

Background to project and aim of the questionnaire

Building Information Modelling (BIM) is the process of creating an intelligent 3D model of an asset which also contains extra information about 'objects' within the asset. This information includes geometric information (e.g. dimensions of a window) and non-geometric information (e.g. details of the materials that make up a structure or manufacturers handbooks). Traditionally, BIM models are created for new build projects using construction drawings and are updated as the project progresses. The finished model can then be used as a tool for facilities management upon the building's completion, to help manage the asset. Historic/heritage BIM (HBIM) is a branch of BIM that creates a model from an existing historical asset. The model is generated from surveys of the asset and then populated with extra information. HBIM could serve as a digital record of heritage information and an accurate 3D recreation of the as-is condition to enable informed decision making. There is currently no standard for HBIM, nor comprehensive identification of the information requirements and storage techniques for HBIM. If correctly developed, HBIM could greatly assist with the sustainable management of heritage for future generations.

The purpose of the questionnaires are to determine the experience and information needs of the different people involved in looking after built heritage. The questions will revolve around your experience of working with heritage, what information you need access to and how you might envisage using a digital model. The first part asks about your experience working with heritage and the subsequent parts ask how you would use a model if it was available and what information you would want it to contain.

Participant Information

Please read this section carefully. It details how the data you provide will be used and stored.

If you have any further questions or wish to withdraw your information, please contact me. If you would like to provide further information you can. Summaries of the results of this research will be available on request.

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Alternatively, you can contact my project supervisors.

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1) How your information will be used

The purpose of the questionnaires are to determine the information needs of the different stakeholders involved in the management of heritage. The questions will revolve around your experience of working with heritage, what information you need access to and how you would envisage using a HBIM model. The aim is to establish information needs and uses according to experts with experience of working with heritage assets. The information requirements will then be associated with modelling and data storage techniques for HBIM and existing heritage practices to develop a standard to be applied to any heritage asset. The information will be included in a thesis and may potentially be used for academic publications.

I consent for my information to be used in this way Yes

2) Withdrawal

You can withdraw your information from this project anytime until **2 months after submitting this questionnaire** by contacting myself or my supervisor. All information will be removed from any work and interview recordings and transcripts will be deleted. After **2 months after you submit this questionnaire** your information will not be able to be removed from the project.

I understand that I can only withdraw my information up until **2 Months after I submit the questionnaire** Yes

3) Confidentiality

Heritage management is largely dependent on individual perspectives and in-use circumstances. Therefore, it may be beneficial to include your **job title and/or organisational affiliations** in association with the data you provide. This will only be done if you consent to it. If you do not

consent to your job title and/or organisational affiliation being associated with the information, the data you provide will be included using a generic title of “Heritage Expert”. Any information you provide that is subsequently used in any publications or the thesis will be anonymised.

I consent for my job title and organisation to be included with information in the thesis and any publications

Yes

I consent for my job title to be included within the information in the thesis and any publications (my organisation will be anonymised).

I would like any information I give to be included in any publications or the thesis in an anonymised format

4) Data storage and sharing

During the project, questionnaire results will be stored securely and will only be shared with myself and my supervisors. **At the end of the project**, data will be made openly accessible. All data will be anonymised prior to sharing.

I understand that information I provide will be anonymised and made available in an Open Access format for referencing at the end of the project.

Yes

Participant Name	
Participant job title	
Participant organisation	

Definitions

For the purpose of this questionnaire the following definitions apply (see also diagram):

Asset= The whole structure/building

Object= The component parts that make up the asset. This includes but is not limited to windows, doors, walls and furniture.

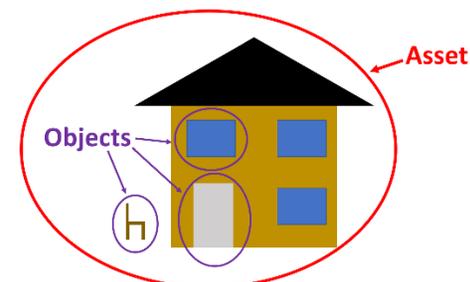


Figure 1-Difference between object and asset

Background questions

5) About you

Please give a brief description of your role.					
What type/s of heritage do you work with? e.g. stately home, historic bridge, listed building, industrial structure, registered park or garden etc					
How many years have you been working with heritage assets?	<5 years (please specify)	5-10 years	11-20 years	21-30 years	>30 years
What relevant qualifications or experience have you obtained you consider may be relevant to this role?					
Are the heritage assets you work with private, open to the public or both?					
In regard to the previous question, how would you say this impacts your role?					
How many people are involved in the management and maintenance of the heritage at your organisations?	1	2-10	11-20	>20	
What key challenges do you face with regards to working with heritage?					

