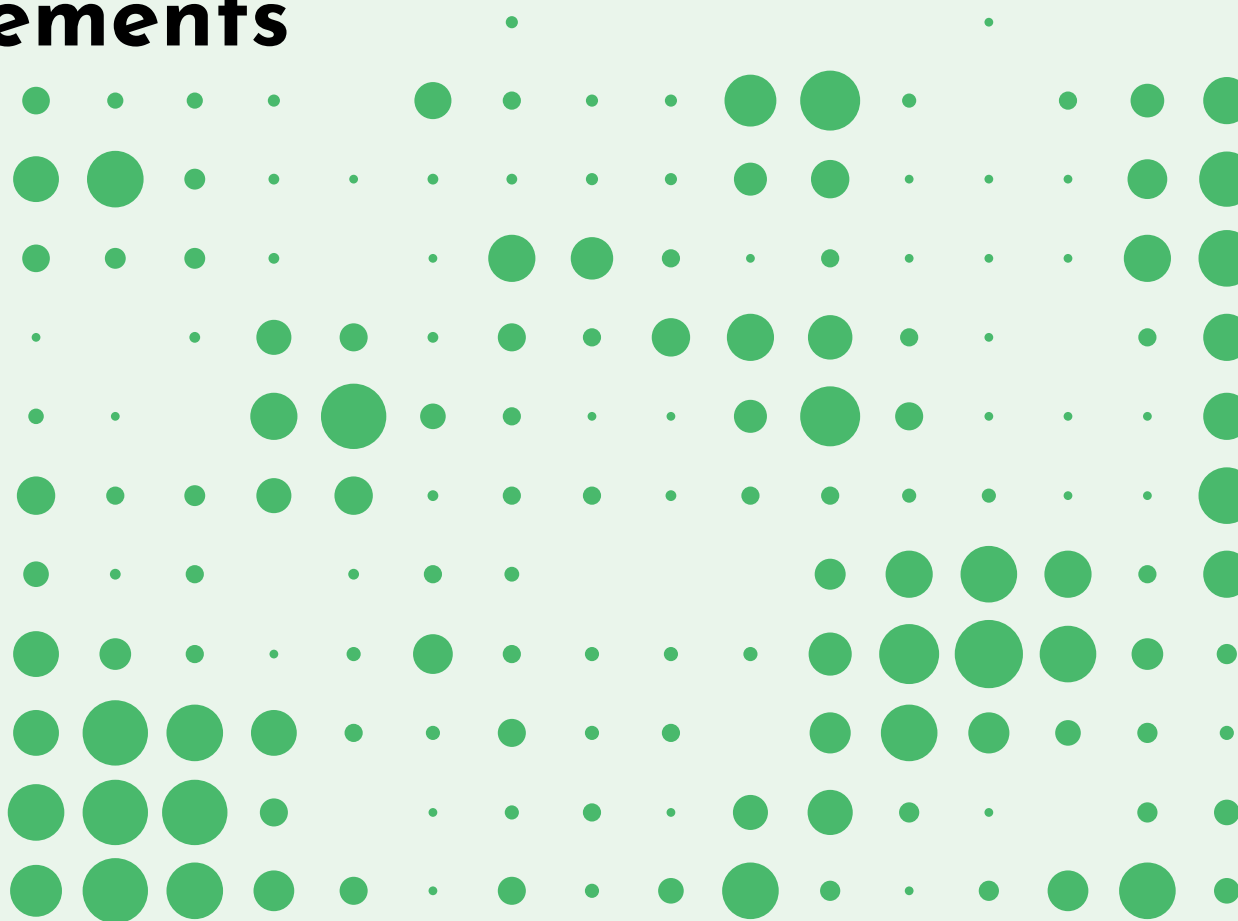


Information management according to BS EN ISO 19650

Guidance Part D

Developing information requirements



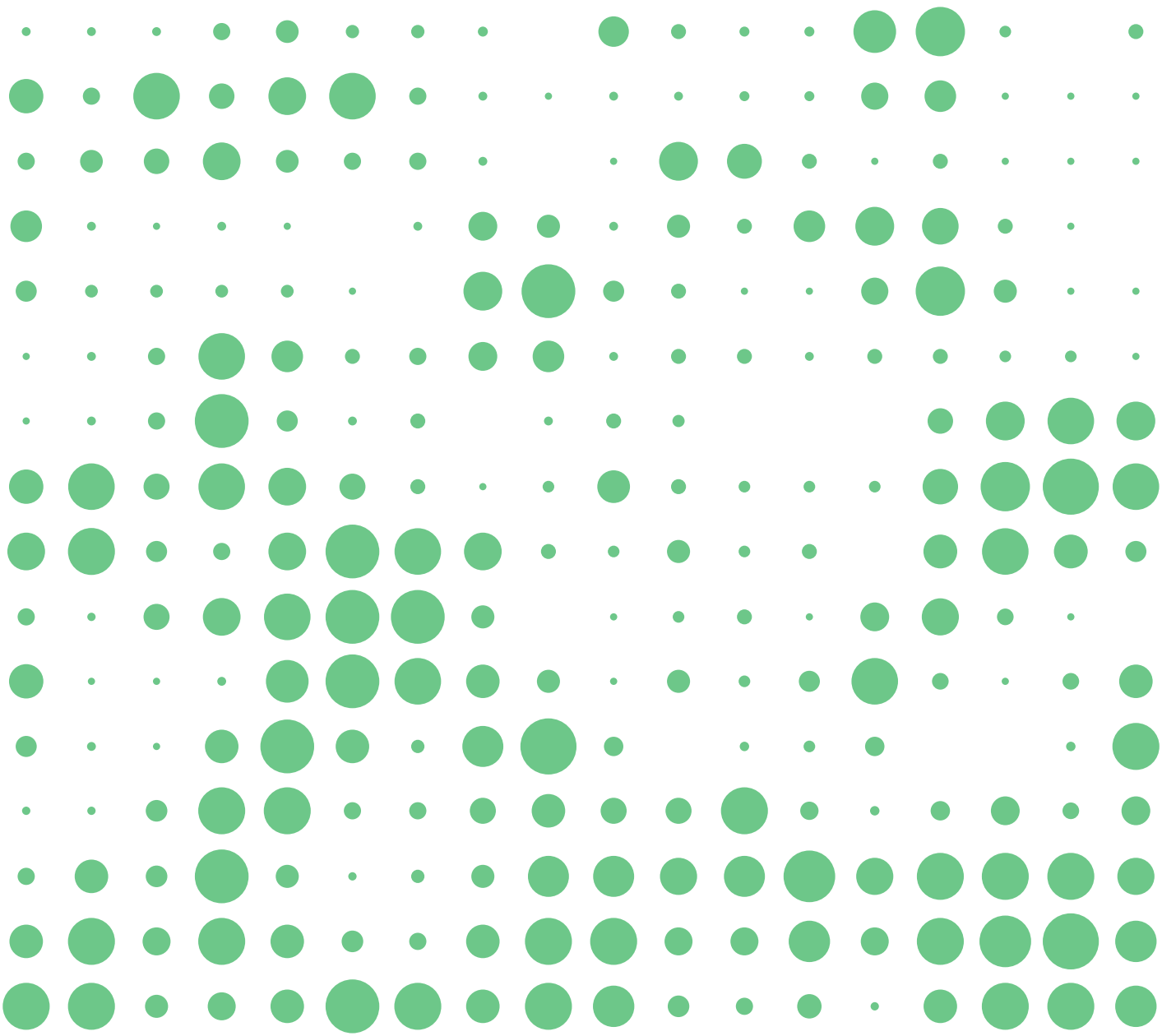
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Message from the UK BIM Alliance Chair

Author: Dr Anne Kemp OBE
Chair - UK BIM Alliance



The UK BIM Framework provides the fundamental step towards digital transformation of the UK's built environment industry. The Framework is based on the ISO 19650 series, which first developed out of the UK's former BIM Level 2, but incorporates and anticipates global and future digital perspectives.

The UK BIM Framework embraces and assists in the implementation of the standards for managing information for the whole life of assets of the built environment. The Framework anticipates the potential for integration across portfolios. The Framework provides extensive Guidance which continues to be developed, including the addition of supplementary tools and materials to enable a firm basis for the evolving National Digital Twin Programme.

This Guidance has been developed to help industry to implement the concepts and principles of the ISO 19650 series upon which the UK BIM Framework is based. It has been continually updated to keep track of the publication of the different parts of ISO 19650, and to reflect lessons learnt as further experience is gained in its implementation.

The key parts of ISO 19650 are now all in place, allowing us to realize information management throughout the whole life of built environment assets. It provides for traditional ways of working entailing exchange of information via files, but also caters for shifts towards data exchange. The key is being specific about what information is required and how it is to be delivered. This needs forethought around what should be

the "end in mind" and consideration from an organizational, whole life perspective. This then informs the detailed requirements right down to appointment level.

The work behind developing this Guidance has been considerable. I would like to thank Sarah Davidson and David Churcher for their tireless commitment in continuing to bring this work together - I so enjoy working with you both. Secondly, I would like to thank the many authors who have contributed so generously to the writing of the Guidance - and been so patient in the criticisms and changes that have been required of them. Finally, I would like to thank the many people who have spared time to review and feedback on the Guidance - the Focus Groups in particular, but also those who have contacted us separately. Without this feedback we would not be able to incorporate the wide-ranging experience and testing which is occurring around the industry.

We welcome your continued feedback and shared experiences. You can provide this via guidancefeedback@ukbimframework.org.

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This guidance represents the collaborative efforts of the following people and organizations

Editors

David Churcher	Hitherwood Consulting Ltd
Sarah Davidson	University of Nottingham
Anne Kemp	Atkins

Authors

Marzia Bolpagni	Mace
Emma Hooper	Bond Bryan Digital

Contributors

Karen Alford	Environment Agency
Andy Green	F+G
John Ford	Galliford Try
Shahida Rajabdeen	F+G
Dan Rossiter	British Standards Institution
Mo Shana'a	Morta
Helen Thompson	HMRC

Production

Centre for Digital Built Britain

About BS EN ISO 19650

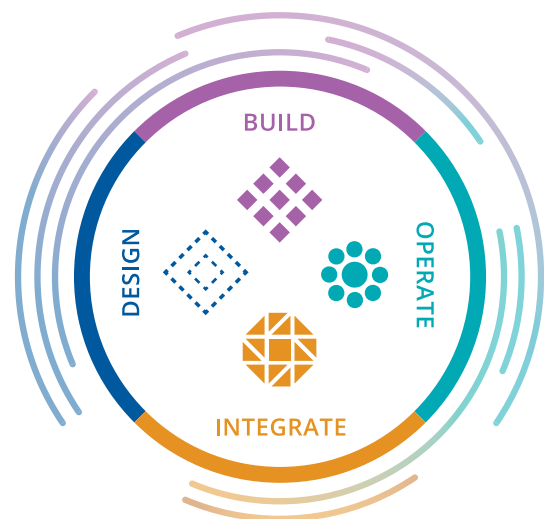
The BS EN ISO 19650 series of standards (herein after referred to as the ISO 19650 series) is an international standard of good practice. It defines information management principles and requirements within a broader context of digital transformation in the disciplines and sectors of the built environment (including construction and asset management industries). Its implementation in the UK is supported by UK National Forewords in ISO 19650 Parts 1 and 2, and a UK National Annex in ISO 19650 Part 2.

The ISO 19650 series replaces some of the existing British Standards and Publicly Available Specifications relating to information management using building information modelling (BIM). It is part of a landscape, or ecosystem, of national and international standards supporting information management processes and technical solutions. It considers all information whether it is a construction programme, a record of a meeting, a geometrical model or a contract administration certificate.

Building information modelling (BIM) plays a key part in the management of information because it provides a methodology that helps us to structure information so that technology can process it.

Structuring information using industry standards helps to improve interoperability. This means that information can be joined-up by both people and technology, which then enables us to extract more valuable knowledge from it. Using the same information structures throughout industry generates consistency, repetition and predictability. This brings real efficiency gains for businesses and provides the data architecture for the connected future.

Standards within the ISO 19650 series are available at www.bsigroup.com. Visit www.ukbimframework.org to see how the ISO 19650 standards plus other standards within the UK BIM Framework map to the design, build, operate and integrate process



Abbreviations and acronyms

This guidance includes a number of abbreviations and acronyms as set out in Table 1.

Table 1: Abbreviations and acronyms

Abbreviation or acronym	Term
AIM	Asset information model
AIR	Asset information requirements
CDE	Common data environment
CAFM	Computer aided facility management
EIR	Exchange information requirements
GIA	Gross internal area
IFC	Industry foundation classes
KPI	Key performance indicator
O&M	Operations and maintenance
OIR	Organizational information requirements
PDF	Portable document format
PIM	Project information model
PIR	Project information requirements
RIBA	Royal Institute of British Architects

About this guidance document (executive summary)

The guidance framework supports the UK implementation of the ISO 19650 series. This guidance document (guidance D) sits within an overall guidance framework as shown in Figure 1:

Guidance D is written to support the implementation of each published ISO 19650 standard.

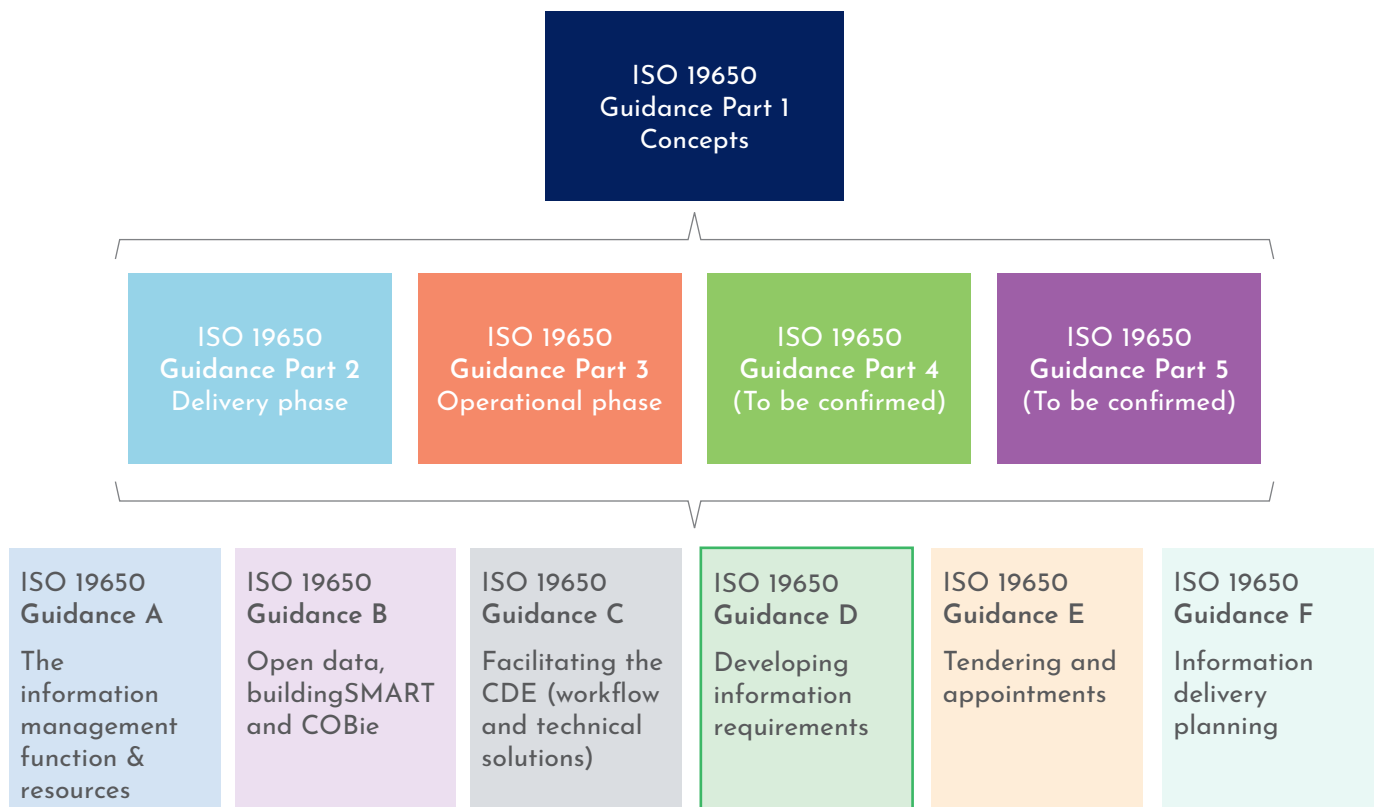


Figure 1: ISO 19650 guidance framework

Who is this guidance written for?

This guidance is for individuals and organizations involved in defining information requirements and information exchange activities on behalf of the appointing party, lead appointed party and the appointed parties.

Who is this guidance 'of particular interest to' and why?

This guidance is of interest to parties throughout the asset delivery lifecycle who seek to produce reliable information requirements that meet defined purposes, and enable effective delivery of information across project lifecycle.

Key takeaways

- Information requirements should define how and when information should be exchanged in the project/asset lifecycle. They should be structured in a consistent manner to enable effective information delivery and automated verification of deliverables.
- Information requirement resources include organizational information requirements (OIR), asset information requirements (AIR) and project information requirements (PIR). Collectively, they define the inputs for appointment level information requirements (exchange Information requirements (EIR)).
- EIR define the purposes and function of information, information requirements, format, and level of information needed by the appointing party. The resource establishes the appointing party's requirement for a particular exchange with a specific lead appointed party.
- Information requirements should be developed in a certain order to gradually build up their detail to tell a consistent story, fulfil their purpose for the project and fulfil their purpose for the receiver's organization.

As with all guidance supporting the UK BIM Framework, we invite comment and feedback on this guidance D at guidancefeedback@ukbimframework.org

1.0 About information requirements

Author: Emma Hooper
Bond Bryan Digital

1.1 Introduction

Information requirements are the most important concept of information management as they define the inputs for the whole information management ecosystem. This section provides guidance for information requirements:

- Organizational information requirements (OIR)
- Asset information requirements (AIR)
- Project information requirements (PIR)
- Exchange information requirements (EIR).

1.2 Background

1.2.1 The principles of information management

Before undertaking a project (either in the delivery or operational phase) consideration must be given to specifying the information as well as the physical asset (for example, a brick, a boiler or even an entire building).

Information management is about making sure that the right information is delivered to the right destination at the right time to meet a specific purpose. Information requirements consider both structured and unstructured information.

Table 1 in ISO 19650-1 clause 4.3 defines examples of four information management perspectives which provide a good starting point in understanding why different stakeholders require information.

1.2.2 Information requirements explained

ISO 19650-1 defines the term “information requirement” in clause 3.3.2 but a more detailed explanation is given here.

According to the ISO 19650 series, information should be created for a specific purpose - for someone to make use of it. Information requirements specify the precise information someone needs so that when it is received they can action that purpose successfully. Working collaboratively means that we should always create information with its use in mind.

In this section the following terms are used:

- Information provider - individual/team/ organization who generates and/or produces the information
- Information receiver (specifier) - individual/ team/ organization who will receive the information (for its own use or on behalf of others).

These terms are found in ISO 19650-1 clauses 3.2.3 and 3.2.4 and during an asset’s lifecycle most people within the appointing and appointed parties will be both.

For example, information could be needed to update a spreadsheet, to be used as reference information when designing, to make a decision and/or to manufacture from (as indicated in Figure 2).



Figure 2: Flow of information delivery

From an information management perspective, and to define information requirements we have to turn this workflow around.

The starting point is that the information receiver (specifier) stipulates their requirements. To do this they first have to understand the purposes for which they require information. The information required can then be defined and communicated to the information provider, so they then understand the scope of what they need to produce. ISO 19650-2 emphasizes this by starting with the assessment and need activity in clause 5.1 (illustrated in Figure 3).



Figure 3: Flow of information requirements

The activities in Figure 3 precede the activities in Figure 2 (see ISO 19650-1 Figure 6). You should not provide someone with information unless they have told you what they require.

Information requirements are like a skeleton or frame containing many holes of different shapes and sizes (see Figure 4). These holes specify the requirements of the information needed to fill them correctly. The information providers then exchange the information deliverables with the information receiver (specifier) thereby filling in the holes.

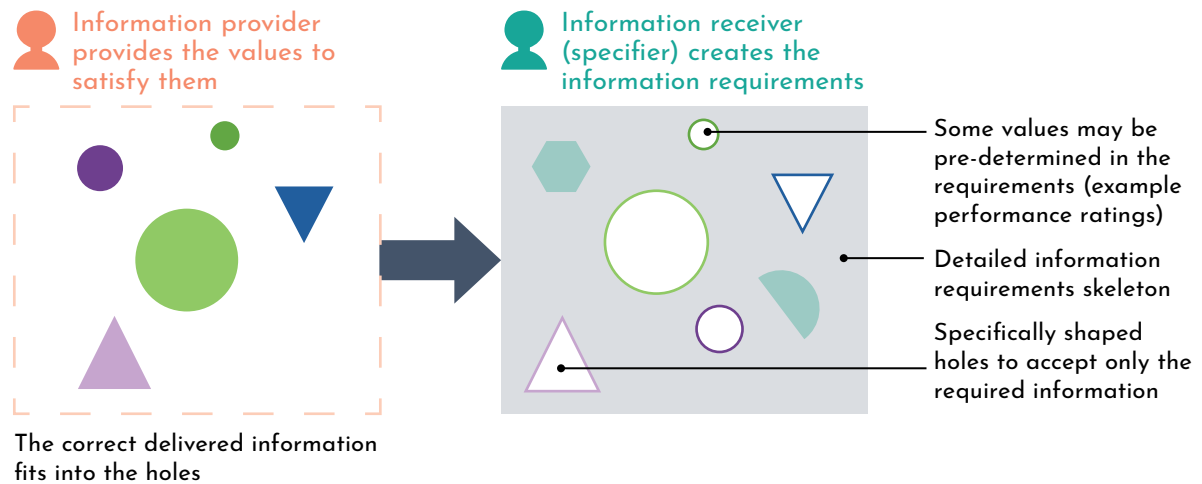


Figure 4: Information requirements skeleton

1.2.3 Why information requirements are needed

According to a variety of sources such as McKinsey¹ and Constructing Excellence² the built environment sector is one of the least productive and most unpredictable of the global industry sectors. Given that delivery and/or operational projects are rarely planned holistically, the way information is generated tends to be ad-hoc and reactive. This also means that software applications are rarely used to their full potential. These issues create risk before any related activity even starts. Furthermore, indiscriminate use of technology can exacerbate this by generating more information than can be handled or by masking the lack of a plan.

