Rossini

ROBOT ENHANCED SENSING, INTELLIGENCE AND ACTUATION TO IMPROVE JOB QUALITY IN MANUFACTURING

Standardization activities within SHAREWORK project

Industrial Human Robot Collaboration

Amanda Suo

UNE
NormalizaciónEspañola

A project coordinated by:
eurecat

AGENDA

1. Summary of Standardization Strategy

2. Planning of Standardization Workshop – CEN WS & CWA

Needs analysis for the development of new standards in the area of HRC and the Creation of a possible CWA (Proposal)

I. Introduction of CWA
II. Deliverable adaptation into a CWA

1. Summary of Standardization Strategy

BEFORE ALL

Standardization Strategy

BEFORE ALL

Standardization Strategy

Planning for the contribution to standardization

- First contact with TCs
- Selection of TCs to contact with
- Compilation of TCs' contacts
- Content to disseminate (agreed with Consortium)
- Planning for the communication and interaction with relevant TCs

Communication and Interaction with relevant TCs

- Follow up of TCs standardization activities
- Update TCs with SHAREWORK progress (reports or meetings)
- Participation of SHAREWORK experts via their NSB (National Standardization Body)
- Project liaison

Standardization Development (Future standardization proposals)

- Via Workshops:
  - Development of new standard
- Via TCs:
  - Development of new standard
  - Contribution to ongoing standard (new or under-review)
  - Request for modifying standards
  - Outline of a future standard

Implementation of the Standardization Strategy

I. Progress

II. Next Steps

III. Risks

IV. Partners Participation

I. Progress

Deliverable of T8.3.1 "D8.3 Report on Standardization landscape and applicable standards"

Conclusions of D8.3 (Standardization landscape)

Technical Committees(TC) related to SHAREWORK

Standards to be considered as *Compliance requirements*, Standards to be used as *Guidelines*, very related to SHAREWORK

Circulated to partners for input
Submitted to EC on May 2019 (M6)
European and international Standardisation basics
Summary of Technical Committees(TC) related to SHAREWORK
Summary of Standards related to SHAREWORK

I. Progress

Conclusions of *D8.3 (Standardization landscape)*

Conclusions of D8.3 (Standardization landscape) were divided into two groups:

- **36 standardization Technical Committees(TC)** identified related to SHAREWORK project.
  - To be able to use the standardization system as a tool for dissemination of the project results an interaction with the market stakeholders there will be necessary to decide the type SHAREWORK´s interaction of with the relevant 36 TCs identified for SHAREWORK (see Table 1). UNE would provide with the necessary technical support required for that interaction.
  - The following is a list of the European and International Technical Committees(TC) which have been identified as technical bodies working on **14 Topics, 21 Areas and 36 TCs** related to SHAREWORK.

- **46 Standards** are especially relevant and might be considered as a compliance requirement for the outputs of the project: they refer to **WP1, WP3, WP4, WP5, WP6** and **WP10.** They refer to **Safety of Machinery, Robot/Robotics, Human Ergonomics, HR interaction, system-human and human-system communication, Automation and integration, Software development, Data Security, Safety risk management**, and **AR training**.
  - In the future it might be possible to contribute to those standards through standards usage information and through the dissemination of the SHAREWORK framework which may include those standards.
  - There will also be possible to report failures, improvement or any other kinds of suggestions.
  - It also might be possible to contribute in the future supplying new knowledge about: *ethical considerations for Industrial Robotic systems, industrial cyber-security, HR interaction, self-optimizing automation, optimal automation levels (linked to human characteristics including satisfaction)*, etc.

