D7.5: PRELIMINARY VERSION OF STANDARDIZATION AND CONCERTATION ACTIVITIES REPORT

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Work Package	WP7 - Exploitation and dissemination plan including standardization activities

Abstract

This report represents the output of task 7.3 "Standardization and Concertation Activities" and provides the perspective of the project in relation to the standardization.

The document analyses the concept of standards, the main groups of standardization bodies involved at international and national level and the procedure for developing a new standard, presenting the process for the release of a new international standard (ISO).

This deliverable describes a preliminary list of relevant standards together with the approach internally shared to consider standardization during technical development and plan dissemination toward standardization bodies.

The ultimate aim of this document is to provide the list of the main channels of dissemination that will be used to reach an increasingly wider audience of stakeholders.

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Executive summary

This report represents the output of task 7.3 “Standardization and Concertation Activities” and provides the perspective of the project in relation to the standardization.

Considering the relevance of international standards in both the use-cases of the CPSoSaware project (both strongly related to safety and security aspects) the project aims at:

- performing a deeper analysis of existing standard related to the use-cases;
- analysing the cross-relevance between technical developments, existing standards and technical committees;
- planning actions toward dissemination of developed contents that might be relevant to standard’s developments.

According to the objective above, task 7.3 is delivering this preliminary version of the deliverable reporting the methodologies and strategies that the consortium is planning to follow during the duration of the project in order to concertate the developed contents with the standardization world.

This document identifies and introduces the fundamental characteristics of a standard, the standardization bodies that regulate their application and analyses in detail the fundamental steps that lead to the publication of a new standard at international level.

After this descriptive phase, the deliverable describes a preliminary list of relevant standards together with the approach shared internally to consider standardization during technical development and plan dissemination towards standardization bodies.

1 Introduction

This deliverable is the output of task 7.3 “Standardization and Concertation Activities” and presents the perspective of the project in relation to the standardization. This document is a preliminary version, while the final version will be included in D7.10 “Final Version of Standardization and Concertation Activities Report” expected at month 36.

This document has dual target:

1) At first, it aims at monitoring the existing standardization landscape and at receiving updates on the standards related to the project;
2) While it also targets to organize the approaches, which are followed by the project in order to communicate to the standardization bodies any results that CPSoSaware has produced and which might be affecting the content of the current standardization landscape.

In order to achieve the objectives above, we set our job as follows:

1) Preparation of a list with the already existing standards, that are related to the innovation field of CPSoSaware.
2) Highlight the development in the project, which might affect the standard in the existing standardization landscape.
3) Investigating the possibility that the partner communicates directly or indirectly with the standardization bodies.
4) All the dissemination actions, undertaken by the partnership, towards the standardization bodies are evident and defined in order to support the achievement of the above point 2.

This document is based on a running spreadsheet document in which the consortium collected relevant standards, defined which technical contents are related to specific standards, and monitored dissemination actions relevant to standard proposals, update suggestions and developments. The spreadsheet file is a running document and will here be introduced. In the final version of the deliverable (due at month 36) all the performed actions, together with the final version of the spreadsheet content, will be described.

1.1 Document structure

This document is structured into four major sections:

- Section 1 introduces the document, outlining its structure, and identifying terms and acronyms used across the document.
- Section 2 proposes a description of what a standard represents and which are the reasons of the standard being important for the organization, in which the activity is inserted. Then subdivision between international and national standardization bodies is provided, focusing on the structure for the Italian standardization body (UNI) and detailing the steps envisaged for the development of a new standard at international level (ISO example).
- Section 3 presents the methodology applied for the collection and classification of the standards involved into the two Use Cases and presents the preliminary planning of the Concertation Plan, including the channels that will be used for the dissemination.
- Section 4 concludes the document.

1.2 Acronyms and descriptions

The most relevant acronyms used in the document along with the recurring definitions are listed below:

Acronym / Term	Description
AUTOSAR	AUTomotive Open System ARchitecture
ACEA	Association of European Automotive Manufacturers
CD	Committee Draft
CEI	Italian Electrotechnical Committee
CEN	European Committee for Standardization
CENELEC	European Committee for Electrotechnical Standardization
CES	Electrosuisse
CYS	Cyprus Organization for Standardization
DIN	Deutsches Institut für Normung e.V.
DIS	Draft International Standard
DKE	Deutsche Kommission Elektrotechnik Elektronik und ·Informationstechnik in DIN und VDE
ECSO	European Cyber Security Organisation
ELOT	Hellenic Organization for Standardization
ENISA	European Union Agency for Network and Information Security
ERTRAC	European Road Transport Research Advisory Council
ESO	European Standards Organization
FDIS	Final Draft International Standard
HRC	Human Robot Collaboration
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
NSB	National Standardisation Body
NWIP	New Work Item Proposal
OCA	Open Charge Alliance
OCPP	Open Charge Point Protocol
OSCP	Open Smart Charging Protocol
PKN	Polski Komitet Normalizacyjny (Polish Committee for Standardization)
PWI	Preliminary Work Item
SFS	Finnish Standards Association
SII	Standards Institution of Israel
SNV	Swiss Association for Standardization
TBT	Technical Barrier Treatment
TC	Technical committee
TC ITS	Technical Committee for Intelligent Transport Systems
UNI	Italian National Unification Body
UNE	Asociación Española de Normalización
WD	Working Draft
WTO	World Trade Organization
5GAA	5G Automobile Association

2 Standardization and Regulatory Overview

2.1.1 Technical standards

Standards are documents that set technical information with regards to various kinds of products, materials, services and processes. A standard is a document, established by consensus and approved by a recognised body, which provides common rules, guidelines or characteristics for activities or their results having the purpose of achieving an optimal degree of order in a given context [1]. In this definition, a "recognised body" refers to the official National Standardisation Body (NSB) of a country.

The European standardisation organisations are a group of National Standardisation Bodies (NSB), including the European Union member states and other countries that are part of the European single market. European standards are developed by *teams of experts* who possess particular knowledge of the specific sector or topic that is being addressed.

The work is developed in technical committees (TC). The experts who develop standards in these TCs are nominated by the NSBs and they represent their country at European level. NSBs are obliged to adopt European standards as national standards and to make them available in their country. They also have to withdraw any existing national standard that conflicts with the new European standard. Therefore, a given European standard becomes a national standard in all 34 member states (EU member states, EFTA countries, and future EU or EFTA countries). The main goal of the European standardisation system is to unify all standards that apply within Europe [2].

