Collaborative RObotics for Circular Economy in Manufacturing Sectors

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Context

Waste, defined in Article 3(1) of Directive 2008/98/EC as ‘any substance or object which the holder discards or intends or is required to discard’, potentially represents a huge waste of resources, both in the form of materials and energy. In addition, traditional waste management and disposal, such as landfilling or incineration, can have serious environmental aspects.

During 2018, 5.2 tonnes of waste was generated per inhabitant of the EU-27. Almost 40% of this 5.2 tonnes was landfilled, while 38% was recycled. This waste came mainly from:

- Construction (36%)
- Mining and quarrying (26%)
- Manufacturing (10%)

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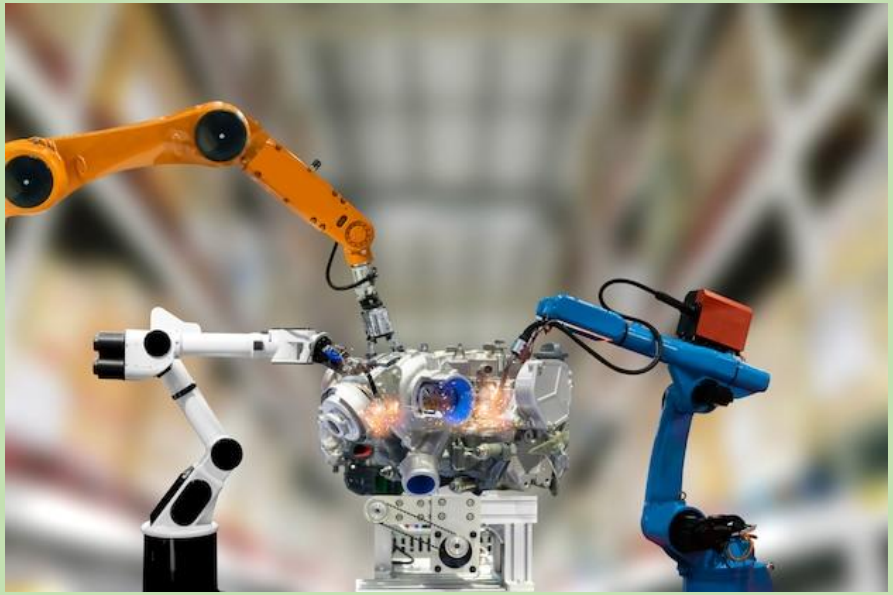
Context

The use of robotics in European industry continues to grow as Europeans consume resources twice as fast as they recover them. A collaborative robot is designed for direct human interaction in a defined collaborative space. Its integration in industry allows non-ergonomic or repetitive tasks to be automated. It improves assembly times, makes automation flexible for changing environments and automates work in restricted areas, a set of advantages that make it very useful for manufacturing sectors, especially when we think about the necessary waste management to develop circular business models.



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Context

The European manufacturing sector is facing a critical juncture, balancing the need to improve efficiency and competitiveness with the imperative of sustainability. In this respect, the manufacturing sector has the right methodologies and technology to perform better in its waste management, with the goal of zero waste production and the circular economy.

The methodologies, or software, are Circular Economy and Lean Robotics Methodology, while the technology, or hardware, is Collaborative Robotics. The urgency to address skills gaps is evident in all industries, and it is more important than ever to do so.

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Main objective of CROCEMS

In response, the **Collaborative Robotics for Circular Economy in Manufacturing Sectors (CROCEMS)** initiative has emerged with a comprehensive training programme aimed at fostering innovation, upskilling and integration of cutting-edge technologies and methodologies.

By fostering collaboration and knowledge sharing, CROCEMS aims to catalyse the adoption of collaborative robotics and the circular economy, thereby improving waste management practices and resource utilisation across the continent.

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Main objective of CROCEMS

CROCEMS' desire is to develop innovative training tools aimed at manufacturing sectors in the fields of collaborative robotics and circular economy, thus facilitating their integration and improving skills and knowledge on this key technology and methodology for the coming years CROCEMS will deliver a training course addressing key aspects for the sustainability of European manufacturing sectors: (a) design of different robotic modules and behaviours to address production needs, (b) sustainability and circular economy in manufacturing sectors, (c) waste management principles, (d) Lean Robotics Methodology and (e) Circular Business Models, Strategy Mapping and value network, and (f) product deployment cycle and eco-design CROCEMS aims to promote both the installation of cobots and the implementation of circular business models to achieve tangible waste management in Europe and improve resource efficiency.

