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Barbero, Silvia and Pereno, Amina

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**Relating Systems Thinking and Design
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Designing Open Innovation Ecosystems for Small and Medium-Sized Enterprises

Silvia Barbero and Amina Pereno

Department of Architecture and Design, Politecnico di Torino

Europe's transition to a circular economy is as much an environmental, economic and social necessity as it is an opportunity for European companies and citizens. Despite encouraging promises, many barriers hinder the circular transition of European companies, especially small and medium enterprises, which represent the bulk of Europe's industrial fabric. The presentation shows the case study of the 'DigiCirc' project (call H2020-INNOSUP) that creates and coordinates innovation ecosystems involving a broad range of stakeholders to foster connections and collaborations supported by digital tools. The role of systemic designers in the project mainly focused on stakeholder selection and engagement and the training of participants on circular economy knowledge and systemic approach methods. The authors offer some reflections starting from the project's experience to understand how design, in particular systemic design, can contribute to creating digital innovation ecosystems and how it can help enterprises overcome the barriers identified in the literature and past experiences. The aim is to open the debate on sustainability transitions and practical co-design experiences with stakeholders to foster those transitions. Authors are addressing design scholars and practitioners dealing with innovation and transition of socio-technical systems within industrial and cross-disciplinary environments.

KEYWORDS: systemic design, circular economy, open innovation, small and medium-sized enterprises, SMEs

RSD TOPIC(S): Cases & Practice, Economics & Organizations, Sociotechnical Systems

Circular economy presentation

Do dreams reflect reality?

Current alternatives to the capitalist linear model seem to converge into the circular economy (CE) model. The CE moves towards a new economic model that is "*constructed from societal production-consumption systems that maximize the service produced from the linear nature-society-nature material and energy throughput flow. This is done by using cyclical materials flows, renewable energy sources, and cascading type energy flows*" (Korhonen, Honkasalo and Seppälä, 2018, p.39). Studies that discussed the CE model argue that the transition to a CE will produce key environmental benefits: more sustainable use of resources, a greater focus on well-being and quality of life, and job growth resulting from new business models (Ghisellini, Cialani and Ulgiati, 2016; Webster, 2017). In the case of the European Union (EU), the transition towards CE represents a chance to foster competitive advantages on a sustainable basis with the potential to create an income benefit of EUR 1.8 trillion and over one million new jobs by 2030 (Ellen MacArthur Foundation, 2015). Applying CE principles across all sectors and industries from a foresight perspective could imply a decrease in the environmental, social and economic pressures, increasing the EU regional strategic autonomy.

Although an encouraging premise, supporting the circular transition of the EU industry is a considerable challenge. The EU business environment comprises 99% SMEs, which employ two-thirds of EU workers (Rizos et al., 2015). Literature shows some crucial barriers to the transition of small and medium-sized enterprises (SMEs) towards circular models (Rizos et al., 2016), namely: a limited environmental culture of companies; limited technical and technological know-how; a lack of collaboration across the value chain; a lack of available capital to make necessary investments; poor government

support and ineffective legislation; and administrative hindrance due to bureaucratic complexity.

Thus, reality shows two significant challenges.

1. On the one hand, legislative and administrative actions need to support industries keen to undertake circular paths.
2. On the other hand, the urgency to foster collaboration between different stakeholders, both within the value chain and across sectors, and facilitate the acquisition and exchange of skills and knowledge.

This presentation focuses on the second challenge, providing reflections emerging from the preliminary results of the DigiCirc project (2020), which aims to create innovation ecosystems using digitisation and digital data to support SMEs' transition to the CE.

The European experience of DigiCirc

DigiCirc tackles circular innovation through two main activities. First, the consortium has been implementing innovative digital tools to foster collaboration among local and European Union (EU) stakeholders within the CE framework:

1. **Industrial Symbiosis Platform** to access a catalogue of real 'waste streams' and find suppliers and partners.
2. **Matchmaking Platform** to find and contact future business partners and potential customers.
3. **Material geolocalisation** to find and access data on waste, people, energy, and other resources.
4. **InfoPortal** to gain knowledge about investment opportunities, regulatory frameworks, and market and technology trends.

