

Urban Planning and BIM

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Executive Summary

There is significant potential for the urban planning system to support the roll-out of DBB and BIM. Equally, the aims and objectives of urban planning in the UK can be supported through an engagement with BIM.

There are three areas where this potential seems particularly strong. Specifically, how:

- National planning policy can be better delivered through BIM (e.g. reducing waste and creating more sustainable development).*
- Planning can help deliver BIM and the roll out of DBB objectives particularly around wider stakeholder engagement (e.g. shaping demand and optimising supply as well as building and service users).*
- Planning can help the further roll out of BIM through requiring certain kinds of development are submitted using BIM approaches thereby accelerating its take up and use.*

Notwithstanding this potential general awareness of BIM within planning was low to non-existent despite national and local planning seeking to support the digital infrastructure and the concept of Smart Cities.

Various recommendations for developing the relationship between urban planning and BIM are made throughout the report along with the need for further work in certain areas.

The main recommendations include the need for Government to publish national policy on BIM and planning to help align the objectives of BIM and planning and ensure that local areas were aware of the needs and benefits of BIM.

Further work is needed to explore how consultation at the plan making and decision-making stages of planning can use BIM to help widen involvement and speed up changes to schemes.

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1. Introduction

The potential advantages of Building Information Management (BIM) are widely known and include unlocking 15–25% savings to the global infrastructure market by 2025. However, as the EUBIM (2017) Taskgroup point out, there are also environmental benefits, such as more accurate material ordering leading to less waste to landfill and optimised simulation of energy analysis leading to lower energy demands from the built environment. Social benefits can be delivered to the public infrastructure owner by utilising BIM effectively in public planning and consultation to build support for new or updated public infrastructure, such as highways, water resources or public building refurbishment. This public engagement can support public infrastructure that is well designed and aligned with the needs of the local community resulting in improved social outcomes such as better resource planning, greater use of public facilities or mapping and protection of architectural historic heritage. In the UK such social, environmental and economic aspects of development fall within the remit of urban planning yet there has been little discussion or engagement with how the planning system might help deliver BIM. This project helps address that gap.

Urban planning shapes the built environment through setting out policies and strategies for development across a wide geography and then regulating that development on a site-by-site basis in line with those plans and strategies. Planning policies and plans reflect analysis of societal trends including demographic change, technological change, transport options, climate change and economic growth. Development includes new buildings as well as changes to existing buildings (retrofit) and associated infrastructure such as roads, public transport, schools, hospitals, etc. Therefore, the planning system potentially has a key role to play in the roll out of BIM in the public and private sector as well as ensuring that wider social and environmental benefits are realised.

The report aims to:

- a. Understand the extent to which the UK planning system is engaging with BIM at different spatial scales (e.g., individual building, development scheme, city, region),*
- b. Explore how the planning system could better help deliver BIM, and*
- c. Inform local and national policy settings and actors about the role of urban planning vehicle for BIM.*

The above aims are linked to the approach outlined in Table 1.

Table 1 Research Methodology.

Aim	Method
<i>a – current engagement with BIM.</i>	<i>Analysis of existing practices and policies in national guidance, regional and local strategies and plans and individual development proposals. Assessment taken from sample from a representative range of areas (e.g., metropolitan, urban, rural) and geographical spread. Review of existing literature and research on planning and BIM.</i>
<i>b – potential to further deliver BIM through planning.</i>	<i>Assessment from semi-structured interviews with key planning and development stakeholders in the public and private sectors to gauge current awareness, understandings of and engagement with BIM alongside assessment of exploration of possible future engagement and integration.</i>
<i>c – Inform policy and policy makers and make recommendations for change.</i>	<i>Report for the Centre for Digital Britain Website setting out findings and making recommendations; identifying areas for further research.</i>

Throughout this report analysis and the views of key stakeholders is provided in text boxes alongside recommendations. This report is structured as follows. First, we outline the nature of BIM and the aspects of it that relate to the UK planning system before setting out an outline of how the system works and its objectives, including the approach to major infrastructure development. This analysis highlights a number of areas where planning can support the further roll out of BIM and where BIM can help achieve the objectives of planning. The next section begins to develop these two themes in greater detail through documentary analysis and discussions with key stakeholders in planning and development. We then present an analysis around the current awareness of BIM within urban planning through documentary analysis and discussions with key stakeholders before making a number of recommendations on going forward.

2. What is BIM and how might it relate to urban planning?

In this section we outline what BIM is and the Digital Built Britain (DBB) strategy in order to identify how it might relate to urban planning.