As a sector, we tend to be reactive and poor at planning and consequently think about things too late in the asset lifecycle. We have to change this mind-set, and everyone (including clients) has a part to play in this.

Without understanding what information is needed, it is very difficult and inefficient to plan how any such information is going to be delivered, the timescales required, and the resources needed.

Good quality information requirements are vital to resolve this situation.

Information requirements are fundamental to the ISO 19650 series. Once defined they inform:

- the tendering and appointment process
- information delivery planning
- information generation and delivery
- the authorization and acceptance process by comparing deliverables against requirements
- the appropriate use of the information.

See the information requirements cycle shown in Figure 5.

¹ 2017 McKinsey Global Institute. Reinventing Construction Through a Productivity Revolution

² 2018 Glenigan, Constructing Excellence, CITB, BEIS. UK Industry Performance Report

Information requirements underpin the golden thread of information, which is a key concept in the BS 8536³ series. See also ISO 19650-1 Figure 4.

Without information requirements there is no information management process.

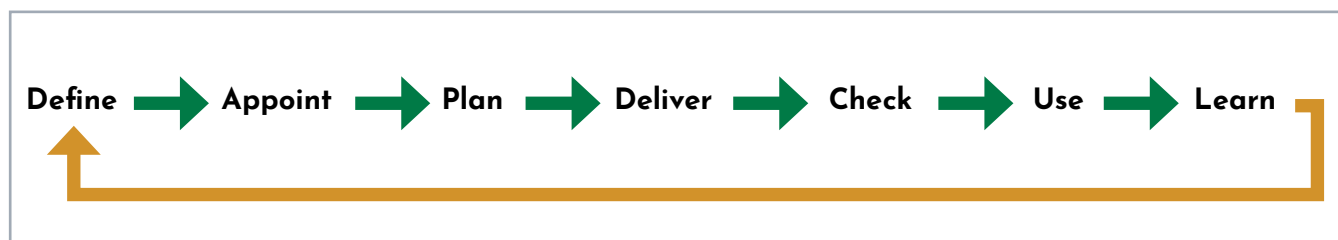


Figure 5: The information requirements cycle

An information receiver (specifier) asking for information unexpectedly will have a negative impact on the way the information producer is working. This can prove to be extremely disruptive, especially if project programmes are tight.

Information requirements should be developed in a certain order to gradually build up their detail to:

- tell a consistent story
- fulfil their purpose for the project
- fulfil their purpose for the receiver's (specifier's) organization.

Simply referring to the "UK BIM Framework" (or worse still the outdated terminology of "BIM level 2") or copying and pasting examples from standards and guidance without explicitly defining what is needed will not meet the requirements of the ISO 19650 series.

Furthermore, defining information requirements is not a tick box exercise; poor inputs tend to produce poor outputs leading to risks and unpredictability as already noted.

Poor information requirements (input) = poor information delivered (output)

³ BS 8536-1:2015 Briefing for design and construction - Part 1: Code of practice for facilities management (Buildings infrastructure) and BS 8536-2: 2016 Briefing for design and construction - Part 2: Code of practice for asset management (Linear and geographical infrastructure)

1.2.3.1 Information risk

People need useful information to help them carry out their activities effectively; likewise, most technology solutions need structured or defined information to work efficiently.

The more precisely the information requirements reflect the receiver's (specifier's) needs, then the more likely the provider will be able to successfully deliver the appropriate information. If information requirements are not sufficiently precise, information providers will be left to make their own assumptions and interpretation and what is needed. This can lead to error and increased risk - which in turn can lead to programme and budget being exceeded.

For example, a contractor (as a lead appointed party) is going to use a digital setting out methodology on site and requires dimensional information to be taken from the geometrical models. These details are not included in the information requirements provided by the contractor. Without this knowledge, the designers produce traditional setting out drawings. They end up wasting time, money and effort creating drawings that are not required.

It is vital that information requirements are defined as early as possible. They are needed to support tender appointments across the whole of the asset lifecycle. As noted in section 1.2.2, ISO 19650-2 supports this by requiring that information requirements are established in the assessment and need and invitation to tender activities, including those of the lead designer and project manager. See ISO 19650-2 clauses 5.1.2 and 5.2.1.

Precise information requirements help to manage risk around information exchange. This is especially important given the complexity of the wide variety of people who may contribute to an information exchange as well as the multitude of technologies that may be in use.

1.2.3.2 Information waste

ISO 19650-2 clause 5.6.2 b) is explicit about not generating wasteful information. To support this, information requirements should seek to avoid waste. All parties, including the client, should only define the information they require, so that they can fulfil their own actions. For example, a client (appointing party) should not try to define information for purposes which will be actioned by a delivery team.

Time will be spent creating, managing, issuing and checking information over many iterations of change. If the information is not required, this is wasted time and resource, which increases the costs of the information provider and may increase the costs for the information receiver (specifier).

For example, a client should not require information for thermal analysis purposes unless they or a separate delivery team will be carrying out thermal analysis activities. However, they may require information that confirms thermal performance in support of operational activities. In this instance, it is down to the delivery team to define the information that they need in order to carry out thermal analysis to assure the thermal performance.

Information receivers (specifiers) should only ask for the information they need.

To reduce wasted effort an appointing party (a client) with a portfolio of assets should consider how they can generate consistent information requirements across their assets to avoid duplication and error. However, it is really important that amendments are introduced as appropriate to make the information requirements project and appointment specific.

1.2.4 How information requirements are defined and communicated

Information requirements should be considered in two parts:

1.2.4.1 The purposes for information (high-level requirements)

This is the most important part of defining information requirements and is the starting point. It is about understanding the day-to-day reasons why information is required, see ISO 19650-1 clause 5.1. This helps to form high-level requirements. These are equivalent to “interested parties’ information requirements” in ISO 19650-1 Figure 2.

To define information requirements, start with the reasons why information is needed before the information itself is considered.

1.2.4.2 The information that is needed (detailed requirements)

Describing information generally is subjective. However, information in accordance with the ISO 19650 series can be described across four main facets:

1. Purpose (the need that the information will fulfill). For example, to convey fire performance of elements.
2. Content, this is split into:
 - Content summary (the overall content of the information). For example fire strategy information or elemental cost information.
 - Content breakdown (geometrical and alphanumerical information across an object hierarchy). For example, a wall with the property ‘fire rating’ or for the project, a property called ‘cost limit’
3. Form (how it is presented). For example, a schedule or a drawing.
4. Format (how it is encoded). For example, PDF or IFC(-SPF).

These are equivalent to “appointment information requirements” in ISO 19650-1 Figure 2.

The level of information need is a framework for defining information across these facets and is referenced in ISO 19650-1 clause 11.2. In accordance with this, information should be defined across the following three sub-divisions:

1. Geometrical information
2. Alphanumerical information
3. Documentation.

Level of information need is explained further section 2 of this guidance.

Where there is generic or industry accepted means of delivering of an information requirement, such as a topographical survey, this should be referenced. In this instance, it is not necessary to specify the contents of the survey to the nth degree. However, if there is something specific that is required in the survey then this should be stated. A pragmatic approach is helpful.

The need for each information requirement to articulate each facet may be determined by context.

For example, an appointing party (client) specifies a fire strategy deliverable only in terms of its content summary. The other facets of content breakdown, form, purpose and format are left to the delivery team to determine. For another requirement the client specifies more facets by requiring a topographical survey (content summary), which shows the building, car park and access routes (content breakdown), delivered as a drawing (form) in PDF (format).

Information requirements should be structured in a consistent way as far as possible to make understanding of delivery easier and to enable automated checking rules to be established.

Using structured tools such as databases and spreadsheets will help achieve this.

A recommended approach would be to establish a master set of information requirements using rationalized purposes plus the level of information need framework then filtering them according to each use case and/or appointment. This would then assist production of appointment specific information requirements and help ensure there is no duplication and no gaps in information delivery. See Figure 6.

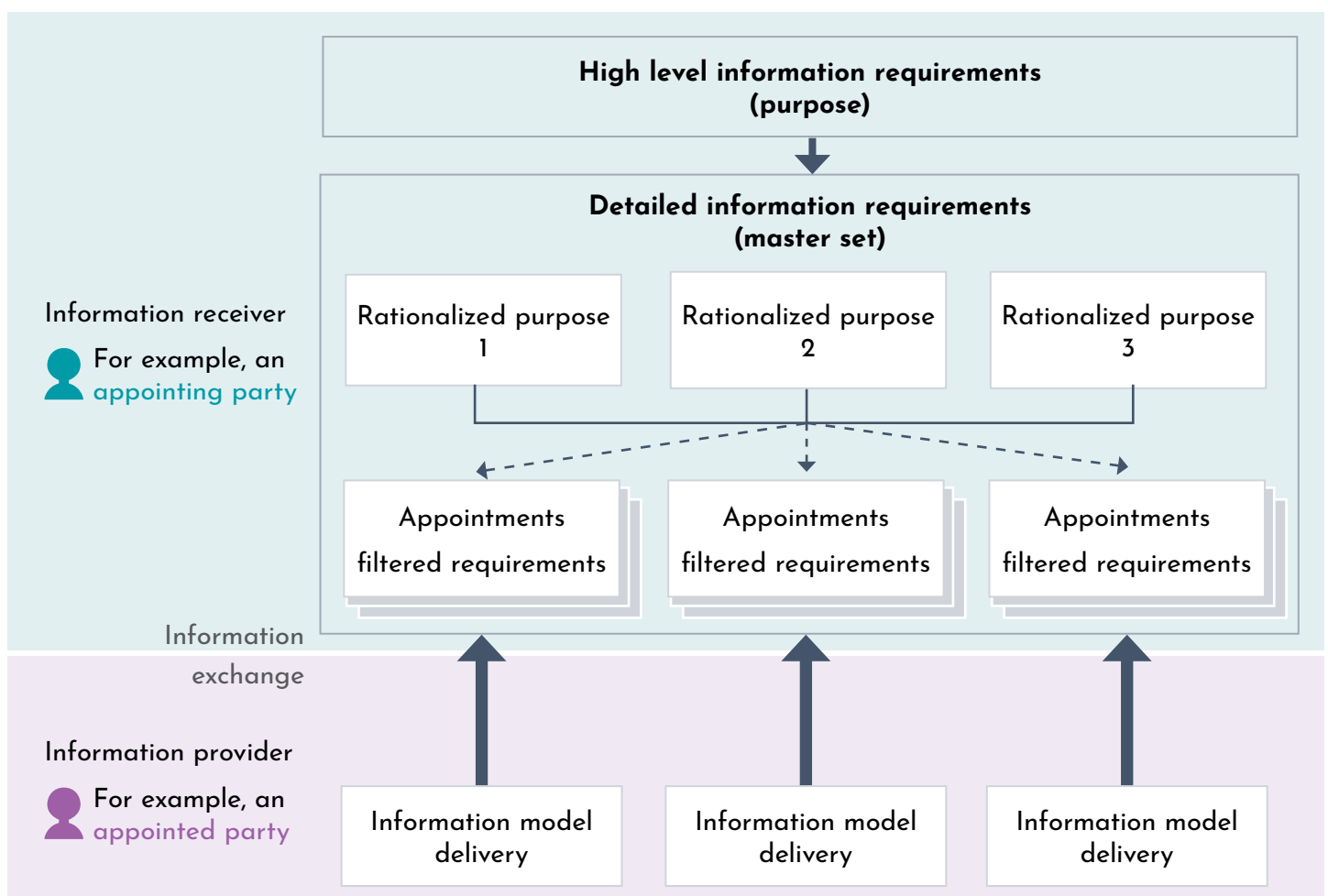


Figure 6: Breakdown of information requirements

1.2.5 Who has information requirements?

ISO 19650-2 considers in detail, the information requirements from appointing to lead appointed parties and then again to appointed parties. For the appointed party this includes information requirements from both the appointing party and lead appointed party.

However, information requirements can exist in the opposite direction and between task/delivery Teams. In fact every party within a project is likely to have them.

For the rest of this guidance section 1.0, the focus is on the appointing party (the project client or representative). The appointing party will always require information both during and at the end of a project whether it is to help make decisions, for statutory/regulatory reasons, to manage the facility or to sell it on.

1.3 Information requirements outside of design and construction project delivery

1.3.1 Introduction

During the running of an organization, the principles and processes defined in ISO 19650-1 and ISO 19650-3 should be applied to define information. In these standards, there are two types of information requirements:

1. Organizational information requirements (OIR)
2. Asset information requirements (AIR)

For their relationship to each other see ISO 19650-1 Figure 2.

1.3.2 Organizational information requirements (OIR)

OIR are explained in ISO 19650-1 clause 5.2 and ISO 19650-3 clause 5.1.2.

Organizations must consider information requirements around in-use (including operation) before they consider information requirements around project delivery.

See [Annex A](#) in this guidance for examples of OIR.

OIR are the starting point for all information management activities. OIR detail the high-level information required by an organization across its whole asset portfolio and its different departments (such as human resources, information technology, finance, facilities management and operations/production). The information requirements from all the assets and departments should be rationalized and joined up to help streamline the business.

Since the UK BIM Framework is specifically about the lifecycle of physical/built assets the focus in this guidance is on this part of the OIR.

OIR enable understanding of the high-level information needed about assets throughout their lifecycle. This helps the appointing party run their business in an informed and effective manner and to understand the information needs of their clients and stakeholders.

1.3.2.1 *What they are for*

OIR ensure the correct information feeds back into an organization's wider business function to support strategic business decisions. OIR are therefore an important resource to support the organization.

1.3.2.2 *When they are defined*

As part of the organization's business activities.

1.3.2.3 *Who creates them?*

The appointing party, for example, the project client, the asset owner or their representative.

1.3.2.4 *What they include*

Identify the high-level activities for which information is required

To begin this process, it is worth considering the high-level activities that require information within an organization. This will help to create a structure. Examples of these high-level activities can be found in the following standards:

- ISO 19650-3 annex A.2
- BS 1192-4:2014 clause 5.2
- ISO 55001:2014 annex A.

Examples include:

(Extracted/adapted from the high-level activities in ISO 19650-3, Annex A.2)

- Health and safety compliance and management
- Environmental management
- Capital investment and lifecycle costing
- Risk assessment and management
- Maintenance and repairs
- Asset operations
- Space utilization
- Asset modifications.

It may be helpful to group these activities into strategic, tactical or operational groups.

Note these high-level activities can inform the structure but are not sufficient to be used as OIR themselves. It has been observed that these examples have appeared within

exchange information requirements (EIR) with no more detail provided. OIR used in this way do not tell the provider what information is required, they are merely a starting point for the receiver (specifier).

Identify the purposes for which information is required

As well as defining the activities for which information is required, it is also important to define the reasons why information is needed. These are the organization-based purposes and could be to satisfy (for example):

- Objectives/outcomes
- Stakeholders (including staff, end-users, shareholders)
- Regulators (including building control, planning, auditors, inspectors)
- Policies (including quality management)
- Business operation tasks (including corporate reporting, applications, auditing, procuring maintenance contractors, analyzing space utilization).

These can be used to generate a matrix of information needs against information activities where each associated information requirement is defined.

Once completed the OIR set the scene for the next two requirements, the:

1. Asset information requirements (AIR)
2. Project information requirements (PIR)

1.3.2.5 *When the information is exchanged to meet them*

Information is exchanged to meet the OIR whenever the AIR and PIR are responded to.

1.3.3 Asset information requirements (AIR)

AIR are explained in ISO 19650-1 clause 5.3 and ISO 19650-3 clause 5.1.4.

See [Annex A](#) in this guidance for examples of AIR.

The process of defining the OIR will generate a set of high-level requirements. These will need to be defined in sufficient detail to enable them to be used in asset management related contracts in the form of AIR.

These AIR set out precisely the asset related information which providers should deliver. The AIR will need to be defined and communicated using order and logic to ensure a comprehensive contract resource.

AIR are generated from OIR. They specify the detailed information needed by the appointing party and their clients/ stakeholders to manage physical assets throughout their lifecycle.

1.3.3.1 What AIR are for

AIR ensure the correct information is delivered to an organization to fulfil the built asset part of the OIR. The AIR is an appointment-based resource. For a design and construction project, AIR form part of the EIR to ensure the delivery of operational information.

For example, AIR content could specify the precise information needed:

- For/from the annual boiler service
- For/from an emergency
- For/from equipment failure
- To review annual energy costs
- To complete an insurance renewal
- To sell a built asset
- To demolish a built asset.

The delivery of information in response to the AIR will build up and/or update the asset information model (AIM). This information will be derived from many sources: from an asset management related contract or from a design and construction project (via the project information model).

As well as telling those providing a service the information that they need to deliver, AIR can be used to aid selection during the tender/ appointment activity.

AIR need to be identified no matter how the asset information is going to be managed, be it by a computer system (for example a computer aided facility management (CAFM) system) or otherwise.

AIR are required for in-use activities during an asset's life and they support contractual delivery of information in design, construction and asset management.

1.3.3.2 When AIR are defined

Defining AIR is an important organizational business activity to support asset management, design and construction contracts. AIR have to be defined prior to any related appointment.

For appointing parties with multiple assets, it is sensible to consider how the AIR can be rationalized so that at appointment level they can be generated in a streamlined and efficient way using a consistent structure as far as practicable.

1.3.3.3 Who creates them?

The appointing party, for example the asset owner or their representative. The creation of AIR is led by the internal team responsible for asset and facilities management (where they exist).

1.3.3.4 What they include

To structure the information, the level of information need framework should be used which is referenced in ISO 19650-1, clause 11.2 and section 1.2.4 of this guidance.

The AIR specify precisely the information required for each particular asset. An asset could be an entire piece of infrastructure, an entire building, its spaces, or even for example an individual instance of a pump³. Selecting the correct schema and classification system is therefore critical to create a consistent breakdown structure across all the different asset types.

Regulatory information, for example the operations and maintenance (O&M) manual, the health and safety file or the building log book, must be defined through the AIR where they apply. The AIR should consider the different facets of information: the contents, the function, the form and the format.

The AIR should also consider the data requirements of the computer systems that will be used to help manage the asset. This is to:

- Ensure the required data is delivered
- Enable the correct pre-defined mappings to be set up.

Following an industry standard such as BS 1192- 4:2014, allows delivery teams to set up methods which can be used across multiple projects and clients.

AIR should only require information that is going to be used to fulfil a specific purpose. This is to ensure that:

- The required information can be delivered in practice
- It is commercially viable to deliver the information.

Note that poor specification of the AIR through, for example, reference to the incorrect classification table, can result in the delivery of information for assets that are not maintainable. The information therefore serves no purpose but has taken time and effort to deliver.

No matter how information is delivered there must be correct and consistent referencing throughout all information containers. The AIR should be therefore compiled and subsequently read in conjunction with the relevant information standard.

For example, an air handling unit which is called AHU-0001 should be identified as this on all relevant drawings, equipment schedules, product data sheets, in any structured data such as a spreadsheet and within geometrical models.

It is important to remember that AIR should be appointment specific as illustrated in Figures 6 and 7. An AIR that is not appointment specific will undermine the appointment/contract. It will also overload information providers by requiring them to generate and/or deliver unnecessary information.

1.3.3.5 When information is exchanged to meet the AIR

Information exchange is driven by the following hierarchy:

- Trigger events associated to the asset lifecycle
- Appointments to respond to trigger events
- Milestones within appointments.

A trigger event in the context of the ISO 19650 series is one which is going to lead to new or updated information concerning the asset. This information is delivered as an information model and when accepted it is incorporated into the AIM.

Trigger events are linked to information purposes and examples of trigger events are found in ISO 19650-3 Annex A.3. They could include:

- Equipment breakdowns
- Annual servicing
- Financial planning
- Insurance renewals
- Refurbishment
- Emergencies
- The construction of a new built asset.

The AIR would be firstly filtered according to the trigger event.

A trigger event could involve one or more appointments and therefore could require one or more AIR. When appointments are being made the AIR should be filtered again so that they are specific to the appointment. This is shown in Figure 7.

Information is exchanged at defined milestones within appointments. An appointment may have just one information exchange at completion, or it may have several within the life of the appointment.

AIR respond to in-use trigger events and are appointment specific.

