CORA Cork Open Research Archive
Cartlann Taighde Oscailte Chorcaí

Title	Circular design project. Educating the design community in sustainable design
Authors	Segalas, J.;de Eyto, A.;McMahon, M.;Bakirlioglu, Y.;Tejedor, G.;Lazzarini, B.;Celik, S.;Jimenez, A.;Martens, J.
Publication date	2021-06-14
Original Citation	Segalas, J., de Eyto, A. McMahon, M., Bakirlioglu, Y., Tejedor, G., Lazzarini, B., Celik, S., Jimenez, A. and Martens, J. (2021) 'Circular design project. educating the design community in sustainable design', EESD2021: Proceedings of the 10th Engineering Education for Sustainable Development Conference, 'Building Flourishing Communities', University College Cork, Ireland, 14-16 June.
Type of publication	Conference item
Link to publisher's version	https://www.eesd2020.org/, http://hdl.handle.net/10468/11459
Rights	© 2021, the Author(s). This work is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 International License - https://creativecommons.org/licenses/by-nc-nd/4.0/
Download date	2026-11-08 01:10:39
Item downloaded from	https://hdl.handle.net/10468/11683

UCC
University College Cork, Ireland
Coláiste na hOllscoile Corcaigh

Circular Design project. Educating the Design Community in Sustainable Design

J. Segalas[1], A. de Eyto[2], M. McMahon[2], Y. Bakirlioglu[2], G. Tejedor[1], B. Lazzarini[1], S. Celik[3], A. Jimenez[4] and J. Martens[5]

[1]Research Institute for Sustainability Science and Technology, UPC – Barcelona Tech, Barcelona, Spain

jordi.segalas@upc.edu

[2] Design Factors, School of Design, University of Limerick, Republic of Ireland

[3]Stichting NHL, Leeuwarden. Netherlands.

[4]Nut Creatives, Barcelona, Spain.

[5]Ceci N'est Pas Une Holding B.V., Netherlands.

Abstract

Design has a key role to play in developing innovative solutions to current challenges – approaches that must consider the needs of end users and integrate sustainability criteria in processes and strategies for creating products and services.

The Circular Design Project (http://circulardesigneurope.eu/) is a European project funded by Erasmus+ Knowledge Alliance within the social business and the educational innovation field. The goal of this Circular Design project is to promote sustainable production and consumption of products and services in Europe. The project have four objectives: to increase and improve the learning strategies of Design for Sustainability, identifying opportunities for sustainably designed products and services as well as business opportunities in both higher education institutions and industries in Europe; To gather and cluster open educational resources and training courses for industry staff and academics in Innovative Design for Sustainability; To train up innovative and entrepreneurial designers who are capable of dealing with a transition towards Design for Sustainability as a mainstream design approach, as well as to promote cooperation and mobility with the EU's partner countries; and to establish a basis for a permanent and active European Network of Design for Sustainability.

This was achieved through a knowledge co-creation process and the development and pilot training materials in order to teach and train students, faculty and enterprise staff of the design sector.

The project formed by 12 partners is organised around four country hubs in Ireland, The Netherlands, Catalonia and Sweden. Each country Hub consists of one university with education and research in Sustainable Design, one Design company with expertise in sustainable Design and one national design association. The project main results are:

- The Open Educational Resources database (http://circulardesigneurope.eu/oer/) where resources in Circular design are clustered in three taxonomies: Categories (First-timers; Practitioners), Level (Beginner; Intermediate; Advanced) and Tags (calculator; report; …).

- The Best Practice Publication, shows the whole design process, materials, challenges, problems and other key issues of Circular Design case studies within sectors like technology, furniture, clothing, lighting or packaging, to demonstrate that circular design strategies can be applied to improve the efficiency of almost every system.
- Four international one semester internships for undergraduate design students in the four universities involved in the project with the participation of 11 companies and 45 students.
- The Circular Design Digital Fabrication Lab Handbook to introduce students, companies and academics to the open-source, participatory, experimental and design & build approach within digital fabrication labs.
- The Professional Development Course in circular design.
- The Policy Paper in Circular Design Education

1 Introduction

The Circular Design - Learning for Innovative Design for Sustainability (L4IDS) project (http://circulardesigneurope.eu/) is a three year (2016-2019) Erasmus + Knowledge Alliance financed project.

