



# A circular economy approach for lifecycles of products and services

## Report of implementing living labs and ACSI-events and recommendations in the future circular economy efforts

Deliverable 7.2.

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## Summary

Deliverable 7.2 *Report of implementing living labs and ACSI-events and recommendations for the future circular economy efforts* is the outcome of Task 7.2 Implementation of Living Labs and Task 7.3 ACSI-events. The report summarizes the CIRC4Life Living Lab implementation results following the Living Lab methodology developed in D7.1. The report explains how the methodology was utilized to support CIRC4Life-project demonstrations to co-create, test and validate their three circular economy business models (CEBMs) with the help of the iterative and multi-stakeholder Living Lab approach.

Task 7.2 Implementation of Living Labs followed the methodology defined in D7.1 and took as the starting point the results of the first Open Innovation Camp (Task 7.3). The task included identifying and engaging relevant user and stakeholder groups for the co-creation, co-development, testing and interaction with the internal solution and business model developers; collecting user feedback, attitudes and comments regarding products and solutions; as well as systematic analysis of user and stakeholder feedback.

Task 7.3 arranged two Open Innovation Camps (OIC), one in the beginning of the Living Lab process in the first year of the project, aiming at collecting ideas and defining and selecting most promising concepts for the Circular Economy Business Model (CEBM) development and for the demonstrators. The second OIC was arranged as a virtual event at the final stages of the project with the aim of validating and evaluating developed solutions, CEBMs and demonstrators. Second OIC also concluded Living Lab activities in CIRC4Life project.

The living lab activities described in this report are interrelated with other project activities. For example, relevant stakeholders have been identified and mapped in WP1 Task 1.4 *Interaction in supply chain concerning consumers*, as well as in WP7 Task 7.4 *Stakeholder involvement along the supply chain*. Identified stakeholders and value chains have been considered and integrated into the implementation actions that are further detailed in the report. Living Labs have been extensively providing inputs for WP1, specifically for the engagement of stakeholders in LED demonstrator. Consumer attitudes have been collected as a part of WP3 Task 3.4 *Consumer satisfaction surveys*, which were also used as the basis for understanding user needs and requirements. Knowledge developed in CIRC4Life Living Labs has been used as the basis for demonstration activities planning in WP6. Especially in the later stages of the development process, real-life testing, a close collaboration with demonstrators' activities have been deployed in the project.

**In all, 3007 persons participated in 54 different living lab activities.** Since the CIRC4Life-project focused on developing CEBMs for companies, end-users were the most dominant stakeholder group in the living lab activities (N=2718, 90.4 percent). The division between the remaining QH stakeholder groups was the following: Business partners (N=136, 4.5 percent), academia (N=130, 4.3 percent), and public authorities (N=23, 0.8 percent). A little over half of the participants (N=1555, 51.7 percent) participated in one of the surveys. Crowdsourcing and open community engagement activities were the second most productive activity (N=596, 19.8 percent). The division between remaining living lab activities was following: Workshops (N=383, 12.7 percent), facilitated testing (N=211, 7.0 percent), Open innovation camp (N=134, 4.5 percent), real-life testing (N= 116, 3.9 percent), and interviews (N=12, 0.4 percent).

Results of the living lab implementation in CIRC4Life clearly indicate the importance of systematic engagement of all relevant stakeholders, including end-users, into the development process from the early stages up until the market launch. The results also confirm that **interactions between the developers and users** are the key to customer acceptance. Experiences of CIRC4Life Living Labs show the varying level of success of such engagement in different demonstrators. It can be concluded that the success of the Living Labs depends on a number of factors, including a company customer knowledge; understanding of user-centered design and open innovation; knowledge and acceptance of co-creation and iterative development, and readiness and ability to engage relevant stakeholders.



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## Acronyms and abbreviations

Abbreviation	Description
CEBM	Circular Economy Business Model
CE	Circular Economy
LL	Living Lab
ACSI	Aalto Camp for Societal Innovation
OIC	Open Innovation Camp (previously referred as ACSI)
DEMO	Demonstrating company
KPIs	Key performance indicators
UI	User interface
QH	Quadruple Helix representation: Academia, Business, Public authorities, Users

## Introduction

Utilization of stakeholder knowledge in a co-creative development process using living labs is at the core of CIRC4Life project methodological approach. In Europe, living lab approach has been applied to develop CE solutions for various industrial settings, especially in Europe's biggest Research and Innovation programme Horizon 2020 (Santonen 2020). However, implementation of the Living Labs in the innovation processes related to CE is a relatively new phenomenon, as it spans not only across different stages of an innovation process, but also involved interconnected value chain networks of companies, citizens and other stakeholders engaged in the CE staged and processes.

In CIRC4life, Living Labs have been defined as a framework for involving actual customers and other key stakeholder in the collaborative innovation process (Purola et al, 2019a). At the core of the living lab process are multi-stakeholder participation, user-centered innovation process, real-life settings, utilization of systematic multi-method approach via iterative co-creation process. In CIRC4Life, Living Labs start with co-developing - and end with co-validation of developed solutions. However, in real-life a living lab is a continuous iterative process which does not end once a solution has been developed but allows for further iterations and interactions between users and solution developers during the solution lifespan.

CIRC4Life project can be roughly divided into 2 phases: development of CEBMs phase (M1 – M18), implemented in WP1, WP2 and WP3 respectively, and implementation of CEBMs in demonstrators phase (M19 – M42). Living Labs run throughout the project, first supporting the development phase by co-creating concepts and solutions together with a wide range of stakeholders, and then testing and evaluating prototypes and developed solutions as a part of demonstration preparation.

In the **development** phase, Living Lab activities mainly covered ideation and conceptualization activities for the development of the three CEBMs. The role of the LL in this phase was to support the development by involving different end-user and stakeholder groups in the development of the solutions, utilizing concepts, methodologies and approaches from the living labs community. The main benefits of such end-user/stakeholder involvement are better acceptance of demonstrators and improved acceptance of the final solutions. Since the project included different tracks of development of CEBMs and solutions (so-called DEMO-specific activities), the end-user co-creation, co-development, testing and validation processes have been coordinated with the different development efforts. The activities included identifying and engaging relevant user and stakeholder groups for the co-creation and co-development.

First Open Innovation Camp (Task 7.3) served as the starting point for the LL activities in the project. It was arranged in the early stage of the project (M7) and concentrated on input to the development of the CEBMs and demonstrators, to enable them to be accurate in their design and usability for the iterative development processes. In the first eighteen months of the business model development process, all together 22 LL activities were organized and/or coordinated by LAU, out of which 6 activities were CEBM-specific (four co-creation workshops for CEBM A development, and 2 activities for CEBM B development). Remaining activities included user and stakeholder engagement across business models. These activities are described in detail in *D7.4 Experience and recommendations of end-user engagement across circular economy business model development*.

In the **implementation** phase, the 32 conducted LL activities concentrated mainly on further refinement of the CEBM concepts and solutions, as well as developing, testing, evaluating and providing feedback for developed solutions. During this stage, demonstration plans (WP6) have been developed based on the results of the LL activities. The phase included a number of physical and virtual testing events, including large-scale digital concept testing using storyboards, and physical real-life small testing events with users to ensure usability and functionality of developed solutions. Second Open Innovation Camp (Task 7.3) served as the final LL activity in this process. The second OIC event took place virtually at a final stages of the project (M37), to evaluate the developed demonstrators and solutions for future development and market deployment, as well as to disseminate the project outcomes.

This deliverable describes practical implementation of both Open Innovation Camps as the starting and ending phases of CIRC4Life Living Labs and presents key insights from the implemented Living Lab activities specific to the project demonstrators. It is worth mentioning that some of the LL activities, such as e.g. consumer app testing events, showrooms and evaluation of sustainable consumption implementation, have been arranged independently from the demonstrators, however, the results of these activities have been utilized by the solution developers in their further work. This report is the outcome of Task 7.2 and Task 7.3.

The remaining part of the report is structured as follows:

- Chapter 2 describes the overall Living Lab approach in CIRC4Life and LL implementation in the demonstrator-specific settings;
- Chapter 3 is dedicated to the practical implementation of the Open Innovation Camps as a method to rapidly engage stakeholders in the LL process;
- Chapter 4 addresses impact of COVID-19 on the LL implementation in CIRC4Life;
- Chapter 5 provides recommendations in utilizing Living Lab approach in future Circular Economy efforts.

## Living Labs in CIRC4Life

### 1.1 Overall principles of Living Lab implementation

Living Labs, as an open innovation approach, provide a general iterative framework for conducting research and development in the real-world, where end-users and other relevant key stakeholders are involved and work together in order to identify challenges and opportunities, and to co-create, test and validate novel solutions (D7.1).

The CIRC4Life Living Lab methodology developed in D7.1 provided a common framework for the implementation of the Living Lab activities. More specifically, demonstrator-specific implementation plans described in Chapter 7 of D7.1 served as the guiding document for the Living Lab implementation, following the four stages of the innovation process described in Figure 1.