Second, the project promotes specific calls on three key areas (Circular Cities, Bioeconomy, Blue Economy) to support SME consortia on CE and digitisation projects, providing them with ongoing support to develop their business ideas and acquire expertise in different fields: from lean start-up methodology to business models consolidation, market analysis, team building, and systemic design.

A total of 49 consortia of companies from 24 countries took part in the three calls and were engaged in the innovation ecosystems promoted by the project. Figure 1 shows the different sectors that consortia have been addressing and the key circular challenges they are tackling through developing industrial solutions and models.

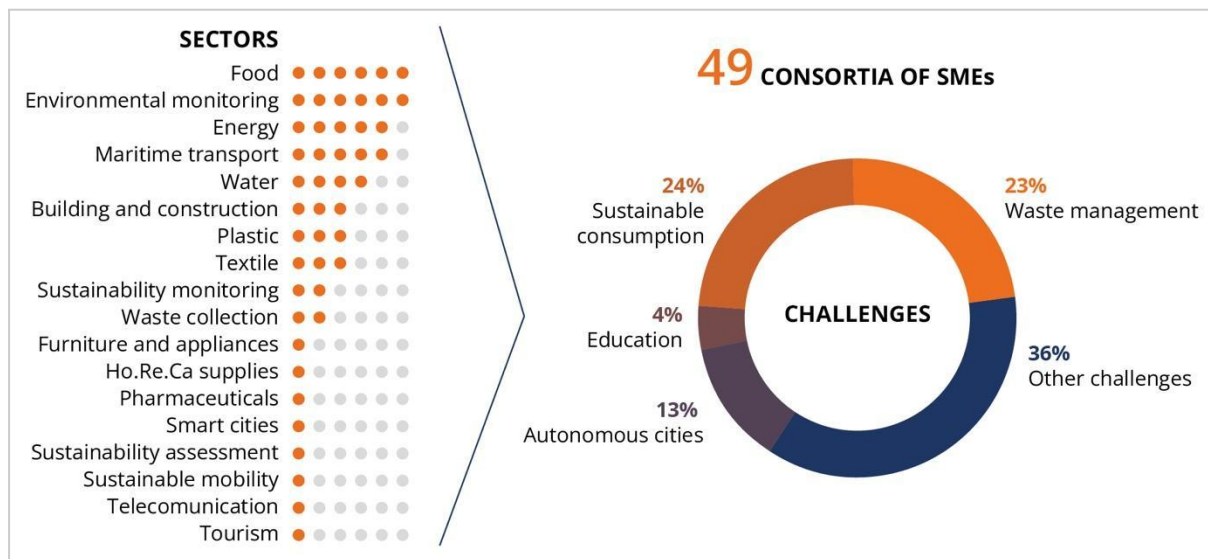


Figure 1. Sectors and challenges faced by the DigiCirc consortia.

Within DigiCirc, our Systemic Design team was essential in selecting SMEs and defining and implementing the acceleration programme, especially in the training segment.

Insights on systemic design contribution to building open innovation networks

In this complex scenario of innovation and sustainability, design plays a crucial role because of its ability to *pro iacere* – looking + moving beyond – (Bassi, 2013) and to be a mediator between different know-hows.

The selection work has theoretical and practical implications, as it establishes the key performance, training and development indicators of innovation ecosystems and

implicitly defines the most efficient relational methodology for knowledge sharing. Forward-looking is important to identify stakeholders that have an innovative mindset and circular ideas that can advance the state of art.

Moreover, SME innovation ecosystems entail many competencies that should dialogue with each other. Innovation ecosystems for SMEs involve many competencies that need to dialogue with each other. This does not only happen through the elaborative activity of the companies themselves but thanks to an educational approach that combines different and often separate knowledge systems: "art/creativity, technology/engineering, economics/management and the humanities" (Celaschi & Celi, 2015, p. 166). Due to its cross-disciplinary attitude, it represents an attempt to overcome the dichotomy between hard and soft sciences (Maldonado, 2010). Through a post-disciplinary approach, each SME can achieve a certain familiarity or empathic understanding with other disciplines and other companies. Thus, the system of enterprises achieves community thinking throughout the value chain, even if the 'language' and disciplinary knowledge of others are not mastered (Blanchard-Laville, 2000).

