Circular Economy Innovation Ecosystems REdesigning Skills

CERES

D1.1

EXECUTIVE SUMMARY

REPORT ON CIRCULAR ECONOMY MARKET LABOUR EDUCATIONAL NEEDS AND SET OF RECOMMENDATION TOWARDS VET AND HE SECTOR

Co-funded by the European Union

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Introduction

The Circular Economy Innovation Ecosystems Redesigning Skills (CERES) project wants to contribute to support the transition of European society towards the Green Deal accomplishment. To achieve the European objectives, CERES points to two main categories of users belonging to Vocational Education and Training (VET) and Higher Education (HE). To reach and effectively empower them, the project will implement and deploy in a collaborative way a new set of assets (curricula, learning material, and services), resilient and adaptable to future knowledge developments in the circular economy (CE) domain and fostering the cross-fertilization among different industries and stakeholders across the European Union (EU).
The results presented in this deliverable (grounded on a literature analysis from a theoretical perspective, complemented by a market investigation and a survey and interviews with practitioners) will be exploited to develop these education initiatives and training curricula in the CERES project.
The objective of this deliverable, belonging to the Work Package (WP) 1, is multi-faceted, aiming to:

- investigate market and resilience needs for competences and skills to better address the challenges of CE transition and the European Green Deal,
- review existing VET and HE training in CE,
- provide accessible insights to feed HE/VET/Market actors' competence development and promote the field of CE education,
- inform the training materials developed within the project.

To achieve these objectives, a systematic literature review (SLR) (sub-section 3.1) has been conducted to explore and systematize the knowledge related to the CE skills and competences research domain. On the other side, a market analysis (sub-section 3.2), an online survey (sub-section 3.3), and a set of interviews (sub-section 3.4) have been conducted to investigate the market and resilience needs for competences and skills to better address the challenges of CE transition and the European Green Deal, to review existing VET and HE training in the CE domain, and to provide accessible insights to feed HE/VET/Market actors' competence development and promote the field of CE education.

2. Research Methodology

To address the main objectives of WP1, a dedicated research methodology has been developed and enacted. Both theory and practice have been investigated using different research approaches.

2.1 Systematic Literature Review (SLR)

A SLR was conducted to identify critical competencies and skills necessary for adopting CE practices in the manufacturing sector. Databases like Scopus and Web of Science were searched using a carefully developed search string combining terms related to skills, competencies, CE, and manufacturing. Articles published after 2012 in English peer-reviewed journals and conferences were considered, resulting in 669 records after removing duplicates. During screening, irrelevant articles such as those focusing on unrelated mathematical models or circular concepts not related to manufacturing were excluded. The final sample resulted in 58 papers, including five additional papers found through a backward snowballing process.. Data extraction included dimensions like year of publication, research type, publication source, and industries addressed. Skills mentioned in each paper were also extracted and analyzed using content analysis techniques, resulting in the identification of three macro-dimensions: Resilience skills, Digital Transformation (DT) skills, and Specialized/Technical skills (Figure 1). This analysis provides valuable insights into the competencies required for CE adoption in manufacturing.

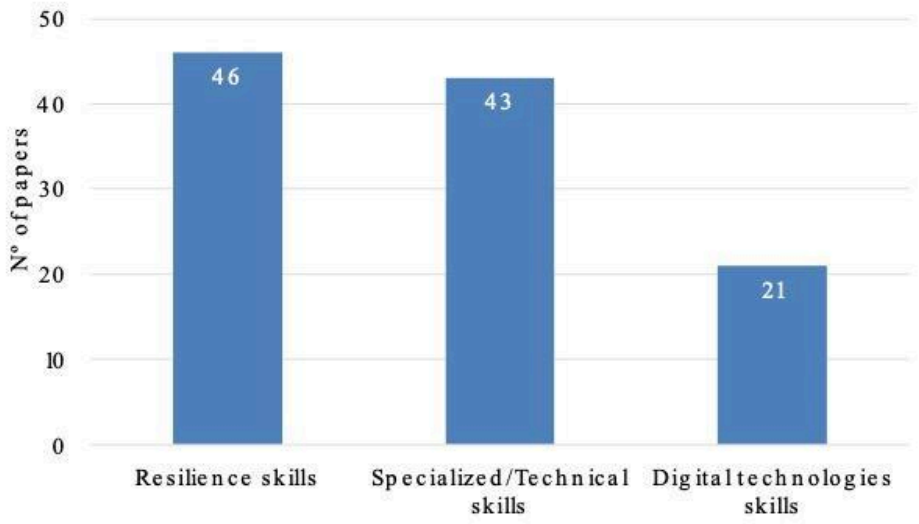
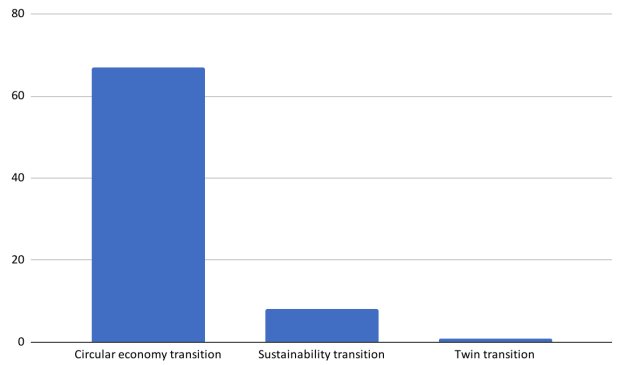


Figure 1: Distribution of categories per number of analyzed papers.