Technical Committees(TC) related to SHAREWORK

Topics	Areas and TCs
INDUSTRIAL ROBOTS	Robot/Robotics
	ISO/TC 299 - Robotics
	CEN/TC 310 - Advanced automation technologies and their applications
	Ethics in Robot Design
	British Standards AMT/10 Robotics
	Automation Systems and Integration
	ISO/TC 184 Automation systems and integration
	CEN/TC 310 Advanced automation technologies and their applications
	Additive manufacturing
	ISO/TC 261 Additive manufacturing
	CEN/TC 438 Additive manufacturing
ADVANCED MANUFACTURING	Industrial Automation System
	ISO/ TC 184 Automation systems and integration
	IEC/TC65 Industrial-process measurement, control and automation
	CLC/TC 65X Industrial-process measurement, control and automation
	Industrial Process Measurement, Control and Automation
	CLC/TC 65X Industrial-process measurement, control and automation
ERGONOMICS & ANTHROPOMETRY	Ergonomics
	ISO/TC 159 Ergonomics
	CEN/TC 122 Ergonomics
	Anthropometry
	ISO/TC 159/SC 3 Anthropometry and biomechanics
	Ergonomics of Human-System Interaction
	ISO/TC 159 Ergonomics*
	CEN/TC 122 Ergonomics*
INDUSTRIAL CYBER SECURITY	Industrial Cyber Security
	ISO/IEC JTC 1/SC 27 Security, cybersecurity and privacy protection
	ISO/TC 22/SC 31 Data communication
	IEC TC 57 Power systems management and associated information exchange
	IEC TC 65 Industrial-process measurement, control and automation
INTEROPERABILITY	Interoperability
	IEC/SC 65 E Devices and integration in enterprise systems
INTERNET OF THINGS (IoT)	Internet of Things
	ISO/IEC JTC 1/SC 41 Internet of Things and related technologies

Topics	Areas and TCs
ARTIFICIAL INTELLIGENCE (AI)	Artificial Intelligence
	ISO/IEC JTC 1/SC 42 Artificial Intelligence
	CEN-CENELEC Focus Group on Artificial Intelligence
	High-Level Expert Group on Artificial Intelligence (AI HLEG)
HEALTH AND SAFETY OF WORKERS	Health and Safety
	ISO/PC 283 Occupational health and safety management systems
	Personal Protective Equipment
	CEN/TC 122 Ergonomics*
SAFETY OF MACHINERY	Safety of Machinery
	CEN/TC 114 Safety of machinery
	CEN/TC 122 Ergonomics*
	CEN/TC 310 Advanced automation technologies and their applications*
	CLC/TC 44X Safety of machinery: electrotechnical aspects
	ISO/TC 159/SC 3 Anthropometry and biomechanics
	ISO/TC 199 Safety of machinery
	IEC TC 3 Information structures and elements, identification and making principles, documentation and graphical symbols
	IEC/TC 44 Safety of machinery - Electrotechnical aspects
UNIVERSAL ACCESSIBILITY	Universal Accessibility and Design for All
	ISO/IEC JTC 1 Information technology*
	ISO/TC 159 Ergonomics*
LIGHTING	Lighting of work places
	ISO/TC 274 Light and lighting
	CEN/TC 169 Light and lighting
TRAINING	Learning, Education and Training
	ISO/IEC JTC 1 Information Technology
VIBRATION	Vibration
	ISO TC 108 Mechanical vibration, shock and condition monitoring
VR/AR/MR	Virtual Reality (VR), Augmented/Mixed Reality (AR/MR)
	ISO/IEC JTC 1 SC 24 Computer graphics, image processing and environmental data representation
	ISO/IEC JTC 1/SC 29 Coding of audio, picture, multimedia and hypermedia information

