Being safe around collaborative and versatile robots in shared spaces

COVR Applicants Guide

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NOTE: This document is subject to revision. Please go to http://safearoundrobots.com/ to ensure that you have the latest version

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ARE YOU DEVELOPING A COLLABORATIVE ROBOT? OR AN APPLICATION FOR ONE? IF SO, YOU MAY BE ELIGIBLE FOR 60,000€

This document will guide you as a potential applicant through the opportunities, requirements and expectations of the open COVR Award call. Additional information can be found in the FAQ section on http://www.safearoundrobots.com/faq.

THE CURRENT CALL

- Opens: November 15, 2018
- Closes: February 28, 2019
- Winners announced: April 19, 2019

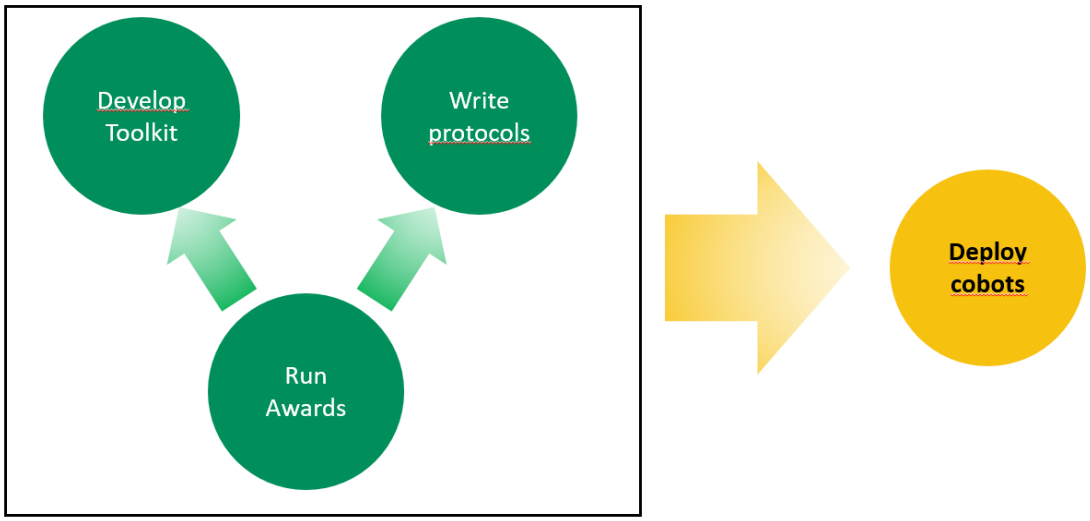
There will be two further Calls with deadlines in October 2019 and June 2020. Watch the website for details.

INTRODUCTION TO THE COVR VISION

The need for collaboration between robots on human tasks is evident in all sectors of the European market. Collaboration however inevitably raises safety issues, and European legislation is very careful to protect people. Robot systems therefore need "certification", i.e. to show compliance with the mandatory Essential Requirements of Safety and Health.

In our experience with end-users, robotics components manufacturers, and system integrators, safety has become a barrier to the promotion and availability of collaborative robotics technologies in all domains. This is due to a number of issues both technical (e.g. some robotics can change their behavior over time) and non-technical (e.g. understanding and correctly applying the current standards).

The EU-funded project "Being safe around collaborative and versatile robots in shared spaces" (COVR) aims to systematically break down certification barriers and support more widespread use of collaborative robots (cobots) in a wide range of industries and domains (e.g. manufacturing, logistics, healthcare, rehabilitation, agriculture).



The COVR Project has 3 main activities:

1. **Run COVR Awards** to promote the development and implementation of safe cobot solutions in Europe, and provide key inputs to the Toolkit and protocols, as well as validating them. The award work is completed by award winners, with the COVR consortium monitoring and assisting the process.
2. **Develop an online accessible Toolkit** to make it easier to find out which standards, directives and requirements a cobot solution must comply with, and which protocols must be completed to validate compliance. The toolkit will be tested by third parties through the award work.
3. **Write new protocols** for validating cobot safety. Protocols serves as "recipes" for the tests that must be carried out in order to demonstrate that a cobot solution meets given requirements. The protocols will be tested and validated through the award projects.

