Rossini

ROSSINI

RObot enhanced SenSing, INtelligence and actuation to Improve productivity and job quality in manufacturing

Deliverable

D9.1 Project Website

Deliverable Lead: CORE INNOVATION

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DISCLAIMER

The sole responsibility for the content of this publication lies with the ROSSINI project and in no way reflects the views of the European Union.

EXECUTIVE SUMMARY / ABSTRACT

A website was created for the ROSSINI project as Deliverable 9.1 as part of Work Package 9, 'Impact Enhancement' and is hosted at www.rossini-project.com. The website's design, development and maintenance are carried out by CORE INNOVATION (CORE). The website was designed and developed by an internal designer at CORE, and content was created, edited and developed internally by CORE. CORE will continue to maintain and update the website in cooperation with the other project partners throughout the course of the project. The website represents the project's primary method of communication within the Consortium and with external stakeholders and the wider public.

SCOPE

ROSSINI deliverable D9.1 describes the website created for external and internal communication about and on the project. This deliverable relates to Work Package (WP) 9 "Impact Enhancement", task (T9.1 "Project Website") which includes the objective: "develop and structure all activities aimed at ensuring the widest possible scientific and industrial impact for the ROSSINI project.".

The Privacy Policy of the website, as well as additional information regarding data processing and policy have been annexed to the present Deliverable, to ensure the compliance with the Ethics requirements foreseen by the project.

1 The Project Website Structure

The website is accessible at: www.rossini-project.com.

All sections of the website have on Left top the ROSSINI logo and in footer reference to the HORIZON 2020 funding by the European Union, the Coordinator, the Communication Manager, and the Partners. Links to the main pages "Rossini" (Home), "Concept", "Methodology", "Platform", "Partners" area is included on the header, i.e. a navigation pane accessible from all sub-pages.

1.1 Website Navigation Tree Map

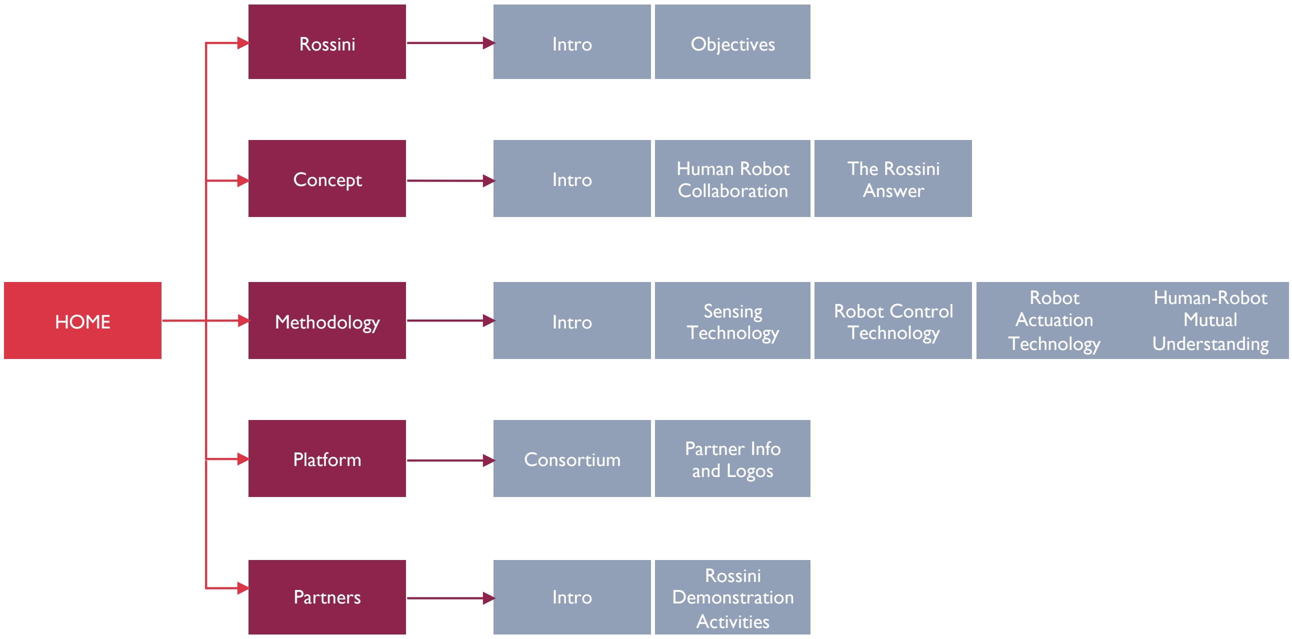

Figure 1-1: Website tree map

1.2 Essential Technical Features

The technical features adopted in the website and Reserved Area are:

- Fully responsive: all website contents and pages have a mobile-ready version
- Cross platform desktop browsers compatibility: website supports five major desktop browsers (Chrome, Internet edge, Firefox, Safari, and Opera) each with several active versions.

1.3 Aesthetic elements

The website follows a semi-continuous flow design, with "learn More" buttons to navigate to the next pages, without requiring to select from the navigation pane. The background colour was selected to be black, in order to be more environmental friendly, and to allow a nice contrast with the orange colour in the logo. All photos are royalty free, respecting their usage rights, and their choice was based on the depicting of the accompanying text to maximise the cognitive workload.

Animated images/visuals have been added in all the pages. These are mainly inspired by our Logo, which represents a continuous rotation of a robotic link. To this end, different structures have been created and animated to represent the text. The goal is to increase the awareness of ROSSINI and its logo as a "stamp" and by applying animated visuals with it, it is envisaged to "stick" to the visitors, remembering and identifying ROSSINI by its logo. The branding of the logo selection will be available in detail in the D9.2 PEDR.

2 Main Pages and Essential Interactive Elements

2.1 Main Menu – Navigation Pane on Header

ROSSINI project web contents are divided into 4 main sections as shown in Figure 2-1.

1. Rossini: It provides the main goal of the project, its vision, and its objectives.
2. Concept: This page contains the main concept of the project, an overview of state-of-the-art technologies in Europe and ROSSINI's approach
3. Methodology: This section describes the main technologies of ROSSINI
4. Platform: This section describes the ROSSINI Platform architecture and the ROSSINI Demonstration activities through 3 use cases
5. Partners: Introduction of the consortium partners, with a short description, their logo, and link to their websites.

Figure 2-1: Main Menu - Navigation Pane on Header

2.2 Footer Section

The footer Section, as described above, contains the reference to the HORIZON 2020 funding by the European Union, with the official EU logo and the Project's Grant Agreement number. The Privacy Policy of the website will be made available upon the completion and approvals from all Partners, as well as the Project Coordinator and Communication-Dissemination Manager with respective contact details. We have decided to include the Partners in the footer, so that they will be available in all pages, apart from their detailed description in the "Partner" page.

