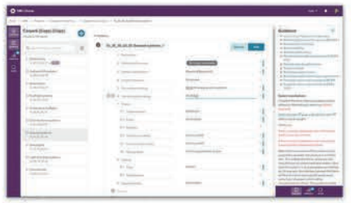


NBS Chorus

Intelligent construction specification, in the cloud




VECTORWORKS A NEMETSCHEK COMPANY GRAPHISOFT A NEMETSCHEK COMPANY AUTODESK.



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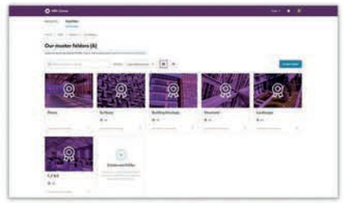

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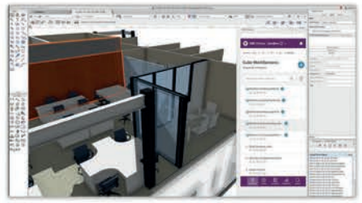

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**Mike Turpin**
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# BIM beyond the labels

*As a term, BIM is now well embedded in the vocabulary of the majority of people working in the construction industry, but what does it mean?*

When we talk about BIM, we are talking about building information modelling, building information models or 'better information management' – or perhaps a variety of other suitable explanations for this acronym. Most of the time when we are talking about BIM, we're more focused on the 'I' than the 'B' or the 'M': we are really talking about BIM as the improved use and exchange of information across the 'design', 'build' and 'operate' phases of a project. But is this understanding as well embedded as the acronym itself?

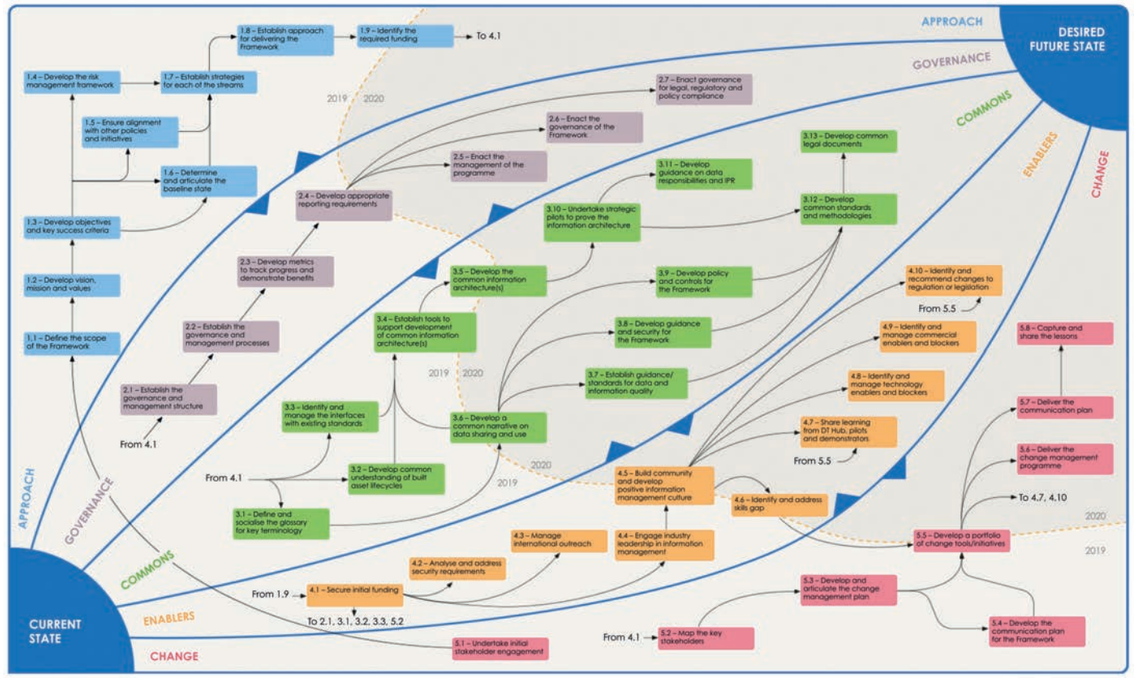
In more general terms, BIM is a label. It is an insignia that we use to more easily define the digital transformation now widely spreading its way through the construction industry like concrete being slowly poured into a slab. Like the concrete making its way inch by inch (or should that be millimetre by millimetre?) across the formwork, it needs some structure and guidance to develop into the right shape. Maybe even some assistance along the way, making sure that it gets into all of those difficult corners for a smooth and consistent finish. However, sometimes when we use labels such as BIM we end up losing focus on what truly matters – and that is the end result. That may mean meeting the handover aspirations of the building operator, achieving the cost and waste reduction targets of the Government Construction Strategy or providing 3D model visualizations for stakeholder engagement and improved coordination. These aims and ambitions are the drivers for change, and should be at the forefront of the conversation – rather than masked by the ever-changing label that we hang them on.

