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List of Acronyms

AI	Artificial Intelligence
AHG	Ad Hoc Group
AFNOR	Association Française de Normalization
ANSI	American National Standards Institute
BSI	British Standards Institution
CEN	European Committee for Standardization
CENELEC (CLC)	European Committee for Standardization in the Electrical field
CWA	CEN or CENELEC Workshop Agreement
DIN	Deutsches Institut für Normung
EN	European Standard
ESO	European Standards Organization
ETSI	European Telecommunications Standards Institute
EU	European Union
FA	Frankfurt Agreement
ISO	International Organization for Standardization; International Standard
IEC	International Electrotechnical Commission; International Standards
ITU	International Triathlon Union
JTC	Joint Technical Committee
NSB	National Standardization Body
PAS	Publicly Available Specification
SC	Subcommittee
SDO	Standards Developing Organization
TC	Technical Committee
TR	Technical Report
TS	Technical Specification
VA	Vienna Agreement
WG	Working Group
WP	Work Package
WTO	World Trade Organization
UNE	Spanish Association for Standardization
UNI	Ente Nazionale Italiano di Unificazione

1. Introduction

The purpose of the "D7.2 Report on the Standardization landscape and applicable standards" is to carry out a detailed analysis of the applicable Standardization landscape, by identifying the relevant standards that can be used during the s-X-AIPI project; is also to provide an overview of standards development by the relevant Standardization Committees and organizations (such as ISO/IEC JTC 1/SC 42 and CEN/CLC JTC 21 - Artificial intelligence)

The inclusion of standardization in the project is to facilitate the acceptance and utilization by the market of the developed solutions. Other objectives are to provide starting information for other Work Packages (WP), ensure compatibility and interoperability with what already exists in the market through standards, as well as to use the Standardization system as a tool for the dissemination of the project results and the interaction with the market stakeholders.

This document contains:

- A summary of the Standardization system and associated documents.
- The status of AI standardization and regulation
- A comprehensive collection of relevant standards for the s-X-AIPI project, grouped by the following standardization areas:
  - **AI concepts, terminology and AI system framework**
  - **Data and Data Governance**
  - **Accuracy, robustness (trustworthiness), and Cybersecurity(Data Security)**
  - **Risk management system**
  - **Data Quality management system**
  - **Technical documentation**
  - **Record keeping**
  - **Transparency and information to users**
  - **Human oversight**
  - **Ethical aspects and societal considerations**
  - **AI use cases and applications**
  - **Computational aspects and machine learning**
  - **Open source**
  - **Industrial-process measurement, control and automation**

1.1 Scope

This document provides a list of relevant standards and standards under development for the s-X-AIPI project. This report "D7.2 Report on the Standardization landscape and applicable standards" has been developed by the task *T7.3 Standardization activities* (Lead: UNE, participants: All), which corresponds to the *WP7 Dissemination, Exploitation, and Standardization* work package.

We will complete the following deliverables in the "Contribution to Standardization" activity:

- "D7.3 Report on the contribution to Standardization-initial version" (M9)
- "D7.6 Report on the contribution to Standardization-intermediate version" (M18)
- "D7.7 Report on the contribution to Standardization-final version" (M36) at the end of the project.

Including engagement and communication activities within relevant standardization Technical Committees, as well as contributions to ongoing and future standardization development (standards and normative initiatives) for standardization gaps identified throughout the project development.

1.2 Overview of the project s-X-AIPI

The overall objective of s-X-AIPI is to research, develop, test and experiment an innovative toolset of custom trustworthy self-X AI technologies (autonomous AI that minimizes human involvement in the loop an exhibit self- improving abilities). AI applications will help workers to deal with external and internal influences and enable agile and resilient reaction of European process industry processes and products lifecycle for a true integration into the circularmanufacturing economy ecosystem.

The aim is to provide existing process industries and its workers with agility of operation, improvement of performance across different indicators and state of the art AI-based sustainability tools for the design, development, engineering, operation and monitoring of their plants, products, and value chains.

Demonstration at four representative industrial use cases (asphalt, steel, aluminum, and pharmaceutics) will generate ashowcase portfolio of trustworthy AI technologies (data sets, AI model and applications) integrated into an innovative open-source toolset available for industry and research as an example of self-X AI technologies integrated in actual process industries value chains.

s-X-AIPI toolset of AI technologies will include an innovative AI data pipeline with autonomic computing capabilities(self-X AI and autonomic manager), architecture, realistic datasets together with their respective algorithms derived from the demonstration in four realistic use cases of process industry. s-X-AIPI technologies will consider workers heterogeneous skill levels and self-adaptation capabilities to the actual profile of the worker respecting their human- in-the-loop role.

s-X-AIPI will be performed by an interdisciplinary consortium (AI integration and Big Data analytics, use case process understanding, modelling and digital platforms, research, industry, SME, communication, exploitation, standardization).

2. Overview of Standardization system and documents

Standards are voluntary technical documents that set out requirements for a specific item, material, component, system, or service, or describes in detail a method, procedure, or best practice. Standards are developed and defined through a process of sharing knowledge and building consensus among technical experts nominated by interested parties and other stakeholders - including businesses, consumers, and environmental groups, among others. These experts are organized in Technical Committees (TCs), which are subdivided in Subcommittees (SCs) or Working Groups (WGs). These TCs are included in the Structure of the Standardization Organizations (National, European, and International, with the respective mirror committees) and Working Documents following their internal regulations.

The Standardization Bodies operate at National (UNE, UNI, DIN, AFNOR, BSI, etc.), Regional (CEN, CENELEC, ETSI) or International (ISO, IEC, ITU) level. Sometimes there are different Standardization Bodies at the same level but covering different fields. This is the case of ISO (general), IEC (electrical) and ITU (telecommunications) at International level, or CEN, CENELEC and ETSI at European level in the same way.

The Standardization Bodies, such as ISO, IEC, CEN, DIN, or UNE, consists of many Technical Committees (TC), which deal with different areas of interest, and each TC may have a few SC or WG according to its need.

2.1 Standardization system

2.1.1 International Standardization Organizations

International Standardization Organizations develop worldwide applicable, market-driven standards, in a multi-stakeholder environment which ensures that a wide range of technical views are represented, including those relating to social and economic interests. While not subjected to a specific jurisdiction, International standards have an important contribution to facilitating international trade. This contribution has been recognized by the World Trade Organization (WTO) and the organizations cited below follow the Code of Good Practice for the Preparation, Adoption and Application of Standards of the WTO Agreement on Technical Barriers to Trade.

Table 1 International Standardization Organizations

International Standardization Organization	ISO is an independent, non-governmental international organization with a membership of 163 national standards bodies. ISO develops standards mainly in fields not related to electrotechnology nor telecommunications.
International Electrotechnical Commission	IEC is a not-for-profit, non-governmental organization with a membership of 84 national standards bodies. IEC develops standards in fields related to electrotechnology.

International TelecommunicationUnion	ITU is the United Nations specialized agency for information and communication technologies. It is based on public-private partnership and currently has a membership of 193 countries and almost 800 private-sector entities and academic institutions.

2.1.2 European Standardization Organizations

The European Standardization system plays a major role in the EU Single Market, enabling the free circulation of goods among 28 countries. The European Standardization system relies on a single standard model. European standards are identically adopted by all their National Members and any national conflicting standard is withdrawn. European standards facilitate compliance with EU harmonization legislation, hence theentry and free circulation of goods in the EU Single Market, based on a set of requirements equallyapplicable in all Member States of the European Union.

European Standardization Organizations work closely with their international level counterparts, in order to avoid duplication of efforts and promote global relevance of standards. As a result of this, 31% of CEN standards are identical to ISO standards and 72% of CENELEC standards are identical to IEC standards.

CEN, CENELEC and ETSI have been officially recognized by the European Union and by the European Free Trade Association (EFTA) as being responsible for developing standards at European level.

Table 2 European Standardization Organizations

European Committee for Standardization	CEN is a non-profit association whose members are the national standardsbodies of 33 European countries. It develops standards in fields not related to electrotechnology nor telecommunications. It is the counterpart at European level of ISO.
European Committee for Electrotechnical Standardization	CENELEC is a non-profit association whose members are the national standards bodies of 33 European countries. It develops standards in fields related to electrotechnology. It is the counterpart at European level of IEC.
European Telecommunications Standards Institute	ETSI is a non-profit organization with more than 800 member organizations worldwide. It develops standards for Information and Communications Technologies (ICT).

2.1.3 National Standardization Organizations

The national Standardization organizations (NSO) are the organizations officially recognized at national level as being able to represent all Standardization interests in their country. They are responsible for developing national standards in their countries and they are the members of ISO, IEC, CEN and CENELEC (note that ITU and ETSI have a different membership policy). National stakeholders interested in Standardization activities are able to take part in the process at European or International level through their national Standardization organization.

The legal status of national Standardization organizations varies from one country to another. The most typical status is a private non-profit organization whose members are national business associations and companies, but sometimes the NSO is a part of the Public Administration.

At European level, the European Standardization System guarantees that European Standards are identically adopted by all the national Standardization organizations and any national conflicting standard is withdrawn. This means the national catalogues of standards have a big level of coherence across Europe.

2.2 Standardization documents

There are different kinds of Standardization documents. The most widespread is the standard, which has a different code depending on the organization under it was developed, e.g., EN for European Standards, ISO for International standards. Other types of documents are Technical Specifications (TS), Technical Reports (TR) and Workshop Agreements (CWA). Further Amendments to the standards are identified by adding A1, A2, etc. at the end of the standard code.

The formal definition of a standard is a "document, established by consensus and approved by a recognized body that provides, for common and repeated use, rules, guidelines or characteristics for activities or their results, aimed at the achievement of the optimum degree of order in a given context". These include requirements and/or recommendations in relation to products, systems, processes, or services. European Standards (ENs) are documents that have been ratified by one of the three European Standardization Organizations (ESOs), CEN, CENELEC or ETSI; recognized as competent around voluntary technical Standardization as for the EU Regulation 1025/2012.

At European level, all the members of CEN shall adopt EN standards as national standards and must withdraw any existing national standard which could conflict with them.

A summary of the characteristics of the different Standardization documents can be found in *Table 3*.

Table 3 Characteristics of different Standardization documents

Type	International code	European code	National code	Main characteristics
Standard	ISO IEC	EN	UNE, NF, BS, DIN, etc. When adopting: UNE-EN, NF- EN, UNE-ISO, NF-ISO, etc.	- Max. Elaboration period: 5 years - steps of member approval - European: compulsory national adoption - Revision: every 5 years
Technical Specification	ISO/TS IEC/TS	CEN/TS CLC/TS	When adopting: UNE-CEN/TS, NF-CEN/TS, UNE-ISO/TS, NF-ISO/TS, etc.	- Max. Elaboration period: 3 years - 1 step of member approval or internal approval in TC European: optional national adoption Revision: at 3 years (upgrading to EN or deletion)
Technical Report	ISO/TR IEC/TR	CEN/TR CLC/TR	When adopting: UNE-CEN/TR, NF-CEN/TR, UNE-ISO/TR, NF-ISO/TR, etc.	- Elaboration period: free timeframe (In the case of a CEN TR, the maximum elaboration period is 18 months) - Internal approval in TC

				- European: optional national adoption - No revision required
Workshop Agreement	IWA	CWA	Variable	- Elaboration: free timeframe (usually few months) - Internal approval in the Workshop - European: optional national adoption Revision: at 3 years (upgrading to EN or deletion)

NOTE: At this point it is important to highlight that the development of a normative document must conform to the procedure of the standardization body, which may sometimes lead to the final approval of that document not being possible if the necessary level of consensus within the standardization body is not achieved.

European and International Standardization Organizations (e.g., CEN and ISO) have signed formal agreements to avoid duplication of efforts and promote global relevance of standards, which allows to adopt or develop in parallel each other's standards with the same content and code.

The technical collaboration between ISO and CEN was formalized through the Vienna Agreement (VA).

European standards developed through the Vienna Agreement have EN ISO codification while International Standards developed through the Vienna Agreement remain only with ISO code.

CENELEC has close cooperation with its international counterpart, the International Electrotechnical Commission (IEC) through the Frankfurt Agreement (FA).

As a result, new electrical standards projects are jointly planned between CENELEC and IEC, and where possible most are conducted at international level. This means that CENELEC will first offer a New Work Item (NWI) to its international counterpart. If accepted, CENELEC will cease working on the NWI. If IEC refuses, CENELEC will work on the standards content development, keeping IEC closely informed and giving IEC the opportunity to comment at the public enquiry stage. CENELEC and IEC vote in parallel (both organizations are voting at the same time) during the Standardization process. If the outcome of the parallel voting is positive, CENELEC will ratify the European standard and the IEC will publish the international standard. Close to 80% of CENELEC standards are identical to or based on IEC publications.