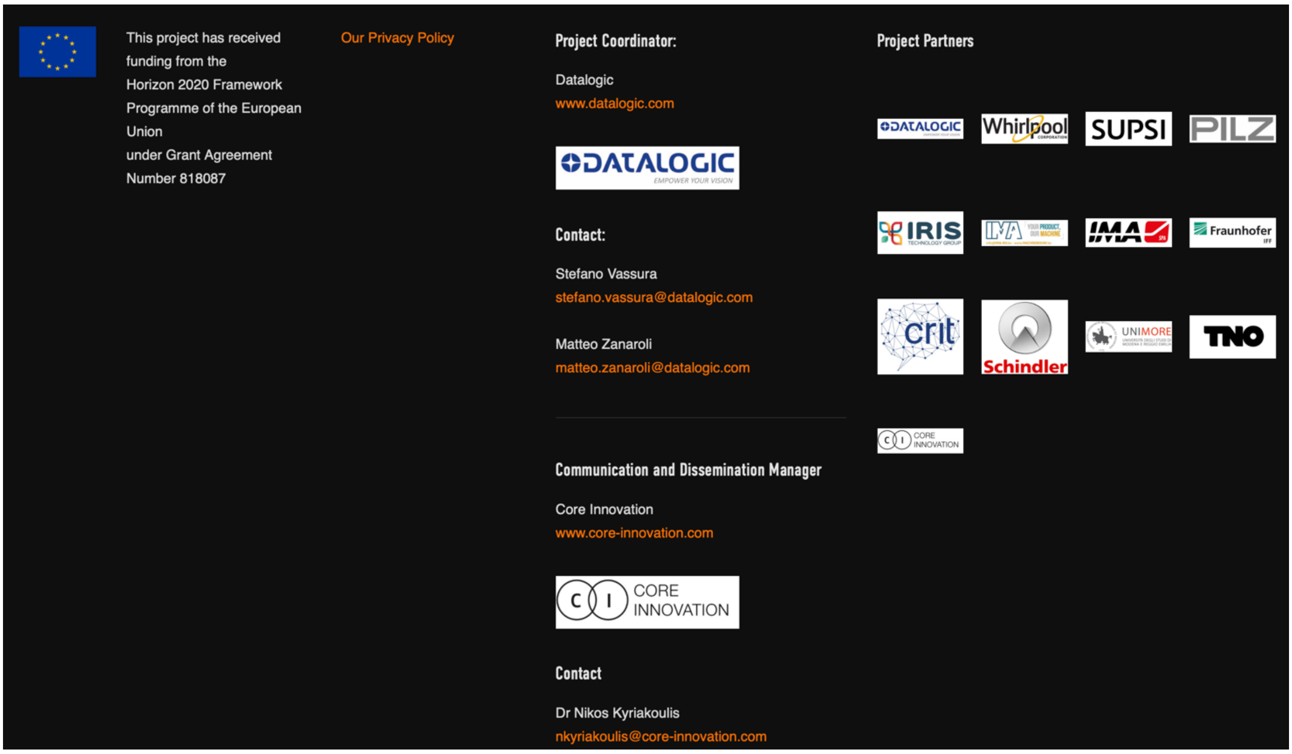

Figure 2-2: The footer of ROSSINI website

2.3 Home page

The homepage introduces the project to an external audience and includes links to every major section of the website. It presents the ROSSINI project at a glance and explains the main goal of the project. The Objectives section highlight the five (5) pillars of ROSSINI project and what is expected to be delivered. The story follows a narrative of describing what ROSSINI is about, why it is necessary, i.e how the manufacturing world would benefit from ROSSINI.

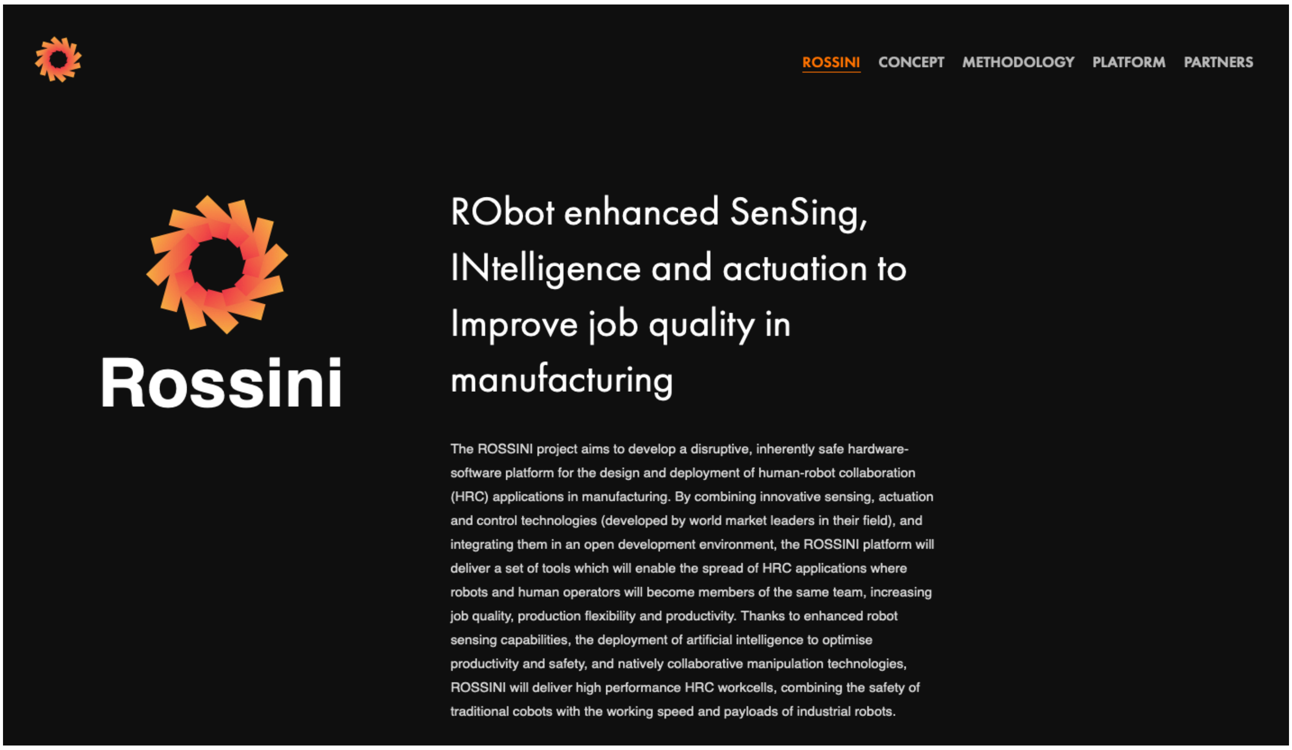

Figure 2-3: Welcome page: www.rossini-project.com

The "Rossini" sub-page clarifies to an external audience the ROSSINI Vision and Ambition, and the objectives pursued for the ROSSINI implementation. The focus is on the advancements that robots will have with ROSSINI projects, and the benefits from its employment to the shopfloors. The sub-page is divided into 2 parts:

1. Vision and Aim
2. Objectives

This page is structured as one-page view in order to ensure effectiveness and consistency to such predominantly technical level contents. This prevents users from missing content, wasting clicks and also facilitates mobile and tablet compatibility read mode. The Objectives being structured in a serial arrangement, allow users to gain this high-level information easily.

