ISO/IEC TR 30194

TECHNICAL REPORT

Internet of things (IoT) and digital twin – Best practices for use case projects

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ISO/IEC TR 30194

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TECHNICAL
REPORT

Internet of things (IoT) and digital twin – Best practices for use case projects

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

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INTERNET OF THINGS (IoT) AND DIGITAL TWIN –
BEST PRACTICES FOR USE CASE PROJECTS

FOREWORD

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ISO/IEC TR 30194 has been prepared by subcommittee 41: Internet of Things and Digital Twin, of ISO/IEC joint technical committee 1: Information technology. It is a Technical Report.

The text of this Technical Report is based on the following documents:

Draft	Report on voting
JTC1-SC41/457/DTR	JTC1-SC41/465/RVDTR

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this Technical Report is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1, and the ISO/IEC Directives, JTC 1 Supplement available at www.iec.ch/members_experts/refdocs and www.iso.org/directives.

INTRODUCTION

The concept of use cases was introduced in the 1980s in system engineering by Ivar Jacobson [1][1] to enable the capture and specification of the requirements of a system, using textual, structural, and visual modelling techniques. The practice of providing use cases has been widely used at research level [2]. It has been nearly systematically used at standardization level as shown in the following examples:

– methodology for use cases from IEC 62559 [3], [4], [5];

– use cases in the ambient assisted living (AAL) domain [6];

– use cases in the big data domain [7], including three iterations from NIST [8], [9], [10];

– use cases in the IoT domain [11];

– use cases in the AI domain [12], including a companion standard on security and privacy [13];

– use cases in the digital twin domain [14];

– use cases in the blockchain domain [15];

– use cases on privacy-by-design in the consumer domain [16];

This document describes best practices for use case projects. It is structured as follows:

– Clause 5 provides an introduction on existing definitions (5.1), and specifies a conceptual model of use cases.

– Clause 6 explains the purpose of use case projects (6.1), and provides examples of use case projects (6.2).

– Clause 7 explains the purpose of use case templates (7.1), providing a conceptual model of a use case template (7.2), and describing the content of a template: description blocks, predefined fields, instructions, and samples (7.3).

– Clause 8 explains the purpose of use case project plans (8.1), covering the use case initiative governance process (8.2), the template development process (8.3), the template maintenance process (8.4), the use case development process (8.5), and the use case maintenance process (8.6).

– Annex A provides examples of use case projects on IoT (Clause A.2), digital twins (Clause A.3), artificial intelligence (Clause A.4), and privacy for consumer goods and services (Clause A.5).

Figure 1 to Figure 9 use the Unified Modelling Language (UML) diagrams notation.

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[1] Numbers in square brackets refer to the Bibliography.

INTERNET OF THINGS (IoT) AND DIGITAL TWIN – BEST PRACTICES FOR USE CASE PROJECTS

1 Scope

This document describes best practices for use case projects in terms of projects, templates and plans, with the objective to improve the consistency of content across different use case projects and enable sharing of knowledge between projects. A long-term goal is to foster interoperability between tools supporting the collection and maintenance of use cases.

This document is intended for developers of use case projects, including in the context of standardization.

The document can be used to complement existing methodology standards such as IEC 62559 [3], [4], [5].

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

- IEC Electropedia: available at https://www.electropedia.org/
- ISO Online browsing platform: available at https://www.iso.org/obp

3.1
actor
stakeholder involved in a *use case* (3.4)

3.2
role
function assumed or part played by an external *actor* (3.1) or party, in interaction with the system under focus

Note 1 to entry: Parties include functions, systems, organizations, devices.

3.3
stakeholder
individual, team, organization, or classes thereof, affected by or affecting the *use case* (3.4) directly or indirectly

3.4
use case
specification of a set of actions performed by a system, which yields an observable result that is, typically, of value for one or more roles or other *stakeholders* (3.3) of the system

Note 1 to entry: Based on ISO/IEC 19505–2:2012, 16.3.6.

3.5
use case template
structured description of a *use case* (3.4) based on a set of *predefined fields* (3.7)

3.6
use case project
project involving the collection of *use cases* (3.4)

3.7
predefined field
agreed set of fields in relation to a domain

3.8
description block
group of *predefined fields* (3.7)

3.9
vocabulary
terminological dictionary that contains designations and definitions from one or more domains or subjects

Note 1 to entry: A vocabulary favours re-use.

[SOURCE   ISO 1087:2019, 3.7.5, modified – Note 1 to entry has been replaced.]

4   Abbreviated terms

UML   Universal Modelling Language

5   Use cases

5.1   General

Table 1 shows a number of definitions which have been provided for the concept of use case in standards

Table 1 – Examples of definitions of the concept of use case in standards

Committee	Standard	Definition
ISO/IEC JTC 1/SC 7 (Software and system engineering)	ISO/IEC/IEEE 26513:2017, 3.46	description of the behavioural requirements of a system and its interaction with a user
ISO/TC 215 (Health informatics)	ISO/TR 28380-1:2014, 2.13	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
ISO/TC 10 (Technical product documentation)	ISO 10209:2022, 3.14.46	description of behavioural requirements of a system and its interaction with a user
ISO/IEC JTC 1/SC 41 (IoT and digital twin)	ISO/IEC TR 22417:2017, 3.2	specification of a sequence of actions, including variants, that a system (or other entity) can perform, interacting with actors of the system
	ISO/IEC TR 22417:2017, 3.3	IoT use case description of a hypothetically possible situation where IoT concepts, products and services may be specified as a set of actions associated with actors in an IoT system, which yields an observable result that is, typically, of value for one or more actors or other stakeholders of the system Note 1 to entry: The aim is to pictorially describe a field of problems in a way that the artificial situation makes IoT approaches to solutions evident in their temporal, spatial as well as technical dimension.