I. Progress

Standards to be considered as *Compliance requirements*

Standard Code (Technical Committee)	Standard Title	Main WP related	Main Module# related	Contribution to standardization
Safety of machinery / Robot/Robotics				
ISO 12100:2010 (ISO/TC 199/WG 5) EN ISO 12100:2010 (CEN/TC 114) VA. ISO lead	Safety of machinery - General principles for design - Risk assessment and risk reduction	WP5. System flexibility through human safety and reliable and secure computing architectures WP1. System conceptualization, use case definition and modelling	Human safety in HRC tasks with collaborative and high-payload robots (Module#10) Module#10 – D5.1 – T5.1 – WP5 Tooling adaptation for safe HRC (Module#11) Module#11 – D5.3 – T5.3 – WP5	Potentially: Usage and dissemination.
ISO 10218 (ISO/TC 299) EN ISO 10218 (CEN/TC 310) VA. ISO lead	Robots and robotic devices - Safety requirements for industrial robots Part 1: Robots Part 2: Robot systems and integration	WP5. System flexibility through human safety and reliable and secure computing architectures	Human safety in HRC tasks with collaborative and high-payload robots (Module#10) Module#10 – D5.1 – T5.1 – WP5	Potentially: Usage and dissemination.
ISO/TS 15066:2016 (ISO/TC 299)	Robots and robotic devices – Collaborative robots	WP3. Task and motion planning for HR cooperation WP4. HR Interfaces for effective collaboration	Offline and real-time human-aware and safe robot motion planning (Module#7) Module#7 -- D3.2 –- T3.2 –- WP3 Direct and natural human-system and system-human (human-robot) communication interface module (Module#9) Module#9 –- D4.1 –- T4.2 -- WP4	Potentially: with respect to supplying new knowledge of human-automation systems design.
Ergonomics / Ergonomics of human-system interaction				
ISO 6385:2016 (ISO/TC 159/SC 1/WG 1) EN ISO 6385:2016 (CEN/TC 122/WG2) VA. ISO lead	Ergonomics principles in the design of work systems	WP4. HR Interfaces for effective collaboration	Human ergonomics (Module#13) Module#13 -- D4.2 –- T4.3 –- WP4	Potentially: with respect to supplying new knowledge of human-automation systems e.g. self-optimizing automation, optimal automation levels (linked to human / worker characteristics including satisfaction), etc.
ISO 10075 (ISO/TC 159/SC 1/WG 2) EN ISO 27501:2019 (CEN/TC 122/WG 2)	Ergonomic principles related to mental work- load -- General terms and definitions Part 2: Design principles	WP4. HR Interfaces for effective collaboration	Human ergonomics (Module#13) Module#13 -- D4.2 –- T4.3 –- WP4	No
ISO 9241-110:2006 (ISO/TC 159/SC 4) EN ISO 9241-110:2006 (CEN/TC 122/WG 5) VA. ISO lead	Ergonomics of human- system interaction. Ergonomics of human- system interaction - Part 110: Dialogue principles	WP4. HR Interfaces for effective collaboration	Direct and natural human-system and system-human (human-robot) communication interface module (Module#9) Module#9 –- D4.1 –- T4.2 -- WP4 Human ergonomics (Module#13) Module#13 -- D4.2 –- T4.3 –- WP4	No
ISO 14915-1:2002 (ISO/TC 159/SC 4) EN ISO 14915-1:2002 (CEN TC 122/WG5) VA ISO Lead	Software ergonomics for multimedia user interfaces -- Part 1: Design principles and framework	WP4. HR Interfaces for effective collaboration	Direct and natural human-system and system-human (human-robot) communication interface module (Module#9) Module#9 –- D4.1 –- T4.2 -- WP4 Human ergonomics (Module#13) Module#13 -- D4.2 –- T4.3 –- WP4	-

Implementation of the Standardization Strategy

I. PROGRESS

II. NEXT STEPS

III. RISKS

IV. PARTNERS PARTICIPATION

II. Next steps

A. Planning. Next ACTIONS to be carried out in T8.3, for *D8.14 Report on the Contribution to Standardization*

Deliverable	Due date	Actions
D8.14-P1	M18	**Report** on Conclusions of D8.3 and Initial Planning of the T8.3.2 contribution to standardization developments
D8.14-P2	M24	**Report** on Communication and Interaction with standardization system - TCs (including the actions carried out and to be carried out, in order to disseminate the project towards possible future standardization activities in the same field)
D8.14-P3	M36	**Report** on Future Standardization Proposal. (the activities to be carried out include the participation to working session on standardization, identification of standardisable topics and contributions to standard development)
Final D8.14	**M42**	**Final report on Contribution to the ongoing and future standardization developments**