There is a great of interest in and activity around BIM though less clarity about what it is and how it is evolving. At its basic BIM is a process for generating and managing digital representations of buildings and places. These digital representations – usually in common file formats – allow the representations to be exchanged and shared between different stakeholders. There are a range of advantages including cost and time savings as well as improvements in the quality of social and environmental outcomes through the use of BIM. The UK developed standards for BIM implementation in 2012 in its Industrial Strategy, following the start of the BIM ‘revolution’ in 2010/2011. At the European level a technical committee has agreed to provide standards for the construction industry around information in the built environment. From October 2016 these so called buildingSMART international standards were officially adopted (CEN/TC 442: IFD (ISO 12006-3:2007), IFC (ISO 16739:2013) and IDM (ISO 29481-2:2012). The UK was a driving force in setting up the EUs BIM Taskforce, which provided a handbook aiming to support the public sector in delivering BIM.

BIM is a key part of the UK’s Digital Built Britain Strategy which aims ‘to create a digitally enabled information landscape which will allow the optimisation of the built environment throughout the construction, manufacturing, maintenance, operations and decommissioning phases’(CSIC and IFM, 2017: i).

The current aim of DBB is develop BIM to what it terms 'Levels 3 and 4' moving beyond construction efficiency to information to support the growth of current and future cities. The UK government sees BIM as allowing the public and private sectors to do more for less, operate buildings for less, optimise service provision, improve quality of life and help grow the UK economy.

BIM is the mechanism through which the DBB Strategy and aims will be achieved though the broadening of the scope of DBB to the city scale and beyond includes wider, social and environmental aspirations. This will involve optimising the demand for new buildings, infrastructure and services through, for example, taking into account the needs of users, both of the building and the wider community. It will also involve influencing the wider supply of buildings and infrastructure by seeking greater efficiency and effectiveness.

3. The UK Planning System

In common with all other development countries the UK has a system of planning that controls development, including changes of use of land and buildings in the public interest. There are a variety of definitions and understandings of the purpose of the UK's planning system¹ that vary depending upon one's perspective though the government's view is that the purpose of the planning system is to save what is best of our heritage and improve the infrastructure upon which we depend for a civilised existence (Planning Portal, 2018).

The system itself is organised broadly in two parts though there is a distinct approach to major infrastructure. These three elements are outlined below.

3.1 The Policy Framework.

The UK system is divided into a multi-scalar policy framework within which decisions are taken on individual development proposals. 'Development' has a legal definition which includes building, engineering and mining operations as well as changes of use of buildings or land.

The policy framework is comprised of a number of distinct though (in theory) related documents. There are a range of policy influences on UK planning at the European level though these are limited due to no specific EU competencies in planning. Instead, there is regional policy and financial support for development, regeneration and infrastructure policy competencies at the EU level. In addition, there are a range of sectoral policies around transport, the environment and agriculture that have implications for planning. While most of the EUs policies take affect through financial incentives (e.g. transport, energy and agriculture), environmental policies provide a regulatory framework for protection. The INTERREG programmes have sought to provide overarching spatial 'visions' for particular areas such as the Baltic Sea though these are non-binding and are more concerned with linking together sectoral policies rather than providing a future orientated plan for the area. An exception is the relatively new Maritime Spatial Planning Directive, which requires the development of Maritime Spatial Plans until 2021. The UKs high number of planned in offshore windfarms, reflected in its Maritime Spatial Planning could play a role in making use of BIM. Overall, however, the EU level provides a 'loose' policy framework for UK planning.

¹ Whilst there are differences between the planning systems in different parts of the UK, particularly between England and Scotland, there is enough broad similarity to refer to the UK planning system in the singular.

At the English national level there is the National Planning Policy Framework (NPPF)², first published in 2012. Supplementary Planning Practice Guidance is also published in specific areas such as minerals, noise and health. Along with sectoral policies around, for example, transport, housing and energy, the NPPF constitutes non-spatial planning policy, i.e. it does not directly link 'policy' with 'place'. These national policies must be taken into account when preparing Local Plans and Neighbourhood Plans (see below) but do not dictate policy at the local level. This advisory relationship between national and local level planning policy is one that sets the UK apart from other jurisdictions. In most countries there are legally binding plans that permit development that conforms without the need to obtain separate permission. In the UK national and local planning policy is a material consideration in determining proposals to undertake development. This approach allows for flexibility and discretion in decision making on individual proposals. It also allows for plans to take into account new and relevant issues such as BIM without the need to change policy³. However, it means that a Local Planning Authority can decide not to engage with an issue such as BIM. At present BIM is not mentioned in national level policy so there is a lack of awareness of and engagement with the issue locally.