These activities are all completed in a context of deploying more collaborative robots in Europe.

For detailed explanation of the COVR Toolkit and protocols, see Appendix 1. For glossary, see Appendix 2.

COVR AWARDS ARE WORTH 5.4M€

COVR will give away 5.4M€ to "third parties" i.e. organisations outside the project, across three calls for projects. Most awards will be given to organizations with a cobot product or system to develop, install or assess. The idea is that the award beneficiaries will act as alpha and beta testers for COVR **while they develop their own cobot.** You will use the COVR Toolkit and protocols through your work and help to complete them – finding bugs and gaps, adding your specific domain knowledge, finding and describing ways of testing the features of interest and recommending changes. This will be done parallel with progressing your own cobot application/product on a specific safety-related issue. Award beneficiaries are required to use COVR facilities and services, but the bulk of the work may take place anywhere in Europe, e.g. at your own sites or in operational settings.

DOMAINS AND COBOT TYPES

There are many cobots being developed to address unique use-cases in a variety of domains. Therefore, the COVR consortium has designed the open calls to be very broad, accepting applications within a wide range of domains for almost all types of cobots. Applications with a high degree of novelty where the cobot solution has a non-mainstream use-case will be especially favored, to broaden the scope of the COVR Toolkit and protocols.

The first call will primarily focus on cobot safety within manufacturing and rehabilitation, while the subsequent calls will include the domains of logistics, agriculture, wearables, personal care and other. Note that the first call will also accept applications outside of manufacturing and rehabilitation.

There are a few types of devices that are not eligible for COVR Awards:

- Drones
- Autonomous road vehicles
- Cobots for military use
- Cobots that penetrate the human body

ELIGIBLE AWARD WORK AND REQUIREMENTS

COVR is looking for applications from companies or organizations working with robots that collaborate with humans. Robots working in spaces shared with and accessible to humans is the minimal requirement, while "plus" points will be obtained for closer collaboration. Applications shall focus on human safety around these types of robots, seeking to define best practice for their specific technology and/or application.

Eligible work includes at least one of:

- Make safety validations of cobot installations/products
- Develop a new cobot product(s) or improve an existing product, focusing on safety perspectives
- Develop or adapt robot peripheral equipment, focusing on safe human-robot collaboration
- Create or improve safety validation protocols for cobots
- Set up cobots in new application areas
- Develop and benchmark new tools, techniques or tests for collaborative robot safety
- Gather empirical data to answer open questions in standardization

There are also some mandatory activities that must be completed in all Award projects. These are:

- Completing an introductory course, learning how to use the COVR toolkit and about COVR's protocols and procedures
- Use and test the safety protocols, procedures etc. produced by the COVR project and relevant to your case
- Document your experiences with every project element using our Worksheets and questionnaires
- Continuously communicate progress to your assigned contact person
- Support the making of videos of non-secret aspects of your work
- Present your experiences at a single COVR dissemination event
- Collect your overall experiences with COVR into a final end-of-project report

DELIVERABLES AND MILESTONES

All Award work must be completed over a 9-month timespan. Applicants choose 2 mandatory Milestones to be reached during their project, to allow project progress to be monitored. The completion of these is documented through submission of one or more deliverables for each milestone.

SINGLE APPLICANTS AND CONSORTIA

The COVR Award calls are open to both single organizations and consortia of up to 4 companies/organizations. For eligibility criteria for the organizations, see section "ELIGIBILITY CHECK". A named individual will be the Lead Applicant, who will be the main contact for communication.