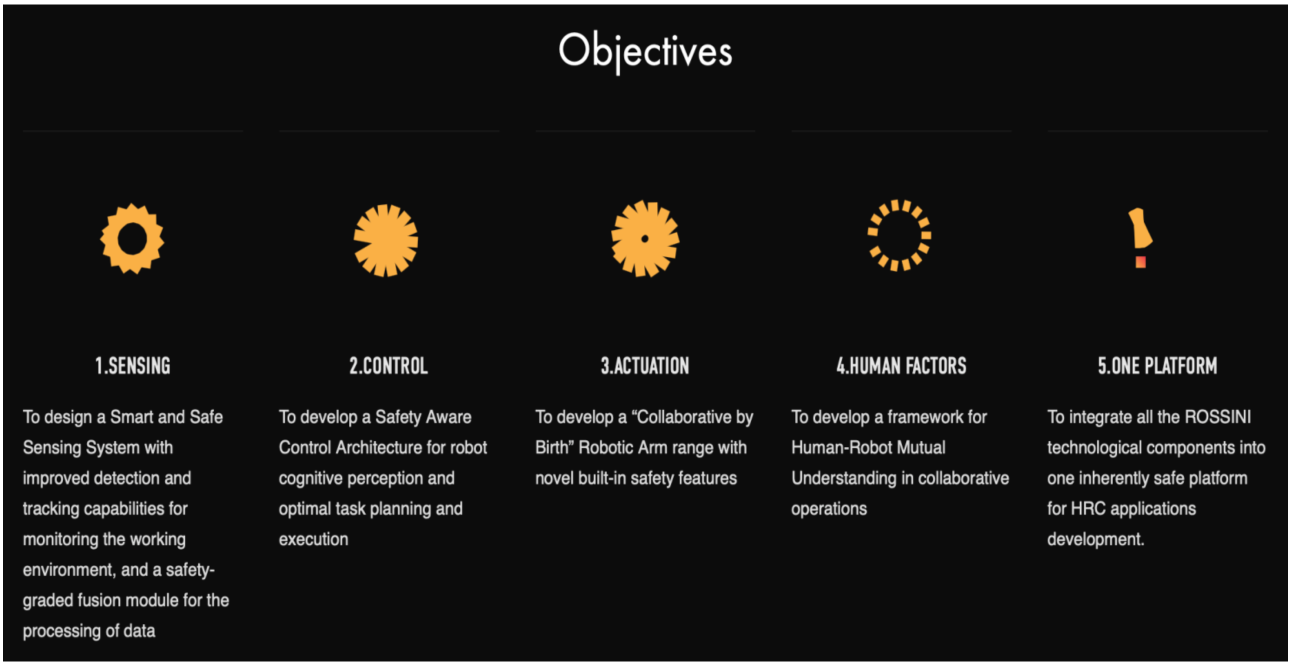

Figure 2-4: The Objectives of the ROSSINI in the "HOME" page (i.e. "ROSSINI")

2.4 Concept

This section describes the overall concept of the ROSSINI project. Although European industry now benefits from the advantages of a single large market, it is faced with new challenges in order to remain competitive in a global scenario. In this contest Advanced Robotics, and in particular Human-Robot Collaboration (HRC) applications, could have a high potential economic impact. Furthermore, it provides information on current methods and constrains to achieve Human-Robot Collaboration, and ROSSINI's approach in the field.

Figure 2-5: Introductory text in CONCEPT sub-page: http://www.rossini-project.com/concept

2.4.1 Concept body – HRC safeguarding methods

The main body in this page provides an overview of the state of art of Safety in Human robot collaboration. According to the world's first specifications of safety requirements for collaborative robot applications (ISO/TS 15066:2016), collaborative operations between humans and robots may include one or more of the safeguarding methods, which are depicted in this sub-page.

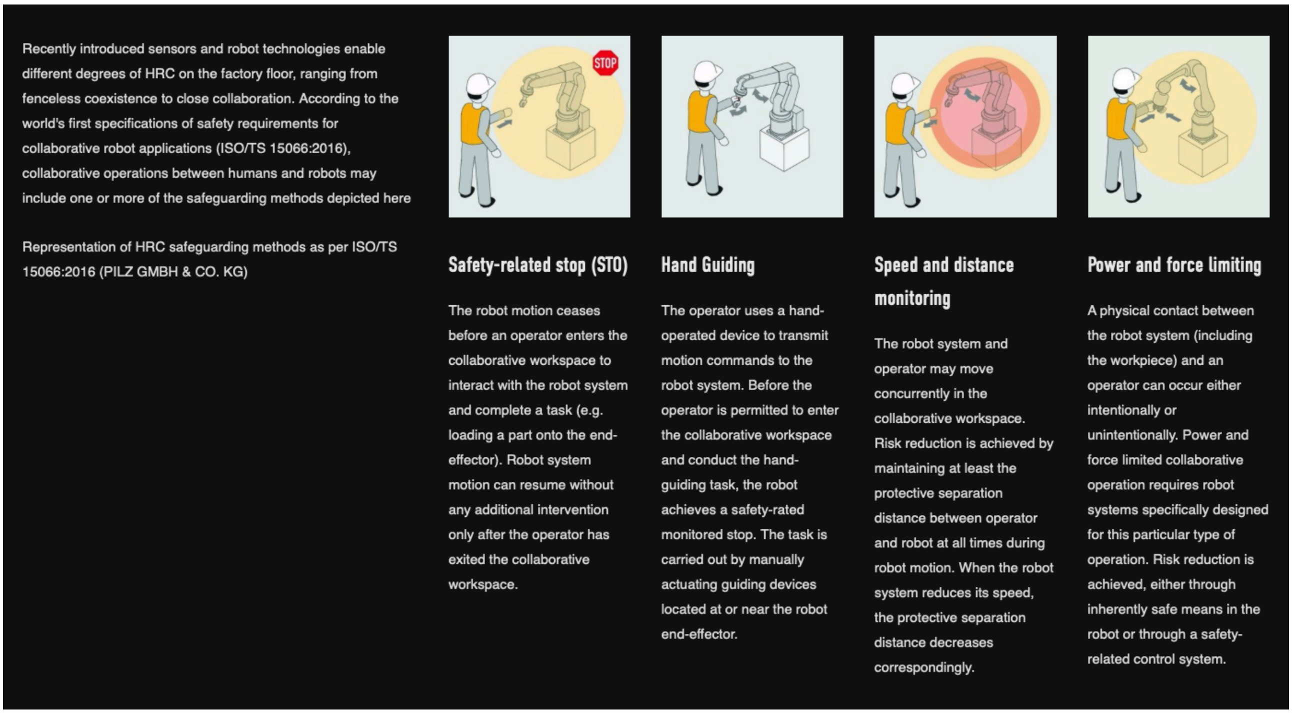

Figure 2-6: HRC safeguarding methods as per ISO/TS 15066:2016 (PILZ GMBH & CO. KG)

