

DESIGN AND TECHNOLOGY. PEOPLE, SYSTEMS, ENVIRONMENT

MUR DM 117/Vico- Territorial ecosystems for circular economy (EC). Enabling digital technologies and innovation strategies for the enhancement of biodiversity

Funded By	VICO S.R.L. [P.iva/CF:00929370096] MINISTERO DELL'UNIVERSITA' E DELLA RICERCA [P.iva/CF:97429780584] Politecnico di TORINO [P.iva/CF:00518460019]
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Context of the research activity	<p>The project is funded within the framework of the PNRR – DM 117/2023 to promote innovation and dissemination of technologies, strengthen skills, and encourage the transition to a knowledge-based economy.</p> <p>The research aims to contribute to the transition to the EC by defining methodologies and tools for managing and enhancing the flow of information related to circularity processes in an ecosystem vision.</p> <p>Progetto finanziato nell'ambito del PNRR - MUR DM 117/2023 - CUP E14D23001940004</p>
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	<p>As global consumption of materials and annual waste generation are expected to double by 2050, the transition to a more sustainable production and economic system is a vital requirement (European Commission, 2020). The circular economy (CE) has been widely recognised as a promising paradigm for decoupling economic growth from resource extraction and environmental destruction (Franzo et al., 2021). It has gained increasing attention from governments, practitioners, and researchers (Korhonen et al., 2018; McDowall et al., 2017).</p> <p>In this context, during the last years it has gained high attention the systematization of relationships along the entire CE supply chain, in order to increase the performances of circular networks. A new concept has raised from the above-mentioned perspective to accelerate a more rapid transition to a circular system. The name of this new model is "circular economy ecosystem".</p> <p>In this new scenario, information plays an important role for decision making as well as the correct and efficient execution of processes.</p>
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Objectives

A better cross-product lifecycle information management in supply chain networks can help to ensure that the circulation of materials and products can be successfully implemented economically and ecologically, despite special challenges such as heterogeneous, small material flow there is usually a break in information when a product is handed over to the end user. Variety of actors with heterogeneous information systems is involved in a product life cycle, making it difficult to exchange existing information without suitable interfaces and transformation of information into exchangeable data formats. In addition to technical heterogeneity, structural and semantic heterogeneity of the different information systems pose further challenges. Moreover, legal and organizational requirements for data protection and data security are to be considered when collecting, exchanging and using information.

A significant development potential is still seen for digitization in the context of the CE. Digitization concepts have the potential to enable better information management and more transparency regarding relevant information for the circulation of materials and products.

Emerging digital technology (EDT), such as the internet of things (IoT), big data analytics (BDA), artificial intelligence (AI), Digital Twin (DT) and 3D-printing, has been radically changing the way products are made, delivered, sold, and consumed (Lasi et al., 2014). Known as Industry 4.0, the new industrial stage not only changes the manner of production but also causes versatile organizational transformation (Vaidya et al., 2018). With the emerging technologies, devices can communicate with other devices and services over the internet to achieve a diversity of goals (Whitmore et al., 2015), such as automated manufacturing, home automation, and smart waste management. There is an increasing interest in the potential of EDT in moving production and consumption towards CE (Awan et al., 2021).

Implementing EDTs is considered a promising means to overcome barriers to the CE transition (Rosa et al., 2020; World Economic Forum, 2016). It can provide CE opportunities for the manufacturing industry, such as retrofitting equipment, increasing workers' efficiency and motivation, building a smart factory based on resource efficiency, and designing closed-loop manufacturing process chains (Stock & Seliger, 2016).

The main objective of the research will develop a framework to design tools to support a circular economy ecosystem for the national context.

The research will involve the company Vico S.r.l. as a case study for the conception, conceptualization, development and validation of the framework.

In this scenario, the specific objectives of the research project will be:

- a) the structuring and schematization of circular economy processes that involve the company according to the main activities and different sectors in which it operates (AEC, infrastructure, reclamation, etc.);
- b) identifying the critical points and opportunities for the development of an innovation project aimed at improving data management processes and information flows for the circular economy;
- c) the exploration of good practices for digital transformation in the circular economy sector at national and international levels;
- d) the analysis of scientific literature about the issue of European Circular Economy Networks / Platforms;
- e) the development of a framework that could make a link between the criticalities and opportunities of the business process and the structuring of tools for the management of the processes of a circular economy ecosystem by identifying guidelines, strategies, objectives and actions.

The candidate should have knowledge and competencies on:
- knowledge gained through a course of study related to the research topics;

Skills and competencies for the development of the activity

- knowledge of Circular Economy, Data Analysis, Innovation process in company context;
- knowledge of English and Italian language (oral and written)
Good knowledge of practical attitude for the research activities and problem solving skills. As the PhD candidate will work with research groups on a multidisciplinary project, he/she must demonstrate adaptability in different environments, and be able to interact positively with the other groups members.