International standardisation organisations are also umbrella organisations. The members are foremost standards organisations in their countries and there is only one member per country. The adoption of international standards at national level by the NSBs is voluntary except for if an international standard is adopted as a European standard. It must then be adopted as a national standard as well. In addition, a standard that has been developed at international level can be simultaneously adopted as a European standard by means of parallel voting procedures in accordance with the Vienna Agreement [3]. Such standards are to be automatically adopted by the NSBs. As with European standardisation, national mirror committees decide whether to take part in international standardisation work. These committees develop the national standpoint, send experts to represent this standpoint, and often lead project work by taking on the secretariat of the relevant international technical committee. The mirror committees also decide whether an international standard should be adopted as a national standard [4].

An example of National Standardization Body is UNI (Italian National Unification Body) where there are about:

- *1100 Technical Bodies*, including commissions, sub-commissions and working groups, made up of over 6000 Italian experts in UNI and around the world, which represent those who will use and benefit from the standards, from producers to consumers, from traders to the Public Administration;
- *7 Federated Bodies*, independent organizations entrusted with standardization activities in specific sectors, such as energy, chemistry, automotive, information technology, plastics, steel.
- The Central Technical Commission provides the directives, coordinates and supervises the works.

In the international organizations CEN (European Committee for Standardization) and ISO (International Organization for Standardization) UNI participates in the work of the technical bodies, with a leading role in those that develop the standards for strategic sectors for Made in Italy [5].

There are 4 important aspects that cannot be overlooked when developing a new standard:

- Consensually: the standard is approved with the consensus of those who participate in the work.
- Democracy: all economic and social stakeholders may attend the meeting and make observations before approval.
- Transparency: the fundamental stages of the approval process are public and the project is always available to interested parties.
- Voluntariness: stakeholders adhere to the rule not by imposition, but by choice.

A technical standard is an established norm or requirement for a repeatable technical task. It is usually a formal document that establishes uniform engineering or technical criteria, methods, processes, and practices. In contrast, a custom, convention, company product, corporate standard, and so forth that becomes generally accepted and dominant is often called a de facto standard.
A technical standard may be developed privately or unilaterally, for example by a corporation, regulatory body, military, etc. Standards can also be developed by groups such as trade unions and trade associations. Standards organizations often have more diverse input and usually develop voluntary standards: these might become mandatory if adopted by a government (i.e., through legislation), business contract, etc.
The standardization process may be by edict or may involve the formal consensus of technical experts. The main standardization bodies (ISO/IEC) have origin from the international technical community while the WTO (World Trade Organization) ensures the adoption of the ISO/IEC norms in all its members' countries. Each country can adopt the standard as a technical norm, or as a local law. Normally the ratified norm can be stricter or equal to the original one. This is also due to the fact that, in case a specific country wants to make a less restrictive application of the norm, the product made according to this local law will not be accepted in other countries applying the full norm.
For example any worldwide producer that wants to sell its products in Europe, has to demonstrate that its products are suitable to achieve the CE mark (Figure 2). Otherwise the commercialization would be forbidden in European community.
Member countries of the WTO/TBT (Technical Barrier Treatment) Agreements ensure the adoption of international standards as own national standards.
IEC/ISO international standards are implemented without duplicating the efforts of various agreements.

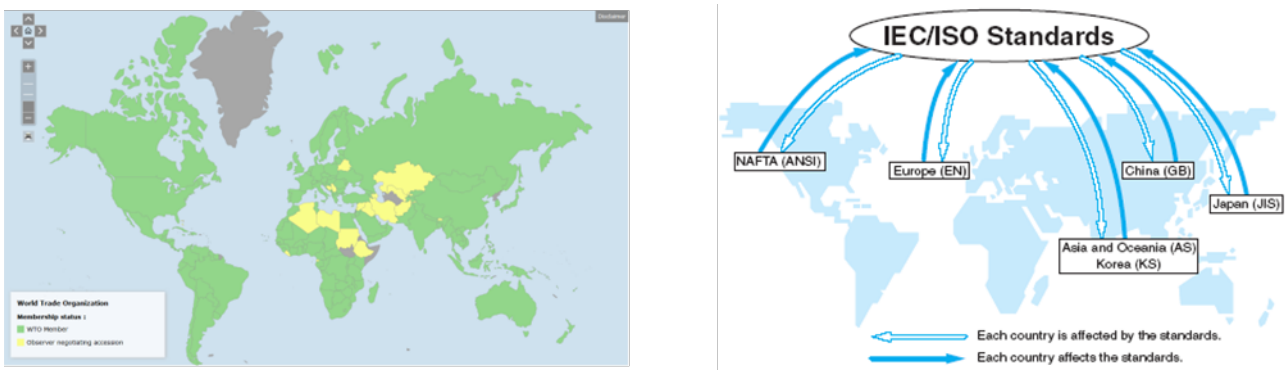

Figure 1 - IEC/ISO Standards application

All IEC and ISO standards are, as a start, valid for the whole world. But each country can install additional, more restrictive standards.
However, there may be differences at local law level:

- Organizational and regulative approach of the control organisms (INAIL, Unions…);
- Definition and quantification of the sanctions.

Standard and regulation structure can be different locally, but contents are harmonized.
International standards define and technical limits; legal consequences (penal and civil), applied penalties, control authorities definition and their power as well as control application methods are defined locally by the national law.

As an example we consider the approach for the application of safety standard for Human Robot Collaboration.
The topics is related to Safety in industrial environment in Human-Machinery interaction.
At European level the Machinery Directive (2006/42/EC) of the European Parliament, defines a harmonized level of safety with regard to accident prevention for machines placed on the market within the European Economic Area (EEA:EU+ISL, LIE,NOR). Therefore, every EU Member State must implement the Machinery Directive in national legislation. For example, in Italy the local law is the D.Lgs 17/2010 (see Figure 3 below); in the Machinery directive the high level safety standards and approaches are listed as well as the certification procedure necessary to obtain the CE mark. The CE mark is the European mark, which certifies that a specific product fulfill all the European law related to safety. Member States shall not prohibit, restrict or impede the placing on the market and/or putting into service in their territory of machinery which complies with this Directive and which have the CE mark certification.

Machinery manufactured in conformity with a harmonized standard, shall be presumed to comply with the essential health and safety requirements covered by such a harmonized standard.

Figure 2 – European Community mark

The essential health and safety requirements should be satisfied in order to ensure that machinery is safe; these requirements should be applied with discernment to take into account the state of the art, at the time of construction and the technical and economic requirements. With the CE mark, the manufacturer or EU importer (or the system integrator) indicates "that the product is in conformity with the applicable requirements set out in Community harmonization legislation providing for its affixing." A robot does not receive a CE mark, but only a declaration of incorporation, as it is classified as partly completed machinery. The whole robotic system (with end-effectors and any safety related machinery in the workcell) receives the CE mark which states that the entire robotic system is in conformity with the applicable requirements.

