



WHITEPAPER

**USE CASES FOR
SMART STANDARDS**

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INTRODUCTION AND MOTIVATION

The future standard will and must be digital. Industry has progressed too far with its own digital solutions in its value adding processes for the provision of standard documents to keep pace in the formats provided hitherto. The corresponding concepts are now being elaborated with all key stakeholders: national stakeholders in IDiS¹, CEN-CENELEC on the European level and international stakeholders at ISO/IEC.

It is important that all these initiatives focus on the practical usage. Referring to the standards user's central question "What do I really need in order to do my job as well as possible?", this paper elaborates on the generic use cases for setting up a SMART standards system.

Introducing and applying generic use cases helps to improve understanding and communication. Therefore it will be possible to prioritize and implement use cases as the basis for defining a corresponding road map.

How the generic use cases have been identified? First of all, a pragmatic bottom-up approach was taken. Various standardization organizations have recorded and documented user stories with their stakeholders. Taking the perspective of a stakeholder, these user stories describe with a non-technical language a functionality that generates a specific benefit in a certain context. The purpose therefore is to show how a function provides added value to the user. A second step then analyses the use cases to see the similarities.

The white paper defines and explains the results of this analysis as generic use cases, which can then be validated and evaluated in a top-down approach.

The practical description of use cases for SMART standards is an important step towards establishing a common understanding in a SMART standards system that includes both the author and the user. The white paper allows the various target groups a better, more coordinated approach to recording their goals, needs and tasks.

The outlook then describes the next steps. The aim is to devise an implementation road map for SMART standards through to 2024 and beyond.

1 DIN/DKE: Scenarios for Digitizing Standardization and Standards, White Paper June 2021, URL: <https://www.dke.de/resource/blob/2034796/0a674443fb9a40f87ae5387e5b2fd2ba/idis-whitepaper-de---download-data.pdf>, accessed on May 2, 2022

DESCRIPTIONS AND BASIC IDEAS OF THE USE CASES

The *generic use cases* (GUS - generic user stories) describe what will be possible when handling SMART standards. “Handling” means the compilation, management, provision and use of standards. It refers to all organizations involved in these processes. In contrast to previous document-based processes, the phrase SMART *standards system* now refers to a system in which all stakeholders know how to handle SMART standards.

The use cases described so far were derived from a large collection of user stories. At present they are being put into

further detail² by expert groups at ISO and IEC with the use case method (standard series IEC 62559) for a better understanding of the wishes and needs particularly of standards users, and to elaborate possible solutions.

The following pages describe all previously defined *generic use cases* in a compact form that is far less complex than the description of a use case as per IEC 62559. This should serve to illustrate the purpose of every single use case and to give a representative overview of all use cases. The descriptions have the following structure:

TITLE: Name of the use case in English and German, numbered consecutively as follows: “GUS #n”.

Reference User Story	<p>This is a user story that can be taken as representative for all user stories attributed to this use case. The reference user story gives a representative depiction of the basic idea of the use case from the user’s point of view. The user story chosen here can either be a user story from the original collection or it can be compiled or derived from several appropriate user stories. User stories name the desired result briefly and simply, without going into detail. They describe the requirements made by the user of a product or service. A user story has the following structure:</p> <p><i>As a [standards user], I would like to [function] in order to [benefit].</i></p> <p>In other words, a user story answers the questions WHO would like WHAT and WHY..</p>
Scope	Brief description of the scope referred to by the use case.
Explanations	Further explanations of the use case. The descriptions are based on the current work results of ISO and IEC for detailed elaboration of the use cases according to IEC 62559.

² The generic use cases are recorded and managed in the IEC Use Case Management Repository (UCMR) (<https://ucmr.iec.ch/>). The UCMR safeguards formal compliance with IEC 62559 and allows IT-based access to the various aspects of use case description.

1 USE CASE #1 – REFERENCES (GUS #1)

User Story	As a [standard creator], I would like to [be able to manage all referenced standards and standard content], in order to [see all necessary requirements at a glance].
Scope	The “References” use case describes the digital, dynamic links between normative content and its application by the creator and/or user of a standard.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → References on the level of standards (GUS #4 and #5) and normative content (GUS #6). → References can be accessed internally (standard creation) and externally (application of standards) via dynamic links. They provide the referenced normative content in an appropriate way. → References describe relations between standards and normative content. They enable the user to search, display and check the relations. → References are a basic prerequisite for many other use cases, e.g. notifications in connection with references (GUS #2).

