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Guidance for understanding and using EN ISO 29481-1:2017 Building information models - Information delivery manual - Part 1: Methodology and format — —

Anleitung zum Verständnis und zur Verwendung von EN ISO 29481-1:2017 Bauwerksinformationsmodelle - Handbuch der Informationslieferungen- Teil 1: Methodik und Format — —

Guide pour la compréhension et l'utilisation de la norme EN ISO 29481-1:2017 Modèles des informations de la construction - Protocole d'échange d'informations - Partie 1: Méthodologie et format — —

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Contents

European foreword

This document (TC 442 WI 00442023) has been prepared by Technical Committee CEN/TC 442 "Building Information Modelling (BIM)", the secretariat of which is held by SN.

This document is a working document.

1 Scope

This document provides a guidance on how to develop an Information Delivery Manual (IDM) in compliance with EN ISO 29481-1:2017. It explains the core components and development process of the IDM methodology in non-technical terms. The objective is to help users and software vendors to understand and utilize the IDM standard in defining information needs and deliverables.

1.1 Background

EN ISO 29481 Building information models - Information delivery manual - Part 1: Methodology and format defines a framework and methods on how to present process maps and exchange requirements for a certain purpose. Even though the IDM standard was first published in 2010, it has not been widely adopted by the industry.

As described in EN ISO 29481-1 (Introduction):

"An IDM provides help in getting the full benefit from a BIM. If the required information is available in the BIM to support a construction process or use case, and the quality of information is satisfactory, then the process itself is much improved.

To achieve this, you need a common understanding of the processes involved across the entire life cycle development of a built environment project. That includes the information that is required for and results from the execution of that process which applies to any activity that results in an exchange of information and may not relate directly to a BIM, e.g. the process to arrive at a work plan or contractual agreement.

This part of ISO 29481 sets out a methodology for the provision of an integrated reference document that describes the processes and data required in the development or management of a constructed facility. It describes how to identify and describe the processes undertaken within that context, the information required for their execution and the results. This part of ISO 29481 also describes in general terms how this information can be further detailed to support solutions provided by software developers, enabling its reuse, and configured to meet national, local and project needs.

In summary, ISO 29481 part 1 provides a basis for reliable information exchange/sharing for users so that they can be confident that the information they are receiving is accurate and sufficient for the activities they need to perform. The development of ISO 29481 part 1 has been driven by the need of users for reliability in information exchange."

In summary, we can say that the IDM methodology is a means to define information requirements, by analysing and mapping business processes.

This guidance document helps in understanding and using the Information Delivery Manual standard Part 1 (later referred as IDM standard) in describing the various information delivery processes.

Moreover, it also expands on some of the less well-defined parts of the IDM standard or items, which are open to interpretation. These additions can be later used to improve the IDM standard or to develop a stand-alone part for EN ISO 29481 series.

The production of this guidance document has been the pan-European collaboration CEN 442 Information Delivery Specification Working Group 3 (CEN TC442 WG3). The primary reference for this guideline has been the IDM standard itself, i.e. ISO 29481-1:2016 and EN ISO 29481-1:2017. In addition, considerable efforts have been made to align this guidance with EN ISO 19650-1:2018 and EN ISO 19650-2:2018.

The technical implementation of IDM in a data model, specifically the IFC Model View Definition, is excluded from the scope of this guideline[1)].

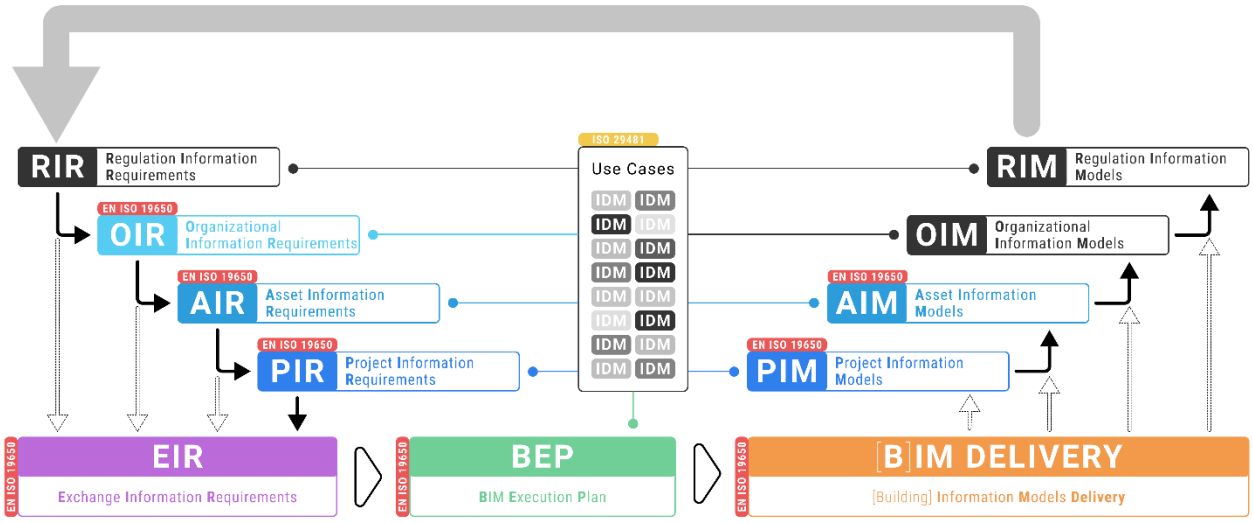
1.2 Users of this guidance document

This guidance document is addressed to clients, architects, engineers, construction companies, surveyors and other parties who need to specify or implement the information deliveries. Even though the original version of the IDM standard was aimed to specify only the BIM deliverables, the current scope of the standard is much broader, and it can be used to outline any requirements for any information delivery.

This guidance document can also help software developers and technology adapters to better understand existing IDM's, as well as to develop their own IDMs.

1.3 Relation to EN ISO 19650

The IDM standard is a process-oriented methodology, that can be seen as a counterpart and complement to the information-management approach outlined in the ISO 19650 series. EN ISO 19650-1 and EN ISO 19650-2 establish how exchange information requirements can be defined for project realization and operation. However, many appointing parties (e.g. facility owner organizations) may not be in a position to identify the information requirements for an appointed party. At best, they can define their strategic goals and information (BIM) Use Cases.



1) An MVD defines a data model or a subset of an existing data model that is necessary to support one or many specific data exchange requirements. MVDs are used in software development and should have a machine-readable representation. An MVD that is dedicated to a single IDM can be used to filter information in software tools to a specific exchange requirement. [SOURCE: EN ISO 29481-1:2017, 5.6.4]

Figure 1 — Development of different levels of requirements may utilize IDMs to specify the detailed information deliverables

EN ISO 19650-1 specifies that "the level of information need of each information deliverable should be determined according to its purpose. This should include the appropriate determination of quality, quantity and granularity of information. This is referred to as its level of information need and this can vary from deliverable to deliverable." IDM is one possible way to describe the level of information need requirements set by EN ISO 19650-1. Since IDM is very purpose driven, if fits well into this demand.

