

A FRESH WAY FORWARD FOR PRODUCT DATA

State of the Nation

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FOREWORD

BY ANNE KEMP



This report is the outcome of an extreme level of collaboration. We recognised at the onset of this project that we were dealing with a thorny and controversial topic. And this became increasingly apparent as the Working Group navigated its way through debate, contradictions and ambiguities. It has involved some considerable strain on relations across individuals and organisations, and an appeal to continue to engage for the good of the industry at large.

The report tries to steer a way through which casts light on the practical and positive way forward - and I have to say that this has required a healthy dose of Solomon's wisdom. I congratulate Su and the Working Group on sticking with it and delivering a balanced and enlightening report.

I hope that readers will recognise that in moving forward in such a challenging area, there has to be compromise. And we have had to remember the end game - which is to arrive at sensible recommendations which do not pre-judge solutions or get drawn into judgements about specific offerings.

I hope you will find the report useful. Please do let us know what you think - and if you would like to get involved or support next steps, you will be welcomed with open arms. As ever, the Alliance activities are for all in the Industry, carried out by the industry.

Dr Anne Kemp
Chair, UK BIM Alliance
Director, BIM Strategy & Development, Atkins

HOW TO RESPOND TO THIS DOCUMENT

The Alliance would like to encourage people and organisations from across industry to respond to this document and inform what next steps are taken.

PLEASE SEND YOUR RESPONSES TO THE WORKING GROUP AT PDWG@UKBIMALLIANCE.ORG BY 21ST DECEMBER 2018.

If you have any questions about the document you can also email us at pdwg@ukbimalliance.org or join the UK BIM Alliance Slack uk-bim-alliance.slack.com here: bit.ly/joinUKBIMAslack and talk to us in the #proj-productdata channel.

INTRODUCTION



This document does not present a utopian vision of the future – several other documents do this. Instead its aim is to identify some of the key challenges to the digitalisation of product data, explain why the process is far from ready to use, and identify what the barriers to progress are and how they might be overcome.

When a need is defined in our industry, it is often met in one of two ways. Either work is done to meet that need for the primary purpose of making a profit, or a trade or professional association looks to resolve the matter for the benefit of their members, sometimes in the hope that their solution will be more widely adopted. Both types of initiative are, however, prone to partiality. In a fragmented industry, one solution may not meet the needs of other parts of the supply chain. And whilst it is fully accepted that we live in a commercial world, the effect of commercial interests can skew the development of solutions and direct them away from the need that they were developed to address. Either way, as a result, our industry tends to develop a myriad of solutions, all clamouring for attention.

Any holistic solution to our product data challenges needs to be grounded in the reality of industry as it exists today. By setting out the 'state of the nation' on product data, this document aims to complete that groundwork and provide a platform from which innovative solutions can be developed, communicated effectively and brought off the drawing

board into reality right to the grass roots; not a simple task.

The UK BIM Alliance is an umbrella body of interest groups, communities and individuals across the whole built environment who have an interest in the digitisation of our industry. As a result, it is in a unique position to represent different voices and bring people together, to provide clarity and leadership and help facilitate a holistic resolution to such challenges. This report has been commissioned by the Alliance for that purpose.

Almost all the six months of work that is behind this report has been done voluntarily. Except for some support for the chair and admin support, which the Alliance has kindly provided, it is also unfunded. This has enabled us to remain independent.

I would personally like to thank all the members of the working group who provided their time for free so generously and were willing to take up the challenge of listening to the many voices of our industry.

Equally, many thanks are due to the over 100 contributors who have given us their views and expertise over the months. A list of those who consented to be named can be found in the appendices.

We are grateful to the IET who hosted all our meetings and made us welcome at Savoy Place.

Finally, we would like to thank the UK BIM Alliance and their Patrons for their support. Alliance Patrons recognise the value that an independent leadership organisation can provide to the development of a digitalised future. If you would like to support work like this and the other Alliance activities, you can find out about Patronage here: www.ukbimalliance.org/patronage/patronage-types.

You are unlikely to agree with everything you read in this report; whether you are a data expert or an interested member of the industry. This is to be expected, as we are not seeking to represent any one view, but look more broadly. You may also find the language too technical and too detailed, or not technical and detailed enough; remember we hope this document is of a format that will be read widely. If you need more, that means that you are better informed than some.

As far as the message itself is concerned, there certainly is a lack of consensus in some places and plenty of confusion in others. Getting people to talk has been a significant challenge and it hasn't been 100% successful. But this document is not finished; it is the beginning of a journey which with good fortune might help us become a better-informed industry, working better together.

Su Butcher
Chair, Product Data Working Group

EXECUTIVE SUMMARY

In January 2018, the UK BIM Alliance held a meeting of several key protagonists in the field of product data, with a view to getting an overview of the issues, particularly from a client and manufacturer perspective.

A great deal of time and effort has been spent on the topic of product data over the years, and much of this appeared to be coming to a head with more new initiatives being launched, others being proposed, some dead ends and a lack of focus and leadership in some areas. The Alliance felt that as an umbrella body for the whole

industry (construction and infrastructure, client and supply chain) all with an interest in digitising our industry, it could serve as the source of focus and leadership that this fragmented topic required.

This first meeting was very well attended, demonstrating both a hunger to find a unified direction, and a willingness to participate in the process. After the meeting the Alliance produced a brief report⁰¹ and moved to set up the Product Data Working Group to take the first step in the journey.

Brief

The Alliance set up the Product Data Working Group to “prepare a document which identifies the current situation” in relation to eight key areas which can be summarised as:

1. A structured approach to product data
2. Standards
3. The need for a form of national body to coordinate efforts
4. Data hosting matters
5. The data journey - processes for inputting, validating, and tracking product information
6. Agreement on terminology
7. Security concerns
8. Education

In each case the Alliance asked, “where is the industry at present, what work is already being done, and where there are gaps?” The intention was for the report to provide a briefing document and roadmap, setting out the current landscape and areas of need. It was envisaged as the starting point from which the Alliance may commission or invite future work on the topic.

This document is the report which has emerged from that process. Given the scale of the topic it is deliberately short and focuses on identifying what the group believes are key issues which need to be addressed if we are to move forward in digitalising product data and ultimately implementing a digitalised built environment.

a broad section of the industry and did not directly represent companies with a commercial interest in product information management. Members of the working group are listed in Appendix 2. They include people with expertise as designers, manufacturers, client advisers and clients, a main contractor and participants in the standards community, and whilst they work for a variety of companies they serve on the group independently as individuals.

The working group then began to engage with industry members to invite their participation. We published articles on the UK BIM Alliance Website and in the trade press and social media. We set up a Slack channel⁰² and email address and published regularly in the Alliance newsletter. During the four months of our engagement activities we also produced reports of our activities which can be read via Appendix 1.

The report you see here has been produced after talking to over 120 people. Those who wished to be named as contributors are listed in Appendix 2. The draft was also circulated to a group of volunteers for review and we thank them for their comments, which have all been reviewed in the process of producing the final report. All comments have been discussed and where appropriate the document was modified to reflect them.

With any complex topic which covers a broad industry with widely differing views it is always going to be difficult to produce a complete overview; this document does not seek to do that. What we have done instead after talking to people from manufacturing to Facilities Management (FM), from designing to contracting, is identify what we believe are the most pressing, and the most important issues which the industry should first address.

It has also been important for us to produce a report which is short, speaks plainly and without jargon, and sets out the issues in an easily accessible way.

What have we done

A Product Data Working Group of twelve individuals, plus chair, was sourced by open invitation. The role of these members was to talk to a wide variety of people in the industry over a 3-4-month period, to meet monthly and to contribute towards the report. Selection criteria included those who could ensure they attended the four meetings we held (two participants had ‘seconds’), represented

⁰¹ A Fresh Way Forward for Product Data: Initial Meeting Report and Next Steps. Details in Appendix 1: ‘Further Reading’

⁰² Slack is a cloud based collaboration platform which allows private and group discussions more effectively than email. See slack

Conclusions

The document has seven sections. Here is a summary of the main conclusions of each:

1. STRUCTURED DATA

There is no universally agreed definition for structured product data, so we have produced a suggested definition. We recommend that a UK Governance hierarchy for interconnected dictionaries, structured data creation and approval needs to be agreed, created and formally documented.

2. PRODUCT DATA STANDARDS

There is no current commonly agreed standard for digital product data in the UK or in Europe and the standards landscape is fluid and complex. The Alliance can help industry get to grips with the landscape and participate in the process of developing standards, which is open to all.

3. THE DATA JOURNEY

There is currently no 'golden thread' of product information for the majority of projects. The way in which information moves through the construction supply chain needs to be significantly improved if we are to truly benefit from efficient and effective digital workflows. The report makes nine key recommendations for principles which should underlie the development of such a 'golden thread' for product data, based on openBIM Principles.