3.2 Major infrastructure Planning

There is a separate planning policy framework and legislation for nationally significant infrastructure projects such as power stations and major transport schemes. The process aims to streamline the decision-taking process for these major and complex schemes, making it fairer and faster for communities and applicants alike.

A series of National Policy Statements set out national policy on different types of nationally significant infrastructure. There are thresholds above which certain types of infrastructure development are deemed to be nationally significant.

Stakeholder Analysis – National Planning Policy.

Discussions with key stakeholders highlighted that national planning policy had an important role to play in ensuring that DBB and BIM were material considerations in the planning process. There was some suggestion that a national DBB strategy could be referenced in the NPPF accompanied by the requirement that local planning authorities include local BIM elements their Plans. Others felt that a separate and bespoke Planning Practice Guidance be prepared which would achieve the same effect but with specific reference to planning.

Recommendation.

The Government should publish a Planning Practice Guidance on DBB and BIM. This Guidance would signal the importance of BIM and ensure that Local Planning Authorities consider the ways in which planning can

² There are equivalents in the devolved administrations of Scotland, Wales and Northern Ireland.

³ This particularity of the UK planning system leads a more diversified set of stakeholders involved in delivering BIM with a huge importance on developers and investors. Other countries, such as Germany or Sweden have incorporated BIM standards in public development projects. For examples on European experiences see CDBB mini project "Future Cities and BIM".

help delivery the aims of DBB and BIM in their Local Plans and development control decisions. Similarly, the Government should include BIM as part of its approach to National Infrastructure Planning.

Recommendation. *The opportunities and advantages of the use of BIM in new construction have been identified by a number of consultancy reports, and reviewed by the EUBIM Taskforce. In order to make use of BIM Level 3 and 4 for urban planning and digitalisation of different elements of urban systems, a further exploration is needed concerning how and under what circumstances BIM can be considered for the existing building stock e.g., (retrofit and renovation). This could include an analysis how the construction regulations and the planning system can incentivise the uptake of BIM in renovation processes.*

3.3 Local Level Policy.

Local Plans are the main local policy documents through which local planning authorities can set out a vision and framework for the future development of the area (Table 2). In doing so authorities must engage with their communities. Plans look across a range of policy sectors to set out needs and opportunities in relation to housing, the local economy, community facilities and infrastructure. Plans aim to protect the environment and promote sustainable development, including adaptation to climate change and help secure high quality accessible design. Overall, the Local Plan provides a framework within which decisions on development are taken, providing a degree of certainty for communities, businesses and investors. Plans are not binding but indicative. Neighbourhood plans provide the opportunity for local communities to prepare plans for their areas covering a narrow or wide range of issues. Neighbourhood Plans need to conform to policies in Local Plans and have to be approved by a referendum of those in the area.

Local Plans are key vehicles for the further roll-out of DBB and BIM given the position at the nexus of national policy concerns and local needs and issues. However, Local Plans are prepared by Local Planning Authorities, usually district or unitary councils or boroughs in London. These local authorities can be based upon boundaries that do not provide effective functional spaces for planning some policy sectors such as housing: travel to work areas around a town or city might and often do extend beyond local authority boundaries. Whilst Local Planning Authorities are required to cooperate in the preparation of Local Plans this is often made more difficult by differences in timing of plan preparation. Elements of the built environment, particularly infrastructure, that have beyond local impacts provide a particular challenge to tightly defined local authority boundaries.

Table 2 The process for preparing and adopting a local plan



Stakeholder Analysis – Local Planning Policy.