Furthermore, according to EN ISO 19650-1 "all this should be described clearly within the OIR, PIR, AIR or EIR." figure 1 demonstrates, how IDMs can be used to specify the deliverables in different levels from organization to project and further to Exchange Information Requirements. In addition to EN ISO 19650-1 specifications, it has also been recognized, that outside the organizational needs there are information requirements that are determined by regulations or demands that are comparable to them.

Figure 1 also visualizes how the same IDMs that are used to specify the requirements, can be used to verify the deliverables. In an ideal scenario, a machine-readable version of the exchange requirements is used to automate the verification.

This document proposes the IDM methodology as a means for both appointing parties and appointed parties to define their information Exchange Requirements - from a process perspective. Indeed, IDMs enable stakeholders across the supply chain to determine their information requirements, by identifying use-cases, mapping processes and define exchange requirements.

Although EN ISO 19650-1 or -2 does not explicitly mention use-case, the term 'purpose' is used to designate the scope or function of a given task. Use cases may be employed to convert a strategy goal into a concrete outcome or deliverable.

For example, a building owner organization may have the strategic objective to maximize tenant occupancy in an office building. The Use Case of model-based area management may support this strategic goal. Using the IDM methodology, the building owner can determine the information requirements necessary to support this Use Case, in turn, to achieve the strategic goal (see figure 2).

For machine readable purposes, Exchange Requirements should be developed further to Model View Definition.

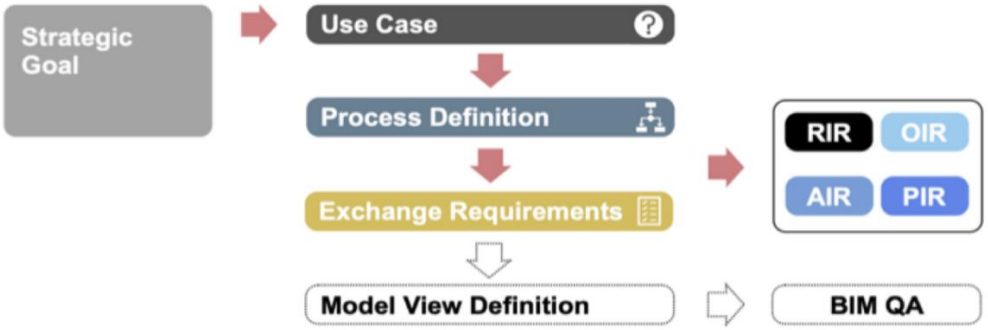


Figure 2 — IDM generation from Strategic goals through different phases of the IDM development and linking the IDM to different types of requirements

In this example, the IDM methodology has supported the definition of Organization and/or Asset Information Requirements. Similarly, IDM can be used to support the definition of Project Information Requirements and ultimately also Exchange Information Requirements for an appointing party.

More commonly understood IDM is used by the delivery team to define their internal exchange requirements for information production and delivery. Consequently, this guidance document may be used by stakeholders along the supply chain from appointing to appointed parties.

This guidance document introduces a new term to the forms of Information Requirements set out in ISO 19650. This is 'Regulatory Information Requirements', to designate national or international statutory requirements that may have an impact on what information is required by an appointing party from an organization, asset, and project level.

1.4 How to use this guidance document

Objective for this document is to help the reader to understand and develop IDMs based on the EN ISO 29481-1. The standard itself can be used in parallel to this document. This guidance explains the development of IDMs step by step in chronological order:

— As a first step, the purpose of the data delivery needs to be specified by answering simple questions defined in the standard and its annexes. In this guidance, these questions have been collected together in order to specify the purpose i.e. the Use Case.

— The second step is to define the information delivery process. EN ISO 29481-1 contains three different methods for this, this guidance explains how and when to use the different methods. This guidance also explains what the difference between process and interaction maps is and how to use transaction maps to fine down the interaction map nodes.

— The third step is to define the Exchange Requirements of the information delivery. According to EN ISO 29481-1, this should be done in plain English terms. The output format of this is defined in detail in the standard. At the same time, the standard hints, that there is a need for a more precise definition, a Model View Definition (MVD). Since MVD is not specified anywhere in detail, this guidance explains both what should be included in the plain English definition of the Exchange Requirements and how to develop it to a technical level that meets the criteria given by the standard.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 29481-1, *Building information models – Information delivery manual – Part 1: Methodology and format*

EN ISO 29481-2, *Building information models – Information delivery manual – Part 2: Interaction framework*

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

3.1
activity
Tasks that are needed to complete deliverables

[SOURCE: EN 15221-5:2011, 3.1]

The second level of a business classification scheme

NOTE Activities are the major tasks performed by an organization to accomplish each of its functions. An activity is identified by the name it is given and its scope note. The scope of the activity encompasses all the transactions that take place in relation to it. Depending on the nature of the transactions involved, an activity may be performed in relation to one function, or it may be performed in relation to many functions.

[SOURCE: ISO 16175-2:2011, 3]

3.2
actor
coherent set of roles that users play when interacting within use cases

[SOURCE: ISO 14813-5:2010, B.1.5]

person or system component who interacts with the system as a whole and who provides stimulus which invoke actions

[SOURCE: ISO/IEC 16500-8:1999, 3.1]

something or someone who supplies a stimulus to the system

NOTE Actors include both humans and other quasi-autonomous things, such as machines, computer tasks and systems.

[SOURCE: ISO 25720:2009, 4.1]

person, organization or organizational unit involved in a construction process

Note 1 to entry: Organizational units include, but are not limited to, departments, teams.

Note 2 to entry: In the context of this document, construction processes take place during the delivery phase and the operational phase.

[SOURCE: EN ISO 19650-1:2018, 3.2.1]

3.3
asset
plant, machinery, property, buildings, vehicles, ships, aircraft, conveyances and other items of infrastructure or plant and related systems that have a distinct and quantifiable business function or service

NOTE This definition includes any information system that is integral to the delivery of security and the application of security management.

[SOURCE: ISO 28001:2007, 3.2]

person or system component who interacts with the system as a whole and who provides stimulus which invoke actions

[SOURCE: ISO/IEC 16500-8:1999, 3.1]

item, thing or entity that has potential or actual value to an organization

Note 1 to entry: Value can be tangible or intangible, financial or non-financial, and includes consideration of risks and liabilities. It can be positive or negative at different stages of the asset life.

Note 2 to entry: Physical assets usually refer to equipment, inventory and properties owned by the organization. Physical assets are the opposite of intangible assets, which are non-physical assets such as leases, brands, digital assets, use rights, licences, intellectual property rights, reputation or agreements.