AWARD FUNDING

The following funding rules apply:

- For single organizations the funding is a fixed €60.000.
- Consortia can apply for a minimum of €60.000 and maximum of €150.000 to be shared so that no partner receives more than €60.000. Consortia's can be a maximum of 4 organizations.
- No single organization can exceed a maximum cumulative total of €100.000 across multiple COVR Awards over the course of the entire project runtime..

This third party funding is primarily intended to pay for time spent completing the activities described in your application. The maximum amount to be spent on equipment is set at 15% of the Award total and is not meant to be used for large purchases such as robots and machines. As an example, Award recipients can use the money to procure components and sub-assemblies such as grippers, sensors and consumables or purchase software licenses. The maximum grant funding available for travel expenses is also set to 15% of the Award total.

Costs will be reimbursed in three lump sums. Only project-related, actual incurred costs can be reimbursed.

Beneficiaries will receive their award according to the following schedule:

1. A lump sum representing 40% of the agreed award on completion of the introductory course or after contract signing, whichever comes latest.
2. A second lump sum representing 40% after 6 calendar months (as long as progress is to COVR satisfaction) or when the work is completed (both project Milestones have been reached to COVR satisfaction), whichever comes soonest.
3. A lump sum representing up to 20% when their work is fully completed, documented and signed off by the COVR partner responsible. These final stages include support for dissemination activities, submission of questionnaires and a COVR end-of-experience report.

ADDITIONAL BENEFITS

In addition to the funding, recipients of a COVR Award will benefit from:

- Access to expert knowledge at the COVR Core Consortium Partners
- Access to Shared Safety Facilities (SSF), including state of the art test equipment
- Becoming familiar with best practices for validating cobot safety
- Receiving guidance about which standards apply to their case
- Becoming part of the COVR Network, which will remain a strong source for safety related information

APPLICATION FORMALIA

- Applications must be in English and follow the template
- Employees of the partner RTOs may not apply.
- Fulfill the general requirements for H2020 funding e.g. secure audit trail.

HOW TO APPLY

Submit an application via https://covraward.smapply.io

The application will consist of 5 parts. The first 4 are mostly administrative while the last will focus on the work to be completed and technical aspects of the Award project.

Part A: Project name, description and public summary

Part B: Primary beneficiary details

Part C: Consortium partner information (if any)

Part D: Additional information checkboxes:

- Select domain, dominant technology and type of work to be carried out.
- How you learned about the COVR Award open call.
- Specify if personal sensitive data will be collected in the project, and if so, how it will be managed. Please see section "ETHICS AND HANDLING OF PERSONAL DATA" to get additional information on relevant legislation.
- Specify if your project raises ethical concerns. Please see section "ETHICS AND HANDLING OF PERSONAL DATA" to get additional information on relevant legislation.

Part E: Project activities and impact

- Describe the work to be completed within the Award project.
- Describe the primary outcomes of the Award work, and how this will impact yourselves, the COVR Project and cobot deployment in the European Union.
- Describe the primary technical challenges you expect to address, the novelty of the work and the data generated in the project.
- Choose your 2 mandatory Milestones, specifying the objectives to be reached at each milestone and the deliverables that document that the milestone has been achieved.
- Provide an overview of the personnel expected to do the work, especially their cobot experience and safety experience.
- Specify in EURO the total sum applied for in the COVR Award application and how it is distributed between the partners.

APPLICATION SUPPORT

All organizations considering applying for a COVR Award are encouraged to contact one of the COVR Core Consortium Partners for help with the Award application process. This includes providing advice, reviewing and suggesting changes to an application to ensure that all key questions are answered and evaluators have sufficient information to fairly score an application.

Please find below the contact information for the COVR Core Consortium Partners.