National standards could also be proposed as a base for new European or International standards.

The Figure 1 shows the possible tracks of the standards.

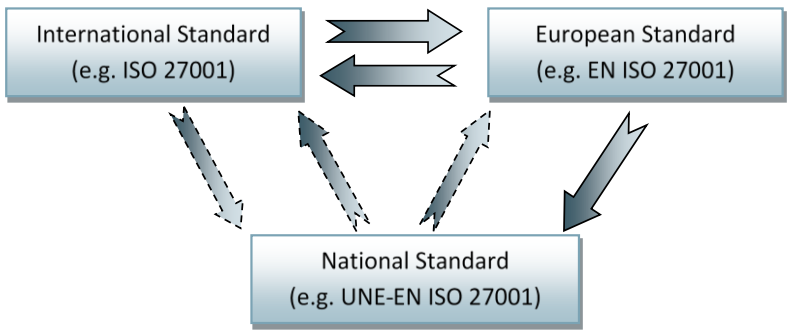

Figure 1 Tracks of standards adoption

Therefore, the code of any standard is the combination of the above-mentioned issues and could be explained as shown in Figure 2.

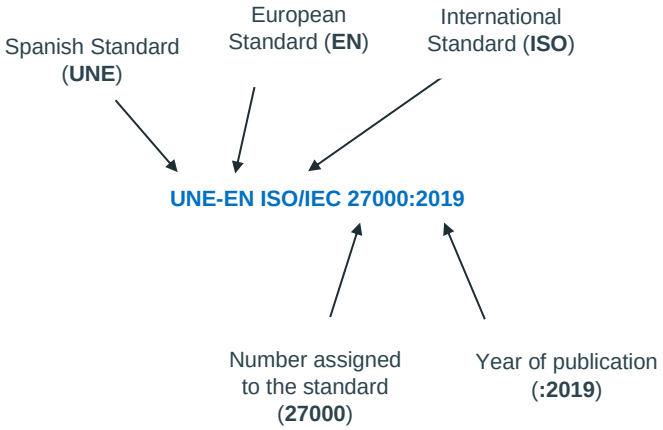

Figure 2 Example of identification of elements in the code of a standard

3 Status of AI standardization and regulation

3.1 Background of the study

When AI technologies are implemented in products or employed in services, new safety risks may arise for users – addressing individuals, legal entities, and enforcement authorities (European Commission, 2021).

Therefore, the White Paper on AI published by the European Commission in February 2020 (European Commission, 2020) recognized the need for an improved regulatory framework, including a potential new Regulation addressing AI risks to safety and fundamental rights (European Commission, 2020).

The Commission on April 21 adopted a proposal for the new AI Regulation (European Commission, 2021). This regulation adopts the approach of the New Legislative Framework.

In accordance with this legislative technique, legal provisions are often formulated as fundamental requirements. The so-called harmonized standards give the technical specifications that enable economic operators to comply with the appropriate legal obligations. Nonetheless, if they so choose, economic operators may utilize other technical solutions outside harmonized standards to establish compliance.

European standardization organizations (particularly CEN/CENELEC and ETSI) generate **Harmonized Standards** in response to a **formal Standardization Request** filed by the European Commission. These standards are to be examined by the Commission services and published in the Official Journal if they are found to satisfy the standardization request. Only standards published in the Official Journal can offer operators a relevant legal presumption of conformance with the legal requirements of the applicable EU harmonization law. Regulation (EU) 1025/2012 establishes the main norms for the operation of the standardization system, including the mandate-issuing procedure (Article 10).

European Standardization Organizations (ESOs) and International Standardization Organizations (such as ISO or IEC) have entered into appropriate agreements to ensure that international standards can be adopted by ESOs and proposed as European harmonized standards in response to a standardization request.

Harmonized standards are therefore a crucial instrument for the application of the law and contribute to the specific purpose of ensuring that AI systems are safe and reliable. Harmonized standards permit technological advancement and the adoption of the most recent state-of-the-art.

In April 2021, the European Commission will submit a proposal for a Regulation establishing standardized artificial intelligence regulations (Artificial Intelligence Act) (European Commission, 2021). This act tries to define artificial intelligence systems and proposes requirements for high-risk AI systems.

In this regard, the purpose of the document is to provide a landscape/overview of the international and European standardization activities pertinent to s-X-AIPI applications and systems that are related to AI. This study examines ISO/IEC, CEN/CLC, and ETSI standards.

3.2 The role of standards

A standard is described by the European Commission as

"a technical specification approved by a recognized standardization body for repeated or continuous application, with which compliance is not compulsory and which is one of the following (European Commission, 1998):

- *international standard: a standard adopted by an international standardizationorganization and made available to the public;*
- *European standard: a standard adopted by a European standardization body andmade available to the public;*
- *national standard: a standard adopted by a national standardization body and made available to the public".*

In addition, as stated in its Regulation No. 1025/2012 on standardization,

"the primary objective of standardization is the definition of voluntary technical or qualityspecifications with which current or future products, production processes or services maycomply. Standardization can cover various issues, such as standardization of different grades or sizes of a particular product or technical specifications in product or services markets where compatibility and interoperability with other products or systems are essential" (European Union, 2012).

Regulation (EU) No. 1025/2012 of the European Commission (2015) places standardization at the core of the EU's digital and industrial strategies. Sustainability and safety standards help protect people and the environment, but in Europe, standards play a unique role in realizing the single market. In conclusion, **standards empower digital transformation for the whole society, boosting market development, increasing the international competitiveness, and supporting regulations.**

International Standards can take on a variety of forms. Apart from product standards, other examples include test methods, codes of practice, guideline standards and management systems standards (ISO, 2021).

3.3 European Standards

European regional standards organizations, known as ESOs (European Standards Organizations), are officially recognized by the European Commission (Regulation (EU) No 1025/2012) and serve as a platform for the development of European Standards. ESOs include: CENELEC, CEN, and ETSI.

Only standards developed by CEN, CENELEC, and ETSI are recognized as "European Standards" in the European Union (Regulation (EU) No. 1025/2012). These ESOs work jointly in the interest of European harmonization, developing both market-driven and harmonized standards to support European legislation.

In addition, these organizations are also the regional mirror bodies to their international counterparts, i.e., ISO, IEC, and ITU-T, respectively.

Regarding the scope of the document, it includes ESOs and related SDOs (Standards Developing Organizations) that are formally recognized by international treaties and regulations, as well as SDOs that participate in the biannual Global Standards Collaboration, which involves all major SDOs. Therefore, we analyze: ISO/IEC, CEN-CENELEC, and ETSI.

Through the use and application of harmonized standards, European standards play a crucial role within the internal market.

3.4 Standardization domain and processes

Standard specifications may cover a vast array of applications (from products to services), systems, and processes, with different aims (from informative to normative) and addressing different phases of the subject's lifecycle (from design to implementation and management). Consequently, standardization processes and related stakeholders may differ based on (at least) three dimensionalities or concerns (described below) that may be used to characterize the standards domain:

- **Business and legal concerns**: may give rise to de-jure or de-facto/industrial standards.
- **Conceptual and process concerns**: lead to the development of foundational/basic or technical/implementation standards.
- **Application and context-specific concerns**: are the driving force behind the distinction between standards covering a broad spectrum of sectors (commonly referred to as horizontal standards) and standards intended for more application domain (or context-specific use), which are referred to as vertical standards.

3.4.1 De-jure versus De-facto standards

A de-facto standard is one that has been widely adopted (e.g., by customers/users or by the market), becoming a well-respected (or popular) standard for its purpose despite lacking official recognition. Acceptance is often based on a proven track record for efficiency and reliability (de Vries, 1998).

De-facto standards that are accepted by an industry are also referred to as professional or industry standards.

In contrast, de-jure refers to a practice that is formally recognized, regardless of whether the practice exists in reality. Therefore, de-jure standards (or standards according to law) are those that have been approved by official bodies such as ISO and IEEE. These standards are assessed critically before to approval; USB, FireWire, and HDMI are examples of de-jure hardware standards, whereas the ASCII character set is a significant example of a software-related standard (deVries,1998, Carpenter, 2012).

HTML and PDF formats are examples of de-facto standards that can become de-jure standards over time (i.e., by acquiring official status from an SDO). HTML became a de-facto standard in 1995 due to the efforts of the Internet Engineering Task Force (IETF) (Vaughan-Nichols, 2010), whereas PDF became an ISO standard (ISO 32000-1) in 2008. (Carpenter, 2012).

3.4.2 Foundational versus implementation standards

Typically, foundational, or basic standards are the basis for a set of standard specifications, defined by an SDO. This work focuses on those aspects that require a common vocabulary, as well as agreed-upon taxonomies and definitions (Bartram, 2018). Eventually, these standards will allow a practitioner and a regulator to speak the same language, as well as a practitioner and a regulator to speak the same language with a technical expert. For instance, ISO/IEC work on Artificial Intelligence covers a number of key areas spanning technology, society, and ethics. There is a need to define a basic starting point by introducing a set of foundational standards since there are numerous different stakeholders to consider.

Example *ISO/IEC 22989:2022 - Information technology — Artificial intelligence — Artificial intelligence concepts and terminology*

The document establishes terminology for Artificial Intelligence (AI) and describes conceptsin the field of AI. The document can be used in the development of other standards and insupport of communications among diverse, interested parties/stakeholders.

According to the Open Geospatial Consortium, implementation standards differ from the abstract specification of fundamental standards because they are created for a more technical audience and describe technical issues such as the interface Structure between software components (OGC, 2020):

Example *IEEE 802.3-2018 - IEEE Standard for Ethernet*

Ethernet local area network operation is specified for selected speeds of operation from 1Mb/s to 400 Gb/s using a common media access control (MAC) specification and management information base (MIB).

3.4.3 Horizontal versus Vertical specifications

As in many other standardized domains, there may be two layers of standardization activities: one addressing general issues that apply in a cross-cutting way to several areas(horizontal) and another dealing with more specific issues relevant to a given sector of activity or application area (vertical).

A horizontal specification contains fundamental principles, concepts, definitions, and similar general information that aims to be applicable over a broad set of subject areas.

Example*: ISO/IEC TR 24372:2021 Information technology — Artificial intelligence (AI) — Overview of computational approaches for AI systems*

The specification aims to provide an overview of the state of the art of computational approaches for AI systems, by describing a) main computational characteristics of AI systems; b) main algorithms and approaches used in AI systems, referencing use cases contained in ISO/IEC TR 24030.

Vertical specifications, on the other hand, aim to address application- or sector-specific topics and, as a result, solely focus on the information pertinent to that product application or sector. However, such specifications/requirements may be reused in other sectors, which may necessitate adaptation.

***Example**: ETSI DES/eHEALTH-008 - eHEALTH Data recording requirements for eHealth*

The aim of this work is to identify the requirements for recording eHealth events, i.e., those from ICT based eHealth devices and from health practitioners. On the understanding, as illustrated in the use case document and in the White Paper, that health records are subjectto security and privacy constraints, but at the same time need to be available to many different stakeholders across time and space without pre-cognition of who those stakeholders are.

3.4.4 Standards dependencies

In order to maintain cohesion and minimize conflicts and duplications of effort, standard specifications typically build upon other already-existing standards. Consequently, the implementation of a standard commonly necessitates the implementation of some other, underpinning, standards; the latter, called second-level standards, in turn may be connected to other foundational ones, and so on.

Commonly, the development of new standards is based on one or more underpinning standards. In turn, the underpinning standards may be connected to one or more fundamental standards. This interconnectedness and layers in the development of standards is intended to ensure consistency and avoid duplication of work. Therefore, generally when an AI system developer selects a first-level implementation standard, he/she discovers one or more propaedeutic standards to comply with —the second-level standards.

Consequently, we can define:

- First-level standard: The standard that an organization is required to implement, which commonly builds on other existing (second level) standards specifications.
- Second-level standard: The standard that an organization may be required to implement because it is foundational for the implementation of another standard — e.g., a first-level standard.

As shown in Figure 3, it is possible to recognize a multi-level network of associated/connected standards beginning with a set of first-level standards.

