

BIM Interoperability Expert Group Report Public Consultation Summary

June 2020



Construction Innovation Hub

The Construction Innovation Hub brings together world-class expertise from the Manufacturing Technology Centre (MTC), BRE and the Centre for Digital Built Britain (CDBB) to transform the UK construction industry.

With £72 million from UK Research and Innovation's Industrial Strategy Challenge Fund, we will change the way buildings and infrastructure are designed, manufactured, integrated and connected within our built environment.

We will be a catalyst for change. We will drive collaboration to develop, commercialise and promote digital and manufacturing technologies for the construction sector. We will help build smarter, greener and more efficient buildings much faster and cheaper than we currently do.

Research will help us understand how the industry must change in terms of skills, product standards, capacity and innovation. This will be combined with an academic programme to create the security-minded frameworks and rules that will underpin the future digital built environment and grow exports for UK know-how.

We will work closely with other initiatives as part of the Government's Transforming Construction challenge programme. Through collaboration across the sector, we can provide a better built environment for future generations.

THE CONSTRUCTION INNOVATION HUB IS DELIVERED BY:

Table of Contents

Executive Summary	4
<i>Key Findings.....</i>	<i>4</i>
Consultation Approach	6
<i>Methodology.....</i>	<i>6</i>
<i>Who Responded?.....</i>	<i>6</i>
Analysis Summary	8
<i>Classification Schema Alignment.....</i>	<i>8</i>
<i>COBie – Practical Application and Development</i>	<i>8</i>
<i>Education and Skills</i>	<i>9</i>
<i>Industry Foundation Classes</i>	<i>10</i>
<i>Standards.....</i>	<i>10</i>
<i>Asset Information Model (AIM) Common Data Environment (CDE)</i>	<i>11</i>
<i>Standard Data Approach</i>	<i>11</i>
<i>Procurement and Contracts.....</i>	<i>12</i>
<i>Areas for Future Consideration.....</i>	<i>13</i>
Annex 1: Consultation Submissions.....	14
<i>Quantitative Analysis</i>	<i>14</i>
Acknowledgements	15

BIM Interoperability Expert Group Public Consultation Summary

Executive Summary

The Centre for Digital Built Britain (CDBB), part of the Construction Innovation Hub (CIH), with oversight from both The Department for Business, Energy and Industrial Strategy (BEIS) and Infrastructure Projects Authority (IPA) and support from the UK BIM Alliance, has undertaken a comprehensive evidence gathering exercise to:

- facilitate ‘real-world’ understanding of the short-term interoperability issues encountered by information management experts when implementing the UK BIM Framework (5 year time frame);
- and understand what alternative interoperable processes/standards are available and their possible advantages and disadvantages.

CDBB is a partnership between the University of Cambridge and BEIS. It is the custodian of HM Government’s Digital Built Britain, UK BIM, International BIM and National Digital Twin programmes.

CDBB has produced recommendations that enable the UK Government to develop existing BIM policy (often referred to as the ‘BIM Mandate’). The resulting report provided a summary of the evidence received by the BIM Interoperability Expert Group’s committee (BIEG) and their resultant recommendations, which will help to support additional beneficial outcomes of interoperability.

On 17 April 2020, CDBB launched a public consultation to consider the full range of people, businesses and voluntary bodies affected by the policy, as well as representative groups. The public consultation was made available via web form on the CDBB website.

Key Findings

The public consultation revealed a consensus between the BIEG and respondents in relation to the following points:

- **Increased BIM interoperability will lead to faster, more efficient and reliable decision making using trustworthy information.** Improved interoperability between asset phases means better decision-making across the entire asset lifecycle.
- **Interoperability is the key to unlocking the wider benefits of information management in the built environment.** Increased interoperability will support a ‘golden thread’ of information, including the provision of statutory information in order to improve compliance, health and safety and zero-carbon targets for the construction industry.

- **Practical development of key elements of interoperability is required** in order to support the UK's long-term ambitions for sustainable and resilient infrastructure. The key elements that should be addressed early in a programme of work include:

- I. Classification schema alignment
- II. COBie /IFC
- III. Education and skills
- IV. Standards
- V. Asset information model common data environment
- VI. Standard data approach
- VII. Procurement & Contract

It is intended that the BIM interoperability report recommendations that are not included in the above list will be included in a second phase of development work.

