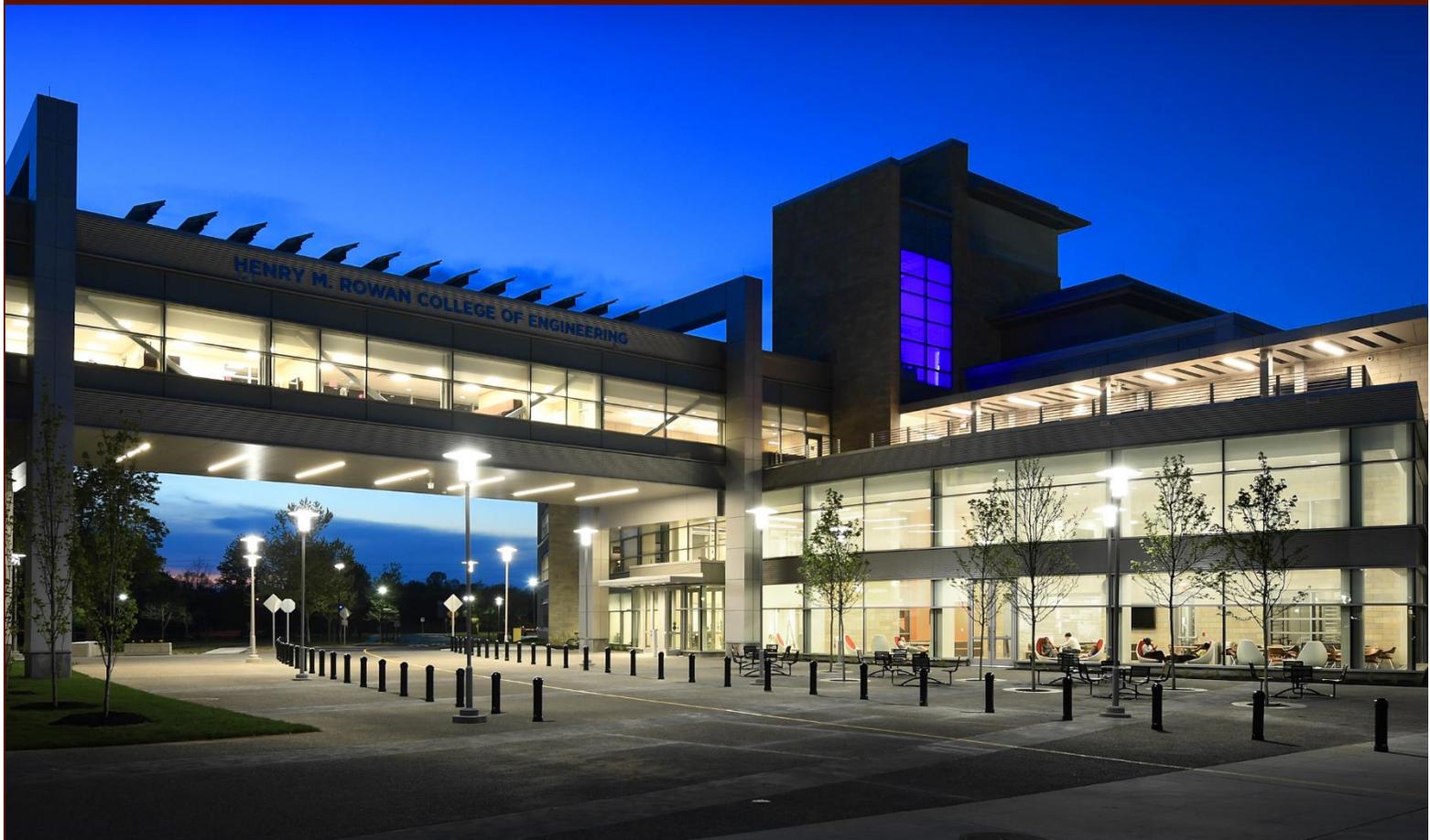


EESD 2018 PROCEEDINGS

ROWAN UNIVERSITY

June 3-6



CREATING THE HOLISTIC ENGINEER

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Circular Design - adventures in interdisciplinary collaboration and learning for a circular economy

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Abstract

The Circular Design (L4IDS- Learning for Innovative Design for Sustainability) project was conceived by members of the EESD network following a three-year application and development stage to secure funding under the European Union Erasmus + Knowledge Alliance scheme. The Partners include four academic institutions, four design led SMEs and four national or regional design representative bodies from Catalonia, Sweden, Netherlands and Ireland.