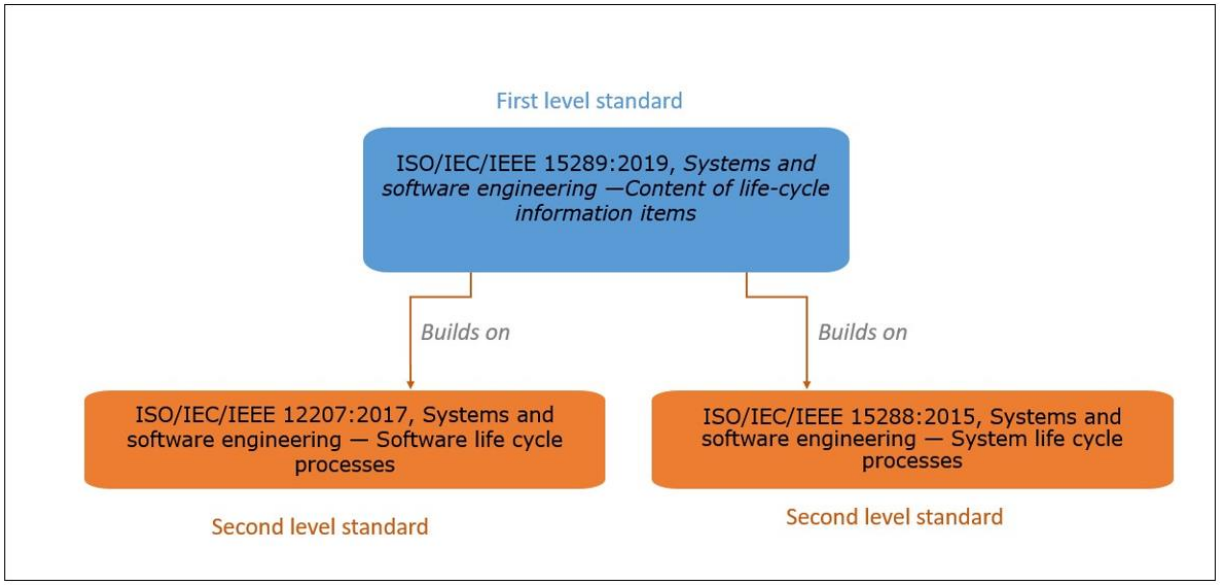

Figure 3 Example of a first-level standard and its associated/referenced second-level standards

3.5 Standards specific to AI

According to the Artificial Intelligence Act (AIA) (European Commission, 2021), 'artificial intelligence system' (AI system) refers to software that is developed with one or more of the techniques and approaches listed in Annex I of the AIA and can, for a given set of human-defined objectives, generate outputs such as content, predictions, recommendations, or decisions affecting the environments with which they interact.

3.6 ISO/IEC JTC 1/SC 42

Many of the emerging products and services in the era of digital transformation rely on the ability to provide forward-looking insights based on the large amount of data being generated. The technologies on which ISO/IEC JTC 1/SC 42 is working will facilitate such innovation:

AI technologies will allow insights and analytics that go far beyond what legacy analytic systems could provide in terms of efficiency, speed and applications that have yet to be envisioned. This is a radical departure from what analytic systems have traditionally been capable of.

Big data technologies will streamline and, in many cases, enable analytics to be performed on massive data sets. This will be achieved by designing computer system architectures around how the data sets will be generated and used in a particular application, rather than applying the same computer system to an application regardless of what the data looks like in terms of its variety, volume, variability and so on.

ISO/IEC JTC 1/SC 42 is considering some of the concerns about the usage and application of these technologies. Data quality standards for machine learning and analytics are crucial for helping to ensure the applied technologies produce useful insights and eliminate faulty features. Governance standards in AI and the business process framework for big data analytics address how the technologies can be governed and overseen from a management perspective. Concurrently developed standards from the outset in the areas of trustworthiness, ethics and societal concerns will ensure responsible deployment.

SC 42 is also developing a revolutionary strategy to instill confidence in the usage of AI technology through a management system standard.

3.6.1 AI Ecosystem approach

ISO/IEC JTC 1/SC 42 is taking an ecosystem approach by looking at emerging requirements from a variety of stakeholders. These include business, domain specific, regulatory, societal, and ethical requirements. The committee assimilates these various demands, translates them into technical requirements and develops horizontal deliverables that are applicable across industries.

This platform approach enables SC 42 to collaborate with other organizations and committees and provides a framework for application domains, such as smart manufacturing, to build upon and use the work of SC 42. The Figure 4 summarizes the approach.

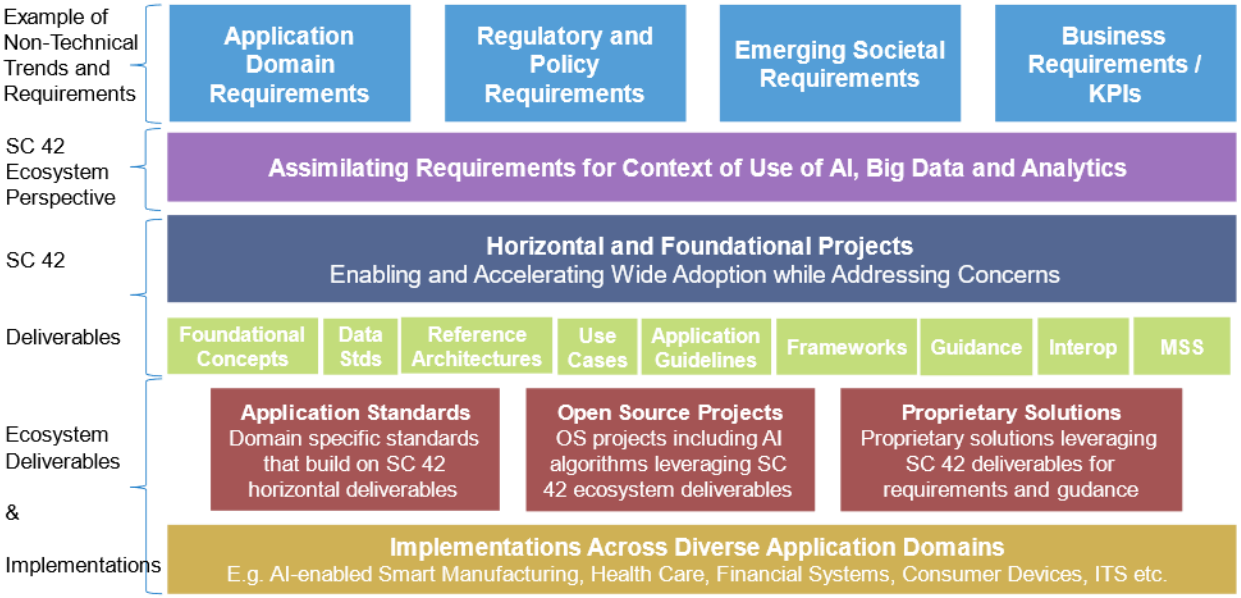

Figure 4 ISO/IEC JTC 1/SC 42's AI Ecosystem Approach

4 Methodology

For understanding the project's Key Concepts and assessing the identification of Standardization Areas, the following methodology has been designed and implemented for analyzing the standardization landscape and identifying applicable standards that are relevant to the project.

4.1 List of Key Concepts

The preparation of a list of Key Concepts served as a beginning point for the determination of Standardization Areas.

The selection of Key Concepts took into account the project's objectives and aims and the levels at which the project should be integrated. Additionally, the needs of the use cases were examined.

UNE, the partners, and the coordinator all concur with the list.

Table 4 displays the final list of Key Concepts utilized in the search.

Table 4 List of Key Concepts for Standardization Area determination

1	AI concepts, terminology and AI system framework
2	Data and Data Governance
3	Accuracy, robustness (trustworthiness), and Cybersecurity(Data Security)
4	Risk management system
5	Data Quality management system
6	Technical documentation
7	Record keeping
8	Transparency and information to users
9	Human oversight
10	Ethical aspects and societal considerations
11	AI use cases and applications
12	Computational aspects and machine learning
13	Open source
14	Industrial-process measurement, control and automation

4.2 Published and under development Standards

After determining the Key Standardization Areas, the applicable standards (relevant to the project) and the Technical Committee responsible for each standard have been identified.

European standardization developed by the European Committee for Standardization (CEN), European Committee for Standardization in the Electrical field CENELEC (CLC), European Telecommunications Standards Institute (ETSI), International standardization developed by the International Organization for Standardization (ISO), and International Electrotechnical Commission (IEC) were included in the search. The databases and websites used for the search are listed in *Chapter 8 "Reference"*.

4.3 Draft of the determined most relevant Technical Committees

The search method generates a list of the Technical Committees (TC) most interested in and relevant to the project.

Chapter 5 specifies the relevant TCs, whereas Chapter 6 describes the scope and general information of each applicable standard (associated with the specified TC) that has been delivered to s-X-AIPI partners.

4.4 Reference of applicable Standards to the project and WP

Following the standards identification process, the references of the relevant standards to their respective WPs are analyzed, which should be considered for the project, specifying in which WPs these standards would be used, how these standards would influence or impact project implementation, and opportunities/risks from technical and business perspectives.

This analysis of the references of the relevant Standards to the project, can assist the partners in interacting with the Standardization TCs during the development of standards.

Interactions with the Standardization TCs may take place via:

- The participation of one or more s-X-AIPI partners in the standardization technical body (Standardization is an open activity, and all interested parties may participate in a CEN/CENELEC or ISO/IEC Technical Committee(TC) via the designation of National Standardization Bodies(NSB) or National Mirror Committee or as organization liaison representative in a CEN/TC).
- The participation and engagement through the s-X-AIPI project's formal liaison with the main CEN/TC(s) in order to participate directly as a liaison organization intending to contribute technically to their standardization works.
- The dissemination of the s-X-AIPI project's progress through delivering reports to the relevant TC Secretaries or by attending their Technical Committee meetings.

As a result of the preceding steps, a list of relevant and applicable standards concerning the s-X-AIPI project has been specified (see Chapter 7).

5 Relevant Standardization areas, TCs and standards

This chapter provides information about relevant Standardization Technical Committees and the corresponding Standards, in the List of Key Concepts.

These Standardization Areas related to s-X-AIPI have been considered:

1	AI concepts, terminology and AI system framework
2	Data and Data Governance
3	Accuracy, robustness (trustworthiness), and Cybersecurity(Data Security)
4	Risk management system
5	Data Quality management system
6	Technical documentation
7	Record keeping
8	Transparency and information to users
9	Human oversight
10	Ethical aspects and societal considerations
11	AI use cases and applications
12	Computational aspects and machine learning
13	Open source
14	Industrial-process measurement, control and automation

5.1 AI concepts, terminology and AI system framework

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

Scope:

Standardization in the area of Artificial Intelligence:

- Serve as the focus and proponent for JTC 1's Standardization program on Artificial Intelligence,
- Provide guidance to JTC 1, IEC, and ISO committees developing Artificial Intelligence applications.

Structure:

- AHG 01 "Dissemination and outreach"
- AHG 02 "Liaison with SC 38"
- AHG 04 "Liaison with SC 27"
- JWG 02 "Joint Working Group ISO/IEC JTC1/SC 42 - ISO/IEC JTC1/SC 7; Testing of AI-based systems"
- WG 01 "Foundational standards"
- WG 02 "Data"
- WG 03 "Trustworthiness"
- WG 04 "Use cases and applications"
- WG 05 "Computational approaches and computational characteristics of AI systems"

Technical Committee: CEN/CLC/JTC 21 Artificial Intelligence

Scope:

The JTC is responsible for developing Standardization deliverables in the field of Artificial Intelligence (AI) and related use of data, as well as provide guidance to other Technical Committees

concerned with Artificial Intelligence. In addition to considering the adoption of relevant international standards and standards from other relevant Organizations, like ISO/IEC JTC 1 and its subcommittees, such as ISO/IEC JTC 1/SC 42 Artificial intelligence. The JTC shall produce Standardization deliverables to address European market and societal needs and to underpin primarily EU legislation, policies, principles, and values.

Structure:

- WG 01 "Strategic Advisory Group (SAG)"
- WG 02 "Operational aspects"
- WG 03 "Engineering aspects"
- WG 04 "Foundational and societal aspects"

CEN and CENELEC have established the new **CEN-CENELEC JTC 21 'Artificial Intelligence'**, based on the recommendations presented in the **CEN-CENELEC response to the EC White Paper on AI**, the **CEN-CENELEC Focus Group Road Map on Artificial Intelligence**, and the **German Standardization Roadmap for Artificial Intelligence**. The Joint Technical Committee, whose Secretariat is held by **DS**, the Danish Standardization Body, is responsible for the development and adoption of standards for AI and related data, as well as provide guidance to other Technical Committees concerned with AI.

CEN-CLC/JTC 21 identifies and adopts international standards already available or under development from other organizations like ISO/IEC JTC 1 and its subcommittees, such as SC 42 Artificial Intelligence. Furthermore, CEN-CLC/JTC 21 focuses on producing standardization deliverables that address European market and societal needs, as well as underpinning EU legislation, policies, principles, and values.