4. PRODUCT DATA NAMING AND PRODUCT IDENTIFICATION

An initiative to implement a unified methodology to produce Data Templates in the UK is long overdue; meanwhile Europe has moved ahead. We recommend that the UK activities align with the European and International standards and initiatives, and that the LEXiCON⁰³ team takes advantage of the Alliance to improve two-way communication. We also recommend that product identification initiatives work together to avoid waste and duplication, and that industry supports the FIS PPP initiative.⁰⁴

5. PRODUCT DATA HOSTING

The way that product information is currently managed and hosted creates several problems for manufacturers, designers and the supply chain. We recommend a series of changes to this process including changes in the activities of manufacturers and object hosting companies to produce a standardised way in which product information is hosted and structured.

6. PRODUCT DATA SECURITY

Asset information security is a relatively new area of investigation for most of our industry and the landscape is wholly inadequate to deal with the issues arising. We recommend an end to the 'on/off' approach to asset information security and instead propose a spectrum approach based on a set of risk levels and a risk assessment process. There is a looming skills shortage in information security, and this whole area needs considerable thought and investment.

7. A PRODUCT DATA STEERING COMMITTEE

In response to the request to look at a national body and the education process, we discovered there is no independent source of information, co-ordination or leadership in the field of product information in the built environment. We therefore propose that a Product Data Steering Committee is set up, with funding to carry out this work. The Committee should be drawn from across industry and key stakeholders in this topic, which will take on communication, co-ordination and guidance roles. The Alliance could undertake to set up and support this Committee to continue this work, if appropriate.

We encourage you to read the detail of the report to find out more about these conclusions.

Key Learnings

As product data is not currently available to many in our industry in a consistent, useable, digitalised form, and as it is not yet clear what manufacturers need to provide about their products or even who decides what that information should be, we have the following advice for people in the supply chain:

MANUFACTURERS should understand that in future product data will be at the heart of marketing and customer engagement strategies. Start to equip yourself with the know-how to meet this challenge. Learn about the current state of the standards landscape. Information should be structured by common standards not yet fully determined; focus on developing a Product Information Management System (PIMS) and structure your data ready to map to the standards when they are ready. Your PIMS will be the source from which you will be able to distribute information about your products.

DESIGNERS should be aware that there is not yet a suitable defined data standard. Designers should appreciate that objects are not necessary for all products but that product data is critical. Educate your clients; show this document to your clients if they insist on objects and don't value information. Once product information is properly structured, genuine comparison will be possible.

CLIENTS should seek to learn the value of digital asset information and get help to specify what is required, being mindful of the lack of agreed standards for data at present. Involve yourself in the discussion about asset information security.

MERCHANTS should be working towards openBIM processes and should not treat 'BIM data' differently to other data. Be aware that manufacturers should be responsible for their information and

assist them in that process. E-commerce is providing additional pressures for merchants and manufacturers and structured data will assist in the smooth introduction of these processes.

HOSTING COMPANIES should work towards separate but connected data and objects - 3D objects are still relevant but not always; objects are optional, but information is not. Invest in the data comparison market, not the object market. Ensure the information you manage can be updated by manufacturers by working with linked databases.

CONTRACTORS should prepare to align to the standards as they develop. Fully structured product information will change how you work, and reduce risk, but there will be investment required to get there.

GOVERNMENT should be aware that product data will save money, but it needs investment in the processes to ensure the industry can and does work in a structured way rather than in silos.

⁰³ LEXiCON is a UK initiative intended to implement the process of confirming what are the key required properties of products and storing that information in a 'templater tool' or dictionary.

⁰⁴ The Finishes and Interiors Sector's Product, Process, People (PPP) initiative aims to create an audit trail of which product was supplied, and installed, and the qualifications of the installer.

1. STRUCTURED PRODUCT DATA

What is Structured Product Data?

Structured data is the essential element to enable communication in a digitally built environment.

Structured Product Data is data that has been defined and organised in such a manner that it is searchable and immediately identifiable and machine readable within an electronic file. Structured data must be:

1. Defined in a standardised way, i.e. identified by naming conventions;
2. Presented in a standardised format, and
3. Transferrable and translatable between users of the data and their software choices, i.e. interoperable.

Structured data is used throughout the world. For example, if you wish to sell a product on Amazon, you are presented with a spreadsheet (a Data Template) setting out a range of properties which must be completed in a standardised way. This enables the information in this case, to be

used to navigate and compare products, it provides information for the user interface (the website) and it provides information for the sale and fulfilment of the product to the purchaser.

Whilst human beings may input some of the information, it is not necessary for the data to be all generated or entered by humans. Neither does all structured data need to be directly readable by human beings - instead humans can consume the information via outputs (e.g. Portable Document Format - PDF), algorithms and schema (e.g. Industry Foundation Class - IFC).

To make sure that product data is truly interoperable within a construction or infrastructure environment, a Data Template (or DT) methodology is being developed by the international community in conjunction with the IFD standard (International Framework for Dictionaries Library) and credible sources such as the Construction Product Regulations - CPR. More information about this is covered in Section 4.

The Problem

The primary problems with structured data in the built environment are:

1. There is no universally agreed definition of what structured data is within the built environment. We hope that the above definition will be adopted.
2. Organisations working with data do not generally apply standardised formats and naming conventions. For example, much of the Industry has free to use & proprietary commercially owned information sources in numerous formats that each owner refers to as "Structured Data".
3. Many information sources use different dictionaries, classification systems, hierarchy class levels, and terminology to refer to the same thing, which produces confusion, lack of interoperability and waste.

It is important to stress that there is no difference between 'BIM Data' and other 'Data'. They are the same thing. What is

important is that data already exists, it simply needs to be structured consistently. This is a particular issue with construction product manufacturers, who have a great amount of information already. The industry has not given the message to product manufacturers to structure their information according to standards, where possible, or to liaise with their trading association to agree how to describe their product in a consistent way. There is also a lack of understanding of what in this case a "product" data template (PDT) is, and how these relate to Product Data Sheets (PDS), technical documentation and other material.

The initiative to develop Product Data Templates (PDTs) is described in Section 4 of this document. Without an interoperable dictionary that describes properties of products in an interconnected data dictionary framework using the same properties, the provision and creation of industry recognised and governed Data Templates will not be possible.

Recommendations

To implement a system of structured product data we recommend that a UK Governance hierarchy for interconnected dictionaries, structured data creation and approval needs to be agreed, created and formally documented. This work needs significant targeted investment; it needs to be developed by industry expertise; it needs to have the backing of industry as a whole.

2 PRODUCT DATA STANDARDS

European Standards

For Structured Product Data to be used effectively and to flow effectively through the life of a built asset, an agreed set of standards is required. The process for producing standards is carried out by International (ISO), European (CEN - European Community for Standardisation) and UK (BSi - British Standards Institution) standardisation bodies. The groups concerned with BIM and the use of data in construction and infra-structure are the CEN Technical Committee 442⁰⁵ and its equivalent in the UK, BSi B/555⁰⁶ Committee. These groups are made up of volunteers who are specialists in their fields.

The European standardisation body CEN set up Technical Committee 442 (CEN/ TC442) to take charge of standardisation work regarding all information in the built environment. Among the first standards adopted by CEN, were three openBIM⁰⁷ standards. These buildingSMART International⁰⁸ standards were officially adopted as EN standards by the UK in October 2016. They are IFD (International Framework for Dictionaries ISO 12006-3:2007), IFC (ISO 16739:2013) and IDM (Information Delivery Manual ISO 29481-2:2012). These openBIM standards are widely known as the three pillars of interoperability. They set out a common format for information exchange, a common structure for defining data-semantic concepts and the relations between them into a data dictionary, and a standard to specify how to describe the required information supporting a given process.

However, there are currently no European standards for managing construction product information. There are regulatory (i.e. mandatory) requirements (e.g. the Construction Product Regulations) and there are standards that provide guidance on the principles to apply in particular circumstances. However, there are no consistent, overarching digital data standards to bridge the gap between the regulatory requirements and this guidance. As a result, people are using different methodologies to provide the same information in different circumstances, removing interoperability and producing waste.⁰⁹

The work to produce digital data standards for products has been scoped out by CEN/ TC442 and the earliest publication date is 2020. No UK product data standards to meet this need are available for use in the interim.

There is also no UK provisional guidance (for example a PAS - Publically Available Specification) available on data provision, dictionary formation, governance & the data template content creation process. There was an unpublished draft product data standard, known as "PAS 1192-7" which was produced in 2016-17, and based on the document Product Data Definition A technical specification for defining and sharing structured digital construction product information.¹⁰ This document will not be published but the BSi intend to use elements of the draft as the basis of a UK standard to complement the European Product Data standard when it is scheduled to be published in 2020.

The Problem

The key challenges around product data standards are therefore:

1. There is no current overarching standard for product data in the UK or in Europe and may not be before 2020.
2. Achieving alignment with the current work of CEN/TC442 is essential in the long term for alignment with the European and International markets, yet it is difficult to do because the CEN/TC442 standard creation is still a work in progress and the process is felt to be beyond most industry stakeholders, for whom getting involved in the discussion is not a priority.
3. Manufacturers, merchants, Facilities Managers (FMs) and other stakeholders are therefore establishing & investing in data processes that are not in alignment with European and British Standards due to UK guidance not being available.