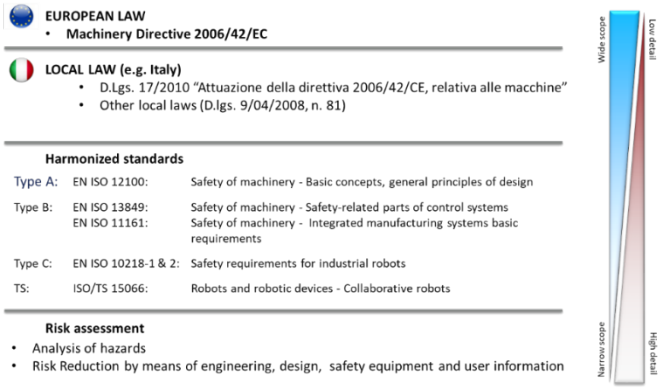

Figure 3 - Safety requirements (laws and standards) for Human Robot Collaboration

After the application of the European and local laws, the technical standard define best practice to achieve safety in specific applications going from higher level contents (Type A standards) to a level (Type C and TS – Technical specifications) which is lower, with high details and restricted scope. In HRC it is the ISO/TS 15066. Being ISO standards defined as best practice, they are normally not compulsory, but it is the integrator's duty to demonstrate that the best practices are applied to obtain the safety required.

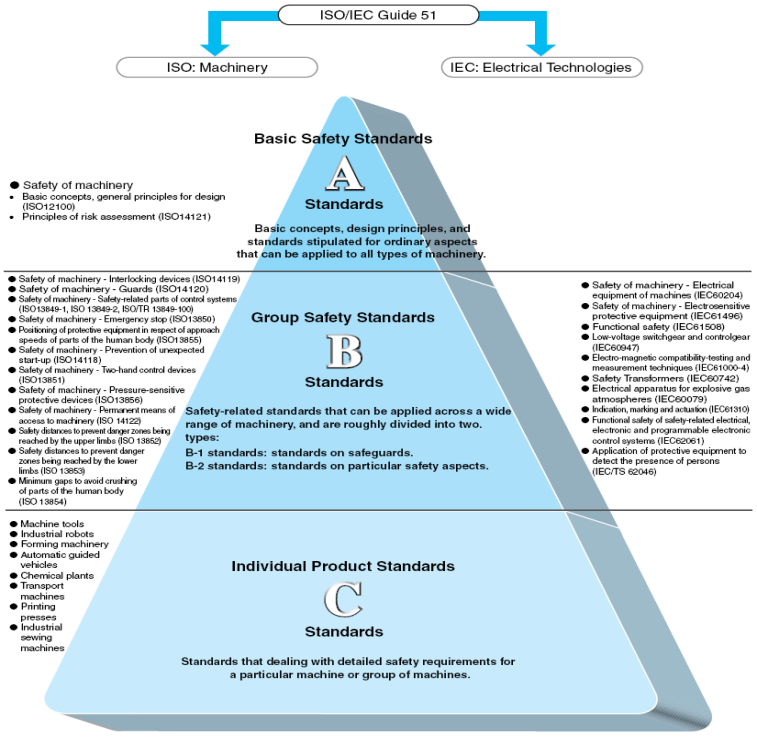

Figure 4 – ISO/IEC Guide for Machinery Safety

In the field of Safety, the International Electro-technical Commission (IEC) prepares international standards for all electrical, electric and related technologies, and the International Organization for Standardization (ISO) prepare international standards for all technologies other than electrical and electric technologies (machinery and management).
Figure 4 shows the outline of main ISO and IEC standards related to machinery safety, from type A to Type C.

2.1.2 List of main reference Standardization Bodies

The first part of the table represents the main European Standardization Bodies (CEN and CENELEC) while the second part represents the main World level Standardization bodies (ISO and IEC), which are connected locally to National Standardization Bodies.

Table 1 - European and International Standardization Bodies

European Committee for Standardization (CEN) European Committee for Electrotechnical Standardization (CENELEC) www.cencenelec.eu	CEN and CENELEC are business catalysts in Europe, removing trade barriers for European industry and consumers. Their mission is to foster the European economy in global trading, the welfare of European citizens and the environment. Through their services they provide platforms for the development of European Standards and other technical specs.
International Organization for Standardization (ISO) www.iso.org/home.html	ISO is an independent, non-governmental international organization with a membership of 165 national standards bodies. Through its members, it brings together experts to share knowledge and develop voluntary, consensus-based, market relevant International Standards that support innovation and provide solutions to global challenges.
International Electrotechnical Commission (IEC) www.iec.ch/homepage	Founded in 1906, the IEC (International Electrotechnical Commission) is the world's leading organization for the preparation and publication of international standards for all electrical, electronic and related technologies. These are known collectively as "electrotechnology". The IEC is a global, not-for-profit membership organization that brings together more than 170 countries and coordinates the work of 20 000 experts globally

The complete list of Standardization Bodies counts 192 organizations from 154 countries (Figure 5). In the Table 2, only those corresponding to the member countries of which the partners of the CPSoSaware project are part have been collected.

Table 2 - List of main Standardization Bodies for the member countries involved in CPSoSaware project

COUNTRY/ TERRITORY	ACRONYM	TITLE	TYPE*	YEAR*
Cyprus	CYS	Cyprus Organization for Standardization	Non-governmental	2009
Finland	SFS	Finnish Standards Association	Non-governmental	1995
Germany	DIN	Deutsches Institut für Normung e.V.	Non-governmental	1995
Germany	DKE	Deutsche Kommission Elektrotechnik Elektronik und ·Informationstechnik in DIN und VDE	Non-governmental	2018
Greece	ELOT	Hellenic Organization for Standardization	Non-governmental	1997
Israel	SII	Standards Institution of Israel	Non-governmental	1997
Italy	CEI	Italian Electrotechnical Committee	Non-governmental	1995
Italy	UNI	Italian National Unification Body	Non-governmental	1995
Poland	PKN	Polski Komitet Normalizacyjny (Polish Committee for Standardization)	Non-governmental	1996
Spain	UNE	Asociación Española de Normalización	Non-governmental	1996
Switzerland	SNV	Swiss Association for Standardization	Non-governmental	1996
Switzerland	CES	Electrosuisse	Non-governmental	1995