2.2 Market Analysis

The market research aimed to identify and analyze available educational opportunities in the circular economy (CE) domain, conducted in three main steps: *1.* Research of learning and training

courses offered on the market and data collection, *2.* Analysis of the information gathered, *3.* Critical discussion of the results obtained. The first step has been conducted classifying the courses by educational levels (i.e., Higher Education (HE) and Vocational Education & Training (VET)). Therefore, dedicated queries were performed on the web browser for gathering information related to the extant courses at HE level, and at VET level. Thanks to these researches, 113 courses were found out in total (27 at VET level (mostly related to specific projects dedicated to their development) and 86 at HE level). Each course was then analyzed in deep and classified into macro-categories through the SLIP method (Maeda, 2006), which is a free-form methodology used to Sort, Label, Integrate and Prioritize concepts: after identifying the keywords for each educational program, and considering courses' main topics and learning objectives, 3 main macro-categories linked to CE, sustainability and digital transition were detected both for HE and VET levels (Figures 2a and 2b).



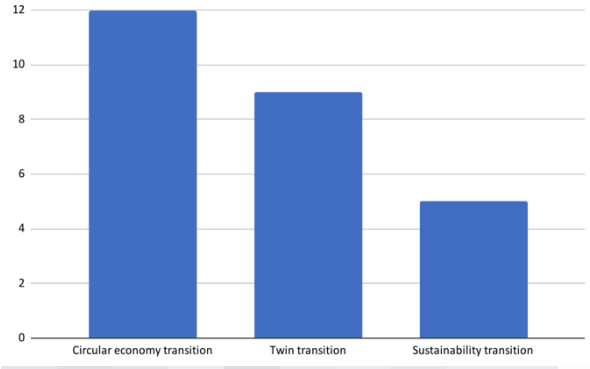


Figure 2a: Macro-Categories at HE level.

2.3 Survey

An online survey was conducted to identify the industrial and practical needs associated with transitioning towards a CE model. The survey aimed to gather insights from employees of companies and organizations involved or interested in the CE domain regarding their experiences, issues, needs, and expectations. The research method consisted of three main phases: survey development, survey execution, and analysis of results.

The questionnaire, initially developed in English and later translated into Italian and Bulgarian, comprised 30 questions divided into four main sections. The first section aimed to profile respondents, the second section gathered information about respondents' organizations, the third section explored the company's understanding of CE and identified barriers to its adoption, and the fourth section investigated organizations' needs in terms of skills, competencies, training, and support for CE transition. The survey, hosted on a professional platform, was then shared in three different languages through multiple channels, including the CERES project website, LinkedIn, partner social channels, newsletters, and direct email contacts. Three waves of dissemination were conducted between November 2023 and January 2024. After the survey closed in February, the data were analyzed, with 102 useful responses obtained after filtering out incomplete answers. Open-ended responses were analyzed by grouping similar answers and identifying recurring themes.

2.4 Interviews

The deliverable involved conducting semi-structured interviews alongside a survey to understand the concrete needs and actions required to align skills and job profiles with the circular transition in textile, WEEE, and automotive sectors. The interview protocol, developed based on guidelines by Yin (2018), consisted of twenty questions covering seven areas of analysis: 1. Interviewees profiling and company information, 2. Industry peculiarities, 3. Job profiles needed, 4. Skills and competencies needed, 5. Training programs developed, 6. External partnerships established, 7. Future outlook. Invitations were sent to 10 expert professionals from the three sectors, selected based on their experience in sustainability or circularity projects. Eight experts responded positively, leading to the conduction of 8 separate semi-structured interviews involving researchers and representatives from the companies. These interviews aimed to gather insights into the challenges, needs, and perceptions regarding the circular transition in the specified sectors.

3. Content Analysis

In this section, the results obtained through the different research methods adopted are reported. Sub-section 3.1 shows the output of the SLR, conducted to explore and systematize the knowledge related to the CE skills and competences research domain. On the other side, the results related to the practice are presented as follows: market analysis (sub-section 3.2), online survey (sub-section 3.3), and set of interviews (sub-section 3.4).

