

Industrial strategy: government and industry in partnership



# Building Information Modelling

“BIM is the first truly global digital construction technology and will soon be deployed in every country in the world. It is a 'game changer' and we need to recognise that it is here to stay - but in common with all innovation this presents both risk and opportunity.

The UK programme based on the BIS BIM Strategy is currently the most ambitious and advanced centrally driven programme in the world. The UK has a window of opportunity to capitalise on the success of its domestic programme and to take on a global leadership role in BIM exploitation, BIM service provision and BIM standards development. In taking on the role it will greatly enhance the global image of UK designers, contractors and product manufacturers which in turn will translate into winning new work, growth opportunities and increased employment.

The comprehensive scope and integrated structure of the current UK programme is also an ideal platform on which to take BIM to the next logical level and aim for a fully integrated BIM - which will bring untold benefits.

The UK has displayed a high degree of courage to embark on the current programme and I for one would urge that they continue to press ahead on the global stage together with their ambitions to develop BIM to the next level. It is often said that ‘fortune favours the bold’ and this will have resonance with this endeavour.”

**Patrick MacLeamy - Chief Executive Officer of HOK**

## INTRODUCTION

The Government has identified Construction as an enabling sector under industrial strategy. The sector is highly diverse with a range of discrete sub-sectors. It delivered around £69 billion GVA (£107bn output) to the UK economy in 2010 employing around 2.5 million workers and as such is a key contributor to UK growth. It is also critical to the achievement of UK climate change targets.

The UK has a comparative advantage in certain construction services, primarily engineering, architecture and activities associated with low-carbon built environment solutions. This advantage will be important in creating opportunities which are driven by technological change, increasing environmental awareness and emerging economies. Construction is heavily influenced by direct and indirect levers from the public sector, which procures around 30% of the industry's output, and commitments to renew and expand national infrastructure are therefore significant to the sector.<sup>2</sup>

This capability assessment sets out the actions that government and industry will take to create opportunities for the UK construction sector by becoming a world leader in Building Information Modelling (BIM). We will build on the considerable progress already made in embedding BIM into the domestic sector.

## BUILDING INFORMATION MODELLING

Building Information Modelling (BIM) is a collaborative way of working, underpinned by the digital technologies which unlock more efficient methods of designing, creating and maintaining our assets. BIM embeds key product and asset data and a 3 dimensional computer model that can be used for effective management of information throughout a project lifecycle – from earliest concept through to operation. It has been described as a game-changing ICT and cultural process for the construction sector. A number of countries globally are starting to realise the opportunities it brings and are now investing in developing their own capability. BIM processes are 'mainstream' to both new buildings/infrastructure and have further potential in 'retrofit' and 'refurbishment' projects when complementary workflows such as laser scanning and rapid energy analysis are employed. BIM technology should be seen as a 'collaboration' between the construction sector and the software

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<sup>2</sup> <http://www.bis.gov.uk/assets/BISCore/economics-and-statistics/docs/I/12-1140-industrial-strategy-uk-sector-analysis.pdf>

industries and creates an environment in which there are opportunities and synergies for both.

In line with the 'mobilisation and implementation' plans contained in the BIM strategy which BIS published in 2011, <http://www.bimtaskgroup.org/wp-content/uploads/2012/03/BIS-BIM-strategy-Report.pdf>, Cabinet Office and BIS have been implementing a long term programme to embed the use of BIM across centrally procured public construction projects. Local Government construction clients are now adopting BIM in increasing numbers as they too see the benefits derived from data-enabled ways of working. Our existing work continues and we now wish to develop our capability in BIM-enabled 'design for manufacture and assembly' (DFMA) and 'lean' construction processes which begins to raise the bar for process/product efficiencies and emulates the types of approaches adopted by advanced manufacturing sectors.

Through this Government-led impetus, industry has responded rapidly and positively with large scale adoption of BIM. The UK is now recognised by its peers as one of the leading nations in the exploitation of BIM technology and processes with an internationally respected centrally-led programme<sup>3</sup>. BIM is a key agent for economic growth in both domestic and international markets.

Equally the converse is true. Other countries are rapidly adopting BIM; we need to progress with the adoption of BIM or these markets will begin to close to UK business as countries look for home grown expertise or source it skills and capabilities from elsewhere in the world. This threat is at its greatest from dynamic emerging markets, where competition is able to 'leapfrog' using innovative technologies and ways of working. BIM competition in construction is likely to come from any construction exporting country.