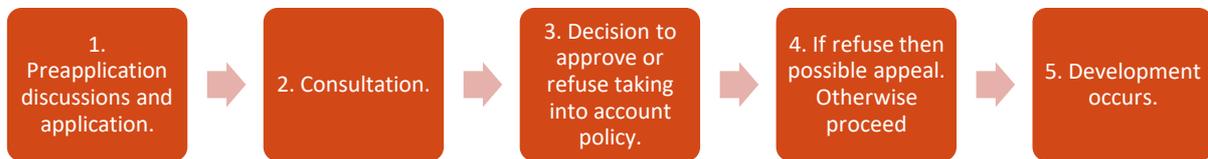
Local Plans were felt to be an ideal mechanism through which to develop policies to help the roll out of BIM. There is an obvious overlap between the focus and aims of BIM around the built environment and the roll of Local Plans in providing information and coordination for regulating change in the built environment. The process of plan making (Table 2) was felt to be suitable to take BIM on board and better coordinate how change in the built environment supports BIM and DBB more generally. Local Plans are legitimised through public consultation though the process also allows for greater coordination and involvement of a wide range of stakeholders. As far as the aims of Levels 3 and 4 BIM are concerned this process would allow for inputs into user needs and wider social goals. However, it was felt that the inclusion of BIM through Local Plans would need to be approached with care in order to avoid delays in plan preparation. Inclusion would also require a national commitment, as discussed above, in order to ensure that the roll out was consistent across local areas and to help overcome any 'boundary issues' between local authorities.

3.4 Development Control.

The accompanying pillar of the planning system to the national and local policies contexts is the regulatory dimension that assesses and determines proposals to undertake development with reference to policy. Most planning applications are dealt with at the local level and decisions are made in accordance with policy, national and local⁴. The process varies depending on the kind of application (e.g., major proposals involve greater consultation and involvement of other public bodies) and the area (whether the area is a National Park, for example) but the basic process remains the similar (Table 2).

⁴ *The exact relationship between plans and decisions is a complex one and there is a good deal of case law on the point. Broadly, decisions should be applications for planning permission must be determined in accordance with the development plan unless material considerations indicate otherwise. Material considerations includes matters such as a change in circumstances since the policy or plan was adopted.*

Table 3. The process for approval planning application.



Decision makers can take into account any matter that relates to the development of land. Beyond the principle of whether development should occur planning considerations are largely concerned with external physical matters, such as appearance, the relationship between buildings or other factors such as building density, landscaping, parking provision, etc. Matters internal to buildings, such as room sizes, configuration, etc. are normally less of a concern or are covered through Building Control regulations. However, providing there is a land use justification then matters internal to buildings can be a planning consideration.

3.5 Conditions and requirements.

The planning system can shape development proposals but also seek to mitigate the impacts through the use of conditions or financial contributions from developers. Financial contributions can be used to fund a wide range of infrastructure needed to support the development of the area. A developer may also be asked to enter into a planning obligation to, for example, undertake works, provide affordable housing or provide additional funding for services.

Stakeholder Analysis – Development Control.

The development control process seeks to ensure that national and local policy are given effect. There is considerable discretion in the UK system to ensure that a range of factors are taken into account. This could include ensuring that development takes forward BIM. There was a feeling from stakeholders that development control had could do more than simply implement policy given that proposals are unique and BIM requirements may differ depending on a range of factors and circumstances. The ability to combine a general policy with individual circumstances was felt to be a particular strength of the system generally and the scope for taking BIM forward through planning.

3.6 Public involvement and e-planning.

Both plan making and decision taking on individual proposals involve public consultation and wider stakeholder involvement. This involvement varies depending on the nature of the proposal though the broad aim is similar. Involving local communities and stakeholders is seen not simply as a way of sharing information on change that will affect them but as an active process of improving outcomes. According to the government planning should ‘...be a creative exercise in finding ways to enhance and improve the places in which people live their lives’ (NPPF, 2012: para 17). Further, ‘applicants will be expected to work closely

with those directly affected by their proposals to evolve designs that take account of the views of the community (NPPF: 2012: para 66).

As far as BIM is concerned the planning system is a gateway through which developments, large and small, must pass. The system shapes that development in many ways and requires proposals submitted for consideration to include certain information and be in a specified format. Most applications are now submitted online including the accompanying plans. One reason for the growth in online submission is to better enable consultation with other public bodies (such as neighbouring local authorities, the Department of Transport, the Environment Agency, Historic England, etc.) and local communities, for example, parish or town councils or individuals. Consultation seeks to ensure a wide range of views are taken into account at the decision-making stage but it also helps coordinate development proposals between different bodies (e.g., transport, education, health, etc.) and it helps elicit community and stakeholder involvement in design. This latter point seeks to bring the users of development into the design process, a particularly important point given the focus of BIM Levels 3 and 4 on service users.

Applicants are strongly encouraged to submit their applications online and use certain file formats. However, at present, proprietary file types linked to CAD are discouraged.

Stakeholder Analysis – The Potential for Linking BIM and Urban Planning.