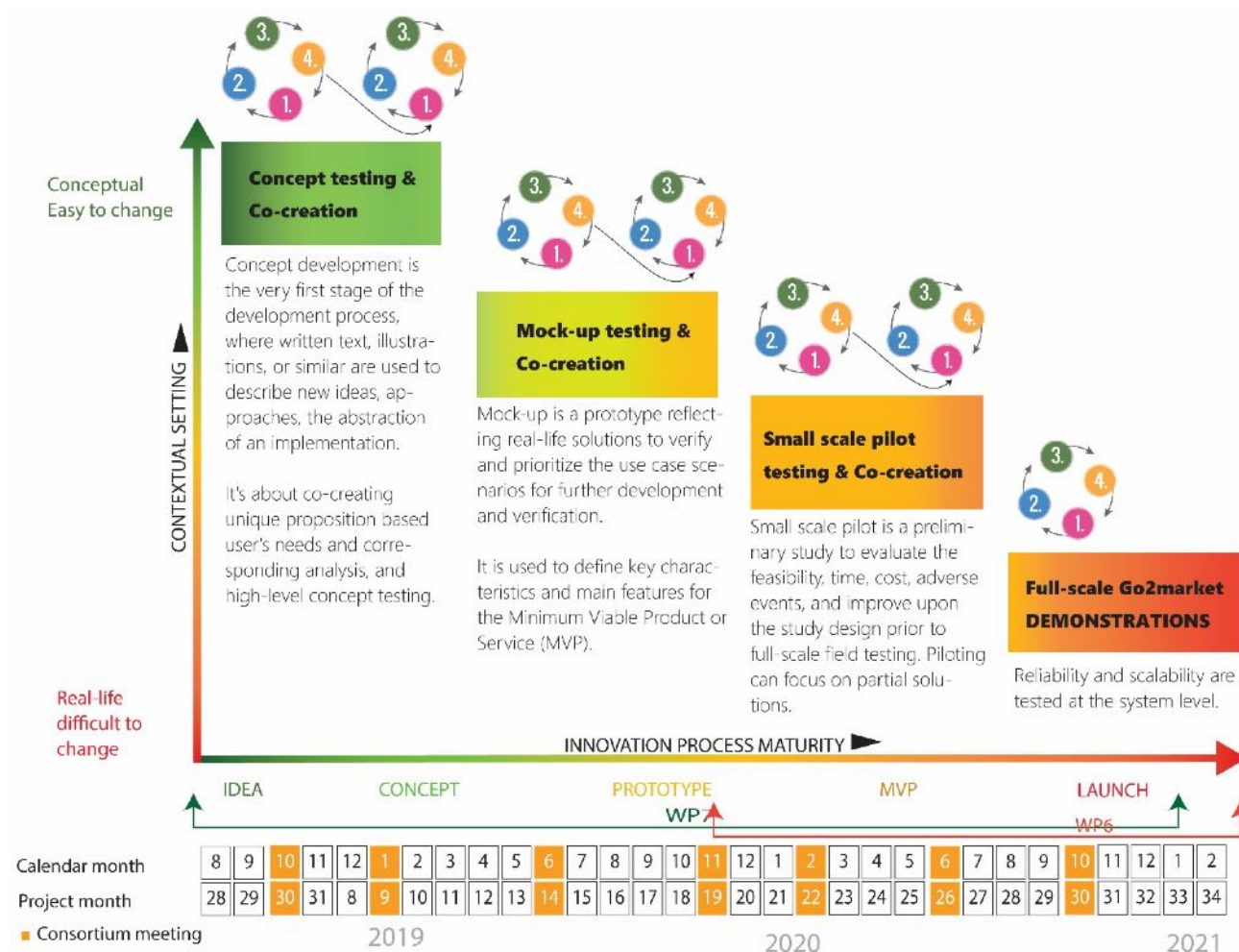


Figure 1. Living Lab approach in CIRC4Life (D7.1)

The living lab plans were updated iteratively after each phase within the rhythm of consortium meetings, in respect to the received feedback and results. These plans consisted of a timeline visualization of the overall process (Figure 2.), including both past execution and planned future activities, as well as written description of each activity. Despite implementation plans being developed and agreed upon, the practical implementation underwent a number of changes as compared to original plans. First, the iterative nature of the Living Lab methodology implies that the results of each co-creation and engagement activity are fed back into the



development process and alter the direction of this process. Thus, the following LL activities can also change, if the development direction changes. In practice it means that each LL activity served as a decision-making point for the developers.

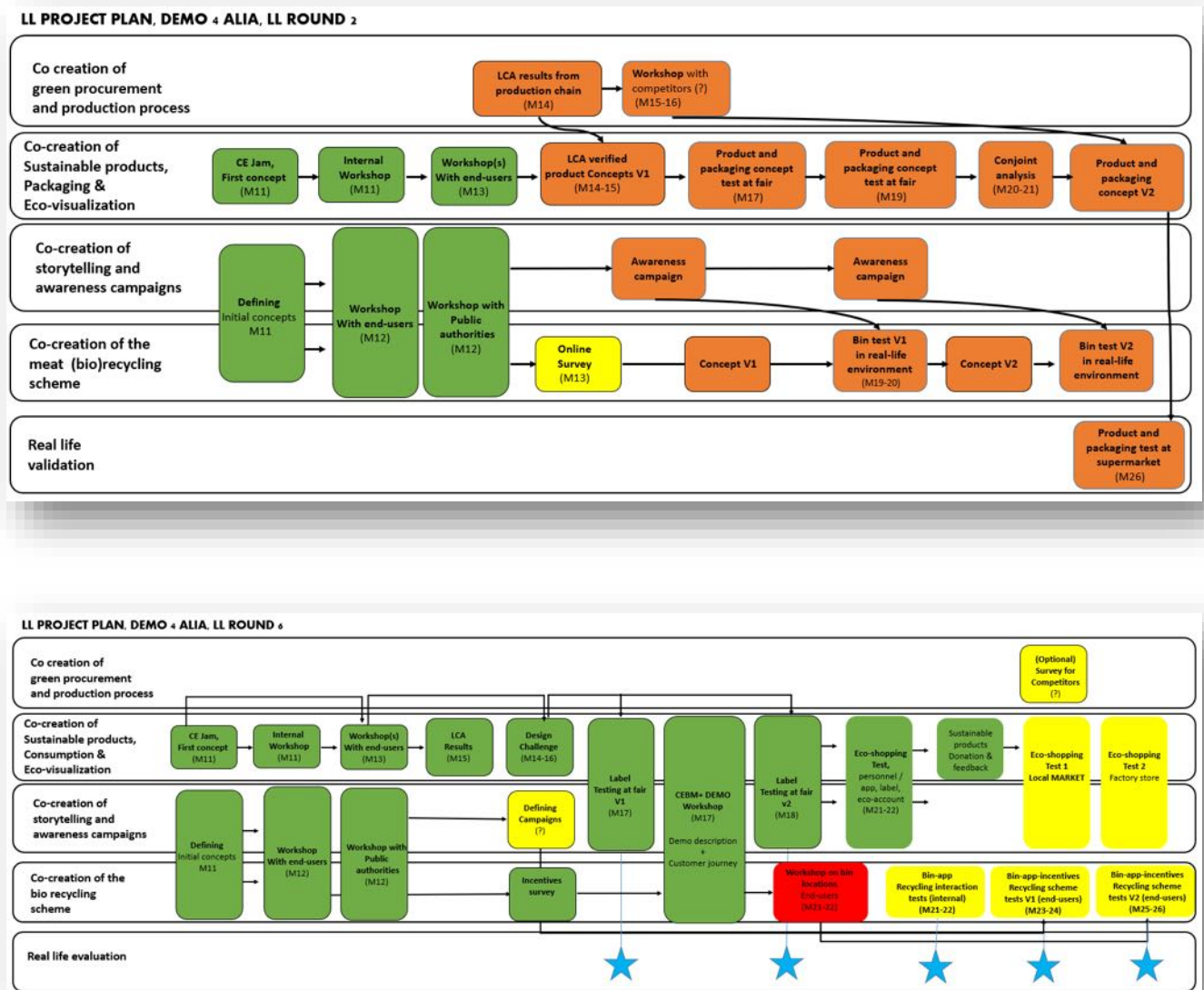


Figure 2: Example of the revision of Living lab plans for Meat supply chain

For each activity, Laurea also produced an internal report and a task summary describing the activity details and the main results. The task summaries from projects implementation phase (M19-34) are presented in Appendix 6 while previous activities are presented in *D7.4 Experience and recommendations of end-user engagement across circular economy business model development*. In addition, a set of guidelines (workshop structures, facilitation guides, reporting templates), tools (such as personas, customer journeys, CELLL – Circular economy Toolkit), prototypes (storyboards, eco-labels, intelligent container, application), events (Ce-Jam, Design Challenge, Consumer Jam, Showrooms) and related communication materials were produced by Laurea to support the living lab implementation, from which a selection of examples is presented in the below Figure 3.



Figure 3: Examples of guidelines, tools and materials developed by Laurea to support living lab implementation

Finally, the Covid-19 pandemic and resulting restrictions affected implementation of the Living Labs greatly, especially in the later stages of the innovation process, which implied participation of focus groups and relatively large numbers of stakeholders in a same place and prevented Laurea's team to travel on site to perform and support living lab activities. Evidently, some planned activities have been cancelled, and alternative plans have been created. The impact of COVID-19 on LL implementation is described more in detail in Chapter 4.

