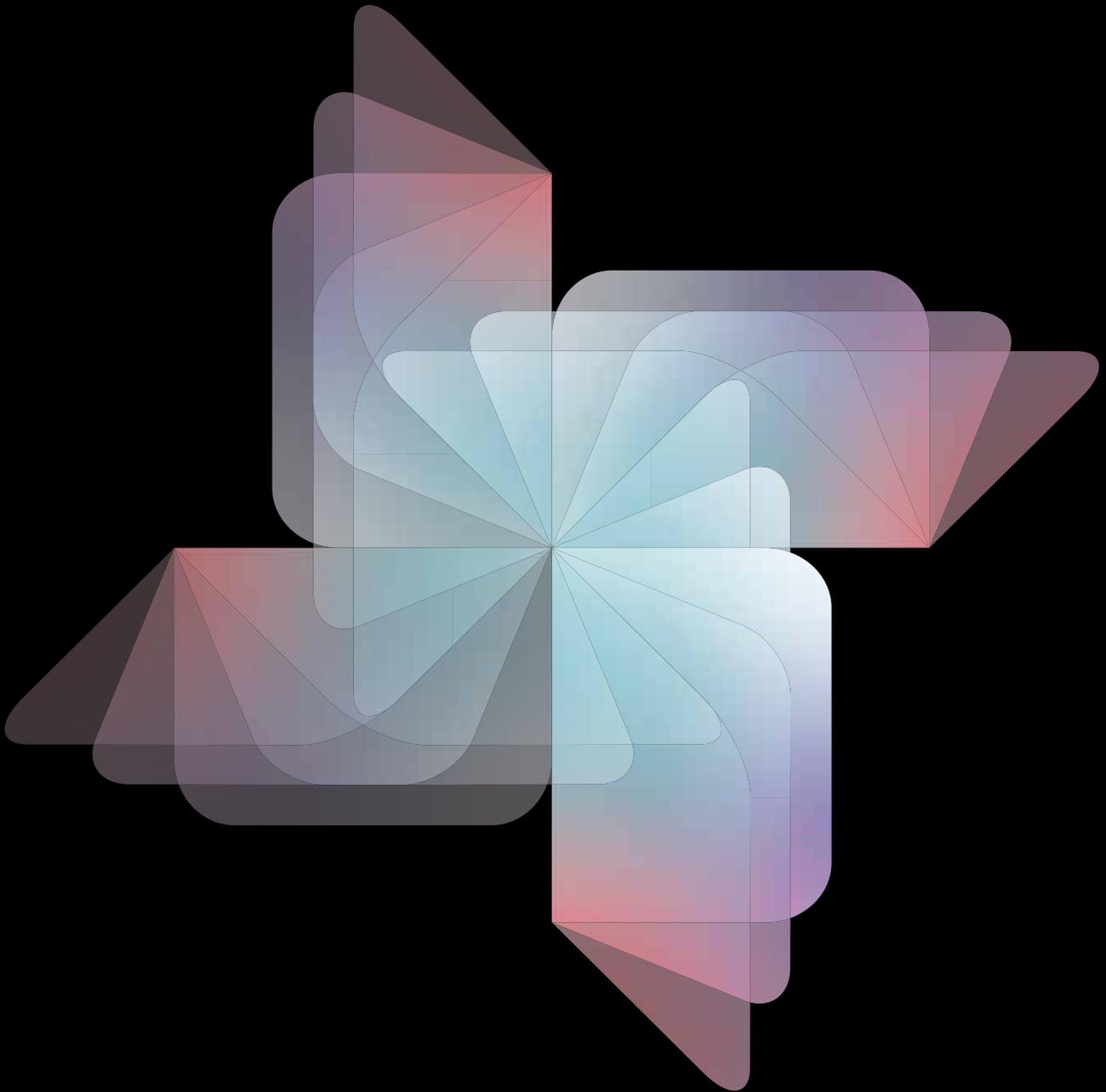


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# National BIM Report 2012

# nbs National BIM Library



The National BIM Library – your free source of high-quality generic and proprietary BIM objects.

From March 2012 the National BIM Library will provide construction-industry professionals with the ability to locate and download a huge selection of generic BIM objects for a comprehensive range of systems. As a result, the Library will encourage consistency and collaboration, as well as establish a common approach to quality standards across the entire industry.

To find out more, visit [www.nationalbimlibrary.com](http://www.nationalbimlibrary.com)

“The idea that BIM is only for big business is challenged by the growing number of small and medium enterprises (SMEs) that can demonstrate a return on investment.”



## Introduction

### Richard Waterhouse Chief Executive, RIBA Enterprises

Many had hoped that the launch of the UK Government’s Building Information Modelling (BIM) strategy last year would inform and direct the industry, and set a path towards improved methods of working to deliver the benefits that advocates believe BIM can achieve. Unfortunately, the second NBS National BIM Survey provides a potentially worrying picture of a divided UK construction industry in which real progress has been made but where real areas of inertia remain. The leap in the percentage of those who are both aware of and use BIM is offset by the large portion of the industry that remains unaware. At a time when government is pushing the industry towards this innovative collaborative environment, our research indicates that far from ignoring the drive towards BIM, one in five remain in blissful ignorance of BIM’s existence.

The picture is certainly not all bad. Research and anecdotal evidence indicate that some sectors are prepared to invest earlier than others, with constructors (medium- and large-scale) seeing the benefits and investing in the use of BIM. Those across the industry who have adopted BIM in the early stages are using it to strengthen their businesses in a competitive environment. Rather than investing in what might be seen as ‘risky’ new technology, the proponents argue that they are willing to invest not just in technology but in a process that improves certainty and efficiency.

The idea that BIM is only for big business is challenged by the growing number of small and medium enterprises (SMEs) that can demonstrate a return on investment. These businesses can be extremely agile. They can use enhanced access to information to extend the range of services offered, as well as producing efficient delivery of these services, thereby providing a welcome boost in difficult economic times. However, there are real concerns regarding the levels of investment required. Those who remain unsure seek to confirm that investment is well researched and well made: they seek evidence that BIM works and represents a good investment. This is the new BIM challenge.

And so we come to implementation (‘How do we get started?’) and return on investment (‘How do we ensure that when we invest, we get a return and do not buy into a dead-end technology?’). The answer is simple: the software and data providers have to make it easy to use and share information across tools and services. Expect to see much more activity and advice in both of these areas during 2012. NBS will continue to provide both guidance and supporting information across these sectors. The launch of NBS Create provides specification data in a format that can be used in the BIM environment. Our work on the National BIM Library also provides associated standard geometric data for construction products and related specification content. Go to [www.thenbs.com](http://www.thenbs.com) for more information.

Beyond the current need to understand how and when to invest, we have to challenge the future barriers to adoption. Our industry continues to be concerned with the risks associated with sharing information – surely this is a contradiction when such sharing is an absolute necessity for projects to be successful? It is likely that new insurance products and contractual relationships will be developed during 2012. Even without this, we believe that the industry can continue to share information and models using current contractual and insurance frameworks.

As it is now 15 years since the launch of the Egan report, we might finally see progress in collaborative working!

We would like to thank the following organisations for supporting this report by circulating the survey to their members:



# BIM and the UK Construction Strategy

David Philp, Head of BIM Implementation at the Cabinet Office and BIM Programme Director at Balfour Beatty, takes a look at the UK Government Construction Strategy and what 2012 has in store for BIM



2011, with its cornucopia of BIM seminars, workshops and related articles, helped trigger a 'light bulb moment' for many in the UK construction industry. The BIM value proposition became even more tangible than before (backed up by great case studies of BIM implementation in the UK); it helped win work (foremost on most people's minds) and, amongst a panoply of acronyms, communicated the message that this digital toolset could actually enable projects to be built several times virtually, rehearsing and determining the optimal design, construct, and most importantly operate solution, shaking out the waste every time the model is analysed and refined – or is it still heresy to say that construction is endemic with waste?