**"BIM will be the future IT solution in China; The Chinese Government is strongly supporting BIM" Tsinghua University, Beijing**

The digital applications (in construction) 'genie' is well and truly outside of the lamp and cannot be put back. The UK is well placed to capitalise on it and to embrace BIM to become a recognised leader in its application and development.

We will identify key actions to support and accelerate this programme to ensure that the UK is able to take advantage of its leading position in exploiting BIM in design, construction and operation of assets.

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<sup>3</sup> Phillip G Bernstein (Lecturer, Yale University) – BuildingSmart Qatar BIM Summit Oct 2012

**Our long term ambition is to be a global leader in the exploitation of this technology and increasingly as a supplier of BIM services and software by developing the UK's capability in this area.**

To realise this ambition we have developed a three part action plan: The parts are:

**1) FULLY COMMIT TO THE EXISTING BIS BIM PROGRAMME TO CREATE CRITICAL MASS**

**2) AIM FOR GROWTH**

**3) HELP CREATE THE FUTURE BY CONTINUALLY DEVELOPING OUR CAPABILITIES.**

## 1. COMMITMENT TO EXISTING WORK

### A. What is Government and Industry doing already?

The initial estimated savings to UK construction and its clients is £2bn pa<sup>4</sup> through the widespread adoption of BIM and is therefore a significant tool for Government to reach its target of 15-20% savings on the costs of capital projects by 2015. An Investor's Report describing the business benefits to the market is available at:

<http://bimtaskgroup.org/wpcontent/uploads/2012/InvestorsReport-BIM.pdf>

The Government/Industry BIM programme commenced in July 2011 and is focused on the adoption of BIM technology by both public and private sector organisations involved in the procurement and delivery of buildings and infrastructure. The drivers for the adoption of BIM have been set out in the BIS BIM Strategy and the Government Construction Strategy and in overview these are the requirements to:

- reduce our asset costs and achieve greater operational efficiency,
- facilitate greater efficiency and effectiveness of construction supply chains
- assist in the creation of a forward-thinking sector on which we can base our growth ambitions.

The Construction Industry Council (CIC) has been at the forefront of developing and leading this programme with Government. They have put in place a number of industry focused programmes to assist the supply chain to gear up to Government's mandate that public sector centrally procured construction projects will be delivered using BIM by 2016.

“BIM will integrate the construction process and, therefore, the construction industry. But it will also have many additional benefits for the nation. It will enable intelligent decisions about construction methodology, safer working arrangements, greater energy efficiency leading to carbon reductions and a critical focus on the whole life performance of facilities (or assets). Of even greater importance are the benefits for the economy that will accrue from better buildings and infrastructure delivered by the construction industry.”

**Graham Watts, OBE, Chief Executive Officer, Construction Industry Council**

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<sup>4</sup> Study into the Business Case for Interoperable Building Information Modelling (BIM)' - Jeffery Wix and Nicholas Nisbet (internal DTI report 2008)

One key competitive advantage of BIM is its ability to promote greater transparency and collaboration between suppliers and thereby reduce waste (procurement, process and material) through all levels of the supply chain. A key driver of the rapid adoption of BIM by clients and industry is that the benefits it creates are shared by the client and the entire supply chain – with downstream benefits to customers who make use of built assets and to society at large.

Under this programme Government, CIC and industry have:

- Established a Government/Industry delivery team with support from Cabinet Office and BIS to assist all Government Departments to develop their own BIM adoption strategies in order to meet the Government's BIM mandate. Progress of these strategies is reported back to the Government Construction Board
- Established a wide number of working groups and other structures to work on key themes to ensure that the UK will have a smooth transition to BIM enablement
- Engaged with a number of professional and trade bodies to ensure that BIM can be embraced by all communities within the construction sector, especially SMEs
- Worked with a number of private sector clients to ensure that the benefits of BIM are shared across the entire client base and where possible to create a consistent presentation of requirements to the supply chain.
- Established 'Regional BIM Hubs' to enable SME and smaller clients to get advice from local networks
- Worked with BSI and other organisations to assist in the development of robust standards including BS 1192-2 and PAS 91
- laid the foundation for the production of a 'digital plan of works' which will help to inform an industry aligned process
- Established a '2050 Group' to enthuse and capture the technical expertise of the young generation within the construction industry and its clients who represent the future
- Developed a core set of skills and training requirements
- Incorporated Government Soft Landings into the BIM Programme.

