SYMETRI
ADDNODE GROUP

Building Information Modelling (BIM): Adoption and implementation for Local Authorities

Contents:

Purpose of this whitepaper:

This whitepaper aims to educate and prompt local authorities to consider their perceptions about BIM/ digital ways of working. It also looks to discuss how local authorities can learn from what the AEC sector has uncovered during implementation and how it can be streamlined without the same level of investment.

Executive Summary

Building Information Modelling (BIM) has been used throughout the construction sector for well over a decade.

In its infancy, BIM was still a concept whilst technology was still catching up. It was an ambition of how data was to be managed for an asset from concept, through to construction and throughout the operational phase, right up to its end of life and decommissioning.

Today, BIM has been globally adopted by governments and organisations for the capital and operational expenditure of their assets. Already BIM and digital transformation have a proven track record for delivering efficiencies, including time, cost, and data availability.

In the UK, local authorities have a huge opportunity to cut the costs of building and maintaining assets via the use of BIM.

The Building Information Modelling (BIM) Mandate

Following the UK Government's Construction Strategy, published May 2011, 'all centralised departments were to adopt BIM for project procurement and delivery processes, as a minimum, from April 2016 onwards' (UK Cabinet Office, 2011). 'This, however, does not include Local Authorities inside of the mandate' (Construction Innovation Hub, 2020).

Although Local Authorities have not been included, this does not mean the adoption of digital transformation and BIM is to be avoided. There are benefits to be gained from the implementation of BIM and UK standards, (ISO 19650).

Low Uptake

The low adoption rate of BIM at Local Authorities has been linked to the lack of digital transformation and digital ways of working. This stems from a shortage of knowledge regarding BIM principles and its overall benefits.

Reluctance to change and disrupt the status quo is also an issue, as there has been no challenge to how current processes and outputs are managed and measured.

An imbalance of the risks and rewards throughout project stakeholders when looking at BIM adoption is also problematic.

Early in its development, the financial burden and steep learning curve was predominantly carried by architectural practices and design consultancies, those who traditionally delivered design products and had mature quality management systems. This resulted in an irregular adoption of BIM and siloed capabilities throughout the supply chain.

Common Misconceptions Surrounding BIM

There are some common misconceptions surrounding BIM that are found throughout the industry, these have led to a misunderstanding of the benefits and opportunities that BIM delivers, this includes:

•**BIM is simply a 3D model**

•**BIM is time consuming and causes adverse effects on project productivity**

•**BIM is costly**

•**BIM is for big organisations and large-scale projects**

•**BIM is a short-term trend**

•**BIM only relates to stakeholders involved in the design and construction of assets**

•**BIM is a software solution'**

(McPartland, 2016)

None of these misconceptions are true if BIM is correctly implemented. However, these misconceptions have stopped some organisations from implementing BIM and realising the benefits.

'Capital expenditure (CAPEX) by local authorities in England alone came to circa £26.3 billion in 2019 to 2020. The largest area was highway and transport services totalling £7.3 billion. The largest growth sector was housing totalling £6.1 billion, a 10 % increase from the previous year' (Ministry of Housing, Communities & Local Government, 2020). Using the above statistics, if CAPEX across local authorities dropped by a single percentage, it would equal cost savings of around £263 million. Given that the target set in the Government Construction strategy was a 20% reduction, there is a clear opportunity for BIM to have a significant impact on local council's expenditure.