Note 3 to entry: A grouping of assets referred to as an asset system could also be considered as an asset.

[SOURCE: ISO 55000:2014, 3.2.1]

3.4
business need (requirement)
requirement that describes in business terms what needs to be delivered or accomplished

[SOURCE: ISO 29481-1:2016, 3.4]

3.5
business need (requirement)
partially ordered set of enterprise activities that can be executed to achieve some desired end-result in pursuit of a given objective of an organization

[SOURCE: ISO/IEC/IEEE 24765:2017, 3.445]

a partially ordered set of activities of an enterprise which can be executed to realise a given objective of the enterprise or a part of the enterprise to achieve some desired end-result

[SOURCE: ISO 15531-31:2004(en), 3.5.2]

3.6
BIM execution plan
plan that specifies in detail how the information management aspects of the appointment (3.3) will be carried out by the delivery team (3.17)

NOTE The pre-appointment BIM execution plan focuses on the delivery team's proposed approach to information management, and their capability and capacity to manage information.

[SOURCE: EN ISO 19650-1, 3.9]

3.7
end user
person receiving facility services

NOTE A visitor could also be an end user.

[SOURCE: EN 15221-5, 3.4]

entity outside the home control system domain that uses the services and functions of the home control system

[SOURCE: ISO/IEC TR 15044:2000, 2.16]

3.8
exchange requirement (ER)
defined set of information units that needs to be exchanged to support a particular business requirement at a particular process phase (or phases)/stage (or stages)

[SOURCE: ISO 29481-1:2016, 3.9]

3.9
Exchange information requirement (EIR)
nformation requirements in relation to an appointment

[SOURCE: EN ISO 19650-1:2018, 3.3.6]

3.10
information
interpretable representation of data in a formalized manner suitable for communication, interpretation or processing

NOTE Information can be processed by human or automatic means.

[SOURCE: EN ISO 19650-1:2018, 3.3.1]

data recorded and/or stored in a system

[SOURCE: ISO 18913:2012, 3.90]

3.11
information constraint
statement that formally defines or constrains the scope of a piece of information due to some aspect of the business, a rule under which an organisation operates or a policy or decision that influences a process

[SOURCE: EN ISO 29481-1:2016, 3.5]

3.12
information delivery manual (IDM)
Documentation which captures the business process and gives detailed specifications of the information that a user fulfilling a particular role would need to provide at a particular point within a project Note 1 to entry: This can be referred to as an information delivery specification (IDS)

[SOURCE: EN ISO 29481-1:2016, 3.10]

Strategy for identifying the processes, exchange requirements, business rules and functional parts for information exchanges in facility projects

[SOURCE: ISO/TS 12911:2012(en), 3.4]

3.13
information requirements (IR)
Specification for what, when, how and for whom information is to be produced

[SOURCE: EN ISO 19650-1:2018, 3.3.2]

3.14
interaction map
Representation of the roles and transactions relevant for a defined purpose

[SOURCE: EN ISO 29481-1:2016, 3.13]

3.15
level of information need
Framework which defines the extent and granularity of information

NOTE Information can be processed by human or automatic means.

[SOURCE: EN ISO 19650-1:2018, 3.3.16]

3.16
model view definition (MVD)
Computer-interpretable definition of an exchange requirement, specifically bound to one or more particular standard information schemas

NOTE A model view definition (MVD) is also referred to as a view definition, a subset (of a schema) and a conformance class (CC) especially in ISO 10303.

[SOURCE: EN ISO 29481-1:2016, 3.16]

3.17
process
set of interrelated or interacting activities that use inputs to deliver an intended result

Note 1 to entry: Whether the "intended result" of a process is called output, product or service depends on the context of the reference.

Note 2 to entry: Inputs to a process are generally the outputs of other processes and outputs of a process are generally the inputs to other processes.

Note 3 to entry: Two or more interrelated and interacting processes in series can also be referred to as a process.

Note 4 to entry: Processes in an organization are generally planned and carried out under controlled conditions to add value.

Note 5 to entry: A process where the conformity of the resulting output cannot be readily or economically validated is frequently referred to as a "special process".

Note 6 to entry: This constitutes one of the common terms and core definitions for ISO management system standards given in Annex SL of the Consolidated ISO Supplement to the ISO/IEC Directives, Part 1. The original definition has been modified to prevent circularity between process and output and Notes 1 to 5 to entry have been added.

[SOURCE: ISO 9000:2015, 3.4.1]

set of interrelated or interacting activities which transforms inputs into outputs

[SOURCE: ISO 9000:2015, 3.4.1]

3.18
process map
representation of the relevant characteristics of a process associated with a defined business purpose

[SOURCE: EN ISO 29481-1:2016, 3.18]

graphical display of a process

[SOURCE: ISO 13053-2:2011, 2.25]

3.19
project information requirement (PIR)
Information requirements in relation to the delivery of an asset

[SOURCE: EN ISO 19650-1:2018, 3.3.5]

3.20
purpose
<of a system> practical advantage or intended effect of the system

[SOURCE: ISO/TS 21089:2018, 3.117.2]

<of use> context and conditions of data/record use at a specific point in time, and within a specific setting

[SOURCE: ISO/TS 21089:2018, 3.117.1]

3.21
organization information model (OIM)
Set of information in a form of 3D design models, databases, spreadsheets ets. that support organizations needs to maintain, operate and develop its assets

3.22
organization information requirements (OIR)
Information requirements in relation to organizational objectives

[SOURCE: EN ISO 19650-1:2018, 3.3.3]

3.23
regulatory information model (RIR)
Set of information in a form of 3D design models, databases, spreadsheets ets. that support the regulatory and comparable needs

3.24
regulatory information requirements (RIR)
information requirements in relation to regulatory and comparable objectives

3.25
requirements
provision that conveys criteria to be fulfilled

[SOURCE: ISO/IEC 11404:2007, 3.51]

need or expectation that is stated, generally implied or obligatory

Note 1 to entry: "Generally implied" means that it is custom or common practice for the organization and interested parties that the need or expectation under consideration is implied.

Note 2 to entry: A specified requirement is one that is stated, for example in documented information.

[SOURCE: ISO/IEC 27000:2018, 3.56]

3.26
reverse engineering
design process that consists in analysing the shape, dimensions and function of a finished part or prototype and using this information to produce a similar product

[SOURCE: ISO/TS 14253-4:2010, 3.1]

3.27
ressource
individually identifiable asset such as a video or audio clip, an image or a text

NOTE All resources shall be locatable via an unambiguous address.

[SOURCE: ISO/IEC 23000-18:2018, 3.3.2]

objective or element expressed in RDF format

NOTE Resource description framework (RDF) resource is usually expressed in uniform resource identifier (URI).

