

BIM for Existing Buildings

Guidance for Housing Associations

BIM for Housing Associations Asset Management in the 21st Century

June 2021

Introduction

There are over five million homes within the social sector. BIM (Building Information Modelling) is essentially value creating collaboration through the entire life cycle of an asset, underpinned by the creation, collation and exchange of shared building models and intelligent, structured data attached to them. Social housing providers are long-term asset holders that act as landlords and therefore have much to gain from using BIM and the principles Information Management for the in-use phase of a building's life.

The requirement for developing the golden thread of information is also an opportunity for the sector to manage its homes more effectively, by enabling faster responses to problems with better information. However, most of the homes within the social sector were built more than ten years ago and those that were built more recently have rarely benefitted from BIM. Therefore, implementing Information Management processes for new supply only will not be sufficient to impact the majority of social homes in the UK.

After the Grenfell Tragedy on the 14th June 2017, Dame Judith Hackitt found in her review of building regulations and fire safety that there was a need for a 'golden thread' of information for higher risk residential buildings and recommended BIM should be phased in. The Building a Safer Future consultation document produced by The Ministry of Housing, Communities and Local Government (MHCLG) has

accepted the recommendation of a need for a golden thread of information, stating that they may look to mandate the standards related to Information Management as well as adopting a new Safety Case Review regime.

To fully implement the recommendations of the Hackitt Report and to leverage the benefits that BIM can realize, how might BIM for existing buildings work?

Consideration should be given to:

- Harvesting building information to create data sets mirroring new-build COBie file architecture.
- Use of visual representations of buildings as a usable container for the building information (point cloud scans/3d and 2d models/360-degree photos/CAD/GIS/Maps/Open Databases/QR Codes/ Asset Tagging/ IoT (Internet of Things)).
- Soft landings of development handovers and integration for asset's useful life phase minimising early failures.
- Developing transactional processes and the ICT systems to represent and update asset information sets keeping information relevant.
- Making information useful, useable and deployable for those carrying out the operation and maintenance of buildings by developing robust information requirements.
- Incorporating Information Management principles into all asset management contracts

"We are carrying out our BIM pilots for several reasons. Following the Hackitt report, we wanted to explore the benefits of BIM for our existing high-rise buildings as well as for new build developments. The 3D models developed to date will be used to design M&E services and sprinkler systems. We will also be adding to the BIM model as capital works are being carried out"

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Data Harvesting

The concept of Information Management for existing buildings has been often dismissed by social housing organisations. This is due to a perceived or actual lack of complete asset information. This can prevent the benefits of Information Management for buildings during their in-use lifecycle stage from being realised. Overcoming this starts with clear data strategies and policies. The opportunity for organisations in the sector to move forward with Information Management for existing buildings and secure benefits is significant.

A building that has been built using BIM properly will by default benefit from a vast dataset that has been compiled during the project and is organised into a pre-defined AIR's format. This will not be the case for existing buildings where it is far less likely that a high quality, well organised data set will have been provided in the same way. Instead, data would have been less rich to start with and would have changed over time. The accuracy of overall information would fluctuate over the lifetime of a building, this is because information is held in disparate systems, formats and with subdivisions of people within a housing association. There would also be varying levels of information around data provenance and confidence.

Despite these acknowledged challenges the volume of asset data held by most housing providers is quite significant. Arguably, this is of sufficient quantity and quality to extract the benefits of Information Management during the in-use phase of the lifecycle, particularly where the ongoing harvesting, collection and updating of this information is integrated into the business-as-usual activities.

Whilst implementing Information Management for existing buildings, consideration should be given to the approach to data collection, governance, hosting and harvesting. This will vary from business to business and will be impacted by factors such as existing systems and media in use, contractual arrangements and stock data strategies. Things to consider:

Review the data currently held

- What data is held in the business systems and in what form?
- What data is held in contractor/3rd party systems and in what form?
- Is the data provenance known by set?
- What is the data confidence by set?
- Can the data be easily updated and extracted?

Identify any key gaps that need to be filled

- What needs to be filled now?
- What can be filled over time?
- How can gaps be filled most cost efficiently?

Implement collection of data to fill gaps

- Collection of data off the back of other business (contractor visits, estate inspections etc)
- Stock surveys
- Indexing and linking H&S / O&M Manuals at Handovers

Organise data in transactional/non-transactional systems

- How will and can the data be federated into a common format?
- How will the data manifest in transactional systems (repairs systems, compliance systems, planned systems etc)?

Build ongoing harvesting and updating of data into BAU process and contracts

- What opportunity is there to collect and update information during business-as-usual transactions (estate inspections, repair raising, customer contacts)?
- Can contractors assist in data collection and updating under existing contracts?
- Build data and information requirements into procurement processes and contracts

For most organisations implementing Information Management will require a shift in how data is considered. It does not necessarily have to exponentially increase the volume of data being handled though. Having clear strategies and policies that utilise latent data harvesting and updating capacity from business-as-usual activities can be transformational with little additional resource required.