Private sector client willingness to put in place BIM requirements which are aligned with to what Government is adopting is creating a 'whole-sector' collaborative platform which will act as a spring-board for future activity. Increasingly, the supply-chain is adopting BIM processes and there is now a tangible supply-side 'push' for greater adoption and a willingness to push BIM technological and process boundaries. It is worth hearing from those companies who are actively pursuing their own corporate BIM strategies.

## **Product Manufacturer**

“Having understood the implications and potential for BIM within the UK, the Rockwool Group has embarked on a mobilisation strategy.

We believe that we have a vital role within the BIM process through the creation and use of structured but relevant product data that can be infused within the models to allow intelligent, informed investment decisions to be made by our clients. Our implementation strategy has already resulted in intelligent discussions with key current and potential future public and private sector clients. These discussions have shown us that the industry requires leading manufacturers, willing to work in a fully collaborative environment, embracing the ethos of BIM at its core and the value that can be secured by all industry stakeholders through collaboration.

Ultimately, Rockwool believe that by embracing the UK government’s BIM strategy, we will ensure that we are at the vanguard of a new digital revolution that will stimulate new efficiencies, innovation and, perhaps most importantly, growth”

**Claire Atchison, Rockwool Group**

## **SME Company**

“We believe BIM represents a fantastic opportunity for smaller organisations to change the odds; there is even a real opportunity for SMEs to lead rather than follow. Our BIM workflow has generated repeat business as we have been able to drive efficiencies from project to project, but best of all BIM has encouraged collaboration and re-focused the team on the project goals leading to better outcomes.

As a bonus BIM has simplified our design management and allowed us to refine our internal systems, which has lead directly to accreditations for ISO 9001, 14001 and Investors in People, highlighting that BIM is a process change not a software purchase. In terms of bottom line we found that as we were learning our costs and income remained fairly parallel. However once we became more experienced and made a full commitment to BIM, our costs have flattened out and our fee income has continued to rise.”

**David Miller - David Miller Architects**

Under the Government BIM programme, the Ministry of Justice (MoJ), Highways Agency (HA) and a number of other Departments are involved in Early Adopter projects which are demonstrating the benefits described. Full details are available at [www.bimtaskgroup.org](http://www.bimtaskgroup.org)



### **Central Government Construction Client**

The MoJ are at the most mature stage of the current programme with a number of projects having passed through the design and procurement stages using BIM enabled processes. Cookham Wood YOI (£20m) which is due to commence building on site in November 2012 has already saved approaching £1M on BIM enabled understanding of how the assets work and by optimising the specification for the building.

“The MOJ were very keen to be part of the early adoption of BIM. As an organisation we have been implementing Lean methods of working for some time. BIM fits in to our philosophy totally. One of our key aims is to promote collaborative working. A collaborative delivery environment helps to drive out duplication, reduce waste, reduce time and improve quality. BIM is a major tool in achieving these goals and will form a major component in our Lean tool kit. Currently the construction industry is on a steep learning curve, but we feel there is a willingness to engage and as the technologies become increasingly embedded, the industry’s drive to embed them in all their activities, (planning, cost management, facilities management, reporting etc) will exponentially grow.”

### **Terry Stocks, Head of Project Delivery Unit, MOJ**

Local Government is also increasingly seeing the potential for BIM to improve the construction and operation of assets.

### **Local Government Construction Client**

Manchester City Council (MCC) Town Hall Complex - Manchester has been exploring how to utilise the projects BIM data on the £100 million refurbishment of the Town Hall Extension and Central Library in a manner that will deliver benefits to Manchester during the complex operational life, this has required MCC and the wider team to engender a culture of collaboration, sharing knowledge and aspirations

"Manchester City Council has been using BIM on a number of projects over the past two years.

It is clear that significant benefits in terms of reduced cost and good quality have already been realised. Our ambition now is to use the model to make our building management process more efficient and provide a better service to our customers"

### **Sir Richard Leese, Leader of Manchester City Council.**

In closing this section we, as Government, recognised the significant body of work and other contributions which individuals, industry and private sector clients have unstintingly given to make this programme a success.

**ACTION 1: EXPAND AND ACCELERATE THE ACTION PROGRAMME IDENTIFIED IN THE BIS BIM STRATEGY TO EMBED BIM IN THE DOMESTIC MARKET AND PLAN FOR INTERNATIONAL GROWTH.**

## 2. AIM FOR GROWTH: BIM AS AN ENGINE FOR GROWTH

### A. Global Strategy

The global export market for UK construction services is estimated at £7.6bn pa (composed of £1.2bn contractor services, £0.6bn design services and £5.8bn construction products). This is considered to be a conservative estimate as significant construction activities are captured in other sector's activities e.g. engineering and technical services.