[SOURCE: ISO/IEC TR 20821:2018, 3.7]

3.28
role
set of responsibilities

[SOURCE: ISO 17573:2010, 3.13]

set of characteristics that distinguish a resource's ability to exhibit a set of required behaviours

[SOURCE: ISO 18435-1:2009, 3.22]

specification which models an external intended behaviour (as allowed within a scenario) of an Open-edi Party

[SOURCE: ISO/IEC 15944-1:2011, 3.60]

3.29
specification
document stating requirements

NOTE A specification can be related to activities (e.g. procedure document, process specification and test specification), or products (e.g. product specification, performance specification and drawing).

[SOURCE: EN ISO 9000:2005, 3.7.3]

3.30
transaction
whole of the exchange of information between two physically separated communication facilities

[SOURCE: ISO 17575-1:2016, 3.21]

specification for a set of messages exchanged between pairs of actors in support of an Integration Profile

[SOURCE: ISO/TR 28380-1:2014, 2.11]

A set of related operations characterized by four properties: atomicity, consistency, isolation, and durability. A transaction is uniquely identified by a transaction identifier.

NOTE For reasons of brevity, the term "transaction" is used as a synonym of the term "provider-supported distributed transaction".

[SOURCE: ISO/IEC 10026-1:1998]

3.31
transaction map
representation of a set of messages that are exchanged between participating roles for a particular purpose

[SOURCE: EN ISO 29481-1:2016, 3.21]

3.32
use case
textual and graphical depiction of the actors and operations that address information exchange in the context of a set of specific tasks for a workflow performed by different systems or devices

[SOURCE: ISO/TR 28380-1:2014, 2.13]

typical application stated at a high level for the purposes of extracting technical considerations or comparing usages across fields

[SOURCE: ISO/IEC TR 20547-2:2018, 3.2.1]

4 General information and requirement summary

4.1 Acknowledgements

Is this needed in TR?

5 What is an Information Delivery Manual?

5.1 General

IDM is a technical document (physical or digital) that describes business needs, activities and transactions and information exchange requirements for a specific purpose. Business need defines a Use Case. IDM is a way to record and share Use Cases in a harmonized way.

The activities and transactions fulfilling the objectives of the Use Case are outlined with process maps and/or interaction maps. According to the standard, the Information exchange requirements should be explained in plain language terms. More technical description should be considered to enable machine-readable data exchange.

Harmonized IDM's benefit clients and other industry actors with better-coordinated and more accurate information with fewer errors combined with the resulting productivity improvements. IDM specifications can be used for information exchange requirements in tenders, contracts as well as for

guidance in projects. For software companies, the IDM's work as a basis for software implementation, including a precise specification of what has to be exchanged.

IDM's can represent the information needs at different levels from project to asset to organization. Also, the regulatory information needs and requirements can be presented using IDM's. The detail level of the Exchange Requirements may be a little bit different on these levels. For example, on the project and asset level, most if not all the exchange requirements should be very specific. At the same time, on the organizational level, some of the requirements can be more general, reflecting the strategic goals of the organization.

Use-Cases, IDM's and Information Requirements are relevant not just in BEP definition but also in all processes leading to its development EIR-PIR-AIR-OIR-RIR (Use cases are derived from strategic goals); see figure 3.

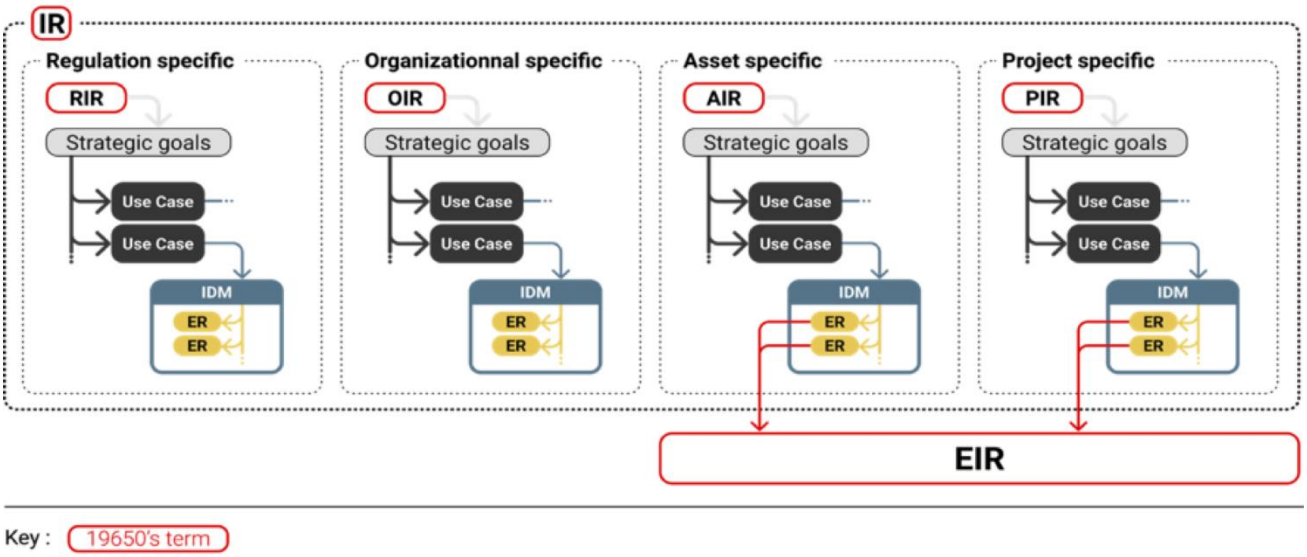


Figure 3 — Use-Cases, IDM's and Information Requirements

5.2 Structure of IDM

IDM has three core elements that are presented in figure 4.

— The first element of IDM is Use Case. Use Case is a combination of the purpose of the information delivery, business need, involved actors and their roles and external aspects, that need to be considered within the delivery.

— Second element is Process Definitions. These are represented in the form of different types of process and/or interaction maps.

— Third element is Exchange Requirements (ER) that present in detail the geometrical and information requirements of the delivery. Even though these properties are presented in non-technical terms, they need to be specific.

— In order to be even more precise, the Exchange Requirements can be developed to a Model View Definition (MVD). It is a technical, IFC specific, way to describe the needed data. For example, the use of IfcEntity data fields (name, number, longname) and IfcPropertySets and IfcProperties for the Exchange Requirement are defined in the MVD.