## 1.2 Classification of the implemented LL activities

In the following demonstration specific chapters (2.3-2.6) living lab activities are presented and classified based on the innovation process maturity phase, used methodology and connection to a CE-phases as defined in *D7.4 Experience and recommendations of end-user engagement across circular economy business model development* and depicted by Figure 4 below. Further analysis of the utilized classification and living lab activity connections to CE-phases is further discussed in Santonen, T & Purola, A., (in review). Each activity also has a event ID number, assigned with a **# mark**, while corresponding activity details can be reviewed from Appendix 6.



Figure 4: Classification of LL activities based on method and connection to CE and innovation process maturity phase

The definitions for living lab activities conducted in the CIRC4Life setting are the following:

- **OIC = Open Innovation Camp** is a multi-day design sprint type of co-creation event in which a group of various stakeholders are developing solutions to the predefined challenges in a facilitated working environment by utilizing a variety of co-creation methods. The OIC highlights the systematic cross-fertilization of ideas and expertise derived from diverse participants. (Santonen et al 2019; Santonen 2016)
- **CO = Open community involvement** included various open access activities such as crowdsourcing (Estellés-Arolas et al, 2012) which is a process where a task(s) is delegated (i.e. outsourced) via an open call by using internet to a large group of people (i.e. crowd) who complete the task according to task description. Open design challenge was arranged to co-create eco-label, which can present products related sustainability information.
- **T/R = Real-life testing** (also sometimes referred to as field test) is a process where quantitative and/or qualitative feedback is collected from the real target group in real-life settings by utilizing different data collection methods in order to validate whether the solution is working as intended, identifying comparing actual and expected outputs and user reactions and/or to make decisions for further actions. (Coorevits, et al 2018)

- **T/F = Facilitated testing** is a process where quantitative and/or qualitative feedback is collected from a target group in a controlled setting (e.g. laboratory, simulation or another similar highly controlled setting) by using low-fidelity to hi-fidelity concepts/prototypes in order to evaluate developed solution feasibility, practical potential, acceptance, and/or make decisions for further development (Schuurman et al 2016). In the context of CIRC4Life-project concept testing, mock-up testing and small-scale pilot testing was considered as facilitated testing.
- **WS = Co-creation workshop** is a facilitated group activity to find solutions for a specific problem by gathering ideas and insights from workshop participants while using variety of collaborative development methods (Schuurman et al 2016; Hagy et al 2017). Typically, durations for co-creation workshops varies from few hours to one day.
- **S = Survey** is a data collection technique of gathering data from a sample of people in which a formal list of questions is prepared, and statistical methodologies are often used for analyzing the results (Ramaswamy, et al 2018). Online, telephone, and street/mall intercept survey were utilized during the CIRC4Life-project.
- **I = Interview** is a qualitative data collection method taking place in an individual or a group setting (i.e. focus groups). Interviews follow either structured, semi-structured or unstructured interview approach and can be conducted in face-to-face, telephone or computer-mediated online setting. (Fowler, FJ. 2013)

### 1.3 Implementation of Living Labs in LED lighting

Demonstration 1, the LED lighting products, consists of two companies with vastly differing operating environments, one specializing on exclusive design in domestic lightings while the other on industrial lightings. Therefore, the two demonstrators were considered as separate cases in the living lab's, having individual processes and activities tailored to the specific needs of the companies.

#### 1.3.1 Domestic lighting products Living Labs (ONA)

Ona is a lighting product company located in Valencia, Spain. As an SME, the company subcontracts most components to other companies and the products are finally assembled at their own workshops. Their products include both ad-hoc and non-ad-hoc indoor/outdoor lighting products for the markets of both domestic and contract lighting products. Their products are sold through their networks of retailers and online shop situated in their [Website](#). The quality and design of their lighting products have also been recognized with numerous awards, and have been exhibited nationally/internationally, showing that research and development activities are highly considered in their business plan.

Ona's demonstration consisted of the implementation of three CEBMs in the following manner:

- **CEBM a) Co-creation of products and services:** development of sustainable, high-profile lighting products by identifying large volumes of consumer preferences and benefitting from value chain stakeholder's participation in the co-creation activities. Sustainable techniques developed by the project will be applied in the production of industrial lights, including traceability, ICT, eco-accounting, and sustainable design and manufacture.
- **CEBM B) Sustainable consumption:** is encouraged by showing the eco-points information of the new domestic lighting in Ona's online store, while providing valuable input to help consumers on their sustainable purchase decisions. The customer can view the product's eco-information, the customers receipt shows the information of both the cash payment and eco-point related to each item purchased, and the eco-points can be recorded into the consumer's eco-account.



- **CEBM C) Collaborative recycling:** by extending the lighting products recycling practices to end-users, enabling citizens to separate and recycle the products which have overpassed the expiration date via logistic recycling in which customer can recycle their products by sending them back to collection points or contacting the company for collection. Recycling processes are planned for recording the recycled product's eco-credits into the consumer's eco-account, while the recycling centre will sort out end of life products and will send the components in working condition to the manufacturer to be incorporated in the production of new lights.

The living lab process for domestic led lighting designer and producer Ona consisted of 19 activities, covering all of the innovation maturity phases described in Figure 1 and Appendix 9. Ten of the activities were conducted during the Concept creation and testing phase, five during the Mock-up and prototype testing phase, and two during the small-scale piloting phase, while further activity details are presented in the Appendix 6. Overall, the living lab process concentrated on supporting the demonstrator in engaging the value chain partners to the development of more sustainable production processes and extracting and utilizing customer preferences in designing and testing the new lighting products, take-back scheme, incentivizing mechanisms and communications for supporting the sustainable consumption.

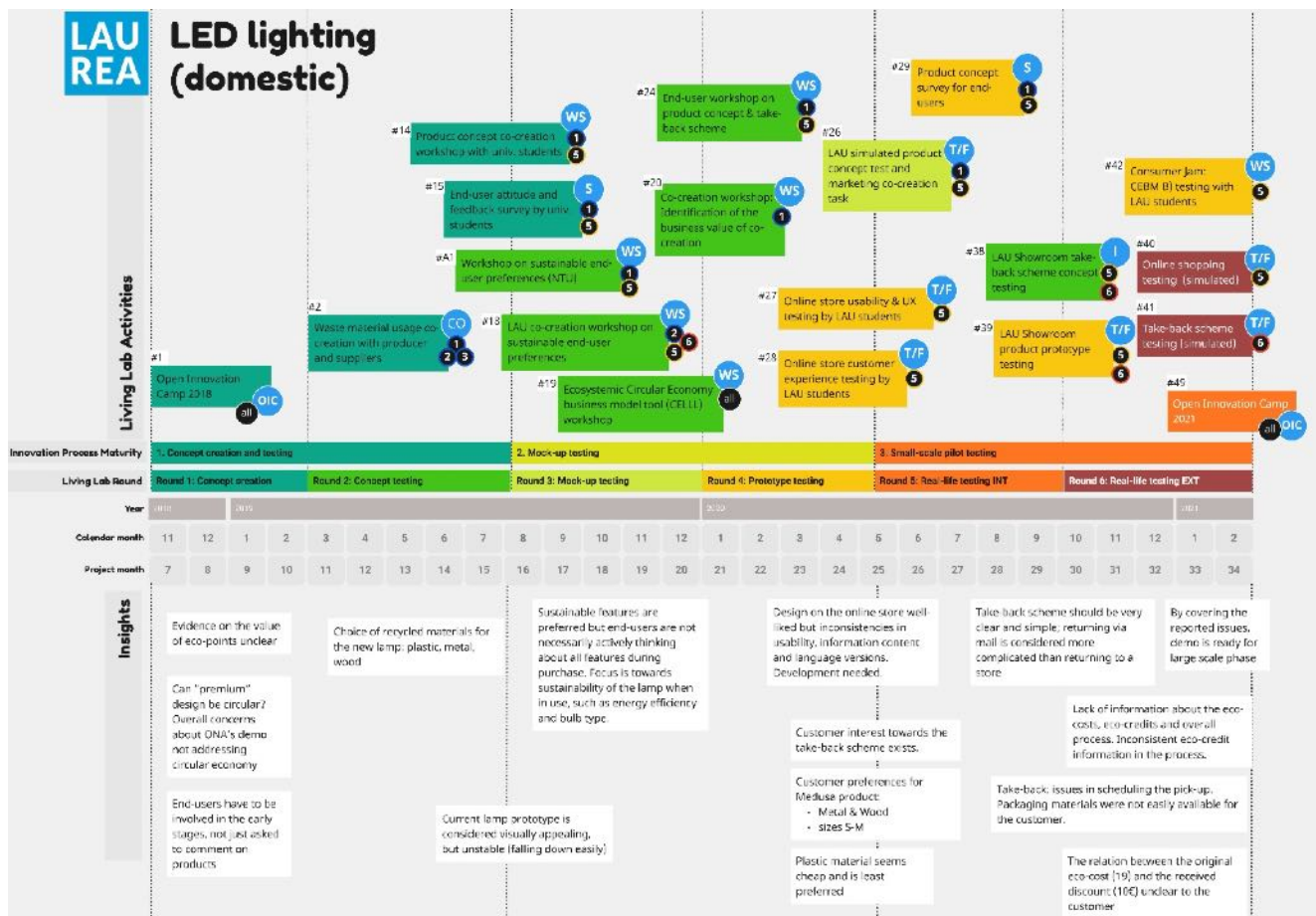


Figure 5: Living Lab process and main insights for domestic LED lightings (Ona)

End-users were also extensively engaged when investigating the user experience and communication of the eco-point information on the web-shop, as well as testing the developed take-back and incentivizing schemes in a simulated real-life environment. In this context, the real-life simulation refers to conditions where monetary transaction did not take place between the recruited test customer and the demonstrating company, whereas the remaining process corresponded to a real-life situation. The individual activities and main insights of Ona's

living lab process are presented in Figure 5 above, while impacts and applications are further described in CIRC4Life Deliverable 6.1 On site demonstrations of LED lightings.