The consortium consisted of 12 partners (4 Universities with education and research in Design and Sustainable Design, 4 Design Companies with expertise or interest in Sustainable Design and 4 Design association of the country) organised around country hubs (Table 1).

Table 1: Circular Design Partnership.

Country hub	Catalonia	Ireland	Sweden	The Netherlands
University	Universitat Politècnica de Catalunya	University of Limerick	Linköping Unviersity	NHL University of Applied Sciences
Company	NutCreatives	One-Off	Habermann	Ceci N'est Pas Une Holding B.V
Design professional body	Barcelona Centre de Disseny	Institute Designers Ireland	Swedish Industrial Design Fundation	House of Design

The goal of the project is to promote sustainable consumption and production of products and services in Europe. This is achieved through a knowledge co-creation process and the development of training materials, through Open Educational Resources (OER), in order to teach and train students, faculty and enterprise staff of the design sector in Innovative Design for Sustainability (IDfS) strategies (Figure 1). The project is aligned with European Circular Economy policies and contributes to the realization of a more sustainable society.

The evolution of the DfS field has broadened its theoretical and practical scope over the years (Ceschin *et al.*, 2016). While the first approaches of the early 90's, were focusing predominantly on the technical approaches of sustainability (Adams *et al.*, 2016), the following ones have recognized the crucial importance of the role of users, resilience of communities, and more generally of the various actors and dynamics of socio-technical systems (Joore, 2010; Joore & Brezet, 2015). This evolution has been accompanied by an increased need for human-centred design knowledge and know-how. Initial DfS approaches related to the product innovation level predominantly requiring technical knowledge and

knowhow. On the other hand, more recent DfS approaches require designers to be provided with a different set of expertise. For example techniques to gather insights from users, news ways of satisfying customers and techniques to co-design with them are essential (Adams *et al.*, 2016). The project presented here aims at influencing the overall system, from the physical product to the socio-technical level.