- **Government must lead the way.** There is consensus that the UK Government should continue its support for the development and adoption of the above enablers as part of the evolving BIM Mandate.

The following consultation summary summarises details the approach to the public consultation and includes an analysis of responses related to the practical development of the seven initial key elements of interoperability listed above. Responses providing comments related to areas of second-phase development are out of scope of the proposed first-phase programme of work, and they are noted for future consideration.

Consultation Approach

Methodology

The consultation was conducted as a survey via web form on the CDBB website. Respondents were requested to submit feedback on the first-phase key enablers of improved interoperability put forward in the report¹ as primary and secondary recommendations.

Individuals and organisations participating in the consultation were asked to provide input in relation to interoperability, defined by the BIEG as ‘the ability of two or more systems to exchange information and to use the information that has been exchanged’.²

As in the report, the respondents were asked to consider the proposed recommendations in the short term only (< 5 years), with a specific focus on practical/applied insights and experience, rather than strategic approaches; on any interoperability expertise that they and/or their organisation have that is relevant to each of the recommendations; and on related case studies and/or research not previously referenced in the report.

Those participating in the consultation were requested to restrict the length of submission to no more than 300 words per recommendation.

Who Responded?

A total of 22 responses were received via the web form, with no responses received in alternative formats. The majority of respondents (72.7%) came from individuals working in industry, followed by those working in a non-governmental or representative professional body (18.1%), academia (4.6%) and non-departmental public body (4.5%).

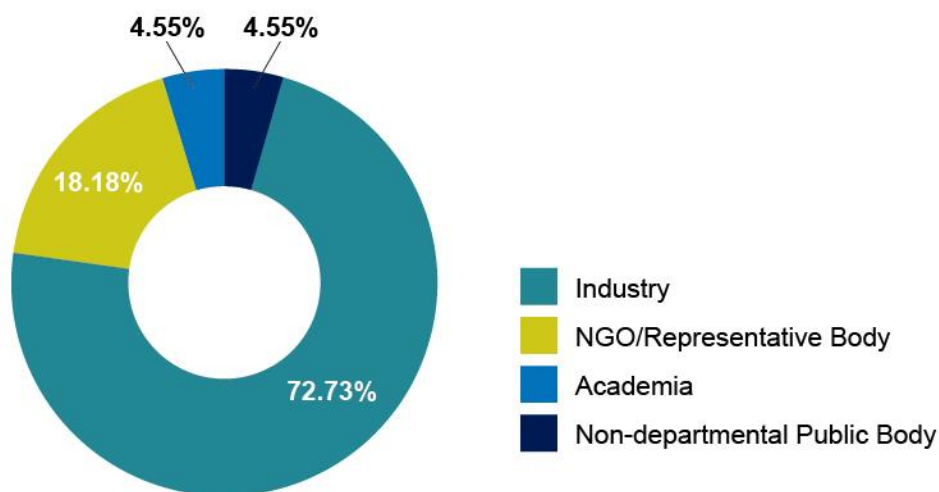
Of those responding to the public consultation, 54.5% were individuals representing their own views, and 45.5% represented the views of their organisation.

¹ BIEG Report, pages 11–12 and 17–22.

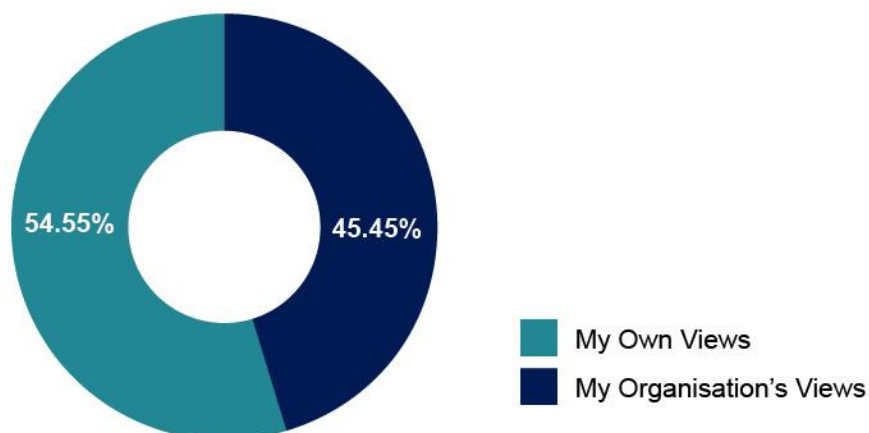
² This definition is adapted from the one contained in ‘ISO/TS 27790:2009, Health informatics— Document registry framework’.