The goal of this Circular Design project is to support the development of skills necessary to promote sustainable production and consumption of products and services in Europe. The project falls within the Innovation, Higher Education and Business area and is aligned with European policies on the Circular Economy.

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

Project Goals:

The project is leading an increase and improvement of the learning strategies of Design for Sustainability, and is identifying opportunities for sustainably designed products and services as well as business opportunities in both higher education institutions and industries in the four partner countries.

Open educational resources and training courses in Innovative Design for Sustainability are currently being co-created and targeted at academics, students and companies and industry staff.

Common goals among Circular Design partners are to train up innovative and entrepreneurial designers (and non-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.

The researchers involved with the project demonstrate how an interdisciplinary co-design approach to tackling 'wicked design problems' can develop viable sustainable product and product service systems in partnership with SMEs and students.

As this project is currently underway, this paper outlines the progress to date of the first and second interdisciplinary student internship programs held in Autumn 2017 and in Spring 2018. It also summarizes the 'Best Practice Publication' developed through the project and outlines the development of OER (Open Educational Resources) to support the project and for future use by SMEs and Educational Institutions.

1 Introduction and method

The Circular Design - Learning for Innovative Design for Sustainability (L4IDS) project is a three year (2016-2019) Erasmus + Knowledge Alliance financed project. 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, 2010). This evolution has been accompanied by an increased need for human-centered 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 (Ceschin *et al*, 2016). The project presented here aims at influencing the overall

system, from the physical product to the socio-technical level.