Whilst the UK is beginning to be seen as a leading nation in BIM exploitation, a number of international markets have quickly spotted the advantage in embedding and developing BIM capability. BIM is a fast moving technology and process and the UK needs to keep up with these developments and put in place a clear strategy to exploit the UK's expertise on BIM if it is to maintain and develop its international construction competitiveness.

It is clear that through its domestic programme that the UK has come a considerable distance and has now become the centre of international focus. We have a limited window of opportunity to capitalise on this domestic success.

“The understanding and endorsement of building information modelling in the United Kingdom construction industry is as rapid as it is impressive. Due in large part to the inspired leadership of the Government's BIM Task Group, BIM is now key to the Construction Strategy and has catapulted UK construction to the forefront in BIM standards and adoption worldwide—the fastest such transition we have seen - supporting the UK's global industry growth ambitions. Its energetic efforts to transform itself into an efficient, integrated and collaborative supply chain through technology positions it as both a global authority in design and construction and an example of UK leadership in innovation and modern practice. In order to support the UK construction industry as it gears-up to meet the ambition of the Government's BIM programme, Autodesk is investing in the UK-- in delivering the technology needed, assisting with strategy, and communication about the transformation occurring within construction.”

**Phillip G. Bernstein FAIA RIBA**  
**Vice President, Autodesk Strategic Industry Relations**  
**Lecturer in Professional Practice, Yale University School of Architecture**

“The BIM process has helped us clearly identify client and project objectives and improve risk management at the outset of major programmes and projects both in the UK and abroad. Without BIM we would not have been so competitive in our international markets. Mace has been an early adopter and investor in BIM processes and this has directly helped us win work overseas and has therefore directly impacted our bottom line. The widespread adoption of BIM in the UK is doing much to improve the image and reputation of the UK construction market at home and abroad which will itself provide increased opportunity. Mace has helped its clients truly understand and better define the objectives be it project or business. On a major commercial development the design was changed to accommodate operational requirements following a review of a virtual prototype. Without BIM processes this would not have been identified pre-construction and would not have given our client a high quality product that met his operational requirements. Essentially BIM gives transparency right at the beginning of a scheme.”

**Phil Brown, Director for Pre-construction, Engineering & Design, Mace.**

“The progress and leadership of the UK’s ‘Collaborative BIM’ initiative is of such international importance that I am committing to spend several months per year here in the UK to support the advancement of Levels 2 and 3, by way of innovations in information mobility for sustaining infrastructure. This has already become a source of global competitive advantage for this country and its enterprises. The effectiveness of the UK's BIM Strategy can be gauged not only by the zeal to achieve its goals shown by both its own Government and Industry, but also by the consequent international investment drawn here on the part of global businesses such as mine.”

**Greg Bentley**  
Chief Executive Office, Bentley Systems

**ACTION 2: TO DEVELOP WITH UKTI A STRATEGY FOR THE EXPLOITATION OF UK LEADERSHIP IN BIM TO ENABLE DESIGN AND CONSTRUCTION FIRMS TO INCREASE THEIR SUCCESS IN GLOBAL MARKETS.**

## B. EU Engagement

At the European level BIM is increasingly being recognised as a major force to drive both growth and increased competitiveness. The forthcoming EU Sustainable Construction Strategy has the potential to acknowledge that BIM will enable European construction companies to maintain their presence in global markets and internally to promote improved performance and an enhanced image of the sector. In parallel, the revision of the EU Procurement Directive is reviewing BIM. It is essential that the UK assist the EU in this endeavour to ensure that emerging BIM protocols are consistent with those already developed in the UK.

**ACTION 3: ENGAGE WITH EU PARTNERS TO ASSIST IN THE COORDINATED ADOPTION OF BIM; AND TO USE OUR LEADERSHIP POSITION TO HELP SHAPE DEVELOPING STANDARDS AND PRACTICE.**

## C. Cultivating and nurturing innovation in software and services sector

The UK has significant talent in advanced ICT techniques which could be a spring-board for the creation of a new industry sub-sector for BIM associated services and software products associated with BIM. The original BIS BIM Strategy recognised this point and was produced internally by teams from the construction and software markets. We will review the possibility of establishing a technology hub to support BIM software development starting

with niche and 'value adding' applications to existing systems. In addition to the provision of software we see that there will be a significant market opportunity for BIM services.

The BIM Technologies Alliance, formed in response to the Government Construction Strategy, represents the BIM software industries. The Alliance's objective is to work with Government and industry to embed existing BIM products and to develop more advanced products, data content and industry standards, protocols and procedures.