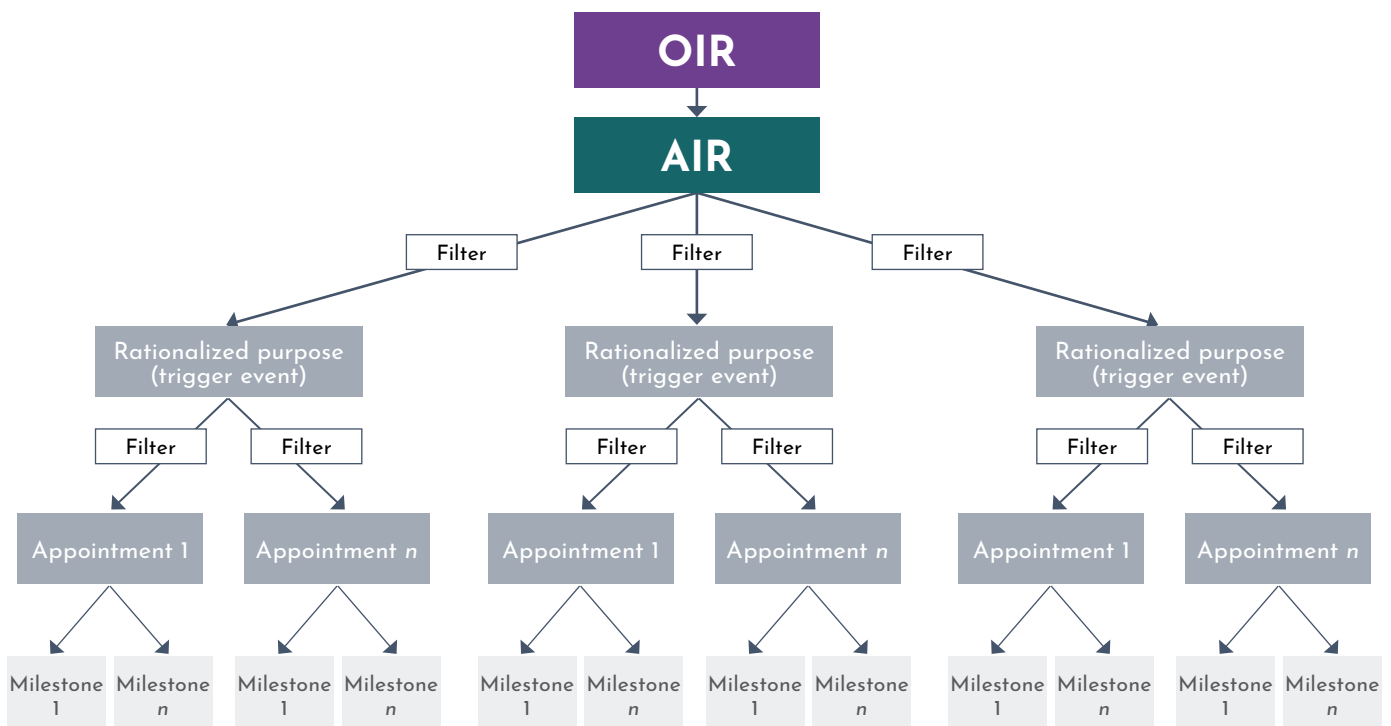


Figure 7: AIR and their breakdown by triggers and appointments

1.4 Information requirements during design and construction project delivery

1.4.1 Introduction

ISO 19650-2 requires that the appointing party's information needs are determined before any delivery team appointments are tendered. There are two types of information requirements to be defined:

1. Project information requirements (PIR)
2. Exchange Information Requirements (EIR).

1.4.2 Project information requirements (PIR)

PIR are explained in ISO 19650-1 clause 5.4 and ISO 19650-2 clause 5.1.2. See [Annex A](#) in this guidance for examples of PIR.

See also ISO 19650-1 Figure 2 for the relationship between the OIR and PIR.

PIR, like OIR, are high-level and identify what information will be needed for the key decision points determined by the appointing party. There is only one set of PIR per project.

PIR are partly derived from OIR. They enable understanding of the high-level information the appointing party requires during a design and construction project.

1.4.2.2 When PIR are defined

Some of the PIR content may have already been defined within OIR that are applicable to design and construction projects. For example, statutory requirements or corporate project delivery policies.

Any additional PIR should be identified and added to those derived from OIR at the inception of a design and construction project, before the appointments for any consultants or contractors are tendered.

Organizations with many projects may find it helpful to consider and define their PIR as a separate off-line exercise from any particular project being started.

1.4.2.3 Who creates PIR?

The appointing party, for example the project client, the asset owner (indirectly through OIR) or their representative.

1.4.2.4 What they include

PIR are derived from the purposes for which the appointing party requires information. These can include:

- Relevant OIR such as corporate key performance indicators (KPIs)
- Project business case for example, financial information to establish value for money and affordability
- Strategic brief for example, strategic programme to establish opening date for a school
- Project stakeholders who require information for example, local residents
- Project tasks which the appointing party themselves need to carry out for example, completing an application.

With the PIR in place the information to be delivered can then be defined more precisely in EIR (ISO 19650-2 clause 5.2.1).

1.4.2.5 When information is exchanged to meet the PIR

The activity of requiring information and then delivering it is called an information exchange.

ISO 19650-2 clause 5.1.2 recommends that the appointing party considers the project plan of work in establishing the PIR. This enables key decision points and associated activities such as information exchange to be anchored against a defined plan, for example, the RIBA plan of work.

Key decision points are when the appointing party and other stakeholders make informed decisions about the project such as, whether or not it is financially viable to proceed to the next stage or decisions about appointment of the project team. These decisions are made using information received from information providers.

A key decision point can be “y” weeks before the end of a work stage or after the beginning of a work stage. Note that ISO 19650-1 clause 3.2.14 could be read to suggest that a key decision point aligns to the end of a work stage but key decisions can be made at any time. Examples might include decisions related to tendering or planning permission. Key decision points need to be mapped out at the start of the project, see ISO 19650-2 clause 5.1.3.

Information delivery milestones are pre-defined points that specify when the required information should be delivered to the appointing party.

Information delivery milestones should be defined relative to key decision points, for example “x” weeks before a key decision point. There are likely to be cases where multiple exchanges may occur at the same information delivery milestone, for example where information models are to be delivered for checking by different delivery teams before being used by the appointing party at a key decision point, see ISO 19650-2 clause 5.7.

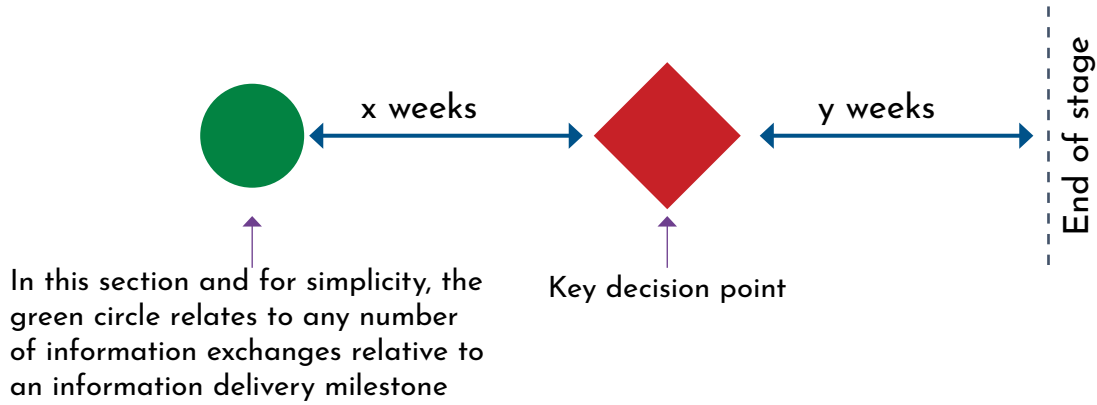


Figure 8: Key decision points and information delivery milestones

When key decision points and information delivery milestones are defined it will be unlikely that all their specific dates will be known. Even so, the dates can and should be defined in relative terms as indicated in Figure 8.

For the purposes of this guidance on PIR, it is assumed that information delivery milestones coincide with information exchange dates. This is not necessarily the case and is considered further in the EIR section of this guidance.

Robust planning of the key decision points and information delivery milestones by the appointing party should, as far as possible, eliminate ad-hoc requests for information at the last minute.

Figure 9 shows the information delivery process associated with a number of key decision points. This is in the context of a design and build procurement (through to the end of RIBA work stage 4) and in respect of three of the lead appointed parties involved in this project.

Reference to numbers 2 to 7 reflect the information management activities set out in ISO 19560-2 clauses 5.2 to 5.7, which are as follows

2. Invitation to tender
3. Tender response
4. Appointment
5. Mobilization
6. Collaborative production of information
7. Information model delivery

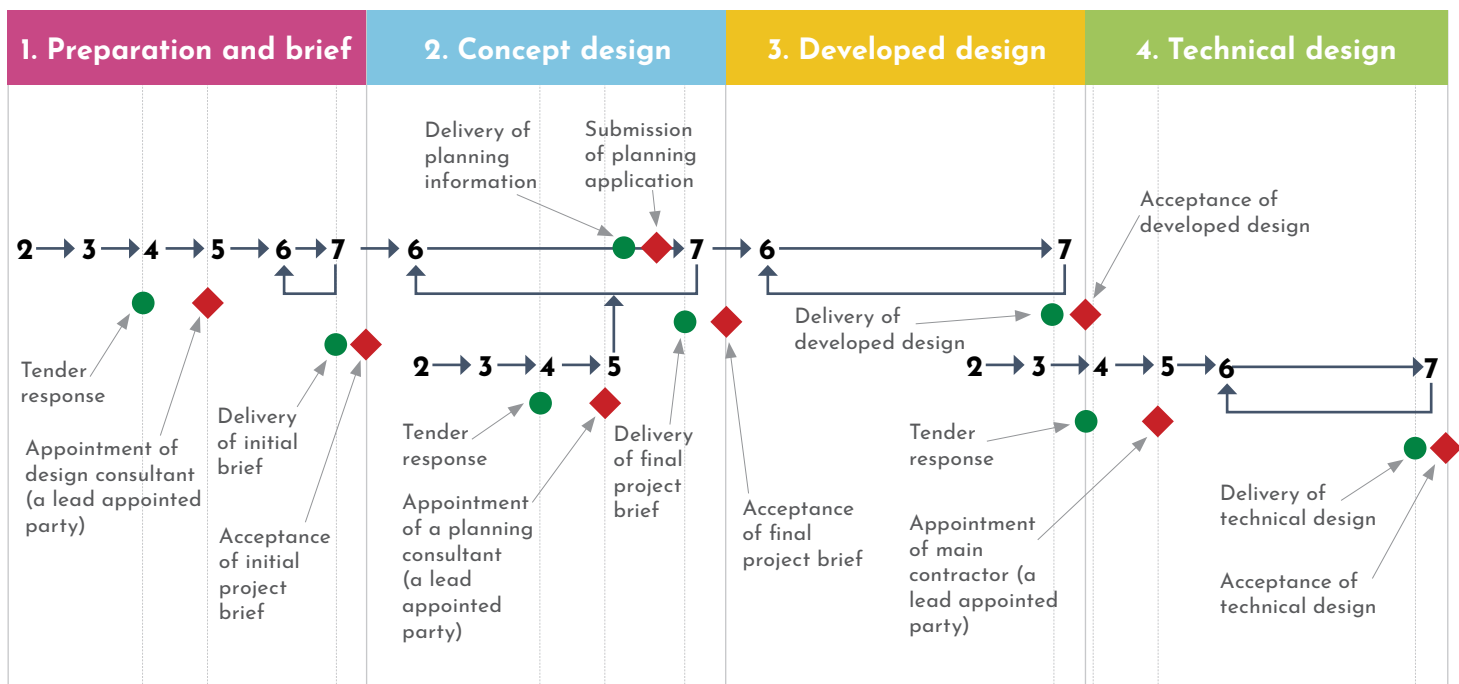


Figure 9: Example of key decision points and information delivery milestones in relation to the RIBA work stages 2013

1.4.3 ISO 19650-2 clause 5.1.2

ISO 19650-2 clause 5.1.2 contains a list of seven points which have to be considered when defining the PIR. They do not have to be considered in any particular order nor, and if they are not relevant or helpful, should they be followed. The list is a tool to help the appointing party arrive at their requirements. Some appointing parties may have a set of questions that they need to answer if they are part of a wider organization or public body. Standalone clients may have other methods they use to develop their PIR - it is very much up to the organization depending on how they want to monitor, check and make use of the information.

Development of PIR should go hand in hand with the strategic project management activities being defined, rather than as a standalone activity. Note that the appointing party does not have to issue a separate document called PIR.

The points to consider as defined in ISO 19650-2 clause 5.1.2 are:

1.4.3.1 Project scope

Having a basic understanding of the project is the first step to understanding what information is required

- What is it you want to build?
- What is the reason for the works?
- What is the business plan?
- What are the objectives/outcomes of the project?

1.4.3.2 The intended purpose for which the information will be used by the appointing party

Like the OIR, defining PIR is very much a stepped process.

The reasons that the appointing party requires information during a project will originate from different departments and stakeholders, see [section 1.4.2.4](#).

This should be done at a high-level and will give a solid base for the information management of the entire project.

1.4.3.3. The project plan of work

This defines the stages of a project and it is generally possible to align the stages with a timescale. There is a unified plan of work that is described in BS 8536. The stages align with the RIBA Plan of Work 2013 and the Construction Industry Council stages. Some specific types of work or project may have their own variation on a standard plan of work.

1.4.3.4 The intended procurement route

Procurement is the process for 'buying' goods and services. For a design and construction project this covers the strategy, methodology and framework for tendering and appointing single or multiple parties. The procurement route affects the types of contractual relationships that are created and also how information is managed. For example, the way information flows through the project team is completely different for a design and build project compared to alliancing contracts. During invitation to tender, the procurement route and appointment structure will influence the different sets of EIR which are produced by the appointing party.

1.4.3.5 The number of key decision points throughout a project

The appointing party needs to define the number of key decision points and when they occur in relation to work stages. See [section 1.4.2.5](#) for more information.

1.4.3.6 The decisions that the appointing party needs to make at each key decision point

At the key decision points there will be decisions that the appointing party needs to make. The scope of a key decision could range from deciding whether to proceed to the next stage of a project to finalizing the internal finishes of a new-build project.

These decisions may be generated from the purposes (such as the business plan) so doing this activity of identifying the key decisions alongside defining the purposes may be beneficial. They may also be defined as part of a wider organizational activity (for example, standard decisions based on spatial information or financial information may have been pre-defined).

Like the purposes, starting with identifying the decisions enables the appointing party to determine the information required to make those decisions. It may be beneficial to do this for each key decision point in turn as the examples in [Annex A](#).

Examples of decision points include:

- Whether the energy performance of the built asset is acceptable
- Whether the overall layouts meet the needs of the staff and end-users
- What specialist equipment will be needed
- Which main contractor to select
- Whether the scheme is financially viable
- Whether it meets the organization's strategic vision.

1.4.3.7 The questions to which the appointing party needs answers, to make informed decisions

Some organizations may have questions that they need to ask themselves during a design and construction project as part of their wider organizational strategies. This is to provide assurance that the project is performing as intended.

In this scenario, these questions (referred to as plain language questions in BS 8536 or key performance questions in business language) can also be used as a reason/purpose for requiring information. This required information essentially becomes a KPI for the project and will be required at the appropriate key decision point(s).

The reason key performance questions exist is to create more useful KPIs. Again, defining purpose first creates better requirements.

Information requirements consequently have two main benefits; firstly, they define what information is needed. Secondly they can also be used as a comparison tool to which the delivered information is compared.

The previous sections give a mixture of reasons why the appointing party could need information. These reasons can also be reworded into questions should the appointing party find this useful.

1.4.4 Exchange information requirements (EIR) under ISO 19650-2

EIR are explained in ISO 19650-1 clause 5.5 and ISO 19650-2 clauses 5.2.1 and 5.4.3.

Examples of EIR are provided in [Annex A](#).

As noted above, the two clauses that define EIR in ISO 19650-2 are:

1. Clause 5.2.1 - Appointing party's EIR to be met by lead appointed parties
2. Clause 5.4.3 - Lead appointed party's EIR to be met by appointed parties

Since EIR essentially perform the same function for the appointing party and lead appointed party, this section of guidance accommodates both the appointing party's and lead appointed party's EIR, with any differences explored.

The appointing party's process of defining OIR, AIR and PIR will satisfy ISO 19650-2 clause 5.2.1 a) by specifying the information required and the degree of granularity needed to fulfil organizational, asset and project-related activities. These will inform EIR (see [sections 1.4.2](#) and [1.4.3](#)). For each appointment, as described in ISO 19650-2, the role of the EIR is to precisely specify what information is to be delivered at each information exchange.

EIR form part of the appointment process, which may be through an invitation to tender package, and they are in essence the information part of the employer's requirements (ER).

Information should be considered in the same manner as any physical asset.

The EIR need to be defined and communicated using order and a logical approach to ensure a comprehensive appointment resource. Think of EIR as a specification for the exact information required.

To satisfy ISO 19650-2 clause 5.4.3 a), the appointing party's EIR are combined with the lead appointed party's information requirements to form the lead appointed party's EIR. These are filtered by the lead appointed party as appropriate, to support the tender and appointment of delivery team members.

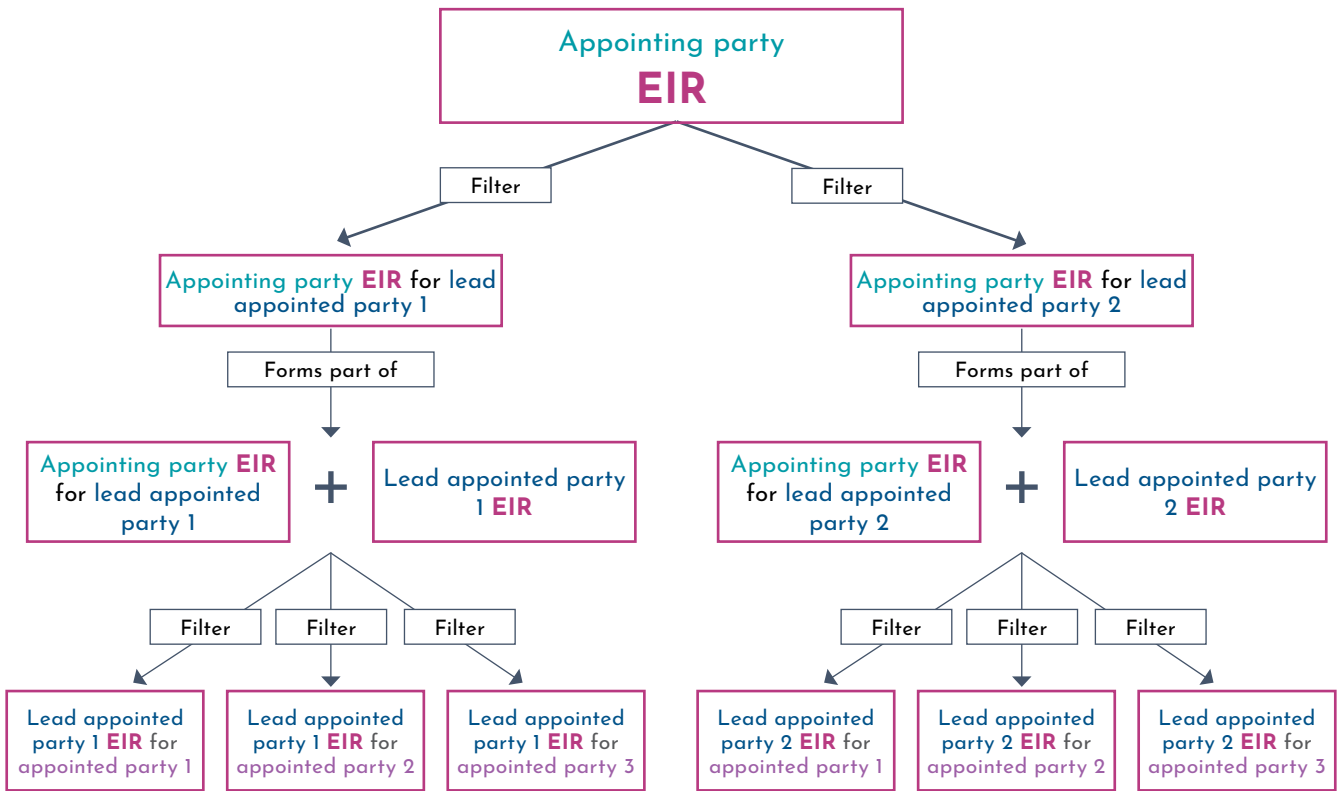


Figure 10: Cascade of appointing party's and lead appointed party's information requirements through delivery teams

1.4.4.1 What EIR are for

EIR are created to ensure that the correct information is delivered to an appointing party or lead appointed party, which enables them to fulfil specific and necessary activities during a project and during the operational phase. EIR have several functions, including:



For the appointing party:

- Selection of those lead appointed parties who can best demonstrate delivering the requirements
- Specifying precisely what information is required at each information exchange, i.e. the information the lead appointed party (information provider) is to deliver (on behalf of its delivery team) to the appointing party (information receiver (specifier)), to enable the appointing party to carry out its purposes effectively
- From a technology perspective EIR enable pre- defined mappings to be established, allowing communication between systems across the project team, to improve interoperability
- Supporting the carrying out of checks to ensure that the information received from the lead appointed party is compliant with what was initially required by the appointing party.