5.2   Conceptual model of a use case

The conceptual model of a use case is shown in Figure 1:

–   a use case can include several interaction scenarios,

–   a scenario involves actors with specific roles,

–   a scenario is about a system of interest, and

–   a scenario describes how a goal is attained.
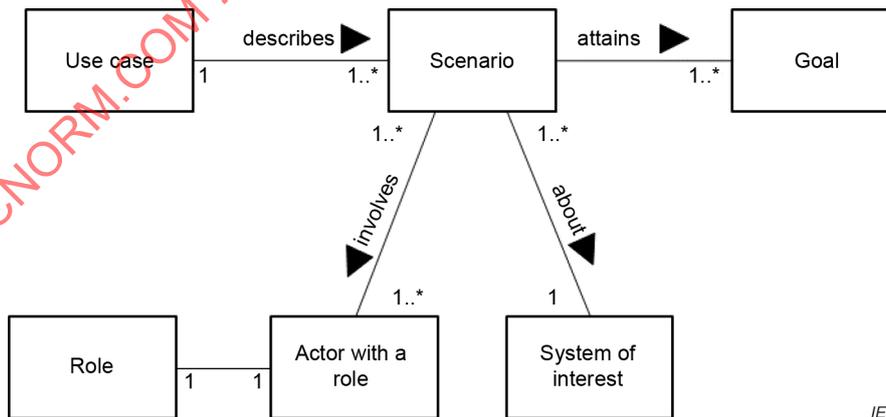
Figure 1 – Conceptual model of use case

6   Use case projects

6.1   Purpose

Use case projects collect use cases in order to serve different goals:

a) study;

b) guidance;

c) expectation;

d) business;

e) system;

f) a use case project providing both justifications on expectations, arguments on business goals, and arguments on a solution.

Use case projects are often followed by other projects.

g) ISO/IEC TR 30172:2023 [14] collects use cases on digital twin. ISO/IEC TR 30172:2023 has been followed by ISO/IEC 30173:2023 [17], which focuses on terms and concepts. A future project, ISO/IEC 30188, focuses on reference architecture.

6.2   Examples of use case projects

6.2.1   Study project

In a study project, use cases describe real implementations. The purpose of a study use case is to provide insight on important building blocks (Figure 2).

EXAMPLE 1   ISO/IEC TR 22417:2017 [11] provides insight on IoT.

EXAMPLE 2   ISO/IEC TR 30172:2023 [14] provides insight on digital twins.
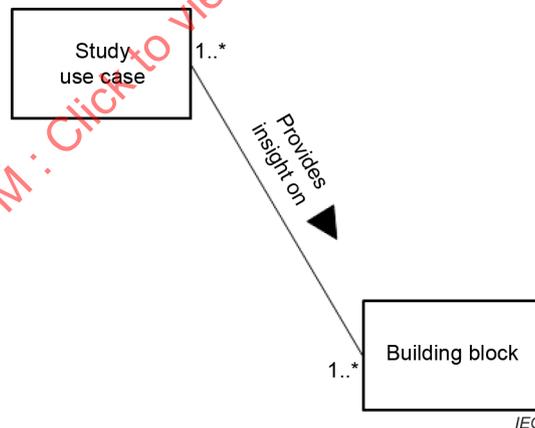
Figure 2 – Purpose of study use case

6.2.2   Guidance project

In a guidance project, use cases are examples, real or invented. The purpose of a guidance use case is to provide guidance on the use of requirements (Figure 3).

EXAMPLE   ISO/TR 31700-2:2023 [16] provides examples on the use of ISO 31700-1:2023 [18].
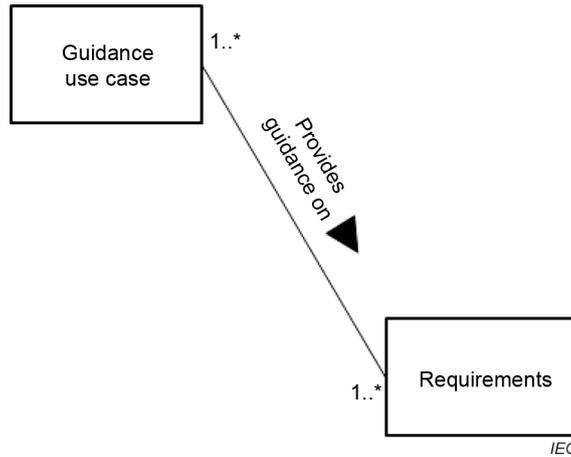
Figure 3 – Purpose of guidance use case

6.2.3   Business project

In a business project, a business use case aims at describing business processes and business role interactions, while remaining solution agnostic (Figure 4).
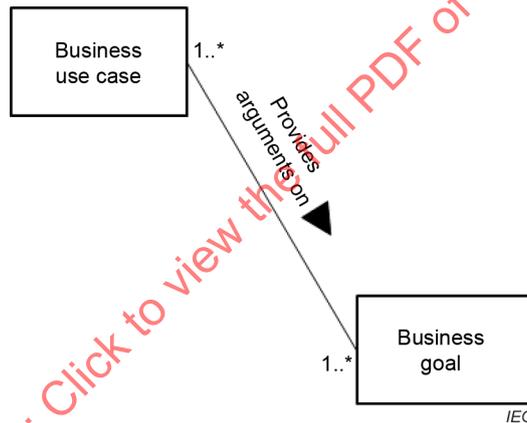
Figure 4 – Purpose of business case