**ACTION 4: WORK WITH THE BIM TECHNOLOGIES ALLIANCE TO IDENTIFY THE OPPORTUNITIES IN THE EXPANDING BIM MARKET AND INVESTIGATE THE NEED FOR A TECHNOLOGY HUB TO INCUBATE/STIMULATE ICT START-UPS/SPINOUTS FROM BIM.**

#### D. Engagement with Construction Product Manufacturers

Construction products represent about 40% by value of UK construction output and manufacturers are essential contributors to the overall efficiency of the construction sector. Although, their readiness to supply BIM data about their products is valuable in context to the success of the current BIM programme it will be increasingly critical as we go forward with ambitions as it will help to create a seamless flow of data through the project lifecycle. The Construction Product Association is fully engaged with the BIM programme and is using the current programme to coordinate product manufacturers to produce good quality data in a consistent way. This endeavour has been greatly assisted by the work of British Standards Institute (BSI) and other organisations working in collaboration to produce non proprietary structured data protocols and standards. Such standards include buildingSMART IFC and COBie.

“The Construction Products Association is fully committed to helping its members play their part in building up the UK’s BIM capabilities through publishing guidance and working with others such as NBS and the National BIM Library. Early adopters in the products sector, both companies and sector trade associations, are already committing resources to ensure their products are BIM enabled. To get the whole of the industry to invest scarce resources will require continuing visible commitment from Government to open, non-proprietary standards so that there is only one set of models to develop. Companies also have to have confidence that those making the investment will see an advantage compared to those that have not invested. If Government and contractors water down the commitment to buy BIM enabled products or retreat into proprietary standards, then producers will see reduced or no commercial advantage in investing in BIM.”

**John Tebbit**  
**Deputy Chief Executive and Industry Affairs Director**  
**Construction Products Association**

We have seen earlier that a number of companies have found that it has made sound business sense to make such data freely available to their clients. However, the converse appears to be a very likely scenario as there is also growing recognition and a stark warning that those manufacturers who are slow in grasping the importance of BIM as a transformational technology and process could well lose ground in both domestic and international markets.

“The day is near when there will be a significant cost to product manufacturers if they do NOT produce BIM information for their clients. The stark reality is that BIM will continue to significantly change the construction business environment and product manufactures who are not willing to adapt to support the BIM process will face the reality that they will cease to remain competitive in the marketplace.”

**John I. Messner, Professor of Architectural Engineering**  
**Director, Computer Integrated Construction Research Program**  
**Penn State University**

**ACTION 5: GOVERNMENT WILL WORK WITH THE CONSTRUCTION PRODUCT ASSOCIATION AND OTHER TRADE BODIES TOGETHER WITH STANDARD ORGANISATIONS TO ENSURE THAT UK MANUFACTURERS REMAIN AT THE VANGUARD OF SUPPLYING BIM DATA TO THEIR CLIENTS.**

## E. Development of BIM enabled 'Designed for Manufacture and Assembly' (DFMA) as a mainstream integrated and sustainable construction option to enhance construction efficiency

The BIM 'early adopter' work with MOJ and Highways Agency has brought into sharp focus the benefits of 'Lean', DFMA and Offsite construction techniques.

Through the publication of the forward pipelines of projects and the capability to develop innovative solutions through widespread adoption of BIM, industry now has the opportunity to work with infrastructure and construction clients to develop innovative approaches to solve common problems.

The spatial geometrical and data-rich environment of BIM supports greater mass customisation of solutions to common construction needs allowing for greater use of manufactured solutions and the ability to improve delivery processes. These techniques have the potential to reduce embedded carbon in construction, reduce site waste, allow a safer more controlled environment, and enable more precise use of materials delivering improved quality outputs. It also promotes more stable employment in a factory environment and creates a new opportunity for UK firms to export products to overseas construction markets and fend off competition from imports.

On 6 September 2012, Government announced the formation of a working group to investigate benefits of offsite manufacturing for housing and report by Budget 2013.

"Rapid advances in digital engineering are revolutionising construction. But Building Information Modelling (BIM) is about more than creating models. It is about unlocking knowledge and insight, creating the platform for more efficient and sustainable solutions. At Laing O'Rourke we're taking BIM beyond the traditional geometrical and asset data approach to include time and cost dimensions, offering unparalleled benefits to clients and end-users over the lifetime of buildings and infrastructure.