### 1.3.2 Industrial lighting products Living Labs (Kosnic)

Kosnic is a UK based industrial lighting company, with manufacturing bases located in the UK and China: encompassing complete control of the supply chain from design, specification, manufacture and distribution – specifying all components delivers ultimate flexibility and competitive advantage. Kosnic’s demonstration in CIRC4Life project consisted of the implementation of three CEBMs in the following manner:

- **CEBM a) Co-creation of products and services:** To implement the co-creation of products model, service design and living lab methods will be applied to address the end-user’s requirements for modular lightning products and leasing service system. Sustainable techniques developed by the project will be applied in the production of industrial lights, including traceability, ICT, eco-accounting, and sustainable design and manufacture.
- **CEBM B) Sustainable consumption:** With the sustainable consumption model, the module design structure will be applied to make the faulty or end-of-life components easily be replaced or repaired at the use stage and, hence, to extend the product service life. Necessary information will be provided for the users to select more sustainable products, and, in particular, the product sustainability indicator, eco-points of the products, will be available for the user to make a purchase decision. Instructions will be provided to the users for sustainable consumption of the products, such as energy saving, longer service life, etc.
- **CEBM C) Collaborative recycling:** To demonstrate the sustainable recycling/reuse model, the company will implement the leasing service. In this service, Kosnic with its partners will look after the lights throughout their product life-time, provide regular maintenance service to enable the product’s performance, and take-back the products when it reaches the end of life (EoL), then the recycling, reuse and remanufacture will be implemented with those EoL products.

The living lab process for industrial LED lighting producer Kosnic consisted of 6 activities, mainly concentrating in the earlier stages of Innovation process and targeted in supporting the demonstrator in engaging stakeholders in the development and evaluation of the LaaS (Lighting as a service) model, as well as producing user requirements for the product specifications of the modular lighting. However, the core activities planned to take place in a real-life setting during the later stages of living lab process suffered a late cancellation due to Covid-19 outbreak and were partially replaced with one-to-one meetings with potential business partners.

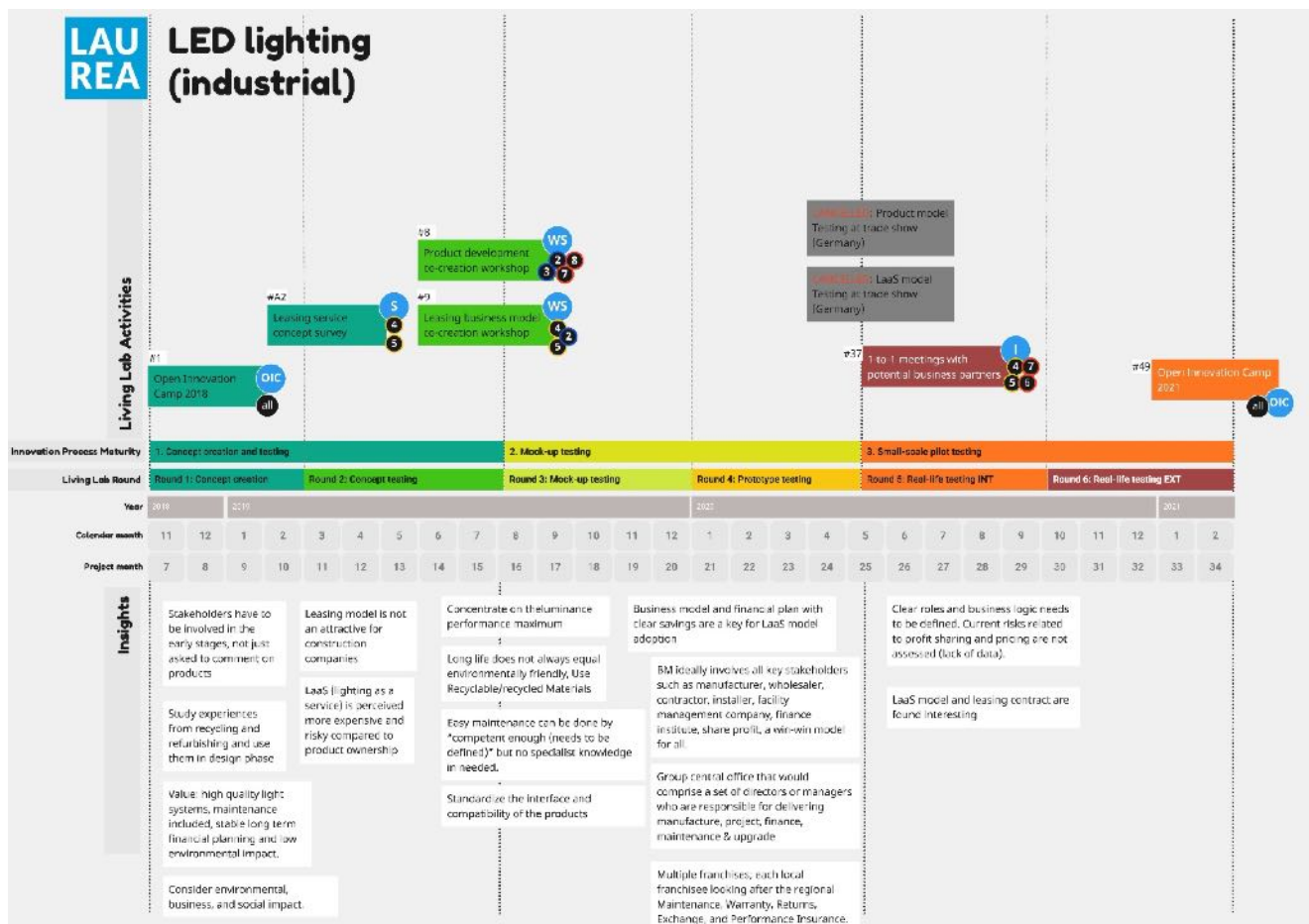


Figure 6: Living Lab process for Industrial LED lightings (Kosnic)

Further living lab activity details can be found in the Appendix 6, while the individual activities and summary of the main insights are presented in the Figure 6 above and Appendix 10. Moreover, the impacts and applications of living labs in relation to final demonstration are further described in the deliverable 6.1 On site demonstrations of LED lightings.

#### 1.4 Implementation of Living Labs in WEEE/Tablets (Indumetal & Recyclia)

Indumetal Recycling is a company specialized in the integrated management of WEEE, while Recyclia is an environmental platform for recycling electronic products, batteries and lamps, both located in Basque Country, in Spain. The Companies' demonstration in CIRC4Life project consisted of the implementation of CEBMs in the following manner:

- **CEBM a) Co-creation of products and services:** Circular economy enabling solutions and tools, including supporting communication campaigns and incentivizing mechanisms, are co-created with all relevant stakeholders, engaging citizens, municipality and local retailers.
- **CEBM B) Sustainable consumption and CEBM C) Collaborative recycling:** New collaborative, intelligent bin-based recycling system will be developed in order to increase collection rates of unused electronic products and encourage citizens to reuse and recycle them.

The overall living lab process of WEEE/ tablets consisted of 19 activities, spreading systematically through all three phases of the innovation maturity process and six living lab rounds. The LL activities focused on supporting the companies, Indumetal and Recyclia, in the identification of end-user needs in the service development of ICT-based collaborative recycling service, and in the identification of incentivizing mechanisms while

establishing collaboration with stakeholders, such as the municipality and external retail. End-users were also extensively engaged when investigating the user experience and usability of the collaborative recycling system, including the CIRC4Life mobile application, and the acceptance of proposed incentivizing mechanisms in real-life settings. The individual LL activities and main insights of this living lab process are presented in Figure 7 below and in Appendix 11, while impacts and applications of these results in shaping the final demonstration are further described in CIRC4Life deliverable 6.2 On site demonstrations of CEBM for Tablets.