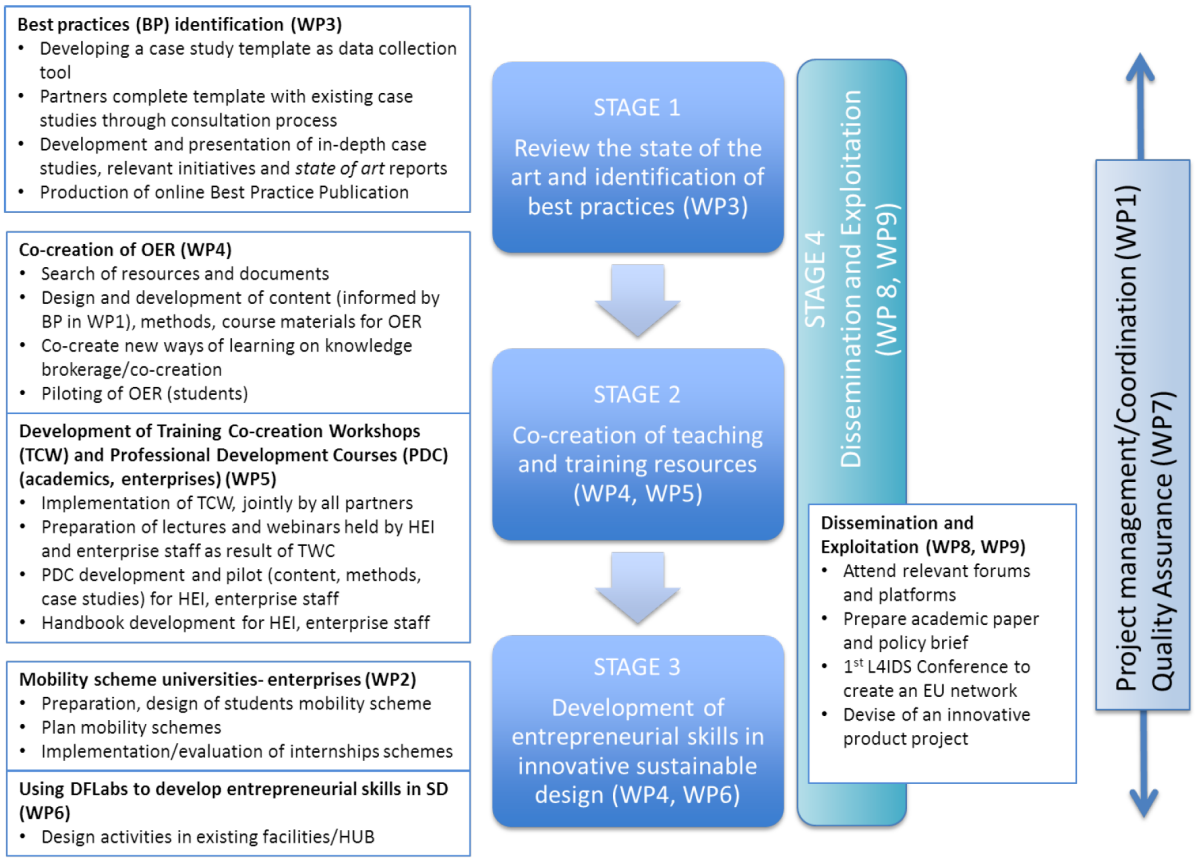


Figure 1: Circular Design – Learning for Innovative Design project rationale.

To map the position of potentially new educational tools and methods, this research builds on the overview of previous initiatives around DfS in higher education which some of the consortium partners have been involved with researching (See section 2). By mapping these initiatives on the triangle Design for Sustainability (DfS) - Knowledge Co-Creation – Innovation we have articulated the gap which the Circular Design project aims to bridge. As a basis for this inventory, the DfS evolutionary framework has been used (Figure 2).

2 Overview of design for sustainability in higher education

The concept of sustainable design as a specialism within design, business and manufacturing is not a new one. Writers and educators such as Victor Papanek (1971) and Buckminster Fuller (1969) were advocating a change in the way we taught students how to design and look at the world in which they live. In parallel with this, many other experts (Carson, 1962; Lovelock, 1979) were highlighting the difficulties being caused by industrialization and global trade in the natural environment. Issues such as the dramatic impact of the global population on ecosystems; the strains on the global and local economic systems and the challenges meted by social inequity were starting to be raised by scientists, economists and even designers

as early as the 1960s. These are now finally accepted as real problems for today's students and professionals and for the world as a whole. They now provide clear opportunity both to graduates and to businesses as fields in which they can provide and develop expertise with a view to mitigating past and future problems.