Recommendations

The Standards Landscape is fluid. We recommend that all stakeholders in product data get to grips with the changing state of the standards landscape and commit to aligning to common standards as they develop, whilst working on their own information and PIMS development. The Alliance should assist by commissioning plain language explanations of the current landscape and reaching out to those working in this area to help collaboration across industry and academia.

Some within industry are of the impression that the standards community is a "closed shop" with a bias towards open data. However open & free data are an ultimate & essential

characteristic of the future success of BIM processes, and the sense of a closed shop is a misconception. The standards community welcomes the input of specialists across industry to participate in the process. As organisations recognise this and get involved in contributing towards tomorrow's standards, the experience gives them a useful insight into the process and helps them create secure, future-proof business models.

The industry would benefit enormously from the use of Plain Language to describe data standards. We recommend that the standards community signs up to the UK BIM Alliance #ConstructingPlainLanguage initiative and applies it to its work.

⁰⁵ CEN/TC442 is the European Technical Committee looking at Building Information Modelling (BIM). It has five working groups.

⁰⁶ BSi B/555 is a Committee of the British Standards Institute (BSi) responsible for UK Input into CEN/TC442. It is responsible for the preparation, revision and amendment of British Standards for digital definition, representation, presentation and exchange of information and knowledge within the Construction industry.

⁰⁷ openBIM is a universal approach to the collaborative design, realization and operation of buildings based on open standards and workflows.

⁰⁸ buildingSMART is an alliance of construction and facilities management organisations established to standardise processes, workflows and procedures for building information modelling (BIM).

⁰⁹ NB the regulatory requirements in European legislation (for example Regulation 305/2011 Construction Products Regulation - CPR) supersede any conflicting content of standards.

¹⁰ Documents referred to in the text are referenced in the 'Further Reading' Appendix

3 THE DATA JOURNEY

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In her interim report on the review of the Building Regulations and Fire Safety, Dame Judith Hackitt first mentioned the concept of a golden thread of information (i.e. a clear audit trail for information), specifically for complex and high rise buildings. To modernise our industry and get the benefits of digital transformation, the whole of industry needs a golden thread.

PAS 1192-2:2013¹¹ sets out how Building Information Modelling (BIM) may be used for a construction project. Its diagrams

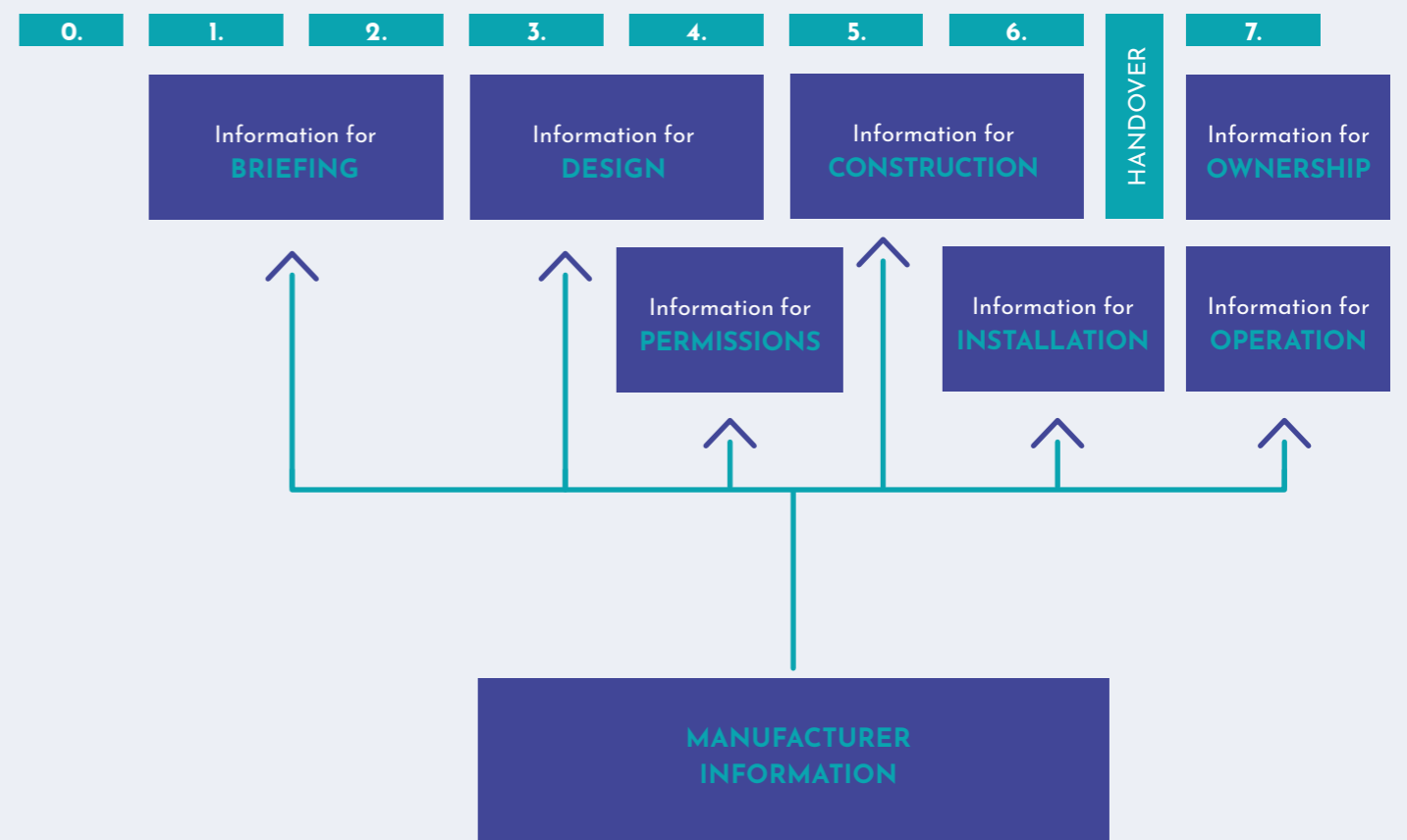
show the quantity of information gradually growing through the construction stages until a uniform output is seamlessly transferred to the owners and operators. But the reality isn't like that... and certainly isn't like that for Product Information.

Currently, in the clear majority of projects, through the 8-stage process outlined in industry plans of work,¹² information of various types is produced by a range of different stakeholders (actors), each of whom utilises product information at some point along the way.

¹¹ PAS 1192-2:2013 "Specification for information management for the capital/delivery phase of construction projects using building information modelling", BSi

¹² The RIBA Plan of work has 8 stages including 0; the CIC BIM Protocol and PAS1192-2 Process map exclude stage 0.

FIGURE 01
The Fragmented Product Data Journey - where is the audit trail?



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The Problem

The Current Data Journey

To understand the data journey, it is important to understand that there are different types of information that make up a complete data set for each product within an asset. Data can be broadly split into the following components:

1. General product information (e.g. Type Name, Component/Instance Name, Description and Classification (referred to as Category in COBie¹³));
2. Design information (i.e. dimensional requirements, specified product, required performance ratings such as fire or acoustic ratings etc.);
3. Manufacturers' information (i.e. specific information for the selected/installed product. This would include ratings of the actual product which may exceed the design requirements);
4. Field information (i.e. information collected onsite such as Installation Date or Barcode);
5. Real time data (e.g. actual delivery mileage of product to site and mission critical information such as performance in service etc.);
6. Computer generated information which is not directly controlled by the user (i.e. name and version of software or Globally Unique Identifiers (GUIDs)).

Information will be therefore provided by different stakeholders (including clients, designers, manufacturers and installers) at different points in the data journey to create a comprehensive set of product information.

Initially information may be provided by the client, who needs to set out their requirements (Employer's Information Requirements - EIR) for the project and what information they require both during a project and for the In-Use phase (Asset Information Requirements - AIR). Industry needs to help clients understand the need to define clearly their specific information requirements. Today this information may be locked in unstructured documentation. Digital transformation needs to start here; but the journey of data throughout the project is long and complex before information is handed over to the client and facilities management teams to operate and manage their assets.

At the start of a construction project, the designers take the initial client information and begin to develop the design. In this design phase, product information is often generic, as products are unlikely to be known in the early phases (exceptions to this exist of course).

As the design progresses, ideas about products emerge and the designers seek information from a variety of sources including catalogues, websites and technical specifications. Again, this information is often unstructured, in many different formats and available from a myriad of sources.

Additionally, with the advent of 3D modelling, designers may seek out 3-dimensional objects to represent products, systems and assemblies in the design. They are likely to source these from a variety of providers (or build their own) and add to their information accordingly. Designers also face the challenge of finding objects effectively (there are numerous sources), suitable for their chosen software platform and available in the latest version. Often though the sourced objects are merely used to represent a product type, may not align with the emerging specification (which is being developed outside the model) or contain erroneous information that does not align with the defined project requirements, or adds considerably to file size.