The foregoing was complemented by the Government's Construction Strategy and its mandate for 'fully collaborative 3D BIM as a minimum by 2016', and the need for efficiency and industry reform to realise a 'cost reduction of 20% during the term of the current parliament'.

Since publication of the strategy, the term BIM has become universally commonplace (though often misused) in our construction vocabulary; so what do we (the Cabinet Office BIM Task Group) mean by BIM? Well, expectedly, the clue is in the title: constructing a managed digital information 3D model of an asset, be it a building or an infrastructure project (both new-build or retained estate) that is infused with data. This information model can be used to inform the decision-making process and answer questions throughout the entire project lifecycle. One BIM input can give us many valuable outputs. In order for this process to be effectively implemented, however, it needs to be undertaken in a truly collaborative environment (with iterative feedback loops), and here lies the real challenge. Manifesting BIM beyond the technology and process to a cultural paradigm shift (never easy) is where the real challenge lies. BIM is very much more a verb than a noun.

Obviously BIM is not a silver bullet. Codifying and bringing harmony (perhaps even a new co-operative bias to our traditionally 'siloed' industry) requires other pieces of the jigsaw to be secured around BIM: the intelligent client, early contractor involvement and soft landings all combine to create the Goldilocks porridge that is 'just right' for BIM. Indeed, all these aspects play equal part in realising the Government Construction Strategy.

A large part of BIM success and a potential industry shift will be down to education and training, ensuring that new entrants to the construction arena have the apposite blend of knowledge and skills: a BIM literacy to fit their function. During 2012, our BIM Training and Education Work Group will be painting a rich picture of the UK BIM scholastic capability 'as is' and putting recommendations together to ensure we are ready for the 2016 digital BIM switchover – and hopefully in a position where we can export our 'integrator' services beyond the U.K. Of equal significance is the need to 'unlearn' much of the existing workforce approach and unravel the tightly knitted web of such comments as: 'BIM? How much will it cost me?', 'Well, we've always done it that way' and 'If there was a better way of doing it, we would have found it by now'.

Although much has been written about BIM, few have truly considered it from the perspective of the Client. While better enabling the design and build process (especially helping tell the story and enable better user understanding), the real big value proposition lies in the bandwidth consequent to practical completion where the data (in our case COBie) and model outcomes can be used to ensure optimal asset performance. Our captured data will allow us to start measuring what really happens in the asset usage, how the systems are actually operated ('Is it easier and more productive for a nurse, teacher or FM staff to use that asset?'). Modelling for better user outcomes and being able to feed this data back to inform future projects is where the real Client value proposition sits.

Traditionally, losing rich data between handover and operation has been a real problem, negatively impacting upon building operations post-occupancy and during the initial after-care periods. A key part of the G.C.S. programme will be to try and ensure a smooth glide path of data between construction and operation, using BIM as the catalyst. Key to the foregoing will be the earlier intervention of the F.M. teams in the briefing, design and construction stages.

2012 has begun quickly with nineteen work packages in the pipeline creating our protocols and guidance, and our five working groups creating the 'push' and Departmental on-boarding workshops. We will also be signposting our journey via an about-to-be-launched Twitter feed [@BIMgcs] and BIM microsite.

We are also cognisant of both scalability and localism, and we intend to ensure that our programme is well understood and can be adopted by all (irrespective of company size) without barriers. Key to this will be our creation of Regional BIM hubs in 2012 to help disseminate our programme and get valuable feedback from around the neighbourhoods.

So why is BIM of so much interest, and how has it kept our attention for so long? Okay, the technology is patently quite 'nifty', but I think it's possibly because we all share a passion for our industry and we know that BIM is a 'unifier' and will conceivably prod the industry in the right direction. The Government mandate will help drive adoption; however, this 'pull' is being equally met by an industry 'push'. We have the perfect storm for BIM in the U.K. and I am confident that we will not miss this opportunity for reform and to reset our construction default. ●

“Of equal significance is the need to ‘unlearn’ much of the existing workforce approach and unravel the tightly knitted web of such comments as: ‘BIM? How much will it cost me?’, ‘Well, we’ve always done it that way’ and ‘If there was a better way of doing it, we would have found it by now’.”

# BIM from the point of view of a small practice

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David Miller Architects is a small practice based in central London. Our work load is fairly typical of a small practice being affordable housing, schools, student housing and some mixed-use commercial work, mainly budget hotels. As more than three quarters of architects work in offices of fewer than ten people we believe our sector needs to engage in the BIM debate. We therefore propose to describe our recent BIM experience in three parts; firstly describing the adoption process, then defining the costs and concluding by trying to quantify the business advantages.



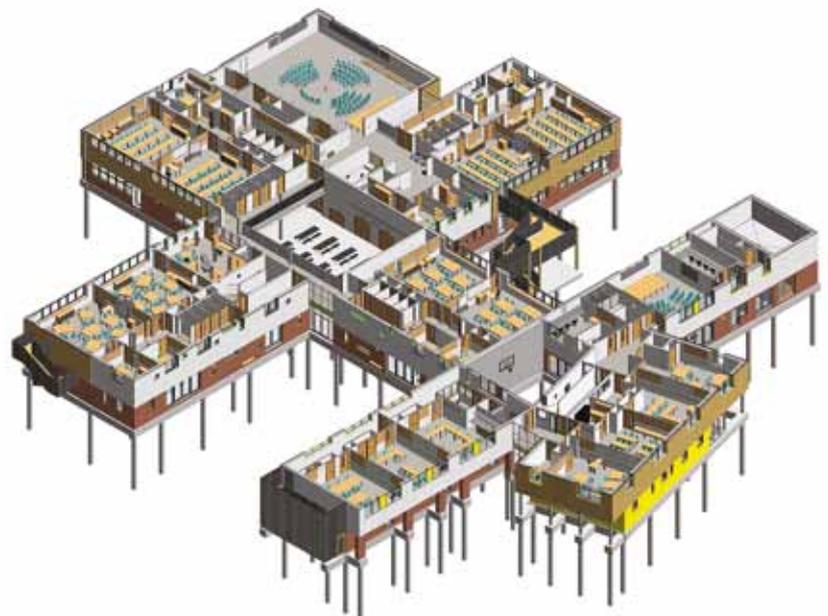
## Process of adoption

DMA came to BIM through 3D modelling; the practice was already modelling all of its projects and then reverse engineering them into 2D to produce construction drawings. On bespoke one off projects, of the sort young practices cut their teeth on, this approach worked, but it was inefficient and created a lot of redundant information. As architects, we are aware that we can add considerable value through the design process. However the time spent communicating our ideas can eat away at that value. So, as the practice started to mature, and we began to target more commercial work with more challenging briefs, we realised that we needed tools that would make us more efficient. What initially attracted us to using BIM tools was the opportunity to develop a project in a single environment without the waste created by our previous workflow. We also hoped that the embedded quality control and co-ordination of the software would add a consistency and a confidence to our output. This is important for a young practice in order to be taken seriously, especially when employing very talented, but comparatively inexperienced staff at the beginning of their careers.

We have come to realise that small organisations like us have got it easy when it comes to change-management. While the cost is often seen as the barrier to entry (it is

the same for larger practices, only scaled), it's actually the process change that is the real challenge. Here smaller practices have the upper hand, we don't need to convince the board or investors and it's easy for us to overcome internal resistance from staff with a vested interest in doing things the way they always have. So whether you approach BIM through ROI calculations or you act on instinct and experience, a small practice can simply make the decision buy the tools and get on with it.