Critical to our innovative Design for Manufacture and Assembly (DfMA) approach, BIM is helping to drive a step-change in the increased productivity of the construction process, tangible quality improvements in the end product and the associated reduction in true costs. It promotes greater collaboration and more informed decision-making within unified delivery teams, while allowing the supply chain to see beyond their own activities to a more holistic view of the client's objectives. Equally important, BIM also acts as a valuable communication tool by bringing the project to life in a virtual world for clients and the workforce.

Fundamental to achieving success is having the right blend of technical and cultural platforms. Laing O'Rourke is realising this through extensive training of forward-thinking engineering and construction leaders to embed BIM and DFMA across our culture. At the same time, delivery teams – both on-site in our projects and off-site in our Manufacturing facilities – are driving BIM into

core business processes. This de-risking enables us to innovate for the benefit of clients, maximising the value of the asset over its lifetime. We are determined to use the momentum around BIM-enabled DfMA to effect an innovative and radical transformation of our industry, helping to create exciting new career opportunities to attract the next generation of engineering and construction talent. I firmly believe that through BIM and DfMA the industry will become more integrated and productive at every stage of delivery - from design to construction and, ultimately, in operation. It is 'challenge and change' at its most visionary."

**Ray O'Rourke KBE, Chairman and Chief Executive, Laing O'Rourke**

**ACTION 6: GOVERNMENT WILL WORK WITH THE OFFSITE CONSTRUCTION WORKING GROUP, INDUSTRY AND BUILD OFFSITE GROUP TO IDENTIFY OPPORTUNITIES FROM THE FORWARD PIPELINE TO ENHANCE THE UK'S BIM ENABLED DFMA CAPACITY FOR WIDER CONSTRUCTION AND INFRASTRUCTURE**

## F. Operational Efficiency of Built Assets.

Our work to date has concentrated on the construction and remediation of assets. However, in undertaking this work tantalising evidence and industry feedback is beginning to emerge of the power of BIM data to bring major efficiencies to the maintenance, operation and energy management of constructed assets. Industry and Government believe that the cost savings and other benefits stemming from the use of BIM data will dwarf that generated in the construction of the asset. Some work is already being progressed in this area but in view of the potential for significant savings it is important that the UK fully explores the benefits that BIM data will bring to the functionality, operational efficiency and effectiveness of assets and their impact on communities.

The hand-over stage of assets is critical to ensure that the 'as designed' performance is achieved as soon as possible and that the ongoing operation continues to conform to 'as designed' parameters. This is an area identified in the Government Construction Strategy and it is being supported through the implementation of 'Government Soft Landings'. There is a strong synergy between BIM derived data and the effectiveness and efficiency of the hand-over process and post operational evaluation of performance. Directing the focus of the supply side to deliver the required hand over outcomes and long term performance is vitally important and BIM data provides the information infrastructure for such an approach. Government Soft Landings is now integrated into the BIM Task Group to improve the transition from construction to operation of assets.

Industry are already recognising the business benefits of pursuing research into how BIM can help bring improvements to the life cycle of an asset in their own parts of the industry. For example, the British Council of Offices has



established a programme with Salford University and HOK Architects to work with investors, designers and constructors to establish the knowledge-base and benefits of BIM across the design, build and operations of offices.

“This research provides a platform to move the whole BIM debate forward and builds on the important work undertaken by the Government and the supply side of the industry. At HOK we’re committed to using BIM on all our projects, and have been for a number of years, because we believe it offers unprecedented efficiencies for our clients. Our goal is to use this expertise and knowledge to help end users appreciate the possibilities and opportunities BIM can create for their business.”

**Andrew Barraclough, Director at HOK’s London office**

**ACTION 7: THE GOVERNMENT, INDUSTRY AND THE RESEARCH COMMUNITY WILL COLLABORATE TO INVESTIGATE HOW TO HARNESS BIM TO ENHANCE THE OPERATION AND FUNCTIONALITY OF ASSETS.**

G. Review public sector portals and establish a strategy to accept digital information.

Central and Local Government utilise procurement portals to improve the delivery of services and engage with industry. There is considerable potential for waste and duplication if such portals are slow to accept BIM derived data in digital form and could potentially act as an impediment to BIM exploitation.