The model may end up with a mixture of generic and specific manufacturers' objects. Additionally, the designers in-house approach to modelling and data can vary from the approach of the hosting site providing 3D objects. This leads to 3-dimensional models with confused data structures. For projects trying to build reliable and reusable data rich models, this represents a massive problem. Any process required to 'clean up' the information introduces waste and can add extra time to project programmes.

Whilst some designers choose to put manufacturers' information directly in their models, others are concerned about the liability of adding other's information to their design models and having to maintain it. By using external systems linked to the design models, this liability is not taken on by the designer.



Clients also have different requirements. Some want information directly in the native authoring models; others accept data needs to be connected. Allowing information to be imported into native models should be considered but an understanding of when, how this is managed and who is liable for maintaining the information needs to be well understood by all parties if this is a preferred route.

Designers are also acutely aware that whilst they specify their choice of products, the selected product may not be the same as that which is finally installed. This could be for cost reasons, availability of the product (e.g. long lead in times) or because a main or subcontractor has a list of alternative preferred suppliers. This was no different previously where a specification reference and description only were placed on a drawing with no specific information about the manufacturer. The information about an outline or detailed specification contained information about the products

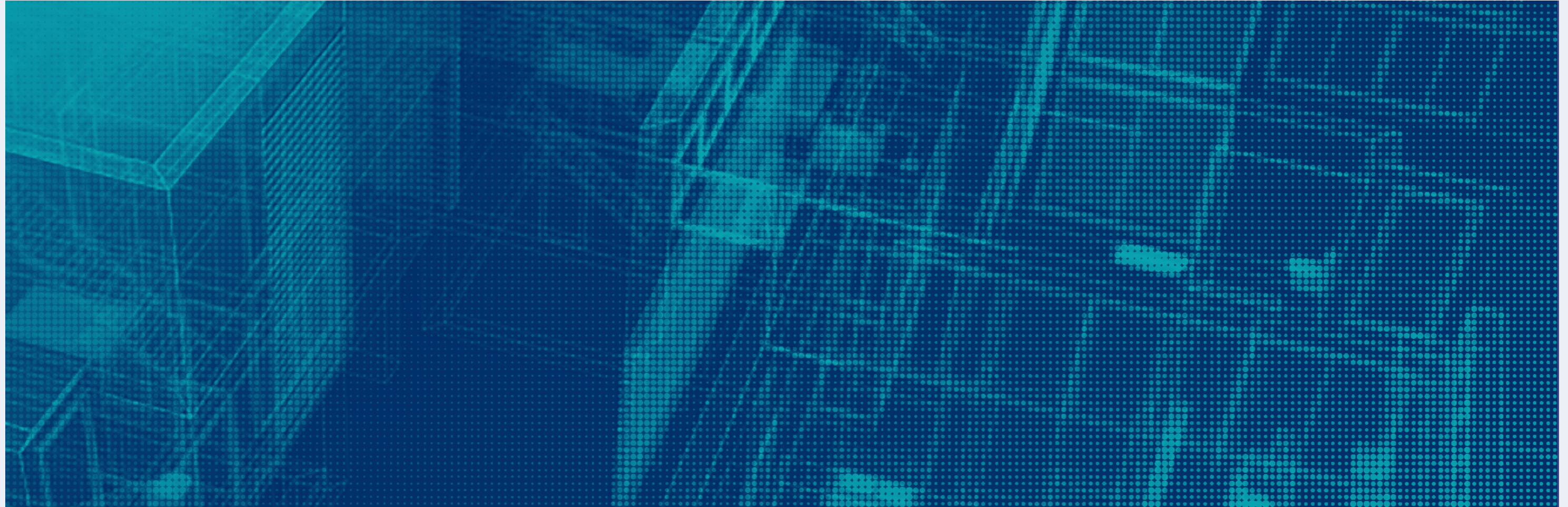
in a separate document; designers worked that way so that they didn't need to constantly update their documents and drawings with changes to products. With BIM, this issue hasn't yet changed, so a BIM process needs to consider how designers can design buildings without getting tied up constantly changing models because the final selected products are being changed by others.¹⁴

Some product geometry is critical to design (for a variety of reasons) and so there is a need for specific 3-dimensional objects in some circumstances. However, with many products a generic approach works fine, as it did when generic representations were placed on drawings. There is a time and place for both approaches but it is definitely not "one size fits all".

Product information provided by manufacturers is still required, however placing this in external systems means the manufacturer themselves can ensure their information is created and maintained

¹³ Construction Operations Building Information Exchange (COBie) is a non-proprietary data format for the publication of a subset of building information models (BIM) focused on delivering asset data rather than geometric information.

¹⁴ In an ideal BIM project (following PAS1192:2) the designer would control the design throughout the project within a collaborative process and products would not be swapped out in this way, however this isn't the current situation for many. Work to develop the digitisation of the industry and in particular product information should enable a more transparent and automated approach to design control.



accurately. Embedding data in objects mean updating data is difficult once it is placed in a model, particularly with so many sources of objects on the market. For large projects objects may exist in a model for several years and products may have changed through that timescale, making the information unreliable. This issue is discussed further in Section 5.

Data ultimately needs to be correct, accessible by the right people and at the right time. Consideration needs to be given to what information is included and when/how this information can be extracted/connected accordingly. At the moment, it is largely a case of being overburdened by more information than most of us need as no one is clear what everyone else wants. Very little information is driven by use cases and this needs to be considered when developing robust product data templates.

There is still the challenge of how you connect the manufacturers' product data provided in other systems outside BIM authoring tools to information produced by designers. Currently these systems are separate. The process of supplying information to specifiers from the process of supplying information for installation, or operation is more complex than it should be. Where is the golden thread here? The risk

of inconsistency in information is too great, and it isn't to be relied upon.

Because the data journey involves information provided at different times by different stakeholders, any system to manage that information may need to be connected to/merged with each other at different points of the journey. For example, field data may be collected in one system whilst manufacturers product information may be contained in another. However, the authors/owners of this data must control their own data to avoid introducing risk that information is modified incorrectly by other parties.

Information from manufacturers at present is often being inserted directly into COBie spreadsheets or in some case databases but both these current workflows are far from smooth and any PDT process should consider the workflow as much as the information requirements for specific products. Without considering the complex data journey we could end up with information simply 'trapped' in PDTs.

The way in which information moves through the construction supply chain needs to be significantly improved if we are to truly benefit from efficient and effective digital workflows.

Recommendations

1. Information must be created because there is a clear purpose for the information in the lifecycle of an asset. Information that has no use case must be considered waste.
2. We should not forget that manufacturer information already exists, but often in pdf format. Manufacturers already have the information about their products but this needs to be developed in structured databases which are accessible by the appropriate stakeholder.
3. Not all manufacturers need to produce 3D objects. We recommend that all manufacturers talk to their supply chain, including designers/specifiers, to ascertain requirements for their products.
4. Each piece of information must be created and maintained by a single source.
5. Information for products must consider all types of information involved in the data journey (as noted above), not just information provided by manufacturers.
6. Information should be able to be used by all stakeholders with whatever software is best for their own business needs according to openBIM principles.¹⁵
7. Standardised industry formats and methodologies should be used to exchange and connect information between different systems.
8. Users of product information should be able to access the required subset of information they need for their specific purposes.
9. Information must be able to flow through the process, be validated by reference back to a single source and for the best outcome, manufacturers may want to be able to collect information about the installation and in-use performance of products. This could be achieved through linking to manufacturer databases.
10. Asset owners and manufacturers need to ensure that the correct data about the product (designed, manufactured and as installed) is available and not overwritten by future amendments to the product data (for example, new versions of the product being released into the market).

¹⁵ This concept of 'openBIM' is a universal approach to the collaborative design, realization and operation of buildings based on open standards and workflows.

4. PRODUCT DATA NAMING & PRODUCT IDENTIFICATION

Data Naming & Data Templates

We have described how product information is provided and used by different actors along the 'data journey'. For this information to be compared, exchanged and connected between these different systems, a standardised industry format needs to be applied. The information needs to persist, it needs to have agreed properties, and industry needs a consistent methodology to define, create, manage and share this product information through the life cycle of an asset.

WHAT IS PRODUCT DATA TEMPLATE

A Product Data Template is a common data structure defining the 'properties' (essential and non-essential characteristics e.g. fire rating and colour) for any product type¹⁶ in a way that can be traced back to a credible source, such as product standards setting out performance characteristics and test methods.

There is a specific hierarchy of credible information sources for data templates. Legal data sources such as European Harmonised standards have greater priority than national standards which have greater priority than industry and user recognised requirements (such as BREEAM¹⁷). In this way, Product Data Templates serve as a common framework for anyone to use to manage construction product related information.

By agreeing the key properties which should be defined in Data Template for a particular product, we remove the need for bespoke data 'sheets', reducing waste and smoothing the process of providing structured data for products.