6.2.4   Business expectation project

In a business expectation project, use cases provide justifications on a specific expectation (Figure 5).
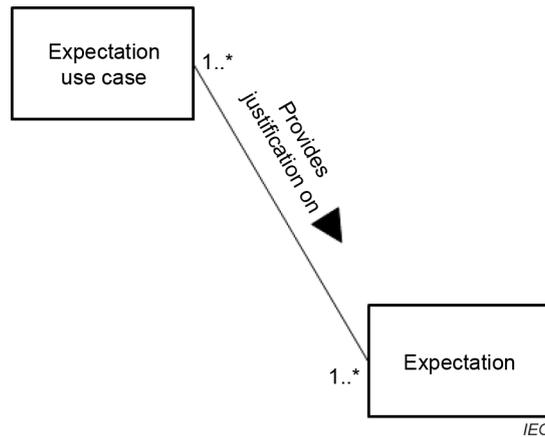
Figure 5 – Purpose of expectation use case

The purpose of an expectation project is to provide guidance on some specific stakeholder expectations in a system of interest.

EXAMPLE ISO/IEC TR 27563:2023 [13] provides expectations on security and privacy related to the artificial intelligence use cases of ISO/IEC TR 24030:2021 [12].

6.2.5 System project

In a system project, a system use case provides arguments on a solution to meet the goals of a use case (Figure 6). A system use case aims at describing functional implementations of a solution to meet business use case objectives
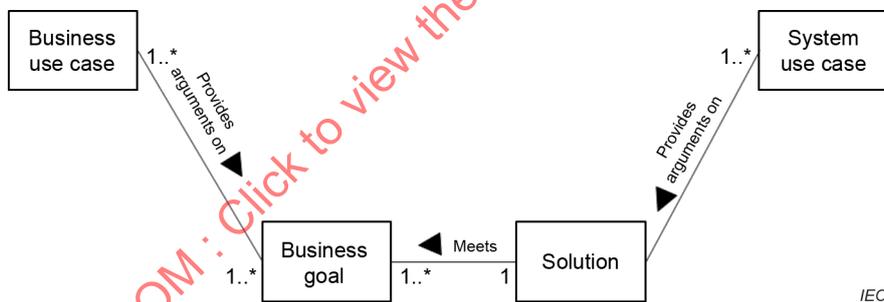
Figure 6 – Purpose of system use case

The conceptual model of a system use case is shown in Figure 7:

– a system use case describes solutions,

– a solution involves architecture descriptions,

– a solution is about a system of interest, and

– a solution describes how a business goal is met.
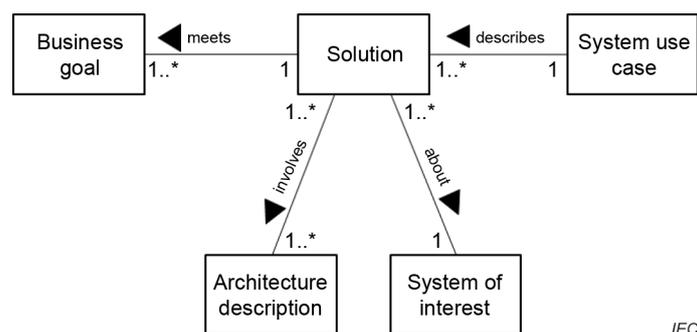
Figure 7 – Conceptual model of system use case

The purpose of a system use case is to describe a solution.

EXAMPLE   Annex C of ISO/IEC 20547-4:2020 [19] describes a solution for security and privacy in an automotive big data environment.

7 Use case templates

7.1 Purpose

Use case templates enable unified descriptions of a collection of use cases.

EXAMPLE 1   ISO/IEC TR 24030:2021 [12] includes 132 use cases.

NOTE   There can be as many templates as situations.

Use case templates enforce the use of a vocabulary based on the conceptual model of use case (Figure 1). The use of a common vocabulary enables in turn the sharing a description resources.

EXAMPLE 2   Roles, goals, and keywords are terms that allow external resources to be shared.

Use case templates provide information on a domain.

EXAMPLE 3   IoT [11], digital twin [14], AI [12], integration of IoT and DLT/Blockchains [15], big data [7], and AAL [6].

Information is provided in predefined fields.

EXAMPLE 4   Identification, scope and objectives, narrative, key performance indicators, actors, issues, relation with other use cases, referenced standards, scenarios, security, privacy, trustworthiness, conformity aspects, use case diagram, data flow diagram, sequence diagram.

Use case templates are constructed to enable relationships between use cases.

EXAMPLE 5   Use case A includes use case B.

EXAMPLE 6   Use case A extends use case B.

EXAMPLE 7   Use case A is a specialization of use case B.

7.2 Conceptual model of use case template

Figure 8 shows the conceptual model of a use case template:

– a use case template shapes the description of a use case;

– a use case template focuses on a domain, on one or several intended goals and several topics;

– a use case template is guided by instructions and samples; and

– samples use template, domain and topic vocabulary.

NOTE 1   The template vocabulary can be based on a standard vocabulary.

NOTE 2   When a standard vocabulary is used, profiles or agreed subsets can be used.