Danish Technological Institute, Denmark
Aske Lassen, aala@teknologisk.dk

Fraunhofer IFF, Germany
José Saenz, jose.saenz@iff.fraunhofer.de

Roessingh Research and Development, Netherlands
Gerdienke Prange, g.prange@rrd.nl

CEA LIST, France
Catherine Bidard, catherine.bidard@cea.fr

Consiglio Nazionale delle Ricerche (CNR), Italy
Federico Vicentini, federico.vicentini@stiima.cnr.it

IMPORTANT NOTE ON CONFIDENTIALITY

The information requested for the application is securely stored on a GDPR-compliant server and will be treated as CONFIDENTIAL INFORMATION. It will only be accessed by the assigned expert evaluators and a reduced project team in charge of the evaluation process. The ONLY PUBLIC information of the application is the Project name, summary and consortium partners. This will be used by COVR for dissemination. Please make sure that no confidential information is included as part of the project summary.

Note that the application need not disclose any details regarding how the technology works. The relevant aspect for the Award application concerns the technology features from a safety perspective.

ETHICS AND HANDLING OF PERSONAL DATA

You need to think about the ethical aspects of your work and how you handle personal data BEFORE applying for a COVR Award. The COVR Core Consortium Partners will be happy to help with this if you want. All work must conform to relevant EU legislations, in particular:

- The Charter of Fundamental Rights of the EU (especially Article 3: right to the integrity of the person; and Article 8: protection of personal data)
- Regulation EU 536/2014 of the European Parliament and of the Council of 16 April 2014 on clinical trials on medicinal products for human use
- Treaty on the European Union (TEU): Article 6
- The "framework" Directive on occupational safety and health: Council Directive 1989/391
- EU General Data Protection Regulation (GDPR)

Any research involving human subjects will have to conform to current legislation and regulations in the countries where the activities will be carried out and will be conducted according to Good Clinical Practice guidelines and in agreement with the Declaration of Helsinki.

Should your proposed Award project include collection of personal sensitive data, please specify this in the Award application, and provide a description of how this will be managed in the project.

APPLICATION EVALUATION

All eligible applications will be evaluated by independent experts and should receive a fair evaluation. The evaluation criteria and procedure are described in the section "SCORING, RANKING AND SELECTION" below.

The final decision on which applications are granted a COVR Award is taken by the Steering Committee (SC), which is responsible for ensuring that the final portfolio of applications is balanced according to COVR objectives as well as rewarding the best applications.

Once this process is completed, an official notification will be sent to the Primary Beneficiary. This notification will contain information on the results of the evaluation, including the evaluation summary report with the opinion of the experts and any other information considered relevant by the people taking part in the selection process.

ELIGIBILITY CHECK

Once the call is closed, the COVR consortium will first check the eligibility of each application.

- **Application received before the deadline**. No applications will be accepted after the deadline has expired.
- **All fields are filled out:** All mandatory fields of the application must have content.
- **Submission system:** All applications must be submitted through the official submission system. Applications submitted by any other means will not be evaluated.
- **English language:** All text fields of the application must be in English.
- **Country:** Only applicants established in the following countries are eligible for a COVR Award:
    - The Member States of the European Union
    - The Overseas Countries and Territories (OCT) linked to the Member States
    - The Countries Associated to Horizon 2020 -- the latest information on which countries are associated can be found in the in the H2020 online manual.
- **Absence of conflict of interest:** Applicants shall not have any potential conflict of interest with the COVR Award selection process.
- **Below funding threshold:** The funding applied for by an organization must not exceed 100.000€ totaled across this application and previously granted Awards.
- **Established:** Each applicant organization has existed for more than a year
- **Ethical**: Some fields of work are, for ethical reasons, not eligible for funding under Horizon 2020. If your application work includes work on human embryos and fetuses, human beings, human cells or tissues, animals, personal sensitive data, projects with negative effects on environment, health and safety, or is for military or dual use, then refer to the "*Horizon 2020 Guidance – How to complete your ethics self-assessment*" to see if you are eligible.

Applications that fail any of the eligibility criteria will not be evaluated and this will be communicated to the applicants.