2.4.2 Human Robot Collaboration

This sub-page involves a summary of the basic principles in the current Human-Robot Collaboration approaches that will be taken into account during ROSSINI design and development.

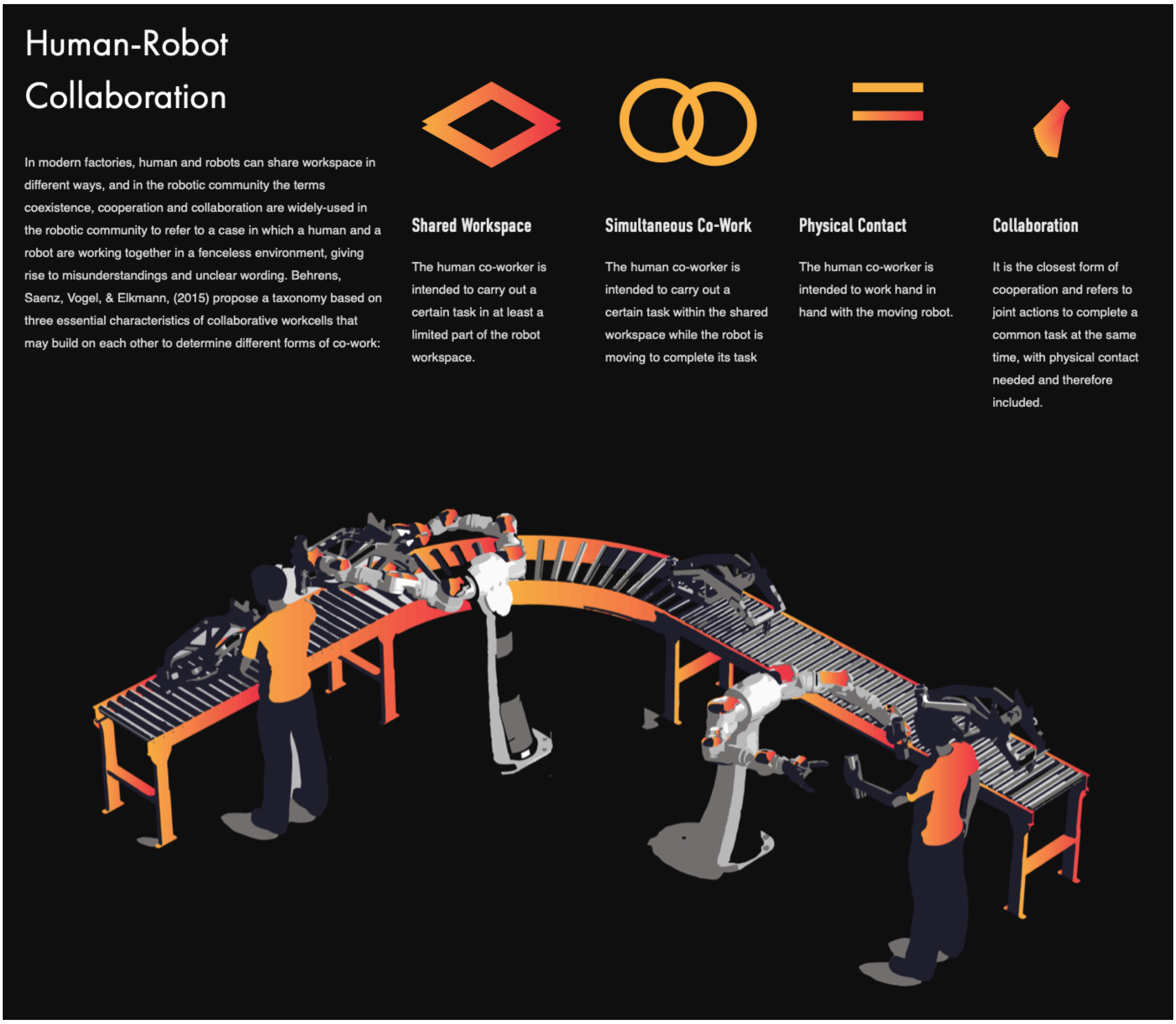

Figure 2-7: Principles on Human-Robot collaboration.

2.4.3 The Rossini answer

This pages involves the tools and guidelines that ROSSINI will use in order to speed up and increase the efficiency of risk assessment and validation procedures for HRC, particularly when measuring collision.