Experience with DigiCirc confirms how universities, research centres and design schools play a crucial role in facilitating eco-innovation in companies (Prieto-Sandoval et al., 2019). Prior works on this topic (Horbach, Oltra & Belin, 2013) has shown how companies require multiple external sources of knowledge and information to develop innovative and sustainable processes and products.

Looking at the barriers SMEs face in the field of CE, the experience of innovation ecosystems mainly addresses three significant obstacles: supporting the growth of awareness and interest in sustainability, providing new cross-disciplinary tools for circular design, and building collaborations between companies and along the value chain. Overall, design contributes by raising awareness and involving people and organisations around biological, environmental, technological and organisation issues. Alongside its educational role, design has offered practical co-design tools by supporting companies in understanding and experimenting with them. Developing collaborative platforms based on user-centred logic fosters long-term collaboration and the acquisition of replicable and scalable tools for an ever-growing ecosystem of companies.

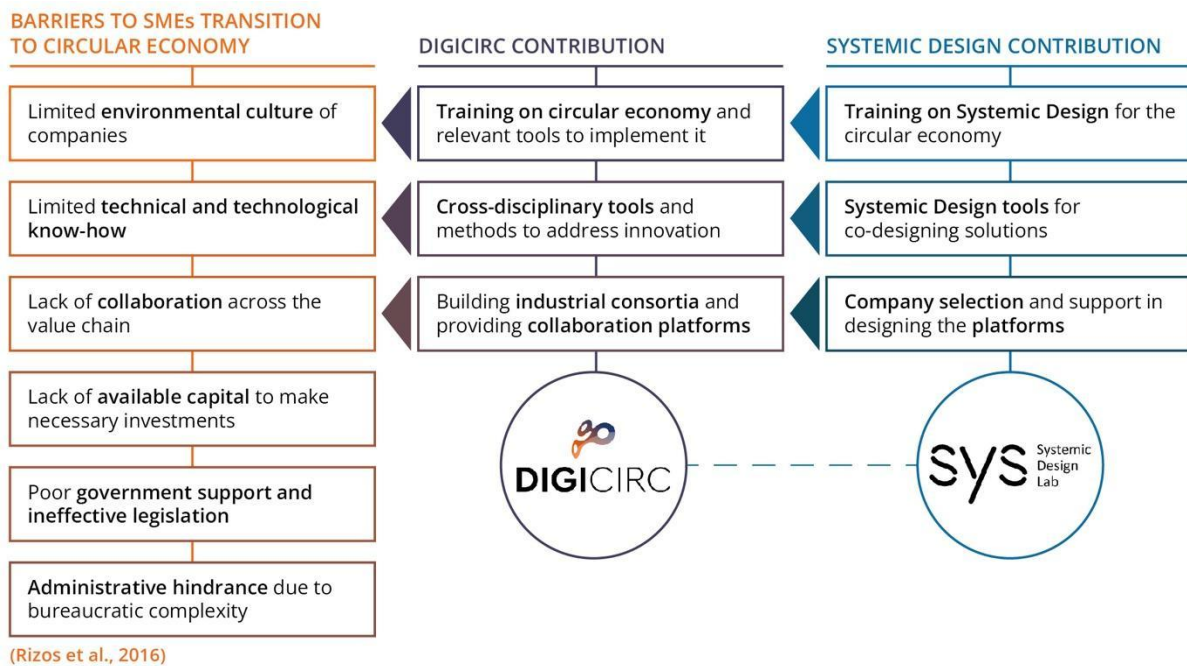


Figure 2. Contribution of the case study to tackling CE barriers and the contribution of systemic designers within the case study.

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