Standards relevant for s-X-AIPI

ISO/IEC 22989:2022

Information technology — Artificial intelligence — Artificial intelligence concepts and terminology

ISO/IEC 23053:2022

Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)

CEN/CLC/JTC 21 standards:

prCEN/CLC/TR 17894

Artificial Intelligence Conformity Assessment

prEN ISO/IEC 22989

Information technology - Artificial intelligence - Artificial intelligence concepts and terminology

prEN ISO/IEC 23053

Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)

5.2 Data and Data Governance

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC TS 4213

Information technology — Artificial intelligence — Assessment of machine learning classification performance

ISO/IEC AWI 5259-2

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 2: Data quality measures

ISO/IEC CD 5259-3

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 3: Data quality management requirements and guidelines

ISO/IEC CD 5259-4

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 4: Data quality process framework

ISO/IEC DIS 5338

Information technology — Artificial intelligence — AI system life cycle processes

ISO/IEC DTR 5469

Artificial intelligence — Functional safety and AI systems

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

ISO/IEC TR 24027:2021

Information technology — Artificial intelligence (AI) — Bias in AI systems and AI aided decision making

ISO/IEC TR 24029-1:2021

Artificial Intelligence (AI) — Assessment of the robustness of neural networks — Part 1: Overview

ISO/IEC DIS 24029-2

Artificial Intelligence (AI) — Assessment of the robustness of neural networks — Part 2: Methodology for the use of formal methods

ISO/IEC FDIS 24668

Information technology — Artificial intelligence — Process management framework for big data analytics

ISO/IEC DIS 42001

Information technology — Artificial intelligence — Management system

Technical Committee: ISO/IEC JTC 1/SC 40 IT service management and IT governance

Scope:

Standardization of IT Service Management and IT Governance.

Develop standards, tools, frameworks, best practices and related documents for IT Service Management and IT Governance, including areas of IT activity such as audit, digital forensics, governance, risk management, outsourcing, service operations and service maintenance, but excluding subject matter covered under the Scope: and existing work programs of JTC 1/SC 27 and JTC 1/SC 38.

The work will initially cover:

- Governance of IT, including the development of the ISO/IEC 38500 series standards and related documents.
- Operational aspects of Governance of IT, including ISO/IEC 30121 Information Technology — Governance of digital forensic risk framework, and interfaces with the management of IT as well as the role of governance in the area of business innovation.
- All aspects relating to IT service management, including the development of the ISO/IEC 20000 series standards and related documents.
- All aspects relating to IT-Enabled Services — Business Process Outsourcing, including the development of the ISO/IEC 30105 series standards and related documents

Structure:

- AG 01 "Communication"
- CAG 01 "Chair's Advisory Group"
- WG 01 "Governance of Information Technology"
- WG 02 "Service management – Information technology"
- WG 03 "IT-enabled services / Business process outsourcing"

Standards relevant for s-X-AIPI

ISO/IEC 38507:2022

Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations

5.3 Accuracy robustness (trustworthiness) and Cybersecurity(Data Security)

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC DTR 5469

Artificial intelligence - Functional safety and AI systems

ISO/IEC TR 24027:2021

Information technology — Artificial intelligence (AI) — Bias in AI systems and AI aided decision making

ISO/IEC TR 24028:2020

Information technology - Artificial intelligence - Overview of trustworthiness in artificial intelligence

ISO/IEC TR 24029-1:2021

Artificial Intelligence (AI) — Assessment of the robustness of neural networks — Part 1: Overview

ISO/IEC DIS 24029-2

Artificial Intelligence (AI) — Assessment of the robustness of neural networks — Part 2: Methodology for the use of formal methods

ISO/IEC AWI TS 8200

Information technology - Artificial intelligence - Controllability of automated artificial intelligence systems

Technical Committee: ISO/IEC JTC 1/SC 27

Scope:

The development of standards for the protection of information and ICT. This includes generic methods, techniques, and guidelines to address both security and privacy aspects, such as:

- Security requirements capture methodology;
- Management of information and ICT security; in particular information security management systems, security processes, and security controls and services;
- Cryptographic and other security mechanisms, including but not limited to mechanisms for protecting the accountability, availability, integrity and confidentiality of information;
- Security management support documentation including terminology, guidelines as well as procedures for the registration of security components;
- Security aspects of identity management, biometrics and privacy;
- Conformance assessment, accreditation and auditing requirements in the area of information security management systems;

- Security evaluation criteria and methodology.

SC 27 engages in active liaison and collaboration with appropriate bodies to ensure the proper development and application of SC 27 standards and technical reports in relevant areas.

Structure:

- AG 01 "Management Advisory Group"
- AG 02 "Trustworthiness"
- AG 03 "Concepts and Terminology"
- AG 05 "Strategy"
- AG 06 "Operations"
- AG 07 "Communication and Outreach (AG-CO)"
- CAG "Chair's Advisory Group"
- JWG 06 "Joint ISO/IEC JTC1/SC 27 - ISO/TC 22/SC 32 WG; Cybersecurity requirements and evaluation activities for connected vehicle devices"
- WG 01 "Information security management systems"
- WG 02 "Cryptography and security mechanisms"
- WG 03 "Security evaluation, testing and specification"
- WG 04 "Security controls and services"
- WG 05 "Identity management and privacy technologies"

Technical Committee: CEN-CLC/JTC 13 Cybersecurity and data protection

CEN-CLC/JTC 13 'Cybersecurity and data protection' is the CEN and CENELEC horizontal technical committee that addresses these needs. Its primary objective is to transport relevant international standards (especially from ISO/IEC JTC 1 SC 27) as European Standards (ENs) in the Information Technology (IT) domain. It also develops 'homegrown' ENs, where gaps exist, in support to EU regulations (RED, eIDAS, GDPR, NIS, etc.). These two streams of activities aim at creating a strategic portfolio of standards in Europe, which fits the European needs. CEN-CLC/JTC 13 works closely with **ENISA** (The European Union Agency for Cybersecurity) in the context of the European certification schemes, and with the European Commission, in the frame of the cybersecurity-related Standardization request under the Radio Equipment Directive (RED).

CLC/TC 65X 'Industrial-process measurement, control and automation' is the other main provider of cybersecurity-related standards in the Operational Technology (OT) domain. It prepares standards for systems and elements used for industrial process measurement, control and automation. It has created the EN IEC 62443 series of standards for Operational Technology (OT) found in industrial and critical infrastructures, including but not restricted to power utilities, water managements systems, healthcare and transport systems.

Standards relevant for s-X-AIPI

ISO/IEC 20547-4:2020

Information technology - Big data reference architecture - Part 4: Security and privacy

ISO/IEC CD TR 27563

Security and privacy in artificial intelligence use cases

ISO/IEC AWI 27090

Cybersecurity - Artificial Intelligence - Guidance for addressing security threats and failures in artificial intelligence systems

ISO/IEC 27001:2013

Information technology — Security techniques — Information security management systems — Requirements

ISO/IEC 27002:2022

Information security, cybersecurity and privacy protection — Information security controls

ISO/IEC 27006:2015/Amd 1:2020

Information technology — Security techniques — Requirements for bodies providing audit and certification of information security management systems — Amendment 1

ISO/IEC 27010:2015

Information technology — Security techniques — Information security management for inter-sector and inter-organizational communications

ISO/IEC 27013:2021

Information security, cybersecurity and privacy protection — Guidance on the integrated implementation of ISO/IEC 27001 and ISO/IEC 20000-1

ISO/IEC 27017:2015

Information technology — Security techniques — Code of practice for information security controls based on ISO/IEC 27002 for cloud services

ISO/IEC 27039:2015

Information technology — Security techniques — Selection, deployment and operations of intrusion detection and prevention systems (IDPS)

ISO/IEC 27701:2019

Security techniques — Extension to ISO/IEC 27001 and ISO/IEC 27002 for privacy information management — Requirements and guidelines

Technical Committee: ISO/TC 22/SC 32/WG 14 Road Vehicles - Safety and artificial intelligence

Standards relevant for s-X-AIPI

ISO/AWI PAS 8800

Road Vehicles - Safety and artificial intelligence

Technical Committee: ETSI ISG SAI - ETSI Industry Specification Group (ISG) Securing Artificial Intelligence (SAI)

Scope:

The rapid expansion of Artificial Intelligence into new industries with new stakeholders, coupled with an evolving threat landscape, presents a tough challenge for security.

Artificial Intelligence impacts our lives every day, from local AI systems on our mobile phones suggesting the next word in our sentences to large manufacturers using AI to improve industrial processes. AI has the potential to revolutionize our interactions with technology, improve our quality of life and enrich security – but without high quality technical standards, AI has the potential to create new attacks and worsen security.

The ETSI Industry Specification Group on Securing Artificial Intelligence (ISG SAI) focuses on three key areas: using AI to enhance security, mitigating against attacks that leverage AI, and securing AI itself from attack. The ETSI ISG SAI works alongside a landscape of huge growth in AI, creating standards to preserve and improve the security of Artificial Intelligence.

Standards relevant for s-X-AIPI

ETSI SAI 002

Securing Artificial Intelligence (SAI); Data Supply Chain Security

ETSI SAI 003

Securing Artificial Intelligence (SAI); Security Testing of AI

ETSI SAI 005

Securing Artificial Intelligence (SAI); Mitigation Strategy Report

ETSI SAI 006

Securing Artificial Intelligence (SAI); The role of hardware in security of AI

5.4 Risk management system

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC DIS 5338

Information technology — Artificial intelligence — AI system life cycle processes

ISO/IEC DTR 5469

Artificial intelligence — Functional safety and AI systems

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

ISO/IEC DIS 25059

Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality model for AI systems

ISO/IEC 38507:2022

Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations

ISO/IEC DIS 42001

Information technology — Artificial intelligence — Management system

5.5 Data Quality management system

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC CD 5259-1

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 1: Overview, terminology, and examples

ISO/IEC AWI 5259-2

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 2: Data quality measures

ISO/IEC CD 5259-3

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 3: Data quality management requirements and guidelines

ISO/IEC CD 5259-4

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 4: Data quality process framework

ISO/IEC AWI 5259-5

Artificial intelligence — Data quality for analytics and machine learning (ML) — Part 5: Data quality governance

ISO/IEC DIS 5338

Information technology — Artificial intelligence — AI system life cycle processes

ISO/IEC CD 5339

Information Technology — Artificial Intelligence — Guidelines for AI applications

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

ISO/IEC TR 24029-1:2021

Artificial Intelligence (AI) — Assessment of the robustness of neural networks — Part 1: Overview

ISO/IEC DIS 24029-2

Artificial Intelligence (AI) — Assessment of the robustness of neural networks — Part 2: Methodology for the use of formal methods

ISO/IEC DIS 42001

Information technology — Artificial intelligence — Management system

ISO/IEC DIS 25059

Software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Quality model for AI systems

Technical Committee: ISO/IEC JTC 1/SC 40 IT service management and IT governance

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC 38507:2022

Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations

Technical Committee: ISO/IEC JTC 1/SC 7 Software and systems engineering

Scope:

Standardization of processes, supporting tools and supporting technologies for the engineering of software products and systems.

Note: The processes, tools and technologies are within the Scope of JTC1 terms of references and exclude specific tools and technologies that have been assigned by JTC1 to other of its SC's.

Structure:

- AG 01 "Chair's Advisory Group"
- AG 02 "Business planning group"
- AG 03 "Communications and outreach"
- AG 04 "Standards management"
- AG 05 "Architecture and future watch"
- AHG 06 "Digital engineering"
- AHG 07 "Open source software"
- JWG 28 "Joint ISO/IEC JTC 1/SC 7 - ISO/TC 159/SC 4 WG; Common industry formats for usability-related information"
- WG 02 "System software documentation"
- WG 04 "Tools and environment"
- WG 06 "Software Product and System Quality"

- WG 07 "Life cycle management"
- WG 10 "Process assessment"
- WG 19 "Techniques for Specifying IT Systems"
- WG 20 "Software and systems bodies of knowledge and professionalization"
- WG 21 "Information technology asset management"
- WG 22 "Vocabulary validation"
- WG 24 "Systems and software standards for Very Small Entities"
- WG 26 "Software testing"
- WG 29 "Agile and DevOps"
- WG 30 "Systems resilience"
- WG 42 "Architecture"

Standards relevant for s-X-AIPI

ISO/IEC 25024:2015

Systems and software engineering — Systems and software Quality Requirements and Evaluation (SQuaRE) — Measurement of data quality

5.6 Technical documentation

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

ISO/IEC TR 24027:2021

Information technology — Artificial intelligence (AI) — Bias in AI systems and AI aided decision making

ISO/IEC DIS 42001

Information technology — Artificial intelligence — Management system

5.7 Record keeping

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

5.8 Transparency and information to users

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

ISO/IEC TR 24027:2021

Information technology — Artificial intelligence (AI) — Bias in AI systems and AI aided decision making

ISO/IEC TR 24028:2020

Information technology — Artificial intelligence — Overview of trustworthiness in artificial intelligence

ISO/IEC DIS 42001

Information technology — Artificial intelligence — Management system

ISO/IEC AWI 12792

Information technology - Artificial intelligence - Transparency taxonomy of AI systems

Technical Committee: ISO/IEC JTC 1/SC 40 IT service management and IT governance

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC 38507:2022

Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations

5.9 Human oversight

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC FDIS 23894

Information technology — Artificial intelligence — Guidance on risk management

ISO/IEC DIS 42001

Information technology — Artificial intelligence — Management system

ISO/IEC 38507:2022

Information technology — Governance of IT — Governance implications of the use of artificial intelligence by organizations

5.10 Ethical aspects and societal considerations

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC TR 24368:2022

Information technology — Artificial intelligence — Overview of ethical and societal concerns

ISO/IEC PWI 17866

Artificial intelligence — Best practice guidance for mitigating ethical and societal concerns

5.11 AI use cases and applications

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC TR 24030:2021

Information technology – Artificial intelligence (AI) – Use cases).