EXAMPLE   IoT is a domain, interoperability is a topic.
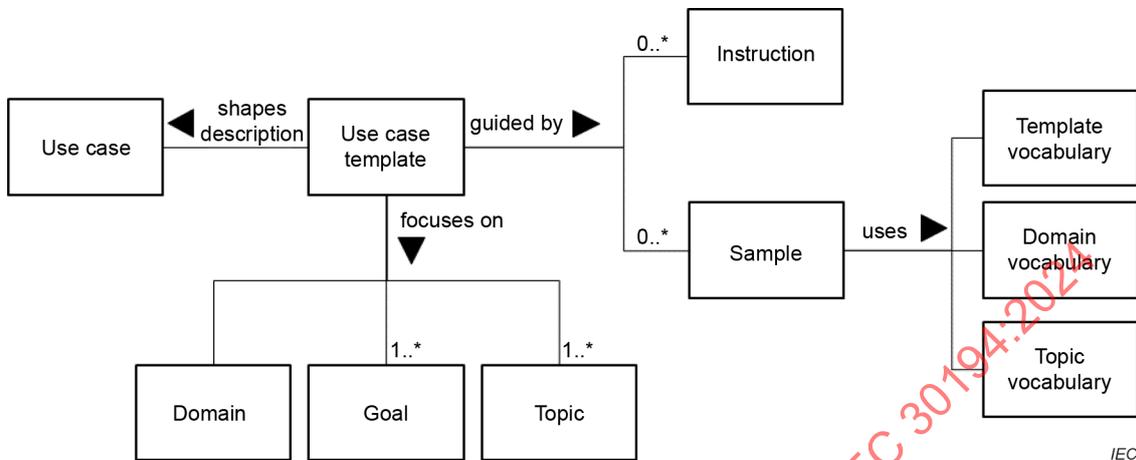
Figure 8 – Conceptual model of a use case template

Table 2 shows examples of vocabulary.

Table 2 – Examples of vocabulary

Template vocabulary	Use case, actor, scope, objective, narrative, issues, referred standards, domain, role, scenario	
Domain vocabulary	IoT domain	IoT, device, sensor, actuator, IoT system, IoT gateway, IoT network, IoT application, IoT platform, digital connectivity
	IoT role	Sensor, actuator, operator, user
	Digital twin domain	Digital twin, digital entity, target entity, digital domain, physical domain, digital representation, digital modelling
Topic vocabulary	Security and privacy	Confidentiality, integrity, availability, unlinkability, transparency, intervenability
	Digital twin application	Visualization, optimization, simulation, monitoring, prediction, planning
	Assurance	Audit, conformity assessment, evidence, testing

7.3   Template description

7.3.1   Overall structure

Figure 9 shows the structure of a use case template:

– a use case template includes one or more description blocks;

– a description block can include nested description blocks;

– a description block includes a title;

– a description block includes one or more predefined fields;

– a predefined field consists of a title, possibly some instruction, and possibly samples.
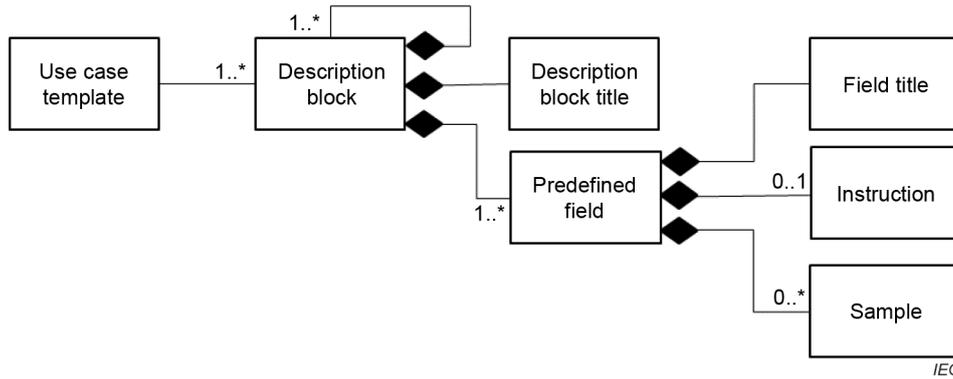
Figure 9 – Structure of use case template

NOTE   The description block title and field title can use the template, domain, and the topic vocabulary.

7.3.2   Description blocks

Figure 10 shows an example of description block:

– the left part shows the description block container, and

– the right part shows the block title, as well as two descriptions fields.
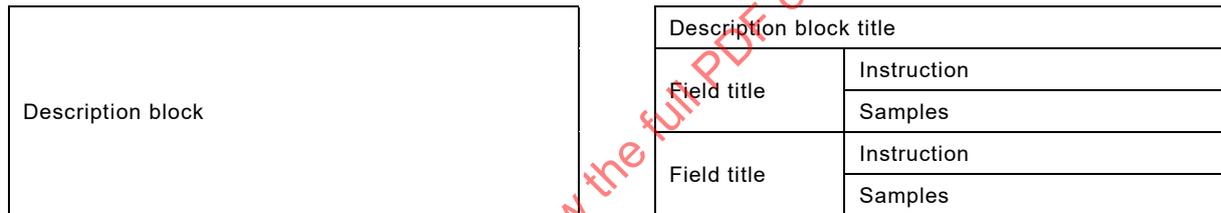
Figure 10 – Description block example

NOTE   A description block title can be considered as a class while the field titles are the attributes of the description block class.