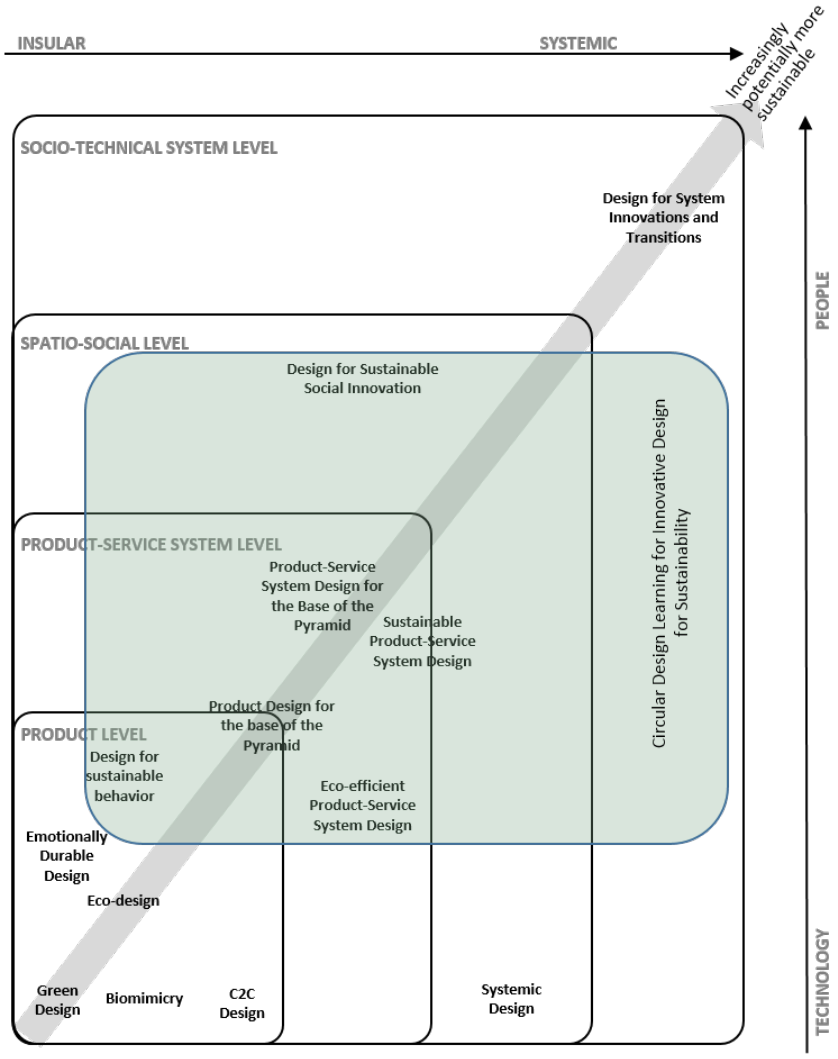


Figure 2: Circular Design Project within the DfS evolutionary framework (Segalas *et al*., 2017).

3 Objectives

The overall objective of the project is to promote sustainable consumption and production of products and services in Europe. To achieve this main goal during the project the partnership co-create open-source training materials, and organised four international internships for design students in order to teach and train students, faculty and enterprise staff of the design sector in Innovative Design for Sustainability (IDfS) strategies (Figure 1).

The project co-created training materials are:

- Best Practice Publication
- Open Educational Resources Database
- International Internships for students scheme
- Professional Development Course and handbook for capacity building and
- Policy Brief in Circular Design Education
- Digital Fabrication Lab handbook for Circular Design.

4 Methodology

The methodology applied is participatory action research. We carried out 3 co-creation workshops with the participation of 29 companies, 45 design students and 40 design academics, where the different outcomes were discussed and agreed. Moreover the different training resources has been piloted and assessed in the sequential four internships during the three years of the project.

5 Results

The Project is structured around the tangible expected outcomes structured in work packages. Next sub-sections show the results achieved. All results can be downloaded from the project website: **http://circulardesigneurope.eu/**

5.1 Best Practice Publication

NutCreatives partner was in charge of coordinating the ideation, prototyping and publication of best case studies publication (Figure 3). Relevant case studies, based on real company successful experiences have been released and disseminated along the duration of the project, and eventually collected in an e-book. Emerging and consolidated companies of diverse fields have been collaborating drafting the case studies. Aside from specific results and the great quality of the final product, the insights resulting from these collaborations processes among the different companies involved were of invaluable contribution for the project experience and for the companies themselves.

The eleven case studies represent the diversity of sustainable designed products and services in Europe. They are from really different sectors like technology, urban furniture, waste management, clothing and accessories, food packaging or furniture to show how sustainable design strategies can be applied in every sector. The result is a collation of well implemented business models based in excellent products, showing the creative process and the strategies that made them innovative and profitable.