The breakdown of responses can be found in the table below.

Organisation by Category	Count	Percent
Academia	1	4.55%
Industry	16	72.73%
NGO/Representative Body	4	18.18%
Non-departmental Public Body	1	4.55%
Total	22	100%



Response by Category	Count	Percent
My Organisation's Views	10	45.45%
My Own Views	12	54.55%
Total	22	100%



Analysis Summary

Classification Schema Alignment

Of those responding, there was 74% agreement with the approach proposed to address classification schema alignment by the BIEG, to initially work with NBS to examine how Uniclass 2015 can be improved, supported and maintained going forwards, and subsequently to consider how Uniclass 2015 aligns/maps to other conventions, such as CoClass, alignment or mapping of appropriate aspects of Uniclass 2015 with other breakdown structures, such as NRM and SFG20, and support to help NBS improve and then maintain Uniclass 2015, including helping NBS to liaise with key construction industry sector stakeholders. Other input was given by respondents in relation to the proposed scope of work by the BIEG, from which emerged three key themes:

- Ongoing revision of Uniclass IDs;
- Development and alignment of project management and cost management tables;
- Alignment of method of measurement to Uniclass and specification, including CESMM and NRM, amongst others.

These themes have been noted by the BIEG and will be included in the scope of work package 1 of the BIEG programme of work.

Two additional items put forward for consideration included:

- The provision of tools that simplify the process of classifying object libraries, such as data dictionaries;
- The provision of an interoperability solution that is machine readable by various ETL-type tools and is openly available as an API.

These two themes are being considered as part of another CIH workstream, namely as BRE's data dictionary work and will potentially be considered as part of future work packages after the initial programme of work is underway.

COBie – Practical Application and Development

Of those responding, there was 74% agreement with the recommended approach by the BIEG to explore the development of multiple Model View Definitions (MVDs), starting with COBie, for the reason that it continues to be a very important part of the UK Government's information procurement, which is to include liaison with the UK BIM Alliance and buildingSMART UKI, with support from buildingSMART International as appropriate.

Two key themes emerged from the consultation responses, which will be addressed in work package 2 of the BIEG work programme:

- Inclusion of other IFC schema that would benefit from a MVD, such as risk, and the use of IFC with MVDs across alternative exchange mechanisms;
- Provision of 'plain English' guidance on the application of COBie across relevant BS/ISO standards so that good practice is not limited based on the level of digital literacy.

A number of comments have been noted by the BIEG for consideration within the programme of work, including moving away from spreadsheet representation(s) of data directly to COBie as an IFC Model View Definition, where IFC is used for data transfer. The provision of practical examples on the application of COBie on linear assets, such as rail and road, will also be considered.

Education and Skills

A significant majority of respondents to the public consultation (74%) agreed with the findings of the BIEG that there is a lack of digital skills within the sector, which needs to be urgently addressed, and that to comprehensively address the issue involves wider engagement coordinated across a number of different built environment organisations.

A key theme emerged across 30% of submissions that, in order to address the issue of skills and education related to interoperability, the BIEG should consider matching appropriate levels of digital skills and literacy to appropriate specific roles across an asset life cycle, rather than taking a generic approach. One illustration used the analogy of 'technical' roles within the taxation and finance sectors. For example, while accountants and other tax and banking professionals are required to have a technical understanding of methodologies to analyse and assess what information and fees are needed in order for one to comply with HMRC regulations, there is no such duty to ensure that tax payers have the knowledge and skills to understand methodological approaches and information requirements in order to complete their tax obligations.

These themes have been noted by the BIEG and will be considered as part of the scope of work package 3 of the BIEG programme of work.

The consultation revealed two perceived barriers to interoperability related to education and skills:

- A lack of human capital investment across the construction sector, specifically through a lack of investment in [a] dedicated information management team at organisational level;
- A skills gap residing at board level, presenting a challenge to effective human capital investment.

Though currently out of scope of the current programme of work, these barriers have been noted by the BIEG and will be considered in future programme development.