For the lead appointed party:

- Selection of those appointed parties who can best demonstrate delivering the requirements
- Specifying precisely what information is required at each information exchange, i.e. the information the appointed party (information provider) is to deliver to the lead appointed party (information receiver (specifier)), to enable the lead appointed party to carry out its purposes effectively, and deliver the information required by the appointing party on behalf of the delivery team as a whole
- From a technology perspective EIR enable pre- defined mappings to be established, allowing communication between systems across the project team, to improve interoperability
- Supporting the carrying out of checks to ensure that the information received from an appointed party is compliant with what was initially required by both the lead appointed party and appointing party.

EIR need to be identified regardless of how the information is going to be delivered, be it by a geometrical model or otherwise. Since every appointment is made up of information exchanges, EIR will always be required to specify what information is needed.

1.4.4.2 When EIR defined

EIR have to be defined prior to every appointment and issued as part of the appointment process:



For an appointing party this occurs before any consultants, specialists or contractors are selected



For a lead appointed party this occurs before any sub-contractors and specialists are selected.

The appointing party should develop one master set of EIR for each project, which is then filtered to create a tailored set for each appointment. Therefore, where there are multiple appointments during a project there will be multiple EIR.

For appointing parties with multiple assets, it is sensible to consider how the EIR can be rationalized so that at appointment level they are specified in a streamlined and efficient way using a consistent structure as far as practicable.

1.4.4.3 Who creates EIR?



The appointing party, for example, the asset owner or their representative



The lead appointed party, for example, a designer or a main contractor, depending on the project timeline.

1.4.4.4 EIR contents

For this section the EIR is broken down into:

- Purposes
- Structuring of information
- Definition of information.

Purposes

The importance of purpose is highlighted throughout section 1 of this guidance. At the EIR stage, the purposes need to be rationalized and thought of as a mini system of inputs, processes and outputs, as shown in Figure 11.

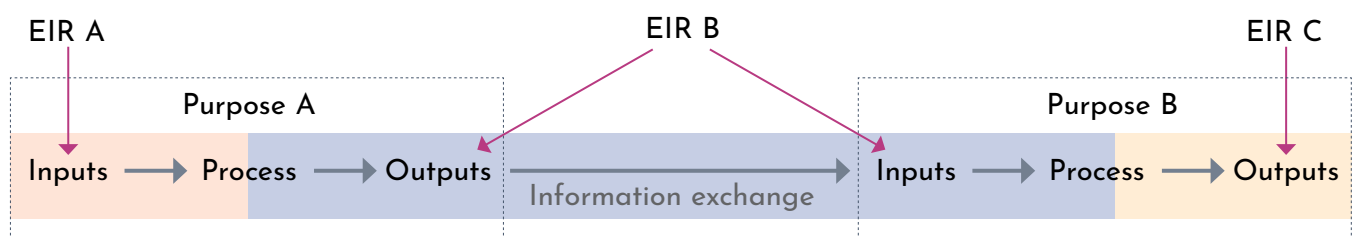


Figure 11: Chain of purposes connected via information exchanges

For each purpose, inputs will be required to feed into processes, both of which will require certain information. Once processed this will generate the specific outputs that are required to feed in to the next process, and so forth.

Purposes form into chains linked by information exchanges to enable information and data to be transferred.

Establishing a set of rationalized purposes should be the starting point of defining EIR.

The appointing party will have already defined the asset-related purposes as part of the AIR. Any project-related purposes should be derived from the PIR.

Lead appointed parties will also have their own purposes which cover design and construction. These need to be captured as part of their EIR.

The following list provides examples of more rationalized purposes, noting that these are not exclusive to the assigned party indicated:

Appointing party

- Asset registration (from the AIR)
- Planned maintenance (from the AIR)
- Replacement (from the AIR)
- Operational cost, e.g. as informed from energy analysis (from the AIR)
- Cost forecasting (from the PIR)

Lead appointed party

- Geometrical coordination
- Construction planning
- Construction costing
- Energy analysis
- Commissioning

Structuring of information

To achieve open, shareable information for the whole life of assets it is important that structured information is delivered, and how it is structured needs to be specified in the EIR.

For structured information, this would include specifying the data that is to be exported from primary purposes (authoring) for input into secondary purposes, as illustrated in Figure 12. Therefore, the secondary purposes should be considered, before the contents of the structured information for primary purposes.

Once the purpose has been accomplished, the information can be output as either structured or unstructured information, depending on its next purpose.

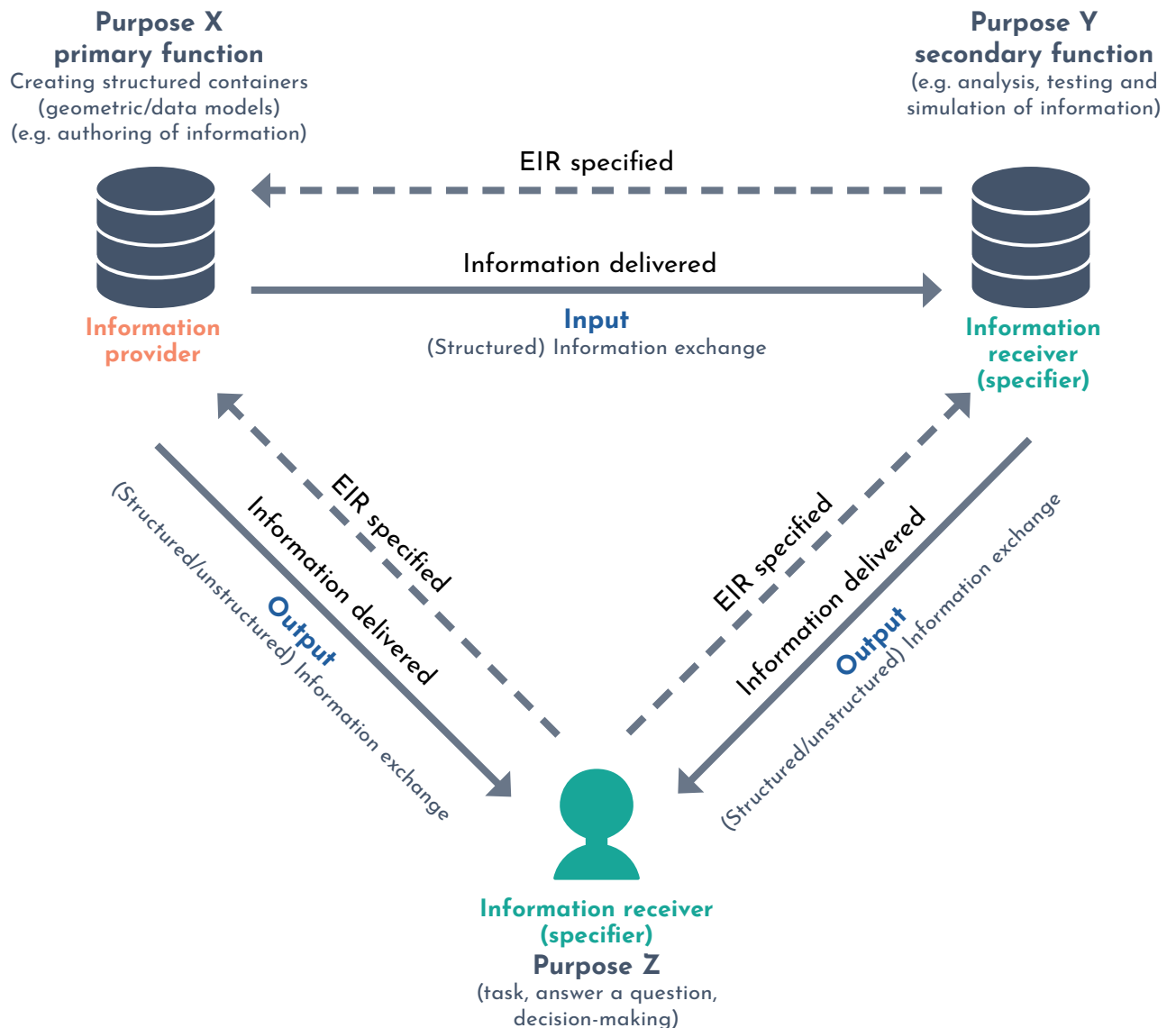


Figure 12: Exchange information requirements between software applications and people

Unfortunately, marketing language has moved people away from defining actual information requirements to using the terms 4D, 5D, 6D, etc. This does not help to define what these purposes are. These are just umbrella terms that have very little meaning from an information perspective. Those defining requirements should always detail what is required to a point that allows useful information to be provided.

Applying this to the chain of purposes we can start to see how structuring information is applied to a project. Figure 13 is set within the collaborative production of information activity (ISO 19650-2 clause 5.6), which is based on repetitive cyclical workflows and generally follows a pattern of authoring, analyzing and decision-making which then feeds back into the authoring process.

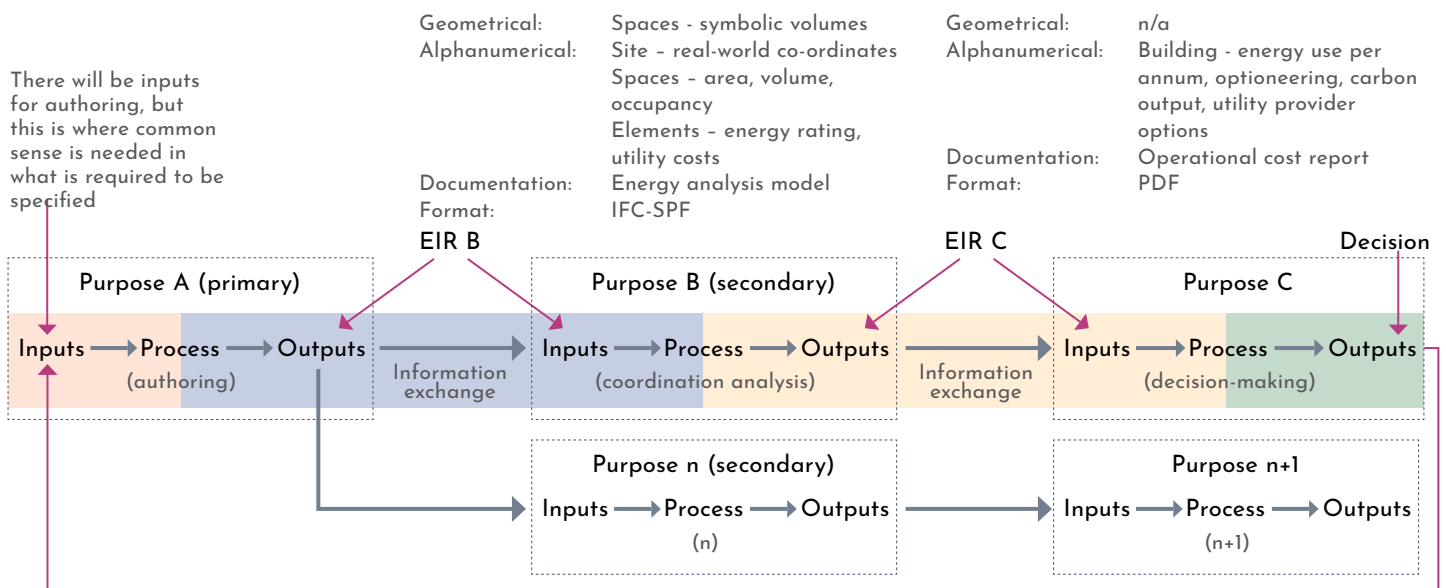


Figure 13: Purpose and EIR applied to a delivery context

Definition of information

To define the precise information needed information must be broken down into its constituent parts. Depending on purposes, this will likely be a mixture of structured and unstructured information.

In [section 1.2.4.2](#) the idea of information facets was introduced as a way of describing how both structured and unstructured information could be broken down across content, form and format. Different combinations of describing these facets contribute to the EIR.

For example, a main contractor needs information to undertake the rationalized purpose of cost. The information they require will be produced using a mixture of processes supported by technologies. This is likely to call upon forms of information including:

- Geometrical models (3D)
- Drawings.

The cost reporting technology import requires information in an open standard, and therefore the information is required in IFC-SPF and PDF format, respectively.

However, this is only part of the requirement, as the content also needs to be specified at an overall summary and breakdown level. At the summary level the model view definition is specified, as well as requiring general arrangement information. The breakdown of the content is the complex part but to simplify, this content can be broken down into geometrical and alphanumeric information across different objects.

To define all this in a more formal manner the level of information need framework should be used as referenced in ISO 19650-1 clause 11.2 and detailed further in section 2 of this guidance. Level of information need is also covered in ISO 19650-2 clauses 5.2.1 b) and 5.4.3 b).

The level of information need provides one of the building blocks of the EIR.

Because it can be complex to define information requirements, it is imperative that a consistent breakdown structure is created by selecting a suitable schema and classification system across all the different:

- Objects (asset types/elements) (from a pump to an entire facility)
- Attributes and properties
- Information containers.

Regardless of how information is delivered, there must be correct and consistent referencing throughout all information containers. The project's information standard will, in part, help form the composition of EIR.

There will be many purposes that overlap in terms of their information requirements. It is important to ensure consistency and considering the EIRs holistically as one overall information resource is helpful. For example, in one purpose the property OccupancyMax could be required. But the same data deliverable could be required in another purpose as MaxOccupancy. Rationalizing this will increase efficiency (see Figure 14).

There is, however, another important aspect to consider: all of these requirements are interlinked; properties reside in objects and objects reside in information containers..

Therefore, using more structured methods to define and communicate these requirements, for example, in linked tables such as spreadsheets, or even better, a database, will ensure that these relationships are maintained. This reduces the risk of duplication and contradiction and makes EIR easier to define.

Following industry standards such as ISO 16739-1:2018⁴ (and the sub schema of BS 1192-4:2014⁵) allows appointing parties and delivery teams to set up methods that can be used across different purposes and multiple projects.

Conversely, departing from these standards means that delivery teams have to respond to wide-ranging and diverse approaches. This introduces inefficiencies, taking more time and resources and potentially introducing risk. It also prevents development of open sharable information across the whole life of the asset.

In summary, and as explained in [section 1.2.3.2](#) of this guidance, you should only specify information for the purposes needed. We have talked about building up the EIR by purpose, but the final EIR outputs should be filtered by appointments (an appointment may contain multiple purposes). An EIR that is not appointment-specific will undermine the appointment/contract. It will also overload information providers by requiring them to generate and/or deliver information that is either unnecessary, or which duplicates/contradicts information from other information providers.

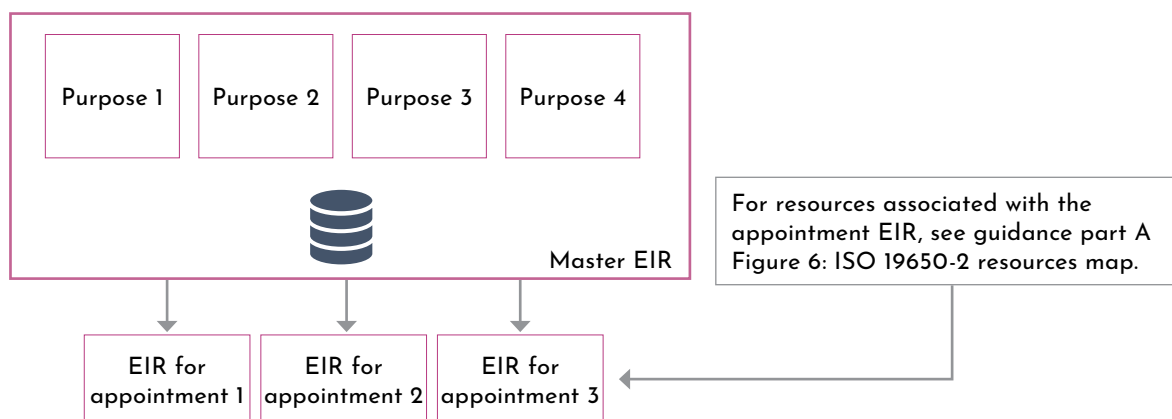


Figure 14: Formation of EIR

1.4.4.5 When information is exchanged to meet the EIR

Dates for information exchange are covered in ISO 19650-2 clauses 5.2.1 e) and 5.4.3 d).

The information exchange is completed when the information receiver (specifier) accepts the information.

For an appointing party, the information delivery milestones are defined relative to the key decision points (see [section 1.4.2.5](#)). In this section it was assumed that the information exchange dates coincided with the information delivery milestones. In practice, the actual dates of the exchange need to be specified when defining the EIR, and there may be multiple dates for each information delivery milestone.

These dates signify when the information is to be submitted by the information provider into the common data environment (CDE) workflow. There will be a period of time between the information being submitted and it being accepted to allow for the governance process defined in ISO 19650-2 clause 5.7.4. This will need to be factored in - see Figure 15.

For lead appointed parties, their own governance processes must also be considered when setting dates (see ISO 19650-2 clause 5.7.2). Information exchanges for the lead appointed party should be defined around:

- Information required for secondary structured information purposes, for example, coordination analysis
- Information required for certain other purposes, for example, planning or work packages.

Ideally, specific dates should be defined, but if this is not realistic a time period relative to the information delivery milestones could be sufficient instead.

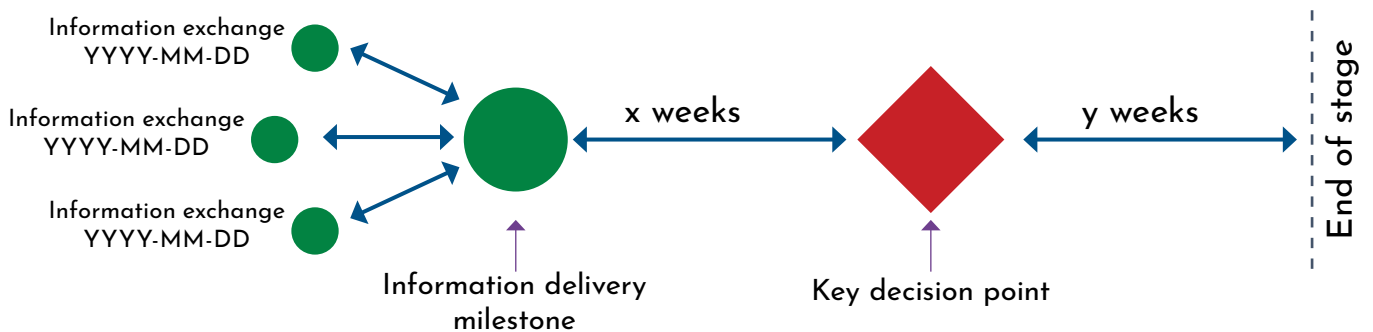


Figure 15: Key decision points, information delivery milestones and information exchanges

1.4.4.6 Additional information for clauses 19650-2 5.2.1 and 5.4.3

Acceptance criteria

Acceptance criteria are covered in ISO 19650-2 clauses 5.2.1 c) and 5.4.3 c). Where structured information has been specified, these acceptance criteria can be turned into automated rules, which can check the information.

There are four resources that provide project-wide rules to govern how the information requirements are defined, delivered and checked:

1. The project's information standard
2. The project's information production methods and procedures
3. Reference information
4. Shared resources.

These resources are referred to in ISO 19650-2 clauses 5.1.4, 5.1.5, 5.1.6.

These rules create a baseline for the acceptance criteria and ensure that the information delivered matches the original requirements before the information is then used by the appointing party or lead appointed party. In addition to the obvious rule that the required information has been delivered, other rules include that:

- The information is correctly constructed (for example, follows correct conventions/syntax, uses the correct case, is spelt correctly and the delimiters are correct)
- The metadata is correct (for example, value type and units)
- Any definition for a value, either precisely or by a range, is satisfied.

The robustness of these rules is dependent upon:

- Nomenclature (how things should be named)
- Industry standards/conventions
- Schemas
- Classification
- Dictionaries
- Metadata.

Tip: To support delivery teams in generating acceptable information it may be helpful to provide examples of what is expected.

Supporting information

Supporting information is covered in ISO 19650-2 clauses 5.2.1 d) and 5.4.3 e).

Supporting information should be provided to aid understanding of the contents of the EIR and the acceptance criteria. The more specific the detail that is made available to those tendering, the more chance they have of understanding exactly what needs to be delivered and will be accepted. For example, it is not helpful to copy and paste blocks of text from standards or other external references, when specific insight would be better.

1.4.5 The relationship: information requirements

Once they are defined, the PIR become the high- level purposes which provide the basis for the more detailed EIR. This is where the project information needs are broken down to appointment level and combined with any project relevant AIR.

Figure 16 shows the relationship between the four types of information requirements in relation to the overall breakdown.