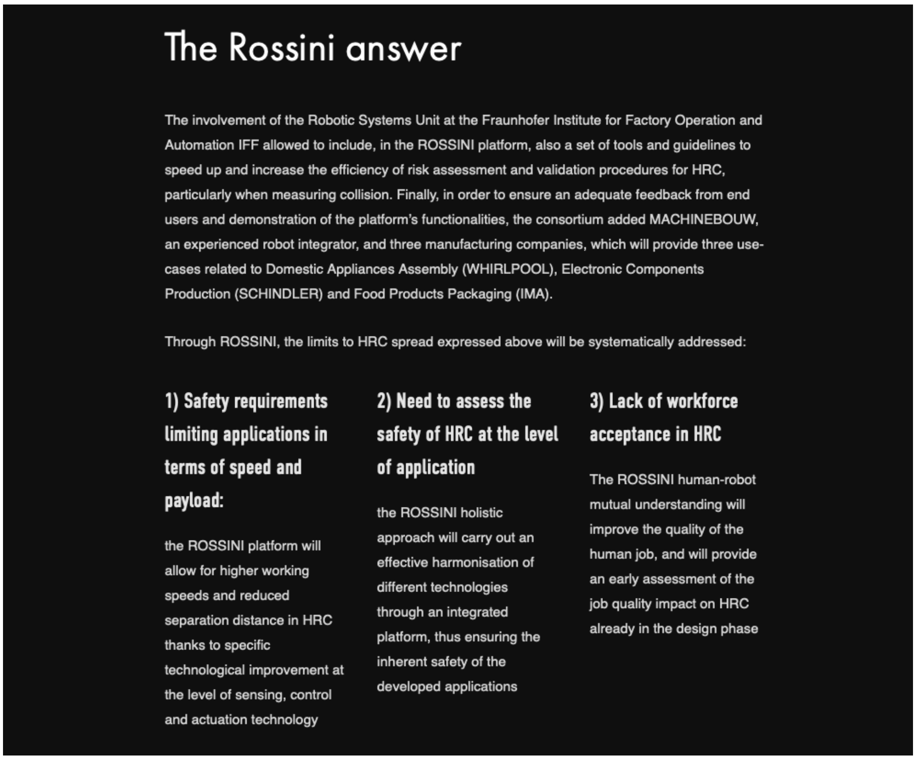

Figure 2-8: ROSSINI answer

2.5 Methodology

This section provides an insight into ROSSINI's structured and coherent approach and the technologies that will be developed and demonstrated. Besides implementing 4 synergic lines of research, and the integration of the results into one comprehensive platform for the design and validation of HRC application, ROSSINI will also develop 3 industrial demonstrators, which will act as technological showcases for the market replication and therefore for the full leverage of the market potential of exploitable results.

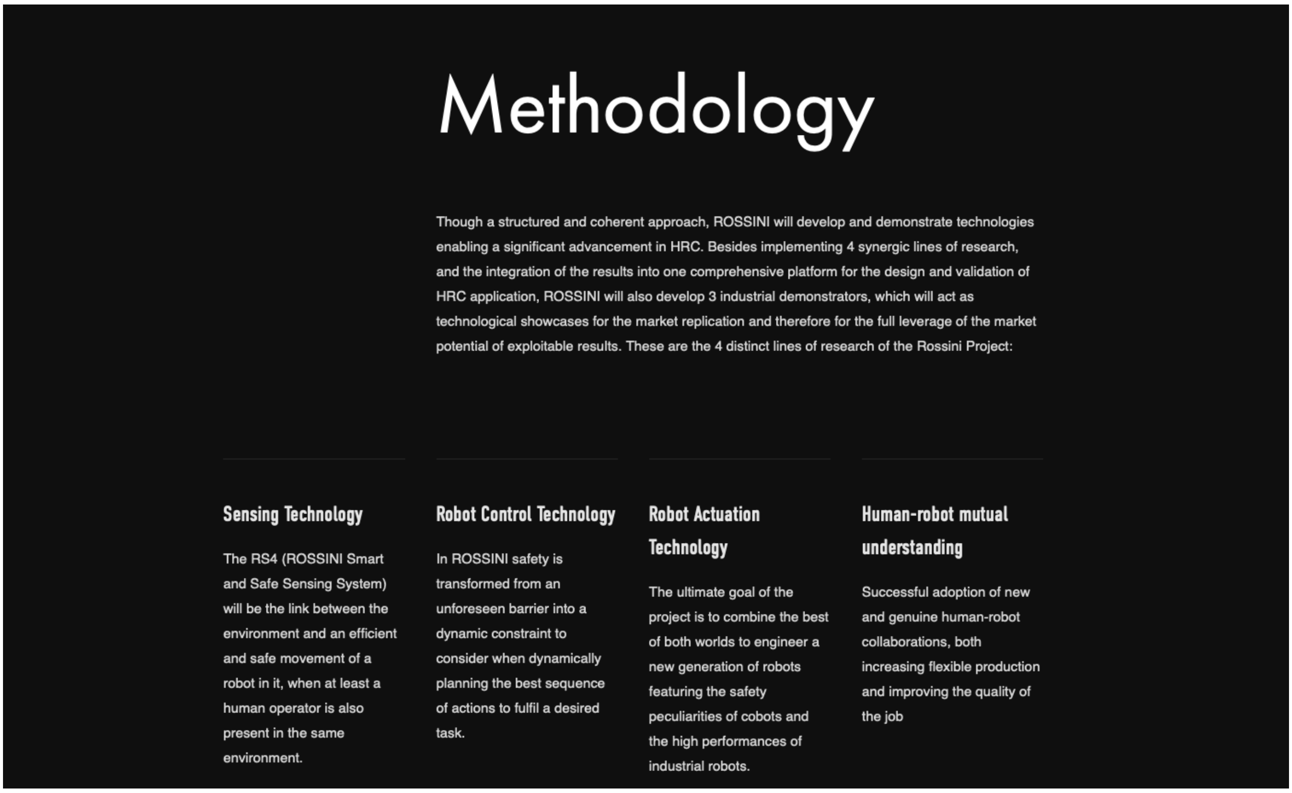

Figure 2-9: Partners sub-page: https://www.rossini-project.com/methodology/

2.5.1 Sensing Technology

This sub-page describes the Sensing technology that ROSSINI will have in order to have a good perception of its surroundings, and especially approaching humans.