2 USE CASE #2 – NOTIFICATIONS (GUS #2)

User Story	As a [standard user], I would like to be able to [subscribe to change notifications on standard content], in order to [adopt my own application to this change].
Scope	The “Notifications” use case describes the information about changes in status of standards or standard content relevant for the creator and/or user of the standard.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Providing information about changes in individual normative content (GUS #6). → Notification can refer to any combination of normative content (definitions, tables, requirements etc.). → The format of the notification itself must be machine-readable and customizable so it can be applied to other use cases (e.g. GUS #8, #9). → Possibility of flexible notification according to the user’s needs, e.g.: <ul style="list-style-type: none"> ● Notification about the revision of a standard on a watch list; ● Notification about the revision of normative content referenced in or transferred to another standard.

3 USE CASE #3 – SEARCH (GUS #3)

User Story	As a [standards user], I would like to [search in content rather than documents] to [find specific type of content].
Scope	The “Search” use case describes all different search types in standards and normative content going beyond the usual full-text search.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → The search considers information such as meta data, normative content, additional information (ontologies, comments etc.) as well as relations between all these elements. → Implementation of enhanced search methods, such as faceted search or semantic search. → Separate search for different types of normative content (definitions, tables, requirements etc.) (GUS #6). → Possibility of a multi-standard search for cohesive normative content. → The search considers referenced (GUS #1) information sources (glossary, CDD³, external semantic repositories etc.) to search across different systems.

4 USE CASE #4 – CHANGE RECORD (GUS #4)

User Story	As a [standard creator/standard user], I would like to [know why a standards body made changes to the standard], in order to [understand the reason for this modification].
Scope	The “Change record” use case describes how modifications of normative content are recorded, justified, connected with interpretation and then made available to creators and users of standards.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Making information about modifications available to different user groups in differing ways (granularity), e.g. <ul style="list-style-type: none"> ● Standards creators for documenting their own decision making (including discarded alternatives etc.) and ● Standards users for understanding the modifications and for impact analysis. → Depict modifications on the level of individual normative content to guarantee IT systems access to authorized information (GUS #6, #8, #9). → Expanding current added-value functions such as red line and commented red line up to dynamic FAQ and knowledge sharing systems for users and creators. → Interactive comments on SMART standards by users on the normative content level

3 CDD - Common Data Dictionary of the IEC, URL: <https://cdd.iec.ch>, accessed on May 5, 2022

5 USE CASE #5 – STANDARDS MATCHING⁴ (GUS #5)

User Story	As [standards user] I would like to [identify all relevant standards for my products], in order to [fully record all normative boundary conditions].
Scope	The “Standards matching” use case describes the identification of all relevant standards for a product range and provides a basis for companies to make specific use of normative content.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → All relevant standards can be identified by means of a formal product description that is to be defined (e.g. IEC CDD). → Matching standards and products may possibly need access to external standardized product descriptions. → Introduction of tagging mechanisms (annotation of additional know-how) to facilitate the matching of standards and products (or general use of standards). The tags should be standardized, accessible in the public domain and also machine-readable.

6 USE CASE #6 – INFORMATION UNIT MATCHING (GUS #6)

User Story	As [standards user] I would like to [identify and apply all relevant parts of a standard, like requirements for a product or a product range], in order to [directly implement all normative conditions into my development environment or application].
Scope	The “Information unit matching” use case describes the creation, management, delivery and application of individual normative content instead of documents.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Individual normative content can be created, changed, versioned, searched, referenced, enhanced and applied separately and in accordance with relations to other normative content. → Normative content can be created and managed using various tools, e.g. properties in the CDD, definitions in a glossary, etc. → Various types of normative content (requirements, definitions, formulas, software components, etc.) can be used separately and transformed into specific formats (XML, AutomationML, JSON, MathML etc.) (GUS #8, #9). → Documents can be generated dynamically and individualized by combining normative content. → Using individual normative content must safeguard due legal process (particularly for harmonized standards).

⁴ Products is used here as a collective term that includes systems, solutions and processes, among others.

7 USE CASE #7 – REGULATION MATCHING (GUS #7)

User Story	As a [standard user], I would like to [know which elements of standards support me in complying with technical regulation] in order to [achieve compliance with law during product development and product placement on the market].
Scope	The “Regulation matching” use case describes the identification of all normative content in relation to regulations and laws applicable for a product range in a specific jurisdiction.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Presentation of relationships between legal requirements and normative content, e.g. as lists. → Connecting legal requirements and normative content facilitates above all the target-oriented development of normative content. This connection must be tool-supported at all steps in the process (creation, management, provision and application). → Rules (names, text extracts, information about market segments) can be used to search for relevant normative content.