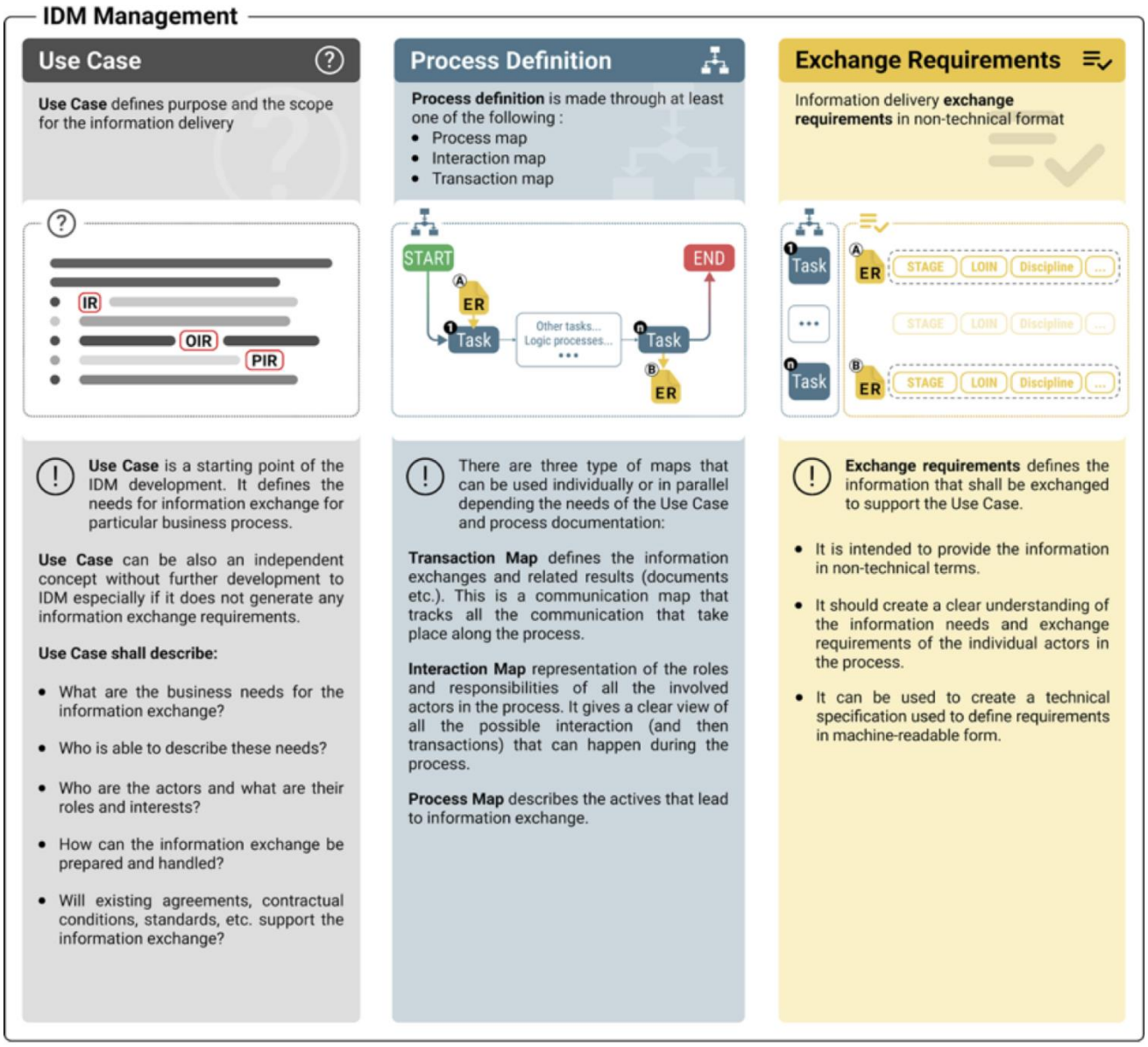


Figure 4 — Elements of Information Delivery Manual

5.3 Use Case

Use Case is the starting point of the IDM development. It describes the business need and ideal scenario – including goals and success criteria – for the information exchange. The different parties and their responsibilities are specified with actors and roles. At the same time, their initial activities in the information exchange are also described. Agreements, contracts, standards etc. deal with the external conditions that may have an effect to the objectives or deliverables of the information exchange.

Use Case can also be used as an independent concept without further development to IDM. That approach would be relevant to such Use Cases that don't generate any information exchange requirements but define the use of existing information. Use Case shall describe:

— Who are the actors, and what are their roles and interests?

— How can the information exchange be prepared and handled?

— Will existing agreements, contractual conditions, standards, etc. support the information exchange?

— When collecting this information, it's also necessary to identify who is able to describe these needs.

The preparation ends up with an assessment of whether it is possible to reach the business needs stated by the goals and success criteria. If the assessment is positive, the actual IDM development can be initiated. If the assessment turns out to be negative, you may choose to revise the use case.

EXAMPLE TBA

5.4 Process Definition

5.4.1 General

Activities and transactions describe the process of information production and exchange for the Use Case. These processes need to specify the tasks and responsibilities of each actor. There are two methods that can be used; the Process Map, and the Interaction Map. The most commonly used method is the process map. The interaction map may be used to support, or in place of, the process map.

5.4.2 Process Map

The Process Map (see figure 5) is an activity-based diagram that describes the actives that lead to information exchange.

EXAMPLE The client asks a design team to manage the design process, so the project leader asks the system engineer to develop system specifications, then the designer develops 3D model, and cost engineer calculate costs. The project leader checks if the design satisfies client's needs and expectations. If no, the project leader asks for modifications to systems engineer, then to designer, eventually to cost engineer, and then he/she checks again if the new design satisfy client's needs and expectations. If the suggested design satisfies the client's requests, it is submitted to the client, who evaluates it and, if it is fine, approves it. Otherwise the client requests adjustments and the design process has to be repeated.