Type* = Type of standardizing body
Year* = Year of acceptance of WTO TBT Code

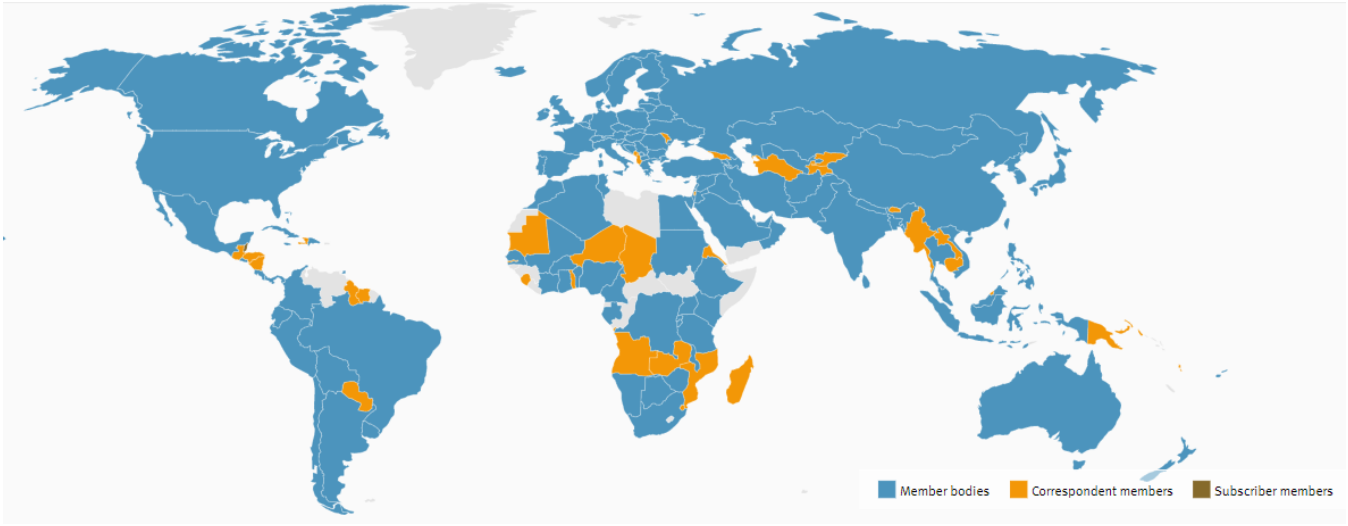

Figure 5 - Geographic distribution of ISO Members[1]

Another important subdivision that must be considered concerns the World trade associations, which do not play an institutional role, but which collaborate in strong synergy with the standardization bodies indicated in the Table 1 and Table 2.

[1] https://www.iso.org/members.html

Table 3 - List of main trade associations

BODIES	DETAILS
5GAA (5G Automobile Association) https://5gaa.org/	5GAA is a global, cross-industry organization consisted from companies along the automotive, technology, and telecommunications industries, working together to develop end-to-end solutions for future mobility and transportation services. Created in September 2016, 5GAA has a large member base, including 8 founding members: AUDI AG, BMW Group, Daimler AG, Ericsson, Huawei, Intel, Nokia, and Qualcomm Incorporated. Since its inception, 5GAA has rapidly expanded to include key players with a global footprint in the automotive, technology and telecommunications industries including automotive manufacturers, tier-1 suppliers, chipset/communication system providers, mobile operators and infrastructure vendors. Diverse both in terms of geography and expertise, 5GAA's members are committed to helping define and develop the next generation of connected mobility and automated vehicle solutions.
European Cyber Security Organisation (ECSO) https://ecs-org.eu/	ECSO defines the R&I roadmap in cyber security to strengthen the EU eco-system by understanding and coordinating the challenges towards digitalisation of the industrial sectors and develop a coherent strategy with other cPPP and EU initiatives. Related working groups WG6: SRIA AND CYBER SECURITY TECHNOLOGIES The working group focuses on the following objectives: • Support cPPP implementation, supervising results and expectations from European Commission and H2020 cybersecurity projects • Coordination of cybersecurity activities across cPPPs, CCN Pilots and other EU Initiatives • Suggestions for the H2020 Work Programme and the future Horizon Europe and Digital Europe Programme Synergies Cybersecurity for dual use technologies.
StandICT.eu https://standict.eu/	StandICT.eu, "Supporting European Experts Presence in International Standardisation Activities in ICT", addresses the need for ICT Standardisation and defines a pragmatic approach and streamlined process to reinforce EU expert presence in the international ICT standardisation scene. Through a Standards Watch, StandICT.eu will analyse and monitor the international ICT standards landscape and liaise with Standards Development Organisations (SDOs) and Standard Setting Organisations (SSOs), key organisations such as the EU Multistakeholder Platform for ICT Standardisation as well as industry-led groups, to pinpoint gaps and priorities matching EU DSM objectives.
AUTOSAR https://www.autosar.org/	AUTOSAR (AUTomotive Open System ARchitecture) is a worldwide development partnership of vehicle manufacturers, suppliers, service providers and companies from the automotive electronics, semiconductor and software industry and aims to develop the standardized software framework for intelligent mobility.

OCA (Open Charge Alliance)	The Open Charge Alliance (OCA) is a global consortium of public and private electric vehicle infrastructure leaders that have come together to promote open standards through the adoption of the Open Charge Point Protocol (OCPP) and the Open Smart Charging Protocol (OSCP).
ERTICO https://ertico.com/	ERTICO – ITS Europe is a public-private partnership of 120 companies and organisations representing service providers, suppliers, traffic and transport industry, research, public authorities, user organisations, mobile network operators, and vehicle manufacturers. ERTICO embodies thought leadership and fosters stakeholder engagement; Together with our Partners, we develop, promote and deploy Intelligent Transport Systems and Services (ITS) through a variety of activities including European co-funded projects, innovation platforms, international cooperation, advocacy and events. ERTICO is the organiser of the annual ITS regional and global Congress in Europe. Their work focuses on Connected & Automated Driving, Urban Mobility, Clean Mobility, and Transport & Logistics. ERTICO STANDARDIZATION FORUMS ADASIS Standardization forums https://erticonetwork.com/new-adas-specification-drives-forward-automation/ https://adasis.org/ ERTICO-coordinated ADASIS, a global open group representing the vehicle manufacturers, navigation system manufacturers, ADAS (Advanced Driver Assistance Systems) manufacturers and map database suppliers, releases the new specification v3.1.0 to the public, which will support Automated Driving. This new improved version available last year to ADASIS members was developed to enable Automated Driving by providing new and more accurate features like detailed lane modelling and line geometry, additional data (e.g., landmarks), etc. with a resolution of 0.01 meter instead of 1.0 meter in former v2.0.4 version. Advanced Driver Assistance Systems need to access and use map data, vehicle position, speed, as well as other data in order to improve the performance of these applications and/or to enable new functionalities e.g. automated driving. However, navigation map databases are inaccessible to applications outside of the navigation system and are stored in the proprietary format of the navigation system. ADASIS is providing the solution. SENSORIS working group https://sensoris.org/vision/ SENSORIS is an innovation platform of actors committed to defining this global standardised interface that will result in new services and increased business opportunities.