Product Data Templates are usually depicted as a spreadsheet but are in fact a data structure - a set of properties - from which the spreadsheet is just an output format. Once the properties for a product type are agreed, manufacturers can then provide the information about their products according to these agreed terms. A populated Product Data Template (PDT) for a manufacturer's product is known as a Product Data Sheet (PDS). Initiatives to develop PDTs have emerged across the industry including considerable work by Construction Products Europe, BIM4M2¹⁸, CIBSE, coBuilder and the National BIM Toolkit in the UK, as well as sector groups such as BIM4Water, who have developed bespoke PDTs for asset information in their sector.

A methodology for defining, creating, managing and sharing product information was first described in the UK in the April 2016 Technical Specification, 'Product Data Definition: A technical specification for defining and sharing structured digital construction product information' published by the UK BIM Task Group.¹⁹

¹⁶ This includes products, systems and assemblies.

¹⁷ Building Research Establishment Environmental Assessment Method, a sustainability rating.

¹⁸ BIM4M2 - BIM for Manufacturers and Manufacturing, a group interested in furthering BIM for manufacturing.

¹⁹ A link to this document and others referred to in the text is included in the appendices under 'Further Reading'.

WHAT IS LEXICON

To put this methodology into practice, a solution was called for to host a dictionary, property sets and a template tool. This work was commenced in 2016 in the UK via an initiative called LEXiCON, led by the BIM Task Group, Construction Products Association and BIM4M2.

The LEXiCON initiative set up the following process:

1. Groups of product manufacturers, Trade Associations and others (aka Relevant Authorities) to approve proposed unique parameters, information sets and product data templates;
2. A Technical Authority to confirm the properties are correct technically and meet digital, national and international standards;
3. An interconnected dictionary (software platform) to facilitate the collation, approval and sharing of the agreed properties.

THE CURRENT SITUATION

The Construction Products Association reports that the software platform has been developed and tested, a wide range of Relevant Authorities have been put in place and more are invited, and the team are working on governance. LEXiCON was mentioned in the Government's Construction Sector Deal (July 2018) but it is not clear at the time of writing whether government funding has been made available to support it.

There have been marked delays and challenges in the development of the LEXiCON project, although the reasons for this remain unclear.

In addition, the last year has seen the Grenfell Tower tragedy which has placed significant pressures on some of the stakeholders working on the project. The CPA has been working intensively with the Hackitt Review and is part of the Industry Response Group²⁰ set up by Government

to help industry respond to the tragedy. It is generally agreed that the outcomes of this work will reinforce the importance of product data ownership and responsibility outlined in this report.

In the meantime, the European Landscape has moved forward at pace. CEN/TC442 Working Group (WG) 4 has confirmed that Europe will be adopting an alternative methodology to the Product Data Definition (known as PPBIM or XP P07-150) which will become an ISO towards the end of 2018. The UK standards community need to prepare a 'National Annex' which will adapt this ISO to the UK market.

It is clearly essential that any agreed UK methodology to produce Data Templates must be not only robust at a national level, but also valid internationally. It must be effective for the whole supply chain and suitable for asset owners and operators, and it must also work in the international markets by aligning with the emerging international standards landscape. For this reason, the LEXiCON project will need to align with the work of CEN/TC442 and with the ISO as it emerges, which is a complex dynamic to manage.

It has become clear in our consultations that there is not wide unity in the industry about whether the LEXiCON project in its current format is fit for purpose; this may be in part because of the limited communication about the project's progress in the last two years since inception and due to the lack of a published timeframe for implementation.

Other related initiatives have continued during this time. For example, a CPA Task Group is working on how sustainability information can be included in the Data Template process, including participation in work at an international level into how Environmental Product Declaration (EPD) information can be integrated into BIM. This work is aligned with the work of CEN/TC 442 and is also intended to lead to an ISO Standard.

²⁰ Industry Response Group announcement - July 2017



Recommendations

1. The LEXiCON project should take advantage of the Alliance to support its communications with industry beyond the product sphere so that all of industry within the data journey (including construction and infrastructure, and asset operation) are participants in this initiative to ensure it meets their needs.
2. The LEXiCON project should take advantage of the Steering Committee recommended in Section 7.
3. The LEXiCON project should ensure it aligns with European and International standards and initiatives such as EN and BS norms and the new ISO, and learn from national government funded projects in Europe, such as those in Switzerland and the Czech Republic. This should ensure that there is no wasteful duplication of work.
4. The LEXiCON project should continue to align its data dictionary with Europe and ensure the agreed properties are interoperable across Europe and internationally. Many manufacturers operate across country borders and CEN has agreed that there may be many data dictionaries, but they should all be interoperable. LEXiCON will be part of a network on interconnected dictionaries following the same methodology and governance.
5. The LEXiCON tool should be free at the point of use for all, including manufacturers, and the work involved in developing it should be fully funded and not for profit, to keep it independent of commercial pressures. If this is not possible then manufacturers may prefer to work with alternative commercial tools including those developed in Europe in recent years.
6. Whilst LEXiCON will provide the framework for agreeing to the make-up of a product data template, it should not be a repository of manufacturers' Product Data Sheets (i.e. the manufacturer's own information, for example).
7. Manufacturers should seek to structure their data in preparation for when the Relevant Authorities begin their work to agree properties.

Product Identification

The improved data journey described in Section 3 also requires the collection of field information and real time information after a product has been manufactured. As a result, it is necessary that products can be identified wherever they are encountered, with a feedback loop to the manufacturer. Several initiatives are underway which seek to facilitate the identification of products: Digital Product Identifiers of several kinds and the FIS PPP initiative.

DIGITAL PRODUCT IDENTIFICATION

A common online identification system for construction products has several benefits:

1. Products can be clearly identified by anyone (or machine read) at any point in the product's life, with confidence.
2. The identifier provides a future proof link back to full information about the product - a single source of truth - controlled by the manufacturer. This information can include the standards a product complies with, lifecycle information and other product information.
3. The identifier can be used to check the status and identity of products before, during and after installation, potentially removing unauthorised substitution and enabling recycling and reuse.
4. The identifier is persistent, making it possible for someone always to be able to get the information even if the manufacturer no longer exists.

Currently there are several initiatives looking at this: In the UK, The NBS, CPA and BSi have been looking at Digital Object Identifiers as part of an InnovateUK part-funded project. In Sweden, a consortium including Skanska and the Swedish BIM Alliance is looking at GTINs (Global Trade Item Numbers).

Construction Products Europe has recently signed off on SmartCE labelling which is a technique for converting Declarations of Performance (DoP) into a CE mark²¹, digitalising information that already exists in pdf format. In effect this turns the DoP into a Data Template. The CEN Workshop Agreement with the XML format for SmartCE labelling was published in June 2018.

Some initiatives look at having an identifier for every product type (i.e. every stock keeping unit or SKU - one for each type of clip or tile, for example). Some look at

having an identifier for every instance of a product, because if the same product is made in two factories they will have different environmental characteristics (such as carbon footprint, materials sourcing information etc.).

For initiatives like these to be workable they must be unified and the schemes need to be interoperable, so that manufacturers who produce their products across Europe and worldwide can apply a single identifier to each product which fulfils not only the requirements of identification but also the pragmatics of identification and information use. Multiple identifiers or labels would be complex and wasteful. There are also potential security issues relating to identifiers which should be considered and the security community should be consulted.

We urge the initiators of these initiatives to work together and with manufacturers to identify a way forward for what should be a major contributor to the golden thread of information about construction products. The Alliance should seek to facilitate this.

PPP - PRODUCT PROCESS PEOPLE

PPP is an initiative by the FIS (Finishes and Interiors Sector) trade association which aims to create an audit trail of which product was supplied, which product was installed, and the qualifications of the installer, using photographs. The initiative is a simple process that does not rely on any one piece of software and could be taken up for any project simply and cheaply.

In outline the process is as follows:

1. Product - evidence that the product specification has been complied with (for example a copy of the delivery note taken on site);
2. Process - a photographic record of the installation process to evidence it was carried out in accordance with manufacturer's instructions; and
3. People - a record that the installation teams are competent as evidenced by their CSCS cards.

We welcome this initiative as a practical attempt to respond to the immediate needs of industry and the challenge of the Hackitt Review. The domestic gas industry implements this process in their Gas Safety Register. We encourage industry to get involved in its development; contact details are available in the Appendix.

²¹ The Construction Product Regulations state that all products traded or sold in Europe must bear a CE mark, where harmonized standards exist.

5 PRODUCT DATA HOSTING

The hardest part of a manufacturer's "BIM" journey is getting started. In the absence of published standards on data structure and process, manufacturers have been left with three main options:

1. Try to navigate the process themselves and generate their own content;
2. Sit back and wait until what they need to do is clearer;
3. Rely on a BIM hosting or specialist software company to help them prepare their content²² for them.

The first option has carried some risk for manufacturers and has tended only to be taken by companies that are very involved in the BIM product data networks or their content is minimal.