Some description blocks can be categories. Figure 11 shows an example of categorized description blocks, using IEC 62559-2 [4] use case template:

– general information is an empty description block which categorizes three description blocks (use case identification, version management, scope and objective);

– the left part shows one category element (general information) and three description blocks,

  • use case identification,

  • version management, and

  • scope and objective; and

– the right part shows the content of the three description blocks.

Use case identification	
Idea	Instruction
	Samples
Area/ Domain(s)/ Zone(s)	Instruction
	Samples
Name of use case	Instruction
	Samples
Version management	
Version number	Instruction
	Samples
Date	Instruction
	Samples
Name of authors	Instruction
	Samples
Changes	Instruction
	Samples
Approval status	Instruction
	Samples
Scope and objective	
Scope	Instruction
	Samples
Objective(s)	Instruction
	Samples
Related business case(s)	Instruction
	Samples

Left column blocks: General information category — Use case identification **description block**; Version management **description block**; Scope and objective **description block**. Right column: General information.

Figure 11 – Categorized description block example

7.3.3 Predefined fields

Table 3 shows examples of description blocks and predefined fields. A template can include a general information block as shown in Figure 11.

NOTE   Description block titles can follow specific rules.

Table 3 – Examples of predefined fields

Description block title	Predefined fields
Name of use case	Id, Name
Version management	Version, data, name of author or committee, approval status
Basic information	Source(s), conditions of use, maturity of use case, regional or national relation, vertical application area, well-known or related existing use cases, keywords for classification
Scope of use case	Scope of use case
Objective of use case	Objective of use case
Narrative of use case	Short description, description, link
Actors and roles	Name, role, description, interaction
Issues	Relevant standardization committees, relevant standards, standard status
Relation with other known use case	Known use case, source, relationship
General remarks	General remarks
Data security, privacy and trustworthiness	Data security requirements, privacy requirements, trustworthiness requirements
Conformity aspects	Conformity aspects
User requirements	User requirements and interactions with other actors

7.3.4 Instructions

A template can provide instructions on a predefined field.

EXAMPLE   Provide the name of the use case (in one line).

Instructions on a predefined field provide guidance to the use case developer on how to provide content for the predefined field. Table 4 shows examples of instructions.

Table 4 – Examples of instructions

| Domain	Category	Predefined field	Instruction
Any	General information	Name of the use case	Provide the name of the use case
Any	Stakeholders	Actor role	Provide the role of the actor, using a vocabulary that is commonly used in the use case domain (e.g. big data)
Any	Security and privacy	Security assets	Provide a list of security assets

7.3.5 Samples

7.3.5.1 Structure of a sample

This document uses the term sample to avoid confusion with the term example. The term sample refers to examples in a template.

The structure of a sample is shown in Figure 12. Samples consist of

– free text,

– well-formed sentences,

– machine-readable diagrams,

– figures, and

– other resources.
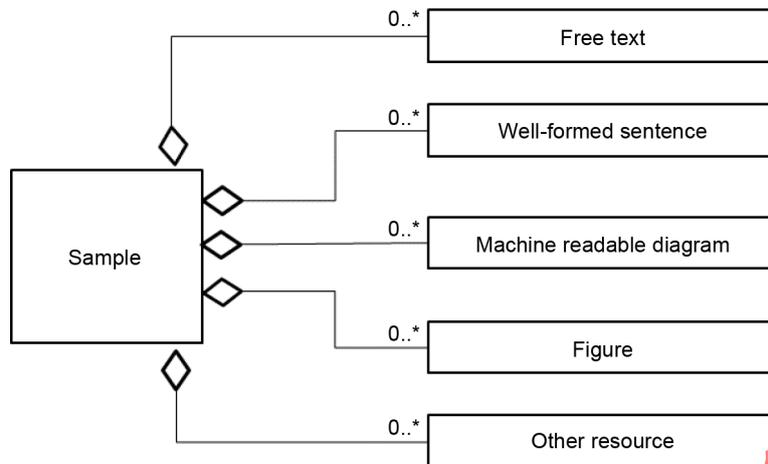
Figure 12 – Structure of a sample

A template can include samples on the content of predefined fields as shown in Table 5, Table 6 and Table 7.

NOTE   Some restrictions can be made on some predefined fields. For instance, the "name of the use case" predefined field can be based on required naming conventions.

7.3.5.2   Free text

Free texts are samples provided from existing use cases. Table 5 shows examples of free text.

Table 5 – Examples of free text

Domain	Use case	Predefined field	Sample
IoT	Remote management of large equipment in a plant [11]	Short description	An IoT system using cloud services is deployed by the equipment manufacturer. The cloud services are connected to all the manufacturer's deployed equipment in different plants. In this set-up, the operator from the manufacturer remotely monitors the equipment. If an event or an alarm occurs, the operator can act on it remotely; for example, by sending the repair person, ordering spare parts, etc.
AI	Explainable artificial intelligence for genomic medicine [12]	Short description	This technology was deployed to improve the efficiency of investigatory work for experts in genomic medicine, utilizing training data and a knowledge graph that made use of public databases and medical literature databases in the field of bioinformatics. It was then evaluated to validate that it was possible to find and link the basis supporting findings with regard to phenomena whose interrelationships are only partially understood.
Integration of IoT and DLT/Block chains	Agricultural product tracing [15]	Privacy requirements and implications for applications, systems, etc.	The privacy requirements are important for every stakeholder, participant, and user. The data/information of stakeholders, participants and users are not obtained by unauthenticated users. Encryption or technologies with anonymous characteristics can be used to protect the data/information privacy.