The security and provenance of the data also needs to be considered and an understanding of the data to be held in the public realm for the good of all.

“We used existing stock condition data for our COBie data. The problem we had was finding some manufacturer information for the costs of new elements, so we used a schedule of rates to fill the gaps. For our 3D photography scans we collected stock condition data at the same time.”

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The benefits in improved safety, better experiences for customers and enhanced value for money for existing buildings mirror new buildings.

BIM and Transactional Software: Crossing the digital bridge between BIM and Asset management

Comparing a capital project using BIM to the ongoing activities of Asset Management, the contrast is stark for Capital projects that involves low volume high value transactions while Asset Management and operational phases that features high volume low value transactions. For a New Build BIM project, the focus is principally the delivery of a building with all its component digital and physical parts for handover to the client. Whereas an asset manager is daily overseeing tasks such as repairs, cleaning and inspections across a host of buildings.

For Asset Managers, a key goal of implementing BIM is to be able to use the information provided to more effectively carry out these planned and responsive asset management activities. If the information available through BIM does not positively impact these activities, huge potential benefit around safety, customer experience and value may not be realised.

This difference in approach is critical in understanding the challenge when these two fields try to collaborate. The capital phase potentially generates thousands of component data points with hundreds of attributes and hands over this information at one time. The asset manager is on the other hand dealing with multiple assets of different ages that have varying maintenance regimes and whose information is stored in a variety of formats and locations. They are both complex, but complex in contrasting ways.

BIM can be beneficial in Asset Management phases by many means, such as lifecycle analysis for efficient facilities management, safe O&M and repair works, sustainable and efficient energy use, cost effective retrofit decision making to assist the Housing industry its journey towards net zero commitment. To realise these benefits retrospectively, housing landlords have been working to create as built BIM for existing buildings.

Digital photogrammetry, terrestrial laser scanning, 360 degrees virtualisation and penetration radars are some of the methods used for “as built” data acquisition for existing buildings. This approach may involve time-consuming intrusive surveys with various means of measurement or manual assessments with a degree of unreliability and error that may become a bottleneck of BIM generation process. Creating BIM from the captured data requires also requires high conversion/modelling effort e.g., rich point cloud datasets into BIM LOD (level of details) data models.

The execution of asset management transactions, day in and day out, is pivotal in how well an organisation performs and has a strong impact on viability and governance status. Organisations deliver hundreds of thousands of these transaction

types every year. The sheer volume makes this challenging. The potential impact of embedded systemised improvement to these transactions that Information Management through BIM offers could reap significant benefits. Customer sentiment about their landlord can hinge on the delivery of these transactions and consistently getting these transactions right, and right first time, could be considered the holy grail of asset management.

Conversely, those that provide BIM services as part of the development of a building are subject to severe impacts on profitability and therefore their businesses' viability if they deliver too much or too little relevant information to clients. If they have spent too long developing the information their profit margins will evaporate and if they have failed to meet the requirements of the contract and provided too little information, they will be required to undertake unforeseen rework and see their profit margins similarly squeezed. It is in the interest of both industries to collaborate to ensure that BIM provides the information that asset managers need to ensure their clients satisfaction and the delivery of a high quality, cost effective service.

The software solutions for these sectors have evolved over time. The BIM market is dominated by a few big players whose tools strongly influence many industry stakeholders' view of what 'BIM' is. In the context of asset management these tools perform modelling, data acquisition, validation, analysis, storing, sharing and communication functions. Modelling includes the creation of geometry in 2D or 3D as well as the creation of components and the information that describes how they will be maintained.

The how and why something is carried out is still held in specifications and communications. The data currently stored typically is the who, what, when and where. This is the principal understanding of what BIM is, but validation and analysis tools are a key component that unlock a myriad of opportunities including (some of which have an impact on how the data is structured and therefore needs to be established at appointment:

- Construction phasing
- Cost estimation
- Surveying – point cloud, photogrammetry, etc.
- Sustainability
- Security
- Crowd simulation
- Physics simulation

Facilities Management BIM tools have also been touted, but these often have interoperability issues with the software tools prevalent in Asset Management and require extra software to be developed to cross this divide.

Communication tools, specifically the process and platforms that form the Common Data Environment (CDEs) are the key concept introduced in BIM. They are however a process for managing information rather than a specific tool as CDE processes apply equally well to the use of a local hard drive as they do to a tool designed to be a CDE that is hosted in the cloud.