8 USE CASE #8 – STANDARD AND SYSTEM INTEGRATION (GUS #8:)

User Story	As an [standards user], I would like [to be automatically notified of violations of standards requirements by my engineering tools during design and have corresponding texts displayed], in order to [increase the efficiency and quality of the design process].
Scope	The “Standard and system integration” use case describes the automated, configured integration of normative content in software-based user systems (system engineering, requirements management, process management etc.), above all to proceed with possible updates in case of changes.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Display and application of normative content where needed (user systems). The content must be delivered in an appropriate format and in a standardized manner (GUS #9). → Integration enables a fixed, continuous link between standards systems and user systems, e.g. in order to: <ul style="list-style-type: none"> ● inform about changes (GUS #2, #4), ● facilitate real-time requests (GUS #3, #5, #7, #9, #10, #11) and ● report user feedback into the standardization process. → Integration is based on “standardized” APIs (interfaces) and services so that it can be automated, configured and monitored.

9 USE CASE #9 – EXPORT OF INFORMATION UNITS (GUS #9:)

User Story	As a [standard user], I would like to [automatically transfer all technical requirements from standards that affect my project into requirements management software], in order to [be able to feed these requirements time-efficiently and with an assured quality into other systems, and to process them there].
Scope	The “Export of information units” use case describes the provision of normative content via interchange formats for broad, simple application and consideration of standards content.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Definition of standardized interchange formats for requirements and the related meta data (date, legal and application relations, relations between standards etc.), to facilitate interchange between IT systems and the interpretation of standards content. → Interchange of individual standards fragments (e.g. only requirements, individual formulas, selected references and content sections etc.), without losing the relation to the standard (origin of the requirements, where adapted, etc.). → Access to different (industry-specific) formats for describing standards content (XML, AutomationML, UML, ReqIF, JSON, MathML, TBX etc.).

10 USE CASE #10 – USE CASE MATCHING (GUS #10:)

User Story	As a [standard user], I would like to receive [all relevant requirements], based on a description of my use case , so that I can [import them into my external selection program (e.g. CAD or database)].
Scope	The “Use case matching” use case describes the identification of relevant normative content for given use cases and user criteria. The relevant normative content can be identified by means of a formal use case description that is to be defined (e.g. IEC 62559).
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Even semi-formal input is conceivable, such as a project description. This requires matching, as in GUS #5, which is subject to uncertainties. → A (tool-supported GUS #1) relation can be formulated between standardized use cases and normative content: <ul style="list-style-type: none"> • The use case is stored in a use case repository. • The use case in the use case repository is referenced when creating normative content (GUS #1). • A search for this or a similar use case identifies and delivers the corresponding normative content.

11 USE CASE #11 – DECISION SUPPORT (GUS #11:)

User Story	As [standards user] I would like to [be supported during the decision-making process for the product design] in order to [design my product as compliant as possible with the standard and to make all decisions transparent and traceable].
Scope	The “Decision support” use case describes the support for (multi-staged) decision processes of standards users to reduce expenditure and improve transparency and traceability of decisions taken.
Explanations	<p>The use case comprises for example:</p> <ul style="list-style-type: none"> → Provision of (meta) information, KPIs and statistical statements to support decision processes. → Provision of information for (content-related) decision problems, e.g. which material can be used for product A in application area B. → Support for multi-staged and possibly condition-based interaction with standards, e.g. process selection for production processes (step 1) with subsequent evaluation of process implementation (step 2). → Many standards users make similar demands

CHECKING THAT THE USE CASES ARE COMPLETE

The described generic use cases must be checked to ensure they are complete and consistent. In other words: does the implemented bottom-up approach provide a complete picture?

A top-down approach is the best way to answer this question. For example, ISO 9001 for quality management systems offers an industry-independent view of processes in companies that has been established and rolled out on a global scale. A future SMART standards system should fulfil the requirements made by this international standard with regard to the management (control) of documented information in the company:

- Distribution
- Access
- Retrieval
- Application
- Storage and preservation
- Change management
- Archiving

The above use cases can be allocated to the requirements for the control of documented information as follows:

Retrieval

- References [GUS #1]
- Search [GUS #3]
- Standard matching) [GUS #5]
- Information unit matching) [GUS #6]
- Regulation matching [GUS #7]

Application

- Standard and system integration [GUS #8]
- Export of information units [GUS #9]
- Use case matching [GUS #10]
- Decision support [GUS #11]

Change management

- Notifications [GUS #2]
- Change record [GUS #4]

The comparison clearly shows the activities (sub-processes) in which the previous use cases were defined: retrieval, application and change. The search for the “right” normative content and its application-oriented use is currently a practical obstacle. The primary intention of the defined use cases is therefore to improve the current situation. Aspects such as

- Access,
- Distribution,
- Filing or storage

are already covered satisfactorily in companies today by means of existing standards management systems that support these sub-processes. This can be one reason why these aspects scarcely featured when use cases were defined up to now. But when it comes to developing a SMART standards system, these activities also have to be taken into account as the system boundary of a standard in future will probably not be a single document, but rather normative content that is configured (automatically) depending on the use case. That means new solutions have to be developed even for sub-processes that currently work well in the company, such as filing or access. However, it is only when the use cases have been implemented for application of the normative content that these become significant.