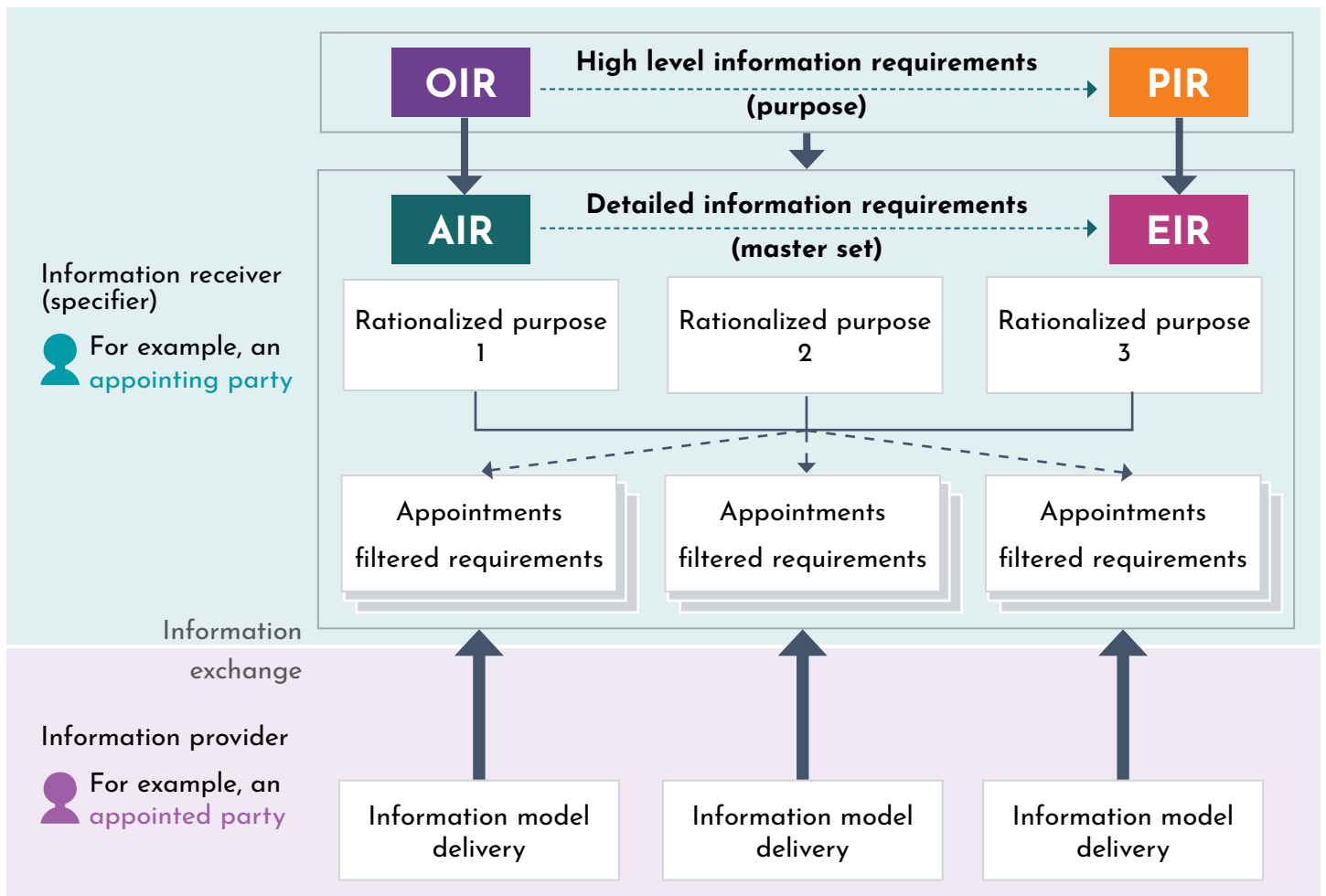


Figure 16: The four types of information requirements in the context of the breakdown of information requirements

1.5 Conclusion

Information requirements should always be based on purposes and defined in sufficient detail to enable each purpose to be effectively actioned. Collectively information requirements tell a story which precisely covers all the information required. When defining information requirements ask yourself "If I had to provide this information would I know what I had to deliver?"

Figure 17 amplifies part of Figure 2 from ISO 19650- 1 clause 5.1. It shows in more detail how the four different information requirements relate to one another.

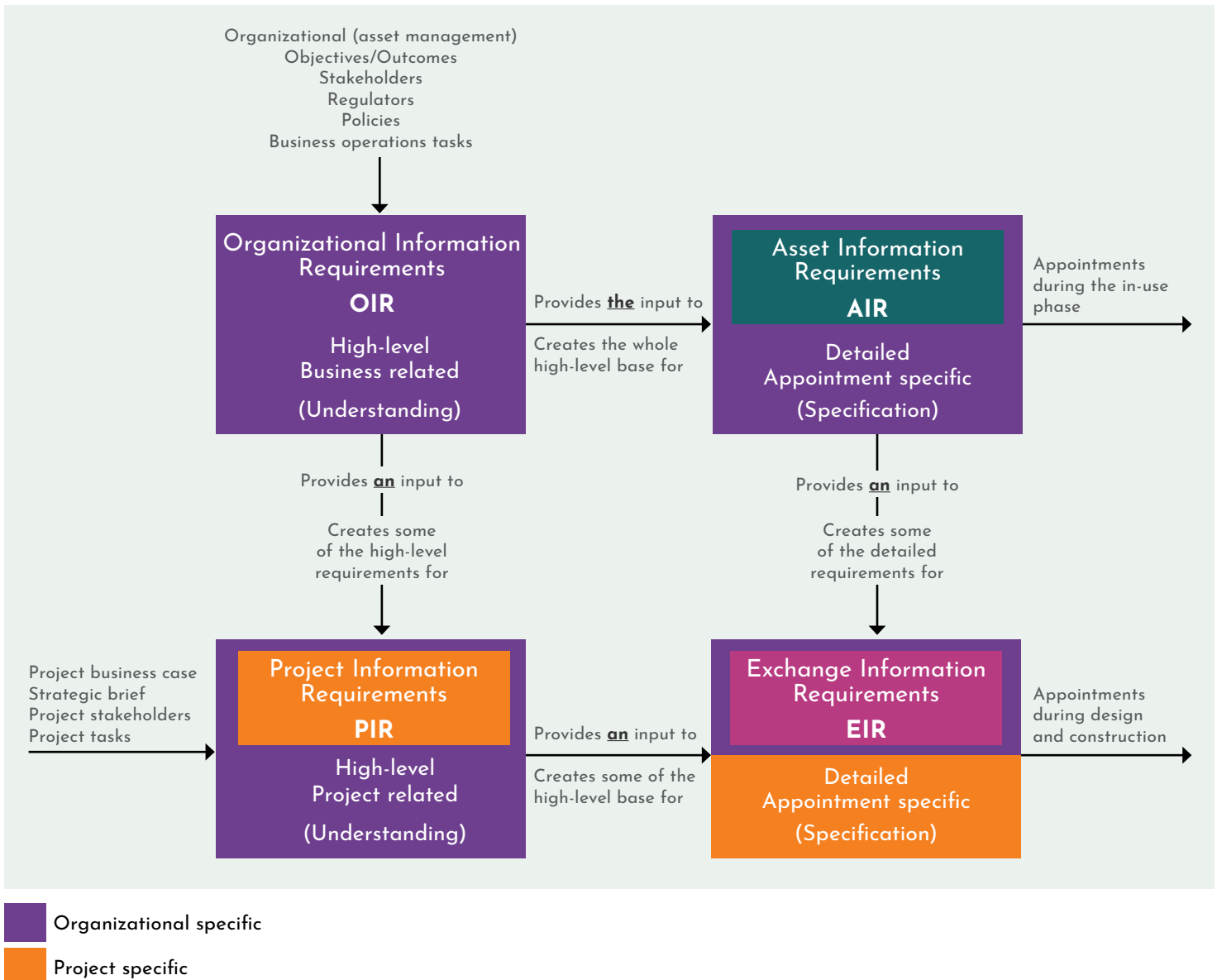


Figure 17: Hierarchy of information requirements extended

Information is needed throughout an asset's lifecycle. Although historically, the built environment sector has tended to concentrate on design and construction projects it is the in-use phase where information requirements are being used long-term and the AIM is updated (see Figure 18). This must be rectified, and is addressed repeatedly in the ISO 19650 series.

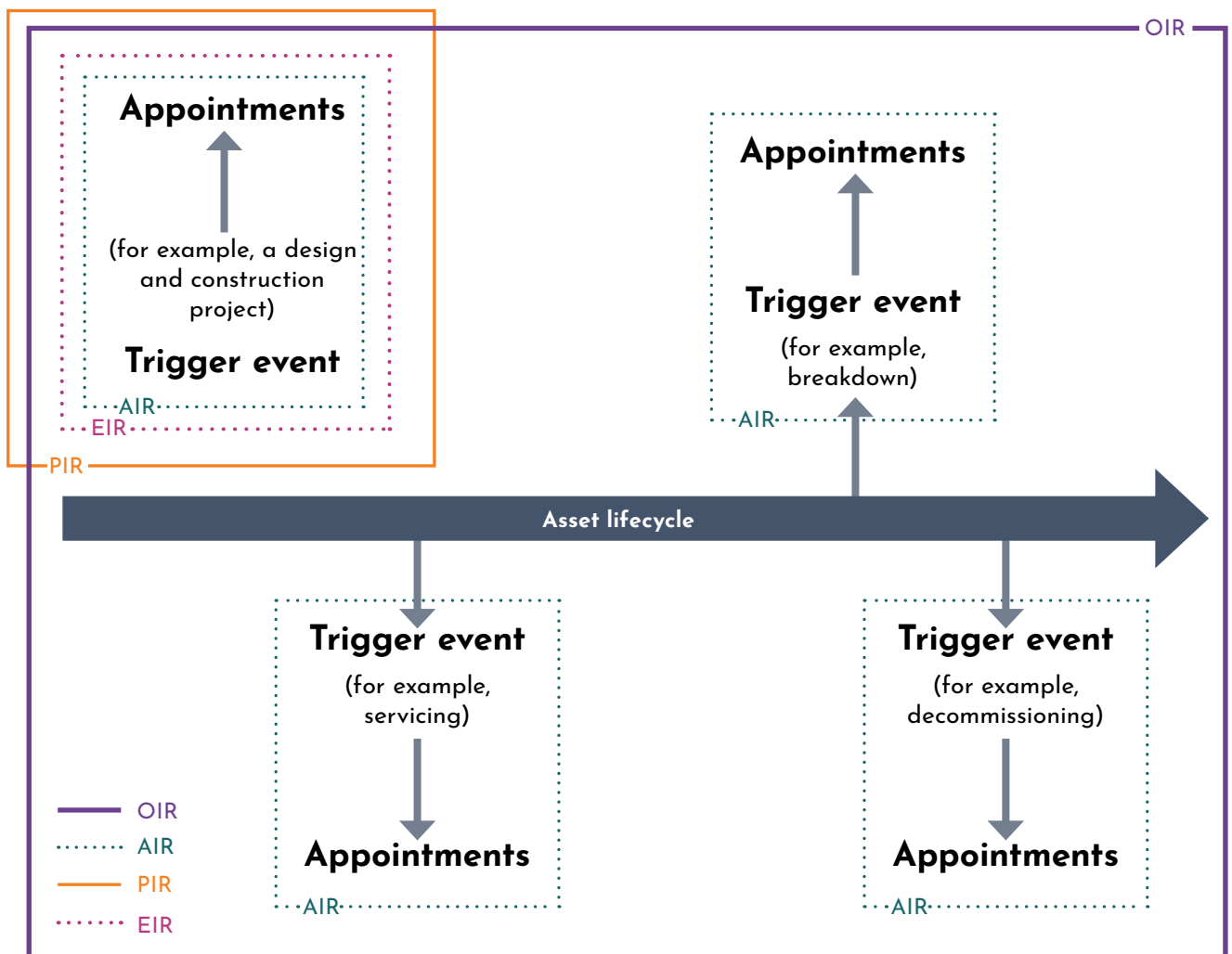


Figure 18: The dominance of the OIR and AIR throughout an asset's life

1.6 Checklist of actions/key points to consider

Information requirements are made up of two parts:

1. Why information is required (purpose)
2. What information is required.

- ✓ Purposes do not have to be shared with anyone outside the organization, they are simply a mechanism to allow the correct information requirements to be defined.
- ✓ There will be times when purposes are unknown. In this scenario, deal with those purposes which are known and make it clear in the information requirements that there could be others.
- ✓ The appointing party should only define information requirements for their own purposes and to their necessary level of information need, not encroaching on the remit of a delivery team. For example, specifying delivery software when there is no purpose in doing so.
- ✓ Purposes can also be in the form of questions which aid the definition of KPIs which are themselves information requirements.
- ✓ Do not include details in information requirements that should be in other information resources such as the information standard.
- ✓ Information is a broad term and can mean different things to different people. In this guidance, information is made up of four main facets but not all of these need to be identified to define information effectively.
- ✓ Information requirements are important in the tendering process of all appointed parties (for example, consultants and contractors), to procure the appropriate delivery teams. Detailed information requirements should be developed in conjunction with other tender information prior to any appointments being tendered.
- ✓ The ISO 19650 series predominantly deals with the information requirements of an appointing party downwards. However, information requirements can exist in the opposite direction and between task/delivery teams. In fact every party within a project is likely to have them.
- ✓ Information requirements are particularly helpful to identify requirements, which need to be emphasized. While they should include all the information the receiver (specifier) is expecting, it is not helpful if the extensive listing of obvious requirements masks those that are particularly needed. Where it is possible to reference a generic group of information - set either by industry practice/standards or organizational procedures, to meet an information requirement this should be done. Some common sense is needed.
- ✓ People undertaking the information management function should have the appropriate skills to understand the different facets of information and to be able to break information requirements down correctly using standard schemas and classification systems.
- ✓ Information requirements have to be precisely defined; statements such as "Information requirements are to reflect the "UK BIM Framework" (or even the outdated term "BIM Level 2"), are not a means of specifying information requirements.

2.0 About the level of information need

Author: Marzia Bolpagni
Mace

2.1 Introduction

Level of information need is a framework for defining the quality, quantity and granularity of information, as explained for the first time in ISO 19650-1 clause 11.2.

Historically in the UK, level of definition was the term used to refer to the aggregate of level of detail and level of information. In practice, it has been found that understanding of the concepts and principles for defining information requires a clearer framework. This was the motivation for introducing the level of information need framework in the ISO 19650 series.

Note that, as stated in section 6.5.1 of ISO 19650 Concepts and Principles Guidance “level of information need” should not be abbreviated.

2.2 What is level of information need?

The level of information need is a framework to define the quality, quantity and granularity of information requirements.

The level of information need is used to communicate clearly the degree of information required according to its purpose; no more and no less.

The level of information need framework helps to define the minimum information requirements with respect to each purpose. Any additional information is considered waste and should not be defined by the appointing party, nor provided by any appointed party, as referred to in [section 1.2.3.2](#).

The “over definition” or “under definition” of information requirements are both considered risky, as they do not support the efficient generation and use of information.

If we look at [Figure 4](#) in [section 1.2.2](#) again, it is the level of information need framework that allows first the information receiver (specifier) (appointing party or lead appointed party) to define the different “shapes” and “sizes” of the information deliverables in a standardized way. Using the level of information need, the information receiver (specifier) can define the quality (green or purple circles, blue or pink triangles), quantity (two triangles and three circles) and granularity (small or big circles) of information.

Then the same framework should be used by the information provider (appointed party) as a reference/skeleton to provide the values to satisfy the information requirements, and therefore to produce information deliverables.

Thanks to the use of the level of information need framework on both sides, the delivered information is structured in a consistent way to enable automated checking (as stated in [section 1.2.4.2](#)).

Different purposes might require different information deliverables; therefore, the level of information need should be different.

Defining the level of information need without a clear purpose is not in line with ISO 19650-1.

At the same delivery milestone, an information container should be the result of one or multiple information requirements defined for each purpose using the level of information need framework.

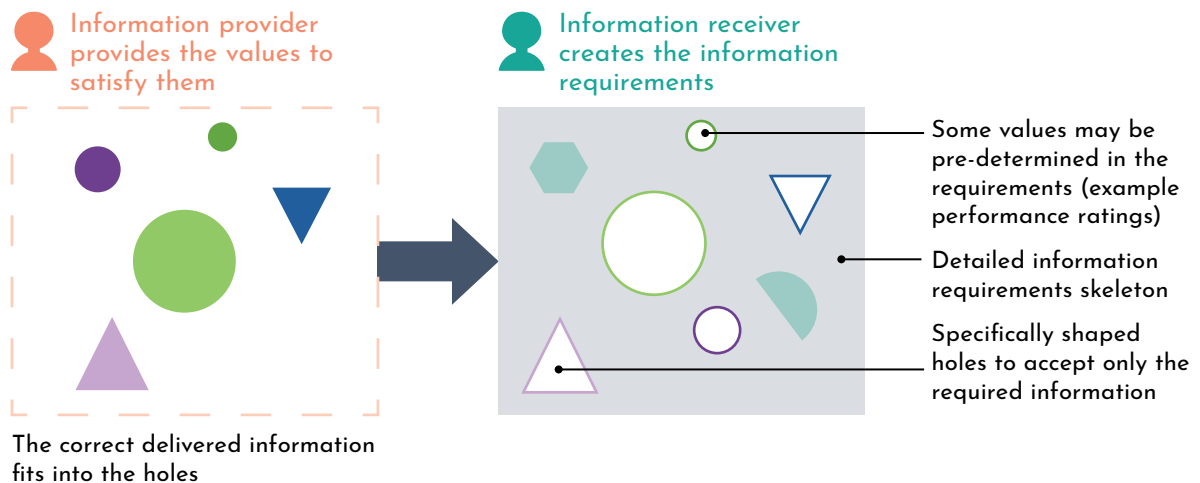


Figure 19: Information requirements skeleton (Figure 4 guidance section 1.2.2)

2.3 Why the level of information need framework important

The level of information need framework is fundamental to enabling the successful information exchange of every information deliverable (as seen in [section 1.2.3](#)). But in practice, most of the time the information need is not defined at all, or it is too generic. It is therefore open to interpretation and difficult to check automatically.

As noted in [section 2.1](#), the concept of “level of definition” was established in the UK as an aggregate of the “level of detail” and “level of information” for information deliverables. Metrics were set (from 1 to 7) and those numbers were used to indicate the geometrical representation and the alphanumerical requirements. But those metrics were too generic and could not be used to automatically check if information deliverables fulfilled the appointing party’s needs in terms of quality, quantity and granularity. In addition, the definitions of those metrics were dissociated from the purpose of the information, contributing to poor information management and under/overproduction of deliverables.

For example, there are instances where the “level of information” of an air terminal during the construction phase of a project has been defined using the metric “4”, without specifying for which purpose(s) the object will be used, or the associated alphanumerical information required (sound frequency, sound pressure, name of manufacturer). Thus, the metric “4” does not enable automated checking rules to be established and is open to interpretation, leading to increased risks for the project.

If the level of information need framework is not used, different parties will continue to specify poor information requirements, and this will increase project risks and wasteful production of information.

2.4 Who defines the level of information need?



The appointing party (client) defines the level of information need of each information deliverable.

Not all appointing parties will have the skills to define the level of information need framework in detail. In this case, the appointing party is required to define at least the purpose for which the information is needed.

ISO 19650-1 allows for an inexperienced appointing party to seek assistance with completing its information management activities. This could be from one of the prospective lead appointed parties or from an independent third party (see examples 3, 4, 5 in [section 2.5](#)) being careful not to create conflicts of interest.

For example, an asset owner might have to provide the quantity of embodied carbon of their asset to the building authority, but they do not have the skills to define in detail the level of information need required to fulfil this purpose. In this case, the asset owner may define the purpose “embodied carbon analysis” and they will seek assistance from the lead appointed party or an independent third party to define the level of information need required.

During design and construction, it is possible that a greater granularity is required than has been defined by the appointing party within the level of information need framework. In this instance, the lead appointed party should establish the appropriate granularity to support their work, but using the level of information need framework defined by the appointing party as a base.

2.5 When the level of information need is defined

Level of information need is defined every time an information requirement is established, either by the appointing party or the lead appointed party. This can happen at different stages throughout the life of an asset.

For example:

- 2.5.1 An appointing party (asset owner) can define the level of information need when defining their Asset Information Requirements (AIR)
- 2.5.2 An appointing party (client) can define the level of information need during a tender phase to specify the quality, quantity and granularity of information they need
- 2.5.3 A lead appointed party (designer) can define the level of information need during the preliminary design phase to define what is needed to perform accessibility analysis
- 2.5.4 A lead appointed party (main contractor) can define the level of information need during the construction phase to define what information is needed to perform health and safety analysis on site
- 2.5.5 A lead appointed party (specialist manufacturer for a heritage project) can define the level of information need during the production phase to define what is needed to 3D print a replacement component.

It is possible that the level of information need is defined by the same appointing party with a different granularity of information as the project progresses, decisions are made, and more information becomes available. But, it is vital that the whole definition of level of information need is made at the beginning of each appointment and it is not unnecessarily changed or developed part- way through.

For example, at the feasibility stage of a project, a quantity surveyor might require just the number of occupants to produce an order of cost estimate of a building typology (a school). At detailed design, instead, the quantity surveyor might require the gross internal floor area to perform more detailed cost planning.

2.6 How to define the level of information need

The level of information need is a framework for defining information across the facets (purpose, content, form and format) described in [section 1.2.4.2](#) of this guidance.

Information should be defined across the following three sub-divisions, as illustrated also in Figure 11 of ISO 19650-1 for the Project Information Model (PIM) and the Asset Information Model (AIM):

- 2.6.1 Geometrical information
- 2.6.2 Alphanumerical information
- 2.6.3 Documentation.

Each sub-division of level of information need is defined in detail in the European standard EN17412-1. This standard is currently under publication and it should be available by Q4 2020.