EXPERT EVALUATORS

Evaluators with expertise in both robotics and safety will assess the COVR Award applications. They will not be employees of the partners of COVR Consortium. The expert evaluators will be selected to cover a broad range of cobot domains. At least three different evaluators will assess each application -- the COVR Project team will do their best to broker a relevant evaluation team for each application.

The whole evaluation process will follow these principles:

- Independence: The evaluation must demonstrate impartiality on its merits, irrespective of the origin or identity of the applicants. Evaluators sign a declaration of conflict of interest saying that they do not have any interest or benefit in the evaluated applications.
- Confidentiality: Evaluators are kept anonymous (their identity is kept unknown to the applicants) and they also sign a confidentiality declaration with the commitment of not revealing to any third party any details of the application, neither during the evaluation, nor afterwards.
- Fairness: Each application is evaluated by at least three evaluators to ensure that a wide range of experience and viewpoints are brought to each application.

SCORING AND RANKING

Only part E of the application form is scored by the evaluators, as the first parts primarily contain formal information about the applicants and information that is used at a later stage to ensure the right mix of Award projects, balancing geography, company size, activity type, industry/domain and dominant technologies.

Part E consists of 4 general sections:

- SECTION 1 – AWARD WORK
- SECTION 2 – IMPACT AND OUTCOMES
- SECTION 3 – TECHNICAL CHALLENGES AND DATA
- SECTION 4 – PROJECT EXECUTION AND STAFFING

Each of the four sections are weighted 25% of the total score.

For each section, the evaluator will assign a score as described below:

- **0 Fail** The application fails to address the criterion under examination or cannot be judged due to missing or incomplete information;
- **1 Poor** The criterion is addressed in an inadequate manner, or there are serious inherent weaknesses;
- **2 Fair** While the application broadly addresses the criterion, there are significant weaknesses (e.g. too little concrete information);
- **3 Good** The application addresses the criterion well, although improvements would be necessary
- **4 Very good** The application addresses the criterion very well, although improvements are still desirable;

- **5 Excellent** The application successfully addresses all relevant aspects of the criterion in question. Any shortcomings are minor.

If an evaluator requires clarification on any part of the application, COVR will request more information from the applicant via email with a deadline for the response.

As all sections are equally weighted 25%, the total score can be calculated as the sum of these scores. For each evaluator, the scoring interval is 0 – 20 points for an application. Please note that fractions are not used as this granularity is deemed unnecessary.

The total score of an application is calculated as the sum of scores from all three reviewers:

Section	Reviewer 1	Reviewer 2	Reviewer 3	SUM
Section 1 – Award work	0-5	0-5	0-5	0-15
Section 2 – Impact and outcomes	0-5	0-5	0-5	0-15
Section 3 – Technical challenges and data	0-5	0-5	0-5	0-15
Section 4 – Project execution and staffing	0-5	0-5	0-5	0-15
Total score	0 - 20	0 - 20	0 - 20	0 - 60

The maximum total score an application can receive is consequently 60 points. All applications from each call are finally ranked according to their overall score.

THE SELECTION PROCESS

The Steering Committee shall decide which applications will be granted an Award. This decision will be based strongly on the ranking, whilst ensuring the portfolio of selected Awards is balanced as detailed below. Feedback provided from the COVR consortium team members regarding e.g. the current status of protocols and Toolkit and the equipment available for cobot testing will also be considered by the Steering Committee during selection.

In particular, the following criteria are used:

- Balance between expected outcomes of Award projects to ensure largest possible overall contribution to Toolkit and protocols
- Balance across European countries/regions
- Balance among industry/domains
- Balance among dominant technologies used in the Awards
- Alignment with the impact goals of COVR
- Contributes to the expanded use of cobots in real settings.

WHAT HAPPENS NEXT

If your application is successful and an Award is granted, a COVR contact person will be assigned to your project, normally from the COVR partner nearest to you. You will use COVR services primarily at that SSF. This contact person is responsible for helping you to use COVR, for communication between you and the COVR consortium, for monitoring progress, and for communicating any actual or likely problems to their SSF leader.