It is clear from the above that planning – both plan making and development control as well as the system for planning and regulating major infrastructure proposals - can have a role to play in supporting the DBB Strategy and the further roll out of BIM, particularly as it evolves and aspires to move from the site level to cities and beyond. It is also clear that BIM can support planning policy. There are 3 broad areas where there this potential seems particularly strong. First, how national planning policy can be better delivered through BIM (e.g. reducing waste and creating more sustainable development). Second, how planning can help deliver BIM and the roll out of DBB objectives particularly around wider stakeholder engagement (i.e. shaping demand and optimising supply as well as building and service users). Third, how planning can help the further roll out of BIM through requiring certain kinds of development are submitted using BIM approaches thereby accelerating its take up and use. The take-up of this final point will reinforce point 2 by facilitating wider and quicker coordination and integration with other key, public stakeholders. However, the potential for greater engagement between planning and BIM varies between these three points and the two stages of planning (see Table 4).

Table 4 provides an assessment of the relationship between BIM and planning as well as an indication of the potential for this relationship as based upon discussions with stakeholders.

Table 4. Overall potential relationship between BIM and planning.

	Delivery of national planning policy through BIM.	Delivery of BIM and DBB through planning.		Support and accelerate the roll-out and take up of BIM through alignment of standards for planning applications.
		Better supply optimisation and shaping demand.	Better engagements with users of	

			<i>buildings and services.</i>	
Planning Policy (national and local).	Potential: Medium. <i>Improvements in supply of housing, less waste in construction, better coordination of investment and infrastructure.</i>	Potential: High. <i>Consultation and coordination with key public sector bodies allows supply to better meet demand, e.g. population growth, housing, transport and infrastructure supply.</i>	Potential: Low. <i>At the policy stage there will be some engagement with building and site standards though this will be more at the development control stage.</i>	Potential: Low. <i>Submissions on buildings and developments at the development control stage.</i>
Development control.	Potential: Low-Medium. <i>Decisions normally follow policy framework so development control ensures implementation.</i>	Potential: Medium. <i>Ensures that consultation and user needs are given effect through changes to design before approval.</i>	Potential: High. <i>Public and community engagement can help shape outcomes for buildings and development.</i>	Potential: Medium. <i>Requirements on BIM compliant submission standards for certain kinds of development to facilitate wider and speedier engagement.</i>

In the next section we develop these relationships more through a looking at how BIM can help support planning policy and how the planning system can support the roll out of planning.

4. BIM and Planning and Housing Policy.

Table 4 highlights in broad ways in which planning and BIM relate. In this section we develop this further to explore how this relationship might usefully be taken forward in three areas: how BIM can support planning, how planning can support BIM policy and objectives and how this might be undertaken through the specific area of consultation and e-planning. This division broadly corresponds to the three columns in Table 4 and is based upon discussions with key stakeholders.

4.1 Potential Contribution of BIM to National Planning and Housing Policy

Table 5 sets out the main national policy aims of planning and housing with the source and then how BIM could help in delivering these aims. Whilst there are clear links between planning and BIM in each of the national policy areas these were not felt to be equally strong. The greatest potential was felt to be around housing supply improvements, particularly in terms of meeting different user needs and increasing the quality of supply through offsite construction and meeting the challenges of climate change manufacture improvements and reduced waste and carbon emissions.

Table 5. How BIM can support the national planning and housing policy framework.

Selected National Planning and Housing Policy (source in brackets)	Contribution of BIM to Achieving Policy Objectives
<i>Building a strong and competitive economy (NPPF).</i>	<i>Better identifying and coordinating infrastructure investment to the needs of businesses and communities to support economic growth. DBB and BIM ensures 'more for the same' and 'more for less' in</i>

	<i>infrastructure provision through increased efficiencies and productivity in construction.</i>
<i>Promoting sustainable transport (NPPF).</i>	<i>Greater integration of transport infrastructure and availability of information. Development of new transport options and modes.</i>
<i>Plan for the right homes in the right places (Housing Market Strategy).</i>	<i>Improving local strategic planning linking infrastructure, housing and transport through better information.</i>
<i>Increasing the housing supply (NPPF/Housing Market Strategy/National Productivity Investment Fund).</i>	<i>Better coordinated investment decisions (based on better data and information) and reduced blockages in the development and production process. Improving construction productivity and efficiencies through shorter build times.</i>
<i>Promoting sustainable development (NPPF).</i>	<i>Greater efficiencies in reduced wastage in construction, improved individual well-being through better housing design and coordinated planning of neighbourhoods and communities, reduced environmental impact through better coordination and improved operational efficiencies.</i>
<i>Requiring good design (NPPF).</i>	<i>Inclusive planning and design and more efficient use of resources in manufacture and construction.</i>
<i>Meeting the challenges of climate change, flooding and coastal change.</i>	<i>Greater efficiencies in manufacture and construction help reduce greenhouse gases, better and more integrated planning processes.</i>

4.2 Delivery of BIM through Planning

Table 6 seeks to relate how planning can help deliver BIM aims and objectives. Whilst there were connections between the two in all areas it was felt that there was a more consistent and strong relationship between BIM policy and planning.