In the meantime, an appointing party should specify their information requirements using the level of information need framework defining:

1. The purpose why information is needed
- And then, if the aspect is applicable:
2. The Geometrical information to fulfil the purpose
 3. The Alphanumerical information to fulfil the purpose
 4. The Documentation to fulfil the purpose

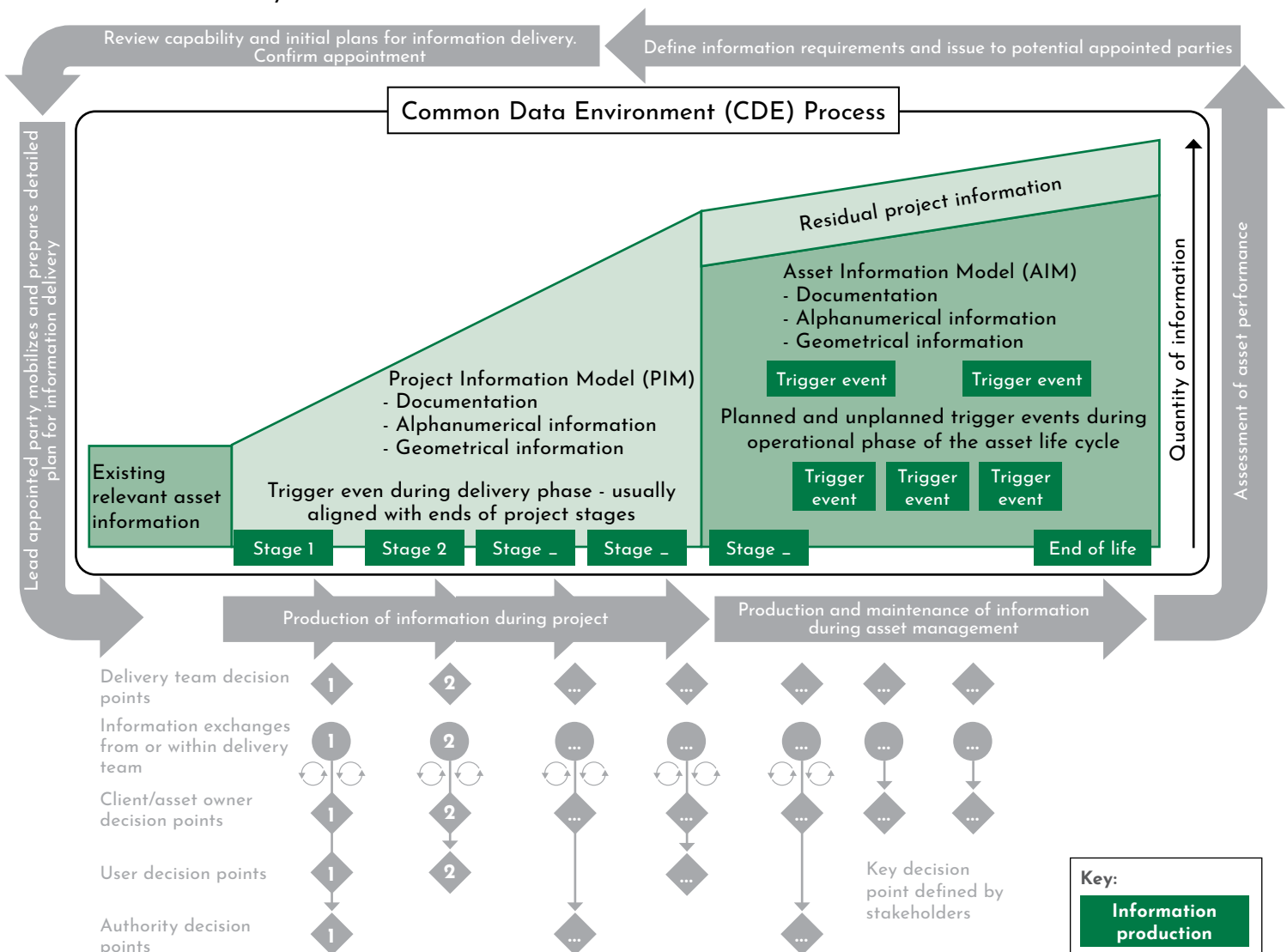


Figure 20: Overview and illustration of the information management process (ISO 19650-1 Figure 11)

2.7 Where the level of information need is defined

The level of information need framework is defined in the project's information standard, where its method of assignment is considered (see ISO 19650-2 clause 5.1.4 c).

In addition, the level of information need framework is used to communicate information requirements in the exchange information requirements (see ISO 19650-2 5.2.1 b) and section 1.4.4.4).

Finally, the level of information need framework is also used in task information delivery plans to record what is being done (see ISO 19650-2 clause 5.4.4 and ISO 19650 Guidance Part F Information delivery planning, section 4.4).

3.0 Summary

ISO 19650 Guidance D has provided further insight into the each of the different types of information requirements plus the level of information need framework.

It should be referred to by practitioners and those implementing the ISO 19650 series across a project, within an appointment or within an organization.

Please note that the ISO 19650 series is still new, albeit based on former UK standards. As experience of implementing the ISO 19650 series is gained over the coming months and years, this guidance will be updated to reflect both this experience and any comments/ feedback received from users.

Please do let us have your feedback by emailing us at guidancefeedback@ukbimframework.org .

Please also remember that standards within the ISO 19650 series are available at www.bsigroup.com.

Visit www.ukbimframework.org to see how the ISO 19650 standards plus other standards within the UK BIM Framework map to the design, build, operate and integrate process.

Annex A - Examples of developing information requirements

The examples provided here are to demonstrate what information requirements could look like, and the contents shown are for **illustrative purposes only**.

The intention of these examples is to explain the concept of how information requirements go on a journey providing a link from the purposes through to the information to satisfy them. They provide the thinking process required to start to build information requirements.



These examples are accompanied by a database and a process video that can be accessed from the [UK BIM Framework website](#). The database is a proof of concept, which brings together several concepts and attempts to make the links between them, consolidating many of the tables shown in the following examples. Vendors may think how they take the base structure and develop tools, which hide the complexity using a simple user interface. The video illustrates how information requirements can be determined in respect of an organization's net zero policy.

We welcome your [feedback](#) on this content so that it can be developed further.

How to read and understand these examples

These examples support the guidance provided in the main section of this document. Please read them in conjunction with that text, not in isolation.

The examples are presented across a suite of scenarios, covering a range of situations where an asset owner or project client (appointing party) might have a need for information. Within each scenario, the example is structured into sub-sections, dealing with the relevant types of information requirement. The sub-sections show how information requirements build on each other.

The information requirements themselves have been signposted to match [Figure 17](#) in this guidance:

- OIR** Organizational information requirements (OIR)
- AIR** Asset information requirements (AIR)
- PIR** Project information requirements (PIR)
- EIR** Exchange information requirements (EIR)

There is a commentary within the examples that summarizes the thought process and the actions of the appointing party (presented as an imaginary Organization X).

There is also one example for a lead appointed party EIR (see A.6), written from the perspective of a main contractor as the lead appointed party. In this example, there are no corresponding OIR, AIR or PIR.

The OIR and PIR sub-sections in each scenario have a straightforward structure, because these information requirements are high-level and do not need to be described in great detail.

The AIR and EIR sub-sections have a more complex structure because these information requirements do need to be set out in detail. The process of defining AIR and EIR is illustrated in the flow chart in Figure A.1. The process starts with defining the purposes for each information requirement, then identifying information provider(s) and information receiver(s), and then summarizing the information delivery milestones.

The next step is to divide the information items into structured and unstructured information. For the purpose of these examples structured information is information (data) which is machine-readable and can be queried (asked a question of).

Examples include databases, models and spreadsheets. Unstructured information cannot be queried by machine and needs to be interpreted by a person to make sense of it. Examples include drawings, reports, images, sound recordings and videos.

In both cases the presentation requirements are tabulated, but for unstructured information any notes about the expected contents that are deemed unusual are also added.

Finally, the detailed requirements for structured information are captured, following the arrangement defined in the level of information need framework. This is shown in sub-divisions of geometrical information, alphanumerical information and documentation. A fourth table is included to capture metadata requirements associated with alphanumerical information.

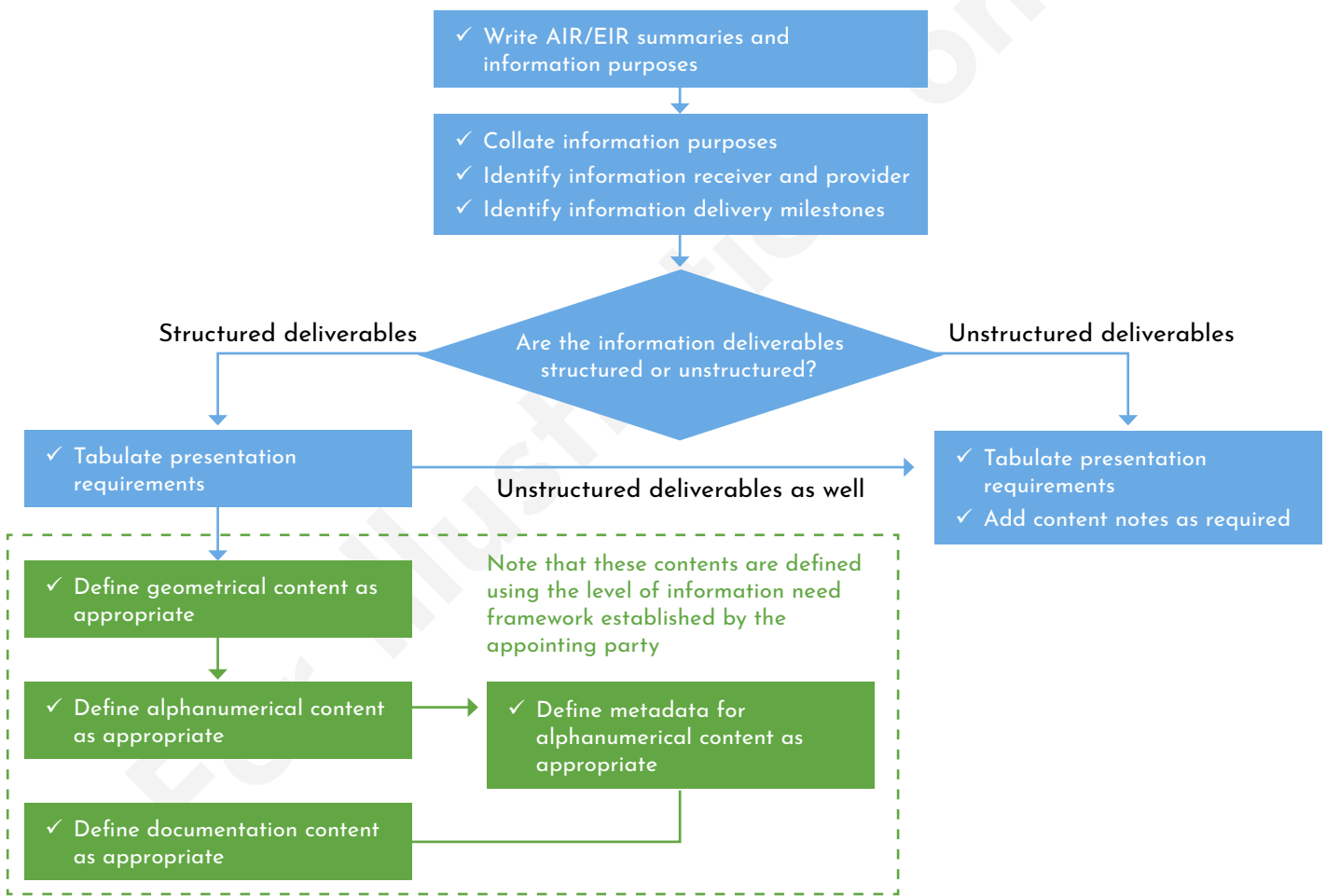


Figure A.1: Flow chart for preparing AIR or EIR

As noted in [section 1.2.4.2](#) of this guidance it is recommended that a master set of AIR or EIR is established and then filtered according use case and/or appointment/function being procured. This assists the production of appointment specific information requirements and helps to ensure that there are no duplication or gaps in information delivery (see [Figure 6](#))



There are several views set-up in the database to show the filtered information for each appointment. Therefore only the requirements particular to a specific appointment are only ever issued as part of the appointment process.

A.1 Example addressing project statutory approvals



A.1.1 Organizational information requirements

OIR For this organization, there are no OIR associated with project statutory approvals. These are all considered within the PIR.

A.1.2 Asset information requirements

AIR As there are no OIR, there is no need to develop asset information requirements for this topic.

A.1.3 Project information requirements

PIR Organization X has reviewed its project tasks related to land registry applications and the Health and Safety Executive (HSE) notifications in relation to a new development project. Organization X has established two PIR as a result of this.

- **Project Task:** Land registry application
 1. Site location and area information
- **Project Task:** Notifying the HSE
 2. Project F10 form to be completed, construction information required.

A.1.4 Exchange information requirements

A.1.4.1 Purposes

EIR Organization X has reviewed its PIR related to statutory project approvals and has determined the EIR and associated information purposes. These are presented in Table A.1. Note, these do not need to be shared with delivery team, they are an internal task to help arrive to the correct information required.

Table A.1: EIR summaries and purposes for statutory approvals

AIR or PIR	EIR	Information purpose - to support:
1. Site location and area information	Site location plan with boundaries clearly marked and the overall site area in m ² for information delivery milestone 2	o Statutory registration (Land Registry)
2. Project F10 form to be completed, construction information required	Sub-contractor numbers and programme dates. To be completed once main contractor is appointed.	o Statutory registration (HSE)

Organization X can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information, for EIR arising from PIR. These are given in Table A.2.

Table A.2: Prerequisites for statutory approval EIR

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> • Statutory registration (Land Registry) • Statutory registration (HSE)
Information specifier/receiver Information provider	Organization X's Project Manager Architectural design team (site location plan) and main contractor (sub-contractor numbers and programme)
Information delivery milestones	Site location plan at information delivery milestone 2. Sub-contractor details at information delivery milestone 4.

A.1.4.2 Specifying the detail

This is the section where the content of the EIR is developed in terms of the presentation of information and the content breakdown of the information.

A.1.4.2.1 Presentation and content

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example, this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.2 of location plan, sub-contractor details and programme. Based on this, Organization X has decided that it needs to receive the types of information listed in Table A.3. Table A.3 also includes content requirements that Organization X has identified are beyond what a typical information provider (in this case the project design team or main contractor) might be expecting.

Table A.3 and similar tables throughout Annex A are focused on specifying what the information is rather than the containers that will deliver it (which will be determined by the delivery team). The information provided below can form the metadata for containers during the delivery phase.



In the database example, the Table A.3 forms part of the information presentation tables

Table A.3: Presentation details for statutory approvals EIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
1	PM_30_10_80: Site boundary information	FI_60_25: Drawing rendition	PDF	At information delivery milestone 2	Site location plan	OS Map with a red line to denote the site boundary, the wider estate including campus A to be marked out in blue
2	PM_60_20_55: Nominated subcontractor or supplier work information	FI_90_75: Schedule or table	PDF	At information delivery milestone 4	Sub-contractor list	To include names and contact details
3	PM_60_30_20: Contract programme information	FI_80_65: Programme	PDF	At information delivery milestone 4	Construction programme	For delivery team to determine

Note, there is no structured information required

A.1.4.2.4 Content breakdown - structured information

In this example, there is no content breakdown for structured information since the items in Table A.3 are all unstructured information

A.2 Example addressing maintenance and repairs



A.2.1 Organizational information requirements

- **Policy:** Maintenance Policy

OIR Organization X has formulated its maintenance policy and has established the following three organizational information requirements (OIR) as a result.

1. The organization wants to remove the backlog of reactive maintenance, all new assets are to be managed more proactively using a computer aided facilities management (CAFM) system.
2. The organization should have its own resources and routes to procure its maintenance contracts independent of manufacturers' maintenance contracts.
3. All new assets are to be accompanied with a maintenance plan to cover their expected life.

- **Business operations task:** Emergency repairs

Organization X has reviewed its business operations and established the following OIR as a result.

4. Information is required to enable emergency repairs to a failing or failed asset.

A.2.2 Asset information requirements

A.2.2.1 Identifying information purposes

AIR Organization X has reviewed each of the OIR in respect of the maintenance policy and its emergency repair tasks and has determined the asset information requirements (AIR) and associated information purposes. These are presented in Table A.4.

Table A.4: AIR summaries and purposes for maintenance and repairs

OIR	AIR	Information purpose - to support
1. The organization wants to remove the backlog of reactive maintenance, all new assets are to be managed more proactively using a computer aided facilitates management (CAFM) system	Reactive maintenance is to be kept to a minimum and managed through a CAFM system. The CAFM system will also retain a register of all assets and their locations and it will be updated as assets are maintained and/or replaced. The CAFM system will be developed and tested during the delivery phase.	<ul style="list-style-type: none"> o Planned/preventive maintenance o Reactive maintenance o The generation of a register of assets o Replacement of the asset
2. The organization should have its own resources and routes to procure its maintenance contracts independent of manufacturers maintenance contracts	Assets that require planned maintenance are to be identified and recorded in an asset register. In-house tendering of maintenance contracts takes eight weeks so the asset register is required at least eight weeks prior to the commencement of operation of any new asset	<ul style="list-style-type: none"> o Planned/preventive maintenance o The generation a register of assets
3. All new assets are to be accompanied with a maintenance plan to cover their expected life	Maintenance plans should form part of the O&M manual for the building/infrastructure. They need to be suitably identified so that they can be assigned to the asset within the CAFM system	<ul style="list-style-type: none"> o Planned/preventive maintenance
4. Information is required to enable emergency repairs to a failing or failed asset	Reactive maintenance instructions and/or troubleshooting guide should form part of the O&M manual for the building/ infrastructure	<ul style="list-style-type: none"> o Reactive maintenance

Organization X can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information. These are given in Table A.5.

Table A.5: Prerequisites for maintenance and repairs AIR

Information is required to meet these purposes - to support	<ul style="list-style-type: none"> • Planned/Preventive maintenance • Reactive maintenance • The generation of a register of assets • Replacement of the asset
Information receiver (specifier) Information provider	<p>Organization X's Estates Department</p> <p>The contractor appointed for the maintenance/replacement activities or the main contractor for a new build project</p>
Information delivery milestones	<p>Spatial information is required at information delivery milestone 3 to support CAFM development and testing</p> <p>Asset register and maintenance plans are required eight weeks prior to asset operation or by handover (whichever is the earliest)</p> <p>The remainder of the O&M manual is required by handover of new build assets</p>

A..1.2.2 Specifying the detail

This is the section where the content of the AIR is developed in terms of the presentation of information and the content breakdown of the information. The tables in this sub-section should be developed together as they will inform each other and cross-refer.

A.2.2.2.1 Presentation

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.5 of spatial information, the asset register, maintenance plans and the remainder of the O&M manual. Based on this consideration, organization X has decided what types of information it needs to receive and has also identified if this information is structured (Table A.6A) or unstructured (Table A.6B). In respect of the unstructured information, Organization X has also identified content requirements where these are beyond what a typical information provider (in this case the main contractor) might be expecting.



In the database example Tables A.6 form part of the information presentation tables

Table A.6A: Presentation details for structured information for maintenance and repairs AIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description
Structured information					
1	PM_80: Asset management information <ul style="list-style-type: none"> • PM_80_10_05: Asset guarantee and warranty information • PM_80_10_10: Asset register 	FI_30_40: Information Exchange	XLSX	Spatial information is required at information delivery milestone 3 Asset register and maintenance plans are required eight weeks prior to asset operation or by handover (whichever is the earliest) The remainder of the O&M manual is required by handover of new build assets	COBie spreadsheet based on the COBie 2.4 schema

Table A.6B: Presentation details and content comments for unstructured information for maintenance and repairs AIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
2	PM_80: Asset management information (Listed in the following order for the assets described in table B3)	FI_90_50: Manual	PDF	By handover	O&M manual	
2.1	PM_60_60_15: Contact information	FI_90_24: Directory	PDF		Project directory	Contact information should be linked to the COBie contact tab. Content to include emergency contact information in the event of a failing asset
2.2	PM_70: Testing, commissioning and completion information:				PM_70: Testing, commissioning and completion information:	For delivery team to determine
2.2.1	<ul style="list-style-type: none"> PM_70_15_10: Building management systems (BMS) commissioning information 	FI_90_13: Certificate	PDF		BMS commissioning certificates	For delivery team to determine
2.2.2	<ul style="list-style-type: none"> PM_70_15_29: Fire safety acceptance information 	FI_90_72: Report + FI_90_13: Certificate	PDF		Fire safety reports and certificates	For delivery team to determine
2.2.3	<ul style="list-style-type: none"> PM_70_75_36: Heating installation test information 	FI_90_72: Report + FI_90_13: Certificate	PDF		Heating system test reports and certificates	For delivery team to determine
2.2.4	<ul style="list-style-type: none"> PM_70_85_52: Manufacturer information 	FI_90_21: Data sheet	PDF +XLSX		Manufacturers product data sheets	Content to include trouble shooting and short-term repair
2.2.5	<ul style="list-style-type: none"> PM_70_85_55: Operating instruction 	FI_90_50: Manual	PDF		Operating instruction for assets	For delivery team to determine
2.3	PM_70_90: Record information:				As constructed information	For delivery team to determine
2.3.1	<ul style="list-style-type: none"> PM_70_90_15: Control system record information 	FI_60_25: Drawing Rendition	PDF		Control system record drawings	For delivery team to determine

Table continues over page

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
2.3.2	• PM_70_90_27: Electrical systems record information	FI_60_25: Drawing Rendition	PDF		Electrical system record drawings	For delivery team to determine
2.3.3	• PM_70_90_30: Fire system record information	FI_60_25: Drawing Rendition	PDF		Fire system record drawings	For delivery team to determine
2.3.4	• PM_70_90_52: Mechanical systems record information	FI_60_25: Drawing Rendition	PDF		Mechanical system record drawings	For delivery team to determine
2.3.5	• PM_70_90_04: Architectural record drawings	FI_60_25: Drawing Rendition	PDF		Architectural record drawings	For delivery team to determine
2.4	PM_80_10_05: Asset guarantee and warranty information	FI_90_21: Data sheet	PDF		Guarantees and warranties	For delivery team to determine
2.5	PM_70_85_50: Maintenance schedule information	FI_90_75: Schedule or table	PDF	Eight weeks prior to asset operation or by handover (the earliest)	Maintenance schedules	Content to include schematic information of main risers and service corridors

A.2.2.2.2 Content breakdown - structured information

Organization X will now detail the exact contents of structured information using up to four tables to define object information and metadata⁶. In this example details have been tabulated only for item 1 in Table A.3A since this is the only structured information deliverable. For the purpose of illustration, consideration has been given to structured information in respect only of the following⁷ and in reference to IFC 2x3 notation:

- Project
- Building
- Building Storey
- Space
- Door
- Pump
- System.