If your Award application is unsuccessful we encourage you to liaise with a COVR Partner to improve your application and resubmit in the next call.

AWARD AGREEMENT

Before the actual Award work can start, an Award Agreement between the primary beneficiary, their consortium and the COVR Core Consortium Partner(s) involved in the specific Award must be signed. The Agreement regulates the extend of Award work, its financing, the allocation of rights and responsibilities, confidentiality and dissemination obligations, etc.. The Parties agree to collaborate on the execution of the project, subject to the terms and conditions set out in the Award Agreement. Should the consortium not sign the Award Agreement for any reason, within the assigned timeframe, the Award will be reallocated to another Applicant.

Each Party has ownership of the knowledge it generates in the course of the collaboration on the project, and knowledge generated jointly by the Parties is jointly owned by the Parties in accordance with the Parties' intellectual contribution to the knowledge. The Parties must treat all confidential information received before, during, or in connection with the project as strictly confidential, so that no confidential information is disclosed to a third party.

EARLY TERMINATION

The COVR consortium will monitor progress throughout the Award work. If any issues and delays occur that cannot be resolved the COVR consortium can intervene to rectify problems. Should progress be unsatisfactory, the COVR consortium reserves the right to terminate the Award and withhold any remaining funding.

DISSEMINATION

To fulfil the COVR projects goal of ensuring a common approach to safety validation across Europe, it is crucial that aspects of each Award's results are made available for dissemination to the general public, predominantly through videos and material on the official COVR website. At all times the information is subject to the duty of confidentiality defined in the Award Agreement. No commercially sensitive information will be released, but there is a lot of information that is not sensitive. Company secrets and personal data will be kept strictly confidential but general information about the new safety procedures, cobots, protocols, best practices and their implications will be available for public communication.

Appendix 1

INTRODUCTION TO THE COVR TOOLKIT

The COVR toolkit is a guided procedure for listing the requirements for determining compliance with relevant safety directives. It can be used by coboteers with different levels of knowledge about the processes of safety assessment according to ISO 12100 [1] / ISO 14971 [2]. The main steps of safety assessment, as specified in ISO 12100 are:

- hazard identification,
- risk estimation,
- risk evaluation,
- risk mitigation,
- validation of protective measures

The toolkit is intended to assist users carrying out different phases of safety assessment and evaluation. It provides explanations about the process with the goal of simplifying the task of finding and interpreting mandatory procedures that are available in published normative materials. It consists of a graphical-user interface (GUI) which provides a walkthrough of the analytical steps necessary to derive the safety requirement checklists. Furthermore, the toolkit helps people to identify the necessary methods for validation of their risk mitigation solutions, by including a collection of validation protocols (step-by-step guides on how to carry out the required measurements) for selected example risk mitigation solutions. If necessary, the toolkit can also support novice robotics users in identifying the preliminary steps for analysing applications and/or systems/components, in order to separately assess hazards and associated risks.

The COVR toolkit IS NOT intended:

- To be a replacement for risk analysis and assessment
- To automatically select the risk mitigation solutions to be implemented (The users will be given a list of possible risk mitigation solutions; they will have to choose them according their risk assessment and case or possibly look for other solutions)
- To function as any kind of certification

The COVR toolkit will be accessible as a web service and will offer multiple paths through the information depending on the user's level of knowledge about the domain, the regulations and standards, and the safety skills and safety functions used.

INTRODUCTION TO VALIDATION PROTOCOLS

Validation is defined as a set of actions to evaluate (i.e. provide evidence through documented real measurements, "metrics") that a (set of) safety functions meets a set of target conditions. Safety validation is the evaluation of whether or not a product, service, or system complies with a defined operational condition characterized by a given level of risk. Safety validation serves as public evidence that a product (including functions and algorithms), or system meets a set of safety requirements agreed by stakeholders.