Local Authorities in Numbers

In England, local authorities are split into five categories and two additions namely the City of London and the Isles of Scilly as demonstrated in the figure below:
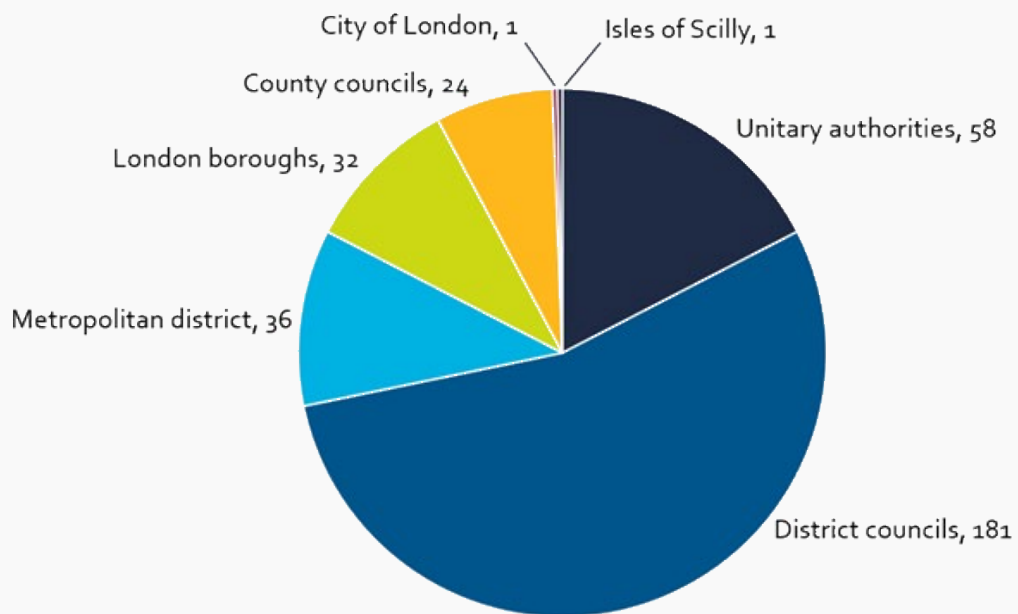

Figure 1 - Breakdown of local authorities in England

(Ministry of Housing, Communities & Local Government, 2016)

The Importance of Information Requirements

Information requirements need to be developed prior to tendering or project commencement. A substantial element of the ISO 19650 standard is information management. The notion of information management is about ensuring that the correct information is delivered to a suitable destination at a precise time or project milestone to fulfil a specific purpose *(UK BIM Alliance, 2020)*.

Organisational Information Requirements (OIR) are the beginning for all information activities whether for an organisation, asset, or project. They are high-level; thus help feed the overall business function and are used to help support strategic business decisions. They contain information relating to activities such as environmental compliance, capital investment and lifecycle costings, maintenance and repairs and space utilisation. The information is then used in departments such as human resources and finance to satisfy aspects such as internal staff and invested stakeholders; objectives, and outcomes; and business operations such as corporate reporting and auditing *(UK BIM Alliance, 2020)*.

Asset Information Requirements (AIR) relate to the information required to operate and maintain an organisation's asset such as a building or road. This information may include annual boiler service dates, insurance renewal dates, replacement costings, and so on. The AIRs specify the information required by the Asset Information Model (AIM) which can otherwise be known as a 'Digital Twin' *(UK BIM Alliance, 2020)*.

Project Information Requirements (PIR) relate to high-level information required by a specific project or contract. They aid in aligning the project to the OIRs and aid in feeding information such as Key Performance Indicators (KPIs), financial data such as affordability, named project stakeholders to be kept informed and to receive information such as planning authorities and end user operators, and strategic data such as opening and completion dates which subsequently feed into the overarching targets and ambitions set out in the OIR *(UK BIM Alliance, 2020)*.

Exchange Information Requirements (EIR) are developed so that suitable information is fed to an end user, such as a local authority, to fulfil a specific requirement or task during the operation of an asset. It identifies the data workflows, or journey, including any gateways that information must pass through such as checking, reviewing, and approval procedures. It also prescribes and defines how data is to be structured including file naming conventions and additional file metadata such as classification, phasing and/or stages, and so on *(UK BIM Alliance, 2020)*.

Waste Avoidance is a fundamental motive for information requirements. In ISO 19650 part 2, it is explicit about not producing data that; will exceed the level of definition, in other words, the information delivered is more advanced or detailed than the project phase requires; it is beyond the specified project scope; it is beyond the scope of a party or discipline and is repetitive or duplicate data; and the deliverables contain superfluous details and / or data (Fugas, 2021).

Benefit Realisation

The scalability of BIM was a highly disputed topic during the tenure of the original BS 1192 and PAS 1192 suite of standards. ISO 1950's introduction aimed to tackle this as the suite of standards has been designed so that it is scalable *(UK BIM Alliance, 2019).*

The scalability of implementation is also mimicked by the scale of benefits received following its implementation. Beneficial outcomes achieved post BIM implementation can be realised at three different levels:

1. Asset Level

2. Portfolio of Assets

3. Business

PricewaterhouseCoopers have produced methods and concepts looking at benefit paths, moving from an individual asset, through to a portfolio of assets, and then up to business or organisational benefits sat within a pyramid structure' *(Pricewaterhouse Coopers, 2020).*

This means that benefits are achieved on an individual asset basis, but they then have a collective impact when we look at several assets as a portfolio, subsequently having an efficacious impact on the wider business, organisation, or in this case, local authority.