ACEA Association of European Automotive Manufacturers https://pr.euractiv.com/company/acea-european-automobile-manufacturers-association-9872	ACEA represents Europe's car, van, truck and bus manufacturers, and works with a variety of institutional, non-governmental, research and civil society partners - as well as with a number of industry associations to ensure the economic environmental and social sustainability of the automobile industry.
European Union Agency for Network and Information Security (ENISA) www.enisa.europa.eu	The European Union Agency for Network and Information Security (ENISA) is a centre of expertise for cyber security in Europe. ENISA has collaboration with standardization organizations and committees, like ETSI and CEN CENELEC. ENISA involves stakeholders/industries in their activities through an Expert network, where they get the needed expertise. The Expert database is not available. Drivees has experts in this list. The European Union Agency for Network and Information Security (ENISA) is a centre of expertise for cyber security in Europe.
Euro NCAP https://www.euroncap.com/en	Euro NCAP has created the five-star safety rating system to help consumers, their families and businesses compare vehicles more easily and to help them identify the safest choice for their needs.The safety rating is determined from a series of vehicle tests, designed and carried out by Euro NCAP. These tests represent, in a simplified way, important real-life accident scenarios that could result in injured or killed car occupants or other road users.
European Road Transport Research Advisory Council (ERTRAC) https://www.ertrac.org/ Technology Platform for Road Transport, supported by the EC (Sector organization)	ERTRAC is the European Road Transport Research Advisory Council. It is the European technology platform which brings together road transport stakeholders to develop a common vision for road transport research in Europe. Their mission is to provide a framework for coordinated efforts of research activities on development of sustainable, integrated transport solutions. The ERTRAC Strategic Research Agenda is implemented through research roadmaps, which presents topics for research, development, and the deployment of innovation. Together, the ERTRAC roadmaps cover all aspects of the transport system and allow to reach the objectives set in the Strategic Research Agenda. **Organization Participants:** R&D, EUCAR OEM's, Automotive suppliers, Energy and Fuel suppliers, Road Infrastructures, Public Authorities, Users, Service Providers, ITS.

https://www.etsi.org/	ETSI is a European Standards Organization (ESO). It is the recognized regional standards body dealing with telecommunications, broadcasting and other electronic communications networks and services. It supports European regulations and legislation through the creation of Harmonised European Standards. ETSI hosts a Technical Committee for Intelligent Transport Systems (TC ITS) that creates and maintains standards and specifications for the use of information and communications technologies in transport systems. TC ITS is organized in 5 working groups on: user and application requirements (WG1), architecture and cross-layer issues (WG2), transport and network (WG3), media and related issues (WG4) and security (WG5).
EUCAR https://www.eucar.be/	EUCAR is the European Council for Automotive R&D of the major European passenger car and commercial vehicle manufacturers. EUCAR facilitates and coordinates pre-competitive research and development projects and its members participate in a wide range of collaborative European R&D programmes. The European automobile manufacturers are the largest private investors in R&D in Europe with over €60.9 billion investment per annum. EUCAR members are BMW Group, CNH Industrial, DAF Trucks, FIAT Chrysler Automobiles, Ford of Europe, Honda R&D Europe, Hyundai Motor Europe, Jaguar Land Rover, PSA Group, Renault Group, Toyota Motor Europe, Volkswagen Group, Volvo Cars and Volvo Group. EUCAR is legally part of ACEA with independent decision-making for R&D. Strengthen the Competitiveness of the European Automotive Manufacturers through Strategic Collaborative Research & Innovation. Activities relevant to CPSoSaware • Pillar «Safe and Integrated Mobility» • EUCAR R&D projects on Connected and Automated Vehicles (CAV) Relevant documents: EUCAR perspective on Connected and Automated Vehicles, March 2019 https://www.eucar.be/wp-content/uploads/2019/03/PERSP_CAV2.pdf EUCAR project book 2019, spec. EUCAR projects on Safe and Integrated mobility https://www.eucar.be/wpcontent/uploads/2018/11/DIGIT_PRJBOOK19.pdf

2.1.3 Procedures for development of new standards (ISO example)

The development process of standards is well defined (e.g. ISO/IEC Directive – Part 1 [6] and Part 2 [7], CEN Regulations Part 2 [8] and Part 3 [9]). The development process of standard usually follows six-steps, shown in Figure 6.

Figure 6 - ISO Development Process[2]

1) Proposal stage

The first step in the development of a standard is to confirm that a particular standard is needed. A new work item proposal (NWIP) is submitted for vote by the members of the relevant technical committee (TC) or sub-committee (SC) to determine the inclusion of the work item in the programme of work. At this stage a project leader, responsible for the work item, is normally appointed.

2) Preparatory stage

Usually, a working group of experts, the chairperson (convener) of which is the project leader, is set up by the TC/SC for the preparation of a working draft. Successive working drafts may be considered until the working group is satisfied that it has developed the best technical solution to the problem being addressed. At this stage, the draft is forwarded to the working group's parent committee for the consensus-building phase.

3) Committee stage

As soon as a first committee draft is available, it is registered by the secretariat and distributed for commenting. Successive committee drafts may be considered until consensus is reached on the technical content. Once consensus has been attained, the text is finalised for submission as a draft standard (DIS).

[2] https://www.standards.org.au/

4) Enquiry stage

The draft standard (DIS) is circulated to all member bodies by the secretariat for voting and commenting. If the approval criteria are not met, the text is returned to the originating TC/SC for further study and a revised document will again be circulated for voting and comment as a draft standard.

5) Approval stage

The final draft standard (FDIS) is circulated to all member bodies by the secretariat for a final vote. If technical comments are received during this period, they are no longer considered at this stage, but registered for consideration during a future revision of the standard. If the approval criteria are not met, the standard is referred back to the originating TC/SC for reconsideration in light of the technical reasons submitted in support of the negative votes received.