3.1 Systematic Literature Review (SLR)

The SLR aims to explore and understand which skills are essential for circular economy (CE) in the manufacturing sector, including those needed to leverage digital technologies (DTs) for a circular approach. As a result, 40 skills have been identified categorized into three dimensions: (1) Resilience skills, (2) DTs skills, and (3) Specialized/technical skills (Figure 3).

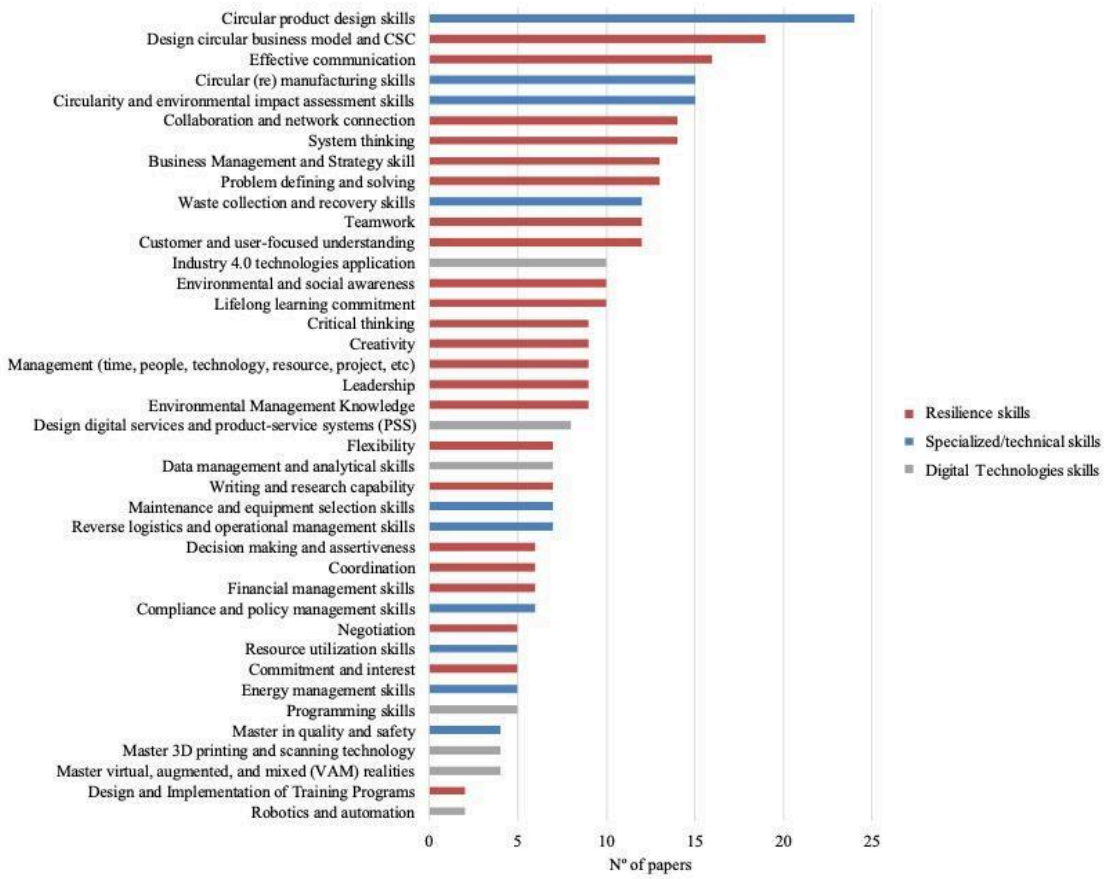


Figure 3: Distribution of skills per number of analysed papers.

3.1.1 Resilience skills

This category encompasses 23 skills divided into two subcategories: *cross-cutting* and *soft skills.* The cross-cutting subcategory includes fundamental skills for developing business models, establishing strategic partnerships, and managing different essential aspects in a CE model. The soft skills subcategory contains the interpersonal skills necessary in the workplace, allowing greater engagement, flexibility, and creativity regarding circular practices.

3.1.1.1 Cross-cutting skills

Professionals in the circular economy (CE) domain require a diverse set of skills to effectively manage solutions and navigate the complexities of sustainable practices. Key skills include: ***1.***