When this approach is applied to a Local Authority, a single asset view is inappropriate as they control many assets, and we can use this methodology at an interdepartmental/interdisciplinary level. A transportation department may have a level of benefits due to the implementation of digitisation, but the effort is multiplied when you look at all assets as a system and start including the benefits taken from other departments such as housing. This relates back to the Information Requirements previously stated, where the OIR sits at the top, the PIR sit at the bottom, and the AIR and EIR sit between depending on the data management setup. AIRs and EIRs might be produced on an individual asset basis or at a framework/portfolio level.

National Digital Twin Programme (NDTp)

Digital twins are a new concept linked with the development of BIM, these "Digital twins are realistic digital representations of physical assets. They can be used to monitor and predict performance, feeding out insights and interventions. These insights lead to better interventions and unlock real-world value from assets through financial savings, improved performance and services, and better outcomes for society" *(Centre for Digital Built Britain - CDBB, 2021).*

'The launch of the NDTp involved the CDBB developing a set of principles to aid in guiding the programme, the Gemini Principles. This set of principles highlights the value of increased data sharing from centralised asset information models or digital twins. The financial benefits include an additional cost saving of £7bn in the UK, on infrastructure projects alone' *(Deloitte, 2017),* 'that's equivalent to 25% of total spend' *(Martin & Proctor, 2018).*

For the NDTp to work successfully, it's going to need to plug the gaps between centrally owned and managed government assets, such as transportation corridors and waterways, with the information from local authorities. There are currently examples of local authorities adopting and creating digital twins including:

- Harrow Council harnessing the power of street-level imagery and LiDAR data inside of a Geographic Information System (GIS) *(The Association for Geographic Information, 2021)*
- Data Mill North (Leeds City Council) collating Open Data information from multiple sources into a centralised location *(Leeds City Council, 2021)*

All asset owners, be it local authorities or centralised government departments can benefit from the data assigned to digital twins. For example, a Highways England road project running through a rural setting will benefit from the existing data collected from a neighbouring Environment Agency asset.

Local authorities too, will be able to benefit from the data collected by these government departments be it not having to survey locations by adopting already produced topography or having access to readily available utility network data.

Sector Skill Gaps

Skill gaps and shortages have been a much-discussed issue in the Construction industry for many years, and 'Science, technology, engineering, and mathematics (STEM) skills are in short supply but remain in high demand' *(UK Commission for Employment and Skills, 2013)*. 'According to The Institution of Engineering and Technology, the UK suffers an annual loss of £1.5bn due to this skill shortage' *(The Institution of Engineering and Technology, 2021)*.

This links to where we discussed the notion for a low uptake in BIM within Local Authorities. It also poses a particular question; should Local Authorities bring that expertise in-house or continue to rely on outsourcing to the private sector?

'Outsourcing in Government has been on the rise since the start of its procurement in the 1980s. If there is a high-level STEM shortage, as suggested, this will inevitably have a detrimental impact on the quality of service provided by outsourced work, or the scarcity of quality candidates in the market if looking to recruit in-house' *(Sasse, Nickson, Britchfield, & Davies, 2020)*.

Whether the route taken is to be in-house, outsourcing, or a hybrid of both, Local Authorities can aid in helping STEM recruitment by:

•'Accommodating and initiating discussions and communication channels between industry and academic institutions, helping to provide more relevant skills aligned to the exponential growth of technology
•Provide and support teachers with training in particular areas such as computing and engineering
•Encourage diversity for those wanting to enter the profession
•Closer connections between Professional Engineering Institutions (PEIs) and local authorities for careers advice and academic routes such as vocational study'

(The Institution of Engineering and Technology, 2021)

'Following the UN Climate Change Conference (COP26), in achieving net zero greenhouse gases by 2050, the Construction Industry Training Board (CITB) has confirmed that there will need to be 350,000 new roles in the built environment industry by 2028. With this new UK green recruitment landscape, it will put a huge emphasis on the importance of STEM recruitment in central government, local authorities, and the private sector' *(The Guardian, 2021).*

Clearly these issues are not going away, we need to look at new ways of working. Delivering infrastructure programs, BIM, Digital transformation and Digital twins, are part of the solution we all need to embrace to continue to deliver value in the communities we are working.