Does it matter that one definition of BIM is different to another? Does it matter that one journey takes a different road to another? As long as the collective industry is moving forward towards that destination, we can reflect on the positives of that success. We can move our energy away from debating terminology and keep the vehicle moving.

***Above:*** BIM needs structure and guidance - like concrete being poured into a slab.

*Sometimes when we use labels such as BIM we end up losing focus on what truly matters – and that is the end result.*

***Below:*** *CDBB: UK Digital initiative roadmap*
*www.cdbb.cam.ac.uk/DFTG/DFTGRoadmap*




During the past ten or more years of the UK's digital transformation journey, we have seen the many evolving facets of BIM. These include: the transition of design from 2D CAD drawings to 3D models; the progression of standards from BS to PAS, and then to the International ISO; the introduction of COBie, and the resulting attention to data for operation; and (who can forget?) the widespread adoption of clash detection, and the many dimensions (4D, 5D, etc.) of BIM implemented during construction. All of these identities of BIM are very different, but in each case and on each project, they are equally important to the stakeholders who benefit from them. Like eggplants and aubergines or chips and fries, these things are one and the same to the majority of the population. As we take the next steps on the UK's journey towards digital maturity, a traditional and notoriously analogue industry is about to see the next phase of these discussions: the 'digital twin'.

CDBB are currently defining the direction of the UK Digital Twin initiative and have published the roadmap for its development (as above).

Alongside all of this, we must still consider the high-level reason why we and the industry have adopted BIM in the first place – and that is to realize the benefits and value that its successful implementation can deliver. In fact, we must remember that this was the UK Government's driver for BIM from day one: to deliver value from the cost savings and efficiencies that BIM can (and has) delivered on public sector projects. More often now, we are seeing the private sector following the Government's lead, with owners and operators of assets across the country looking to BIM to improve their existing processes, and help them to drive better outcomes from the assets which are handed over to them. It is the reversal of leadership throughout this change (from designers across to owners and operators) which will have the biggest effect, and which should in turn distil the essence of BIM down into a product which will provide a wide range of positive results.

Whilst we are still on this road to the future of our industry, it is my opinion that we need to refine our outputs – from focusing on what we can do to focusing on what we should do. We should be reflecting on our own selves, our own team, or our own company's reasons for BIM, and how it provides an outcome for us. That could be an increase in quality, an increase in efficiency, a reduction in cost, more project wins or a whole host of other goals. It's these goals and our personal ambition to reach them which will ultimately make a success of BIM for us, our teams and our organizations – and the wider industry will benefit from this. As the saying goes, sometimes you have to be selfish to be selfless.



***Below:*** Construction 2025. One potential outcome of BIM is to help achieve the targets set out in the Government's Strategy.


**Lower costs**

33%

reduction in the initial cost of construction and the whole life cost of built assets

**Faster delivery**

50%

reduction in the overall time, from inception to completion, for new build and refurbished assets

**Lower emissions**

50%

reduction in greenhouse gas emissions in the built environment

**Improvement in exports**

50%

reduction in trade gap between total exports and total imports for construction products and materials

Whatever the term BIM means (or whatever a person understands it to mean), we expect BIM to meet three key criteria. When reviewing anything you're doing, ask yourself whether it delivers:

**BETTER DECISIONS**

**BETTER THINKING**

**BETTER OUTCOMES**

BIM can be the foundation that enables us to build a tower towards far greater outcomes and opportunities, but only if it is solid, complete and without defects, before we begin to load too much on top of it. That being said, we should now be considering the design for these future plans and looking at all possible options to help steer our future development in the direction that best meets our vision and goals. Undoubtedly, our future will change in ways that we could never have predicted, and we will have to be able to flex and adapt to this whilst still moving forward as an industry. We are already seeing sustainability and climate change soar higher up the national and global agendas. We are seeing the continual demand for more housing, better social care and increased infrastructure capacity.

How can your adoption of BIM be a part of meeting these and other critical parts of our future? Alongside all of this, 2020 has seen the tragic global pandemic which is COVID-19, and that has had an unprecedented impact on every aspect of life as we know it. Perhaps now more than ever, we need to push forward and deliver more; can we as an industry use the tools that we have to achieve prosperity from catastrophe?

*Mike is Director and Lead Consultant for Innovating Futures, a UK-based BIM and digital construction consultancy. Alongside this, Mike is an avid supporter of UK-based BIM initiatives to expand the adoption of BIM, working with the CDBB International Team and the UK BIM Alliance Communities group.*

*Whilst we are still on this road to the future of our industry, it is my opinion that we need to refine our outputs – from focusing on what we can do to focusing on what we should do.*

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