II. Next steps

B. WHICH committees have to be contacted?

- **Focus on European/International standardisation**
  - Existence of the following relevant TCs.
    - ISO/TC 199, CLC/TC 44 X, IEC/TC 44 on Safety of machinery
    - ISO TC 299 on Robotics; CEN/TC 310 - Advanced automation technologies and their applications
    - ISO/TC 184 on Automation systems and integration; IEC TC 65 and CLC/TC 65X on Industrial-process measurement, control and automation
    - ISO/TC 159 on Ergonomics
    - ISO/TC 261 and CEN/TC 438 on Additive manufacturing
    - ISO/IEC JTC 1/SC 27 Cybersecurity and privacy protection, ISO/TC 22/SC 31 Data communication, IEC TC 57 Power systems management and associated information exchange
    - ICS Standards catalogue: 25.040.01 Industrial automation systems in general
  - Dissemination and exploitation plans
- **Different approaches**
  - Informative
  - Proactive
- **Main Technical Committees(TC) to be contacted**

…detect the relevant TCs regarding the identified Standards

Safety of machinery:

ISO 12100:2010
(ISO/TC 199/WG 5)
EN ISO 12100:2010
(CEN/TC 114)

ISO 10218
(ISO/TC 299)
EN ISO 10218
(CEN/TC 310)

ISO/TS 15066:2016
(ISO/TC 299)

Ergonomics / Ergonomics of human-system interaction:

ISO 6385:2016
(ISO/TC 159/SC 1/WG 1)
EN ISO 6385:2016
(CEN/TC 122/WG2)

ISO 10075
(ISO/TC 159/SC 1/WG 2)
EN ISO 27501:2019
(CEN/TC 122/WG 2)

ISO 9241-110:2006
(ISO/TC 159/SC 4)
EN ISO 9241-110:2006
(CEN/TC 122/WG 5)

ISO 14915-1:2002
(ISO/TC 159/SC 4)
EN ISO 14915-1:2002
(CEN TC 122/WG5)

II. Next steps

C. WHAT actions could be done?

- **C.1 Implication in Technical Committees(TC)**
  - Follow up of standardization activities (UNE)
  - Joining and participation in TCs (Fraunhofer, INTRA, STAM, CNR, LMS, EURECAT…)
  - Establishing a “Project Liaison” (Consortium)

- **C.2 Informing Technical Committees**
  - Delivering reports (UNE)
  - Attending to TCs meetings (ALL)

- **C.3 Requesting information to Technical Committees (UNE)**

II. Next steps

D. Schedule proposal for developing *D8.14 Report on the Contribution to Standardization*

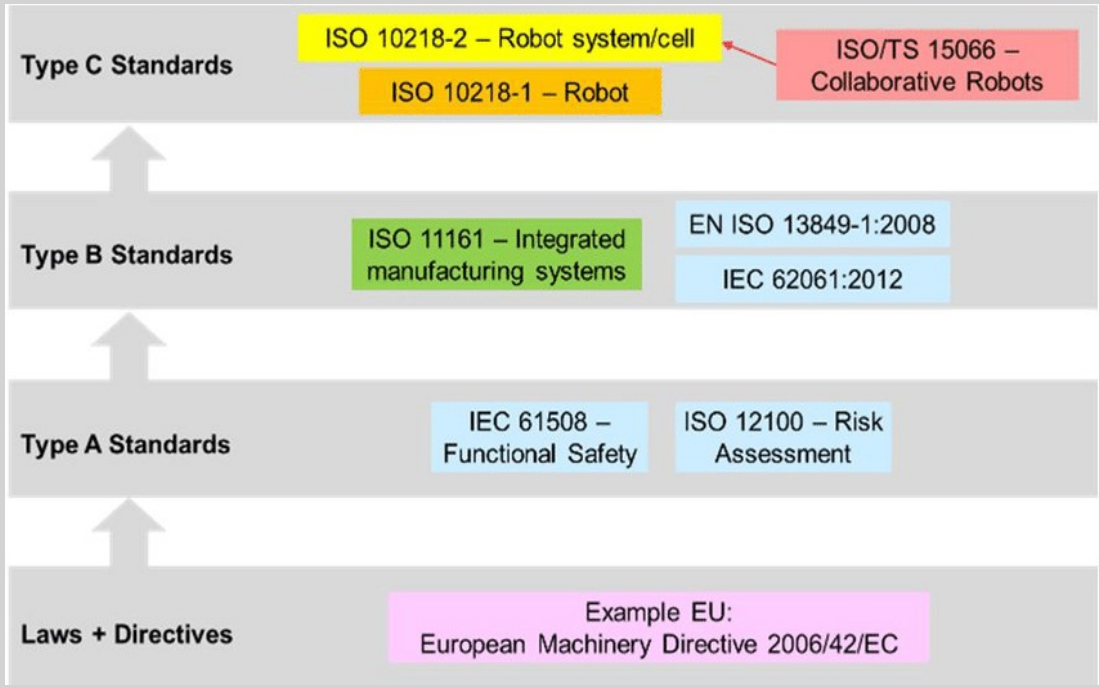
#	Action	Technical committee	Responsible	Date
1	Follow up of TCs standardisation activities	All selected	UNE	**Continuous (Month 1-Month 42)**
2	Participation in one/several TCs	**CEN/TC 310, CEN/TC 122,…**	Coordinator, partners	**If relevant, when TC meets**
3	Delivering reports to TCs	All selected	UNE	**D8.14-P1 M18** **D8.14-P2 M24** **D8.14-P3 M36** **Final D8.14 M42**
4	Presentation of the project in TCs meetings	**CEN/TC 310, CEN/TC 122…**, other if requested	UNE, coordinator, partners	**M24, Nov 2020 (expected)**
5	Information requests to TCs	All relevant	UNE, in the basis of partners requests	**When relevant**
6	Information to TCs on workshops and conferences	All relevant	UNE	**When relevant**