The ICT solutions market for asset management to deliver these high-volume transactions has evolved over time but remains relatively small. Further, the way the Registered Providers (RPs) often implement a variety of different tools results in fragmentation with few implementing fully joined up solutions. More often RPs use a collection of systems with interfacing between them in some cases and in other cases no interface at all. Some have adopted pilots based on selected standalone buildings to be BIM compliant through safety case reviews. This fragmented network of systems and data sources increases the difficulty of harnessing the potential power of the data held. This in turn makes the implementation of advanced digital processes like BIM more complex than they otherwise might be.

Much of the asset management activity surrounds the execution of a vast range of high-volume low value transactions, including:

- Repairs
- Compliance checks
- Servicing
- Major repairs/investment programmes
- Component replacements
- FRAs
- Estate Inspections
- Cleaning
- Grounds Maintenance
- Energy Efficiency and Sustainability IoT
- H&S management

Consideration should be given to how the information available from BIM will be used in transactional systems allied to BIM software. Some sector system providers in the marketplace are beginning to engage more actively with BIM principles. This is welcome and may make adoption easier for some. It appears currently though that out of the box BIM solutions that link BIM software to the range of transactional functionality that RPs require are rare, if available in the market at all.

It is recognised that the software market for the RP sector has some work to do in developing functionality and capability to make the implementation of BIM principles for the in-use phase of assets commonplace. The sector should not be relying on software providers to deliver solutions on a plate for asset managers though. Implementing BIM within RPs will be dependent on the asset managers defining their specific requirements through OIRs and AIRs, owning their own data and them being the driving force behind necessary improvements in functionality that will deliver tangible benefits for the business. Clearly linking BIM through to a range of benefits is necessary. These include building safety, customer experience, value for money and asset performance. These benefits must be used in framing system development investment by utilising cost benefit analyses that look at both financial and non-financial deliverables. These are the factors that can be compelling for CEOs and Boards. Working in partnership with software providers, with mutually beneficial intellectual property arrangements, is one way that the sector could move forward more efficiently.

Contracts and documents will need to provide sufficient rights over BIM data so that this can be used for the purpose intended. Intellectual property and copyright of data aligned with liability arising from this should be clearly agreed at the outset.

Whilst acknowledged as a challenge, the limitations of the current offerings in the marketplace is not necessarily a barrier to providers beginning to get the benefit of BIM information when using transactional systems, but instead an opportunity for the industry to develop these solutions together for the best outcomes.

“For our pilots we use both desktop and cloud-based systems. Our 3D model is viewed locally on Autodesk and our 3D photography is hosted in cloud by a third party. There does seem to be an increasing number of companies providing BIM services although smaller in number to those carrying out our general asset management surveys, but the number is growing. We have not yet synchronised the pilot BIM models with our asset management software at this stage but will when we start using the BIM models operationally.”

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Scanning and Data Containers

To be able to bring the existing housing stock to a point where its information can be managed effectively can be a complex task.

The 3D BIM model associated with BIM is often mistaken as BIM itself. This misconception has been a barrier for the Asset Manager. The idea of creating a full 3D Revit-type model of an existing building is seen as both important but impossible at the same time. Point cloud scanning to create Revit models, 360-degree photography creating fly-thorough models as well as other technologies for existing buildings are emerging in the marketplace and these offerings are growing in number and functionality.

The cost, complexity and some of the compromises remain a challenge for some asset managers though. Some form of data container is beneficial to implementing BIM approaches for existing buildings, but this could be a simple 2D plan of a building in some cases, simplifying the initial data capture and the ongoing use of the information by several factors. It is vital that the data required for the intended purpose is specified and the most effective methods of delivering the required outcome selected.

Modern properties where a BIM process has been undertaken require less work, whereas older properties with inconsistent and slow to access information will need more work to achieve the same outcomes. Versions of BIM, suitable for existing buildings can be implemented to achieve some middle ground between the benefits of a traditional full BIM environment and what RPs are working with now.

“A Lidar scan was used to develop the 3D model and 3D photography used for internal and external imagery. The 3D model is owned and updated by us and we will continue to add to this model as we carry out work or amend the building. The 3D photography scans are hosted in cloud by a third party, and these have to be updated by that consultant which is a disadvantage of using that type of approach.”

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Conclusion

Implementing Information Management, or BIM-like solutions for existing buildings presents a great opportunity for asset managers. Instead of providing the well documented benefits of BIM during design and build, the benefits of establishing BIM for existing buildings could begin to transform how building portfolios are managed day to day during their full lifecycle.

Building safety and delivering on the findings of The Building a Safer Future consultation document by creating the golden thread are both possible through the implementation of BIM for existing buildings. However, the potential to transform building safety, customer experience, value for money and asset performance sets a much broader compelling case for Boards and CEOs to consider.

Disclaimer

This document is part of the Toolkit *BIM for Housing Associations*. For more information about the project, to download the rest of the Toolkit and join the BIM4HAs Forum for support, please visit housing.org.uk/BIM4HAs or email BIM4HAs@ukbimalliance.org

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