Business Management and Strategy. Understanding team dynamics, market analysis, sustainable marketing, and risk management are essential for effective solution management. ***2. Collaboration and Network Connection***. Building partnerships, facilitating collective intelligence, working in multidisciplinary teams, and co-creating solutions are crucial skills for navigating the CE landscape. ***3. Coordination***. Aligning partners and activities towards common goals, both within a company

and across supply chains, requires effective coordination and synchronization. ***4. Customer and User-Focused Design***. Understanding user experience, market needs, and consumer behavior is vital for co-creating value with clients and improving products and services. ***5. Design and Implementation of Training Programs***. Developing training programs ensures that employees are engaged, retained, and equipped to respond to new market demands. ***6. Design of Circular Business Models and Supply Chains***. Knowledge of innovation, prototyping, value proposition ideation, and managing circular supply chains are essential for transforming businesses. ***7. Environmental and Social Awareness***. Conscious resource use, consideration of social and ethical aspects, and ensuring health and safety are critical elements of CE practices. ***8. Environmental Management Knowledge***. Understanding sustainability, CE strategies, recycling, waste reduction, energy efficiency, and responsible consumption is essential for effective environmental management. ***9. Management Skills for Circular Manufacturing Processes***. Time, resource, knowledge, and self-management are crucial for developing and implementing circular manufacturing processes. ***10. System Thinking***. A holistic view of processes and resources enables professionals to predict future scenarios, understand internal and external contexts, and consider the entire product lifecycle. ***11. Research and Writing Skills***. Conducting research, collecting data, and effectively communicating environmental issues through technical reports tailored to different audiences are essential competencies. ***12. Financial Management***. Understanding financial impacts, costs, and return-on-investment timelines is crucial for effective financial planning and avoiding constraints during the transition to CE.

3.1.1.2 Soft skills

1. Decision-Making and Assertiveness. Product designers must think logically and evaluate business opportunities critically, avoiding personal biases and making informed choices. ***2. Commitment and Interest in Learning***. CE demands commitment, support from senior management, and motivation to transform ideas into actions, inspiring stakeholders to become involved. ***3. Effective Communication***. Clear exchange of information, opinions, and ideas is vital, requiring mastery of communication techniques like storytelling to engage stakeholders and disseminate circular practices. ***4. Creativity***. Workers need to leave their comfort zones and use their imagination to devise new solutions and processes, with creativity fostered through simple strategies and DIY approaches. ***5. Adaptability***. Quick adaptation to changes in the work environment enables teams to face unexpected challenges efficiently, making openness to new adaptations and changes crucial for integrating circular principles. ***6. Leadership***. Strong leadership and supportive organizational culture inspire employees to embrace sustainability, covering aspects like providing constructive feedback and identifying appropriate human capital. ***7. Lifelong Learning Commitment***. Continuous learning from mistakes and active listening allow professionals to update their skills constantly, with a commitment to lifelong learning enhancing problem-solving abilities. ***8. Negotiation***. Expertise in negotiation helps to strategically direct actions and establish work agreements that satisfy both parties, applying to both commercial transactions and internal agreements. ***9. Problem Definition and Solving***. Professionals must identify, analyze, and establish strategies to address complex and new problems that emerge in industrial systems, devising intelligent solutions to optimize resource use. ***10. Teamwork***. Unified commitment to achieving goals, maintaining open communication, and facilitating effective usage of ideas characterize effective teamwork, requiring cross-disciplinary collaboration and trust-based structures.

3.1.2 Digital technologies (DTs) skills

This category encompasses seven skills grouped into two subcategories: *Digital transformation of businesses* and *Technology innovation in the CE.* The subcategory of digital transformation of businesses covers skills associated with digitalization and business data management processes. The technology innovation subcategory includes skills relating to applying specific DTs that promote circularity, such as 3D printing and virtual, augmented, and mixed realities, among others.

3.1.2.1 Digital Transformation of Business

- ***Data Management and Analytics***: professionals need to work with large datasets, including generation, collection, storage, sharing, cybersecurity, and visualization, to extract valuable insights supporting decision-making.
- ***Programming Skills***: proficiency in programming is crucial for developing new software and platforms, enabling various digital applications such as industrial robots, artificial intelligence, digital models, and 3D printing.
- ***Data and Algorithm Knowledge***: understanding digital services and product-service systems (PSS), enabling dematerialization, and increasing resource use efficiency in product-services are vital for circularity-oriented business model innovation.

3.1.2.2 Technology Innovation in the CE

- ***Knowledge of Industry 4.0 Technologies***: integrating DTs like the Internet of Things (IoT), cloud, and artificial intelligence into daily activities and functions is essential for leveraging digital functions and making real-time decisions.
- ***Mastery of 3D Printing and Scanning***: understanding software, methods, and materials used in 3D printing helps minimize waste and maximize sustainable initiatives by optimizing material use.
- ***Mastery of Virtual, Augmented, and Mixed Realities***: simulating manufacturing environments and product development using virtual and augmented reality technologies enables analysis, predictive maintenance, and interaction with systems.
- ***Knowledge of Automation and Robotics***: operating and maintaining industrial robots is crucial, including skills in human-robot collaboration, remote control, and construction and operation in a digitalized environment.