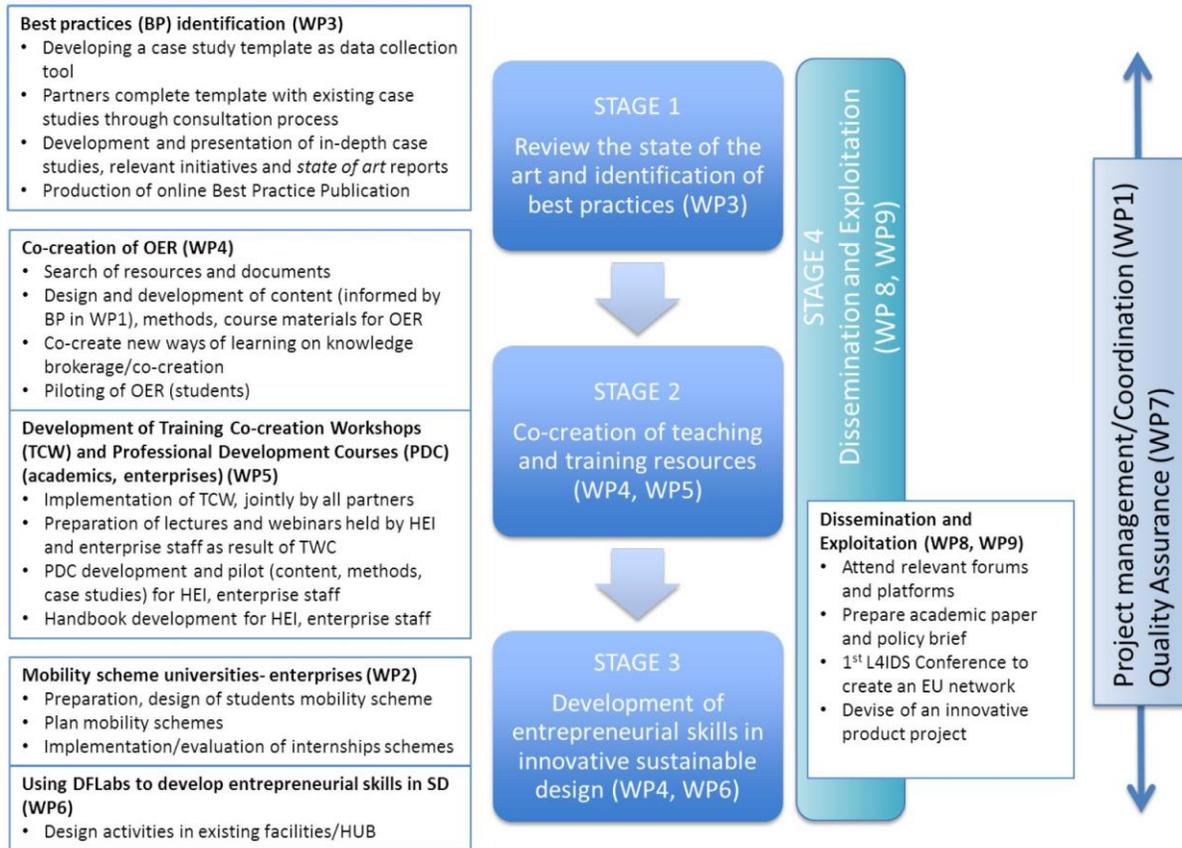


Figure 1. Circular Design – Learning for Innovative Design project rationale

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 (see 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. Many of the collaborators and authors on the project have previously published research work in this area at EESD and elsewhere and this experience has proven invaluable to informing the project formation. (Dewulf K *et al*,2009, de Eyto *et al*, 2013, Wever *et al*, 2015, Mulder & Segalas, 2012 & Mc Mahon *et al* 2008)

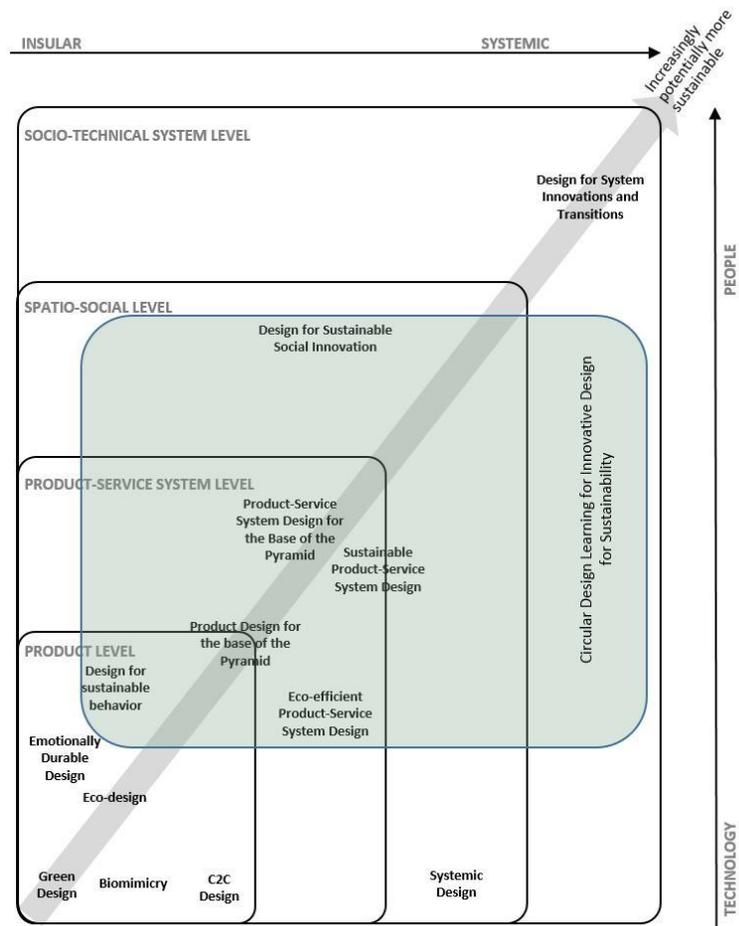


Figure 2. Circular Design Project within the DfS evolutionary framework Published by Segalas et Al. E&PDE 2017

3 Circular Design Internships

The internship programme is being developed by the four higher education institutions in four different

EU countries, who share similarities on their approach to design education (i.e. practice-based learning in studio environment). Challenges persist in structuring of curriculum and content (e.g. duration of bachelor education, courses, trainings, access to workshops, etc.). This complicates the development of a standardised internship programme with respect to the students differing backgrounds and inclusion of the programme in existing curricula. On the other hand, the focus of the internship (i.e. sustainability and circular design) clarifies the common educational goals that help structure the internship programme. Hence, four higher education institutions agreed upon adopting a *Collaborative Action Research methodology* (Oja & Smulyan, 1989) through iterating the internship programme by reflecting on and building upon the previous implementation of it, and providing reflections and guidance for the subsequent internships.