We put a lot of energy into the creation of infographics that allow different levels of reading, to illustrate the different process and methodologies in a clear way. This includes concept maps, icons, tags, etc. but also longer texts that show the information achieved during the interviews. The Publication contains 11 case studies:

1. **Sea2see**: a change agent in the eyewear industry
2. **Transparent speaker**: a future proof strategy for the technology sector

3. **Mamukko**: Ecoinnovation thanks to a new material combination.
4. **Novell coffee capsules**: a family-owned company rethinking its business model
5. **Frisian sweater**: sustainable design strategies for the clothing industry
6. **Vectorial system**: improving accessibility with a sustainable product
7. **2.31 Recycled carbon chair**: ecoinnovation enabled by a new production process
8. **Deterra by Tierra**: world's First 100% Bio-Based and fossil-free technical Jacket
9. **Relaja**: an urban furniture system that gives value to a waste material in small local economies.
10. **Cool Downlight**: finding sustainability in searching for efficiency
11. **R11 New Logic chair**: a big compendium of strategies to produce a long-lasting and sustainable product



Figure 3: Best Practice Publication; Circular Design Handbook and DFlab publications

5.2 Circular Design Open Educational Resources Database.

A database collating tools and methods for Design for Sustainability and Circular Economy, presenting them in different and easy-to-navigate categories was made available through the project website, and widely disseminated to different stakeholders. The database was designed to be consulted according to different levels of expertise, from first-timers to experts. Furthermore, the technical design of the database allows researchers, educators and practitioners to easily upload and share with the design community their OERs through the portal.

5.3 International Internships scheme for Circular Design

The universities involved in the project developed an International Internship program for Circular Design with an adoptable schedule conforming to the structures of these universities. The aim of the program is to promote a culturally-diverse, interdisciplinary working environment for students from varying backgrounds (i.e. Product Design, Business, Materials Science).

To develop the internship the action research approach was used as developing an adaptable Circular Design internship program, where different institutions from different cultural backgrounds and pedagogical perspectives are involved and the development of the program, requires reflection of the involved

researchers on the existing design education. Hence, in line with the action research cycle steps of reflection, planning and action (McNiff & Whitehead, 2006), the collaborative action research framework in Figure 4 was developed.

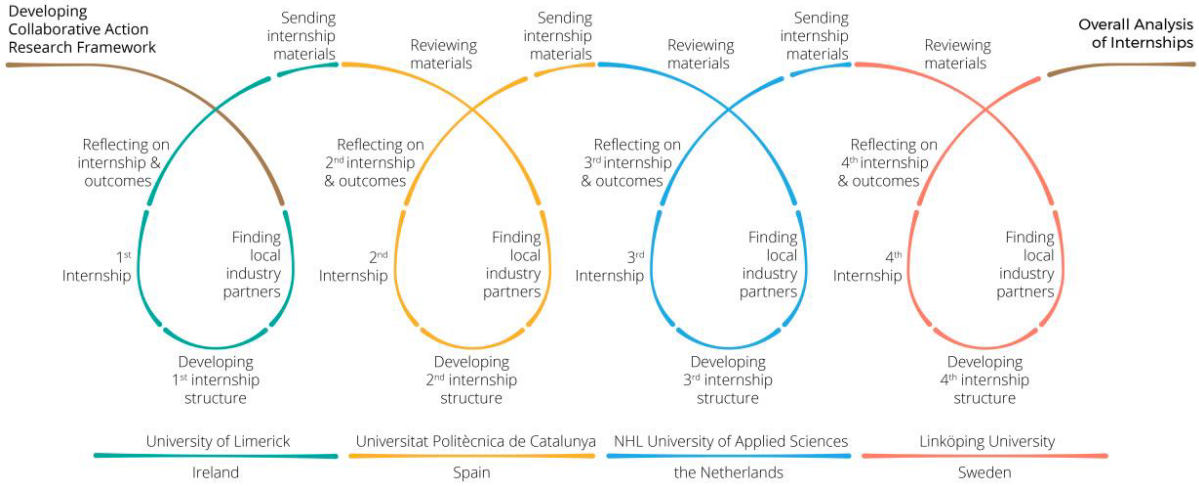


Figure 4: Collaborative Action Research Framework developed indicating the internship cycles. (Adapted from Bakirlioglu et al., 2018)