3.1.3 Specialized/Technical skills

This category embraces 10 distinct skills, which have been grouped into three categories: *Circular lifecycle management*, *Cleantech and advanced materials*, and *Waste management*. The Circular lifecycle management category encompasses skills involved in enhancing circularity throughout various stages of the product lifecycle, including product design, (re)manufacturing, and assessing circularity and environmental impact. Waste management skills pertain to managing reverse flows of materials, such as waste collection, reverse logistics management, and utilizing resources from waste. The Cleantech and advanced materials category involves developing competencies related to processing recovered materials, including energy recovery, creating new materials from

recovered resources, and understanding product and environmental regulatory aspects and certifications.

3.1.3.1 Circular Lifecycle Management

- ***Circular Product Design***: sustainable product and process design strategies, including design for durability, timeless design, and design using waste materials.
- ***Circular (Re)Manufacturing***: designing, selecting, and developing innovative transformation technologies and circular processes, as well as managing remanufacturing facility operations and production planning.
- ***Circularity and Environmental Impact Assessment***: evaluating the environmental impact of circularity strategies, conducting audits, tracking key performance indicators, and implementing environmental protection measures.

3.1.3.2 Cleantech and Advanced Materials

- ***Compliance and Policy Management***: developing and implementing environmental policies, monitoring legal developments, and ensuring compliance with regulations and certifications.
- ***Energy Management***: efficient and sustainable energy use, including understanding energy costs, monitoring energy consumption, and implementing energy-saving measures.
- ***Maintenance and Equipment Selection***: maintaining equipment, performing quality control analysis, and ensuring safety in deconstruction processes.
- ***Master in Quality and Safety***: applying quality and safety principles to materials, products, and processes within the CE context.

3.1.3.3 Waste Management

- ***Waste Collection and Recovery***: waste management principles, mapping supply chains, and identifying materials suitable for recovery.
- ***Reverse Logistics and Operations Management***: designing reverse logistics systems, managing daily operations, and controlling reverse flows efficiently.
- ***Resource Utilization***: implementing waste recovery strategies, identifying types of waste, prioritizing resources, and optimizing resource usage.

3.2 Market Analysis: Content Analysis

A mapping of the formative and training opportunities already available at European level has been performed. They have been analysed according to several variables (e.g., target audience, content, countries, educational level), also providing an overview in terms of modules and existing professional careers related to CE topic.

3.2.1 HE: Macro-categories

I. CE transition at HE level

Almost all courses in the HE sample were classified into the "CE transition" macro-category, which includes all those courses that aim to provide teaching intended to develop knowledge and skills related to the CE. Data was sorted, labeled, integrated, and prioritized according to seven principal topics. ***1. Introduction to Circular Economy***. Basic CE principles, sustainability concepts, circular business models, and benefits/obstacles of CE implementation. ***2. Strategy & Marketing***. Exploring business resilience, value creation cycles, marketing strategies, and ecosystems/partnerships in CE projects. ***3. Circular Supply Chain***. Focuses on transitioning supply chain processes to align with CE principles, including procurement (analyzing raw materials and sustainable alternatives) and operations (waste and energy management). ***4. Circular Eco-design***. Design approaches for reuse, repair, recycling, and remanufacturing, often tailored to specific industries. ***5. Policies and EU Regulations***. Modules dedicated to environmental laws and EU regulations relevant to CE practices and incentives. ***6. Introduction to Advanced Technologies enabling CE Implementation***. Technologies supporting the transition to Circular Industry 4.0, such as blockchain, digital platforms, additive manufacturing, and waste recovery technologies. ***7. Assessing & Monitoring***. Assessment of environmental and economic impacts using Key Performance Indicators (KPIs), including circular and sustainable finance concepts and Life Cycle Assessment (LCA) methodologies.

II. Sustainability transition at HE level

The "sustainability transition" macro-category encompasses HE courses focused on developing expertise for adopting environmentally and socially responsible practices. The primary subjects covered include: ***1. Introduction to Sustainability***. Definitions and principles of sustainability, integration of sustainability vision, understanding of Sustainable Development Goals (SDGs) and Environmental, Social, and Governance (ESG) standards, and the link between circular economy (CE) and sustainability. ***2. Sustainability Management***. Sustainable business models, tools for sustainability strategy implementation, leadership and organizational change skills, green marketing. ***3. Assessing & Monitoring***. Key metrics for measuring economic, social, and environmental impacts, following the Triple Bottom Line (TBL) approach and ESG standards, evaluating long-term impacts and understanding concepts of sustainable finance, including impact investment.

III. Twin transition at HE level

The "twin transition" macro-category within HE courses emphasizes both the green/circular and digital transitions equally. Only one course was identified in this category. Competencies developed include: ***1. Key Concepts of Sustainability and CE***. Understanding principles and definitions of sustainability, CE, and their interrelationship. ***2. Energy Management***. Exploring aspects like renewable energies, socio-economic impacts, energy efficiency of buildings, and energy

certifications in detail. ***3. Green Technologies***. Courses deepen knowledge and capabilities in implementing green technologies within existing infrastructure to enhance energy efficiency.