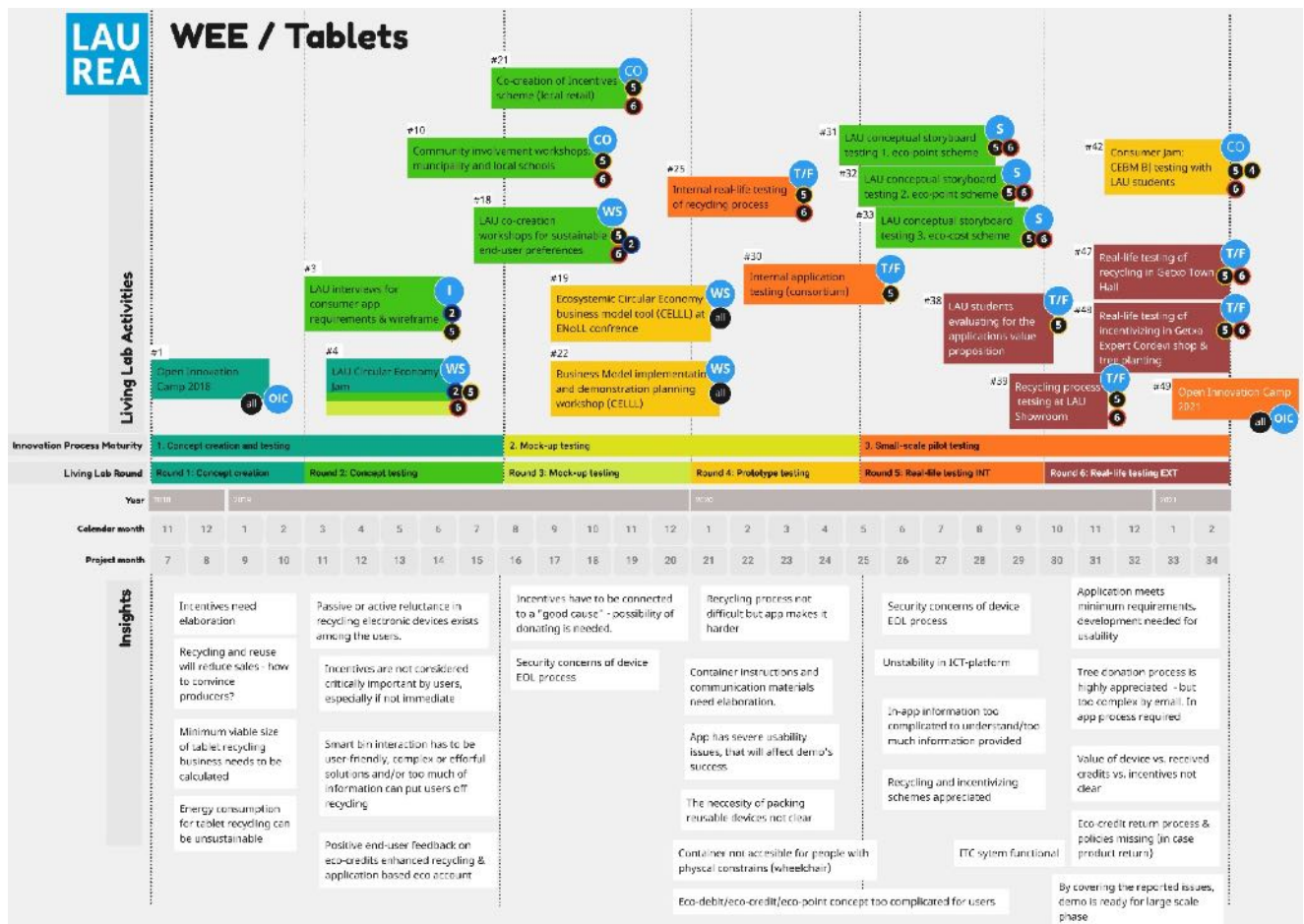


Figure 7: Living Lab process for WEEE/Tablets (Recyclia & Indumetal)

### 1.5 Implementation of Living Labs in Vegetable foods (Scilly Organics, Jonathan Smith)

Scilly Organics is a certified organic fruit and vegetable farm, based on St Martin's in the Isles of Scilly, UK. The farm comprises about 4 acres of vegetable growing land, including 2 polytunnels and a glasshouse. The products are sold in company's vegetable stall, located on St Martin's at the top of Middle Town Hill, near the Island Hall. Scilly Organic's demonstration in CIRC4Life project consisted of the implementation of CEBMs in the following manner:

- **CEBM a) Co-creation of products and services:** Co-creating new sustainable products by involving consumers, policy makers, academia, and the industry in its development.
- **CEBM B) Sustainable consumption:** A Carbon footprint-based indicator is displayed on products to support consumers' knowledge on the environmental impacts.
- **CEBM C) Collaborative recycling:** Demonstrate the current waste streams created from vegetable production, and assess how the waste products could be treated more sustainably and (2) how organic



waste by products (such as crop waste, manure, straw, etc.) can be turned in to fertility and/or energy sources on farm. Analyse the existing practices of sustainable use of current waste streams, and possibilities of implementation of sustainable use of current waste streams. Demonstrate the impacts of different packaging materials, especially on waste management.

The overall living lab process for Scilly Organics consisted of 11 activities covering all stages of innovation maturity process. The activities were focused on supporting the demonstrator in establishing collaboration, such as community-based recycling practices, within the local community, as well as investigating end-user preferences and market opportunities regarding the sustainable farming methods and products. Individual living lab activities and the corresponding key insights are presented in Figure 8 below and Appendix 12, while further activity details are presented in Appendix 6. The impacts and applications of these results in contrast to the final demonstration are yet described in deliverable D6.3 On site demonstration of CEBM for vegetable foods.

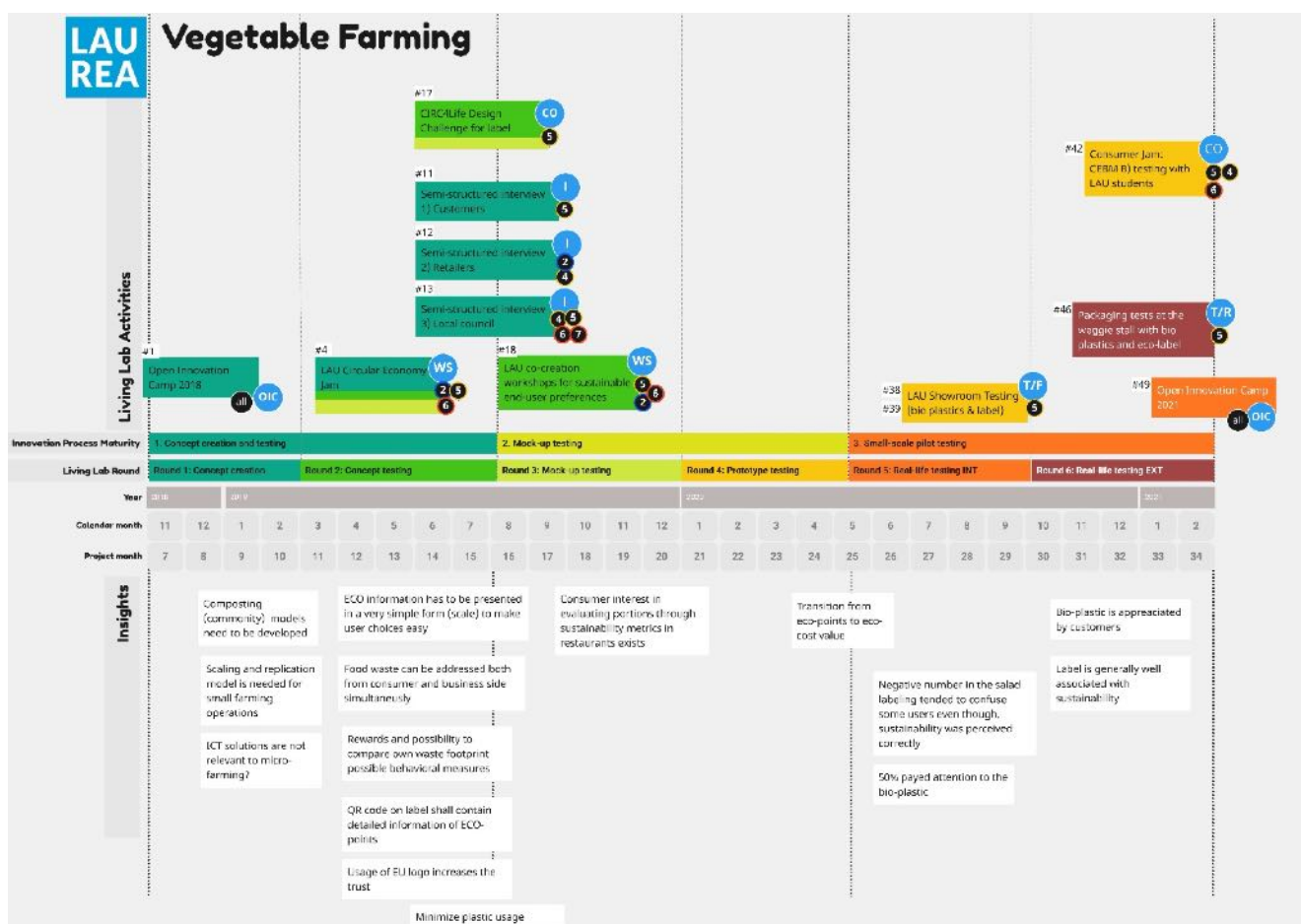


Figure 8: Living Lab process for Vegetable foods (Scilly Organics, Jonathan Smith)

Due to the lack of time resources of the demonstrator, most of the LL activities were conducted by Laurea apart from the demonstrator. However, one of the key results of the living lab process was the development and utilization of the eco-cost label, which was then further developed and integrated with the carbon calculator tool by the demonstrator. The development of the label is described in chapter 2.7 Case studies from living labs.