5.4 Professional Development Course and Handbook for Circular Design

Based on the experience and knowledge gained through project outcomes - and specific co-creation workshops held jointly with university and enterprises in the different partners' countries - an online handbook (Figure 3) aimed at guiding knowledge co-creation processes among staff of university and enterprise in IDfS have been published. This training resource aims at providing universities and design enterprises a selection of useful resources, strategies, training methods and step-by-step recommendations in order to engage with IDfS in professional practices and to foster entrepreneurial skills in this specific field. The content of this handbook has been drafted as a working base to develop/structure professional development courses on IDfS

5.5 Policy Brief in Circular Design Education

A policy brief based on the project's outcomes has been drafted and disseminated. This outcome constitutes a call for action aimed at integrating Circular Design in policies of the European Union particularly addressed to Circular Economy. Specifically, it states that circular design thinking and development should be implemented throughout all of European policies and sectors: i) starting with education in schools and universities; ii) offering a lifelong learning covering all sectors, including policy makers and iii) continuously adding high level sustainable development for all professionals and business types.

5.6 DFLab handbook for Circular Design

The handbook (Figure 3) is an introductory guide to bring together digital fabrication labs (e.g. FabLabs, hackerspaces, makerspaces, etc.) and the related practices enabled through digital knowledge sharing into

design education for sustainability and Circular Economy. It introduces terms of these newly espousing fabrication spaces and the communities around them, potentials of these spaces for sustainability and Circular Economy. The contents of this handbook were used as a base for delivering masterclasses as part Circular Design Internships conducted during the project.

6 Acknowledgements

We like to thank all companies, students and faculty that have collaborated with this project. Special thanks to the Erasmus+ Key Action program: Cooperation for innovation and the exchange of good practices. Action Type: Knowledge Alliances for higher education for funding the project.

References

Adams R., Jearnrenaud D., Bessant J., Denyer D. & Overy P. 2016. Sustainability-oriented innovations: A systematic review. International Journal of Management Reviews, 18(2), 180-205.

Bakirlioglu, Y., McMahon, M., Eyto, A. & Rio, M. 2018. Training the next generation of designers for a sustainable future: action research on the circular design internship. A: Design Research Society. "Design Research Society 2018 Catalyst: DRS 2018".

Carson R. 1962. Silent spring, Boston: Houghton Mifflin.

Ceschin F. & Gaziulyosy, I. 2016. Evolution of design for sustainability. From product design to design for system innovations and transitions. Design studies, 47, 118-163.

Fuller R. & Snyder J. 1969, Operating manual for spaceship earth, Southern Illinois University Press Carbondale, Illinois.

Joore P. 2010. New to Improve, The Mutual Influence Between New Products and Societal Change Processes, (PhD Thesis), 2010 (Delft: Technical University of Delft).

Joore P. & Brezet H. 2015. A multilevel design model: The mutual relationship between product-service system development and societal change processes, Journal of Cleaner Production, 97, 92-105.

Lovelock J. 1979. Gaia a new look at life on earth, Oxford University Press.

McNiff, J. & Whitehead, J. 2006. All You Need to Know About Action Research. London: Sage.

Papanek V. 1971. Design for the real world, human ecology and social change, London: Thames & Hudson.

Segalas, J.; DeEyto, A.; McMahon, M.; Joore, P.; Crul, M.; Wever, R. & Jimenez, A. 2017. Circular Design. Learning for innovative design for sustainability: Erasmus + knowledge Alliance Project for Sustainable Design. International conference on Engineering and Product Design Education. pp. 18. Oslo. Norway.