Table 6 How planning can help support BIM

BIM Objective (from Strategic Outline Business Case for the delivery of Digital Built Britain Programme Level 3 – BEIS).	Role of Planning
Reduce the total expenditure associated with the built environment: Information-enabled transformation will enable optimisation across the built environment lifecycle, resulting in reduced whole-life costs. For example, information that can enable changes in maintenance and energy use or enable advanced manufacturing techniques to drive down costs.	<i>The planning process in general and e-planning in particular allows for the electronic submission and sharing of documentation relating to the consideration of development proposals. It is now common across the UK and helps facilitate e-participation, a process of technology-mediated interaction between the stakeholders, communities and the development process. Both widens engagement and speeds it up, allowing for better and quicker decisions. E-planning can lead to better coordinated development, reducing costs and waste, and better reflect the needs of users and communities and protect environmental assets. There is also likely to be lower capital and operational costs through better coordination and community involvement.</i>
Maximise the return on investment in the built environment: Enable trusted data-driven decision-making through integrated strategic financial investment planning to promote transparency, cost	<i>There are a range of social and environmental benefits from BIM that will become more pressing as through the aspiration to move to DBB Levels 3 and 4. Such wider benefits can, in part, be achieved through greater engagement with and coordination around infrastructure</i>

<i>certainty and provide confidence that every pound invested will be maximised.</i>	<i>planning, other kinds of development and community and stakeholder needs.</i>
Increase availability, capacity and performance of the existing built environment: <i>The majority of infrastructure planned to be available in 2050 is already in existence. This programme will define a commercial and information framework to accelerate the development and application of new disruptive technologies to increase performance and get the most value out of the existing built environment.</i>	<i>Planning can help raise awareness of opportunities through the provision of information on supply and demand in land and property thereby creating certainty, reducing risk and ensuring markets work more efficiently.</i>
Drive growth in the UK's information economy: <i>New technologies, skill sets and high-paid employment opportunities which drive growth and create valuable export opportunities.</i>	<i>Planning can help deliver high quality communications infrastructure through ensuring provision and capacity in new development, future-proofing development and identifying areas of need.</i>

4.3 Major infrastructure planning and BIM

The complementary CDBB BIM mini project Future Cities and BIM analysed international experiences in BIM implementation. In particular, the German and Swedish experience showed that other countries make use of BIM at all spatial scales, and in particular in support of infrastructure provision at large scales. There are several advantages. For example, due to the large number of contractors and stakeholders often involved in cross-country projects information sharing through BIM software can support project implementation. The UK Crossrail project connecting Maidenhead and Heathrow in the west to Shenfield and Abbey Wood in the east of London is an example where BIM Level 2 criteria have been used. The idea was to integrate spatial data irrespective of its native format in order to facilitate cooperation between different engineering disciplines such as geotechnics, tunnelling, noise and vibration, commitments, interfaces and heritages. Other examples show that the digitalisation of major infrastructure can help support the long-term transport planning and traffic coordination effectively combining the national routes with city traffic apps.

In contrast to urban development, where influence on the construction and built environment itself is rather indirect and reliant on market forces public sector-led schemes including major infrastructure provides an area in which the public hand can lead through example.

This project focusses on urban planning. Nevertheless, the importance of infrastructure planning in the digitalisation of the construction industry is very high due to the potential for financial savings and waste management, for example. Further analysis that explores public sector-led schemes would be useful here.

4.4 Consultation and e-planning

One area that stakeholders felt had a high potential both in terms of planning supporting BIM and vice versa was around wider involvement and consultation with planning preparation and planning applications.

Consultation and better coordination and integration of different views to improve change in the built environment supports the aims of BIM and planning. At a strategic and policy level coordinating development is undertaken through the Local Plan preparation process though this does not involve design details. Consulting on the quantity and broad location of, for example, future housing allows for various necessary and associated elements of development infrastructure such as transport, energy and water and services such as schools to be coordinated. There was felt to be some potential at this stage for planning to use BIM and help support its roll out though the greatest potential was felt to be at the more detailed, development control level.