At DMA the rollout was incremental. In 2007 all workstations were converted to Autodesk Revit and all subsequent new starters got a Revit work station. However the initial purchase is only the beginning. The office has become steadily more sophisticated over the last four years, with an intensive push over the last two. It would have been a considerable challenge for us to go straight to level two BIM without a few practice runs. At DMA we were lucky to be able to cut our teeth on some smaller projects where if it had gone wrong we could have easily reversed out into 2D CAD. We started with some initial training and went straight into a small £1m residential building, using Revit simply to produce the drawings, with no collaboration. This process was repeated a number of times on increasingly larger projects, making particular effort to co-ordinate the digital BIM information with the latest NBS update.





However, there was still a tendency to fall back into AutoCAD on refurbishment projects and sometimes if under intense time pressure. At the end of 2009 we made an internal commitment to use BIM tools on all projects. To facilitate this we hired an in-house trainer and BIM champion. This upped the game immediately and led to our first collaborative models. Our BIM champion developed an intensive but entertaining 6 day training schedule broken down into 40 minute modules. This ensured that staff always had time to complete some training. This was then backed up by a BIM 'Boot Camp' for new starters that involves full immersion with no distractions in their first week in the office. This sets the agenda for how the office would like to work.

More recently the BIM champion role was blown apart, with individual members of the team taking responsibility to explore different parts of the process and share their experiences in office CPD sessions. This has led to us producing our first Quantity-Take-Offs and a FFE Procurement model (linked to Codebook) for our school projects. We have also completed an O&M model for a small student housing scheme and drafted our first BIM execution plans. During this recent evolution we have developed an in-house BIM manual and a BIM Plan of Work which defines inputs, processes and outputs for each of the RIBA work stages.

**How much does it cost?**

A realistic budget for a workstation is around £10,000 once you include hardware, software and training. Even when offset against the cost for a conventional workstation it represents a big investment. DMA have spent £30,000 a year since 2007.

Left  
Visualisation from recent education project

Above  
Investment in change

Right  
Fee income against BIM cost

However viewed in relation to technical staff costs and fee income it starts to look a little less scary. We believe that if you have high quality professional staff it makes commercial sense for them to be using the best available tools.

**What has been the benefit to the business?**

In the current commercial environment the ability to do more for less has been a considerable advantage. Being able to offer additional services outside our traditional scope has helped to differentiate us in a difficult market particularly with services like Quantity-Take-Off. We are also confident that the consistency in our output is generating repeat business, not least because we have been able to drive efficiencies from project to project as our database of standard components has become richer.

Most exciting is that the new process is encouraging collaboration at a micro and a macro level, refocusing the team on the end product rather than just on project trackers and compliance reports. The virtual building is on the team's workstation monitors and the office projector screens constantly, reminding everyone what we are working towards.

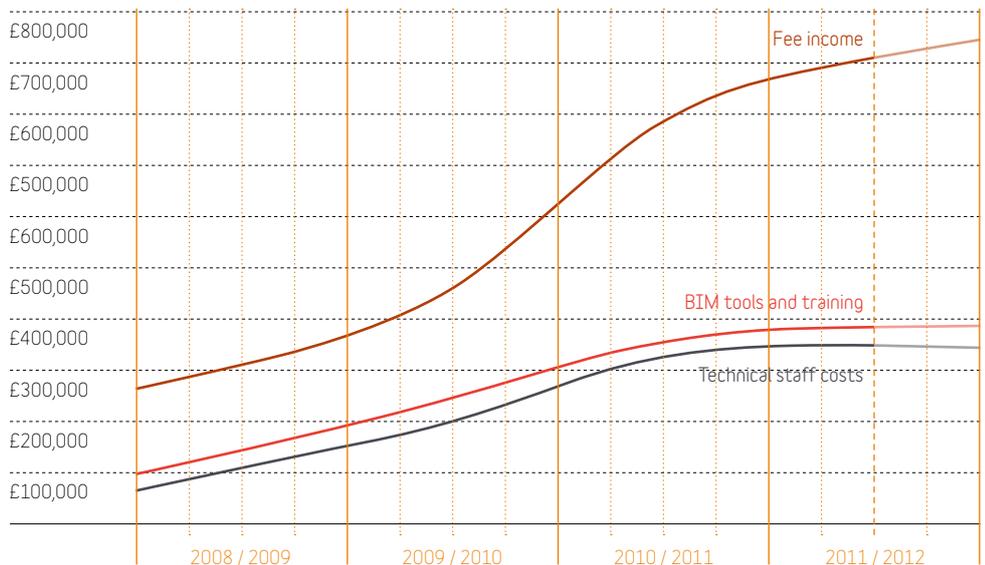
The quality controlled output has undoubtedly given our team confidence while the tools have reduced the drudgery of production of information, enabling staff to punch above their weight, which has improved team morale and motivation.

We are also seeing unpredicted advantages in areas such as stakeholder consultation; users are seeing exactly what they are going to get and this is useful in managing their expectations early on in the design development.

As a further bonus, our new workflow has simplified our internal design management and allowed us to build our office process around BIM. This has impacted on our external accreditations, ISO 9001 / 14001 and Investors in People which have all benefited positively from our BIM workflow.

In a recent review of fee income against technical costs the impact on the business has become clear. Early on, as we were learning the tools, our costs and income remained fairly parallel. However, once we became more experienced and made the full commitment to BIM, our costs have flattened out and our fee income has continued to rise.

By reviewing cumulative construction values we can see the potential impact that this is having on the business. Not only has the office grown from four to 14 people in the last three years, but the size of the projects that we are working on has increased considerably. Whilst some of this growth can be attributed to a young office growing, we believe the quality and quantity of the output due to BIM has had a contribution, particularly to our repeat clients who represent the majority of our workload. ●



# BIM Survey: Summary of findings

Adrian Malleson; Research and Analysis Manager, NBS



## Introduction

In October and November 2011, NBS followed up their 2010 BIM research\* with a further survey. The survey was similar to the last one so that we could make comparisons; we thought it useful to track how people's attitudes towards and use of BIM had changed over the last year.

Once again, we did the research using an online survey. This year there were around 1,000 respondents, more than double the number we had last year. Our thanks to everyone who took the time to respond: it's most appreciated and we do take the time to read and consider all the comments.

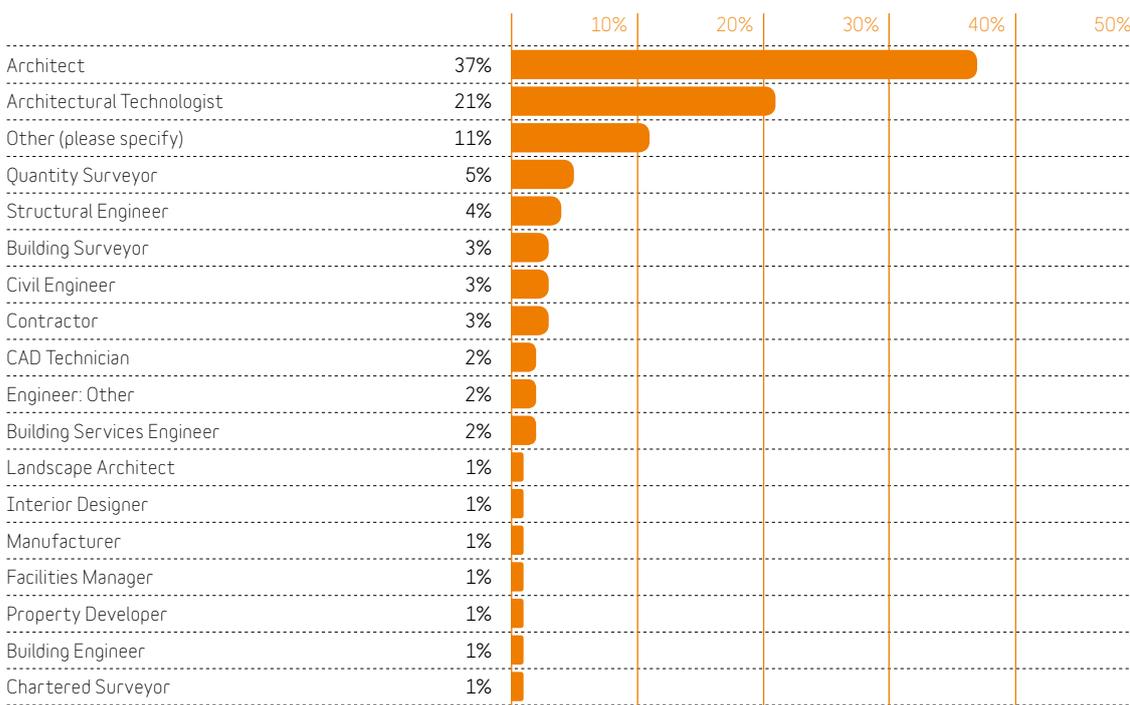
This year, as the numbers reflect, we extended the reach of the survey beyond those we contacted last year. We were fortunate to have the help of various institutes and associations in promoting participation in the survey to their members. Whilst architects are still the largest group, this has resulted in a broader range of participants, as you can see below. We think this is important because