Most manufacturers to date have therefore taken the 2nd or 3rd option. Most of those that have used BIM object hosting

companies had their content developed for them by the hosting companies based on their product catalogues, drawing files and any existing product information.

Object hosting companies in the UK include BIMobject, bimstore, the NBS National BIM Library and SpecifiedBy, although there are many other companies who are either entering this space or who have diversified to add BIM content creation to their services. The objects they host are data-rich (embedded data) and usually available in several CAD platforms.

Not all hosting companies/platforms have relied on hosting objects. Some, such as coBuilder's GoBIM platform, have chosen to work just with manufacturer's information enabling users to assign manufacturer's information to their existing (generic) objects via software plug-ins in several CAD platforms.

The Problem

All the hosting companies have been gathering manufacturers on to their platforms. As all of them have slightly different requirements for them to create the information and the 3D object, most manufacturers that have listed with an object hosting company have chosen to just list with one platform. Those that have chosen to be on multiple platforms now potentially have slightly different BIM objects available to download via the different hosting companies (see Figure 2). This is because each hosting company has created their own 'standard' for object creation, which are not all aligned with each other.

This makes it very difficult and resource and time consuming for manufacturers to keep control of their information. Although some of the object hosting companies have good back end systems to enable individuals to edit information, add and remove objects, etc., it is still a manual task that requires excellent operational control by the manufacturer to ensure that their objects contain up to date product information.

This can, and has, caused a few other issues:

1. Manufacturers are being persuaded to spend considerable sums to develop three dimensional objects which have no clear commercial benefit to them or to specifiers.
2. As some large UK companies are forcing their supply chain to use a particular hosting company, manufacturers are picking up large costs and information management issues that are avoidable.
3. Not all object hosting companies allow manufacturers to own their content, causing them to pay to generate the objects again for other hosting platforms.
4. The tendency of many hosting companies to focus on the production of large visually rich 3D objects and systems, has produced the unintended consequence of neglecting the importance of the data itself and driving companies towards object creation for products that do not need it (e.g.: coatings, coverings, switches, etc.)²³
5. If customers using the objects would like a certain level of detail, file format or have certain information requirements, then the manufacturer must generate a bespoke object.
6. As several manufacturers have simply paid an object hosting company to generate content and considered their work complete, there is a risk that many objects currently available to download are unreliable (i.e. not version-controlled).
7. This process may also be handled as part of a marketing budget and not related at all to the production of 3D information for manufacture which may already exist.

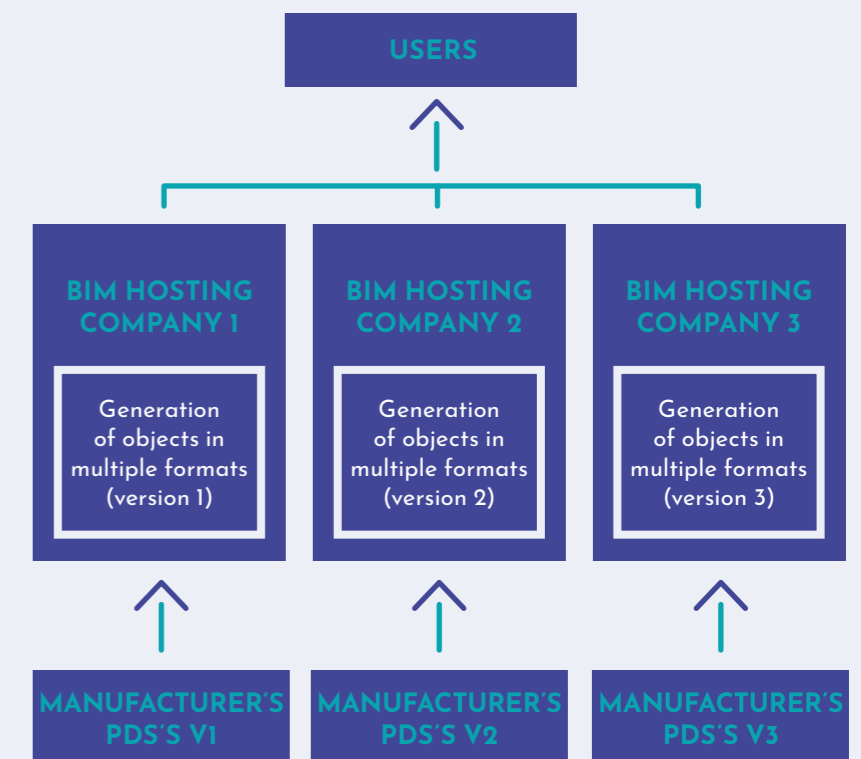


FIGURE 02
The current situation with BIM object hosting platforms

²² For the purposes of this report, content can be defined as 3D Objects, structured product data and/or supporting documentation.

²³ We are not saying that 3D objects are not useful; they are in many circumstances useful in conveying spatial information.



Recommendations

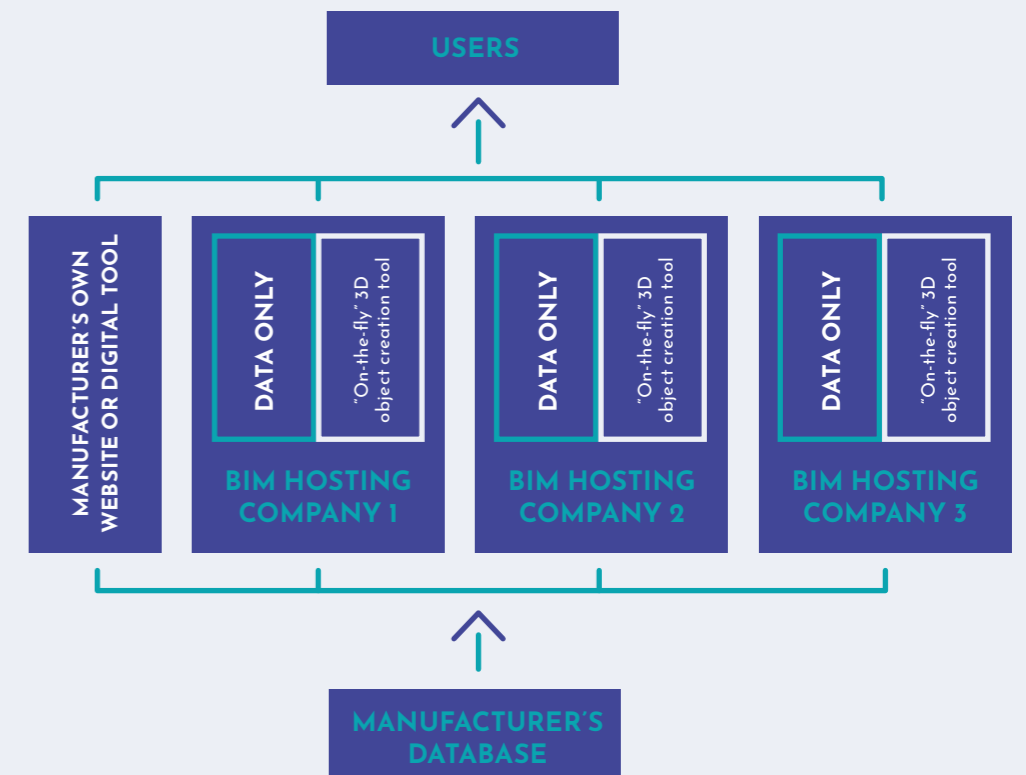
There are some key learnings both from the way information has been managed to date and from how we need to control information in the future:

1. Manufacturers need to engage with the market and discuss options for their BIM development. Talking to other manufacturers that have gone through this journey would be very beneficial.
2. Manufacturers must be able to easily update their product information no matter where it is stored.
3. Information needs to be split from objects and held separately. Manufacturers should have their own product databases, or PIMS, where they can hold, and be responsible for managing, their own information.
4. Those databases should be linked (i.e. by API) to any company that hosts that manufacturer's information at property level. This enables manufacturers to manage one database with all other information automatically linked - i.e. a "single source of the truth"
5. The non-geometrical data should be named based on international standards.

6. Object hosting companies should use available 3D object creation tools to enable the information to be added/linked to an object "on the fly" (at the point of download). Care should be taken to ensure that parametric object performance is not affected where relevant.
7. Most hosting companies have existing version control processes to alert users when objects/information in their models have been updated. These may need to be amended so that they trigger automatically when amended, and follow a change control management process.
8. It is a further recommendation that object hosting companies also enable the application of manufacturer's information to existing/generic objects in models.

Figure 3 below shows how this new process could function. If all manufacturers worked in this way, then the way in which their information is hosted and structured would be standardised. This is a key enabler for the development of larger tools and digital platforms and would also assist in the management of product information throughout the data journey into asset information and product reuse.

FIGURE 03
Proposed new structure for BIM hosting platforms



6 ■ PRODUCT INFORMATION SECURITY

Appropriately managed data and information security, including product information security, is fundamental to facilities/assets. However, the concept of data and information security is not widely understood or appreciated.