Many local authorities encourage applicants for planning permission to include 3D digital modelling to help with the assessment of impact. For example, the draft Cambridge Local Plan states 'The use of 3D digital modelling and visualisation by applicants for tall buildings is strongly encouraged at pre-application discussions with applicants. As part of the planning process, developers may produce 3D computer models of their scheme to illustrate the scale and massing of proposed development'. To enable this, applicants are asked to submit material for SketchUp or AutoCAD (using file formats .dwg or .dxf). Requirements for submission of proposals and supporting information in digital formats is common across local authorities. It was felt that planning authorities could require the parallel submission of BIM-ready data as standard helping achieve the DBB Strategy. Similarly, having a common, BIM ready approach for consultation would allow greater sharing of data and quicker and simpler amendment of proposals. Overall, a common data format for planning consultation and application consideration could be encouraged or even required facilitating greater involvement and engagement of different stakeholders – the community, end-users, manufacturers and builders and service providers – ultimately leading to better, cheaper, less wasteful and quicker development.

Stakeholder Analysis – How can planning support BIM and vice versa.

Overall there was felt to be significant potential and synergies around BIM and urban planning. For planning the quality and quantity of supply and user needs of housing were highlighted along with supporting the objectives of sustainable development and climate change adaptation. For BIM there was a clear alignment across all objectives. Consultation and e-planning were felt to be a relatively 'easy win' in taking forward this relationship more to the benefit of BIM and urban planning.

Recommendations.

Much could be achieved through the better coordination and integration of BIM and urban planning with closer alignment. Further work is needed through, for example, pilot studies to explore how this might be taken forward.

More work is needed on how planning can support BIM through consultation and wider involvement around common processes and data requirements.

5. Awareness and current use of BIM.

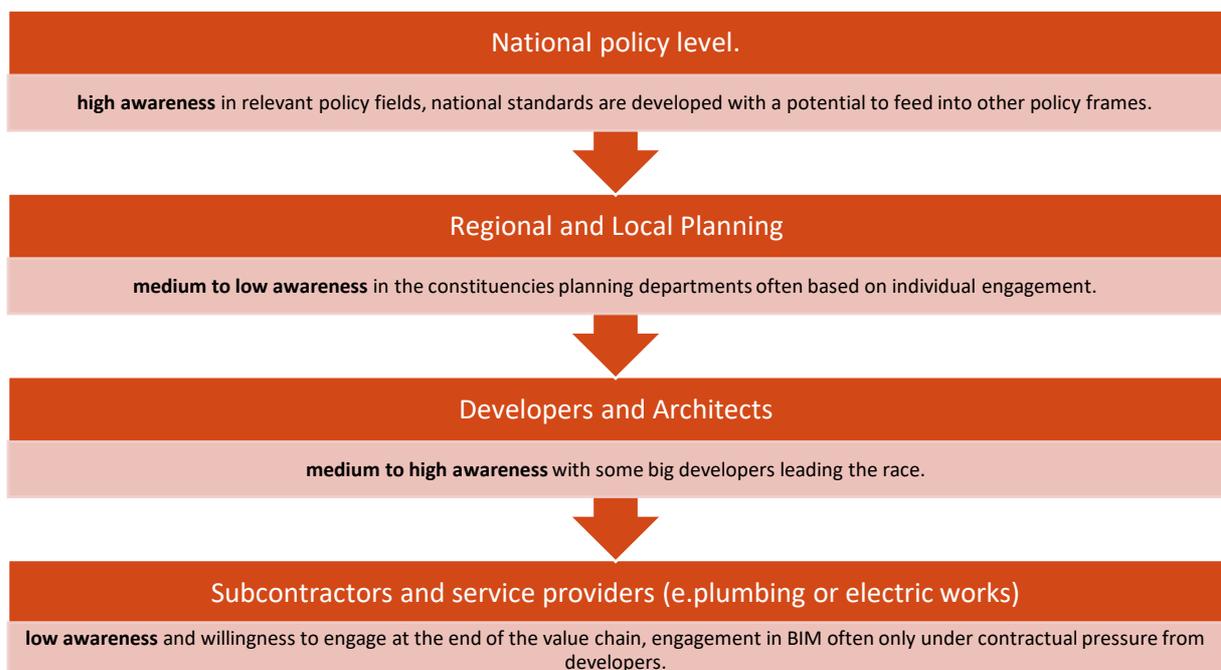
Analysis of Local Plans and discussions with key stakeholders provides little evidence of awareness of BIM and DBB. A desk-based assessment of four Local Plans (two urban, two rural) as well as background and supporting documents highlighted no mention of BIM or DBB. However, there was some acknowledgement of the need for greater growth in digital infrastructure alongside strong support for supporting the growth of digital industries, both for employment but also as a way of helping address climate change as part of wider proposals to reduce commuting and helping foster an environment of greater home-working. However, there is very little detail on what this might mean, particularly in terms of combining housing design and supply.