7.3.5.3   Well-formed sentences

A well-formed sentence is a fixed text with a variable part, shown in brackets. The variable part can be

– a variable,

EXAMPLE 1   [system of interest] is a variable in the use case.

– a list

EXAMPLE 2   [confidentiality, integrity, availability] is a list in the security topic.

Variables are based on the template vocabulary, domain vocabulary and topic vocabulary.

Table 6 shows examples of well-formed sentences.

Table 6 – Examples of well-formed sentences

Domain	Predefined field	Sample	Examples
IoT agriculture [2]	Value proposition	[Verb] [Object]	[Verb] = Increase [Object] = Yield
IoT [11]	Security	The following goals are taken into account: [security protection goal]	[security protection goal] = confidentiality
Security and privacy in AI use cases [13]	Security and privacy plan	Organization operating the [use case system of interest] integrating [Asset A] asset should establish a security and privacy plan, which will be validated and reviewed periodically for continual improvement.	[use case system of interest] = genomic sequence processing system [Asset A] = genomic data store asset

7.3.5.4   Machine-readable diagrams

Machine-readable diagrams are stored as text. Table 7 shows an example of machine-readable diagram based on work done for an ongoing standard development on privacy protection of AI. The web-based display used is from https://sequencediagram.org/.[2]

NOTE   Machine-readable diagrams can be based on UML [20].

_____

[2]   SequenceDiagram.org is the trade name or trademark of a product supplied by NoSpareTime AB. This information is given for the convenience of users of this document and does not constitute an endorsement by ISO or IEC of the product named. Equivalent products may be used if they can be shown to lead to the same results.

Table 7 – Example of machine-readable diagram

Domain	Predefined field	Machine-readable diagram	Diagram
| Privacy | Narrative on privacy control | ```
title Stealing
personal data from
smart phone device

participant Thief

participant Owner

participant Smart
phone

participant Operator

Owner->Smart
phone:Create personal
data (pictures)