6) Publication stage

Once a final draft of the standard has been approved, only minor editorial changes, if and where necessary, are introduced into the final text. The final text is sent to the secretariat which publishes the standard.

The trigger of the above standardisation process is the need for a new standard. This need may arise, for example, from the lack of a standard that regulates a new technology or when an existing technology is used in a different field that has certain peculiarities not covered by existing standards.

3 Methodology for Standardization & Concertation Activities

3.1 CPSoSaware standardization approach

As already explained in the introduction of this deliverable, the document represents the Preliminary Version of Standardization and Concertation Activities with the scope of collecting all the main regulation/laws/standards concerning the reference Use Cases.

To select and find applicable standards and technical specifications, we decide to proceed as follows:

1. Collect and classify known standards related to the field of application of the two use-cases and highlight those that are more relevant in the use-cases.
2. Collect and classify topics developed in the CPSoSaware project which are strongly related to/affected/affecting existing standard, highlighting those concepts where the specific development in the project could be limited/hindered by the strict respect to existing standards, or eventually when the development is in a non-standardized zone (missing standards).
3. Create a table of contacts and activities by the partners in standardization bodies.
4. Create a set of planned actions by the project in order to share developments with the standardization bodies with the aim to fill gaps.
5. Highlight remnant issues that have to be taken into account in exploitation plans for actions after the end of the project (preferably in connection to tasks 7.2)

Regarding the first point, before analysing the single standard used in the Use-Case, all the types of references already mentioned in the previous deliverables were collected in order to have a sufficiently structured starting base. After defining the strategy to be adopted, an Excel file was created that would collect all this information in a clear and exhaustive way.

For this reason, we find 4 main tabs in the Excel file:

1. Current Reference standards;
2. CPSoSaware content;
3. Standardization bodies contact;
4. Standardization Activities Plan

As regards the first sheet (**Current Reference standards**), the main rules / regulations / standards / laws that are considered relevant for the Use Cases have been collected.
In column "H" (Use Case) there is the possibility to setup the field of the Use-Case (Manufacturing or Automotive) while column "J" poses the question "How does the standard have an impact on CPSoSAware contents?" and will be necessary to write an answer following the suggestion: *"Does the standard for example help to conform to regulations, to fulfil a customer requirement, to ensure technical compatibility, to improve your quality and process and/or to get an additional marketing advantage?"*

Document identifier	Title	Abstract	Committee reference	Publication date	Legal connection / value	Category	Use Case	Relation to CPSoSAware	How does the standard have an impact on CPSoSAware contents?
ISO/IEC 15938	DSM standards for video analysis	MPEG-7 is a multimedia content description standard. It was standardized in ISO/IEC 15938 (Multimedia content description interface). This description will be associated with the content itself, to allow fast and efficient searching for material that is of interest to the user. MPEG-7 is formally called Multimedia Content Description Interface. Thus, it is not a standard which deals with the actual encoding of moving pictures and audio, like MPEG-1, MPEG-2 and MPEG-4. It uses XML to store metadata, and can be attached to timecode in order to tag particular events, or synchronise lyrics to a song.	MPEG-4, MPEG-7	2015	No	Safety	ADAS	Relevant	Adopt MPEG-4, MPEG-7, AVI to include several encoding/decoding and multimedia metadata to the processed video data
ISO/TS 15066	Robots and robotic devices - Collaborative robots	ISO/TS 15066:2016 specifies safety requirements for collaborative industrial robot systems and the work environment, and supplements the requirements and guidance on collaborative industrial robot operation given in ISO 10218-1 and ISO 10218-2. ISO/TS 15066:2016 applies to industrial robot systems as described in ISO 10218-1 and ISO 10218-2. It does not apply to non-industrial robots, although the safety principles presented can be useful to other areas of robotics. NOTE This Technical Specification does not apply to collaborative applications designed prior to its publication.	ISO/TC 299 Robots and robotic devices	2016-02-00	No	Safety	Manufacturing / industry	Relevant	Technical specification setting rules for the application of Human Robot Collaboration

Figure 7 - Extract of the table relative to Current Reference Standards

For each standard in the list it is possible to select the type of category it belongs to:

Table 4 - List of categories included in the Current Reference Standards

Categories	Search terms
Ergonomics	Human-system interaction, tactile/haptic interaction, ergonomic design, working posture, health risk, repetitive movement, repetitive work, handling at high frequency, limits for whole body, manual handling, manual limit.
Safety	Unexpected start-up, safe human intervention, safe design, safety-related control systems, tolerable risk, risk assessment, risk management, safe design, hazard zone, safety requirements, hazard, unexpected movement.
General	Terminology, vocabulary, guidance, classification, categorization, characteristics, graphical symbols, labelling, considered factors, environmental conscious design.
Test	Key performance indicators, parameter, test equipment, test condition, test method, test forces, method, performance criteria, measurement, determination.
Information and Communication Technology (ICT)	Industrial communication, fieldbus, network, taxonomy, user interface, gesture-based interfaces, voice command, interaction, security, software, life-cycle, data confidentiality.
(Robot) Environment	Navigation, coordinate system, dimension.
Others	Mechanical interface, smart device.

In the second sheet (**CPSoSAware content**), it is possible find the list of the innovations that developed in the project having an innovative content compared to the existing standards. And above all, which of the expected standards could be affected.

CPS content	Demonstrator	Description	Innovative contents with standardization relevance	Possibly affected standards	Standardization bodies	Technical comitee
Active anthropometric adaptation of machinery	Manufacturing Use-Case	Skeleton dynamic recognition for anthropometric adaptation of machinery	Active adjustment of machinery is not standardardized; risk assessment definition for all situations and body percentiles	10218-1;10218-2; TS 15066	ISO	299
Driver State Monitoring (DSM)	ADAS use-case	Monitoring of driver's state using mobile device and wearable sensors	DSM is not standardized; risk assessment definition for all state scenarios	MPEG-7	ISO	
Semantic data integration framework	ADAS use-case	Semantically integrates data from various sources (e.g. sensors, components performing analyses, etc.) into a uniform semantic model and runs rules on-top that derive inferences.	Semantic data iintegration process based on CTL's novel CASPAR framework.	R2RML	W3C	
4D Co-operative situational Awareness	Automotive Use Case	Design and development of multimodal cooperative approaches for 4D Situational Awareness	Co-operative awareness functions have not been standardized as the Sensing and the communication functions are tackled in different standards	ISO TC204, NHTSA	ISO, NHTSA	ISO TC22

Figure 8 - Extract of the table relative to CPSoSaware content

In the third sheet (**Contact of standardization bodies**), it is possible find for each partner involved in the project, which type of standard it is believed can provide a contact with the respective standardization body.