Current guidance on asset information security is provided by PAS 1192-5:2015 Specification for security-minded building information modelling, digital built environments and smart asset management. This PAS is transitioning to an ISO and will become BS EN ISO 19650-5. It provides a framework for the owners of assets to review the trustworthiness and security of their digital built assets, and how to translate these requirements for their suppliers. It requires asset owners to understand the nature of security threats and develop holistic strategies for dealing with them.

In 2016 the IET ran a survey of 1000 built environment professionals to examine the impact of digital technologies on the security and resilience of built assets (buildings and/or infrastructure). 46% of respondents were not aware of the existence of PAS 1192-5 and fewer than 9% were attempting to implement it.

The UK BIM Alliance recognised that this PAS document was difficult for clients to understand, and in particular was difficult for clients who needed to develop only 'baseline security measures'. The Alliance ran a project which provided some tools to assist with the development of such baseline measures. These simple tools can be accessed on the Alliance website.²⁴

However, there is also a larger problem relating to product information in assets - the granularity of security risk. In a situation with little structure and minimal guidance, construction product manufacturers don't know whether to put information in the public domain, designers and contractors don't know how to manage this issue, and asset managers are likely to want to lock away all asset information of all kinds.

Large swathes of asset information remains in the public domain, essentially because the industry is only just becoming aware of issues of asset information security. PAS1192-5:2015 is providing a focus on the problem, but a specific mechanism for managing it was still outstanding.

When attention is drawn to a security breach - for example when a member of the public discovers they can access asset information, or a manufacturer asks a question about the security of their product information then the client's or operator's tendency is to close down all information, leading to a data blackout.

Both scenarios: fully open data or a complete data blackout, pose problems for a sector that is working towards digitisation. Digital information is required for the day to day operation and maintenance of equipment, for example, and asset and facilities managers may be unwilling to operate in a digital way due to security issues they don't have the skill set or the tools to manage.

Currently, PAS 1192-5 does not recognise a spectrum of security risk, or the situation where there are different components and elements of components within an asset which need different levels of security. For the moment, it does not provide a methodology for identifying the level of security risk for different components and the capabilities of a product. With the transition of this PAS to ISO, there may be the opportunity for this to be included. In the meantime, the standards community has produced further guidance in the form of PAS 185: 2017, Smart Cities - Specification for establishing and implementing a security-minded approach, and PAS 1085:2018, Manufacturing. Establishing

and implementing a security-minded approach - Specification. This guidance outlines a triage process that could be applied on a cascading basis starting at the highest level (i.e. an overall asset or portfolio of assets) and then if appropriate repeated on a granular basis down to product or product group level.

A granular approach to assessing levels of risk in built assets requires the categorising of not just the whole asset itself in terms of who can see its asset information, but also its inner workings and its capability. Take the example of a security bollard outside an office building. A range of information is recorded, from the location and main materials, its inner workings, structural performance and other properties. If an organisation needs to maintain the bollard they have to be able to access certain aspects of this information necessary for the work, without being able to access others. If the information in the bollard can be categorised by risk level, different types of information can remain accessible when others require higher security clearance to access.

An effective asset security risk assessment process allows for development of a range of criteria for each risk level along with how the information is to be protected throughout the data journey. Risk assessments could then be made collaboratively between the members of a design team, the client's requirements and the manufacturer.

The Problem

Asset information security is a relatively new area of investigation for built environment professionals, and practice is relatively simple and broad brush. Whilst with sensitive projects such as government funded built assets, security issues will be considered, in other sectors including the private sector there is a widespread lack of awareness and understanding about information security.

²⁴ <http://www.ukbimalliance.org/resources/guidance-on-bim-security>



Recommendations

Other work happening in this sphere includes initiatives which aim to bring together the safety and security industries, so that security can learn from the success of safety risk assessment techniques. For example, Failure Mode Analysis, which in engineering systems looks at what can go wrong by accident, can be adapted to be applied to security risks.

The Centre for the Protection of National Infrastructure (CPNI)²⁵ has been funding work into automotive safety and security which is leading to a further PAS in draft form: PAS 11281 Automotive ecosystems - Impact of security on safety - Code of Practice, and the National Cyber Security Centre (NCSC) are working with IET (Institute of Engineering and Technology) also on automotive security. This work could potentially be extended into the built environment.

²⁵ CPNI is the United Kingdom government authority which provides protective security advice to businesses and organisations across the national infrastructure.

We are only at the beginning of a conversation about asset information security, but if we are to be able to digitise our product information and assets and use them in an effective way a pragmatic, workable solution needs to be found.

1. To avoid a binary 'on or off' approach to asset information, an asset-based risk management process should be employed for all built asset data and information, along the lines set out in PAS 1085:2018.
2. Asset information security levels need to be included in the process of developing Data Templates for construction products.
3. Manufacturers will need to consult their customers on levels of risk for components of their products and begin to develop a 'spectrum approach' to information security.
4. Designers, and contractors and others in the supply chain need to be aware of the need for a security risk assessment process and advise their clients accordingly.
5. Professional bodies need to consider information security as part of their evaluation processes. It may even be helpful for an assessment, labelling and certification scheme for construction products with regard to their information security.
6. There is also a need for a whole new group of data security management roles across industry. Whilst PAS1192-5 talks about the role of security asset manager, contractors do not currently have people employed in this type of role, and as asset information security becomes more and more important there will be an inevitable skills shortage in this area.

7. GUIDING THE PRODUCT DATA JOURNEY

The Product Data Steering Committee

The working group has discovered that there are a wide variety of groups working to develop solutions to product data issues. Some of these groups are voluntary or professional associations, some are commercial organisations. The work these groups have done, especially in a changing environment where the

value of digitisation has not necessarily been proven, is laudable. However, having spoken to people across industry there is clearly a pressing need for an independent source of information and advice about product data, to enable companies and organisations to decide what steps to take on their digital journey and when.

A PRODUCT DATA STEERING COMMITTEE WOULD

1. Act as a source of consistent, reliable, independent information and advice about structured product data, demonstrating the benefit of structured product data to industry.
2. Act as a two-way channel of communication between the standards community and the users of product information.
3. Help co-ordinate solutions the product data challenge and ensure that the solutions developed and promoted meet the needs of the whole data journey and the widest industry via harmonised standards and openBIM principles.
4. Facilitate best practice for structured product data across the built environment industry in the UK.
5. Act as an arbitration service where there are disputes.
6. Set up and maintain an online hub to act as a source of guidance related to product data and a gateway to further sources of information.
2. British Standards Institution representing the UK standards process;
3. The UK BIM Alliance Standards Group representing the wider standards community within the UK & Ireland;
4. The Industry Response Group which was set up by government to help ensure the construction industry meets the challenges brought about by the Grenfell Tower fire, providing a link with the outcomes of these deliberations;
5. Hardware and software providers and data hosts (this perhaps could be provided for by The UK BIM Alliance Technology Group);
6. The Centre for Digital Built Britain, liaising with the Digital Framework Task Group (DFTG) set up in July this year, and relevant research streams;
7. Data Specialists drawn from outside the Built Environment sector;
8. A function which executes the communications elements of the task.

IT IS PROPOSED THAT MEMBERSHIP OF THE STEERING COMMITTEE WOULD BE DRAWN FROM

This list is not exhaustive.

1. A group of members from the BIM4 communities and others to represent a cross industry voice;

The group should be fully funded to maintain its independence and to ensure that representation from SMEs and individuals can be sustainable in the long term. It is envisaged that the group could be chaired by a representative of the UK BIM Alliance, if appropriate, and would meet Quarterly, producing a quarterly newsletter on the latest developments.



APPENDIX 1: FURTHER READING

The following links provide information referred to in this report. They should be read in the context of the report and with the understanding that they are produced by others and don't necessarily align with the recommendations of this report.

RIPE FOR TRANSFORMATION, READY FOR CHANGE? PROJECT 13 DIGITAL TRANSFORMATION WORKSTREAM: INFRASTRUCTURE INDUSTRY BENCHMARKING REPORT

Mott MacDonald and the Project 13 Digital Transformation workstream Infrastructure Client Group, June 2018

<https://www.ice.org.uk/news-and-insight/ice-press-centre/new-report-highlights-readiness-of-infrastructure>
A report assessing the readiness of the infrastructure industry for digital transformation. Check out the 'Asset Delivery' industry readiness level and how it describes products.

DATA FOR THE PUBLIC GOOD

National Infrastructure Commission, December 2017

<https://www.nic.org.uk/publications/data-public-good/>

The National Infrastructure Commission's report examines the opportunities that new innovative technologies present - and makes recommendations to increase open data sharing to make the most of them.