Thief->Owner: Observe
owner

Owner->Owner: Enter
pin number

Thief->Owner: Steal
smart phone

Smart phone->Thief:
Read personal data

Owner->Operator:
Alert on theft

Operator->Smart
phone: Lock
``` |  Sequence diagram:<br><br>Stealing personal data from smart phone device |

8   Use case project plans

8.1   Purpose

The purpose of a use case project plan is to break down a use case project into processes. The following processes are defined:

– the use case initiative governance process,

– the template development process,

– the template maintenance process,

– the use case development process, and

– the use case maintenance process.

NOTE   This document uses the conventions of ISO/IEC/IEEE 24774 [21]. A process is described as follows: it has a purpose; it creates outcomes; and it consists of activities which themselves consist of tasks.

8.2   Use case initiative governance process

The process of developing use cases is often associated with an overall initiative. Examples are

– use cases for IoT,

– use cases for digital twins,

– use cases for AI, and

– use cases for smart cities.

Table 8 describes the resulting use case initiative governance processes

Table 8 – Use case initiative governance process

Purpose	The purpose of the use case initiative governance process is to establish the rules and policies of a use case initiative.
Outcome	The outcome is a use case initiative infrastructure
Stakeholder	Use case project manager
Process description	Activity 1: define the overall objective of the use case initiative
	Activity 2: specify the policies, organizational roles, responsibilities and authorities
	Activity 3: direct and monitor the activities

8.3   Template development process

It is important that the process of developing a template takes into account the global objective of a use case initiative.

EXAMPLE 1   ISO/IEC TR 24030:2021 [12] focuses on identifying key AI characteristics.

EXAMPLE 2   ISO/IEC TR 27563:2023 [13] is based on the same use cases, but it uses a different template.

The development of a template is driven by the concerns of the domain stakeholders, the goals and the arguments that are expected in the description (Figure 1). It is important that they use different vocabularies as showed in Table 2. It is important that they use well-formed sentences based on Figure 12. The identification of predefined fields depends on the objective of the use case. Table 9 describes the template development process.

Table 9 – Template development process

Purpose	The purpose of the template development process is to identify the objective of the template, to identify the predefined fields for which information will be requested, to provide guidance on how information is provided and evaluated.
Outcome	The outcome is a use case template
Stakeholder	Use case project manager Developer of template

Process description	– Activity 1: define the overall objective
	   • define the objective of the use case template
	   • identify the domain vocabulary to use
	– Activity 2: specify the topics of objectives and the expected input
	   • structure topics into description blocks
	   • structure description blocks into predefined fields
	   • identify expected input, and specify requirements on instructions and samples
	– Activity 3: develop guidance text
	   • define in detail the instructions and samples
	– Activity 4: validate template
	   • validate instructions and samples through a number of examples, involving representatives of the domain community
	   • review the instructions and samples and finalize them
	– Activity 5: identify criteria for validating contents that will be provided by the community.

8.4　Template maintenance process

The maintenance of a template involves the use case project manager and the template developer. It includes:

– the maintenance of a description block and of predefined fields (see 6.2);

   EXAMPLE 1　The name of a predefined field is changed from objective of use case to purpose of use case (see Table 3).

– the maintenance of an instruction; and

   EXAMPLE 2　The instruction of the predefined field Name of the use case is changed from Provide the name of the use case to Provide a meaningful name of the use case in one line (see Table 4).

– the maintenance of samples.

   EXAMPLE 3　The sample of the predefined field Security in the domain IoT is changed from The following goals are taken into account: [security protection goal] to The following properties are taken into account: [security properties] (see line 2 of Table 6).

The impact of a change varies. For instance,

– a change that clarifies a template (e.g. additional samples are provided) in general does not impact use cases concerned by this clarification;

– a change on a description block, predefined field, or instruction, can impact all use cases.

Table 10 describes the template maintenance process.

Table 10 – Template maintenance process

Purpose	The purpose of the template maintenance process is to collect the feedback provided during the development of use cases using the template to improve and extend the template.
Outcome	The outcome is a practice for continual improvement.
Stakeholder	Use case project manager Developer of template

Process description	– Activity 1: establish a maintenance process.
	  • define a maintenance plan including objectives, policies and resources
	  • agree with use case initiative governance
	– Activity 2: carry out the maintenance process.
	  • implement an exchange with the community so that as the number of use cases grows, modifications can be implemented

8.5   Use case development process

Table 11 describes the use case development process.

Table 11 – Use case development process

Purpose	The purpose of the use case development process is to undertake the submission of a use case in the use case initiative
Outcome	The outcome is a use case based on the provided template
Stakeholder	Use case project manager Use case developers
Process description	– Activity 1: specify general information – Activity 2: study relationship of use case with template topics – Activity 3: provide input to template – Activity 4: validate use case contribution

8.6   Use case maintenance process

The maintenance of use cases takes into account the following maintenance cases and resulting challenges:

–   Template modification in a use case project. The challenge is to update use cases that have been provided with the former template when use case contributors are no longer involved in the use case project.

EXAMPLE 1   The use case template used in ISO/IEC TR 24030:2021 [12] will be changed in the second edition of ISO/IEC TR 24030.

–   Contribution of modification in a specific use case. The challenge is to update the use case project when it has completed.

The maintenance of use cases involves the use case project manager and use case developers. It includes

–   a request for change from use case developers, or

EXAMPLE 2   The developer of a health use case has gained new results in the use case that are worth contributing further to the use case project.

–   a request for additional contribution to all use cases from the use case project manager.

EXAMPLE 3   The use case project ISO/IEC TR 24030:2021 [12] has changed the template (for instance, addition of a predefined field on trustworthiness).

The resolution of such requests depends on parameters such as

– publication constraints of the project use cases, or

> EXAMPLE 4   Publication date targeted by standardization projects.

– the availability of the initial use case developers.

> EXAMPLE 5   A use case contributed by a project that has completed.

The maintenance of use cases is based on a process described in Table 12.

NOTE   Machine-readable use cases rely on a digital representation of the use case content, including of diagrams. The maintenance of machine-readable use cases is more flexible, enabling, for example, the direct modification of a use case, or a global modification due to a template change.

Table 12 – Use case maintenance process

Purpose	The purpose of the use case maintenance process is to update the use case, either because the use case has evolved, or because the use case initiative is asking for modifications
Outcome	The outcome is a practice for use case maintenance.
Stakeholder	Use case project manager Use case developers

Process description	– Activity 1: establish a maintenance process.