Draft Cambridge Local Plan states that 'Provision for high capacity broadband (such as ducting for cables) should be designed and installed as an integral part of development, to minimise visual impact and future disturbance during maintenance. All telecommunications infrastructure should be capable of responding to changes in technology requirements over the period of the development' (Cambridge City Council, 2013: 140). However, the reason for this policy is as much do with BIM and DBB than with avoiding future disturbance when infrastructure will be retrofitted.

Local Plans acknowledged and included broader policies around supporting digital industries and infrastructure highlighting an awareness of broad trends and needs the awareness within development control was understandably driven by this policy context. There were possibilities in developing the links between broader digital issues and programmes relating to smart cities and resilient cities as ways of taking forward BIM and DBB. Smart cities and resilient cities are concepts that are helping raise awareness of the need for planning to engage with the digital agenda.

In summary, documentary analysis and key stakeholders revealed a diverging awareness of BIM at different levels of in the political landscape and the construction industry (Table 7).

Table 7 Awareness of BIM by spatial scale.



Stakeholder Analysis – Awareness of BIM and DBB.

General awareness of BIM and the wider DBB strategy was low to non-existent despite what was considered to be clear connections and overlaps. In part this was felt to be because BIM was relatively new and had, until recently, focused upon the narrower, levels 1 and 2 BIM around design, building, maintenance and operation of buildings. There was widespread feeling that raising awareness of BIM and DBB more generally would help and ensure that local planning authorities reflected more on how BIM might be supported and how BIM could help achieve policy objectives. More work was needed to provide case studies and examples of how BIM is being used in other policy sectors and how it could be used more in planning. A small number of pilot projects were one way in which it was felt that this could be achieved. That said there were still some basic questions around what BIM was and could be – it's potential – that needed to be explored and developed further first.

Recommendation.

More information is needed on how the planning system can better support the roll out of digital infrastructure and development including clusters of employment, work-home schemes and designs and future proofing cities. The roll-out of BIM, particularly to Levels 3 and 4 will require greater understanding of future user and needs from individual sites to wider developments and cities. The publication of Planning Practice Guidance – recommended above - following further research was felt to be a way in which this could be achieved.

In addition to the provision of further information awareness raising can be supported by a number of initiatives such as cooperation with chambers of commerce for business trips of relevant industry sectors to best practices examples.

6. Going forward.

It is surprising that planning has not played a greater role in thinking on DBB and BIM given the clear and significant relationships between the two. Whilst the original aim of this project was to explore how planning could support the roll out of BIM there are obvious areas where both can support and help the other. Those involved in planning and development as well as BIM users that helped in this research all highlighted both the lack of existing engagement and the potential for much closer future alignment.

Nevertheless, the focus of this project is on BIM. As DBB seeks to move BIM beyond buildings to wider city level and wider policy objectives planning can help including the need to engage communities and end users. Planning can support BIM as much with process as with outcomes – it is a deliberative, coordinating and regulating mechanism. Planning can also support BIM (and vice versa) in achieving wider policy objectives, particularly around climate change and reducing resource use. The development of 'smart city' approaches that include BIM therefore depends on the involvement all stakeholders in the value chain of building.

In taking matters forward to achieve greater alignment there are two areas where quick and easy actions are possible. The first is the recommendation for government to publish Planning Practice Guidance on BIM.

This would raise awareness and require local authorities to consider BIM when preparing Local Plans and taking decisions on development proposals. The second area where there would be developing a common data approach to consultation allowing greater sharing and better management of information. This could also be achieved through the publication of Planning Practice Guidance.

In the longer term, more work is needed on how planning and BIM can work at the operational level. One approach would be to align their objectives and develop a common understanding of how planning can directly support BIM and in what ways. With common policy objectives, say around smart cities, BIM can become a mechanism or tool for implementing a wide variety of policy objectives.

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