ISO/IEC CD 5339

Information Technology — Artificial Intelligence — Guidelines for AI applications

ISO/IEC DIS 5338

Information technology — Artificial intelligence — AI system life cycle processes

5.12 Computational aspects and machine learning

Technical Committee: ISO/IEC JTC 1/SC 42 Artificial intelligence

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC CD 5392

Information technology — Artificial intelligence — Reference architecture of knowledge engineering

ISO/IEC TR 24372:2021

Information technology — Artificial intelligence (AI) — Overview of computational approaches for AI systems

ISO/IEC AWI TR 17903

Information technology — Artificial intelligence — Overview of machine learning computing devices

ISO/IEC TS 4213

Information technology — Artificial intelligence — Assessment of machine learning classification performance

5.13 Open source

Technical Committee: ISO/IEC JTC 1 Information technology

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC 5230:2020

Information technology — OpenChain Specification

Technical Committee: ISO/IEC JTC 1/SC 7 Software and systems engineering

(The Scope of this TC is quoted previously)

Standards relevant for s-X-AIPI

ISO/IEC/IEEE 41062:2019

Software engineering — Recommended practice for software acquisition

5.14 Industrial-process measurement, control and automation

Technical Committee: IEC TC 65 Industrial-process measurement, control and automation

Scope:

- To prepare international standards for systems and elements used for industrial-process measurement and control concerning continuous and batch processes.
- To co-ordinate the Standardization of those features of related elements which affect suitability for integration into such systems. The work of Standardization outlined above is to be carried out in the international fields for equipment and systems operating with electrical, pneumatic, hydraulic, mechanical or other systems of measurement and/or control.

Structure:

The Scope of IEC TC 65 is so wide (currently 396 published standards, 56 standards under development) that it has been broken down into four more specific subcommittees, namely:

- **IEC SC 65A System aspects**

  Scope: To prepare standards regarding the generic aspects of systems used in industrial-process measurement and control: operational conditions (including EMC), methodology for the assessment of systems, functional safety, etc.

  Horizontal Safety Function

  Functional safety of electrical/electronic/programmable electronic systems (which would encompass safety-related software).

- **IEC SC 65B Measurement and control devices**

  Scope: Standardization in the field of specific aspects of devices (hardware and software) used in industrial process measurement and control, such as measurement devices, analyzing equipment, actuators, and programmable logic controllers, and covering such aspects as interchangeability, performance evaluation, and functionality definition.

- **IEC SC 65C Industrial networks**

  Scope: To prepare standards on Digital Data Communications sub-systems for industrial-process measurement and control as well as on instrumentation systems used for research, development andtesting purposes.

- **IEC SC 65E Devices and integration in enterprise systems**

  Scope: To prepare international standards to specify digital representation of device properties and functions, methodologies and applications supporting automation of engineering processes, including diagnostic and maintenance techniques.

CENELEC CLC/TC 65X Industrial-process measurement, control and automation is the IEC TC 65 mirror committee at European level. No relevant differences have been identified between both Technical Committees, so only information about IEC TC 65 has been included in this subclause to avoid unnecessary duplication of information.

Standards relevant for s-X-AIPI

IEC TS 62443-1-1:2009

Industrial communication networks - Network and system security - Part 1-1: Terminology, concepts and models

IEC 62443-2-1:2010

Industrial communication networks - Network and system security - Part 2-1: Establishing an industrial automation and control system security program

IEC TR 62443-2-3:2015

Security for industrial automation and control systems - Part 2-3: Patch management in the IACS environment

IEC 62443-2-4:2015

Security for industrial automation and control systems - Part 2-4: Security program requirements for IACS service providers

IEC TR 62443-3-1:2009

Industrial communication networks - Network and system security - Part 3-1: Security technologies for industrial automation and control systems

IEC 62443-3-2 ED1

Security for industrial automation and control systems - Part 3-2: Security risk assessment and system design

IEC 62443-3-3:2013

Industrial communication networks - Network and system security - Part 3-3: System security requirements and security levels

IEC 62443-4-1 ED1

Industrial communication networks - Security for industrial and control systems - Part: 4-1: Product development requirements

IEC 62443-4-2 ED1

Industrial communication networks - Security for industrial automation and control systems - Part 4-2: Technical security requirements for IACS components

IEC 62890 ED1

Life-cycle management for systems and products used in industrial-process measurement, control and automation

IEC 62708:2015

Documents kinds for electrical and instrumentation projects in the process industry

IEC TR 62794:2012

Industrial-process measurement, control and automation - Reference model for representation of production facilities (digital factory)

IEC 61512-1:1997

Batch control - Part 1: Models and terminology

IEC 61512-2:2001

Batch control - Part 2: Data structures and guidelines for languages

IEC 61512-3:2008

Batch control - Part 3: General and site recipe models and representation

IEC 61512-4:2009

Batch control - Part 4: Batch production records

IEC 62682:2014

Management of alarm systems for the process industries

IEC 61499-1:2012

Function blocks - Part 1: Architecture

IEC 61499-2:2012

Function blocks - Part 2: Software tool requirements

IEC 61499-4:2013

Function blocks - Part 4: Rules for compliance profiles

IEC TS 62603-1:2014

Industrial process control systems - Guideline for evaluating process control systems - Part 1: Specifications

IEC TS 61804-1:2003

Function blocks (FB) for process control - Part 1: Overview of system aspects

IEC 61804-2:2006

Function blocks (FB) for process control - Part 2: Specification of FB concept

IEC 61804-3:2015

Function Blocks (FB) for process control and Electronic Device Description Language (EDDL) - Part 3: EDDL syntax and semantics

IEC 61804-4:2015

Function blocks (FB) for process control and electronic device description language (EDDL) - Part 4: EDD interpretation

IEC 61804-5:2015

Function blocks (FB) for process control and electronic device description language (EDDL) - Part 5: EDDL Builtin library

IEC TR 61804-6:2012

Function blocks (FB) for process control - Electronic device description language (EDDL) - Part 6: Meeting the requirements for integrating fieldbus devices in engineering tools for field devices

IEC 61987

Industrial-process measurement and control - Data structures and elements in process equipment catalogues

IEC 62264-1:2013

Enterprise-control system integration - Part 1: Models and terminology

IEC 62264-2:2013

Enterprise-control system integration - Part 2: Object and attributes for enterprise-control system integration

IEC 62264-3:2007

Enterprise-control system integration - Part 3: Activity models of manufacturing operations management

IEC 62264-4:2015

Enterprise-control system integration - Part 4: Objects models attributes for manufacturing operations management integration

IEC 62264-5:2016

Enterprise-control system integration - Part 5: Business to manufacturing transactions

IEC PAS 62264-6:2016

Enterprise-control system integration - Part 6: Messaging Service Model

IEC 62337:2012

Commissioning of electrical, instrumentation and control systems in the process industry - Specific phases and milestones

IEC 62381:2012

Automation systems in the process industry - Factory acceptance test (FAT), site acceptance test (SAT), and site integration test (SIT)

IEC 62382:2012

Control systems in the process industry - Electrical and instrumentation loop check

IEC TR 62541

OPC unified architecture

IEC 62714-1:2014

Engineering data exchange format for use in industrial automation systems engineering - Automation markup language - Part 1: Architecture and general requirements

IEC 62714-2:2015

Engineering data exchange format for use in industrial automation systems engineering - Automation markup language - Part 2: Role class libraries

Technical Committee: ISO/TC 184 Automation systems and integration

Scope:

Standardization in the field of automation systems and their integration for design, sourcing, manufacturing, production and delivery, support, maintenance and disposal of products and their associated services. Areas of Standardization include information systems, automation and control systems and integration technologies.

This TC has currently 810 published standards and 37 standards under development.

Structure:

- ISO/TC 184/SC 1 Physical device control
- ISO/TC 184/SC 4 Industrial data
- ISO/TC 184/SC 5 Interoperability, integration, and architectures for enterprise systems and automation applications
- ISO/TC 184/WG 6 OGI (Oil and Gas Interoperability)

CEN/TC 310 Advanced automation technologies and their applications has not been considered relevant because it has a very small number of standards published, mainly developed at ISO level.

Standards relevant for s-X-AIPI

ISO 11354-1:2011

Advanced automation technologies and their applications -- Requirements for establishing manufacturing enterprise process interoperability -- Part 1: Framework for enterprise interoperability

ISO 11354-2:2015

Advanced automation technologies and their applications -- Requirements for establishing manufacturing enterprise process interoperability -- Part 2: Maturity model for assessing enterprise interoperability

ISO 14258:1998

Industrial automation systems -- Concepts and rules for enterprise models

ISO 15531-1:2004

Industrial automation systems and integration -- Industrial manufacturing management data -- Part 1: General overview

ISO 15531-31:2004

Industrial automation systems and integration -- Industrial manufacturing management data -- Part 31: Resource information model

ISO 15531-32:2005

Industrial automation systems and integration -- Industrial manufacturing management data: Resources usage management -- Part 32: Conceptual model for resources usage management data

ISO 15531-42:2005

Industrial automation systems and integration -- Industrial manufacturing management data -- Part 42: Time Model

ISO 15531-43:2006

Industrial automation systems and integration -- Industrial manufacturing management data -- Part 43: Manufacturing flow management data: Data model for flow monitoring and manufacturing data exchange

ISO 15531-44:2010

Industrial automation systems and integration -- Industrial manufacturing management data -- Part 44: Information modelling for shop floor data acquisition

ISO 15704:2000

Industrial automation systems -- Requirements for enterprise-reference architectures and methodologies

ISO 15745

Industrial automation systems and integration -- Open systems application integration framework --

ISO 15746-1:2015

Automation systems and integration -- Integration of advanced process control and optimization capabilities for manufacturing systems -- Part 1: Framework and functional model

ISO 16100

Industrial automation systems and integration -- Manufacturing software capability profiling for interoperability

ISO 9506-1:2003

Industrial automation systems -- Manufacturing Message Specification -- Part 1: Service definition

ISO 9506-2:2003

Industrial automation systems -- Manufacturing Message Specification -- Part 2: Protocol specification

ISO/TR 10314-1:1990

Industrial automation -- Shop floor production -- Part 1: Reference model for Standardization and a methodology for identification of requirements

ISO/TR 10314-2:1991

Industrial automation -- Shop floor production -- Part 2: Application of the reference model for Standardization and methodology

ISO/TS 18876-1:2003

Industrial automation systems and integration -- Integration of industrial data for exchange, access and sharing -- Part 1: Architecture overview and description

ISO/TS 18876-2:2003

Industrial automation systems and integration -- Integration of industrial data for exchange, access and sharing -- Part 2: Integration and mapping methodology

ISO 19440:2007

Enterprise integration -- Constructs for enterprise modelling

ISO/DIS 15746-2

Automation systems and integration -- Integration of advanced process control and optimization capabilities for manufacturing systems -- Part 2: Activity models and information exchange

ISO/NP 15746-3

Automation systems and integration -- Integration of advanced process control and optimization capabilities for manufacturing systems -- Part 3: Part 3: Validation and Verification

6 Description of the s-X-AIPI most relevant Standards

6.1 ISO/IEC standards description

Reference ID
ISO/IEC 25024:2015
Title
Systems and software engineering – Systems and software Quality Requirements and Evaluation (SquaRE)
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
ISO IEC 25024 2015 contains the following (a) a basic set of data quality measures foreach characteristic; (b) a basic set of target entities to which the quality measures are applied during the data-life-cycle; (c) an explanation of how to apply data quality measures; (d) a guidance for organizations defining their own measures for data qualityrequirements and evaluation. It includes, as informative annexes, a synoptic table of quality measure elements defined in this International standard (Annex A), a table of quality measures associated to each quality measure element and target entity (Annex B), considerations about specific quality measure elements (Annex C), a list of quality measures in alphabetic order (Annex D), and a table of quality measures grouped bycharacteristics and target entities (Annex E).
Maturity level
Review
Release time of specification/initiative outcome
2015
Useful Link
https://www.iso.org/standard/35749.html