One of the main objectives of the COVR project is to provide support for the validation of protective safety measures. This entails assistance for creating the necessary documentation (e.g. checklists for showing compliance with individual requirements), as well as step-by-step instructions for performing the validation tests themselves. There is a lot of uncertainty in the robotics community concerning the

validation of systems. One reason is the complexity of robotics installations, as discussed in [4]. Furthermore, some of the standards applicable to robotics safety were written prior to the existence of collaborative robots, such as the ISO 13855.

The COVR consortium has applied two distinctive methodologies for identifying protocols. On one hand, by focusing on the two relatively mature domains of manufacturing and rehabilitation, we have identified safety functionalities that require verification in the form of measurements that are defined in the relevant standards. This methodology can be termed to be a “standards-based” approach. We consider this approach to be valid as the required measurements for validation are the state of the art and mandatory for collaborative robotics manufacturers and end-users, when relying on the given safety skill. In order to investigate domains that do not yet have advanced standards, we used a “bottom-up” methodology whereby collaborative robotics applications from specific domains are the starting point for identifying protocols. Under this methodology, we briefly described specific applications, identifying corresponding risks and hazards, before describing options for the risk mitigation actions. These risk mitigation measures can be considered to be a form of safety skill, and the means to validate their proper function under the appropriate conditions are the validation protocols we are identifying.

Appendix 2

GLOSSARY

Activity	A task that needs to be accomplished within a defined period of time or by a deadline to work towards work-related goal or deliverable.
Award Responsible Partner (ARP)	The ARP will typically be the geographically nearest partner which can offer the necessary facilities to a given Award project. The beneficiaries will use COVR services primarily at that SSF. The ARP is responsible for communication between COVR partners and beneficiaries, for monitoring project progress, and for communicating any actual or probable problems to the COVR consortium.
Award Agreement	Legal agreement between the ARP and the Award winner. The Agreement regulates the commitments and responsibilities of both sides during the project work.
COVR Award	A FSTP funded project lasting for up to 9 months.
COVR Course	A short course given by COVR consortium to a defined public.
COVR Shared Safety Facilities (SSF)	COVR physical site containing test equipment and physical access to services, where coboteers bring their cobot for test.
COVR Toolkit	This is a program developed in the COVR project to help people assess cobot safety by identifying which protocols need to be applied for a specific case/application. It is a single point of access (“one-stop shop”) program which uses a common approach to safety certification which is valid across all people, all technologies, and all applications.
COVR Workshop	A meeting for presenting and discussing results from COVR to an outside audience
Deliverable	Term used in project management to describe a tangible result of a project, used partly for monitoring project activity and progress.
Directive	A legislative act that sets out a goal that all EU countries must achieve. However, it is up to the individual countries to devise their own laws on how to reach these goals. It’s the second highest ranking legislative act in terms of binding, after Regulation. In COVR we almost exclusively mean “product safety Directive” (so the Machinery Directive, the Medical Device Directive, the Personal protective equipment (PPE) Directive, etc).
Expert evaluator	Person assessing COVR Award applications. These evaluators will have expertise in both robotics and safety and will not be employees of the COVR Consortium.
Milestone	A tool used in project management to mark significant points along a project timeline e.g. the end of a phase, or a technology/information handover.
Protocol	A predefined procedural method used in the design and implementation of an experiment. A protocol is the collection of all the procedures and the prerequisites that are necessary to carry out safety experiments, together with the instructions for documenting results with respect to verification

	or validation objectives (verification protocol or validation protocol, respectively).
Steering Committee (SC)	A COVR management instrument consisting of one selected member from each of the partners within the COVR consortium. Their mission is to ensure that COVR is executed in accordance with the agreed work plans, is of high scientific quality and that the results will be useful to the European robotics community.
Dominant technology	Used as a rough method for COVR to classify the robotic technologies used within an Award, the list of dominant technologies is intended to be industry agnostic and can be applied across many applications in many fields. One example is pick and place technology, where 3D bin picking is suitable in manufacturing, healthcare, agriculture and logistics applications.