## 1.6 Implementation of Living Labs in meat supply chain

Alia is an animal feed manufacturer and meat product producer, located in Lorca, Spain. Alia's traditional products are well-known and sold in several retailer chains all across Spain. The company's demonstration in CIRC4Life project consisted of the implementation of CEBMs in the following manner:

- **CEBM a) Co-creation of products and services:** Co-creating new sustainable products by involving consumers, policy makers, academia, and the industry in its development.
- **CEBM B) Sustainable consumption:** The CIRC4Life developed sustainability indicator, eco-cost, is displayed on Alia's products to support consumers' knowledge on the environmental impacts.
- **CEBM C) Collaborative recycling:** Encouraging citizens to recycle their bio-waste, so that it can be transformed into compost or organic fertilizers. In return, citizens will earn Eco-credits and receive a reward. Alia also uses by-products from the agri-food sector to produce animal feed. In turn, their farm waste is used to make organic fertilizers.

Alia's Living lab process was implemented systematically throughout the innovation phases and living lab rounds, consisting of variation of 29 activities. The overall process was designed to support the demonstrator in identifying and defining consumer preferences regarding sustainable product development and bio-waste recycling practices to ensure acceptance in the demonstration phase. Citizens were also engaged in co-creating measures for impactful communication campaigns regarding sustainability actions, especially through the development of eco-label and consumer application as described further in chapter 2.7 Case studies from living labs. In addition, end-users were engaged in testing the developed solutions, the ICT based sustainable shopping and collaborative recycling processes, in real-life settings. Further living lab activity details can be found in Appendix 6, while the individual activities and main insights are briefly presented in Figure 9 below and Appendix 13.

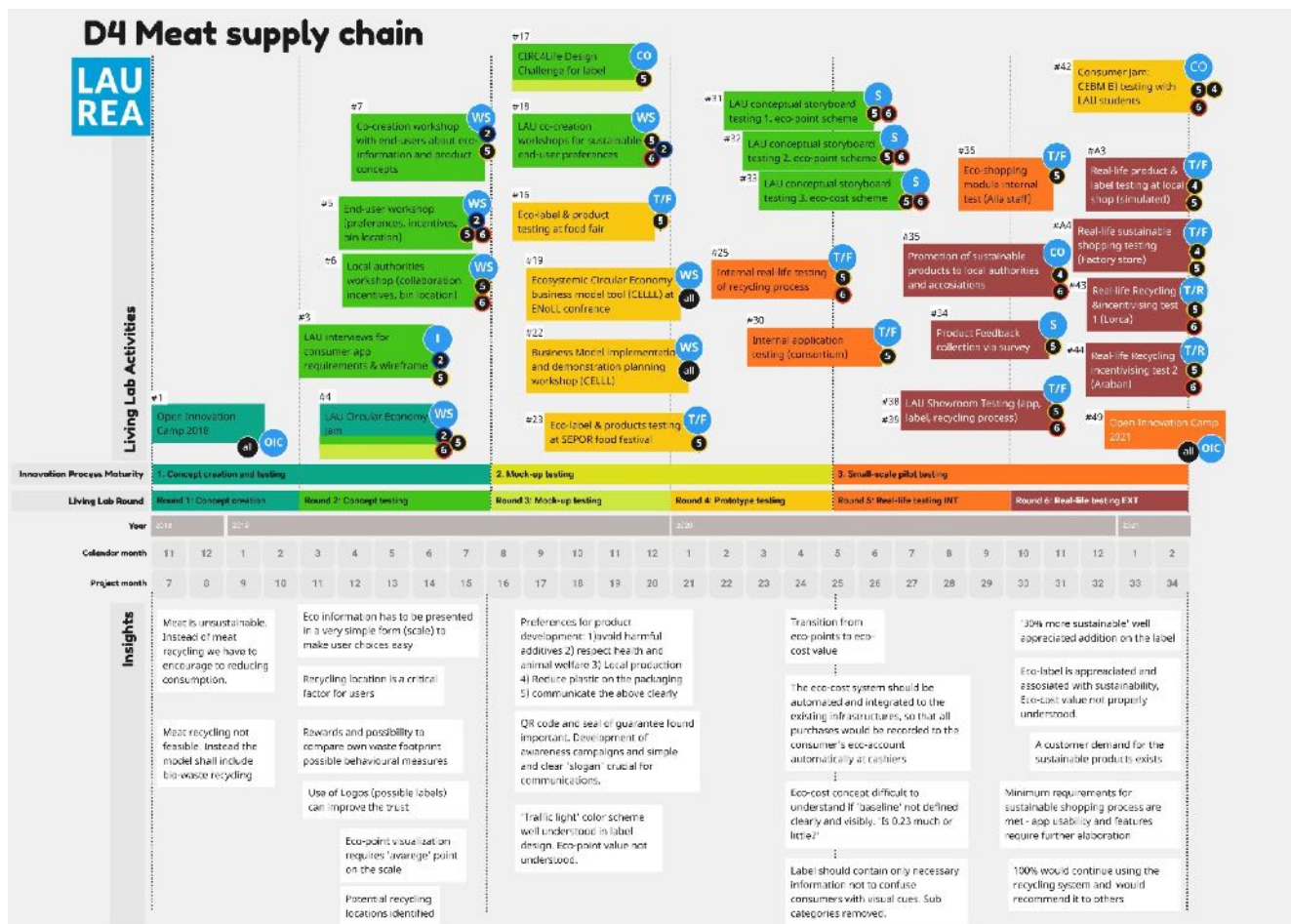


Figure 9: Living Lab process for meat supply chain (Alia)

Finally, the impacts and applications of living labs in shaping the final demonstrations of meat supply chain are further described in the deliverable 6.4 On site demonstration of CEBM for meat supply chain.

## 1.7 Case studies from living labs

While the above chapters briefly describe the living lab activities from a certain demonstrator's perspective, living labs also had an encompassing impact on the key innovations and solutions developed by the CIRC4Life project. In this chapter, two examples are presented, both supporting the implantation and acceptance of the proposed eco-point concept.

### 1.7.1 Eco-label

The first case-example depicted in Figure 10 and Appendix 14, the eco-cost label, was presented as one of the key innovations of the project during the 2<sup>nd</sup> OIC. While a label wasn't included in the initial specifications of the project outcomes, the need for developing simple and clear way of communicating sustainability aspects was already brought up during the 1<sup>st</sup> OIC, when discussing the potential of eco-points in supporting sustainable consumption (CEBM B). Based on the conclusions from the 1<sup>st</sup> OIC, Laurea arranged an international CE Jam event where one of the teams was concentrating on a challenge 'How can we make eco-information appealing and easy to grasp?', and produced a first label prototype based on the facilitated service design process. This prototype was then presented at Alia's end-user co-creation workshop in Spain, where the citizens worked

together to define ways for improving the label. Based on the recommendations and results of these events, Laurea developed new prototype versions of the label design based on a 'traffic light scheme' and existing energy labelling, which were distributed and evaluated through the eco-point survey by MMM in 2019. Based on the survey results, there was no clear indication for a preference for a certain label, while comments were more concentrated on the un-clear indication of the presented eco-point value and the sub-categories (economic, social, environmental).

As further development was needed, Laurea launched a CIRC4Life [Design Challenge competition](#) to engage the design community in finding solutions. Altogether 10 designs were created and evaluated during the competition. The three most voted designs were then tested at food fairs in Spain by Alia, and further improved by Laurea based on these results before the second food fair testing event. The end-user feedback continued systematically supporting a view that the label itself was appreciated and associated with sustainability, however, the eco-point value continued to be unclear as a sustainability indicator, while there seemed to be an existing convention of 'points' being something worth collecting while shopping. After the three storyboard conceptual testing rounds and corresponding results from ALIA's survey, the consortium decided to change the terms **eco-point** and **eco-debits** into **eco-cost**. The new, eco-cost label was tested at Laurea Showrooms. Based on the Showroom results, the leading indicator for sustainability was yet again considered to be the traffic light color scheme, and especially the green color. Respectively to the previous feedback, the eco-cost number itself, especially when presented without a possibility for comparison, was difficult to understand as the baseline for the scale is not defined clearly. However, when presenting multiple labelled products simultaneously, more than 70% of the users were able to select the most sustainable product. This goes to show, that the value of numeric eco-cost label is reached when users are given the opportunity to compare multiple products in the same category.