<p>Have you encountered BIM before? If yes, what is your experience with it?</p>	
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6) How you currently manage heritage information

<p>Is the information you currently possess about the heritage you are involved with sufficient for your purposes? Strongly agree (5), Agree (4), Neither agree of disagree (3), Disagree (2), Strongly disagree (1)</p>	
<p>What are the main types of information you currently possess? This could include, but is not limited to, architectural drawings, records of previous conservation work etc. Please be as comprehensive as possible.</p>	
<p>How do you currently manage the information you possess? E.g. is it paper copies, personal experience, digital copies or other</p>	
<p>What are the key challenges you face with regards to how you manage heritage information?</p>	
<p>Are there any specific tools or computer software that you use to store and manage the data and information?</p>	
<p>If yes, what are the specific tools or computer software you use?</p>	
<p>What is good about the tools or computer software you currently use?</p>	
<p>What are the limitations of the tools or computer software you currently use?</p>	

Questions about HBIM

7) Purposes of a HBIM

As previously mentioned, BIM is the process of creating an intelligent 3D model of an asset which also contains extra information about ‘objects’ within the asset. This information includes geometric information (e.g. dimensions of a window) and non-geometric information (e.g. details of the materials that make up a structure or manufacturers handbooks). A HBIM is a BIM model of a historic asset. Essentially, all the information about an asset should be stored and accessible within the model alongside a visual representation of the object. BIM software allows people to plan activities, create schedules and design new constructions. BIM can also be used as part of artificial reality/ virtual reality (AR/VR) tools to create virtual experiences. **Based on this information for what purpose do you think you could see the benefits of a HBIM?**

Purpose of HBIM		A HBIM could be beneficial for this purpose. Strongly agree (5), Agree (4), Neither agree of disagree (3), Disagree (2), Strongly disagree (1)	Any other comments about the potential use of HBIM?
Restoration projects	Defined as any works attempting to return an asset to its original condition.		
Renovation projects	Defined as works to upgrade or change an asset. This could be for aesthetic, structural or energy performance reasons.		
Conservation projects	Defined as actions/work to maintain an asset in its current condition. This includes day to day and ad hoc maintenance.		
As a virtual tool used to share heritage with the public	This is envisioned as an educational tool (potentially incorporating AR/VR) that could contain information about the intangible heritage of the asset or be used to teach others about conservation etc.		
Management of a heritage asset	Asset management- defined as managing an asset at an organisational level to maintain its value in line with organisational objectives		

	Facilities Management -defined as managing the asset and its contents for day to day running. This involves planning maintenance, managing resources, space management and monitoring energy performance.		
Translocations	Defined as moving a structure from one location to another. It may be intact for the relocation; dismantled from its original site and rebuilt somewhere else; or it may be recreated from already dismantled parts at a new location.		
Other (please give details)			
Other (please give details)			

Please add any uses you don't think have been mentioned.

What are the key functionalities you would require a HBIM to perform in order for it to assist with your role?	
What challenges do you think you'd face trying to use/implement a HBIM for the assets you work with?	

8) What information would the model need to contain? Please add any other requirements you think necessary that haven't yet been included.

This project aims to identify the comprehensive information requirements for a new standard methodology applicable to any historical/heritage building or asset and recommendations for a standard methodology for storing historic and heritage specific information within a model. Some examples of potential information requirements are given in the table below. **Given your experience working with heritage, which requirements would you need to successfully carry out your work?** The information requirements suggested are intentionally broad due to the wide variety of heritage assets in existence so please feel free to provide any extra detail you feel necessary. Please indicate if the requirement is **critical** (work cannot continue without it), **useful** (assists with/adds value to a task but work can progress without it), for a **wish-list** or **not necessary**.

Information is stored in a BIM model by associating the information with 3D model objects e.g. an object representing a window. Depending on the modelling technique these may be simplified versions of the real condition or may be highly accurate. Hence for each information requirement there is another question asking how important an accurate 3D model of an object (reflecting real-life) is for you to understand the information requirement.

The questions also ask how often you need to access the data and how frequently new versions of the data are created?

Note: The first potential information requirement given is ‘Geometric Surveys’. These are typically be provided by techniques such as point clouds, which are a collection of thousands of points that provide a 3D representation of an area, or photogrammetry. An example point cloud is shown below to demonstrate the sort of information they provide.