if BIM is to be a tool for collaboration, we need the views of all those in the design team (and beyond). One word of caution, though; because the response sample is different this year, comparisons we make with last year's findings should be read as indicative rather than definitive.

As well as a range of disciplines, the respondents also came from a range of business sizes, with a quarter coming from very small organisations (one or two employees) and 14% coming from very large businesses (more than 500 employees). A majority, 52%, of respondents came from organisations with 15 or fewer employees.

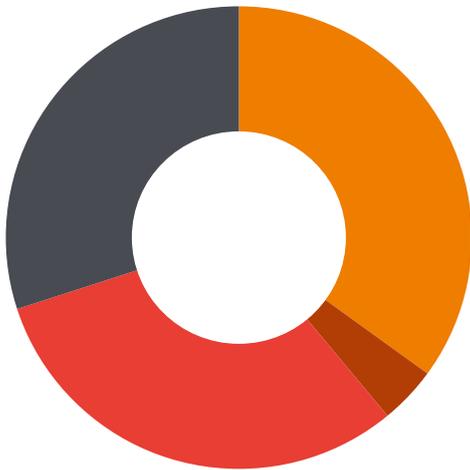
The organisations respondents come from also offer a diverse range of services, with a majority offering specification, contract administration, planning, tendering, project management and Building Regulations services. Three quarters offer a detailed drawing service, whilst half are now offering 3D computer modelling services.

What is your main discipline?



**CAD usage**

Before asking people about BIM, we wanted to get an understanding of their personal CAD usage. Unsurprisingly, we found that most people use CAD in one form or another - but not all. Whilst a third use 3D CAD (though only 4% use 3D CAD only), 30% are using only 2D and 35% are not using CAD.



**CAD drawing: types done**



Usage varied significantly by discipline, for example, 82% of architects and 90% of architectural technologists were personally involved in producing CAD drawings, whilst only 5% of quantity surveyors were.

We also found that, compared to last year, fewer people were not using CAD, (down from 42% to 35%) and more were using 3D CAD (35%), though typically along with 2D CAD. Just under a third only use 2D CAD.

**Use of CAD: comparison**



3D CAD was often described as a central to deep, co-ordinated building documentation, and integral to BIM.

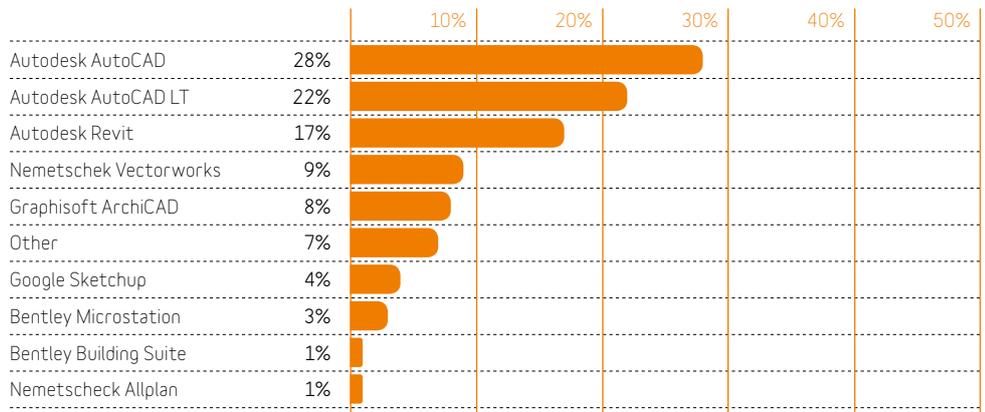
*"I produce drawings in 3D to show detailed analysis of potential clashing of construction items"*

*"BIM is the production of a co-ordinated parametric 3D model of your project"*

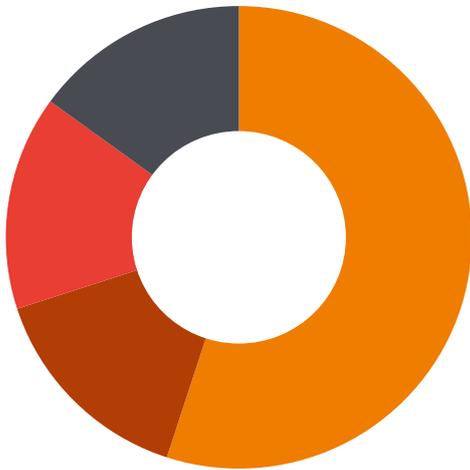
We also asked those using CAD which package they were mainly using. We found that Autodesk, in one form or another, accounted for over two-thirds of the "mainly used" CAD packages.

*"Whilst architects are still the largest group, this has resulted in a broader range of participants... We think this is important because if BIM is to be a tool for collaboration, we need the views of all those in the design team (and beyond)."*

**When producing CAD drawings, which of the following tools do you mainly use?**



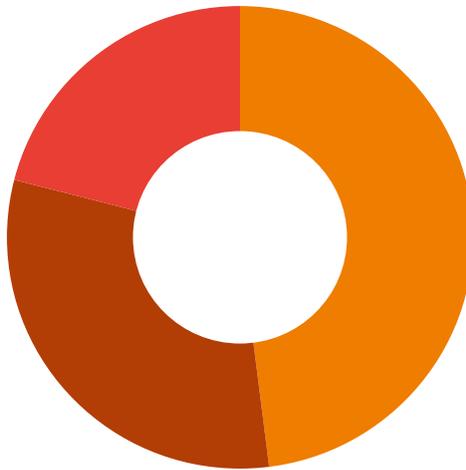
When it comes to the use of object-orientated CAD tools, we find that usage has increased marginally, from 39% of total CAD packages used to 42%, though such a small change may be a result of sampling. We can see the reported share of object-orientated CAD tools in the graph below.



Share of usage between various object-orientated CAD tools

Autodesk Revit	55%	●
Nemetschek Vectorworks	15%	●
Graphisoft ArchiCAD	15%	●
Bentley Microstation/Building Suite	15%	●

“We found that awareness of BIM is not universal, with 21% telling us that they were not aware of BIM. But when we compare the 2011 findings to 2010’s, it’s clear the tide is turning..”



Awareness and use of BIM

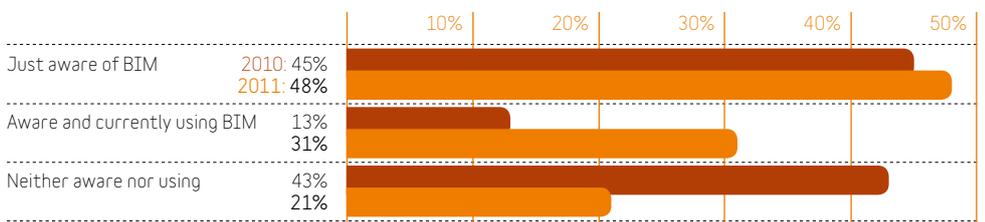
Just aware of BIM	48%	●
Aware and currently using BIM	31%	●
Neither aware nor using	21%	●

**BIM now: current use and awareness**

Again this year we wanted to find out people’s awareness and use of BIM. We did this by asking: “Before taking this survey had you ever heard of BIM (Building Information Modelling)?” We found that awareness of BIM is not universal, with 21% telling us that they were not aware of BIM.