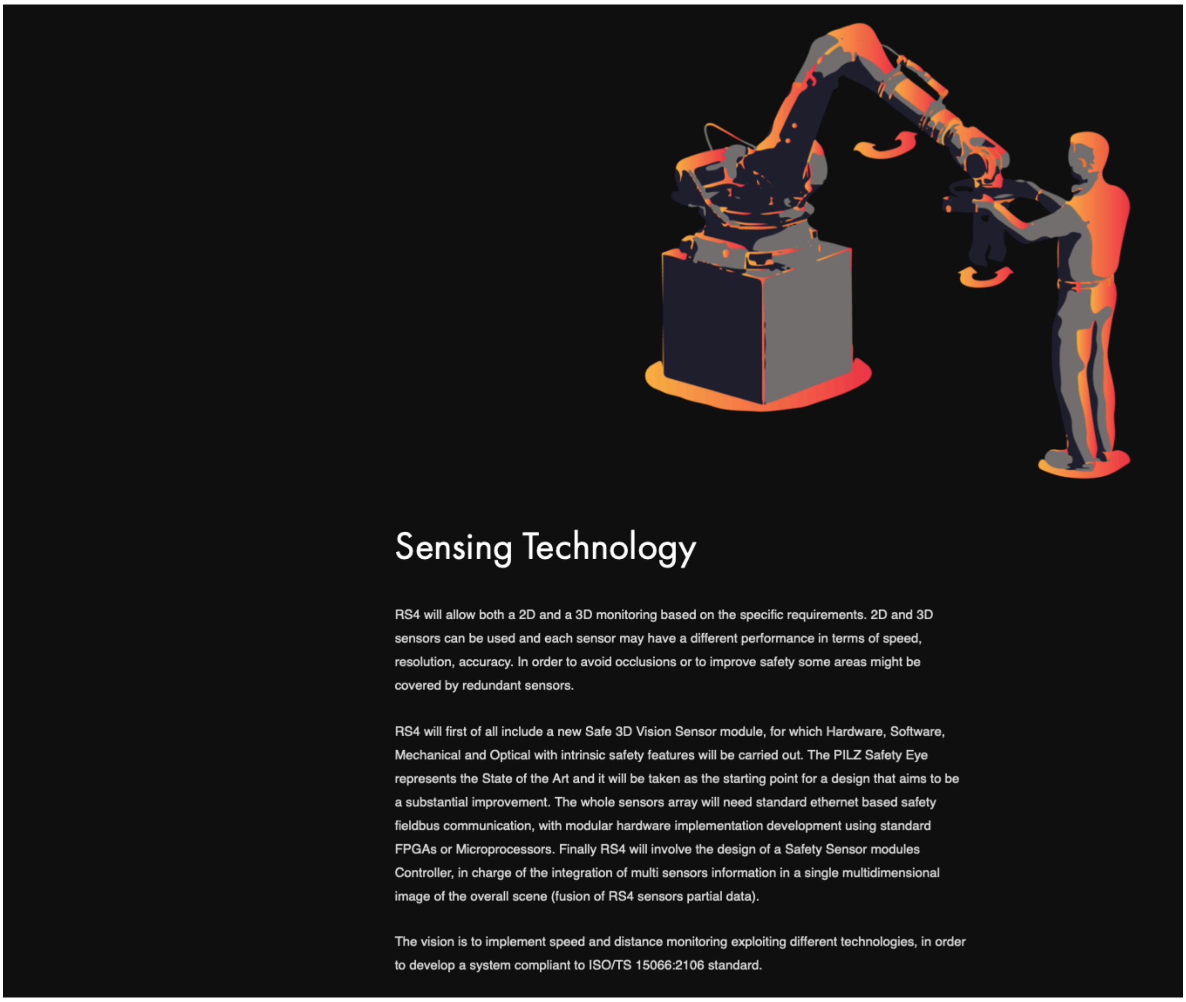

Figure 2-10: ROSSINI's Sensing Technology

2.5.2 Robot Control Technology

This sub-page describes the Control technology that ROSSINI will have in order to coordinate its actions to maximise collaboration and efficiency.

Figure 2-11: Figure 2-12: ROSSINI's Sensing Technology

2.5.3 Robot Actuation Technology

This sub-page describes how ROSSINI will engineer a new generation of robots featuring the safety peculiarities of cobots and the high performances of industrial robots.

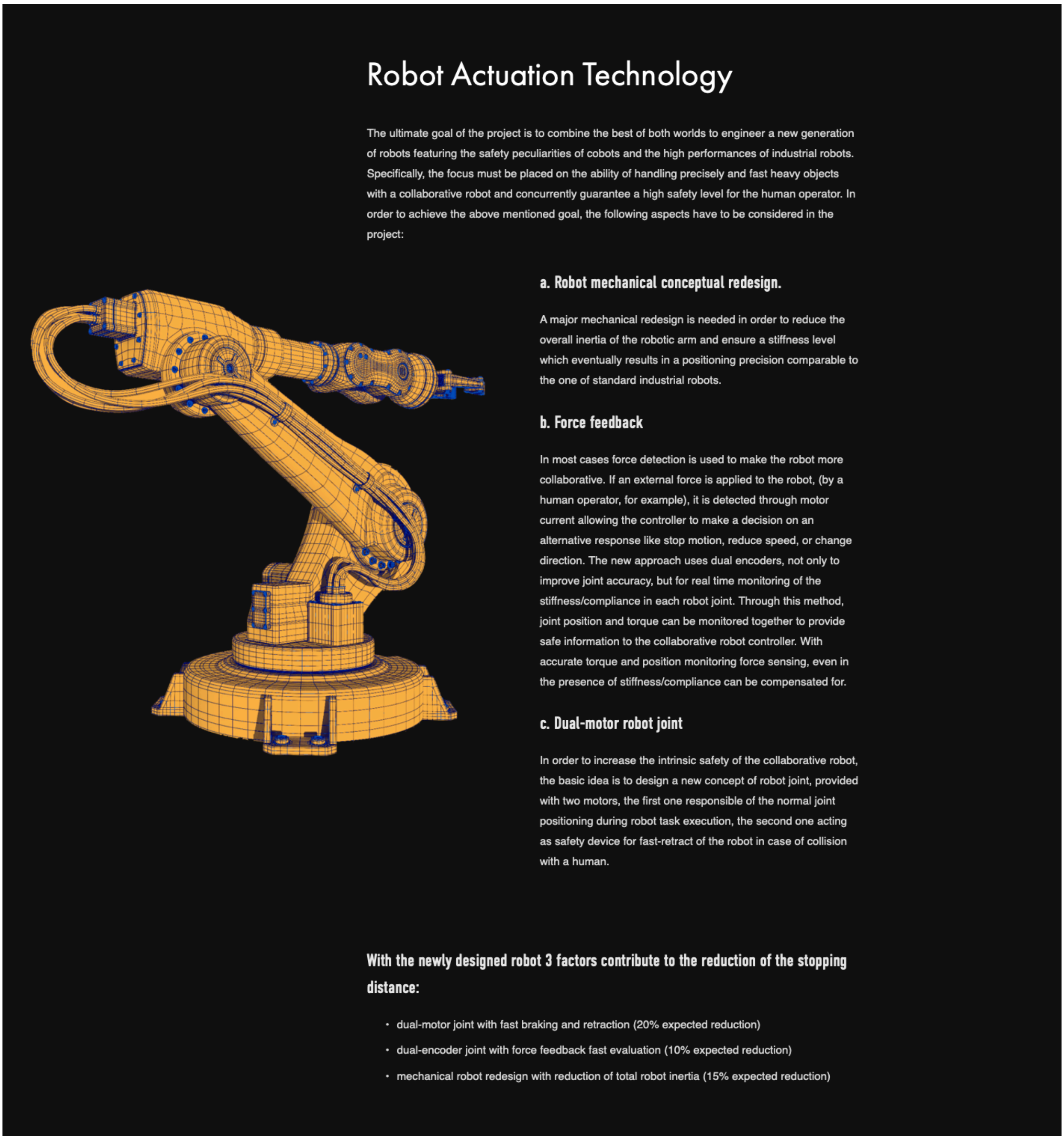

Figure 2-13: Robot Actuation Technology

2.5.4 Human robot mutual Undestanding

The last sub-page on the Methodology involves the principles that will be adopted to increase flexible production and improve the quality of the job. The Holistic approach of ROSSINI is given by describing its fundamental elements.