Conclusion: After reconciling a company’s processes with the defined use cases, it can be said that the use cases with a bottom-up definition are currently seen as adequate for developing solutions that are suitable for many users in terms of implementing standards information.

FURTHER STEPS TOWARD A ROAD MAP FOR SMART STANDARDS

As already outlined in the IDiS white paper “Scenarios for Digitizing Standardization and Standards”, the central questions of what a SMART standard looks like, how it is created, and how it is made available, must be answered from the perspective of usage and the specific user benefit. This white paper builds on this. With the generic use cases, it provides a concept for making the next steps easier to understand and reach corresponding agreement among the stakeholders. Further activities will be planned in a road map that still has to be compiled and formulated by the IDiS and coordinated with the international and European standardization organizations. A roadmap is a rough planning of the steps to be executed over a longer period of time. The roadmap is used to structure long-term project goals into individual steps that are easier to manage, taking into account uncertainties and possible scenarios for achieving the goals.

The main specifiable steps for a road map are as follows:

- The generic use cases are taken to define which information a SMART standard should contain and how the information should be structured. This entails defining the key objects (fragments of a standard, e.g. requirements, definitions, formulas) and the information describing these objects. The result consists in a Standards Information Model – SIM⁵. The model still has to be aligned with the generic use cases (GUS) described here.
- The information model should be not only generic (e.g. non-specific in terms of certain application areas, user groups, etc.) but also as harmonized as possible and suitable for uniform usage by various standardization organizations on the international, regional and national level. This promotes compatibility and interoperability between the standards of various organizations, which is an essential requirement of application. Coordinating and collating the work results in a joint model must therefore be a focal point of the efforts for all stakeholders.

- National (IDiS) and international pilot projects should generate prototype solutions on the basis of a first robust version of the information model coordinated among all stakeholders. The aim of the prototypes must be to validate the information model and generic use cases. The subject of such prototypes consists of services leading from the generic information model to specific use cases (e.g. a data converter providing requirements for a requirements management system). IDiS plays a special role in this context, as the pilot results must be validated in close collaboration with the national stakeholders.
- Pilot projects will also act as the vehicles for developing and testing the future technical infrastructure, including the necessary tools (e.g. for recording and processing content). At the same time, the gained insights should be transformed into a joint solution with the necessary adjustments made on the process level (directives/rules), organizational level (new roles/competences) and technological level (data models/databases and tools).
- The international SMART standards communities are developing the first concepts for business models. The GUS concept can be used as a suitable basis for ascertaining the varying valences of SMART standards.

A road map should then be drawn up that takes account of the above steps and the GUS concept. It is clear that the whole SMART standards system will need to go through further development and specification year by year. New requirements will result from progressing digitalization and new use scenarios so that a corresponding ongoing adjustment of the road map will be necessary.

⁵ The SIM is being elaborated and developed in 2021 jointly by working groups in the CEN, CENELEC, ISO and IEC.

TAKE PART IN THE IDIS AND GET INVOLVED!

The Initiative Digital Standards (IDiS)⁶ already delivered initial answers for gradual digital transformation in the white paper “Scenarios for Digitizing Standardization and Standards.”

This paper with its practical focus resulted from the thoughts and reflections of the various IDiS working groups.

- Working group 1 is pursuing a joint understanding for the vision and method of a SMART standards system.
- Working group 2 is specifying initial national pilot projects to illustrate the benefit of SMART standards, as well as collecting experience and developing further use areas.
- Working group 3 is mirroring the (international) activities related to the topic and coordinating external and internal activities. It is the first point of contact for national experts on the international stage.

The IDiS working groups are coordinating their activities for example with working group 2 “Technology and use scenarios” of the Industry 4.0 platform to establish closer links between Industry 4.0 and SMART standards and to dovetail with the Asset Administration Shell (AAS) – the digital twin of the Industry 4.0 platform – in specific implementation projects.

Besides DIN/DKE, numerous other standardization organizations are working on digital standards, in some cases separately from each other. Therefore, there is an urgent need for coordinated collaboration on the European and international level. IDiS offers the chance to ensure that national interests play a role in European and international standardization work, as DIN and DKE are actively involved in corresponding international projects at CEN, CENELEC, IEC and ISO.

DIN and DKE invite you to get involved in the IDiS – the national platform for SMART standards.

6 DIN/DKE: „IDiS – Initiative Digitale Standards“, in: DK1 website, URL: <https://www.dke.de/idis>, accessed on May 2, 2022



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