But when we compare the 2011 findings to 2010’s, it’s clear the tide is turning. In 2010, 13% of respondents told us they were currently using BIM. This has risen by 18 percentage points to 31% in 2011. So, more than double the number of people report using BIM this year than last.

Awareness of BIM has also risen. Last year 43% told us they were unaware of BIM but this year the figure has more than halved with 21% telling us they are unaware of BIM.

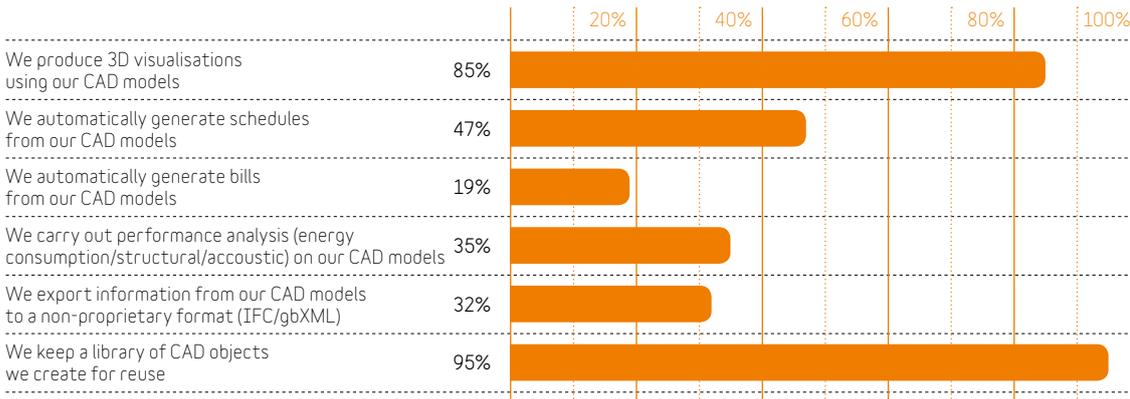


**Uses of CAD Models**

When looking at respondents that say they use CAD, we can see that they are using their models for a variety of different purposes. For example, 35% use CAD models to carry out energy performance analysis, 47% are automatically generating schedules. Almost all respondents, 95%, keep a library of CAD objects, whilst 85% use them to produce 3D visualisations (though not necessarily 3D CAD models). A third of people, 32%, export their information into a non-proprietary format.

“BIM is the future for the industry.’ This increased adoption is a trend people expect to continue... By the end of 2012 three quarters of those currently aware of BIM predict they will be using it on some projects.”

**Your organisation’s use of CAD?**

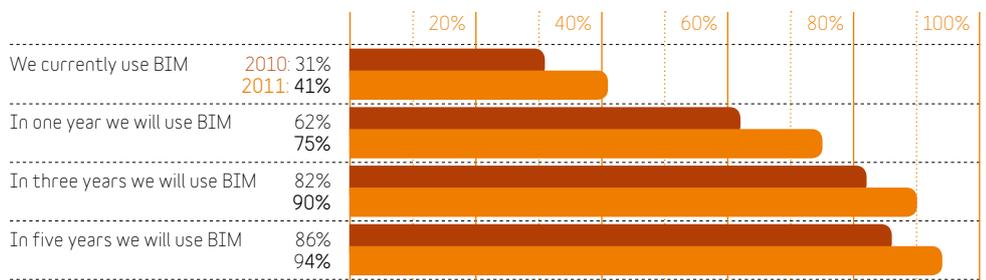


**BIM in the future: predicted use**

“BIM is the future for the industry.” This increased adoption is a trend people expect to continue. We asked **only those who were aware** of BIM whether they expected to be using it for **at least some** of their projects at various points in the future. Three quarters expect to be using BIM in one year’s time, and almost 19 out of 20 people expect to be using it in five years’ time.

By the end of 2012 three quarters of those currently aware of BIM predict they will be using it on some projects. This is more than last year. Having said that, people’s expectations aren’t always realised. In 2010, 62% expected to be using BIM in 2011, but only 41% have told us they are actually doing so.

**Projected use of BIM among those aware of it**



**Attitudes towards BIM**

When we look at respondents' views on BIM, the increase in awareness and adoption is understandable, with 90% agreeing that they "hear more and more about BIM these days", 78% that it's the "future of project information" and almost three quarters agreeing that the government will "make people use BIM for public sector work".

It's also clear that BIM is about collaboration, with 69% agreeing it's "all about real time collaboration".

**"[BIM is] a collaborative process for the design, procurement and operation of buildings"**

On the other hand, there's strong disagreement that BIM is just software or CAD, with only 13% agreeing that BIM is a synonym for 3D CAD drawings, and only 15% agreeing it's all about software (though people's comments suggested a concern that BIM is being equated with software by software vendors).

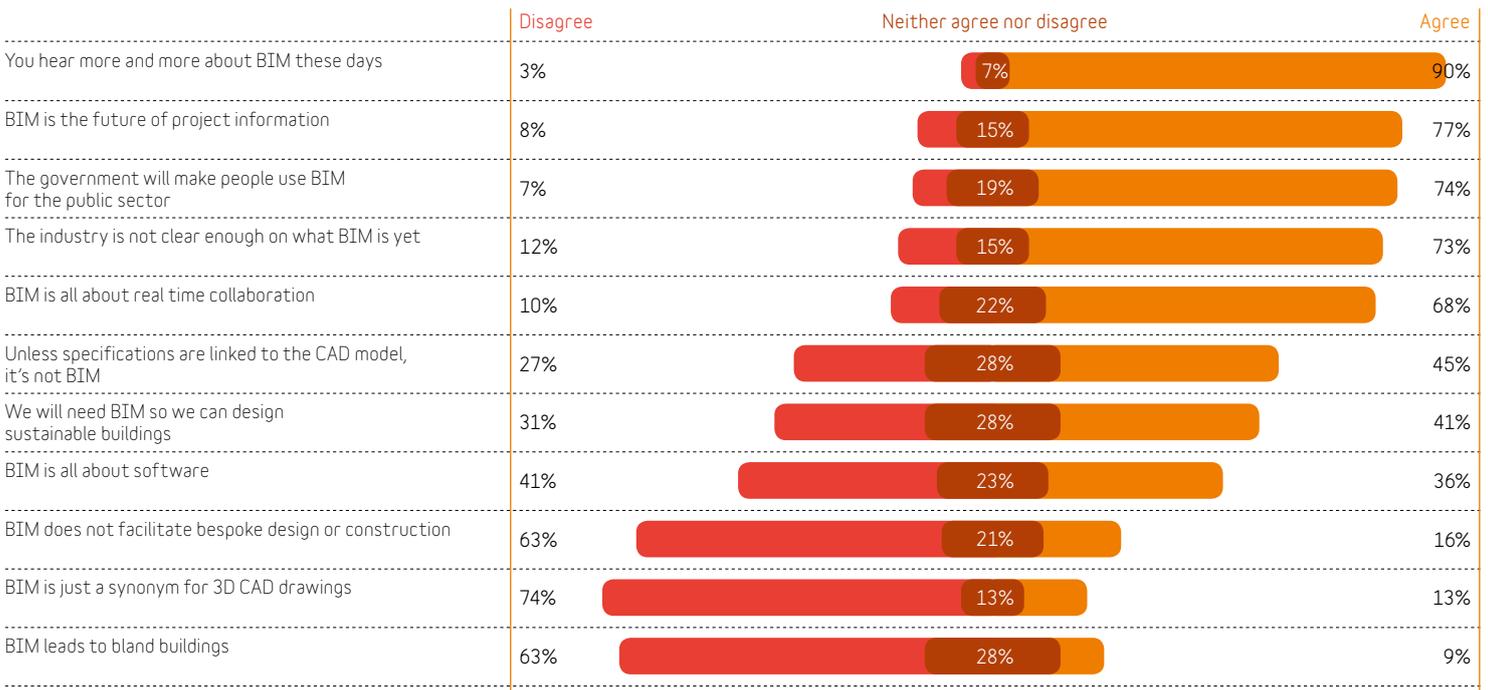
**"The reality is that BIM is a process; it is not a box of software"**

There's no real feeling that BIM is restrictive either, with no strong agreement that BIM leads to bland buildings or stands in the way of bespoke design.