The internship programme was announced in the four partner universities, calling for students of varying backgrounds that were interested in issues of sustainability and wanted to experience design for sustainability in real-life contexts. The industry collaboration, interdisciplinary nature and multi-cultural approaches of the internship were clarified in this announcement. Students applied to this internship through a portfolio, an academic reference and a short video addressing their interests in design for sustainability and their expectations from the programme. The applications were assessed according to academic and design performance, evidence of team work, interest in design for sustainability and demonstration of motivation to take part in this internship. As a result of this assessment, 10 interns from different backgrounds (i.e. Product Design, Business, Materials Science) were selected to participate. It should be noted that these participants were novice designers and accordingly the internship needed to provide two kinds of learning experience: *general design practice* and *design for sustainability*.

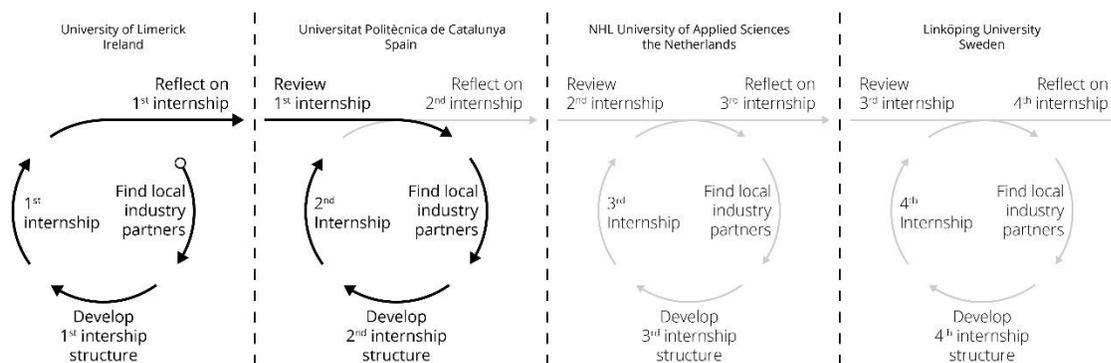


Figure 3. Collaborative Action Research Framework developed in the Circular Design (LAIDS) project, indicating the internship cycles.

3.1 First CD Internship program (September-December 2017):

This program took place in Limerick, Ireland over a 12-week period in the autumn of 2017 with the

collaboration of three industry partners with diverse needs, who are capable of realising projects of different scales, three different design briefs were developed which are summarized as follows:

- **Material Explorations** with [Mamukko, Kinsale](#), Exploring the potentials of a reclaimed material – used fishing nets – and developing innovative solutions on reusing it along with leathercraft.
- **Retrofitting** with [OneOff, Dublin](#), Designing bespoke, high-end office furniture with a take-back system and reusable products/parts/materials
- **Preventing Food Waste** with [Southern Regional Waste Management Office, Limerick](#), Reimagining the food waste management in/around Limerick and develop solutions for prevention and reuse of food waste.

These projects presented three distinctly different scales in terms of circular design. The *material explorations* project focuses on the reuse/recycle of a problematic material that is discarded in oceans, contaminating the sea and endangering marine life. The purpose of the project was to explore ways of introducing this material into SME production processes thus giving it a second life. The *retrofitting* project focuses on the problem of underused, high-end furniture with valuable materials being discarded before their potential life span ends and aims to explore ways of reusing the furniture or the materials used in the furniture with the limited organizational capabilities of a design consultancy. The *preventing food waste* project identifies the issue of excessive amounts of food waste produced by citizens and the cultural implications of this issue. The project aims to intervene into existing models of discarding food waste and its waste stream to explore ways of preventing food waste in the first place.