2. Planning of Standardization Workshop – CEN WS & CWA

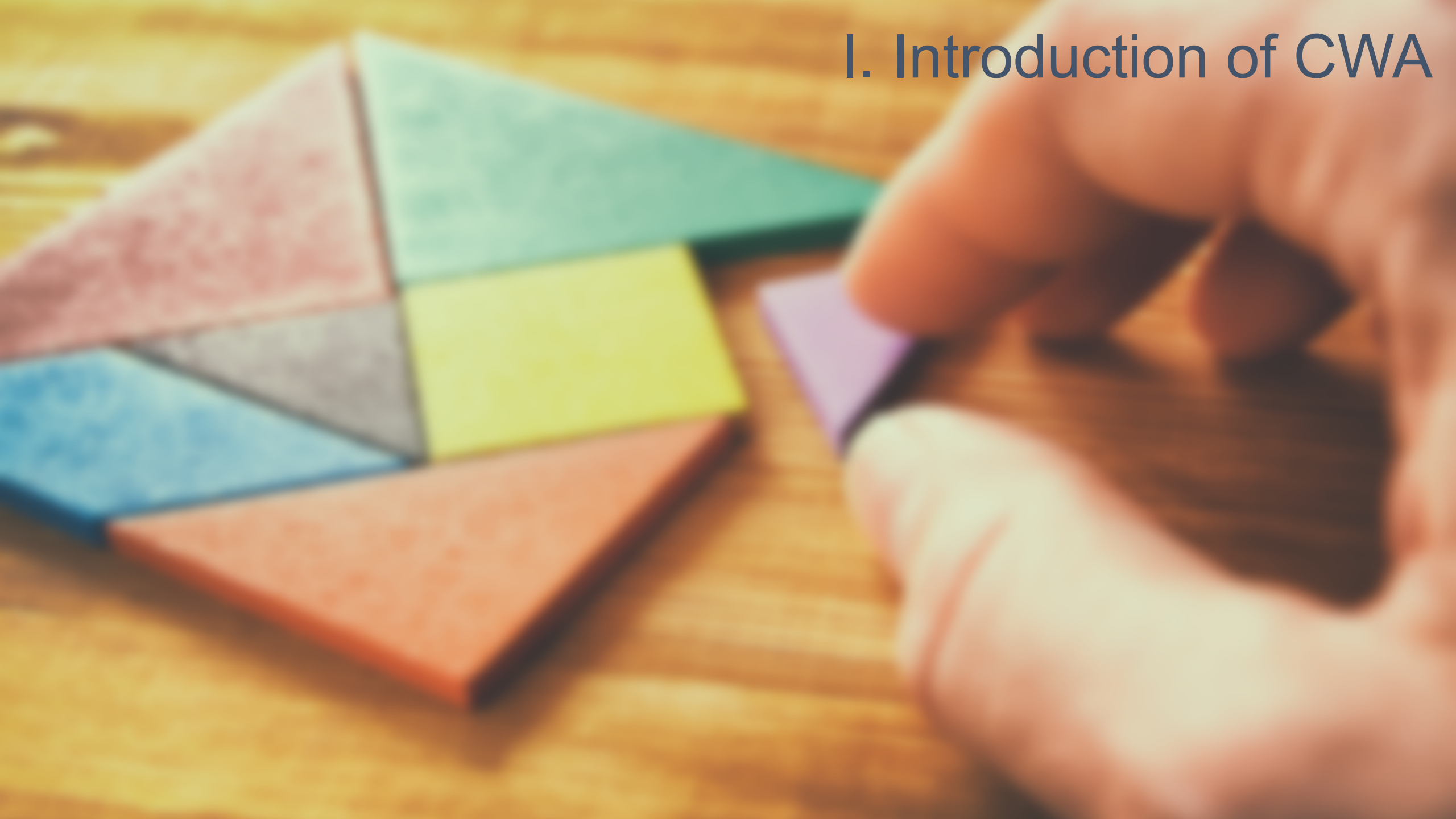
Needs analysis for the development of new standards in the area of HRC and the Creation of a possible CWA (Proposal)