PRODUCT DATA DEFINITION: A TECHNICAL SPECIFICATION FOR DEFINING AND SHARING STRUCTURED DIGITAL CONSTRUCTION PRODUCT INFORMATION

Steve Thompson PCSG Ltd on behalf of the BIM Task Group, BIM Task Group, April 2016

http://bim-level2.org/globalassets/pdfs/product-data-definition_v2.pdf

Identified the need for construction product data to travel through the construction cycle and led to the initiation of the LEXiCON project

THE FUTURE OF CONSTRUCTION PRODUCT MANUFACTURING. DIGITALISATION, INDUSTRY 4.0 AND THE CIRCULAR ECONOMY

Construction Products Association, October 2016

<https://www.constructionproducts.org.uk/publications/corporate-and-industrial/the-future-for-construction-product-manufacturing/>

This report sought to identify the progress made in the construction manufacturing sector in support of Building Information Modelling and digitalisation. It set out a vision for the next 10 years, put forward the argument that manufacturing was 'doing more than its bit' and called for stronger partnership with government.

FUTURE FOR CONSTRUCTION PRODUCT MANUFACTURING - INDUSTRY 4.0, CIRCULAR ECONOMY AND SMART ASSETS (VIDEO)

Steve Thompson, The IET, April 2107

<https://tv.theiet.org/?videoid=10139>

Summary of the CPA Report, explaining some of the diagrams and setting out a scenario for how construction product manufacture might be in future.

INDUSTRY RESPONSE GROUP [GOVERNMENT PRESS RELEASE]

July 2017

<https://www.gov.uk/government/news/new-industry-group-to-ensure-construction-sector-ready-to-meet-building-challenges-after-grenfell-tower>

A new industry response group made up of government and the construction industry will help ensure the sector can meet the challenges following the Grenfell Tower fire.

INDUSTRIAL STRATEGY - CONSTRUCTION SECTOR DEAL

HM Government, July 2018

<https://www.gov.uk/government/publications/construction-sector-deal>

A sector deal between government and the construction sector.

LEXICON - A SINGLE PROCESS FOR BIM DATA

Construction Products Association, March 2017

<https://www.constructionproducts.org.uk/news-media-events/news/2017/march/lexicon-a-single-process-for-bim-data/>

Press release announcing the LEXiCON project.

PRODUCT IDENTIFICATION - THE MISSING LINK OF BIM (PAGE 44 OF THE NBS NATIONAL BIM REPORT 2018)

Simon Powell, Adrian Malleon, The NBS, May 2018

<https://www.thenbs.com/-/media/uk/files/pdf/nbs-national-bim-report-2018.pdf>

Gives an update on the InnovateUK funded Digital Object Identifier research project

PPP - PRODUCT PROCESS PEOPLE INITIATIVE

The Finishes and Interiors Sector (FIS) 2018

<https://www.thefis.org/knowledge-hub/product-process-people/>

The FIS initiative to create an audit trail of which products are supplied and installed and the competency of the installer.

SECURITY AND RESILIENCE IN THE DIGITAL BUILT ENVIRONMENT

IET The Institution of Engineering and Technology, 2016

<https://www.theiet.org/sectors/built-environment/topics/building-information-modelling/files/security-resilience-dbe-report.cfm>

A report on a survey to examine digital technology on the use, the security, and resilience of built assets (buildings and infrastructure). The report offers recommendations on the immediate actions that could contribute to safeguarding asset and occupier data associated with digital models.

GUIDANCE ON BIM SECURITY

UK BIM Alliance, October 2017

<http://www.ukbimalliance.org/resources/guidance-on-bim-security/>

A FRESH WAY FORWARD FOR PRODUCT DATA: INITIAL MEETING AND NEXT STEPS

UK BIM Alliance/Su Butcher, January 2018

<http://www.ukbimalliance.org/news-and-events/articles/a-fresh-way-forward-for-product-data-initial-meeting-report-and-next-steps/>

Report of the initial meeting which led to the setting up of the Product Data Working Group

UKBIM ALLIANCE PRODUCT DATA WORKING GROUP - MEETING 1 INTERIM REPORT

UK BIM Alliance/Su Butcher, April 2018

<http://www.ukbimalliance.org/news-and-events/articles/ukbim-alliance-product-data-working-group-meeting-1-interim-report/>

UKBIM ALLIANCE PRODUCT DATA WORKING GROUP - MEETING 2 INTERIM REPORT

UK BIM Alliance/Su Butcher, May 2018

<http://www.ukbimalliance.org/news-and-events/articles/ukbim-alliance-product-data-working-group-meeting-2-interim-report/>

UKBIM ALLIANCE PRODUCT DATA WORKING GROUP - MEETING 3 INTERIM REPORT

UK BIM Alliance/Su Butcher, June 2018

<http://www.ukbimalliance.org/news-and-events/articles/uk-bim-alliance-product-data-working-group-meeting-3-interim-report/>

Standards & Guidance

BUILDING INFORMATION MODELLING (BIM) STANDARDIZATION

Martin Poljanšek, Joint Research Centre (JRC) of the European Commission's Science and Technology Service, 2017

<https://ec.europa.eu/jrc/en/publication/building-information-modelling-bim-standardization>

A useful publication outlining the efforts to standardise BIM across Europe, includes the role of CEN/TC442, and looks at interoperability as a concept, information delivery, data dictionaries etc.

EUROPEAN STANDARDS FOR BUILDING INFORMATION MODELLING (BIM)

Kieran Parkinson, British Standards Institution, May 2018

[Not available online] A summary document produced by BSI to give an update on the standards landscape in Europe and the UK relating to BIM.

PAS 1192-5:2015 SPECIFICATION FOR SECURITY-MINDED BUILDING INFORMATION MODELLING, DIGITAL BUILT ENVIRONMENTS AND SMART ASSET MANAGEMENT

British Standards Institution, May 2015

<https://shop.bsigroup.com/ProductDetail?pid=00000000030314119>

The Publicly Available Specification dealing with asset data security referred to in Part 6 of the report. This PAS is transitioning to an ISO and will become BS EN ISO 19650-5. British Standards Institution

PAS 185: 2017, SMART CITIES - SPECIFICATION FOR ESTABLISHING AND IMPLEMENTING A SECURITY-MINDED APPROACH

British Standards Institution, November 2017

<https://shop.bsigroup.com/ProductDetail?pid=00000000030376032>

The Publicly Available Specification dealing with security in Smart Cities referred to in Part 6 of the report. British Standards Institution

BIM4WATER PRODUCT DATA TEMPLATES

BIM4Water

<https://www.britishwater.co.uk/bim4water-standards-library.aspx>

Library of PDTs produced by BIM4Water and details of their development procedure.

SMARTCE MARKING CEN WORKSHOP AGREEMENT

CEN, August 2018

<https://www.cen.eu/news/brief-news/Pages/NEWS-2018-025.aspx>

The CEN Workshop Agreement (CWA) for SmartCE Marking, together with the XML format has been recently published. This is the first publication of a format that supports the data template structure from CEN/TC 442.

BIM Dictionaries & Terminology

BUILDINGSMART DATA DICTIONARY (BSDD)

buildingSMART International

<http://bsdd.buildingsmart.org>

The buildingSMART Data Dictionary (bSDD) is a library of objects and their attributes. It is used to identify objects in the built environment and their specific properties regardless of language, so that "door" means the same thing in Iceland as it does in India.

BIM ACRONYMS AND BIM DICTIONARY

Bond Bryan

<http://bimblog.bondbryan.com/document/>

The BIM Dictionary is a collated collection of terminology found in current UK standards, specifications, protocols and other relevant documentation. All terms are referenced to their original sources. In some cases, multiple definitions are included where different terminology exists. There is also a useful list of acronyms.

BIM DICTIONARY (PART OF BIME INITIATIVE)

<https://bimdictionary.com>

An international BIM Dictionary. Each Dictionary Item has its own page so it can be easily referenced in documents and websites. The BIM Dictionary is part of the BIME Initiative and will expand through the efforts of Volunteer Supporters and Official Sponsors.

BIM TERMINOLOGY

BRE Group

<https://www.bre.co.uk/bim-terminology.jsp>

The BRE BIM Terminology is a free-to-use, browser based tool and mobile app for BIM-related terms and definitions. The terms within the BRE BIM Terminology tool are extracted from the relevant British, European and International Standards to provide a consistent and controlled source of terminology.

CONSTRUCTING PLAIN LANGUAGE PLEDGE

UK BIM Alliance

<http://www.ukbimalliance.org/news-and-events/articles/uk-bim-alliance-publish-constructing-plain-language-charter/>

A commitment to use plain language in construction and guidance for how to do this.

APPENDIX 2: PARTICIPANTS

Product Data Working Group Members

Members of the working group were appointed as individual volunteers, not as representatives of their organisations.

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The UK BIM Alliance would like to thank the following organisations for allowing their employees to participate in the working group:

AIREY MILLER
ATKINS
BOND BRYAN DIGITAL
ELECTRIUM SALES LTD
JUST PRACTISING LTD
LEGRAND
NORTHUMBRIAN WATER
TATA STEEL
WIENERBERGER
WILLMOTT DIXON

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These contributors have consented to be named in the report. We thank them and their colleagues for their expertise and support.

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