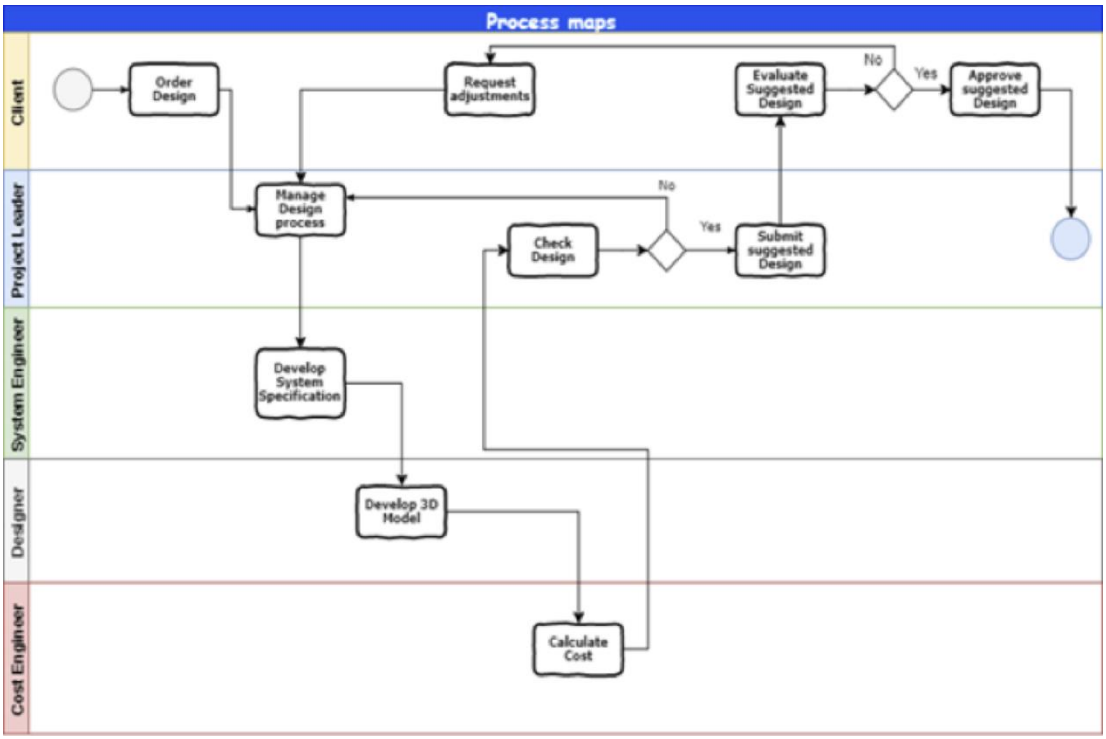


Figure 5 — Example of a Process Map

5.4.3 Interaction Map

The Interaction Map (see figure 6) is an actor-based representation of the roles and responsibilities of all the involved actors in the process. It gives an overview of all the interactions and transactions that can happen during the process.

EXAMPLE To start and develop a design process, the client has to interact with a project leader, who has the role to coordinate all the design activities undertaken by the design team Therefore the project leader interacts with: the system engineer who is in charge of developing the system specifications, the designer who is in charge of developing the 3D model, the cost engineer who is in charge of calculating costs.

The project leader is responsible for leading the design team, interacting with each design specialist and checking the final suggested design in order to guarantee that it satisfies client's needs and expectations. Once the design is ready, the project leader interacts back with the client submitting him/her the suggested design.

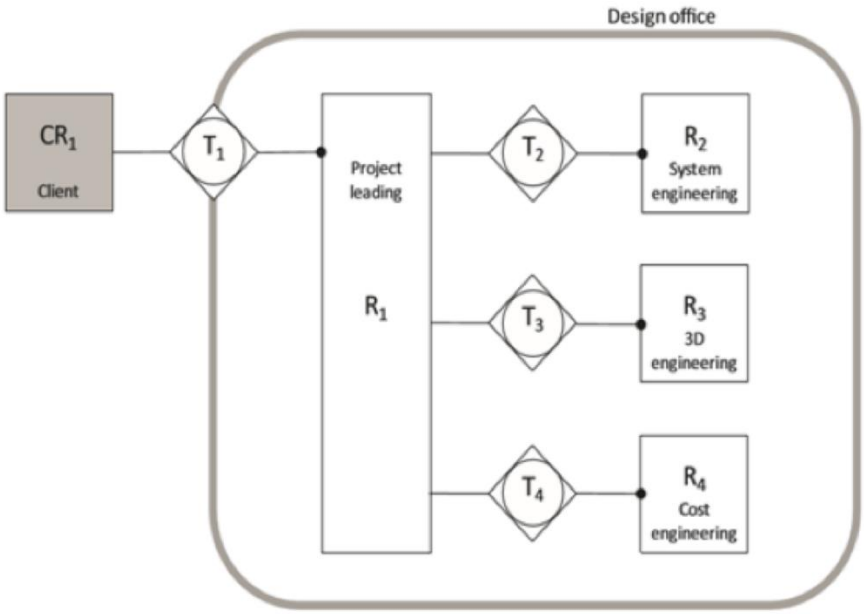


Figure 6 — Example of an Interaction Map

In addition, the Interaction Map can be further detail using a Transaction Map.

5.4.4 Transaction Map

A Transaction Map (see figure 7) represents the particular transactions of the interaction map and their related results (documents etc.). It is a communication map that tracks all the communication (such as agreements, changes, updates) that take place along the process. Transaction cannot be used alone without an interaction map.

EXAMPLE If the client appoints the project leader for developing a design, this request for delivery of design represents a transaction which is then followed by the transmission of documents (for instance, existing drawings/3D models, reports, certifications, and authorisations), that are useful for the design team. Once the design team has accomplished its task, the project leader submits the proposed design, and this is considered a transaction from the project leader to the client. Then the client can ask for adjustments (this is a transaction which leads to a new design process reiteration) or approve the proposed design; or not approve the proposed design, asking for a new design team.

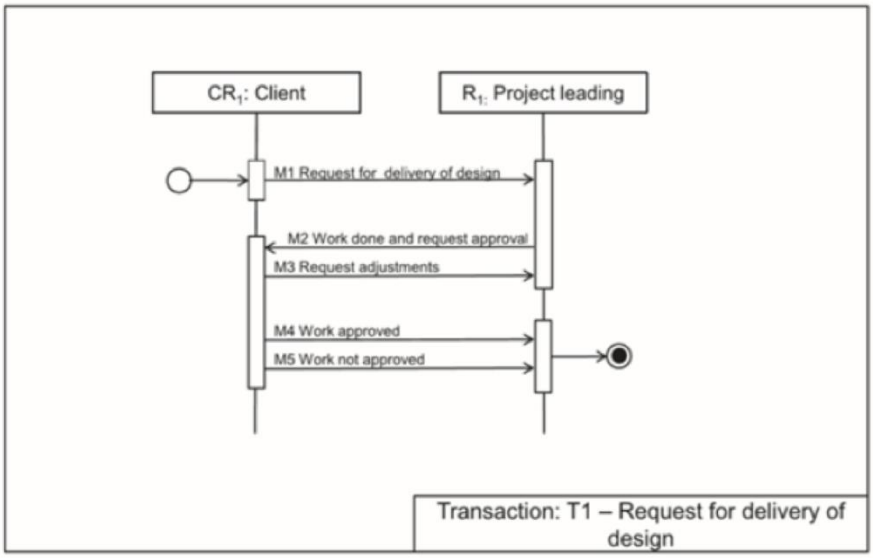


Figure 7 — Example of a Transaction Map

5.4.5 Exchange Requirements

Exchange Requirements define the information that shall be exchanged to support the activities within the Use Case. This can be both in-coming and out-going data. Exchange Requirements are intended to provide a description of the information in non-technical terms so that it is understandable to the downstream actor (architect, engineer, contractor, etc.).

Even though being non-technical, the requirements should be specified in such detail, that reliable data delivery is possible. For example, in the case of three-dimensional BIM delivery, the following aspects need to be defined:

XXXXX

5.4.6 Data formats

The Exchange Requirements (ER) should specify the data formats that have to be used for different data forms in the delivery. In the examples of this document, the model data format for the deliverables is IFC (EN ISO 16739).