Standards

- Standards sufficiently developed?
  - Mobile robots? Safety related vision systems? Industrial Cyber Security?
  - Data formats (e.g., point clouds)
- Standards sufficiently translated in good practices? Matter of dissemination?
- Challenges benefits only long-term, known as long-lasting and dull
- What is involvement of EU projects in development standards:
  - **SHAREWORK** (active stand in standardization process)
  - ROSSINI: active stand in standardization process
  - COROMA (DIN is partner, SICK/DGH is expert standard implementation)
- Important that EU voices are heard (EU mostly SMEs, other countries mostly big companies).



I. Introduction of CWA



1) Introduction

What is a CWA?

A CEN Workshop Agreement (CWA) is a document agreed by the participants of a CEN Workshop (WS), that commonly is composed by a H2020 project partners.

A CWA normally includes guidelines, recommendations, best practices… and can be converted in a CEN standard in the future.

REASONS for developing a CWA:

- To give more visibility to SHAREWORK project within industry and standardisation system
- Possibility to use already done Deliverables as a basis

1) Introduction

EXAMPLES of CEN WS currently developing CWAs

- CEN/WS - Procedure for evaluating if the use of a Volatile Fatty Acid Platform technology for a given type of biowaste at a given location is economically and ecologically reasonable (H2020 EvaVOLATILE)
- CEN/WS - Sustainable energy retrofit process management for multi-occupancy residential buildings with owner communities (H2020 SMARTER TOGETHER)
- CEN/WS - Description and Assessment of Good Practices for Smart City Solutions (H2020 SMARTER TOGETHER)

EXAMPLES of already published CWAs

- CEN/WS SUSTINROADS - FP7 Project LCE4ROADS
  CWA 17089:2016 "Indicators for the sustainability assessment of roads"
- CEN/WS SustainWATER - FP7 Project E4Water
  CWA 17031:2016 "Sustainable Integrated Water Use and Treatment in Process Industries – a practical guidance"

More WS and CWA examples and details on CEN Website

1) Introduction

CONCLUSIONS (standardisation and CWA)

- It is necessary to define a **message/scope and index** ➔ target
- Feasible Deliverables to be adapted into a CWA
  - Methodologies
  - Dxx.xx Guidance for SHAREWORK design…
- It is necessary to define a **date** for the launching the CEN WS that will develop the CWA

2) Principles and elements

A Workshop…

- is meant to meet a market need with an innovative technology
- operates separately from Standardisation TCs

A CWA…

- shall not conflict a European Standard
- cannot include legislative requirements or cover significant health and safety issues
- can be proposed for transformation into a European Standard