Figure 4. The 1st Intern Group with their Industry Collaborators at the final presentation in UL

3.2 Second CD Internship program (February-April 2018):

At time of writing the second Circular Design Internship is underway in Barcelona, Spain with Student groups working again with a variety of local companies and enterprises.

- **Waste management** in municipalities with user identification technologies with [ENT](#), environment and management consultancy.
- **Selective separation of waste in the workplace.** PC Recircula, a project that promotes the circular economy in the use, purchase and responsible management of resources and waste of Universitat Politècnica de Catalunya.
- **Material innovation for urban application.** [ZICLA](#), a company that innovates with recycled products and with the management of residues.

Although the challenges of each of the projects are quite diverse, they were regarded in the scope of the Circular Economy. These projects were well-aligned to observe the implications of Circular Design at different scales and how this internship programme can train the next generation of designers to respond to the diverse challenges imposed by a Circular Economy approach. It should also be noted that the industry partners for these projects were aware of the global and local issues related to sustainability, however they needed assistance to respond to these challenges in the context of their businesses. The outcomes of this internships did not have to be applicable right away, rather these industry partners were interested in the Circular Design process and the opportunities it presented for their businesses. The enthusiasm of the industry partners is important to support the design process, and concurrently, the interns.

4 Best Practice Publication

The Circular Design Project consortium is currently in the final stages of developing a Best Practice Publication (BPP) for educators, SMEs and others to use as a suite of exemplars for current best practice in design for circular economy. The Case studies have been generously provided by a wide variety of industry and societal stakeholders in the partner countries that are involved with the project. By Developing the BPP as an open source platform

The Best Practice Publication in Circular Design is the first tangible outcome of the project for those not directly involved with the Internships and aims at inspiring designers and design students in the process of developing more sustainable products and services. In it you can see a selection of projects of a great variety of sectors, from furniture to food packaging, lighting, clothing or accessories, with the common characteristic of being created from a perspective of sustainability, including circular design strategies that involve improvements throughout their life cycle. The main difference of this publication with others of a similar scope is that it is more focused on the process, on the actions that were necessary and on the actors involved than on the final result of the project itself, with the aim of providing methodological tools to those who consult it, in addition to including a strong graphical load with infographics to make its reading as clear as possible.

While there are examples of case study or best practice publications within circular economy (e.g. (Bakker *et al* 2014, Tempelman *et al*, 2015 & MacArthur foundation, 2017) , the one the Circular Design project is developing:

- has a focus on projects utilizing co-creation approaches,
- describes the actual processes, and not only final results,
- explicate the learnings for the stakeholders involved.

As this will be a co-design for sustainable learning processes publication, the successful learning will be more important for the inclusion of cases than the successful innovation. This is also interesting because of the fact that we are studying the combination of DfS strategies with Co Creation processes, so that the publication will showcase a methodology than combines the environmental approach with the social sciences leading to the IDfS.

By doing so, the relevance of the case descriptions for designers is hopefully maximized, and therefore the usability of the publication within the Circular Design project. It will be utilized as study material in the student exchanges, and in the training material for the Professional Development Course, and within the Open Educational Resource.

5 Conclusions to Date

The Circular Design project builds on the experiences of the undergraduate and masters' level of learning around DfS and links it with SME needs in a CE environment. Many of the DfS programs that currently exist have a real challenge in implementing their learning within societal and industrial contexts. The multidisciplinary internships that use co-design methodologies alongside of CE strategic approaches are providing a link between stakeholders within the real economy. i.e. the SME sector and the students.

As the project is ongoing it is difficult to articulate all of the outcomes and new learnings however the reflections by participants and educators on the first two stages of the collaborative action research cycles has shown promise as students and industry participants suggest that they are developing their understanding and implementation of CE and Circular Design practices in an applied and practical manner. Turning the Theory of CE into a reality and grappling with the wicked problems that Design for a Circular Economy presents. The Project is due to conclude in 2019 so further publications of the final outputs and learnings will follow.

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