5.4.7 Geometric Properties

The geometrical requirements should include the digital building objects (entities) that need to be included in the delivery. If applicable, the ER should specify the additional measures of the geometry, such as extrusion direction.

In MVD level, the geometrical properties need to be specified in technical terms such as required IfcEntities and their values.

5.4.8 Alphanumeric Properties

The additional properties need to be specified in such detail, that appointed party can produce and deliver the data in the way, that is specified in the ER. It should also specify which units and standards for data content have to be used. For example, in case of airflow terminal, you would need to specify that the unit for the airflow is m/s, and it should present the as-designed value of the airflow.

In MVD level, the additional properties need to be specified in technical terms such as IfcEntity data fields, PropertySets and Properties.

5.5 How to create an IDM

5.5.1 General

IDM development follows the structure of IDM elements explained above. Accordingly, the development has 3+1 steps:

— Use Case definition,

— Process Definitions,

— Exchange Requirements, and if needed,

— Technical Exchange Requirements.

5.5.2 Define the Use Case

To define a Use Case, you should answer the questions that are introduced in the Use Case definition section. You should also need to find parties who can answer them. By answering the questions, you shall specify:

— What is the purpose of the information delivery?

— What is the business need and goals of the information delivery?

— What are the success criteria for the information delivery?

— Actors; who are the stakeholders and domains connected to the information delivery process?

— Roles; which kind of role the actor has in the information delivery?

— How can the information exchange be prepared?

— How can the information exchange be handled?

— Will existing agreements, contractual conditions, standards, etc. support the information exchange?

Once you have answers to these questions, you need to evaluate, whether it is possible to reach the business needs stated by the goals and success criteria. If the assessment is positive, the actual IDM development can be initiated. If the assessment turns out to be negative, you may choose to revise the Use Case.

5.5.3 Discover the process

The standard offers different ways for process discovery – process map and interaction map – that can be used individually or in parallel. If there is no particular reason to describe the process using the interaction map, it is recommended that only the process map is used. The recommended way to outline the process map, is BPMN. When an interaction map approach is used, it can be supported by transaction map. Since transaction map is a sub-set of interaction map, it should not be used alone without an interaction map.

The process map can be developed with following methods: process discovery, information constrains customization and reverse engineering.

5.5.3.1 Process discovery

If there is no existing solution that supports the information delivery process, then it should be developed utilizing the Process Discovery path (1) visualized in the figure 8.

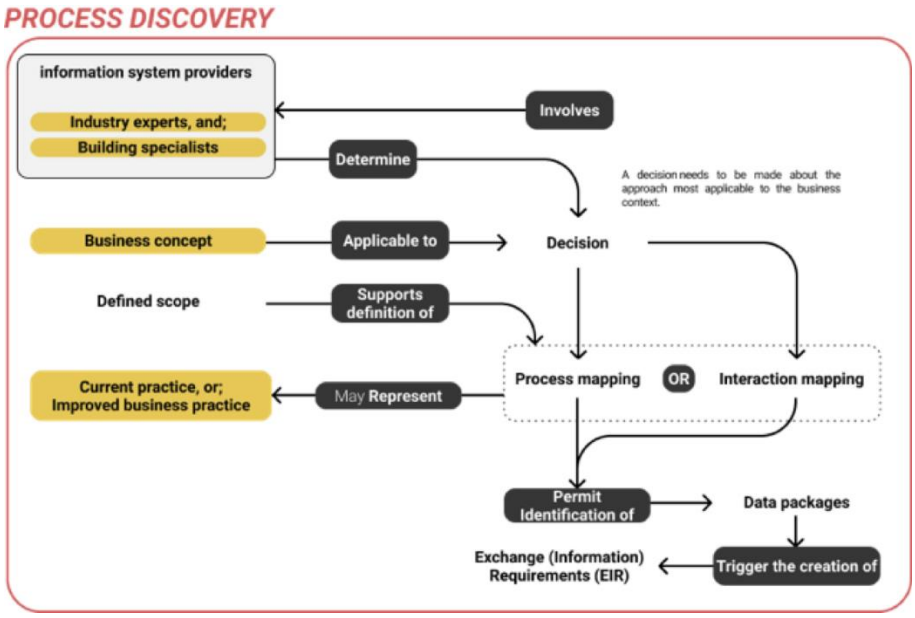


Figure 8 — Process Discovery path

5.5.3.2 Information Constrain Customization

If there is already an existing solution that supports partially the information delivery process, then it should be developed utilizing the Information Constrain Customization path (2) visualized in the figure 9 (figure 9 TBA).

Figure 9 — Information Constrain Customization path

5.5.3.3 Reverse Engineering

If there is already an existing solution that supports the information delivery process, then it should be developed utilizing the Information Reverse Engineering path (3) visualized in the figure 10.

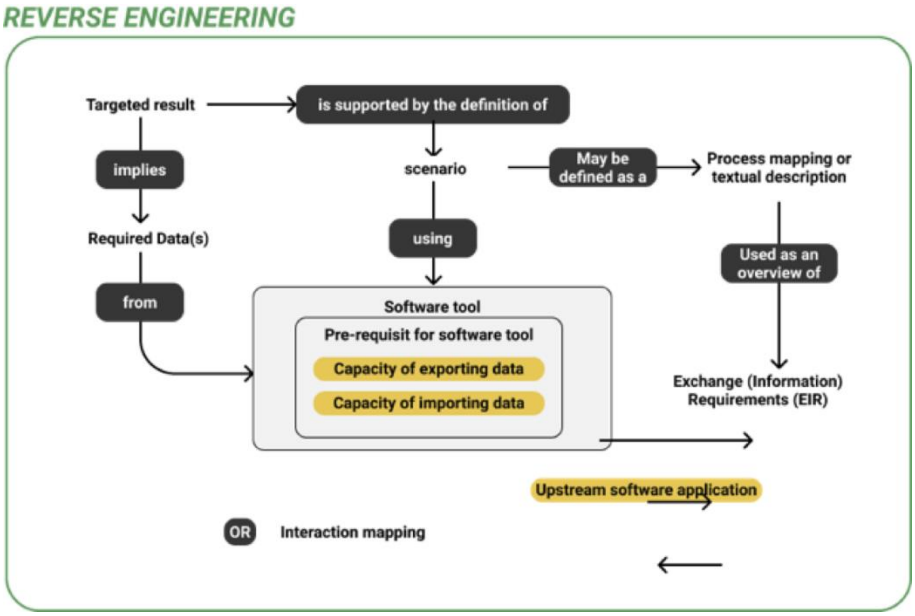


Figure 10 — Reverse Engineering path

Figure 11 shows an IDM process development overview.