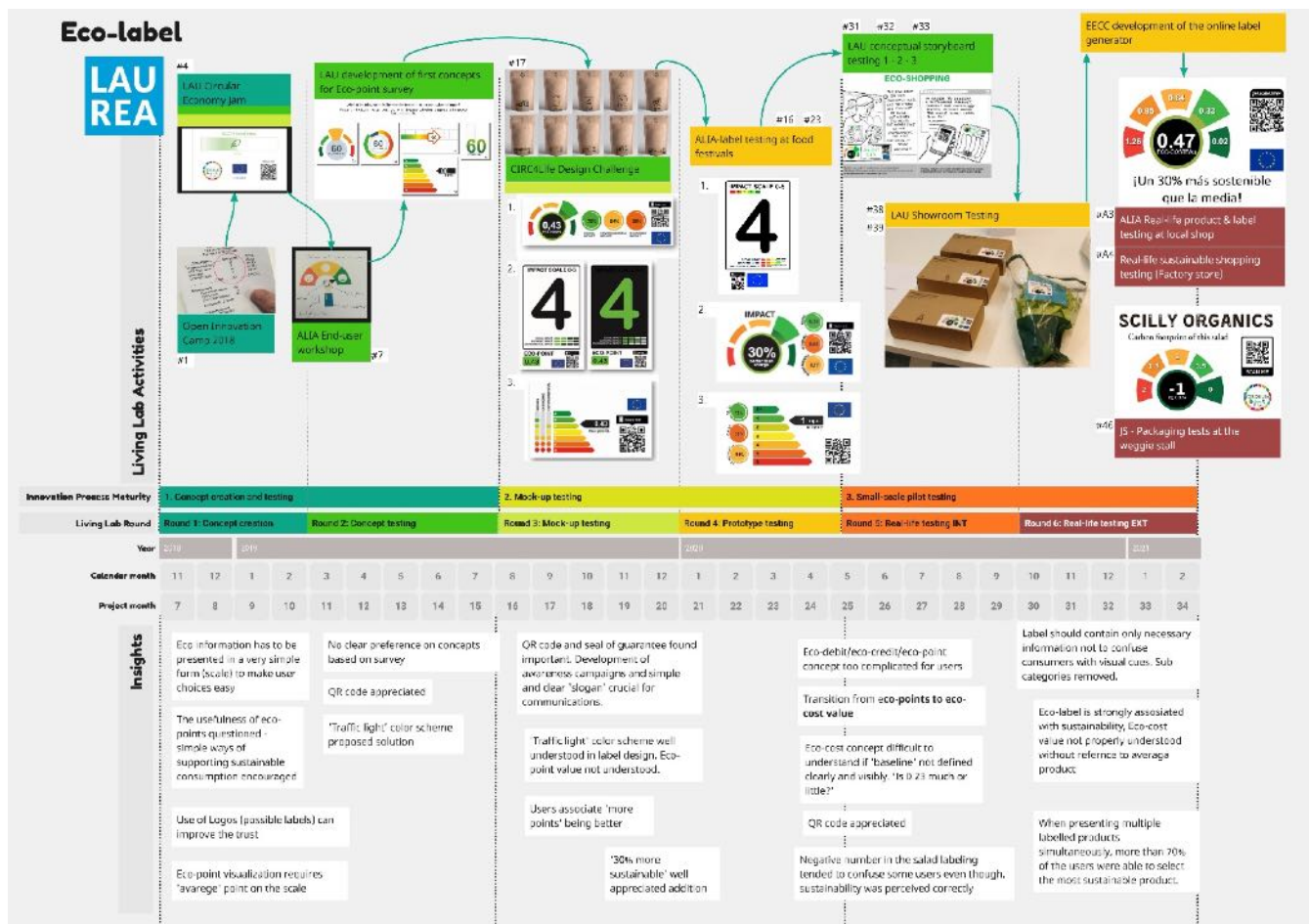


Figure 10: Development of the eco-label through the living labs

Finally, CIRC4Life partner EECC developed an [eco-label generator](#) which allows different companies to create their own eco-label. The eco-label generator includes an explanation of the eco-label, instructions for the eco-label creation, and possibilities for editing its different fields. This tool was utilized by both meat supply chain demonstrator Alia and vegetable farming demonstrator Scilly Organics for testing and tailoring their labels before launching the demonstration phase.

### 1.7.2 Consumer application and eco-account

Respectfully to the eco-label, the need for developing simple and impactful consumer tools for supporting the utilization of CIRC4Life solutions was already brought up during the 1st OIC. At the time, a navigable pilot version of a consumer online tool was presented by ENV based on their earlier work done in the specification phase, and was met with interest and perceived potential among camp participants. Based on these insights, Laurea's ICT students conducted a series of user interviews and produced a set of product specifications and UI-flow chart. Their findings and results were presented and utilized as the foundation during the CE Jam event, where one of the multidisciplinary groups was concentrating on the challenge "How to create a mobile application to help customers make sustainable choices?" and produced and tested a prototype of a new mobile application as a result of the service design process.

The results of these events were delivered to NTU, which developed the first functional version of the application. This beta version was tested the first time as part of a simulated WEEE-recycling process at Indumetal's premises in Bilbao, together with the intelligent container. The results were alarming, as none of the test users were able to use the application user interface (UI) version without assistance. To support the



technical developers in addressing the user requirements, Laurea produced a UI toolkit and guidelines for the implementation. Once the next application version was published, Laurea launched internal testing for the consortium members via a self-administrative survey, and these results were utilized by the developers for meeting the requirements set for launching the external testing.

The results of the storyboard-based concept testing surveys also impacted the application through the change of the used terminology (from eco-points and debits to eco-cost), and indicated that such application was, in fact, considered very potential in supporting daily sustainability, especially in recycling practices. In fall 2020, the CIRC4Life application was tested by external users during Laurea Showroom events, and communication and value propositions were developed as a course assignment by students. During the real-life phase, four testing activities took place before launching the application for the demonstration phase. Two of these were related to the demonstration of tablets, and the others supported the demonstration of the meat supply chain. The development process of the mobile application is depicted in Figure 11 and Appendix 15.

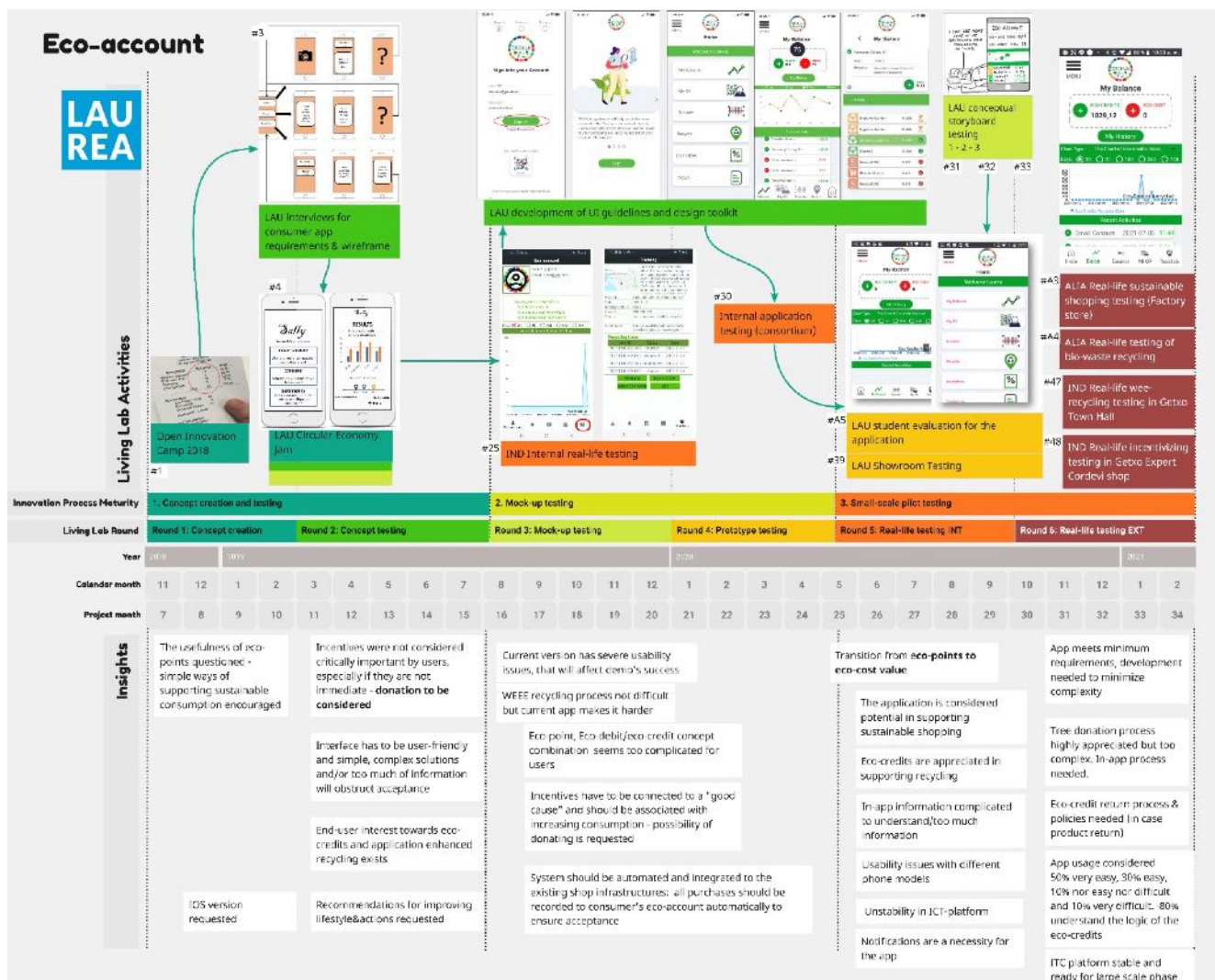


Figure 11: Development of the CIRC4Life mobile application through the living labs

## 1.8 Evaluation of Living Lab implementation in CIRC4Life demonstrators

CIRC4Life Living Lab concept and implementation plans were designed as a number of systematic and iterative co-creation events engaging a wide range of users and stakeholders in the real-life environment throughout the D7.2: Report of implementing living labs and ACSI-events

innovation process, from the ideation stage to the full-scale market demonstration (in WP6). All CIRC4Life Living Lab activities followed an iterative multi-step development approach, where the needs and requirements of the different end-users and stakeholders, as well as corresponding solutions evolve based on the collective development effort. Consortium meetings were planned to serve as the decision-making points, allowing developers to evaluate user requirements and alternative concepts and correct the direction of the development work accordingly.