3.2.2 VET: Macro-Categories

I. CE transition at VET level

The "Circular economy transition" macro-category is defined according with the same criteria used for HE level. Within VET projects and courses, six key topics were identified: ***1. Introduction to Circular Economy***. All courses cover CE principles, including definitions, frameworks (e.g., 4R - Reduce, Reuse, Repair, Recycle), the relationship between CE and sustainability, advantages, obstacles, and circular job opportunities. ***2. Circular Business Models***. Principles, implementation strategies, and case studies tailored to specific industries for implementing circular business models. ***3. Business Management in the CE***. Few courses focus on managing circular models, covering commercial and environmental impacts evaluation and entrepreneurial skills development. ***4. Circular Supply Chain***. Innovative approaches for adopting circular supply chain, including procurement (raw materials, sustainable alternatives, and green public procurement), operations (waste management), and marketing (addressing greenwashing). ***5. Circular Design***. Many courses offer insights on circular design approaches (e.g., Design for X), covering design for reuse, recycling, repair, and EU regulations compliance. ***6. Advanced Technologies enabling CE Implementation***. Addressed by only a few projects/courses, focusing on technologies like augmented reality, 3D printing, digital platforms, and tracking systems to support CE.

II. Sustainability transition at VET level

The "Sustainability transition" macro-category consists of five projects aimed at developing training courses for transitioning towards sustainable practices encompassing environmental, social, and economic aspects, with a strong focus on ESG standards and the Triple Bottom Line. Four key topics were identified: ***1. Climate Change***. Projects introduce the issue of climate change, defining it and outlining its environmental, social, and economic impacts. ***2. Social Circular Economy***. All projects address this topic, defining key terms, describing business strategies, discussing benefits to people, planet, and profit (3P), and introducing resilience concepts. ***3. Entrepreneurship***. Courses aim to develop entrepreneurial skills, showcasing real innovative businesses and encouraging new ideas, focusing on social and sustainable entrepreneurship as well as eco-entrepreneurship. ***4. Monitoring & Assessing KPIs***. Only one project offers courses on measuring and assessing social circular economy through various tools and KPIs, including materiality assessment, evaluating efficacy of sustainable practices (including circular ones), SDGs implementation, and alignment with EU policies, alongside discussions on Triple Bottom Line results.

III. Twin transition at VET level

The "Twin transition" macro-category encompasses projects and courses facilitating the adoption of new technologies and promoting both digital and green or circular transitions. Eight projects/courses were identified within this category. Key topics addressed include: ***1. Sustainability and CE***. Principles of CE, circular business models, and tools for CE implementation. Some link CE to sustainability, covering SDGs, green certifications, and policies. ***2. Digital Tools***.

Overview of technologies supporting digital transformation, such as automation & AI, IoT, visualization platforms, quantum computing, and blockchain. ***3. Robotics***. Collaborative robotics and lean robotics, focusing on applications in logistics, quality control, and assembly. ***4. Design for X (DfX)***. Different DfX approaches tailored to specific industries, including design for robotic cell, recycling, eco-design, energy efficiency, and waste management, supported by EU legislations. ***5. Monitoring & Assessing KPIs***. Some courses teach calculating environmental impacts, interpreting results, conducting LCA, choosing KPIs, and circular tools to measure environmental impacts like GHG emissions.

3.3 Survey

The survey analysis section provides detailed insights into the responses from 102 participants across various aspects related to the transition to a CE model. Here's a summary of the key findings:

1. Personal Details: the majority of participants identified their role as "Other" (48%), followed by industrial (20%), consultant (15%), and academic (10%). Diverse job titles such as manager, sustainability manager, project manager, and engineer were reported.

2. CE-Related Activities: 73% of respondents indicated involvement in CE-related activities, primarily for 1-4 years (50%). Areas of responsibility included training & education (39 respondents) and sustainable management (30 respondents).

3. Organization Descriptions: "Other" industries (e.g., healthcare, research, consulting) were most common (48%), with many organizations being SMEs (35%) and having national (50%) or international (49%) reach.

4. Understanding of CE: top barriers included financial resources scarcity, expertise shortage, and lack of collaboration. Around 30% of respondents had a good understanding of CE, while gaps in expertise included regulations, cultural hurdles, and data collection (Figure 4).