IFC notation has been used as the primary base schema as many purposes will be covered not just those for maintenance and operations. The COBie sub-schema can still be obtained through this.

Note, additional classifications can be used to apply the net level of granularity to the object structure. It is advisable to start with industry standard taxonomies (grouped lists of information) to reduce the need for mapping (which is a more sustainable approach).

⁶ Refer back to the "How to read and understand these examples" section for an explanation of these tables in specifying information details

⁷ This is likely to be just a sub-section of structured information requirements

Object - Geometrical Information

In this example, no geometrical information is required to fulfil the requirements of the COBie 2.4 spreadsheet deliverable so there is no corresponding table for item 1 in Table A.6A.



In the database example Table A.7 has been replaced with metadata Table A.9 to enable appointment specific views to be created and forms part of the alphanumerical information. However, the thinking in Table A.7 is still required before Table A.9 can be created

Object - Alphanumerical Information

Table A.7 shows **some** of the IFC attributes and properties considered for each object listed in A.1.2.2.3. A tick indicates information to be provided and stating n/a is good practice to confirm information that is not required. Note that there is a minimum number of fields which are mandatory in COBie and must be delivered regardless. This example only shows some of these mandatory fields. In addition, AcousticRating is not defined as part of the COBie schema and is an additional property captured in the Attribute tab.

Table A.7: Alphanumerical details for item 1 in maintenance and repairs AIR

Object (Asset)	Name (Occurrence/Component)	Name (Type)	NominalHeight	Manufacturer	ModelLabel	InstallationDate	AcousticRating
Project	✓	n/a	n/a	n/a	n/a	n/a	n/a
Building	✓	n/a	n/a	n/a	n/a	n/a	n/a
Building Storey	✓	n/a	n/a	n/a	n/a	n/a	n/a
Space	✓	n/a	n/a	n/a	n/a	n/a	n/a
Door	✓	✓	✓	✓	✓	✓	✓
Pump	✓	✓	✓	✓	✓	✓	n/a
System	✓	n/a	n/a	n/a	n/a	n/a	n/a

Object - Documentation information

To delve into greater granularity than that shown in Table A.6B unstructured information can be assigned to objects, this enables the party specifying which asset requires what documentation.

Schemas such as IFC and COBie enable documents to be associated to objects therefore supporting Organization X's requirements as indicated in Table A.8.



In the database example, Table A.8 forms part of the documentation information tables

Table A.8: Documentation details for item 2 in maintenance and repairs AIR

Object (Asset)	DocumentName	DocumentCategory (based on Uniclass 2015)	DocumentDescription
Project	✓	PM_60_60_15: Contact information	✓
Building	✓	PM_80: Asset management information	✓
Building Storey	✓	PM_70_90_04: Architectural record drawings	✓
Door	✓	PM_70_85_52: Manufacturer information	✓
Pump	✓	PM_70_85_52: Manufacturer information PM_70_85_55: Operating instruction PM_70_90_52: Mechanical systems record information	✓
Space	n/a	n/a	n/a

Note, ✓ = required

Note, more objects (assets) would be included

Metadata (value type and units) for alphanumerical information

Organization X has reflected on Table A.7 and has determined that value types and units are as shown in Table A.9. They have also provided example values to indicate the nature of the expected content.



In the database example, Table A.9 forms part of the alphanumerical information tables

Table A.9: Metadata for alphanumerical information

Object and Attribute/ Property	Metadata(1) e.g. data type	Metadata(2) e.g. units	Metadata(3) e.g. example value	Metadata(4) e.g. placeholder value
Project.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Building.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
BuildingStorey.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Space.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
DoorStyle.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
DoorStyle/ NominalHeight]	Numeric	mm*	1000	0
Door.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Door/InstallationDate]	Alphanumeric	n/a	2020-03-23T1700:00:00	1900-12-31T23:59:59
Door/AcousticRating]	Alphanumeric	dB	35	n/a
PumpType.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
PumpType/ NominalHeight]	Numeric	mm*	1000	0
Pump.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Pump/InstallationDate]	Alphanumeric	n/a	2020-03-23T1700:00:00	1900-12-31T23:59:59

*Note that the metadata (units) for Type.NominalHeight is shown as mm here but in the COBie schema this would be conveyed in the Facility.LinearUnits field. When using standard schemas some of this information will be documented therefore this may only be necessary for properties which sit outside industry standard schema.

A.2.3 Project information requirements

PIR There are no PIR for maintenance and repairs, so there is no content at this point of this example.

A.2.4 Exchange information requirements

A.2.4.1 Purposes

EIR Organization X has reviewed its AIR and PIR related to maintenance and repairs and has determined EIR and associated information purposes. These are presented in Table A.10. Where these are brought forward from the AIR, the details are the same (see Table A.4). All further details concerning these information requirements are the same as those shown in sub-section A.2.2.

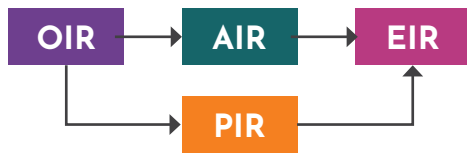
Table A.10: EIR summaries and purposes for maintenance and repairs

AIR	EIR	Information purpose - to support
Reactive maintenance is to be kept to a minimum and managed through a CAFM system. The CAFM system will also retain a register of all assets and their locations and it will be updated as assets are maintained and/or replaced.	Reactive maintenance is to be kept to a minimum and managed through a CAFM system. The CAFM system will also retain a register of all assets and their locations and it will be updated as assets are maintained and/or replaced.	<ul style="list-style-type: none"> o Planned/preventive maintenance o Reactive maintenance o The generation of a register of assets o Replacement of the asset
Assets that require planned maintenance are to be identified and recorded in an asset register. In-house tendering of maintenance contracts takes eight weeks so the asset register is required at least eight weeks prior to the commencement of operation of any new asset	Assets that require planned maintenance are to be identified and recorded in an asset register. In-house tendering of maintenance contracts takes eight weeks so the asset register is required at least eight weeks prior to the commencement of operation of any new asset	<ul style="list-style-type: none"> o Planned/preventive maintenance o The generation a register of assets
Maintenance plans should form part of the O&M manual for the building/infrastructure. They need to be suitably identified so that they can be assigned to the asset within the CAFM system	Maintenance plans should form part of the O&M manual for the building/infrastructure. They need to be suitably identified so that they can be assigned to the asset within the CAFM system	<ul style="list-style-type: none"> o Planned/preventive maintenance
Reactive maintenance instructions and/or troubleshooting guide should form part of the O&M manual for the building/infrastructure.	Reactive maintenance instructions and/or troubleshooting guide should form part of the O&M manual for the building/infrastructure.	<ul style="list-style-type: none"> o Reactive maintenance

Organization X consolidated the purposes, information delivery milestones and the detailed contents of the information requirements associated with AIR and these have been presented in section A.2.2.

These details can be carried straight through to the EIR, so have not been re-presented in this section.

A.3 Example addressing environmental management



A.3.1 Organizational information requirements

OIR Organization X has formulated a range of environmental management policies and has established the following three OIR as a result.

- **Policy:** Environmental policy
 1. To align to the organization's 2030 energy targets, all new built assets must achieve an EPC 'A' rating
- **Policy:** Carbon policy
 2. All new assets are to have an embedded carbon value which is lower than the corporately defined value for that asset type
- **Policy:** Sustainability policy
 3. All wood used must be from sustainable sources

A.3.2 Asset information requirements

A.3.2.1 Identifying information purposes

Organization X has reviewed each of the OIR in respect of its environmental management policies and has determined the AIR and associated information purposes. These are presented in Table A.11.

Table A.11: AIR summaries and purposes for environmental management

OIR	AIR	Information purpose - to support:
1. To align to the organization's 2030 energy targets, all new built assets must achieve an EPC 'A' rating	Evidence needs to be provided at each information delivery milestone during a new build project, to prove that the proposed design/construction meets this target for regulated in-use energy consumption.	<ul style="list-style-type: none"> o Regulatory sign-off o Organizations carbon footprint agenda
2. All new assets are to have an embodied carbon value which is lower than the corporately defined value for that asset type	Each new asset's proposed/ actual embodied carbon to be compared to the corporate benchmark at each information delivery milestone during a new build project.	<ul style="list-style-type: none"> o Organizations carbon footprint agenda
3. All wood used must be from sustainable sources	Certification that the project is FSC compliant is needed at handover for each new asset.	<ul style="list-style-type: none"> o Organizations sustainability agenda

Organization X can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information. These are given in Table A.12.

Table A.12: Prerequisites for environmental management AIR

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> • Regulatory sign-off • Organizations carbon footprint agenda • Organizations sustainability agenda
Information specifier/receiver Information provider	Organization X's Safety, Health & Environment Department The design team or the main contractor for a new build project
Information delivery milestones	Regulated energy consumption information is required for each project key decision point, including handover) Embodied carbon information is required for each project key decision point, including handover) FSC certification compliance is required at project handover

A.3.2.2 Specifying the detail

This is the section where the content of the AIR is developed in terms of the presentation of information and the content breakdown of the information.

A.3.2.2.1 Presentation and content

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.12 of energy consumption information, embodied carbon information and FSC compliance information. Based on this consideration, Organization

X has decided that it needs to receive the types of information listed in Table A.13. Table A.13 also includes content requirements that Organization X has identified are beyond what a typical information provider (in this case the project design team or main contractor) might be expecting.



In the database example, Table A.13 forms part of the information presentation tables

Table A.13: Presentation details for environmental management AIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
1	• PM_XX_XX_XX: Energy analysis information	FI_90_72: Report	PDF	At each information delivery milestone	Energy report	EPC value to be included
2	• PM_80_10_25: Energy performance certificate	FI_90_13: Certificate	PDF	At handover	EPC certificate	For delivery team to determine
3	• PM_30_30_10: Carbon calculation information	FI_90_72: Report	PDF	At handover	Carbon report	Embodied carbon values for all new assets
4	• PM_70_15: Compliance and certification information	FI_90_13: Certificate	PDF	At handover	FSA certificate	For delivery team to determine

Note, there is no structured information required

A.3.2.2.2 Content breakdown - structured information

In this example, there is no content breakdown for structured information since the items in Table A.12 are all unstructured information.

A.3.3 Project information requirements

PIR Organization X has reviewed its environmental management policies. There are no PIR directly coming from the environmental policy or the carbon policy since these have already been covered in its OIR and its AIR.

However, there is an aspect of its strategic brief that supports localized workforces on projects and minimizing travel distances to work for its contractors. Organization X has established a PIR as a result of this.

- **Strategic brief:** 80% of the sub-contractors will be based within a 30-mile radius of the site
 1. Evidence required at information delivery milestones 4, 5 and 6 concerning the location of sub-contractor businesses

A.3.4 Exchange information requirements

A.3.4.1 Purposes

EIR Organization X has reviewed its AIR and PIR related to environmental management and has determined the EIR and associated information purposes. These are presented in Table A.14. Where these are brought forward from the AIR, the details are the same (see Table A.11). All further details concerning these information requirements are the same as those shown in sub-section A.3.2.

Table A.14: EIR summaries and purposes for environmental management

AIR or PIR	EIR	Information purpose - to support:
Evidence needs to be provided at each information delivery milestone during a new build project, to prove that the proposed design/construction meets this target for regulated in-use energy consumption.	Evidence needs to be provided at each information delivery milestone during a new build project, to prove that the proposed design/construction meets this target for regulated in-use energy consumption.	<ul style="list-style-type: none"> o Regulatory sign-off o Organizations carbon footprint agenda
Each new asset's proposed/ actual embodied carbon to be compared to the corporate benchmark at each information delivery milestone during a new build project.	Each new asset's proposed/ actual embodied carbon to be compared to the corporate benchmark at each information delivery milestone during a new build project.	<ul style="list-style-type: none"> o Organizations carbon footprint agenda
Certification that the project is FSC compliant is needed at handover for each new asset.	Certification that the project is FSC compliant is needed at handover for each new asset.	<ul style="list-style-type: none"> o Organizations sustainability agenda
1. Evidence required at information delivery milestones 4, 5 and 6 concerning the location of sub-contractor businesses	Reports on the locations of sub-contractors working on a new build project, required at information delivery milestones 4, 5 and 6.	<ul style="list-style-type: none"> o Organizations sustainability agenda

Organization X consolidated the purposes, information delivery milestones and the detailed contents of the information requirements associated with AIR and these have been presented in section A.3.2. These details can be carried straight through to the EIR, so have not been re-presented in this section.

Organization X can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information, for EIR arising from PIR. These are given in Table A.15.

Table A.15: Prerequisites for environmental management EIR based on PIR only

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> Organizations sustainability agenda
Information specifier/receiver Information provider	Organization X's Safety, Health & Environment Department Main Contractor
Information delivery milestones	Sub-contractor location report required at information delivery milestones 4, 5 & 6

A.3.4.2 Specifying the detail

This is the section where the content of the AIR is developed in terms of the presentation of information and the content breakdown of the information.

A.3.4.2.1 Presentation and content

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example this is done with reference to Uniclass 2015. Consideration is therefore

given to components shown in Table A.14 of sub-contractor location report. Based on this, Organization X has decided that it needs to receive the type of information listed in Table A.16. Table A.16 also includes content requirements that Organization X has identified are beyond what a typical information provider (in this case the project design team or main contractor) might be expecting.



In the database example, Table A.16 forms part of the information presentation tables.

Table A.16: Presentation details for environmental management EIR based on PIR only

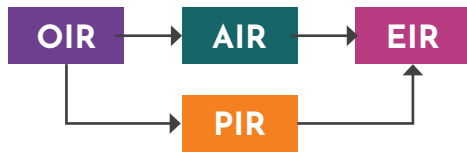
Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
1	PM_60_60_15: Contacts information	Report	PDF	At information delivery milestones 4, 5 and 6	Sub-contractor travel report	Evidence to be provided showing the distance between each sub-contractors base and the site together with calculations showing this exceeds 80%

Note, there is no structured information required

A.3.4.2.2 Content Breakdown - structured information

In this example, there is no content breakdown for structured information since the item in Table A.16 is unstructured information.

A.4 Example addressing asset operations



A.4.1 Organizational information requirements

OIR Organization X has reviewed its range of business operations tasks around operating its assets and has identified the following OIR as a result.

- **Business operations task:** Insurance renewal
 1. Information required to renew buildings and contents insurance

A.4.2 Asset information requirements

A.4.2.1 Identifying information purposes

AIR Organization X has reviewed its OIR and has determined the AIR and associated information purposes as presented in Table A.17.

Table A.17: AIR summaries and purposes for asset operations

OIR	AIR	Information purpose - to support:
1. Information required to renew buildings and contents insurance	Provide total Gross Internal Area (GIA) and number of storeys for each built asset in the estate	o Insurance renewal

Organization X can now identify the information delivery milestones and the type of party that will provide the required information. These are given in Table A.18.

Table A.18: Prerequisites for asset operations AIR

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> Insurance renewal
Information specifier/receiver	Organization X's Estates Department
Information provider	Estate surveyor or main contractor in the case of a new-build project
Information delivery milestones	GIA and number of storeys required at handover for any new-build project, and on completion of any construction works carried out on an asset during its operational life

A.4.2.2 Specifying the detail

This is the section where the content of the AIR is developed in terms of the presentation of information and the content breakdown of the information. The tables in this sub-section should be developed together as they will inform each other and cross-refer.

A.4.2.2.1 Presentation

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example, this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.17 of gross internal area and number of storeys. Based on this consideration, Organization X has decided that it needs to receive the types of information listed in Table A.19. As all the information is structured, there is no need to split the table into structured and unstructured parts.



In the database example, Table A.19 forms part of the information presentation tables.

Table A.19: Presentation details for environmental management AIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description
Structured information					
1	PM_80: Asset management information <ul style="list-style-type: none"> Asset register 	FI_30_40: Information Exchange	XLSX	At completion of construction works	COBie spreadsheet based on the COBie 2.4 schema

Note, there is no unstructured information required

A.4.2.2.2 Content breakdown - structured information

Organization X will now detail the exact contents of structured information using up to four tables to define object information and metadata⁸. In this example there is only item 1 in Table A.16. For the purpose of illustration, consideration has been given to structured information in respect only of the following⁹ and in reference to IFC 2x3 notation:

- Building
- Building Storey
- Site

Object - Geometrical Information

In this example, no geometrical information is required to fulfil the requirements of the COBie 2.4 spreadsheet deliverable so there is no corresponding table for the item in Table A.19.

Object - Alphanumerical Information

Table A.20 shows **some** of the IFC attributes and properties considered for each object listed in A.4.2.2.2. A tick indicates information is to be provided and stating n/a is good practice to confirm that information is not required. Note that there is a minimum number of fields that are mandatory in COBie and must be delivered regardless. This example only shows some of these mandatory fields. In addition, **GrossFloorArea** is not defined as part of the COBie schema and is an additional property captured in the Attribute tab.



In the database example Table A.20 has been replaced with metadata Table A.21 to enable appointment specific views to be created and forms part of the alphanumerical information. However the thinking in Table A.20 is still required before Table A.21 can be created.

Table A.20: Alphanumerical details for item 1 in maintenance and repairs AIR

Object (Asset)	Name	Description	ClassificationReference. ItemReference	ClassificationReference. Name	GrossFloorArea
Building	✓	✓	✓	✓	✓
Building Storey	✓	n/a	n/a	n/a	n/a
Site	✓	✓	n/a	n/a	n/a

⁸ Refer back to the "How to read and understand these examples" section for an explanation of these tables in specifying information details

⁹ This is likely to be just a sub-section of structured information requirements

Object - Documentation information

In this example, no documentation information is required so there is no corresponding table for item 1 in Table A.19.

Metadata alphanumerical information

Organization X has reflected on Table A.19 and has determined that value types and units are as shown in Table A.21. They have also provided example values to indicate the nature of the expected content.



In the database example, Table A.21 forms part of the alphanumerical information tables

Table A.21: Metadata for alphanumerical information

Object and Attribute/ Property	Metadata(1) e.g. data type	Metadata(2) e.g. units	Metadata(3) e.g. example value	Metadata(4) e.g. placeholder value
Building.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Building.Description	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Site.Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Site.Description	Numeric	mm	See information standard for value	No placeholder allowed
Building. ClassificationReference. ItemReference	Alphanumeric	n/a	See information standard for value	No placeholder allowed
Building. ClassificationReference. Name	Alphanumeric	n/a	See information standard for value	No placeholder allowed
BuildingStorey.Name	Alphanumeric	n/a	2020-03-23T1700:00:00	1900-12-31T23:59:59
Building [GrossFloorArea]	Numeric	m ²	10000	No placeholder allowed

A.4.3 Project information requirements

PIR Organization X has reviewed its asset operations activities. There are no PIR directly coming from the business operations tasks since these have already been covered in its OIR and its AIR.

However, there is an aspect of its project business plan related to a maximum value for operational energy costs of any new-build asset. Organization X has established a PIR as a result of this.

- Project business plan: The operational energy costs of the facility should be no more than £X per year per m².
 1. Annual running costs per m² to be estimated at information delivery milestones 2, 3 and 4 during design.

A.4.4 Exchange information requirements

A.4.4.1 Purposes

EIR Organization X has reviewed its AIR and PIR related to asset operations and has determined the EIR and associated information purposes. These are presented in Table A.22. Where these are brought forward from the AIR, the details are the same (see Table A.17). All further details concerning these information requirements are the same as those shown in sub-section A.4.2.

Table A.22: EIR summaries and purposes for environmental management

AIR or PIR	EIR	Information purpose - to support:
Provide total GIA and number of storeys for each built asset in the estate	Provide total GIA and number of storeys for each built asset in the estate	o Insurance renewal
1. Annual running costs per m ² to be estimated at information delivery milestones 2, 3 and 4 during design.	Provide estimate of annual running costs per m ² at the precision appropriate to the design state, for information delivery milestones 2, 3 and 4.	o Operational costing

Organization X consolidated the purposes, information delivery milestones and the detailed contents of the information requirements associated with AIR and these have been presented in section A.4.2. These details can be carried straight through to the EIR, so have not been re-presented in this section.

Organization X can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information, for EIR arising from PIR. These are given in Table A.23.

Table A.23: Prerequisites for asset operations EIR based on PIR only

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> Operational costing
Information specifier/receiver	Organization X's Operations Department
Information provider	Building services design consultant
Information delivery milestones	Operational energy calculations presented as £/m ² , at information delivery milestones 2, 3 and 4.

A.4.4.2 Specifying the detail

This is the section where the content of the EIR is developed in terms of the presentation of information and the content breakdown of the information.

A.4.4.2.1 Presentation and content

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example, this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.23 of operational energy calculations. Based on this, Organization X has decided that it needs to receive the type of information listed in Table A.24. Table A.24 also includes content requirements that Organization X has identified are beyond what a typical information provider (in this case the project design team or main contractor) might be expecting.