Industry Foundation Classes

All respondents (100%) agreed with the recommended approach by the BIEG to support the further development of IFC, liaising with buildingSmart International and its UK/Ireland Chapter, with the aim of helping to voice the concerns of key construction industry stakeholders, as expressed by a number of the evidence providers.³

A number of respondents provided recommendations to the BIEG for consideration in the further development of IFC:

- Standardisation of property set conventions, and tooling to manage the quality of data, linked in to product data templates;
- Process improvement for IFC implementation;
- Development of IFC and Model View Definitions (MVD) to be more accurate as an FM record.

These recommendations have been noted and will be addressed in the appropriate work package(s) in the programme of work.

Another recommendation noted from the public consultation and to be explored by the BIEG is the potentiality of mandating IFC as a data exchange format. Any such intervention will need careful consideration and engagement with stakeholders from across government and industry.

Standards

A significant majority (94%) of respondents to the public consultation agreed with the recommended approach by the BIEG that work to review the standards landscape be prioritised so that any gaps or overlaps that relate to interoperability can be identified and addressed, with further discovery required to correctly scope the work.

The consultation revealed a perceived need to raise the baseline understanding of ISO-19650, IFC and general digital competencies. The BIEG supports the ongoing work of the UK BIM Alliance, BSI, CDBB and the collaboration of many BIM experts to develop and champion the [UK BIM Framework](#), a single set of guidance in a clear and concise manner to support industry understanding of BIM standards and their implementation, and will work collaboratively to ensure that the education and skills work package aligns and supports a unified approach to UK BIM. It is the view of the BIEG that the published standards, guidance and resources provided by the UK BIM Framework are a key enabler to addressing BIM interoperability now and into the future.

Consultation responses suggested that greater effort should be made on the preparation of appropriate information requirements on the client side, and the verification of their delivery, rather than putting the emphasis on the technical features of CDE solutions. While this is outside the remit of the BIEG, CDBB's ISO Transition Working Group (PSITWG) continues to develop a common understanding and approach to the development of organisational

³ See BIM Interoperability Expert Report, Appendix B.

information requirements (OIR) and asset information requirements (AIR), aligned to both BS EN ISO 19650/the UK BIM Framework and asset life-cycle events, to enable procurement and evidencing of the need for consistent information and data. The aim of the PSITWG will be to provide the following best-practice framework for capturing and developing OIR and also support and guidance material.

Responses related to non-BIM standards as an enabler for interoperability, though critical to the long-term vision for a digital built Britain and a national digital twin, are out of scope of the BIEG programme of work. A summary of these responses can be found in the section ‘areas for future consideration’ later in the report.

Asset Information Model (AIM) Common Data Environment (CDE)

All consultation respondents (100%) providing comments on the asset information model common data environment (AIM CDE) agreed with the BIEG that the relationship between interoperability and the AIM CDE revolves around the handover of information from project delivery teams to the asset operation teams. According to the BEIG Report, it is the obligation of the asset operation teams to curate the information over the operational life of the asset and see that it is updated as the asset ages and changes. The long-term nature of this commitment supports the need for open interoperability to eliminate the risks from proprietary data formats and specific software products, and consultation has demonstrated consensus among respondents that this a critical enabler of the ‘golden thread’ of information established in the Hackitt Review.⁴

In relation to AIM-CDE, respondents provided the following input to the BIEG for consideration:

- The work on open standard CDE by BSI/CEN should greatly improve interoperability between the project information model and the asset information model;
- Development of open standards for CDE interoperability;
- Incorporation of life-cycle cost information using international standards such as the ICMS.

Additional information provided through the public consultation highlighted that data requirements from asset operation teams – getting information right from the very start of a project – are an integral part of successful BIM implementation, as suggested in ISO 19650-1, and it is where interoperability should first be addressed within the project. In the case where information requirements for the operational phase of the asset life cycle have not been specified, effort should be made to capture independent data through the BIM process as a standard project communication.

Standard Data Approach

During the evidence-gathering phase, the BIEG found that standardised data deliverables through standardised information requirements was an approach supported by a small number

⁴ Hackitt, J., 2018. Building a safer future—Independent review of building regulations and fire safety: final report. *UK Gov.*

of evidence providers, primarily from the practitioner category – most applicable to clients who have project and/or asset portfolios that contain large degrees of similarity within them (i.e. many projects for similar types of buildings or infrastructure assets). According to the BIEG, ‘the consequence of this for open interoperability is that for a particular client, the range of project and/or asset types then forms a relatively small subset of all possible requirements for information exchange, and thus limits the extent of interoperability needed between the client and their project/asset suppliers’⁵.