To this end, CROCEMS will be in contact during the life of the project with ISO/TC 299 and 323, the ISO Working Groups for Robotics and Circular Economy.

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Specific objectives of CROCEMS

- SO1: Increase quality in work by designing and developing new cross-cutting and cutting-edge curricula on collaborative robotics and its use in waste management and the circular economy. Adapt VET provisions to the skills needs of the targeted sectors, opening up to new actors.
- SO2: Create flexible learning pathways and didactic tools based on the learning outcomes approach, able to deliver, assess and recognise the identified key competences of the target groups by addressing common needs and priorities in the fields of education and training.
- SO3: Deliver training through e-learning platforms (MOOC) in different EU languages, providing innovative learning materials and promoting the use of open and online learning and the liquid education approach, which will improve access to lifelong learning for all.
- SO4: Promotion and use of information on project outputs and results across Europe to further exploit project results and ensure their impact on EU VET providers' policies.
- SO5: Ensure the sustainability and impact of the project after its completion by ensuring.

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Consortium

The partnership consists of 5 partners from 5 different European countries:

- CETEM (Centro Tecnológico del Mueble y la Madera de la Región de Murcia) from Yecla, Spain; COORDINATOR
- Technical University of Vienna, Austria;
- Atmoterm SA from Opole, Poland;
- HKA (University of Applied Sciences) in Karlsruhe, Germany;
- University of Deusto in Bilbao, Spain.

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Consortium

CETEM is a non-profit scientific research and training organisation located in the city of Yecla, one of the most important furniture clusters in Spain.

The Ecodesign Research Group of the Technical University of Vienna has been involved in research and education since 1993, with a special focus on the integration of sustainability and circularity aspects in product development.

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Consortium

Atmoterm SA is a medium-sized Polish company founded in 1981 that competes effectively on the international market for intelligent solutions in the field of environmental protection and sustainable development.

The Karlsruhe University of Applied Sciences offers degrees in engineering, computer science, business and media.

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Consortium

The University of Deusto is a HEI of more than 125 years old, with 11,000 students. It stands out for its ability to combine numerous contrasting elements.

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Expected results

- Foster eco-innovations by providing both circular economy hardware (cobots) and software (knowledge, expertise, methodologies and business models).
- Focus on cost savings, job creation and competitiveness potential of manufacturing sectors.
- Prolific collaboration between education, innovation and research from different backgrounds, profiles and geographies. It would help organisations to exchange knowledge and experience targeted at the needs of the current labour market situation.
- Strengthen collaboration and relations between the education community and the labour market.
- Develop in manufacturing companies the framework of a) business model ensuring circularity, b) product design and production influencing the circularity potential of the product, and c) use and post-consumption contributing towards closed-loop product cycles.

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Expected results

- A contribution to engage SMEs and other stakeholders in a European debate on waste management, circular business models and process automation to give them the role of actors of change.
- To provide methods and reorganisation of management systems that drive the closing of loops and the increase of resource efficiency.
- Provide new practical, theoretical and methodological knowledge to current (C-VET) and future (I-VET) workers to validate and guarantee the quality of project results.
- To reduce in the manufacturing sectors the use of resources, increase their efficiency and minimise the generation of hazardous substances - To raise awareness on Zero Waste and Circular Economy job profiles.
- Facilitate the automation of waste management in European manufacturing sectors, thereby improving recycling, reuse and product redesign.
- Increase the efficiency and sustainability of European manufacturing sectors through the installation of Collaborative Robotics.

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Expected results

- Expand European digital and green skills and attitudes - Increase the number of SMEs applying Industry 4.0 technologies and circular strategies.
- Boost and update VET provision on how to adapt current manufacturing jobs and companies for a smart and circular industry model.
- A recognition of skills, knowledge and attitudes that encourage the use of robotics in Europe. The basic knowledge of Collaborative Robotics could be further developed by adding multiple equipment such as tools, or axes, turning Collaborative Robotics into a complete Robotic System. Furthermore, this could foster the use of automation and Artificial Intelligence, putting Europe at the forefront of the Digital Singularity.
- Support the development of green businesses in all European regions.

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Methodology

The methodology of the CROCEMS initiative encompasses a multi-faceted approach aimed at developing and disseminating tailored educational resources and fostering collaboration to catalyse the adoption of collaborative robotics and circular economy principles in the manufacturing sector. Through this holistic approach, the initiative aims to foster sustainability, resource efficiency and competitiveness in all European manufacturing sectors.

1. Educational philosophy and joint curriculum development
2. Creation of training content
3. Development of a collaborative e-learning platform
4. Implementation of pilot actions
5. Sustainability and waste management plan

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