Detailed information on CWAs is available in CEN/CENELEC Guide 29

3) Development

INITIATION

- Proposal
  - Project plan
  - Self-assessment
  - Analysis of interest
- Submission to CEN
- Workshop set up
  - Coordinator
  - Secretariat (UNE)
- Commenting period
  - Other participants

DRAFTING

- Kick-off meeting
  - Chair
  - Secretariat (UNE)
- Drafting
- Open commenting phase (recommended)
- Final agreement and approval

FINALISATION

- Submission to CEN (M48)
- Publication

Publication → 3 years → Confirmation, revision, transformation in other Deliverable, withdrawal → 3 years → Transformation in other Deliverable or withdrawal

II. Deliverable adaptation into a CWA

2. Deliverable adaptation into a CWA

GENERAL PRINCIPLES

Main work consist in ADAPTING the text of the chosen Deliverable(s) according some general principles

- PARTNERS' PARTICIPATION by:
  a) Management tasks
  b) Taking part in approval decisions
  c) Reviewing CWA drafts and commenting
  d) Adapting text, introducing new text
- CEN/CENELEC Internal Regulations Part 3 (guidelines on how to draft standards) can be followed, but is not mandatory

CEN documents common structure
Introduction
1. Scope
2. Normative references
3. Terms and definitions
4. Clause 1
6.1 Subclause 1
6.2 Subclause 2
5. Clause 2
….
Annexes
Bibliography

2. Deliverable adaptation into a CWA

GENERAL PRINCIPLES

- TEXT must be plain, clear and concise. Use short sentences
  Example: Concrete panels should be stored vertically to avoid deformations.
- NEW provisions can be added. NOT ALL text have to be transferred
- SUMMARIZE, shorten the paragraphs to be adapted. Avoid unnecessary explanations or repeating ideas.
  Avoid a large final document. A concise document will be more useful for users.
- SCOPE must describe what the document does, the aspects covered, the limits
  Example: This document provides recommendations for the design and installation of ventilated façade systems with innovative technologies.

2. Deliverable adaptation into a CWA

GENERAL PRINCIPLES

- TERMS and DEFINITIONS clause is recommendable for a better understanding of the document
  Examples: 3.1 Ventilated façade system, 3.2 Cladding system…
- USE “should”, “may”, “can”, that mean recommendation or permission. Do not use “shall”, “must” that mean obligation
  Example: The installation of the automated window should be performed before the installation of the façade substructure
- Do not require to comply with Conformity assessment schemes and systems.
  Examples: EN ISO 9001, EN ISO 14001

2. Deliverable adaptation into a CWA

GENERAL PRINCIPLES

- AVOID Trademark names. Use general designations or descriptions. If cannot be avoided, use ® or ™

  Examples:

  Use DYNAMIC WINDOW WITH AUTOMATED SOLAR BLINDS instead “EURECAT window”

  Use MULTIFUNCTIONAL INSULATED PANEL instead “STAM panel”

  Use SOLAR THERMAL AIR COMPONENT instead “SOLARWALL component”

  Use LIGHTWEIGHT VENTILATED FAÇADE MODULE instead “ULMA module”

2. Deliverable adaptation into a CWA

SELECTION OF THE CWA SUBJECT

IT'S TIME TO CHOOSE

the CWA Title, Scope, index

It is possible to develop 2 or more CWAs

2. Deliverable adaptation into a CWA

SOME POSSIBILITIES FOR THE TITLE AND SCOPE

CWA xxxxx:2021 “Guidelines for ….(p.ej. Guidelines of Cyber Security for Industrial Robotics”
This document is intended to help xxxxxxxxxxxx.

CWA yyyyy:2021 “Requirements for cybersecurity to the extent that it applies to industrial robot safety” or “Safety and Cyber Security requirements for industrial robots intended for use in collaborative applications”
This document is intended to provide a methodology to xxxxxxxxxxx

CWA zzzzz:2021 “Safety and security testing of an industrial robot”
This document is intended to xxxxxxxxxxxxxx

Thank you!

Amanda Suo
asuo@une.org

UNE
NormalizaciónEspañola