Partner	Std Body	Committee
CRF	UNI	ISO 10218 renewal
PASEU	IEEE Standards	IEEE P2020 Standards
PASEU	ADASIS	ADASIS Protocol V3
CTL	ISO	MPEG-7 renewal
CTL	W3C	R2RML

Figure 9 - Extract of the table relative to Contact of standardization bodies

Last, in the sheet (**Standardization Activities Plan**) it is possible to insert all types of activities (working group, writing a paper, webinar, etc.) already carried out (during the project) and those that will be implemented in the future (respecting the project deadline).
Publications with content related to standards should also be listed in this table.

	A	B	C	D	E
1		STANDARDIZATION ACTIVITIES			
2	Partner Name	Date	Standardization Body	Activity	Comments
3	CRF	TBD	UNI/ISO	Working group	CRF can introduce aspects related to ISO 10218 in the UNI/ISO italian working gorup in which it is participating
4	PASEU	TBD	IEEE Standards	WG: Automotive Image Quality for Copmuter Vision	PASEU Leads the Working Group of Computer Vision on Automotive Image Quality. We can introduce some metrics of image quality degradation also used on Cyber Attack use case
5	PASEU	TBD	ADASIS Hosted By ERTICO	Co Operative Awareness	The consortium can align on which of the conclusion of co operative awareness can be pushed in the standard
6	CTL	TBD	ISO	paper	Publication on standardizing semantics-enabled ETL tools and semantic data integration framework (T4.5)
7	CTL	TBD	ISO	paper	Publication on standardizing Driver State Monitoring

Figure 10 - Extract of the table relative to Standardization Activities Plan

3.2 Relevant technical standards (Preliminary list of applicable standards)

At the moment, the list of applicable standards contains 78 elements for both Use-Cases, which can be differentiated by the different category indicated in the previous paragraph.
For more details, all the standards divided by each category have been collected in the table below:

Table 5 – Preliminary list of applicable standards for each category

Category	Document identifier	Title
Environment	ISO 9787	Robots and robotic devices - Coordinate systems and motion nomenclatures
Ergonomics	ISO 11228-1	Ergonomics - Manual handling - Part 1: Lifting and carrying
	ISO 11228-2	Ergonomics - Manual handling - Part 2: Pushing and pulling
	ISO 11228-3	Ergonomics - Manual handling - Part 3: Handling of low loads at high frequency
	EN 1005-5	Safety of machinery - Human physical performance - Part 5: Risk assessment for repetitive handling at high frequency
	ISO 11226	Ergonomics - Evaluation of static working postures
	ISO 15534-1	Ergonomic design for the safety of machinery - Part 1: Principles for determining the dimensions required for openings for whole-body access into machinery
	ISO 9241-910	Ergonomics of human-system interaction - Part 910: Framework for tactile and haptic interaction
	ISO 9241-110	Ergonomics of human-system interaction - Part 110: Dialogue principles
	ISO 9241-920	Ergonomics of human-system interaction - Part 920: Guidance on tactile and haptic interactions
	EN 614-1+A1	Safety of machinery - Ergonomic design principles - Part 1: Terminology and general principles
	EN ISO 15536-1	Ergonomics - Computer manikins and body templates - Part 1: General requirements (ISO 15536-1:2005)
	EN ISO 13732-1	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 1: Hot surfaces (ISO 13732-1:2006)
	EN ISO 13732-3	Ergonomics of the thermal environment - Methods for the assessment of human responses to contact with surfaces - Part 3: Cold surfaces (ISO 13732-3:2005)
	ISO/TR 7250-1	Basic human body measurements for technological design — Part 1: Body measurement definitions and landmarks
	ISO/TR 7250-2	Basic human body measurements for technological design — Part 2: Statistical summaries of body measurements from national populations
	ISO/TR 7250-3	Basic human body measurements for technological design — Part 3: Worldwide and regional design ranges for use in product standards
General	ISO 8373	Robots and robotic devices - Vocabulary
	ISO 9946	Manipulating industrial robots - Presentation of characteristics
	ISO 14539	Manipulating industrial robots - Object handling with grasp-type grippers - Vocabulary and presentation of characteristics
ICT	OWL 2 Web Ontology Language	Ontology language for creating semantic models (W3C Recommendation)
	SPARQL 1.1 Query Language	Query language for querying semantic models (W3C Recommendation)
	Shapes Constraint Language (SHACL)	Standard for validating semantic models (W3C Recommendation)
	SWRL: A Semantic Web Rule Language Combining OWL and RuleML	Rule language for executing rules over RDF/OWL data
	R2RML: RDB to RDF Mapping Language	Language for mapping data from relational DBs to RDF-based semantic models (W3C Recommendation)
	ISO/IEC 30113-1	Information technology - User interface - Gesture-based interfaces across devices and methods - Part 1: Framework

	ISO/IEC 30113-11	Information technology - Gesture-based interfaces across devices and methods - Part 11: Single-point gestures for common system actions
	ITU-T E.333	Man-machine interface
	ITU-T Y.4106 (new number ITU-T F.747.3)	Requirements and functional model for a ubiquitous network robot platform that supports ubiquitous sensor network applications and services
	IEEE 1872	IEEE Standard Ontologies for Robotics and Automation
	ISO/IEC 15408-1:2009	Information technology - Security techniques - Evaluation criteria for IT security - Part 1: Introduction and general model
	ISO/IEC TR 15443-1:2012	Information technology - Security techniques - Security assurance framework - Part 1: Introduction and concepts
	ISO/IEC 18033-1:2015	Information technology - Security techniques - Encryption algorithms - Part 1: General
	ISO/IEC 18045:2008	Information technology - Security techniques - Methodology for IT security evaluation
	ISO/IEC 27000:2018	Information technology - Security techniques - Information security management systems - Overview and vocabulary
	ISO/IEC 27005:2018	Information technology - Security techniques - Information security risk management
	ISO/IEC 27004:2016	Information technology - Security techniques - Information security management - Monitoring, measurement, analysis and evaluation
	ISO/IEC 27032:2012	Information technology - Security techniques - Guidelines for cybersecurity
Safety	ISO/IEC 15938	DSM standards for video analysis
	ISO/TS 15066	Robots and robotic devices - Collaborative robots
	ISO 26262-1:2018	Road vehicles — Functional safety (26262-1:2011, Revised 1:2018)
	ISO/TC 22	Road Vehicles
	NHTSA	Federal Motor Vehicle Safety Standards and Regulations
	IEC 60204-1	Safety of machinery - Electrical equipment of machines - Part 1: General requirements
	ISO/TR 20218-1	Robotics - Safety design for industrial robot systems - Part 1: End effectors
	ISO/TR 20218-2	Robotics - Safety design for industrial robot systems - Part 2: Manual load/unload stations
	ISO/TR 22100-3	Safety of machinery - Relationship with ISO 12100 - Part 3: Implementation of ergonomic principles in safety standards
	ISO 11161	Safety of machinery - Integrated manufacturing systems - Basic requirements
	ISO 14118	Safety of machinery - Prevention of unexpected start-up
	EN ISO 10218-1	Robots and robotic devices - Safety requirements for industrial robots - Part 1: Robots (ISO 10218-1:2011)
	EN ISO 10218-2	Robots and robotic devices - Safety requirements for industrial robots - Part 2: Robot systems and integration (ISO 10218-2:2011)
	EN 547-2+A1	Safety of machinery - Human body measurements - Part 2: Principles for determining the dimensions required for access openings
	EN 547-3+A1	Safety of machinery - Human body measurements - Part 3: Anthropometric data
	EN 614-2+A1	Safety of machinery - Ergonomic design principles - Part 2: Interactions between the design of machinery and work tasks
	EN 842+A1	Safety of machinery - Visual danger signals - General requirements, design and testing
	EN 894-1+A1	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 1: General principles for human interactions with displays and control actuators
	EN 894-2+A1	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 2: Displays
	EN 894-3+A1	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 3: Control actuators
	EN 894-4	Safety of machinery - Ergonomics requirements for the design of displays and control actuators - Part 4: Location and arrangement of displays and control actuators