We see again that people continue to agree that the industry is not yet clear enough on what BIM is, with almost 4 out of 5 agreeing.

**"BIM is still a very misunderstood subject"**

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



**"There's no real feeling that BIM is restrictive, with no strong agreement that BIM leads to bland buildings or stands in the way of bespoke design. We see again that people continue to agree that the industry is not yet clear enough on what BIM is"**

**BIM: expectation and reality**

Why not adopt BIM? Broadly speaking, people anticipate BIM being a positive move, and it often turns out that way. So what stands in the way? We asked people who had not adopted BIM, but who were aware of it, to answer a couple of questions, shown below.

“The construction industry is experiencing one of its worst contractions and this is having an effect.”

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



The construction industry is experiencing one of its worst contractions and this is having an effect. When asked, 48% say they “need to get through the downturn” before looking at BIM and 63% agree that BIM is “too expensive”.

“I am concerned about the financial and time commitment from a small practice”

“The industry is in a mess”

Further, some small practices saw BIM as unnecessary or as a threat:

“As a sole practitioner, I generally work on small scale residential projects and do not see any fundamental benefit in changing to BIM”

But other small practices are more hopeful:

“For me, as a sole practitioner with aspirations to grow into a small practice, it's all about working smarter - doing more for less”

Other respondents feel the downturn may be just the time to adopt BIM:

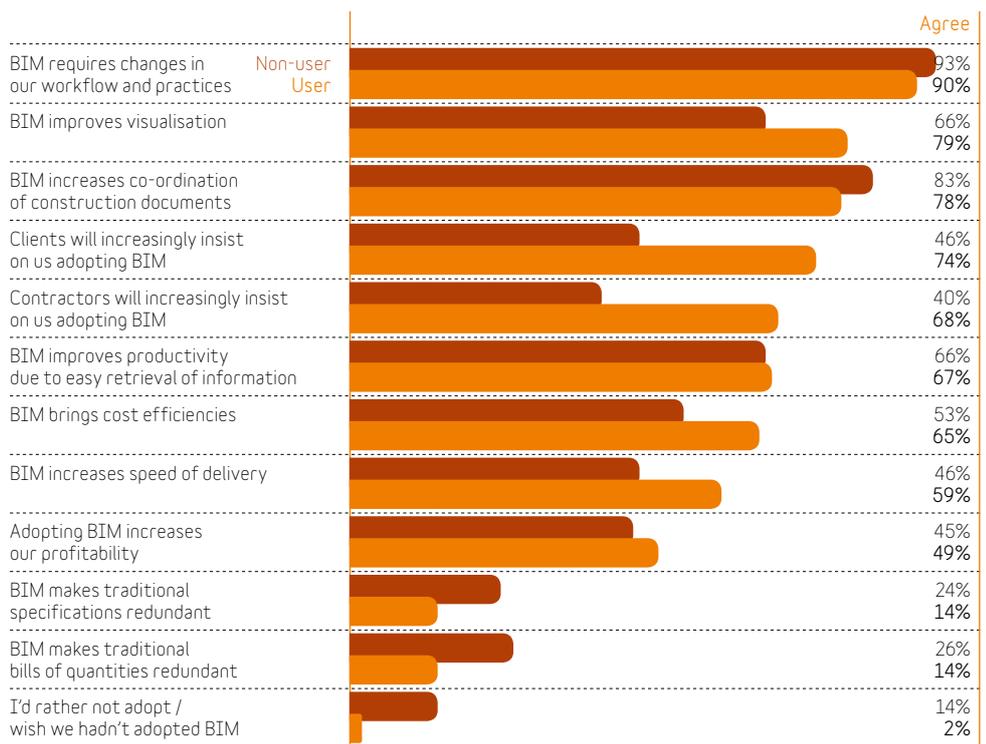
“Although the downturn has made it difficult to afford the changeover to BIM software, it is also a good time to make the move in order to allow the time for training and implementation”

We were able to compare the views of those who had already adopted BIM, for at least some projects, and those who were aware of BIM, but had yet to adopt it. This helps us understand how expectations compare to experience.

What we found suggests that adopting BIM, very broadly speaking, turns out better than people anticipate. The negatives are less negative and the positives more positive.

**Attitudes towards BIM.**

A comparison of those who use it, and those who don't



**“BIM is worth the initial effort, investment and training”**

Clearly adopting BIM requires changes in workflow, practices and procedures, but those changes have generally brought about greater benefit than people anticipate.

**“Adopting a BIM process requires a significant adjustment to the way many tasks are undertaken in the industry”**

Several respondents stressed that this adjustment was not about software or systems but about people's practices:

**“Adopting BIM is all about the people and training”**

It's also clear that BIM increases co-ordination and productivity through information retrieval, though the expectation is closer to experience here.

Once BIM is adopted though, it's clear that it makes neither bills of quantities nor specifications redundant.

Those who have adopted BIM are more likely to agree that BIM brings improved visualisation, cost efficiencies and speed of delivery. They are also more likely to agree that external demands will be made for BIM to be adopted, whether from clients or contractors. If this is the case, those not adopting BIM may be putting themselves at a competitive disadvantage.

**End note**

The use and awareness of BIM is increasing, but the current economic situation and cost stand in the way. From those who have adopted BIM, it looks like BIM presents real commercial opportunities and the current climate might be the right time to adopt.

**“As part of a larger architectural organisation, BIM is being considered very seriously. A few of our partner offices are beginning to use BIM, have been asked to use BIM by clients and will need to use BIM in bidding for large or public projects”**

Very few people wish they hadn't adopted BIM. Some who haven't, a small minority, would still rather not. Yet looking at the assessment of those who have adopted BIM, perhaps the transition process is not so onerous and the rewards may be greater than first thought.

Last year we suggested “BIM is the future... It looks like it might pay to get on board sooner rather than later”. We might now say that BIM is increasingly the present and it might be best not to get left behind. ●

**“Last year we suggested ‘BIM is the future... It looks like it might pay to get on board sooner rather than later’. We might now say that BIM is increasingly the present and it might be best not to get left behind.”**

# What will BIM mean for design fees?

In the 1980s, the construction industry disposed with typewriters and drawing boards and adopted computer software to produce construction documentation. Now, another revolution is happening in the industry that is producing a step change in efficiency and accuracy. This revolution is called Building Information Modelling (BIM). In this article, NBS Head of BIM, Dr Stephen Hamil discusses what this will mean for design fees.



At our 2010 NBS BIM conference, the Head of BIM for a large UK commercial client told the audience of 200+ architects that, through the adoption of BIM, they anticipated that they could reduce the design fees they pay. This wasn't particularly well received. Who knows exactly how BIM will change the industry, but my personal view is that those designers who adopt BIM may actually see their fees **increase**.