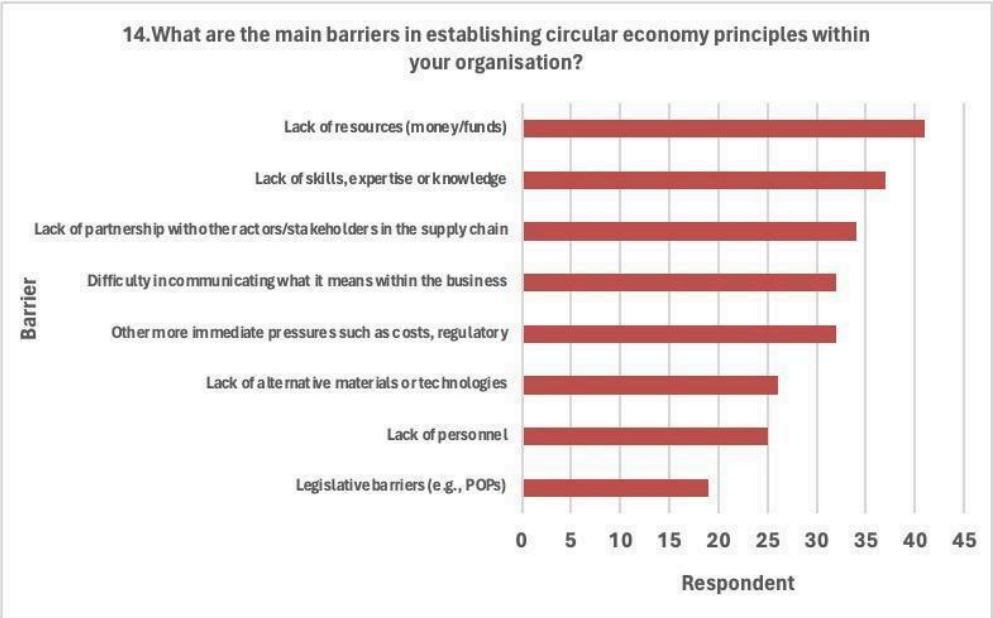


Figure 4: Barriers in adopting circular economy.

5. Priorities in CE-Related Skills: respondents prioritized skills for advancing CE in their organizations, including designing systems, circular business model design, market awareness, procurement, DTs, remanufacturing, and communication with consumers. Skills needing further development included resilience cross-cutting skills, soft skills, technology innovation in CE, digital transformation, and specialized technical skills.

6. Preferred Types of Training: continuing Professional Development (CPD), academic courses, and formal certification were preferred options (Figure 5).

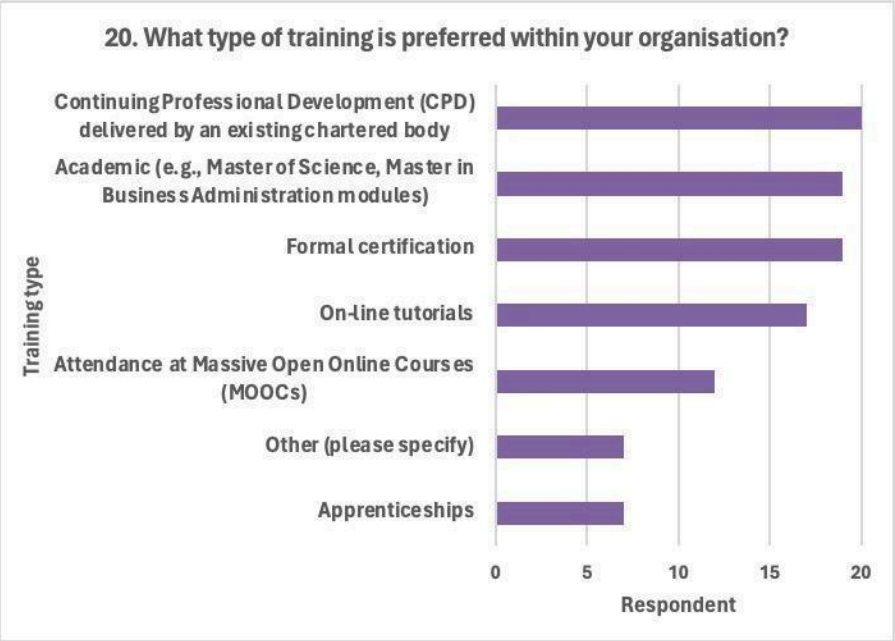


Figure 5: Types of training preferred within organizations.

7. Required Technical Skills at Different Product Lifecycle Stages: circular design of products was deemed crucial for the beginning of life stage, while understanding product durability, repairability, and digital skills were highlighted for the middle of life stage. Skills for assessing the health of goods, implementing reuse and recycling strategies, and stakeholder engagement were identified for the end of life stage.

8. Awareness of Available Training Courses: most respondents were aware of available training courses, with professional online courses and Massive Open Online Courses (MOOCs) being the most common types taken. However, there was a noted lack of courses addressing specific CE aspects (Figure 6).