	  • define a maintenance plan including objectives, policies and resources
	  • agree with use case initiative governance
	– Activity 2: carry out the maintenance process.
	  • interact with the use case initiative governance

Annex A
(informative)

Examples of use case projects

A.1   Overview

IEC has undertaken significant work on use cases. The rationale for creating a community of use cases at standardization level has been discussed in systems committee IEC SyC SM as shown in Figure A.1.

Key

ISO/SMCC   ISO Smart Manufacturing Coordination Committee

Figure A.1 – Rationale for a repository of use cases

The IEC SMB SG3 recommendation 7, approved by the Standardization Management Board (SMB) at its February 2010 meeting (SMB/4204/DL, Decision 137/10), requesting the urgent delivery of a generic use case repository for all smart grid applications introduced a need to transform IEC PAS 62559 to the IEC 62559 series to support the development of an IEC use case repository and to provide support for the use case methodology in general. In terms of resources,

– Three documents are available:
  - IEC TR 62559-1:2019 [3],
  - IEC 62559-2:2015 [4],
  - IEC 62559-3:2017 [5].

– A use case methodology tutorial is available, tools are available, and the IEC is trying to provide a use case management repository (UCMR) that can be used by all relevant committees.

Many subcommittees (SCs) and working groups (WGs) in ISO/IEC JTC 1 are using use cases in their standardization (AG 6, AG 8, AG 13, SC 24, SC 27, SC 29, SC 38, SC 40, SC 41, SC 42). But templates differ, which makes it hard to share information. Here is a list of available resources and activities:

– IEC

- IEC SyC SM: ISO/IEC TR 63306-1:2020 [22].

- IEC SyC AAL: IEC TS 63134:2020 and IEC TS 63134:2020/AMD1:2022 identify active assisted living (AAL) scenarios and use cases based on real-world applications and requirements [6].

- IEC SyC Smart Cities: IEC SRD 63301-1:– [23] and IEC SRD 63302-1:– [24].

- IEC SyC Smart Energy: IEC SRD 63268:2020 [25].

– ISO/IEC JTC 1

- JTC 1/SC 24 and work in AG 13 on White Paper on Guidelines for VR/AR Education and Training Systems [26].

- JTC 1/SC 29: ISO/IEC 23093-1:2022 includes use cases [27].

- JTC 1/SC 41: ISO/IEC TR 22417:2017 [11].

- JTC 1/SC 42: ISO/IEC TR 20547-2:2018 [7], or ISO/IEC TR 24030:2021 [12].

– ISO

- TC 215 Heath Informatics: ISO/TR 19669:2017 [28].

- TC 204 Intelligent Transport System provides a service package website that is based on the US National ITS reference architecture [29].

- PC 317 Privacy-by-design for consumer goods and services: ISO/TR 31700-2:2023 [16].

– ETSI

- Standardization use case for eHealth [30].

- ETSI work on ontologies in the area of automotive, e-health, wearables and water distribution [31].

A.2 IoT

ISO/IEC TR 22417:2017 [11] is an IoT use case project. It covers 25 use cases in 13 domains: transport, home, public buildings, offices, factories, process plants, agriculture, forestry, fishing, body and personal, healthcare, vehicles, and smart cities. The template used includes the following description blocks:

– Scope and objectives of use case;

– Narrative of use case, including the following predefined fields:

- Short description,

- Complete description;

– Actors;

– Issues: legal contracts, legal regulations, constraints;

– Reference standards or standardization committees;

– Relation with other known use cases;

– General remarks;

– Security and privacy;

– Conformity aspects and critical requirements;

– Interaction between actors and user requirements;

– Diagram of use case;

– Data flow diagram of use case.

Future IoT use case projects will benefit from standards published or under development such as ISO/IEC 20924:2021 [32], ISO/IEC 30147:2021 [33], ISO/IEC 30141:2024 [34], and ISO/IEC TS 30149:2024 [35].

A.3   Digital twins

ISO/IEC TR 30172:2023 [14] is a digital twin use case project. It covers 17 use cases in five domains: building/construction, urban, energy, power grid and transport. The template used includes two parts: the description part and the diagram part. The description part includes the following description blocks (not all predefined fields have been listed):

– Name of use case;

– Digital twin application area or context of use;

– Version management;

– Basic information on use case, including the following predefined fields:

- Maturity of use case,

- Generic, regional or national relation,

- Vertical application area,

- Well-known or related commercial or existing use cases (optional),

- Keywords for classification;

– Scope of use case;

– Objective of use case;

– Narrative of use case, including the following predefined fields:

- Short description,

- Complete description;

– Entities which are modelled as digital entities in use case, including the following predefined fields:

- Entity name,

- Data,

- Model type,

- Requirements or constraints on the models;

– Actors: people, organizations or systems, including the following predefined fields:

- Actor name,

- Actor type,

- Actor description,

- Actor interactions;

– Life cycle of digital twin system in use case;

– Key performance indicators (KPIs) of use case, including the following predefined fields:

- Name,

- Description,

- Reference to mentioned use case objectives;

- Digital infrastructure, including the following predefined fields:
  - Name,
  - Description,
  - Impact on use case;
- Referenced standards and standardization committees (optional), including the following predefined fields:
  - Relevant standardization committees,
  - Standards relevant to the use case,
  - Status of standard;
- Reference papers or patent (optional), including the following predefined fields:
  - References,
  - Type,
  - Impact on use cases,
  - Links;
- Relation with other known use case, for example common requirements (optional), including the following predefined fields:
  - Known use cases,
  - Source,
  - Relationship;
- General remarks (optional);
- Challenges and issues (optional);
- Data security, privacy and trustworthiness (optional), including the following predefined fields:
  - Data security requirements and implications for applications and systems,
  - Privacy requirements and implications for applications and systems,
  - Trustworthiness requirements and implications for applications and systems;
- User requirements and interactions with other actors (optional).

The diagram part includes drawings or diagrams depicting the use case:

- Drawing of use case;
- Data flow diagram of use case (optional);
- Sequence diagram of use case (optional);
- Deployment diagram of use case (optional).

This use case project was developed at the same time as ISO/IEC 20924:2021 [32] and ISO/IEC 30173:2021 [17]. Subsequent digital twin use case projects will benefit from standards published since then or projects under development such as

- ISO/IEC 30188, or
- ISO/IEC 30186 [36].

A.4   Artificial intelligence

The results of two use case projects have been published.

The first is ISO/IEC TR 24030:2021 [12]. It covers 132 use cases in 22 domains: agriculture, digital marketing, education, energy, fintech, healthcare, home/service robotics, ICT, knowledge management, legal, logistics, maintenance & support, manufacturing, media and entertainment, mobility, public sector, retail, security, social infrastructure, transportation, work and life, and others.

The template used includes two parts: the description part and the reference part. The description part includes the following description blocks:

– Id;

– Use case name;

– Application domain;

– Deployment;

– Model;

– Status;

– Objectives;

– Narrative, including the following predefined fields:

  • Short description,

  • Complete description;

– Stakeholders;

– Stakeholders' assets, values;

– System's threats and vulnerabilities;

– Key performance indicators (KPIs), including the following predefined fields:

  • Id,

  • Name,

  • Description,

  • Reference to mentioned use case objectives;

– AI features, including the following predefined fields:

  • Task(s),

  • Method(s),

  • Hardware,

  • Topology,

  • Terms and concepts used.

– Standardization opportunities/requirements;

– Challenges and issues;

– Societal concerns, including the following predefined fields:

  • Description,

  • Sustainable Development Goals (SDGs) to be achieved.

This use case project was developed at the same time as ISO/IEC TR 22989:2022 [37] and ISO/IEC TR 24028:2020 [38].