References

British Standards Institution (BSI). (2019). Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - information management using building information modelling - *Part 1: Concepts and principles.* London: British Standards Institution (BSI).

Centre for Digital Built Britain. (2021). *Digital Twins.* Retrieved from University of Cambridge: https://www.cdbb.cam.ac.uk/research/digital-twins

Construction Innovation Hub. (2020). *BIM in Local Authorities - A paper discussing the issues surrounding the implementation and adoption of digital ways of working / BIM in local authority organisations.* CDBB.

Deloitte. (2017). *New Technologies Case Study: Data Sharing in Infrastructure - A final report for the National Infrastructure Commission.*

Fugas, K. (2021, March 9). Explaining Information Requirements in ISO 19650. Retrieved from BIM Corner: https://bimcorner.com/explaining-information-requirements-in-iso-19650/

Leeds City Council. (2021). About us. Retrieved from Data Mill North: https://datamillnorth.org/about-us/

Martin, J., & Proctor, H. (2018, August). D*evloping new statistics of infrastructure.* Retrieved from Office for National Statistics: https://www.ons.gov.uk/economy/economicoutputandproductivity/productivitymeasures/articles/evelopingnewmeasuresofinfrastructureinvestment/august2018#what-is-infrastructure-and-how-do-we-measure-it

McPartland, R. (2016, October 21st). *Top 10 BIM myths debunked.* Retrieved from The NBS: https://www.thenbs.com/knowledge/top-10-bim-myths-debunked

Ministry of Housing, Communities & Local Government. (2016, January 11). L*ocal government structure and elections.* Retrieved from GOV.UK: https://www.gov.uk/guidance/local-government-structure-and-elections

Ministry of Housing, Communities & Local Government. (2020, November 5). *Local authority capital expenditure and receipts in England: 2019 to 2020 final outturn.* Retrieved from GOV.UK: https://www.gov.uk/government/statistics/local-authority-capital-expenditure-and-receipts-in-england-2019-to-2020-final-outturn/local-authority-capital-expenditure-and-receipts-in-england-2019-to-2020-final-outturn#accompanying-tables

Pricewaterhouse Coopers. (2020, May). Assessment of the benefits of BIM in Asset Management, Part 1 - Context and Methodology.

Sasse, T., Nickson, S., Britchfield, C., & Davies, N. (2020). Government outsourcing - *When and how to bring public services back into government hands.* London: Institute for Government.

Sawhney, A., Khanzode, A. R., & Tiwari, S. (May 2017). *Building Information Modelling for Project Managers.* London: Royal Institution of Chartered Surveyors (RICS).

The Association for Geographic Information. (2021, August 25). *Harrow Council creates digital twin, adds street imagery and LiDAR data to ESRI GIS.* Retrieved from AGI: https://www.agi.org.uk/harrow-council-creates-digital-twin-adds-street-imagery-and-lidar-data-to-esri-gis/

The Guardian. (2021, November). *How COP26 will advance job opportunities in the drive to net zero.* Retrieved from The Guardian Jobs: https://recruiters.theguardian.com/cop26/drive-to-net-zero

The Institution of Engineering and Technology. (2021). Addressing the STEM skills shortage challenge.

UK BIM Alliance. (2019, July). Information management according to BS EN ISO 19650, Guidance Part 1: Concepts.

UK BIM Alliance. (2020, September). Information management according to BS EN ISO 19650, Guidance Part D: Developing information requirements.

UK BIM Alliance. (2020, September). Information management according to BS EN ISO 19650, Guidance Part E: Tendering and appointments.

UK Cabinet Office. (2011, May). Government Construction Strategy.

UK Commission for Employment and Skills. (2013, November). The Supply and Demand for High-Level STEM Skills, Evidence Report 77

SYMETRI
ADDNODE GROUP

At Symetri we support innovative architecture, engineering, infrastructure and construction companies to optimise their working methods and increase the quality of their projects. Our purpose is to challenge people to work smarter and to turn ideas into new realities that shape a better future. With a combination of our own IP, best-of-breed technology from our partners and a comprehensive range of services, we enable our customers to build sustainably, maximise efficiency and increase their competitive advantage.

Our services include the provision of software, consultancy, training and support, and we offer a comprehensive range of IT and Document Management solutions.

Learn more:
www.symetri.co.uk

Contact us:
info@symetri.co.uk

AUTODESK