**ACTION 8: GOVERNMENT WILL BUILD THE CAPABILITY BY TO ACCEPT AND HANDLE BIM DATA TO SUPPORT OUR ASPIRATION TO BE A RECOGNISED GLOBAL FORCE IN BUILDING INFORMATION MODELLING.**

3. HELP CREATE THE FUTURE – ‘DEVELOPING UK CAPABILITY’

A. Sustaining a UK leadership

We recognise that the leading edge of the industry is pushing the frontiers of BIM exploitation whereas the majority of businesses are still developing capability in this area. The current BIM strategy is aimed at bringing

Government Departments and the sector up to a common minimum level. Our ambition does not stop at this level. To be world leading we will develop fully integrated BIM models to pave the way for huge savings in the construction and operation of assets.

We do not underestimate the challenge and are already taking action to create the 'Digital Built Britain' network to begin the process of planning for this new environment. This will help us realise our ambition to be a world leader in BIM.

Digital Built Britain is the organisation by which the UK will also deliver and support the integration of BIM into 'Smart Cities' and 'Smart Grids'. This approach will provide the information to enable strategic investment decisions for those networks and systems (eg highways and energy) which cut across society.

One of the key activities of Digital Built Britain is to find a way for the increasing variety and complexity of BIM software and applications to work together in support of connectivity of data feeds from a network of sources. Other activities will be developing the commercial and legal practices necessary to enable these ways of working to be adopted by Industry.

**ACTION 9: COMMIT TO 'DIGITAL BUILT BRITAIN' AS A VEHICLE TO ALLOW THE UK TO ACHIEVE FULLY INTEGRATED BIM.**

**ACTION 10: THE UK WILL TAKE A LEADING ROLE AND SEEK GLOBAL PARTNERS IN DEVELOPING INTERNATIONAL BIM STANDARDS TO ENABLE SOFTWARE TO WORK TOGETHER MORE EFFECTIVELY.**

## **B. Action to ensure that the UK has a Coordinated Approach to the collection and analysis of BIM data**

We are beginning to see that there is high quality data being collated from projects using BIM. Government is looking at how data can be interrogated in a way that will help both Government and businesses in understanding and developing ways to improve the construction, operation and management of assets and take better decisions at each stage of future projects.

**ACTION 11: GOVERNMENT WILL ESTABLISH A PILOT PROGRAMME FOR THE COLLECTION AND ANALYSIS OF BIM DATA TO CAPTURE LESSONS AND SHARE BEST PRACTICE.**

## C. Leading the move from BIM to Smart Communities and Future Cities.

It is clear that the quality of life and economic vibrancy of our cities is dependent on our ability to provide consumers with a wide variety of digital services at home or on the move. For example, we need to be able to predict peaks in demand eg in energy or transport, in order to match capacity to demand and to inform customers of any disruption. This requires, and consumers now expect, to have access to the information they need, when they need it. BIM provides one of the key building blocks of information but it has to be linked to data from other sources, e.g. location data from mobile phones or satellites, to ensure that consumers have access to the full range of services which they are beginning to demand. This requires careful integration of different data sets from different data sources, to ensure privacy and security, as well as the development of more powerful search tools, to cope with the paradigm shift in the volume of data.

The Government is keen that the UK be at the forefront of developments in the Semantic Web and in leading the move from the use of BIM in individual assets to its incorporation in the design and management of smart cities.

“BIM is transforming, not only the way buildings are designed and constructed, but also how they are managed and developed in the light of changing customer needs. In so doing, BIM is changing relationships and business models across the whole value chain. Meanwhile at a city level, the technology-enabled city is an untapped source of sustainable growth and represents a powerful approach for tackling unprecedented environmental and economic challenges. By unlocking technology, infrastructure and public data, cities can open up new value chains, spawning innovative applications and information products that make sustainable modes of city living and working possible. The data delivered through BIM at a building level will be an important enabler of these new value chains.”

**Léan Doody, Smart City Lead, Arup.**

“We enthusiastically support the Government’s plans to extend their Building Information Modelling initiative into the domain of operational data and performance. The BIM initiative reflects what’s already been achieved in the advanced manufacturing space (eg aerospace, automotive...), and in that space working across the entire life-cycle has become standard practice. Improving operational efficiency starts with BIM and the consideration of building physics and materials alongside control models - and the ability to optimise across physical design iterations is a great complement to the in-service optimisation enabled by platforms like the Urban Operating System.

The ability to utilise real time data to improve the functionality and performance of built assets and to establish innovative value chains for solution delivery is something that we are pursuing in a consortium with Cisco and Infusion through the RAPTOR (<http://www.raptorsme.com>) collaborative research project which is being supported by the UK's Technology Strategy Board. RAPTOR and the associated creation of new SME led businesses will directly support the Government's ambitions to establish "Digital Built Britain" and at the same time drive innovation and growth in both domestic and international markets."