Who benefits most from quality digital information being transferred through the construction timeline from briefing, through design and construction and then ultimately to the owner-operator of the building? The general consensus is that the owner-operator will benefit most. Consider the following:

#### Energy in use

The amount of energy that is consumed each year by a building accounts for the majority of the running costs. Through BIM, building design and thermal calculations can be analysed and energy-use can be significantly reduced; for example, through improved design of the building fabric and services, use of renewable energy and even through simple decisions such as the building's position with respect to its environment. Other less obvious opportunities here include the easier interrelation of services that react to the presence of occupiers and intelligently learn from the actual use of the facility.

#### Maintenance

No longer will clients be provided with a big-box-of-paper following the construction of their buildings. They will be provided with high quality digital information that they can use to help with the maintenance of the facility. For example, how often the carpets need to be cleaned and when they need replaced, how often the intruder alarm needs testing, how many chairs of a particular type should exist in a particular space. Having this information digitally will ensure that maintenance happens to an optimal schedule. It will also allow clients to have maintenance staff that can work in any of their building and not simply rely on a single staff member who mentally stores the operating knowledge.

#### Informed decisions

Through modelling the building at design time clients may make informed decisions about the quality of the products that get installed in their facility. The old saying "Buy cheap, buy twice" can be numerated. Is it better to spend

£10,000 on a floor covering system that will need replacement after five years, or £15,000 on a system, that will need replacement after ten years?

What makes these savings even greater is the fact that a building may be in use for hundreds of years. Any annual savings are multiplied many times.

The construction team also benefits from an integrated BIM provided by the designers. For example:

#### Purchasing

A list of all construction products in a digital, automatically generated report allows contractors to purchase in bulk and quickly select products that comply with proprietary, prescriptive or performance specifications.

#### Clash detection

The cost of correcting a clash between the structure and the services on the construction site can be significant. Research into this indicates this could cost as much as £3,000 per clash<sup>2</sup>; in the situation where there are multiple clashes per story on a multiple-story building then these costs quickly escalate. However, the cost of detecting and fixing a clash between structural elements and services at design-time is insignificant.

#### Reduced requests for information

Incomplete or badly co-ordinated construction documentation results in inevitable requests for further information by the construction team. This, in turn, has a cost – any rework to design once construction has started has a greater expense. The use of BIM allows the building to, in effect, be constructed twice, once digitally at design time and a second time as the physical building.

So, is the suggestion of reduced design fees unfair? Can clients demand a construction process that will: (a) give them and the construction team significant cost savings; (b) be a more holistic service – and yet (c) provide less remuneration to the design team? I think the answer to this is a comprehensive 'no'. For the design of a building which will deliver all of these benefits, the design team must receive an increased fee for their extra effort and their openness in delivering quality design in the format of transferable digital information.

#### References

1. Laura Handler, Tocci Building Corporation  
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“For the design of a building which will deliver all of these benefits, the design team must receive an increased fee for their extra effort and their openness in delivering quality design in the format of transferable digital information.”

I have attended a number of BIM conferences in the last few years, and one of the finest illustrations of the benefits of BIM is “the BIM, BAM, BOOM” benefit from buildingSMART presentations. This shows that £1 (or pound as we say in the UK) extra spent on design is the equivalent to £20 savings in construction and then £60 savings in operation<sup>2</sup>.

However, (and there is a big however), clients are entitled to reduce their design fees where they build a similar building multiple times. For repeat work, lessons must be learnt and savings must be made. A common quote when it comes to BIM is Albert Einstein’s “insanity is doing the same thing, again and again, and expecting different results”. With BIM, it is very easy to create digital templates and to standardise common elements of a building, such as the specification and geometric components. For similar repeat buildings the BIM template can be continuously refined – the lessons learnt from a previous building can feed into a detailed brief for the next building. Through the use of standardised digital construction templates, savings can be made and designs can be improved. This is true at different levels, whether it is national standard content that is maintained and updated centrally, or specialist knowledge specific to a particular client, contractor or design company. Some may say that we have always been able to do this, but with BIM we can now do this **smarter**.

So, in conclusion, designers that adapt and adopt BIM may see their design fees rise – the value they add to the construction process is significant and they should be rewarded for this. However, where designers get repeat business off clients for similar projects, then fees will reduce but, through the use of BIM, these projects will be produced efficiently and the margin for all members of the construction team will be raised. Ultimately, the fees a professional can charge are a reflection of the value that they add to the project; by building BIM models, running simulations, designing out clashes and waste, and handing over usable asset data, designers are offering significantly more value to their clients than they can by traditional design methods. It is up to the architects and engineers to demonstrate this to clients and receive fees in proportion to the value they add. ●

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Patrick MacLeamy. Chairman, buildingSMART International and Chief Executive Officer, HOK  
Architects have traditionally been compensated for time spent designing and documenting building projects for clients. Being paid for time spent is not a value proposition.



Instead, architects should help clients understand the value of their design work – and be compensated for the value created, not the time expended. By leveraging their use of the BIM, architects can learn to clearly show the value created over the life of the building. For example, the energy savings over a building lifetime, or the maintenance savings due to property selection of materials.

In this way, the architect becomes the client’s partner during the life of the building instead of the midwife during the creation.

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Mark Bew. Chairman UK Government BIM Group and Director, Engineering Construction Strategies Ltd  
For BIM to be a success there has to be a win for all. The transparency of data that BIM brings gives us all an opportunity to look at what we do and the value we add to the delivery of assets. For the clients’ part, they need to be clear as to what is needed and what is not. The COBie drops specified in the BIM strategy are very clear as to the requirements, designers must work out how to use the tools effectively to deliver what is needed rather than what the technology is capable of. Over design at the early stages stifles innovation and adds cost, we must all focus on the commercial needs of the project and ensure we deliver high quality low carbon, best value assets.



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Angela Brady. President, RIBA  
The transparency of data that BIM brings will radically change the way architects’ work is done, bringing additional effort and costs into the earlier stages of the RIBA Plan of Work (Stages A–D) but, if done effectively, producing greater efficiencies and client value in the later stages of the design and construction process. Therefore the stage payments of the design team’s fees will be more ‘front loaded’ across the RIBA Plan of Work stages.



The additional equipment, skills and efforts required for BIM and building full electronic design and construction models may increase the fees of designers, but produce much greater cost and time savings to the constructors and clients, making it worthwhile for everyone.

# BIM collaboration and engineering – many heads are better than one

With experience in both contracting and consulting in the UK, Australia and New Zealand, Hannah George's work has spanned both design and construction in sectors including health, corrections and data centres. Many of these projects have naturally involved working closely with end users and owners of buildings and facilities. Driven to develop better and more efficient ways of working, communicating and delivering build projects using technology into operation, BIM has become a natural focus.



## Collaboration or extinction

Today we live in an information-rich world. A traditional 2D drawing to BIM is the hardback encyclopaedia to Wikipedia or even Web 2.0. The text is comforting and familiar but lacking in depth and perspective – we know we're only getting part of the story.

Intuitively BIM makes sense, the benefits being particularly clear to owner operators like government organisations with the long term use of a facility, and its multifaceted data central to a build project.

An evolutionary step change is taking place. Slide rule at the ready, we are doing battle with antiquated and inefficient processes involved in building design and construction. There is much to gain.

As with any project, the goals and objectives must be set out at the outset. Is the BIM process to deliver a detailed cost model? Is this model to be used ultimately with facility management? Effective planning is essential.

All members of a project team from client to builder must understand what is to be achieved in totality, at key project stages and even on a weekly basis for team co-ordination.

To bring together the information and engage in BIM, effective and co-ordinated collaboration is essential. The BIM environment of databases, models, and interfaces is highly structured. Time and effort placed in planning the BIM processes upfront, determining relationships and interdependencies, is well rewarded throughout the life of the project.

Design co-ordination in the digital age requires more than a friendly latte with the architect. Regular data exchange keeps the team working from the same basis. Few project teams are able to work from a single model due to size of files or location of team members.