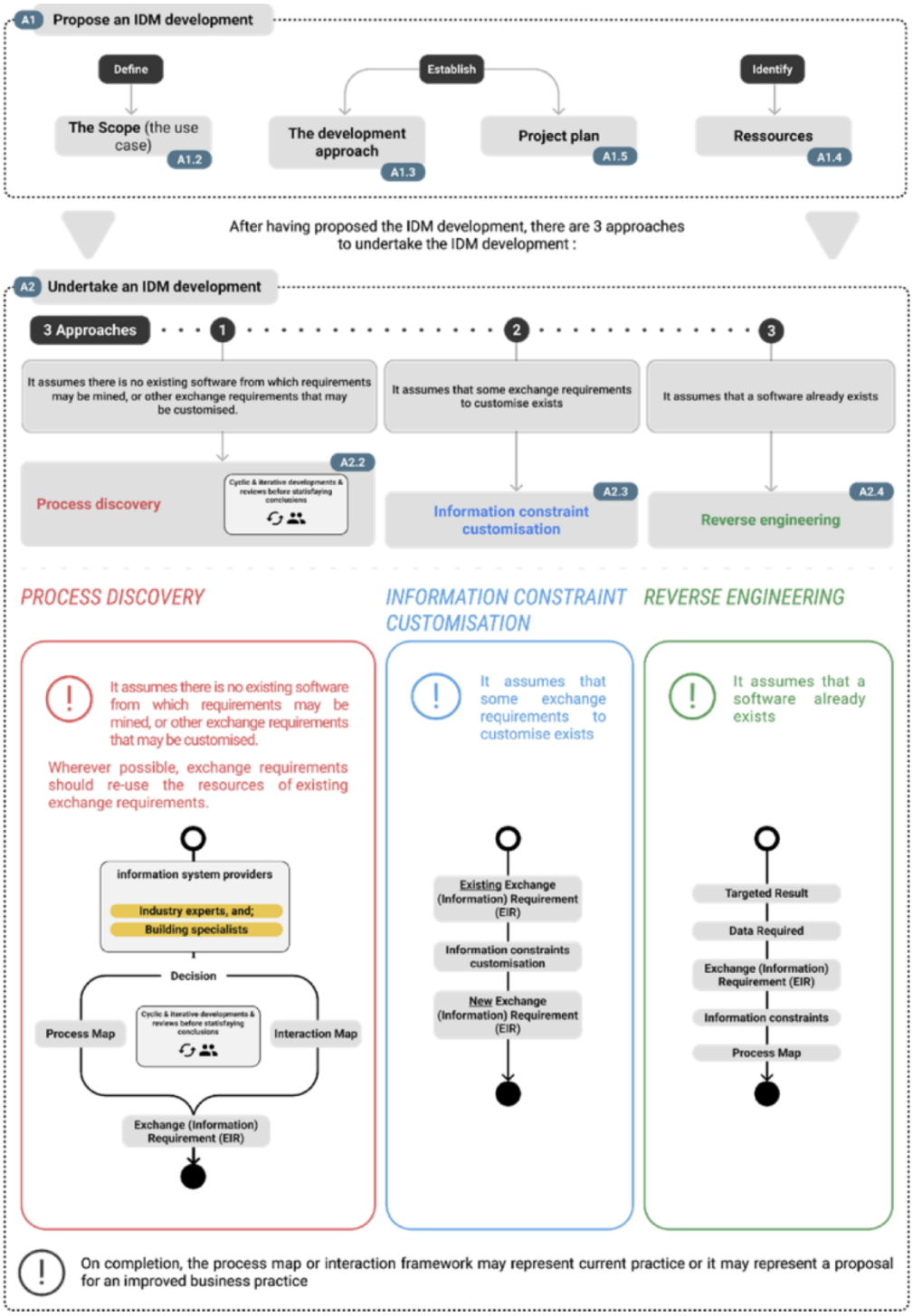


Figure 11 — IDM process development overview

5.5.4 Addressing the Exchange Requirements

The end result of the IDM is the information exchange requirements. This can be done in two steps:

— In the first step, you define the overall information needs for the data delivery.

— In the second step, this is developed to a more detailed level.

In the detailed description, the list of entities and entity properties has to contain all the information that is needed to carry out the data exchange successfully (see table 1).

Table 1 — Example of Exchange Requirements

Entity type	Definition	Example and further explanations	Mandatory	Optional
Concrete Beam	Beam s a horizontal, or nearly horizontal, structural member that is capable of withstanding load primarily by resisting bending.	Definition according to ISO 6707-1: structural member for carrying load(s) between or beyond points of support, usually narrow in relation to its length and horizontal or nearly so.		
Property concept				
3D Model	Three-dimensional bounding box	The minimum or smallest bounding or enclosing box is a term used in geometry, with plans parallel to the axis in a coordinate system.		
Property				
Identification	Number or code that identifies the beam.	The same identifier has to be used in all documents and models that reference the beam.	x	
Description				x
Profile Type	Type of the beam profile		x	
Length	Length of bounding box in mm	Length is the length (x) of the beam	x	
Weight	Total gross weight of the beam without add-on parts,	Not taking into account possible processing features (cut-out's, etc.) or openings and recesses.	x	
Location	Location of the bounding box in a coordinate system	Vector and rotation from the origin of the coordinate system to insertion point of the bounding box.	x	
Fire Rating	Fire rating for the element.	Value is given according to the national fire safety classification.		x
Rebar Total Weight	Total weight of the steel rebars in the beam	If the total weight of the steel rebars is not known, use property "Rebar Estimate Weight".	(x)	

5.5.5 Technical Exchange Requirements

In order to be sure that the information delivery actually meets the needs of the Use Case, it is many times necessary to define the required entities and their properties in an exact manner. Even though Model View Definition is not a part of the IDM standard definition, you may need a machine-readable description of the Exchange Requirements. This definition needs to be specified in a way and detail, that supports machine-to-machine data exchange (see table 2).

Table 2 — Example of Technical Exchange Requirements

Entity type	IFC definition	Sample Value	Unit	Data Type
Beam	IfcBeam			
Property concept				
3D Model	Geometry according to EN ISO 16739			
Property				
Identification	Name			String
Description	Description			String
Construction Method	Pset_ConcreteElementGeneral.ConstructionMethod	Precast		String
Profile Type	Profile according to EN ISO 16739			
Length	Qto_BeamBaseQuantities.Length	4800	mm	Decimal
Wight	Qto_BeamBaseQuantities.GrossWeight	1830	kg	Decimal
Location	IfcLocalPlacement; IfcGridPlacement			
Fire Rating	Pset_BeamCommon.FireRating	EI120		String
Rebar Total Weight	PsetFIN_StructuralElementCommon.RebarTotalWeight	95	kg	Decimal
Rebar Estimate Weight	PsetFIN_StructuralElementCommon.RebarEstimateWeight	100	kg	Decimal

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