**John Stenlake – Chief Technology Officer, Living PlanIT**

**ACTION 12: TO ENSURE THE UK LEADS THE DEVELOPMENT AND COMMERCIALISATION OF TECHNOLOGIES IN THIS AREA, THE GOVERNMENT IS INVESTING IN BOTH A CONNECTED DIGITAL ECONOMY CATAPULT, AND IN A FUTURE CITIES CATAPULT, TOGETHER WITH £25 MILLION TO CREATE A FUTURE CITIES DEMONSTRATOR TO BE LAUNCHED IN EARLY 2013.**

#### 4. CONCLUSION

Government has set out in this paper its strategic intention of utilising our current global leadership in BIM exploitation to create 'growth' for the UK Market. Given that BIM represents both a domestic and global opportunity it would have been remiss if we had not developed a forward plan in this manner. Government recognises that we have a limited 'window of opportunity' to cement our position and if we fail to do so then other nations will quickly begin to erode our competitive advantage away.

The three point plan outlined above to:

- fully commit to our existing programme
- aim for growth and new opportunities
- help create the future

will set a fair wind for the UK as we continue on our journey to extend our position as a leading force in BIM technology and process. Industry's response to our existing BIM programme has already been enthusiastic and we must continue with this partnership if we are to realise our ambitions. Government recognises the value of international collaboration and we aim to become the coordinating force of global efforts in standards development. This is already beginning to happen and discussions with our global partners are progressing.

Over the coming months Government will work with industry and clients to put 'detail' to the actions presented above and begin the process of developing programmes of activities to support our ambitions. Government recognises that not all these activities will progress at the same pace since many of the

actions have significant complexity. With some elements of the programme the BIM experts are only just beginning to get their minds around the questions, let alone formulating the answer, with others we are still working to devise a route-map to reach the particular goal and achieving global consensus can often prove to be a 'slow burn' process. However, none of this should stop the UK from embarking on this journey as one of the more certain propositions is that BIM will be an essential part of the business environment in which the construction sector and, indeed, their clients will in future have to operate. The accelerating take-up of BIM across the globe will itself create a number of tipping points for companies to adopt BIM.

In the short-term, Government has made clear to its own client-base and supply-chain its forward requirements for BIM data. A five-year lead-in time should permit both clients and industry to take appropriate action to deliver to these new requirements. Of course, there is a wider private sector construction market which will take its own decisions, however, some leading clients are following Government's example. One international contribution to this paper has already highlighted that the day is not far off when there will be a significant business cost of NOT being BIM enabled.

Despite this complexity and uncertainty, it is Government's belief that with industry's engagement we can succeed with our programme and Government looks to the considerable success of the current programme to assist in propelling us into the future programme.

## **Major Contractor**

“Innovation and efficiency are at the heart of our strategy and our ongoing BIM actions are designed to provide us with competitive advantage. It extends across all of our capabilities and markets, from infrastructure investment and professional services to construction and on-going asset management and enables us to provide our clients with a wealth of new information about the infrastructure we are building and managing on their behalf.

“At Balfour Beatty, BIM is very much becoming part of the way we think and work, unlocking new efficiencies for our customers, our supply chain and our projects. We have already used BIM on a number of high profile projects including the San Francisco Bay Bridge, the widening of the M25 outside London, and design and construction for the replacement of Terminal 2 at London Heathrow International Airport. For the new Terminal 2B, the largest ever airside project at Heathrow, the use of BIM helped the company coordinate over 30 active stakeholders through 13 interfacing projects and enabled a peak workforce of 1,600 to complete work, including a 2 km diaphragm wall, the largest in Europe, ahead of schedule.

“BIM is a fundamental a part of our integrator philosophy, ensuring best value at every stage of the project life-cycle. The Government Construction Strategy promotes integrated supply chains. For Balfour Beatty we are realising this agenda through our BIM approach to asset creation, maintenance and operation. We believe that the Government Construction Strategy and its BIM requirements will impact all members of the supply chain and herald a new era where intelligent decision making and optimal asset performance will be facilitated by structured “in-use” asset data.”

**Ian Tyler, Chief Executive Officer, Balfour Beatty PLC**

The Government recognises the considerable voluntary contribution made by individuals, construction trade and professional bodies, the construction supply chain, public and private sector clients, academia and numerous industry groupings to our BIM programme and who have all made it the success it is. Government would like to acknowledge and to offer its thanks to the many UK and international contributors to this document.

Image Credit: "Forth Road Bridge" - "Balfour Beatty Construction Services UK"

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