The virtual building comprises many different elements. The main models are typically divided along traditional lines of architecture, structure and services, though this depends on the team member's roles and the size and type of the building. Each of these models may then in turn be divided into smaller pieces for ease of handling, such as façade and cores or mechanical and electrical. With a snapshot of the design available at any time from the central co-ordinated model, other members of the project team can step in to contribute or extract information.

Collaboration is not limited to the design team, and the use of BIM processes is growing and varied.

Augmented reality has stepped out of Minority Report and landed in the design office. With an engaging virtual environment at hand, end users and other stakeholders can step into their new office, school or home. Wandering the office with an iPad outstretched may not be a mere amusement, but actively immersing in this virtual building.

I myself look forward to meeting my client in this virtual world to discuss what they want for the virtual meeting room we are standing in, or approving equipment in-situ in the virtual built environment. Red or blue pill? It once was science fiction.

“If everyone is moving forward together, then success takes care of itself.”  
Henry Ford

#### Engineered success

BIM has brought the black art of building engineering out into the light of day. If it's achieved nothing else, it makes pipes, ducts and steelwork attractive and accessible.

Humour aside, it's quite apparent that a 3D model communicates the end result like no single line diagram ever could. That alone is a great benefit to the engineer, their client and the team.

Co-ordination between designers or trades is enhanced by clash detection techniques provided by BIM software which form part of regular co-ordination of models. Early on the design rules are more relaxed, tightening up as detail and accuracy increase. The ability to detect conflict between whole models in an automated and regular fashion means that issues are raised and resolved promptly. The same level of detailed co-ordination is traditionally only achieved at major project stages, potentially resulting in considerable re-work.

Many industry reports, including those produced globally by McGraw-Hill, have indicated that engineering firms have gained less, if not the least, in moving to BIM. As it's an industry-wide change and all design team members on a BIM project must be using compatible software and systems, for most this is a non-issue. Perhaps only for some the question remains when.

For those early adopters there have been significant costs involved in developing standard processes, libraries of equipment and components. There is still benefit and efficiency to be gained from industry standardisation and sharing of this information through the supply chain.

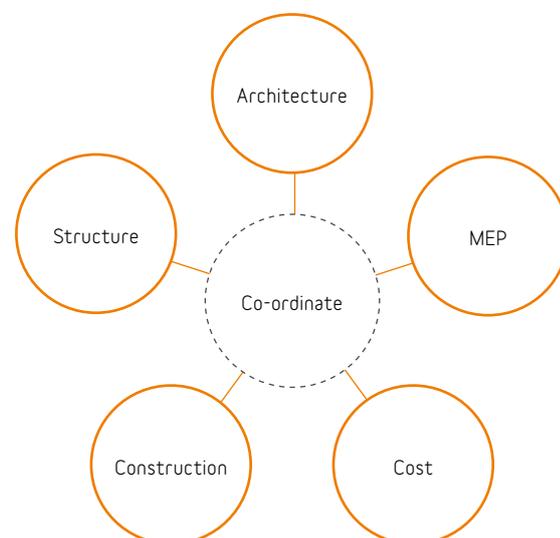
The data set for a boiler, switchboard or other item of equipment needs to be able to flow from manufacturer to operator and facilities manager. Similarly, the design model should transit seamlessly to the contractor or sub-contractor. As many of the smaller parties downstream of the design process are not prepared for BIM, almost all designs produce duplicate deliverables. Producing traditional 2D drawings in addition to a unified model does incur additional costs to the design team and remains an area where efficiencies could be made.

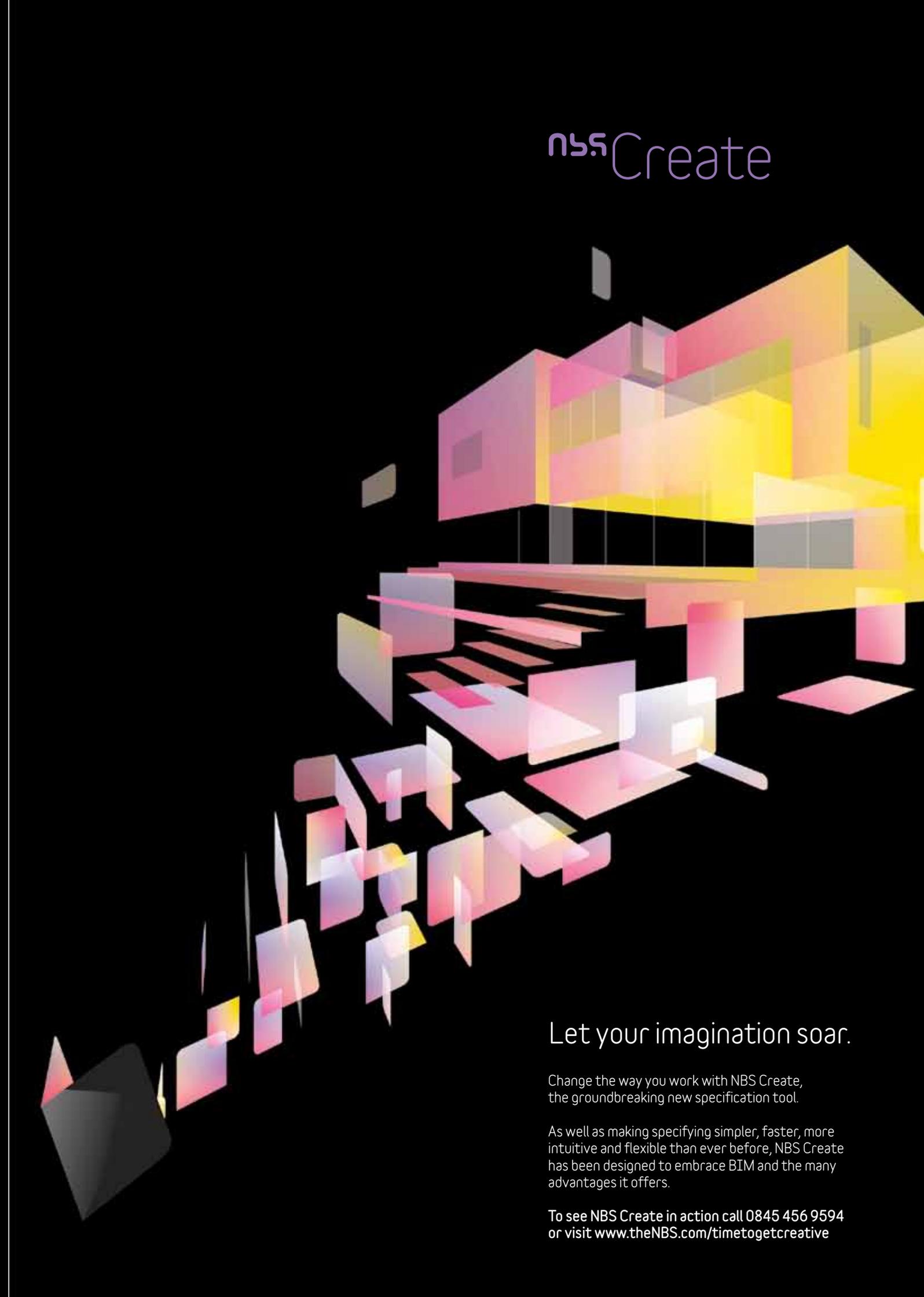
Breaking the BIM chain does risk not delivering the full potential of BIM to the end user, and in a committed BIM project this is simply not an option.

I have always had a special place in my heart for Operating & Maintenance Manuals, like only an engineer could. If an installation is not documented, then it might as well have not been completed, in my mind. That said, I think many owners feel the same.

The attention to detail, co-ordination and documentation that is paid to a building design with BIM has the ability to produce a real environment to satisfy owner, occupant and a fastidious engineer alike. ●

“In the long history of humankind... those who learned to collaborate and improvise most effectively have prevailed.”  
Charles Darwin





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