Human-robot mutual understanding

Successful adoption of new and genuine human-robot collaborations, both increasing flexible production and improving the quality of the job, requires a holistic approach in which:

1. human factors like user experience, comfort, trust, feeling of safety, and liability, are addressed and accounted for in the early design stages (Design Level);
2. constant monitoring of the process, human behaviour, and robot behaviour takes place and online changes to the original task planning can be made during operation (Adaptive Level);
3. profound mutual understanding between robots and people in operation is realized (Communication Level).

Design level

Elements to address in the design stage, is the explicit design of the human-robot interaction and the definition of human-robot collaboration scenarios. Here the work process is evaluated. Based on a task and capacity analysis it is investigated which actors (human and/or robot) can perform which task. Moreover, scenarios describe possible ways for humans and robots to interact. The scenarios indicate what information needs to be exchanged between actors to establish mutual understanding and successful job completion (Johnson et al., 2014). Furthermore the scenarios give a basic indication on how the workspace is designed (shared workspace, synchronous movements, basic safety implementations). An evaluation tool allows to assess job quality, productivity, flexibility, and configuration time for different collaboration scenarios in early stages of the design process.

Adaptive level

The adaptive level dispatches tasks to the actors according to the scenarios that were made. When the scenarios contain multiple execution paths the ACL should consider human and machine factors when dispatching tasks to humans or robots. Dispatching criteria are influenced by foreseeable and unforeseeable factors.

- Foreseeable: Inclusiveness of vulnerable workers, Day shifts / night shifts, training, scheduled equipment maintenance, etc.
- Unforeseeable: Sick leave, safety interventions, equipment failure, temporarily lowering of operator capacity, etc.

Communication level

To enhance smooth human robot interaction, human and robot must be mutually predictable and adequately estimate each other's intentions (Klein et al, 2004). Two key technologies to achieve this are:

- Estimating human intentions through sensor fusion
- Projecting robot intentions through augmented reality (AR)

Figure 2-14: Human-robot mutual understanding.

2.6 Platform

This section contains information on the 3 industrial environments that the ROSSINI Platform will be demonstrated. The first page involves the information about ROSSINI platform, and its key features that will allow effective and safe Human-Robot collaboration.

Platform

The Rossini Platform

The developed components are expected to be integrated in to the ROSSINI Platform architecture. The Platform can be represented as an integrated set of layers, each related to a specific dimension/function:

- The Sensing Layer will combine information from safe and non-safe sensors in a fusion module to feed the Safety Aware Control Architecture
- The Perception Layer, through the employment of artificial intelligence techniques, will generate a Semantic Scene Map integrating geometric and semantic information, which will in turn create a set of virtual "Dynamic Shells" for safety, surrounding each object in the scene
- The Cognitive Layer will be provided by a high-level scheduler, capable of dynamically planning a set of cooperative actions that the robot needs to execute, and to update them when the working environment conditions, captured by the Semantic Scene Map, change.
- The Control Layer will interpret the high-level action to execute and will generate the most efficient and safety preserving low-level plan for the robot, thus optimizing trade-off between safety and productivity in the workcell, ensuring that
- The Actuation Layer will encompass a novel concept of manipulators with built-in safety features, capable of reducing the separation distance between the man and the operator when performing collaborative applications, thus increasing the degree of freedom for robotic applications design
- The Human Layer will ensure the inclusion of human-related factors from the early design phases of collaborative applications design, and the constant monitoring of factors influencing job quality during robotic operations
- The Integration Layer will provide integrators with a set of tools and guidelines to ensure inherent safety in design of HRC applications, and to speed up application configuration and reconfiguration

Moreover, the platform will include also a set of methodologies and guidelines to improve application design and risk assessment in HRC. Recent research studies (R. Behrens, N. Elkmann, and H.-J. Ottersbach 2012) show that the difference between free and clamping impacts depends on how the involved robot and human masses are distributed. ISO/TS 15066 already provides a scaling factor that allows for switching measured impact results between both contact cases. The factor only applies if the effective masses, colliding at the contact point, are given. A method to estimate the robot mass is also available in ISO/TS 15066. It takes all link masses and their configuration account and estimate the mass at the considered contact point (in most cases the robot TCP). Besides this estimate, each robot manufacturer offers models with higher precision. Instead of providing a similar method for estimating the effective mass of the human body, ISO/TS 15066 recommends using the single weights of the particular body parts and neglects the body kinematics. From a scientific standpoint, this approach will lead to wrong and highly biased estimates that have the potential to a wrong risk evaluation and is therefore not accepted by official bodies. To ensure reliable estimates of body part masses, the ROSSINI Platform will include a simplified human body model that replicates the kinematics and mass distribution of a 50th percentile human. The development work to be carried out will include the development of the kinematics of the model, the integration with other available studies and the conversion the model in an algorithm. The inertia parameters will be derived from the result of a collision study with volunteers which was carried out in 2012 (ethical approved – see R. Behrens, N. Elkmann, and H.-J. Ottersbach 2012). The study goal was to determine the difference between constrained and unconstrained impacts. The results of this study can be considered as valid and enables the model to create reliable results.

Figure 2-15: Rossini Platform – the prerequisites of success. (www.rossini-project.com/platform)

2.6.1 Rossini Demonstration Activities

The use cases have been chosen trying to have the widest possible span in terms of application sector, tasks to be executed technologies to be deployed. A short description is given for each use-case and how ROSSINI will be deployed and which benefits will bring to the respective demonstrators.