Reference ID
ISO/IEC TR 24027:2021
Title
Information technology – Artificial Intelligence (AI) – Bias in AI systems and AI-aided decision making
Domain level
General
Type of initiative
Technical report
Main Objectives and Expected content
To address bias in relation to AI systems, especially with regards to AI-aided decision making. To provide measurement techniques and methods for assessing bias, with the aim to address and treat bias-related vulnerabilities. All AI system lifecycle phases are in Scope:, including but not limited to data collection, training, continual learning, design,testing, evaluation, and use.
Maturity level
Publication
Release time of specification/initiative outcome
2021
Useful Link
https://www.iso.org/standard/77607.html?browse=tc

Reference ID
SO/IEC TR 24028:2020
Title
Information technology — Artificial intelligence — Overview of trustworthiness in artificial intelligence
Domain level

General
Type of initiative
Technical report
Main Objectives and Expected content
This document surveys topics related to trustworthiness in AI systems, including thefollowing: • approaches to establish trust in AI systems through transparency, explainability, controllability, etc.; • engineering pitfalls and typical associated threats and risks to AI systems, along with possible mitigation techniques and methods; and • approaches to assess and achieve availability, resiliency, reliability, accuracy, safety, security and privacy of AI systems. The specification of levels of trustworthiness for AI systems is out of the Scope of this document.
Maturity level
Publication
Release time of specification/initiative outcome
2020
Useful Link
https://www.iso.org/standard/77608.html

Reference ID
ISO/IEC TR 24029-1:2021
Title
Artificial Intelligence (AI) – Assessment of the robustness of neural networks – Part1: Overview
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide background about the existing methods to assess the robustness of neuralnetworks.
Maturity level
Publication
Release time of specification/initiative outcome
2021
Useful Link
https://www.iso.org/standard/77609.html

Reference ID
ISO/IEC DIS 24029-2
Title
Artificial Intelligence (AI) – Assessment of the robustness of neural networks – Part2: Methodology for the use of formal methods
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide guidelines on the use of formal methods to assess robustness properties of neural networks.
Maturity level
Enquiry
Release time of specification/initiative outcome

Useful Link
https://www.iso.org/standard/79804.html

Reference ID
ISO/IEC WD 5259-1
Title
Data quality for analytics and ML – Part 1: Overview, terminology, and examples
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide the landscape for understanding and associating of data quality for analyticsand ML series and guides the foundational concepts regarding data quality for analyticsand AI.
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/81088.html

Reference ID
ISO/IEC AWI 5259-2
Title
Data quality for analytics and ML – Part 2: Data quality measures
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide a data quality model, data quality measures, and guidance on reporting dataquality in the context of analytics and machine learning (ML).
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/81860.html

Reference ID
ISO/IEC WD 5259-3
Title
Data quality for analytics and ML – Part 3: Data quality management requirements andguidelines.
Domain level
General
Type of initiative
Standard

Main Objectives and Expected content
To provide requirements and guidance for establishing, implementing, maintaining andcontinually improving the quality for data used in the areas of analytics and ML.
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/81092.html

Reference ID
ISO/IEC WD 5259-4
Title
Data quality for analytics and ML – Part 4: Data quality process framework
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide general common organizational approaches, regardless of type, size or nature of the applying organization, to ensure data quality for training and evaluation in analytics and ML.
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/81093.html

Reference ID
ISO/IEC WD 5338
Title
Information technology – Artificial intelligence – AI system life cycle processes
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide processes that support the definition, control and improvement of AI systemlife cycle processes used within an organization or a project. Organizations and projectscan use these processes when developing or acquiring AI systems.
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/81118.html?browse=tc

Reference ID

ISO/IEC DTR 5469
Title
Artificial intelligence – Functional safety and AI systems
Domain level
General
Type of initiative
Technical report
Main Objectives and Expected content
To describe properties, relevant risk factors, usable methods and processes for the application of AI in safety-relevant functions, for the application of safety-relevant functions for the control of AI systems and for the application of AI in the developmentof safety-relevant functions.
Maturity level
Committee (under development)
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/81283.html?browse=tc

Reference ID
ISO/IEC TR 24368:2022
Title
Information technology – Artificial intelligence – Overview of ethical and societalconcerns
Domain level
General
Type of initiative
Technical report
Main Objectives and Expected content
To provide a high-level overview of AI ethical and societal concerns. In addition, this document: provides information in relation to principles, processes and methods in this area; is intended for technologists, regulators, interest groups, and society at large; is not intended to advocate for any specific set of values (value systems). This document includes an overview of International Standards that address issues arising from AI ethical and societal concerns.
Maturity level
Publication
Release time of specification/initiative outcome
2022
Useful Link
https://www.iso.org/standard/78507.html

Reference ID
ISO/IEC TR 24372:2021
Title
Information technology – Artificial intelligence (AI) – Overview of computationalapproaches for AI systems
Domain level
General
Type of initiative
Technical report

Main Objectives and Expected content
To provide an overview of the state of the art of computational approaches for AI systems, by describing: a) main computational characteristics of AI systems; b) main algorithms and approaches used in AI systems, referencing use cases contained in ISO/IEC TR 24030.
Maturity level
Publication
Release time of specification/initiative outcome
2021
Useful Link
https://www.iso.org/standard/78508.html?browse=tc

Reference ID
ISO/IEC CD 24668
Title
Information technology – Artificial intelligence – Process management framework for Big data analytics
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide a process management framework to effectively leverage big data analytics across the organization irrespective of the industries/sectors. This document specifies the process reference model for big data analytics with its process groups considered along with their interconnectivity, and the process assessment model that provides a common basis for performing assessments on big data processes.
Maturity level
Committee
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/78368.html?browse=tc

Reference ID
ISO/IEC 25012:2008
Title
Software engineering – Software product Quality Requirements and Evaluation(SQuaRE) – Data quality model
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content

To define a general data quality model for data retained in a structured format within acomputer system. ISO/IEC 25012:2008 can be used to establish data quality requirements, define data quality measures, or plan and perform data quality evaluations. It could be used, for example, • to define and evaluate data quality requirements in data production, acquisitionand integration processes, • to identify data quality assurance criteria, also useful for re-engineering,assessment and improvement of data, • to evaluate the compliance of data with legislation and/or requirements. ISO/IEC 25012:2008 categorizes quality attributes into fifteen characteristics consideredby two points of view: inherent and system dependent. Data quality characteristics willbe of varying importance and priority to different stakeholders. ISO/IEC 25012:2008 is intended to be used in conjunction with the other parts of the SQuaRE series of International Standards, and with ISO/IEC 9126-1 until superseded by ISO/IEC 25010. THIS STANDARD WAS LAST REVIEWED AND CONFIRMED IN 2019. THEREFORE, THIS VERSION REMAINS CURRENT.
Maturity level
Published
Release time of specification/initiative outcome
2019
Useful Link
https://www.iso.org/standard/35736.html

Reference ID
ISO/IEC WD TS 4213
Title
Information technology – Artificial Intelligence – Assessment of machine learning classification performance
Domain level
General
Type of initiative
Technical specification
Main Objectives and Expected content
To specify methodologies for measuring classification performance of machine learningmodels, systems and algorithms.
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/79799.html

Reference ID
ISO/IEC FDIS 23894
Title
Information Technology – Artificial Intelligence – Risk Management
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content

To provide guidelines on managing risk faced by organizations during the development and application of artificial intelligence (AI) techniques and systems. The guidelines alsoaim to assist organizations to integrate risk management into their AI-related activitiesand functions. It moreover describes processes for the effective implementation and integration of AI risk management. The application of these guidelines can be customized to any organization and its context.
Maturity level
Approval
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/77304.html?browse=tc

Reference ID
ISO/IEC CD 38507
Title
Information technology – Governance of IT – Governance implications of the use of artificial intelligence by organizations
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide guidance for governing bodies of organizations that are using – or consideringthe use of – tools or systems that incorporate artificial intelligence. This document is a high level, principles-based advisory standard. In addition to providing broad guidance on the role of a governing body, it encourages organizations to use appropriate standards to underpin their governance of information technology – including the use of artificial intelligence (AI).
Maturity level
Committee
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/56641.html?browse=tc

Reference ID
ISO/IEC WD 42001
Title
Information Technology – Artificial intelligence – Management system
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To provide the requirements and provides guidance for establishing, implementing, maintaining and continually improving an artificial intelligence management system within the context of an organization.
Maturity level
Preparatory
Release time of specification/initiative outcome

Useful Link
https://www.iso.org/standard/81230.html?browse=tc

Reference ID
ISO/IEC DIS 25059
Title
Software engineering – Systems and software Quality Requirements and Evaluation(SQuaRE) – Quality model for AI-based systems.
Domain level

Reference ID
ISO/IEC DIS 25059
Title
Software engineering – Systems and software Quality Requirements and Evaluation(SQuaRE) – Quality model for AI-based systems.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
To introduce a quality model for AI systems. It is an application-specific extension to the SQuaRE series. The model characteristics provide a consistent terminology for specifying, measuring and evaluating AI system quality.
Maturity level
Enquiry
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/80655.html

Reference ID
ISO/IEC 22989:2022
Title
Information technology – Artificial intelligence – Artificial intelligence concepts and terminology
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This document establishes terminology for AI and describes concepts in the field of AI. This document can be used in the development of other standards and in support of communications among diverse, interested parties or stakeholders.
Maturity level
Publication

Release time of specification/initiative outcome
2022
Useful Link
https://www.iso.org/standard/74296.html

Reference ID
ISO/IEC 23053:2022
Title
Framework for Artificial Intelligence (AI) Systems Using Machine Learning (ML)
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This document establishes an Artificial Intelligence (AI) and Machine Learning (ML) framework for describing a generic AI system using ML technology. The framework describes the system components and their functions in the AI ecosystem. This document is applicable to all types and sizes of organizations, including public and private companies, government entities, and not-for-profit organizations, that are implementing or using AI systems.
Maturity level
Publication
Release time of specification/initiative outcome
2022
Useful Link
https://www.iso.org/standard/74438.html

Reference ID
ISO/IEC 5230:2020
Title
Information technology — OpenChain Specification
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This document specifies the key requirements of a quality open source license compliance program in order to provide a benchmark that builds trust between organizations exchanging software solutions comprised of open source software.
Maturity level
Publication
Release time of specification/initiative outcome
2020
Useful Link
https://www.iso.org/standard/81039.html

Reference ID
ISO/IEC/IEEE 41062:2019
Title

Software engineering — Recommended practice for software acquisition.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
Describes a set of useful quality considerations that can be selected and applied during one or more steps in a software acquisition process. The recommended practices can be applied to software that runs on any computer system regardless of the size, complexity, or criticality of the software. The software supply chain may include integration of commercial-off-the-shelf (COTS), custom, or free and open source software (FOSS). Each organization or individual using this recommended practice will need to identify the specific quality and activities that need to be included within the organization's acquisition process. Security will be included as a quality attribute considered during the acquisition.
Maturity level
Publication
Release time of specification/initiative outcome
2019
Useful Link
https://www.iso.org/standard/75341.html

Reference ID
ISO/IEC 20547-4:2020
Title
Information technology - Big data reference architecture - Part 4: Security and privacy
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This document specifies the security and privacy aspects applicable to the big data reference architecture (BDRA) including the big data roles, activities and functional components and also provides guidance on security and privacy operations for big data.
Maturity level
Publication
Release time of specification/initiative outcome
2020
Useful Link
https://www.iso.org/standard/71278.html

Reference ID
ISO/IEC CD TR 27563
Title
Security and privacy in artificial intelligence use cases
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content

Impact of security and privacy in artificial intelligence use cases has been progressed to Draft Technical Report (DTR) stage. It is awaiting approval of a title change to Security and privacy in artificial intelligence use cases.
Maturity level
Committee
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/80396.html

Reference ID
ISO/IEC AWI 27090
Title
Cybersecurity – Artificial Intelligence – Guidance for addressing security threats and failures in artificial intelligence systems
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This document provides guidance for organizations to address security threats and failures in artificial intelligence (AI) systems. The guidance in this document aims to provide information to organizations to help them better understand the consequences of security threats to AI systems, throughout their lifecycle, and descriptions of how to detect and mitigate such threats. This document is applicable to all types and sizes of organizations, including public and private companies, government entities, and not-for-profit organizations, that develop or use AI systems.
Maturity level
Preparatory
Release time of specification/initiative outcome
Useful Link
https://www.iso.org/standard/56581.html

6.2 ETSI standards description

Reference ID
DES/eHEALTH-008
Title
eHEALTH Data recording requirements for eHealth
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The aim of this work is to identify the requirements for recording eHealth events, i.e., those from ICT based eHealth devices and from health practitioners. On the understanding, as illustrated in the use case document and in the White Paper, that health records are subject to security and privacy constraints, but at the same time need to be available to many different stakeholders across time and space without pre-cognition of who those stakeholders are. The purpose of this technical specification is to very carefully specify at stage1 and stage 2 level the normative framework for ensuring events/transactions related to a patient are recorded accurately by identifiable entities (devices or health professionals) and made available with minimumdelay to any other health professional (i.e. to ensure that actions taken by one health professional is visible to any other health professional irrespective of location without delay). The normative framework is intended to be

adopted by all groups contributing to eHealth including CYBER, smartM2M, smartBAN.
Maturity level
Early Draft
Release time of specification/initiative outcome
08/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=56908