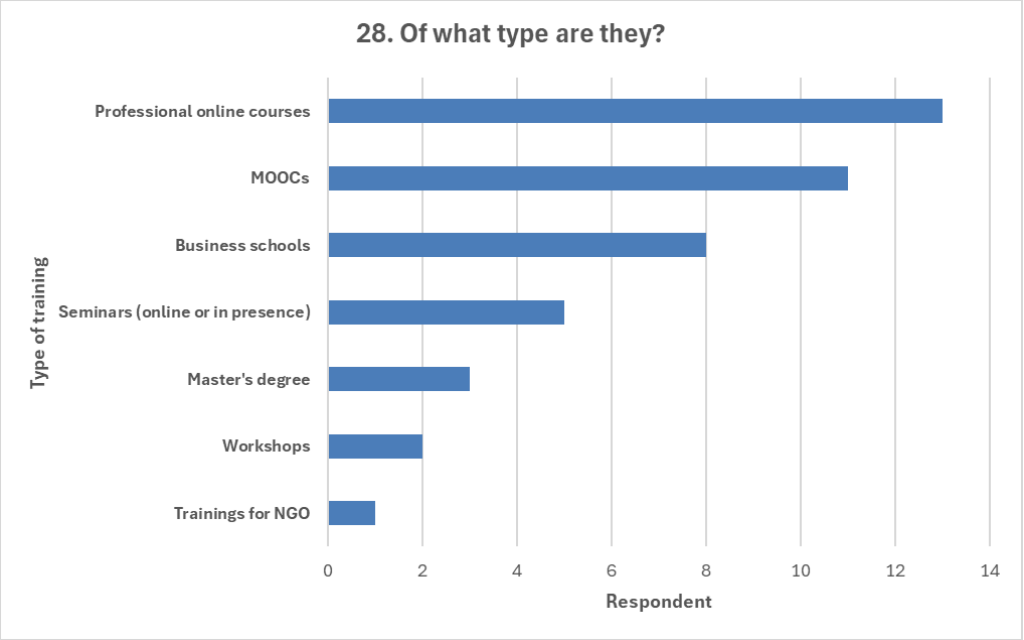


Figure 6: Types of courses.

3.4 Interviews

The interviews (together with the survey) have been employed to grasp the concrete needs and existing actions to align the skills and job profiles required in the circular transition from experts working in textile, WEEE, and automotive sectors. The survey findings across various industries highlight the ongoing efforts and challenges in transitioning to a CE model.

In the **textile** industry, companies are implementing CE actions systematically, including product design processes with environmental analyses and collaboration networks for waste management. While specific professional profiles for CE transition weren't identified, there's a need for both technical and soft skills not commonly taught in traditional training. Digital skills, however, received mixed emphasis among respondents.

In the **WEEE** (Waste Electrical and Electronic Equipment) industry, there's a demand for specialized skills in logistics and data management, along with the ability to promote and sell used products to address social acceptance barriers. The alignment between educational pathways and job demands appears satisfactory, but there's a greater emphasis on soft skills training for existing employees.

In the **automotive** sector, there's growing awareness of environmental concerns, particularly regarding regulations and customer demands. Product redesign based on environmental analyses and a shift towards electric mobility are notable trends. Digital skills are deemed essential here as well, especially for managing batteries, which are critical components. Internal training is prevalent due to sector-specific requirements, and there's a call for clearer regulatory frameworks.

Overall, while each sector has its unique challenges and actions, common themes emerge. Digital skills are crucial for performance monitoring and value chain tracking, driven by the emergence of Digital Product Passports (DPPs). Soft skills are vital for fostering collaboration, both internally and across value chains. While specific job profiles may not be necessary, there's an expectation that technical roles will incorporate circularity skills, necessitating closer collaboration between universities and the labor market.

4. Critical Discussions

To recall, the objective of the WP1 of the CERES project is to investigate market and resilience needs for competences and skills to better address the challenges of CE transition. Market needs were explored through survey and interviews with actors involved or interested in CE, while current offerings and developments of training and education were explored through review of existing VET and HE courses and education-related projects as well as through systematic literature review.
Below is a summary of the main gaps identified.

I. **Sector-specific knowledge**: practitioners emphasize the need for sector-specific experience and expertise, with varying priorities across industries. While most literature focuses on the manufacturing sector, there's a demand for more sector-specific educational modules.
II. **Skills (individual level):** designing systems and components for CE compliance and circular business models rank high in importance. Practitioners stress commercial understanding and increasing customer awareness, which aren't extensively covered in current courses.
III. **Skills (macro categories level**): resilience cross-cutting and soft skills are prioritized, with digital transformation and technology innovation following. However, there's a gap in addressing soft skills in current offerings, especially in HE courses.

IV. **Course arrangements**: There's a mismatch between preferred training modes and accessibility. Companies prefer formal academic courses and continuous professional development (CPD) by accredited bodies, indicating a need for more formalized CE-specific courses. While online delivery dominates, practitioners rank online tutorials and Massive Open Online Courses (MOOCs) lower, suggesting a preference for more formalized education.

In conclusion, there's a need for more sector-specific educational modules addressing both individual-level and macro-level skills, with a focus on formalized CE-specific courses to bridge the gap between existing offerings and practitioners' needs.

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