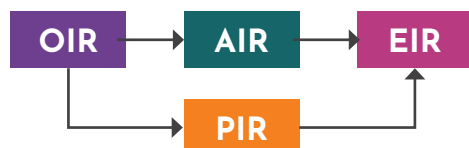
In the database example, Table A.24 forms part of the information presentation tables

Table A.24: Presentation details for asset operations EIR based on PIR only

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
1	PM_80_30_90: Utilities cost information	Report	PDF	At information delivery milestones 2, 3 and 4	Utilities cost report	To contain - Energy usage of equipment, walls, roof and floor U-values, whole facility monthly energy cost, whole facility annual energy cost

Note, there is no structured information required

A.5 Example addressing capital investment and lifecycle costing



A.5.1 Organizational information requirements

OIR Organization X has reviewed its range of business operations tasks around its capital investment and lifecycle costing activities and has identified the following two OIR as a result.

- **Business operations task:** Strategic Asset Management Portfolio
 1. Financial actuals, full year and full project forecasts to be delivered monthly
- **Business operations task:** Purchasing of specialist equipment
 2. The purchasing of specialist equipment will be conducted by the estates department and form part of corporate reporting

A.5.2 Asset information requirements

A.5.2.1 Identifying information purposes

AIR Organization X has reviewed each of the OIR in respect of its capital investment and lifecycle costing and has determined the AIR and associated information purposes. These are presented in Table A.25.

Table A.25: AIR summaries and purposes for capital investment and lifecycle costing

OIR	AIR	Information purpose - to support:
1. Financial actuals, full year and full project forecasts to be delivered monthly	Monthly financial information to include capital investment, actual operating costs, life expectancy forecasts.	<ul style="list-style-type: none"> o Cost forecasting o Operational costs
2. The purchasing of specialist equipment will be conducted by the estates department and form part of corporate reporting	Accurate schedules of all specialist equipment to be installed in new-build projects and to replace existing equipment are needed for the estates department to order the correct quantities	<ul style="list-style-type: none"> o Procurement of goods

Organization X can now identify the information delivery milestones and the type of party that will provide the required information. These are shown in Table A.26.

Table A.26: Prerequisites for capital investment and lifecycle costing AIR

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> • Cost forecasting • Operational costs • Procurement of goods
Information specifier/receiver Information provider	Organization X's Finance Department (for finance information) and Estates Department (for equipment schedules) New-build main contractor or Estates Department (for finance information) and new-build design team (for equipment schedules)
Information delivery milestones	Finance information is required monthly Equipment schedules are required eight weeks before the start of construction (stage 5) on a new-build project

A.5.2.2 Specifying the detail

This is the section where the content of the AIR is developed in terms of the presentation of information and the content breakdown of the information. The tables in this sub-section should be developed together as they will inform each other and cross-refer.

A.5.2.2.1 Presentation

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example this is done with reference to Uniclass 2015. Consideration is therefore given to

components shown in Table A.26 of finance information and equipment schedules. Based on this consideration, Organization X has decided what types of information it needs to receive and has also identified if this information is structured (Table A.27A) or unstructured (Table A.27B). In respect of the unstructured information, Organization X has also identified content requirements where these are beyond what a typical information provider might be expecting.



In the database example, Tables A.27 form part of the information presentation tables

Table A.27A: Presentation details for structured information for capital investment and lifecycle costing AIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description
Structured information					
1	PM_60_50_58: Order information	FI_90_75: Schedule or table	XLSX	Eight weeks before start of construction	Specialist equipment schedule

Table A.27B: Presentation details and content comments for unstructured information for capital investment and lifecycle costing AIR

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
2	PM_60_50_25: Cost forecast information	FI_90_72: Report	PDF	Monthly	Cost plan	For delivery team to determine
3	PM_80_30_63: Operational cost information	FI_90_72: Report	PDF	Monthly	Operational cost plan	To also include equipment life expectancy forecasts (updated annually)

A.5.2.2.2 Content breakdown - structured information

Organization X will now detail the exact contents of structured information using up to four tables to define object information and metadata¹⁰. In this example there is only item 1 in Table A.27A. For the purpose of illustration, consideration has been given to structured information in respect only of the following¹¹: and in reference to IFC 2x3 notation:

- Electric Appliance
- Medical Device

Object - Geometrical Information

In this example, no geometrical information is required so there is no corresponding table for item 1 in Table A.27A.

Object - Alphanumerical Information

Table A.25 shows the IFC attributes and properties required for each object listed in A.4.2.2.2. A tick indicates information is to be provided and stating n/a is good practice to confirm that information is not required.



In the database example Table A.28 has been replaced with metadata Table A.29 to enable appointment specific views to be created and forms part of the alphanumerical information. However the thinking in Table A.28 is still required before Table A.29 can be created.

¹⁰ Refer back to the "How to read and understand these examples" section for an explanation of these tables in specifying information details

¹¹ This is likely to be just a sub-section of structured information requirements

Table A.28: Alphanumerical details for item 1 in capital investment and lifecycle costing AIR

Object (Asset)	Name (Occurrence/Component)	Description (Occurrence/Component)	Manufacturer	ModelLabel	ModelReference
ElectricAppliance	✓	✓	✓	✓	✓
MedicalDevice	✓	✓	✓	✓	✓

Object - Documentation information

In this example, no documentation information is required so there is no corresponding table for item 1 in Table A.27A.

Metadata (value type and units) for alphanumerical information

Organization X has reflected on Table A.28 and has determined that value types and units are as shown in Table A.29. They have also provided example values to indicate the nature of the expected content.


 In the database example, Table A.29 forms part of the alphanumerical information tables.

Table A.29: Metadata for alphanumerical information

Object and Attribute/Property	Metadata(1) e.g. data type	Metadata(2) e.g. units	Metadata(3) e.g. example value
ElectricAppliance.Name	Alphanumeric	n/a	See information standard for value
ElectricAppliance.Description	Alphanumeric	n/a	Vacuum station
ElectricApplianceType [Manufacturer]	Alphanumeric	n/a	ABC@Manufacturer.com
ElectricApplianceType [ModelLabel]	Alphanumeric	n/a	MXC7564
ElectricApplianceType [ModelReference]	Alphanumeric	n/a	(Catalogue number)
MedicalDevice.Name	Alphanumeric	n/a	See information standard for value
MedicalDevice.Description	Alphanumeric	n/a	Vacuum station
MedicalDevice [Manufacturer]	Alphanumeric	n/a	ABC@Manufacturer.com
MedicalDevice [ModelLabel]	Alphanumeric	n/a	MXC7564
MedicalDevice [ModelReference]	Alphanumeric	n/a	(Catalogue number)

A.5.3 Project information requirements

PIR Organization X has reviewed its capital investment and lifecycle costing activities. There are no PIR directly coming from the business operations tasks since these have already been covered in its OIR and its AIR.

However, there is a project task and some aspects of its project business plan related to the negotiation of funding for a new project, the financial revenue generated by any new-build asset and the investment target for any new-build asset. Organization X has established three PIR as a result of this.

- **Project task:** Secure funding from lenders
 1. Area/occupancy information and visualizations required at key decision points 1 and 2 to demonstrate to lenders what the facility will look like to support the business case for development
- **Project business plan:** The facility will need to generate £X turnover in the first year
 2. Area/occupancy information of retail departments and benchmark sales figures per m² to be provided at key decisions 1 and 2
- **Project business plan:** The investment target will be between £X-£Y
 3. Project cost information to be provided at each key decision point.

A.5.4 Exchange information requirements

A.5.4.1 Purposes

EIR Organization X has reviewed its AIR and PIR related to capital investment and lifecycle costing and has determined the EIR and associated information purposes. These are presented in Table A.30. Where these are brought forward from the AIR, the details are the same (see Table A.25). All further details concerning these information requirements are the same as those shown in sub-section A.5.2.

Table A.30: EIR summaries and purposes for capital investment and lifecycle costing

AIR or PIR	EIR	Information purpose - to support:
Monthly financial Information to include capital investment, actual operating costs, life expectancy forecasts.	Monthly financial Information to include capital investment, actual operating costs, life expectancy forecasts.	<ul style="list-style-type: none"> o Cost forecasting o Operational costs
Accurate schedules of all specialist equipment to be installed in new-build projects and to replace existing equipment are needed for the estates department to order the correct quantities	Accurate schedules of all specialist equipment to be installed in new-build projects and to replace existing equipment are needed for the estates department to order the correct quantities	<ul style="list-style-type: none"> • Procurement of goods
1. Area/occupancy information and visualizations required at key decisions 1 and 2 to demonstrate to lenders what the facility will look like to support the business case for development	High level rendered images and report with space areas, space occupancy levels and total occupancy levels for information delivery milestones 1 and 2	<ul style="list-style-type: none"> • Funding negotiation
2. Area/occupancy information of retail departments/units and benchmark sales figures per m2 to be provided at key decisions 1 and 2	Schedule of proposed retail departments/units for the lettings department to add benchmark sales figures to each space at information delivery milestones 1 and 2	<ul style="list-style-type: none"> • Financial sales forecasting
3. Project cost information to be provided at each key decision point	Capital project cost reports to be provided at each information delivery milestone	<ul style="list-style-type: none"> • Cost estimating and cash flow forecasting

Organization X consolidated the purposes, information delivery milestones and the detailed contents of the information requirements associated with AIR and these have been presented in section A.5.2. These details can be carried straight through to the EIR, so have not been re-presented in this section.

Organization X can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information, for EIR arising from PIR. These are given in Table A.31.

Table A.31: Prerequisites for capital investment and lifecycle costing EIR based on PIR only

Information is required to meet these purposes - to support:	<ul style="list-style-type: none"> • Funding negotiation • Financial sales forecasting • Cost estimating and cash flow forecasting
Information specifier/receiver Information provider	<p>Organization X's Finance Department</p> <p>Architectural design team (rendered images and retail space schedule) and cost consultant (cost estimates and cash flows)</p>
Information delivery milestones	<p>Rendered images and space schedule at information delivery milestones 1 and 2.</p> <p>Cost estimates and cash flow forecasts at information delivery milestones 1 to 6.</p>

A.5.4.2 Specifying the detail

This is the section where the content of the EIR is developed in terms of the presentation of information and the content breakdown of the information.

A.5.4.2.1 Presentation and content

Organization X now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example, this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.31 of rendered images, space schedules, cost estimates and cash flow forecasts. Based on this, Organization X has decided that it needs to receive the type of information listed in Table A.32. Table A.32 also includes content requirements that Organization X has identified are beyond what a typical information provider (in this case the project design team or main contractor) might be expecting.


 In the database example, Table A.32 forms part of the information presentation tables

Table A.32: Presentation details for capital investment and lifecycle costing EIR based on PIR only

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
1	PM_40_30_62: Photorealistic visualization information	FI_60_95: Visualization	JPEG	At information delivery milestones 1 and 2	Visualization imagery	External views from all vantage points approaching the store. Internal views of premium stock areas and cafe
2	PM_10_80_75: Space design information	FI_90_75: Schedule or table	PDF	At information delivery milestones 1 and 2	Schedule of accommodation	To include max and min occupancy levels
3	PM_10_80_75: Space design information	FI_60_25: Drawing rendition	PDF	At information delivery milestones 1 and 2	Departmental layout drawings	Coloured area plans of each department
4	PM_60_50_23: Cost estimate information	FI_90_72: Report	PDF	At information delivery milestones 1 to 6	Project cost forecast report	For delivery team to determine

Note, there is no structured information required

A.5.4.2.2 Content breakdown - structured information

In this example, there is no content breakdown for structured information since the items in Table A.32 are all unstructured information.

A.6 Example for lead appointed party EIR related to logistics planning

EIR

A lead appointed party cascades the appropriate EIR received from the appointing party down to the appointed parties in their delivery team. Each appointed party should only receive EIR relevant to their work in the delivery team. While doing this, the lead appointed party can add some of their own EIR as necessary for each appointed party. This is in line with ISO 19650-2 clause 5.4.3. You will notice in the EIR database this information is only present in the lead appointed party views

A.6.1 Purposes

In this example, the main contractor is a lead appointed party on one of Organization X's projects. The project is using offsite manufactured components and the main contractor has identified a specific information requirement for them to receive information in relation to how these components are lifted on site. The lead appointed party has identified the EIR and the information purpose as shown in Table A.33.

Table A.33: Lead appointed party EIR summaries and purposes for offsite component lifting

Information requirement	EIR	Information purpose - to support:
Information to show how the lifting of offsite manufactured components can be conducted safely	<p>Time sequencing analysis of component delivery and installation to feed into the project programme and the site logistics plan.</p> <p>Manufacturer information concerning offsite components</p>	<ul style="list-style-type: none"> o Simulation

The main contractor can now consolidate the purposes, identify information delivery milestones and the type of party that will provide the required information, for these lead appointed party EIR. These are given in Table A.34.

Table A.34: Prerequisites for lead appointed party EIR relating to offsite manufactured components

Information is required to meet these purposes - to support:	o Simulation
Information specifier/receiver Information provider	Main contractor's Design Manager Design consultant responsible for offsite components + manufacturer of the components
Information delivery milestones	Time sequence of delivery and installation, and manufacturer information required during work stage 4

A.6.2 Specifying the detail

This is the section where the content of the EIR is developed in terms of the presentation of information and the content breakdown of the information.

A.6.2.1 Presentation and content

The main contractor now needs to consider the overall content, form and format of the information (i.e. how the information is to be presented and encoded). In this example this is done with reference to Uniclass 2015. Consideration is therefore given to components shown in Table A.34 of time sequence of delivery and installation of components. Based on this, the main contractor has decided what types of information it needs to receive and has also identified if this information is structured (Table A.35A) or unstructured (Table A.35B). In respect of the unstructured information, the main contractor has also considered content requirements where these are beyond what a typical information provider might be expecting but none are specified in this example.



In the database example, Tables A.35 form part of the lead appointed party information presentation table

Table A.35A: Presentation details for structured information for lead appointed party EIR relating to offsite manufactured components

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description
Structured information					
1	<ul style="list-style-type: none"> PM_XX_XX_XX: Sequencing PM_60_70_17: Construction phase health and safety information 	FI_60_50: Model rendition	IFC-SPF	Six weeks before the end of work stage 4	IFC model IFC2x3 (no official MVD) use Coordination View 2.0

Table A.35B: Presentation and content details for unstructured information for lead appointed party EIR relating to offsite manufactured components

Item	Content summary (based on Uniclass 2015)	Form (based on Uniclass 2015)	Format	Information exchange date	Plain language description	Content comments
Unstructured information						
2	PM_70_85_52: Manufacturer information	FI_90_21: Data sheet	PDF	YYMMDD	Product data sheet	For delivery team to determine

A.6.2.2 Content breakdown - structured information

The main contractor will now detail the exact contents of structured information using up to four tables to define object information and metadata¹². In this example there is only item 1 in Table A.35A. For the purpose of illustration, consideration has been given to structured information in respect only of the following¹³ and in reference to IFC 2x3 notation:

- Element Assembly.

Object - Geometrical Information

In this table all the objects which are required to be federated to enable the time sequencing analysis to take place would need to be listed. For the purposes of this example, only the objects which are significant have been listed.



In the database example, Table A.36 forms part of the lead appointed party geometrical information table

¹² Refer back to the "How to read and understand these examples" section for an explanation of these tables in specifying information details

¹³ This is likely to be just a sub-section of structured information requirements

Table A.36: Geometrical details for item 1 in lead appointed party EIR relating to offsite manufactured components

Object (Asset)	Detail	Dimensionality	Location	Appearance	Parametric Behaviour
ElementAssembly	<p>Simplified/generic detail, accurate dimensions. Each component to show lifting hooks (DiscreteAccessory) in the following positions:</p> <ul style="list-style-type: none"> • HookPosition X, • HookPosition Y • CenterOfMass X • CenterOfMass Y 	3D	Absolute to real world coordinates	Colour of the material	n/a

Note, further information about the date can be added, as different objects may be required at different times

Object - Alphanumerical Information

Table A.37 shows the fields/parameters required for each object listed in A.6.2.2. A tick indicates information is to be provided and stating n/a is good practice to confirm that information is not required.



In the database example Table A.37 has been replaced with metadata Table A.39 to enable appointment specific views to be created and forms part of the alphanumerical information. However the thinking in Table A.37 is still required before Table A.39 can be created

Table A.37: Alphanumerical details for item 1 in lead appointed party EIR relating to offsite manufactured components

Object (Asset)	MaximumWeightPerHook	ElementWeight
ElementAssembly	✓	✓

Object - Documentation information



In the database example, Table A.38 forms part of the lead appointed party documentation information table

Table A.38: Alphanumerical details for item 1 in lead appointed party EIR relating to offsite manufactured components

Object (Asset)	DocumentName	MaximumWeightPerHook	ElementWeight
ElementAssembly	✓	PM_70_85_52: Manufacturer information	✓

Note, ✓ = required

Note, further information about the date can be added, as different document information for different objects may be required at different times

Metadata (value type and units) for alphanumerical information

Organization X has reflected on Table A.37 and has determined that value types and units are as shown in Table A.26. They have also provided example values to indicate the nature of the expected content.


 In the database example, Table A.39 forms part of the lead appointed party alphanumerical information table

Table A.39: Metadata for alphanumerical information

Object and Attribute/Property	Metadata(1) e.g. data type	Metadata(2) e.g. units	Metadata(3) e.g. example value	Metadata(4) e.g. placeholder value
ElementAssembly .MaximumWeightPerHook	Numeric	kg	10000	No placeholder allowed
ElementAssembly .ElementWeight	Numeric	kg	8000	No placeholder allowed

For illustration only

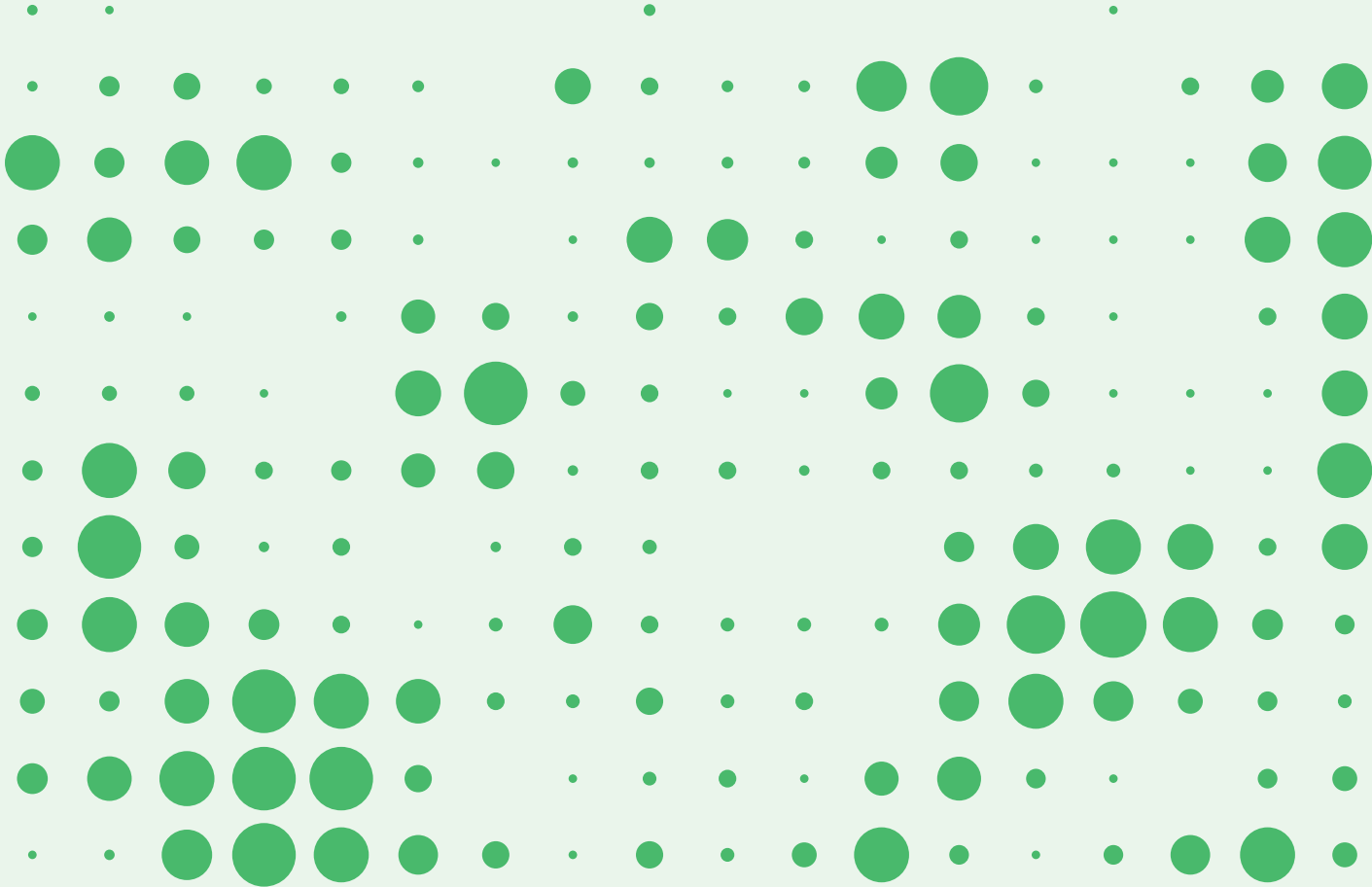
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