Reference ID
TR 103 821
Title
Autonomic network engineering for the self-managing Future Internet (AFI); ArtificialIntelligence (AI) in Test Systems and Testing AI models.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This work item covers the following points: • A general guide on the benefits of AI in Test Systems, with illustrations of AI inTest Systems • A general guide for testing AI Models in general, and the definitions of standardized metrics for measurements and assessments in Testing and Certification of AI Models, including certification of AI models of AutonomicComponents/Systems • Testing ETSI GANA Models Cognitive Decision Elements (DEs) as AI Models forAutonomic (Closed-Loop) Network Automation, in the space of Autonomic Management & Control (AMC) of Networks and Services, with illustrations of AIModels for Autonomic Management & Control of 5G Network Slices • Generic Test Framework for Testing ETSI GANA Multi-Layer Autonomics & theirAI Algorithms for Closed-Loop Network Automation (see EG 203 341).
Maturity level
In development
Release time of specification/initiative outcome
01/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=58442

Reference ID
GS/ARF-003
Title
Augmented Reality Framework (ARF); AR framework architecture
Domain level
General
Type of initiative
Application
Main Objectives and Expected content
The document specifies a functional reference architecture for AR components, systems and services. The structure of this architecture and the functionalities of its components have been derived from a collection of use cases (ETSI GR ARF 002) and an overview of the current landscape of AR standards (ETSI GR ARF 001). The document introduces the characteristics of an AR system and describes the functionalbuilding blocks of the AR reference architecture and their mutual relationships. The generic nature of the architecture is validated by mapping the workflow of several usecases to the components of this framework architecture.
Maturity level

Published
Release time of specification/initiative outcome
03/2020
Useful Link
https://www.etsi.org/deliver/etsi_gs/ARF/001_099/003/01.01.01_60/gs_ARF003v0101 01p.pdf

Reference ID
GS CIM 009 V1.2.1
Title
Context Information Management (CIM); NGSI-LD API.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
The purpose of the document is the definition of a standard API for Context Information Management (NGSI-LD API) enabling close to real-time access to information coming from many different sources (not only IoT data sources). The document defines how such an API enables applications to perform updates on context,register context providers which can be queried to get updates on context, query information on current and historic context information and subscribe to receive notifications of context changes. ISG CIM has not so far defined reference points specifically to higher-layer AI reasoning platforms. NGSI-LD API uses linked open dataand property graphs to reference data definitions (ontologies) such as those in SAREF.
Maturity level
Published
Release time of specification/initiative outcome
10/2019
Useful Link
https://www.etsi.org/deliver/etsi_gs/CIM/001_099/009/01.02.01_60/gs_CIM009v0102 01p.pdf

Reference ID
GR CIM-007
Title
Context Information Management (CIM): Security and Privacy
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
Main Objectives and Expected content: The purpose of this Work Item is to provide a state-of-the-art assessment of security and privacy issues associated with ISG CIM specifications, related to the API, Data Publishing Platforms and Data Model Work Items. Recommendations shall be accompanied by pro/con information with the intent to reference as much as possible existing widely supported concepts. There are severalissues that need to be addressed, including but not limited to provenance of data, assuring privacy and security between stakeholders, assuring trust, understanding howto ensure the aggregation of data does not increase the attack space or compromise privacy. The work item will investigate items such as but not limited to; what should beconnected via the information model and are there any particular lifecycle constraints that may be placed on data? The *Scope:* of this work is strictly limited to the CIM *Scope:* of work, e.g. device security is excluded. Where appropriate, it references existing work, specifications and standards.
Maturity level
In development (early draft)

Release time of specification/initiative outcome
01/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=53370

Reference ID
GS ENI 001 v2.1.1
Title
Experiential Networked Intelligence (ENI): ENI use cases
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The specification ETSI GS ENI 001 demonstrates several use cases on service assurance, fault management and self-healing, resource configuration, performance configuration, energy optimization, security and mobility management.
Maturity level
Published
Release time of specification/initiative outcome
09/2019
Useful Link
https://www.etsi.org/deliver/etsi_gs/ENI/001_099/002/03.01.01_60/gs_ENI002v030101p.pdf

Reference ID
GS ENI 005
Title
Experiential Networked Intelligence (ENI); System Architecture
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
The specification ETSI GS ENI 005 shows as a functional architecture how the data is collected, normalized and recursively processed to extract knowledge and wisdom fromit. This data is used for decision-making and the results are returned to the network, where the behavior is continually monitored.
Maturity level
Published
Release time of specification/initiative outcome
09/2019
Useful Link
https://www.etsi.org/deliver/etsi_gs/ENI/001_099/002/03.01.01_60/gs_ENI002v0301 01p.pdf

Reference ID
GR ENI 007
Title
Experiential Networked Intelligence (ENI); ENI Definition of Categories for AIApplication to Networks
Domain level
Application
Type of initiative
Standard

Main Objectives and Expected content
The document defines various categories for the level of application of Artificial Intelligence (AI) techniques to the management of the network, going from basic limited aspects, to the full use of AI techniques for performing network management.The requirements document ETSI GR ENI 007 on network classification of AI details the use of AI in a network into six stages, from "No AI" to "full AI" deployment.
Maturity level
Published
Release time of specification/initiative outcome
11/2019
Useful Link
https://www.etsi.org/deliver/etsi_gr/ENI/001_099/007/01.01.01_60/gr_ENI007v0101 01p.pdf

Reference ID
GR NFV-IFA 041
Title
Network Functions Virtualisation (NFV); Release 4 Management and Orchestration;Report on enabling autonomous management in NFV-MANO
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The goal of the Work Item is to study and evaluate possible enhancements to NFV- MANO to improve its automation capabilities and introduce autonomous network mechanisms. This work will align with automation related work in organizations such as ETSI ISG ZSM, ETSI ISG ENI and 3GPP SA5. Recommendations for normative work to enable autonomous management in NFV-MANO will be made. Within ISG NFV (NetworkFunction Virtualization), AI is being considered as a tool that eventually becomes part of the Management and Orchestration (MANO) stack. NFV virtualization is not explicitlyconsidering AI, except in requirements to properly feed data and collect actions from AI modules.
Maturity level
In development (early draft)
Release time of specification/initiative outcome
03/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=58467

Reference ID
DGR SAI-001
Title
Securing Artificial Intelligence (SAI); AI Threat Ontology AI Threat Ontology
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
The purpose of this work item is to define what would be considered an AI threat and how it might differ from threats to traditional systems. The starting point that offers the rationale for this work is that currently, there is no common understanding of whatconstitutes an attack on AI and how it might be created, hosted and propagated. The AI Threat Ontology deliverable will seek to align terminology across the different stakeholders and multiple industries. This document will define what is meant by theseterms in the context of cyber and physical security and with an accompanying narrative that should be readily accessible by both experts and less informed audiences across the multiple industries.

Maturity level
In development (stable draft)
Release time of specification/initiative outcome
05/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=58856

Reference ID
DGR SAI-002
Title
Securing Artificial Intelligence (SAI); Data Supply Chain Report.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
Data is a critical component in the development of AI systems. This includes raw data as well as information and feedback from other systems and humans in the loop, all ofwhich can be used to change the function of the system by training and retraining theAI. However, access to suitable data is often limited causing a need to resort to lesssuitable sources of data. Compromising the integrity of training data has been demonstrated to be a viable attack vector against an AI system. This means thatsecuring the supply chain of the data is an important step in securing the AI. The report will summarize the methods currently used to source data for training AI along with the regulations, standards and protocols that can control the handling and sharing of that data. It will then provide gap analysis on this information to *Scope:* possible requirements for standards for ensuring traceability and integrity in the data, associated attributes, information and feedback, as well as the confidentiality of these.
Maturity level
In development (early draft)
Release time of specification/initiative outcome
07/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=58857

Reference ID
DGS SAI-003
Title
Securing Artificial Intelligence (SAI); Security Testing of AI.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
The purpose of this work item is to identify objectives, methods and techniques that are appropriate for security testing of AI-based components. The overall goal is to have guidelines for security testing of AI and AI-based components considering of thedifferent algorithms of symbolic and subsymbolic AI and addressing relevant threats from the work item “AI threat ontology”. Security testing of AI has some commonalities with security testing of traditional systems but provides new challenges and requires different approaches, due to (a) significant differences between symbolic and subsymbolic AI and traditional systems that have strong implications on their security and on how to test their security properties, (b) non-determinism since AI-based systems may evolve over time (self- learning systems) and security properties may degrade, (c) test oracle problem, assigning a test verdict is different and more difficult for AI-based systems since not allexpected results are known a priori, and (d) data-driven algorithms: in contrast to traditional systems, (training) data forms the behaviour of subsymbolic AI.
Maturity level
In development (early draft)

Release time of specification/initiative outcome
05/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=58860

Reference ID
GR SAI 004
Title
Securing Artificial Intelligence (SAI); Problem Statement
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This work item describes the challenges of securing AI-based systems and solutions, including challenges relating to data, algorithms and models in both training and implementation environments. The focus will be on challenges which are specific to AI-based systems, including poisoning and evasion.
Maturity level
In development (draft)
Release time of specification/initiative outcome
12/2020
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=59209

Reference ID
DGR SAI-005
Title
Securing Artificial Intelligence (SAI); Mitigation Strategy Report.
Domain level
General
Type of initiative
Standard
Main Objectives and Expected content
This work item aims to summarize and analyze existing and potential mitigation against threats for AI-based systems. The goal is to have guidelines for mitigating against threats introduced by adopting AI into systems. These guidelines will shed lightbaselines of securing AI-based systems by mitigating against known or potential security threats. They also address security capabilities, challenges, and limitationswhen adopting mitigation for AI-based systems in certain potential use cases.
Maturity level
In development (early draft)
Release time of specification/initiative outcome
03/2021
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=59214

Reference ID
ETSI TS 103 327 V1.1.1
Title
Smart Body Area Networks (SmartBAN); Service and application standardized enablers and interfaces, APIs and infra*Structure:* for interoperability management.
Domain level
Application

Type of initiative
Standard
Main Objectives and Expected content
TC SmartBAN considers interfaces which would allow semantic interoperability ofeHealth sensors with external systems (including by default AI).
Maturity level
Published
Release time of specification/initiative outcome
04/2019
Useful Link
https://www.etsi.org/deliver/etsi_ts/103300_103399/103327/01.01.01_60/ts_103327 v010101p.pdf

Reference ID
GS ZSM 002
Title
Zero-touch network and Service Management (ZSM); Reference Architecture.
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The document defines and describes the reference architecture for the end-to-end Zero-touch network and Service Management (ZSM) framework based on a set of userscenarios and requirements documented in ETSI GS ZSM 001.ISG ZSM (ISG Zero- touch Network and Service Management), was formed with the goal to introduce a newend-to-end architecture and related solutions that will enable automation at scale and at the required minimal total cost of ownership (TCO), as well as to foster a larger utilization of AI technologies. The ZSM end-to-end architecture framework has been designed for closed-loop automation and optimized for data-driven machine learning and AI algorithms.
Maturity level
Published
Release time of specification/initiative outcome
08/2019
Useful Link
https://www.etsi.org/deliver/etsi_gs/ZSM/001_099/002/01.01.01_60/gs_ZSM002v010 101p.pdf

Reference ID
Smart Applications REFerence (SAREF) ontology
Title
Smart Applications REFerence ontology
Domain level
Application
Type of initiative
Ontology
Main Objectives and Expected content
An enhancement of the SAREF portal, being finalized in 2020, concerns the double roleof AI in semantics as a facilitator of the development and alignment of ontologies and semantics meanings, supporting human experts. The SAREF family of ontologies also supports IoT information discovery, enrichment and validation, therefore enabling the provision of AI services to support IoT semantic interoperability, based on a common understanding of IoT information (both for peopleand machines).
Maturity level
Published
Release time of specification/initiative outcome
2020

Useful Link
https://saref.etsi.org/index.html

Reference ID
TR 103 674
Title
SmartM2M: Artificial Intelligence and the oneM2M architecture
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
Detailed description of selected use cases and identification of architectural evolutions(components, required mappings, etc.) to the oneM2M framework. It addresses the introduction of AI/ML into IoT systems and the opportunities for improving AI/ML performance through use of the horizontal oneM2M standard and itsfamily of common service functions (CSFs).
Maturity level
In development
Release time of specification/initiative outcome
12/2020
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=57866

Reference ID
TR 103 675
Title
SmartM2M AI for IoT: A Proof of Concept
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
Detailed description of the use cases design and implementation; instructions for the (re-)creation of the prototypes from the selected framework and components; lessons learned. improving AI/ML performance through use of the horizontal oneM2M standardand its family of common service functions (CSFs). Its aim is to build and test a proof of concept that targets two technical innovations. One innovation involves extensions of existing CSFs to support new AI/ML-related functional requirements. The second innovation is to test the concept of new CSFs that offer AI/ML capabilities on an "as-a- service" basis. This could take the form of a configurable classification algorithm, for example, that one or more IoT solutions could access on aoneM2M-compliant IoT platform.
Maturity level
In development (draft)
Release time of specification/initiative outcome
12/2020
Useful Link
https://portal.etsi.org/webapp/WorkProgram/Report_WorkItem.asp?WKI_ID=57867

Reference ID
TS 102 181 v1.3.1
Title
Emergency Communications (EMTEL); Requirements for communication betweenauthorities/organizations during emergencies.

Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The specification describes requirements for communications from authorities/organizations to individuals, groups or the general public in emergency situations. It describes the functional requirements for communications between the authorized representatives involved in the responses and actions when handling an emergency. The level of precision has been chosen to avoid interaction with the specific local, regional or national organizations and diagrams of relations between authorized representatives. It follows from this that adaptations will have to be done when implementing the present document at a local level. The *Scope:* of the document also encompasses various types of services that can bring an added value to this basicscenario or add new scenarios, such as the services brought by other technologies e.g. IoT devices that support communications between authorities during emergencies.
Maturity level
Published
Release time of specification/initiative outcome
06/2020
Useful Link
https://www.etsi.org/deliver/etsi_ts/102100_102199/102181/01.03.01_60/ts_102181 v010301p.pdf

Reference ID
TS 102 182 v1.5.1
Title
Emergency Communications (EMTEL); Requirements for communications fromauthorities/organizations to individuals, groups or the general public during emergencies.
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The present document gives an overview of the requirements for communication from authorities/organizations to citizens in all types of emergencies. It collects operational and organizational requirements as a basis for a common notification service, includingtargeting of the area to be notified. Although many of the requirements relate to national public policies and regulation, there are several service and technical aspects which are better dealt with on the European level to ensure harmonized access and services over Europe and service effectiveness through increased user awareness by using standardized solutions.
Maturity level
Published
Release time of specification/initiative outcome
07/2020
Useful Link
https://www.etsi.org/deliver/etsi_ts/102100_102199/102182/01.05.01_60/ts_102182 v010501p.pdf

Reference ID
TS 103 194
Title
Network Technologies (NTECH); Autonomic network engineering for the self-managing Future Internet (AFI); Scenarios, Use Cases and Requirements for Autonomic/Self-Managing Future Internet
Domain level
Application

Type of initiative
Standard
Main Objectives and Expected content
The document contains a description of scenarios, use cases, and definition of requirements for the autonomic/self-managing future internet. Scenarios and use cases selected in the present document reflect real-world problems which can benefitfrom the application of autonomic/self-management principles. TC INT specifications consider events that can trigger a network to dynamically change network properties. Events vary depending on the specific AI systems deployed in the network and the level where they operate, external or internal to the network. These events can occur in a chain-like fashion, e.g. policy change can trigger several secondary events in lower-level functional units.
Maturity level
Published
Release time of specification/initiative outcome
10/2014
Useful Link
https://www.etsi.org/deliver/etsi_ts/103100_103199/103194/01.01.01_60/ts_103194 v010101p.pdf

Reference ID
TS 103.195-2
Title
Autonomic network engineering for the self-managing Future Internet (AFI); Generic Autonomic Network Architecture; Part 2: An Architectural Reference Model forAutonomic Networking, Cognitive Networking and Self-Management.
Domain level
Application
Type of initiative
Standard
Main Objectives and Expected content
The Scope of the document is to provide the definition of the Generic Autonomic Network Architecture (GANA) as an architectural reference model for autonomic networking, cognitive networking and self-management that addresses the requirements defined in ETSI TS 103 194 - a compilation of example requirements which reflect real-world problems that benefit from the application of automated management, autonomic management and self-management principles for networksand services delivered by the network to applications. The objective of the document is to describe the GANA reference model with its associated Functional Blocks (FBs) and their associated reference points that can beinstantiated onto target currently existing, emerging or future reference network architectures (including their management and control architectures) to create autonomics-enabled reference network architectures and their associated management and control architectures.
Maturity level
Published
Release time of specification/initiative outcome
05/2018
Useful Link
https://www.etsi.org/deliver/etsi_ts/103100_103199/10319502/01.01.01_60/ts_1031 9502v010101p.pdf

Reference ID
EG 203 341 V1.1.1
Title
Core Network and Interoperability Testing (INT): Approaches for TestingAdaptive Network.
Domain level
Application
Type of initiative
Standard

Main Objectives and Expected content
The document, "Approaches for Testing Adaptive Networks" defines a framework of testing principles and guidelines that may be used to test networks that exhibit some form of autonomic adaptive behavior, which allows them to dynamically change their configuration, *Structure:* or operational parameters. The (re)-configuration is performedin response to stimuli such as changes in workload, operator policies that govern their operation, context (the network is context-aware and may have a degree of self- awareness); and challenges in the environment (i.e. conditions under which the network is operating, e.g. manifestations of faults, errors, failures in various parts ofthe network and its hardware and software components).
Maturity level
Published
Release time of specification/initiative outcome
10/2016
Useful Link
https://www.etsi.org/deliver/etsi_eg/203300_203399/203341/01.01.01_60/eg_20334 1v010101p.pdf

7 Conclusions

In this report an overview of the AI standardization landscape was briefly provided. A detailed analysis was carried out to map the existing standards onto the **14** relevant standardization areas of the project. The following conclusions may be drawn:

- There are a huge number of International and European Technical Committees (TC), as well as standards and standards under development, relating to the s-X-AIPI project that may be relevant for its development and future dissemination. Two distinct types of the aforementioned Technical Committees can be differentiated. On the one hand, there are Technical Committees that can serve as a source of relevant information for the project's development, but where dissemination activities are not foreseen. On the other hand, Technical Committees that may be directly interested in the project's findings and where dissemination activities can be conducted.

- The Technical Committees which can be more interested in the results of the s-X-AIPI project are the following:
  - **ISO/IEC JTC 1/SC 42** (**CEN/CLC JTC 21**) – Artificial Intelligence
  - **ISO/IEC JTC 1/SC 40** – IT service management, IT and Data Governance
  - **ISO/IEC JTC 1/SC 27** (**CEN/CLC JTC 13**) – Cybersecurity, Privacy and Data Protection
  - **ETSI ISG SAI** – ETSI Industry Specification Group on Securing Artificial Intelligence
  - **ISO/IEC JTC 1/SC 7** – Software and systems engineering
  - **IEC TC 65** and **ISO/TC 184** – Industrial-process measurement, control and automation

- **Ten** Technical Committees (TC) connected to the s-X-AIPI project have been identified.
  - To be able to use the standardization system as a tool to disseminate project outcomes and connect/interact with market stakeholders.
  - It will be important to determine the communication/interaction strategy of s-X-AIPI with relevant TCs. UNE would provide the technical assistance required for the communication/interaction.

- Several standards relevant to the s-X-AIPI project have been identified as a result of the study of the standardization landscape using the methodology outlined above.

- Approximately **forty** standards are highly pertinent/relevant and could be viewed as requirements for compliance with the project results; they refer to WP1, WP2, WP3, WP4, WP5, and WP6.
    - WP1 – Coordination and Management
    - WP2 – Design and Architecture of self-X AI solutions integration in process industry plants
    - WP3 – Self-X abilities in AI Data pipeline components for human support
    - WP4 – Integrated technology of self-X components and autonomic managers
    - WP5 – Self-X AI apps prototype demo, user training and performance improvement in process industry
    - WP6 – Replicability and exploitation
  - In the future, it may be able to contribute to these standards via disseminating standards usage information and the s-X-AIPI framework, which may contain these standards.
  - It will also be possible to report recommendations for improvement, and other types of feedback.
  - It may also be feasible in the future to contribute by providing new expertise of AI integration, Big Data analytics, use case process understanding, modelling and digital platforms, industry automation, etc.

- These applicable standards, including Standardization Technical Specifications (TS) or Technical Reports (TR), could be utilized as guidelines or manuals for WP1, WP2, WP3, WP4, WP5, and WP6. They could be used for design guidelines and usability analysis and evaluation.

- This study will contribute to the establishment and development of guidelines for the Standardization of AI technologies, AI data, AI systems and applications, not just for the s-X-AIPI project, but also for the entire continent of Europe.

Table 5 Summary of the relevant Standards and TCs for the s-X-AIPI Key Standardization areas

Key concept / Standardization areas	Relevant Standards	TCs
AI concepts, terminology and AI system framework	ISO/IEC 22989, ISO/IEC 23053	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
Data and Data Governance	ISO/IEC TS 4213, ISO/IEC 5259-2, ISO/IEC 5259-3, ISO/IEC 5259-4, ISO/IEC 5338, ISO/IEC 5339, ISO/IEC 5469, ISO/IEC 23894, ISO/IEC 24027, **ISO/IEC 24029-1, ISO/IEC 24029-2**, ISO/IEC 24668, ISO/IEC 38507, ISO/IEC 42001, ETSI SAI 002, **ETSI SAI 005**	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21) ISO/IEC JTC 1/SC 40
Accuracy robustness and Cybersecurity (Data Security)	ISO/IEC TS 4213, ISO/IEC 5338, ISO/IEC 5469, ISO/IEC 5059, ISO/IEC FDIS 23894, ISO/IEC 24028, **ISO/IEC 24029-1, ISO/IEC DIS 24029-2**, ISO/IEC 24668, ISO/IEC 25024, ISO/IEC 25059, ISO/IEC 42001, **ISO/IEC 20547-4, ISO/IEC TR 27563, ISO/IEC AWI 27090**, ETSI SAI 002, ETSI SAI 003, **ETSI SAI 005**, ETSI SAI 006	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21) ISO/IEC JTC 1/SC 27 (CEN/CLC JTC 13) ETSI ISG SAI
Risk management system	ISO/IEC 5338, ISO/IEC 5469, ISO/IEC 23894, ISO/IEC 25059, ISO/IEC 38507, ISO/IEC 42001	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
Data Quality management system	ISO/IEC 5259-1, ISO/IEC 5259-2, ISO/IEC 5259-3, ISO/IEC 5259-4, ISO/IEC 5259-5, ISO/IEC 5338, ISO/IEC 23894, **ISO/IEC 24029-1, ISO/IEC DIS 24029-2**, ISO/IEC 25059, ISO/IEC 38507, ISO/IEC 42001	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21) ISO/IEC JTC 1/SC 40 ISO/IEC JTC 1/SC 7
Technical documentation	ISO/IEC FDIS 23894, ISO/IEC 24027, ISO/IEC 42001	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
Record keeping	ISO/IEC FDIS 23894	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
Transparency and information to users	ISO/IEC FDIS 23894, ISO/IEC 24027, **ISO/IEC 24028**, ISO/IEC 38507, ISO/IEC 42001	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21) ISO/IEC JTC 1/SC 40
Human oversight	ISO/IEC FDIS 23894, ISO/IEC 38507, ISO/IEC 42001	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
Ethical aspects and societal considerations	ISO/IEC TR 24368, ISO/IEC PWI 17866	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
AI use cases and applications	ISO/IEC TR 24030, ISO/IEC 5339, ISO/IEC 5338	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)

Computational aspects and machine learning	ISO/IEC TS 4213, ISO/IEC 5392, ISO/IEC TR 24372, ISO/IEC AWI TR 17903	ISO/IEC JTC 1/SC 42 (CEN/CLC JTC 21)
Open source	ISO/IEC 5230, ISO/IEC/IEEE 41062:2019	ISO/IEC JTC 1 ISO/IEC JTC 1/SC 7
Industrial-process measurement, control and automation	IEC TS 62443-1-1, IEC 62443-2-1, IEC 62443-2-4, IEC 62443-3-2, IEC 62443-3-3, IEC 62443-4-1, IEC 62443-4-2	IEC TC 65C ISO/TC 184 (CEN/TC 310)

8 References

- ISO website: www.iso.org
- ISO Standards Development Portal: https://isotc.iso.org (restricted to authorized users)
- ISO Portal: https://login.iso.org/portal/
- IEC website: https://www.iec.ch/
- ITU website: https://www.itu.int/
- CEN website: https://www.cen.eu/
- CENELEC website: https://www.cenelec.eu/
- CEN/CENELEC Projex Online database: https://projex.cencenelec.eu/ (restricted to authorized users)
- ESTI website: https://www.etsi.org/