One respondent suggested that the BIEG should test assumptions about the value of these standardised data deliverables by establishing a challenge panel of owner–operators to assess how the ‘best practice’ exemplars of information deliverables could be adapted to make them accessible to decision-makers at project-gateway decision-points.

Other enablers of a standard data approach identified by the consultation respondents include:

- The development of standards-based tools to express client information requirements;
- A review of the available data standards related to standard data approach, and the potential development of a new one. Development of the EN 17412-3 standard should be monitored, as it will be highly relevant to this;
- Development of product data templates hosted in product libraries.

A key theme that emerged from the consultation responses is that, in order for any work to progress, a standard data approach must not be developed independently from the COBie, classification schema or IFC topics.

Procurement and Contracts

All those responding to the public consultation (100%) in relation to procurement and contracts agreed with the testimony of evidence providers and the observations of the BIEG. Specifically, there was agreement that:

- Commonly used forms of contract do not promote collaborative working; and
- Commonly used forms of contract drive the delivery of documents, not the delivery of usable, accessible, sufficient quality information;
- Where a contract is in place to deliver an asset, priority tends to be given to the handover of the physical asset, and not the handover of complete and validated information about the asset.

A number of reoccurring themes related to procurement and contracts became evident through the consultation analysis:

- There is a need for collaborative contracts and new procurement models, potentially based on key performance indicators (KPIs).

⁵ BIEG Report, page 22

- There is a need for specification of interoperable formats at the time of contract.
- Time and resource requirements for quality assurance and quality control of data, and assessments, such as BIM capability assessments, must be considered and built in to contract milestones and/or deliverables.
- The change in relation to procurement and contracts must be driven by incentives or disincentives.

The key themes were noted by the BIEG that will be incorporated into the programme of work and will be addressed in the appropriate work package(s).

Lastly, there is an emerging consensus between respondents, evidence providers and the BIEG that there is a need for greater understanding on the owner/operator side to drive procurement of interoperable data as a strategic asset.

Areas for Future Consideration

Two key themes emerged from the responses reflecting the mid- to long-term vision for the future of UK infrastructure that go beyond the 'here and now' issues of BIM requiring the immediate intervention proposed in the BIEG programme of work. The two themes, as well as future outputs and outcomes of the BIEG programme of work, will feed in to CDBB's Digital Built Britain, UK BIM, International BIM and National Digital Twin programmes, and the digital workstream of the Construction Innovation Hub.

Key Theme 1: Systems-of-Systems Approach

A number of respondents commented that BIM data, IFC models and open CDE standards can support integration between asset datasets and larger data systems:

- Across sectors: to support interoperability with other industries in preparation for digital twins;
- Across life cycle: to support interoperability of time series operational data collected throughout the asset life cycle;
- Across environments: to support interoperability with natural environmental data, such as air quality, water quality, geospatial and weather data;
- Across scales: how BIM models can be linked to smart city models and wider nationwide digital twin efforts.

Key Theme 2: Ontologies-based Approach

A number of respondents commented that further exploration of an ontologies-based approach to interoperability would be beneficial to industry:

- The expansion of current IFC schema and object requirements

- Scoping of purpose-driven alternative classifications, taxonomies, ontologies and increasing the use of SKOS
- Greater understanding of ontologies for data interoperability that are required to manage each phase of the lifecycle

Annex 1: Consultation Submissions

Quantitative Analysis

Question	Thematic area	Agree with findings/ recs	Disagree with findings/ recs	No answer/ answer not applicable	Total	% agree	% disagree
1	Classification schema alignment	14	5	3	22	73.68%	26.32%
2	COBie practical application and development	14	5	3	22	73.68%	26.32%
3	Education and skills	14	5	3	22	73.68%	26.32%
4	Industry Foundation Classes (IFCs)	19	0	3	22	100.00 %	0.00%
5	Standards	16	1	5	22	94.12%	5.88%
6	Asset information model (AIM) common data environment (CDE)	13	1	8	22	92.86%	7.14%
7	Standard data approach	18	0	4	22	100.00 %	0.00%
8	Procurement and contracts	9	0	13	22	100.00 %	0.00%

Acknowledgements

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