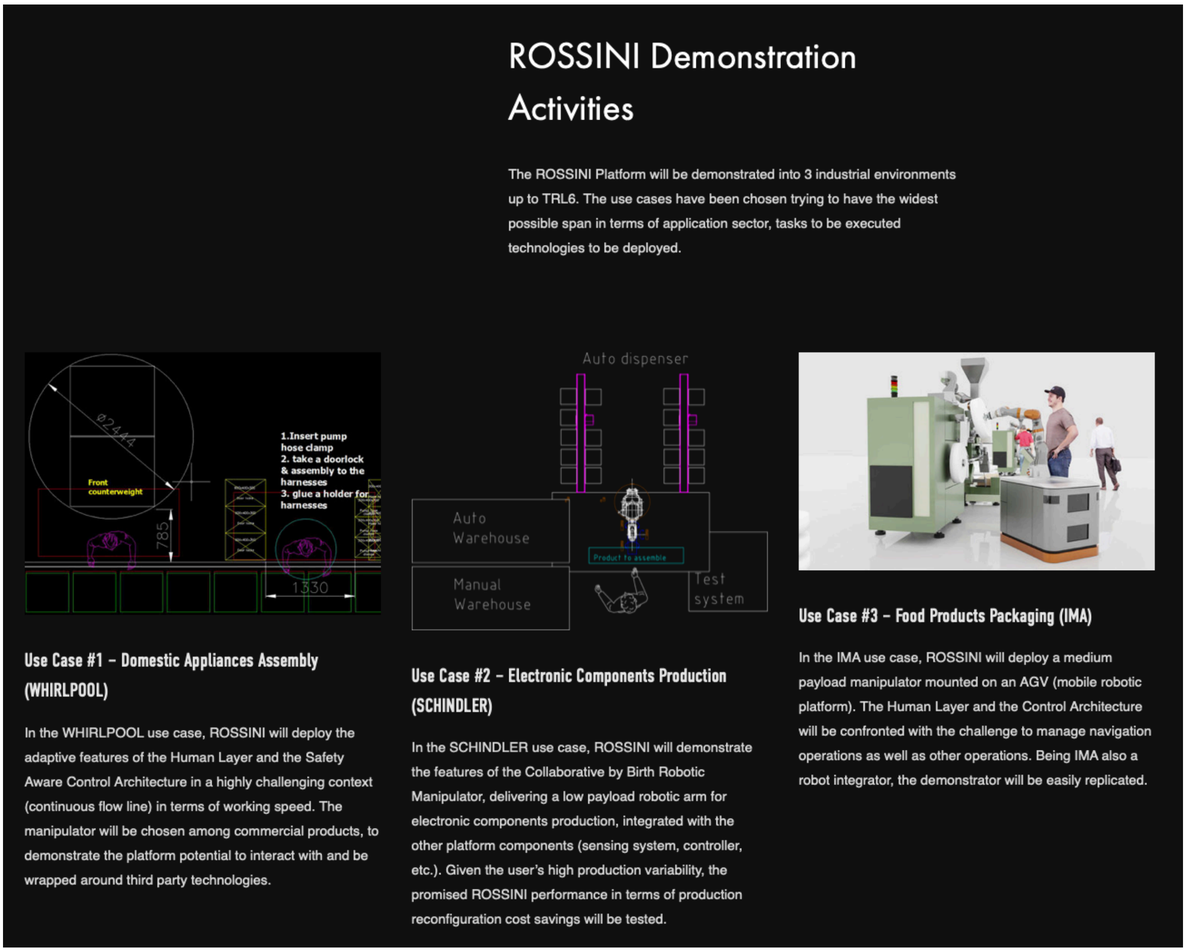

Figure 2-16: Rossini Demonstration Activities

2.7 Partners

This last section briefly introduces all 13 partners of the project consortium. A description of each partner's organization is accompanied by a company logo which links to the respective organization's website.

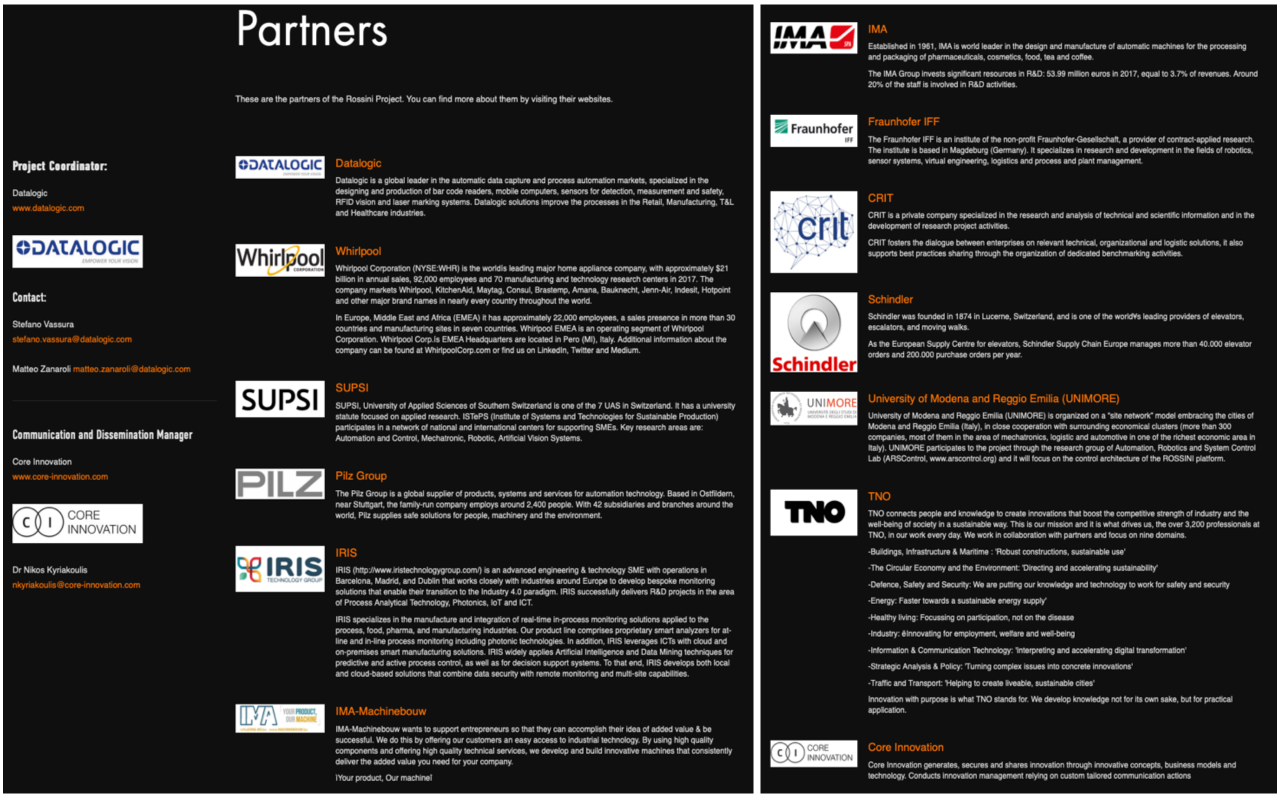

Figure 2-17: Rossini's Consortium

3 Additional Pages

The website will be constantly updated based on the project progress and its outcomes. Some additional pages and sections that are considered to have added value and being investigated to be introduced are:

News

As the project will progress, and the respective dissemination and communication activities will be increased, the consortium website will have a section "News" where providing all relevant and updated information on the Project status. In this way, the audience be updated about the industry and the whole sector actions and progresses.

The ROSSINI social media

The management of the website will be backed up also by making usage of LinkedIn). Linkedin will be used by consortium to attract attention and consequently raise the awareness levels of the project. The existing social network channels of the consortium partners will be widely exploited to enhance the project activities and results towards the target audiences.

4 ANNEX - Privacy Policy of Rossini website

Privacy Policy

A Privacy Policy will be available on the website in order to inform the site's users about the processing of their personal data, whether applicable, when using or accessing to the website.

The Privacy Policy will reflect the privacy arrangements agreed by the consortium's members and will include a specific "cookies policy" explaining what cookies are present and how they are used.