	EN 981+A1	Safety of machinery - System of auditory and visual danger and information signals
	EN 1005-1+A1	Safety of machinery - Human physical performance - Part 1: Terms and definitions
	EN 1005-2+A1	Safety of machinery - Human physical performance - Part 2: Manual handling of machinery and component parts of machinery
	EN 1005-3+A1	Safety of machinery - Human physical performance - Part 3: Recommended force limits for machinery operation
	EN 1005-4+A1	Safety of machinery - Human physical performance - Part 4: Evaluation of working postures and movements in relation to machinery
	EN ISO 14738	Safety of machinery - Anthropometric requirements for the design of workstations at machinery (ISO 14738:2002, including Cor 1:2003 and Cor 2:2005)
	EN 1837+A1	Safety of machinery - Integral lighting of machines
	EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction (ISO 12100:2010)
	EN ISO 13849-1	Safety of machinery - Safety-related parts of control systems - Part 1: General principles for design (ISO 13849-1:2015)
	EN ISO 13849-2	Safety of machinery - Safety-related parts of control systems - Part 2: Validation (ISO 13849-2:2012)
	EN ISO 13850	Safety of machinery - Emergency stop function - Principles for design (ISO 13850:2015)
	EN ISO 13855	Safety of machinery - Positioning of safeguards with respect to the approach speeds of parts of the human body (ISO 13855:2010)
	EN ISO 13857	Safety of machinery - Safety distances to prevent hazard zones being reached by upper and lower limbs (ISO 13857:2008)
	EN 349+A1	Safety of machinery - Minimum gaps to avoid crushing of parts of the human body
	EN 574+A1	Safety of machinery - Two-hand control devices - Functional aspects - Principles for design
	EN 61310-3	Safety of machinery - Indication, marking and actuation - Part 3: Requirements for the location and operation of actuators (IEC 61310-3:2007)
	EN 62061	Safety of machinery - Functional safety of safety-related electrical, electronic and programmable electronic control systems (IEC 62061:2005/A2:2015)
Others	ISO/TC 204	Intelligent transport systems
	IEC/TR 62899-250	Printed electronics - Part 250: Material technologies required in printed electronics for wearable smart devices

3.3 CPSoSaware contents Connected to Standardization

In this paragraph we will analyse, for both Use-Cases, the main innovations that we are developing in the project, evaluating their impact with existing standards and which other standards, on the other hand, could be affected.

The current list already available could be summarized in 4 major points:

1. Active anthropometric adaptation of machinery
2. Driver State Monitoring (DSM) and Operator State Monitoring
3. Semantic data integration framework
4. 4D Co-operative situational Awareness

Figure 8 shows an extract of the table in spreadsheet.

3.4 Preliminary planning of a Concertation Plan

3.4.1 Dissemination channels

The main dissemination channels for the CPSoSaware will be:

1. Public papers with content related to topics relevant for the standardization bodies;
2. Conferences were the presence of standardization bodies is expected;
3. Presentations in the working group;
4. Webinar online.

Figure 10 shows an extract of the table in spreadsheet (see for major details column "D").

3.4.2 Partnership involvement in Standardization Bodies

For each individual partner involved in the project, it is intended to identify the relationship that would be established between the partner and the standardization body that should be involved during the review process of a specific standard, evaluating the impact it could have on the rest of the scientific community.

Below, a first list of Standardization Bodies involvement for both Use-Cases:

- UNI
- IEEE Standards
- ADASIS
- ISO
- W3C

Figure 9 shows an extract of the table in spreadsheet.

3.4.3 Dedicated (standard) dissemination plan

The main goal of dissemination strategy is to identify and organise the activities to be performed in order to maximise the influence of the project and to promote commercial and other exploitation of the project results.

In more detail, the objectives of the dissemination are:

1) To raise public awareness about the project, its expected results and progress within defined target groups using effective communication means and tools;
2) To exchange experience with projects and groups working in the field in order to join efforts, minimize duplication and maximize potential;
3) To disseminate the fundamental knowledge, the methodologies and technologies developed during the project;
4) To pave the way for a successful commercial and non-commercial exploitation of the project outcomes.

The dissemination plan plays an important role with the activities included in the D7.1 “Preliminary Version of CPSoSaware Dissemination Plan & Material” and D7.7 “Final Version of CPSoSaware Dissemination Plan & Material”. In particular, as already explained in the previous paragraph, our attention is focalized on the Standardization and the relative impact for the main stakeholders.

4 Conclusions

This deliverable describes the main contents of the standardization process from a high-level point of view, moving on to the description of the main Standardization Bodies that may be involved during the development of a new standard and how they play an important role in defining the criteria, which must be adopted for the publication of a new standard.

In order to correctly represent the methodology applied for the collection of the main rules used for both Use-Cases, a specific category has been defined for each of them in which they can be inserted.

As this is a preliminary version, it can be assumed that it can be enriched with new rules not currently considered in view of the final version.

References

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