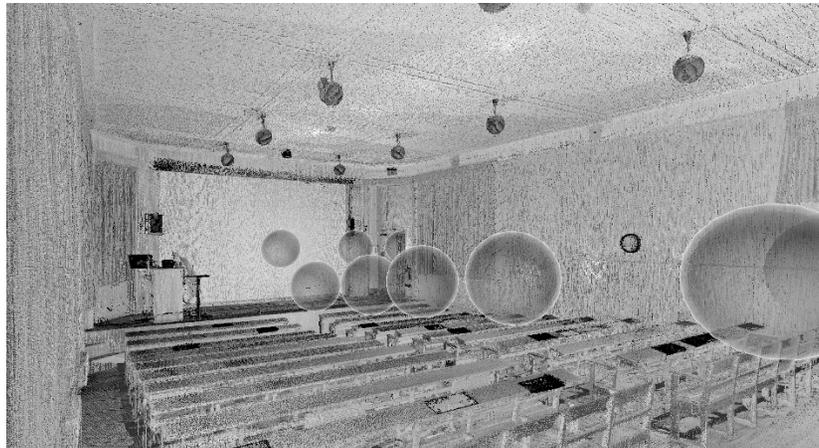


Figure 2-Example geometric survey type (point cloud)

Information Requirement	Is this specific information requirement Critical (4) , Useful (3) , a wish-list requirement (2) or not needed (1) ?	What format would you require this information in for this requirement (if known) e.g.,	Do you currently possess (1) this information, does it need to be created/gathered (2) for the HBIM or do you possess some but not all	An accurate 3D model object is needed for you to understand this information requirement? Strongly agree (5) , Agree (4) ,	Any other comments for this information requirement?

			text and/or image etc?	(3) of the information?	Neither agree of disagree (3), Disagree (2), Strongly disagree (1)	
Geometric surveys- defined as the geometric information gathered with which to create the model. These will typically be provided by techniques such as point clouds, which are a collection of thousands of points that provide a 3D representation of an area (see figure 2), or photogrammetry.	The geometric survey themselves					
	Details about the geometric survey e.g. how and by whom it was carried out					
Information (data) about the fabric of the asset- defined as the physical material/structure that makes up the asset.	Materials data e.g. what materials are used					
	Architectural data e.g. floor plans					
	Current building fabric status data					
Condition assessments- defined as inspections of the physical condition of an asset which could include, but is not limited to, assessments of decay or energy performance.	The raw data from the assessment					
	The results and recommendations of the assessments					
	Details about the assessments e.g. how and by whom it was carried out					

<p>Legal requirements- defined as any requirement that may affect your ability to carry out certain work. This may include a planning regulation (e.g. Grade Listing etc) or statutory document (e.g. other requirements such as conditions of bequest).</p>	Planning regulations					
	Statutory documents affecting the asset					
<p>Historical information- defined as <u>archaeological data</u> (including data about lost heritage) and <u>major changes</u> to an asset (not regular conservation works) over time. It is <u>not</u> referring to historical significance.</p>	Archaeological Evidence					
	Changes that have occurred over time					
<p>Environment data – defined as more detailed data about the specific environment (or space) of an asset which may affect its condition or performance. This may</p>	Light levels (internal and external)					
	Vibration levels					

<p>be at a large scale (e.g. whole building) or smaller scale (e.g. light levels in a specific room affect a specific object).</p>	Weather					
	Dust levels					
	Humidity					
	CO2 Levels					
<p>Safety and security information- defined as any information related to the safety and security of the asset. This could include fire evacuation drawings, locations of fire alarms, accessibility information such as wheelchair accessible routes etc.</p>	Fire Safety					
	H&S					
	Potential threats/risks and vulnerabilities					
	Security					
	Accessibility Information					
<p>Space data- defined as information about how the physical space of an asset is broken down and used. This may include, but is not limited to, room allocations (space breakdown), which areas are open to the</p>	Space usage					
	Space breakdown					
	Visitor information					

public/private (space usage), occupancy limits or average footfall (visitor information) etc.						
Maintenance manuals/instructions – defined as information provided or required to help plan and/or carry out maintenance and conservation works on an object.	Required equipment					
	Minimum level of performance					
	Whether the maintenance can be performed by a normal user or requires skilled personnel					
	Intervention type (work required)					
	Intervention Frequency					
	Previous maintenance including Conservation history					
	Cost of work					
Historical significance- defined as the tangible or intangible significance which attributes to the importance of the asset e.g. how it evidences a way or life/ practice, architectural or structural importance, associations to notable figures etc	For education					
	To inform management decisions					

<p>Location data- defined as information about the wider location surrounding the asset. This may or may not be owned by you. For example, a local river may be prone to flooding and a risk to your asset. Alternatively, it may be information about the grounds surrounding the asset itself e.g. the boundaries of the land.</p>	Setting of the asset (e.g. in grounds)					
	Nearby physical hazards					
	Related assets nearby					
	Other generic locational information					
<p>Objects not part of the building's fabric - defined as important objects not necessarily considered part of the building which could be artistic (e.g. tapestries, artwork, sculptures etc) or other moveable assets (e.g. old factory machinery, furniture with a specific significance etc).</p>	Moveable objects					
	Artistic objects					

Please add any requirements you think haven't been mentioned.

9) Are you happy to be contacted again if necessary?

Yes No

I am happy to be contacted again

If yes, please provide contact information such as address, email address, phone number.

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