As expected, initial Living Lab plans have been altered a lot during the course of the CIRC4Life project, partly in line with the proposed methodology and approach, partly due the Covid-19 and partly because of certain constraints that Living Labs bring. Such constraints included the following key issues:

- **Lack of understanding of the co-creation benefits.** The biggest constrain was related to the lack of understanding of the co-creation and Living Labs. To some of the demonstrators a Living Lab was a new concept, and these companies have not engaged users or supply chain partners in joint development efforts. An example of the issue can be illustrated by one of the demonstrators who mentioned that “they are experts [in their business field] and know better than customers how to design sustainable products”. A similar approach has been mentioned by another demonstrator, working in a B2B sector, who mentioned that “the industry is very traditional and if you wish to engage your stakeholders, you have to pay them for consultancy work”. Such an attitude hindered some open innovation activities and especially limited creativity in the testing and experimentation phase of the Living Labs. In their study about benefits of co-creation, Seikkula et al (2020) found out that while collaboration is perceived as the key element of co-creation, real business benefits are not well known by the companies. The results indicate that unless co-creation directly improves a company’s business and offers simple solutions, it is perceived as a laborious process which requires extra resources.
- **Lack of time and resources.** In a dynamic business environment, the lack of time to participate in co-creation sessions and experimentation creates an issue of certain stakeholder group not participating in the Living Lab activities. Living Labs are known as a long and rather complex process, and even the companies directly involved in the project activities as demonstration owners have not always has people available to participate in a systematic stakeholder engagement. Interviews of the consortium partners conducted in the last year of the project showed that especially for business partners the process of Living Labs was perceived as laborious and the one that requires specialized knowledge and ideally an internal orchestrator.
- **Unbalanced representation of stakeholders in the Living Labs.** The issue of engaging relevant stakeholders has been a challenging task, especially in LED lighting and micro-farming demonstrators, but for different reasons. Thus, some stakeholders did not share the need for joint co-development. Especially in industrial LED lighting, where planned development work included changing the business model from manufacturing to leasing, actors of the manufacturing value chain were not interested in a new collaboration business model as it would disrupt the current established market. In the micro-farming demonstrator, the local stakeholders were limited to one key customer due to the size of the business, and thus it was not possible to implement a genuine Quadruple Helix approach.
- **Lack of real users/lack of access to users.** Involvement of real users has also proven challenging in the CIRC4Life Living Lab implementation. Access to users and the knowledge of customers varied among the demonstrators. In domestic LED lighting case, open engagement of real customers in initial stages of product design was not possible due to privacy policy of the case company. For example, new product designs were officially registered and protected before displaying them to customers for feedback collection, which raises the threshold for making changes to the design based on received feedback. In the case of micro-farming, two groups of users were planned to be engaged in the Living Labs – local businesses (B2B) and tourists (B2C), but as the main Living Lab activities fall under COVID-19 restrictions

and there were no tourists to engage, B2C part of the micro-farming Living Labs have been limited to some survey results.

- **Combination of different development approaches.** While Living Labs have been defined as the methodology supporting both the development and implementation effort, the technical development work followed waterfall methodology where requirements were identified internally by the development team in the beginning of the project, and further development depended on the previous stage. The combination of the two development approaches resulted occasionally in demand for extra development efforts and resources from the developing partners in situations, where user requirements were in conflict with already pre-defined functionalities of e.g. consumer tools.

In addition to the implementation constraints across the Living Labs, clear differences between demonstration-specific implementations shall be highlighted. First of all, Living Labs have been more successful when demonstration activities have been supported by a local municipality (WEEE/tablets and meat supply demonstrators). Policy-makers' support enabled wide spread of the Living Lab activities and involvement of citizens', and it also showed real commitment from relevant stakeholders to continue development efforts.

Second, demonstrators already operating ecosystemic business models (those in which value is co-created and co-shared with value chain actors) have been more successful in engaging their stakeholders and co-creating solutions together. Third, interest and openness of the case companies in trying a new methodology varied significantly. Demonstrators who were more eager to experiment and try new ways of development were also more open to engaging in the Living Lab activities. Finally, as in the case of micro-farming, personnel constraints hindered Living Lab implementation especially during the high season, when farming activities took most of the time and did not leave resources for planning and development work.

Successful Living Labs are characterized by multi-stakeholder participation, user-centered innovation process, real-life settings, systematic multi-method approach and iterative co-creation process. **Detailed analysis of CIRC4Life Living Labs shows that all key components were systematically present in the CIRC4Life project.** The detailed evaluation of CIRC4Life project living lab activities is presented in Santonen, 2020 and Santonen and Puroila 2021, who argued that multi-stakeholder engagement and multi-method approaches depend also on the stage of the innovation maturity process. The one-way methods were emphasized especially during the need, challenge and opportunity identification stage as well as during the detailed development and validation stages due transnational scalability and cost effectiveness, whereas multi-method approach has been used in the later stages of the innovation process, mainly in prototyping and testing phases. User-centered approach has been utilized both as design for users (via surveys and activities to collect user preferences and attitudes) and design with users, when users were active participants of the co-creation process, for example, via Service Jams or co-creation and prototyping workshops. Real-life setting referred both to the real operating environments, in which solutions have been tested (for example, testing of a recycling process with intelligent bin for WEEE and bio-waste in Spain), but also to the real-like usage situations, when the environment can be simulated, but the usage situation is close to real (such as testing the online shopping experience in Demo 1). Such real-like setting was also applied for example during the showroom events arranged at Laurea University of Applied Sciences's campuses. During the showrooms, parts of the campuses were turned into demonstrational spaces, in which test users had a possibility to experience solutions and provide feedback.

In EU-funded projects such as CIRC4Life, project partners have clearly pre-defined objectives and budgets, to comply with the funding requirements. From this perspective the structure of EU projects possesses challenges for all iterative process-based innovation processes including a living lab approach. The core idea of iterative process is to refine the developed solution throughout the multiple rounds and in some cases even complete change the original plans. In European Commission funded H2020 projects, it was relatively long and time-consuming process to get the amendment request agreed among consortium members and accepted by European Commission authorities. Therefore, the iterative process benefits related to flexibility and agility cannot fully be redeemed as it could be done in privately funded projects where decision can be made by a



single company. As a result, in the future funding calls should highlight more also the genuine possibility to follow explorative innovation approach in which the final outcome is not fully defined. This would allow better possibilities for project partners to explore out-of-the-box solutions for the challenges and opportunities discovered during the iterative process.

## Open Innovation Camps as a part of Living Lab approach

### 1.9 CIRC4Life Open Innovation Camp methodology

CIRC4Life Open Innovation Camp (OIC), originally described as ACSI – Aalto Camp for Societal Innovations - is a proactive hands-on instrument for addressing specific societal innovation challenges in an open, international and self-organising context. Theoretical foundations of OIC are grounded on Open innovation approach (Chesbrough, 2006). Santonen et al (2019) define CIRC4Life OIC as a novel methodological approach for overcoming the constraints on upscaling Living Lab experiments. According to them,

*“Open Innovation Camp (OIC) is co-creation sprint type of multi-day event grounded on an open innovation 2.0 principles where a group of carefully selected stakeholders having diverse but complimentary expertise meet locally and creates a common understanding of (a complex societal) challenge and work together in teams to develop, present and review in a co-creative manner user centred concepts and solutions to pre-defined challenges in a set timeframe”.*

CIRC4Life OIC can be positioned among a family of service design exercises such as hackathon, design sprint, service jam, innovation camp, solution camp and entrepreneurship camp. Depending on the goals and thematic focus of an OIC it can take different forms, however a key novelty of the CIRC4Life OIC approach is in its ability to rapidly establish new collaboration relationships, discover new insights by sharing knowledge and co-creating novel solutions by diverse set of actors who can apply outcomes of the OIC to their work.

Circ4Life OIC is an open innovation and co-creation sprint where multidisciplinary and multicultural teams work on developing user-centred solutions for a real-life challenge in a set timeframe, or on validations and evaluating developed solutions and business models. Thus, the camp is a true co-creative innovation process starting from real-world problems and requirements and focusing on practical results in terms of identification of business opportunities and developing novel solutions. It works as a facilitated space for both business and social interaction and exchange among the diverse set of actors. During an OIC, developers interact with each other and with external stakeholders to jointly discover and specify topics, addressing which serves to order to achieve the goals of a specific project, as well as the particular goals that each of the participants might have alongside these.

A key characteristic of an OIC is a **matrix structure** as opposed to challenge-specific silo approach often used in other co-creational service design events. Such structure allows experts to work across challenge-specific group boundaries and thus manage and utilize unique multidisciplinary skills of participants. Conclusions and results of a certain group will influence another groups work. Interactive matrix structure of the CIRC4Life OIC is presented in Figure 12 below.

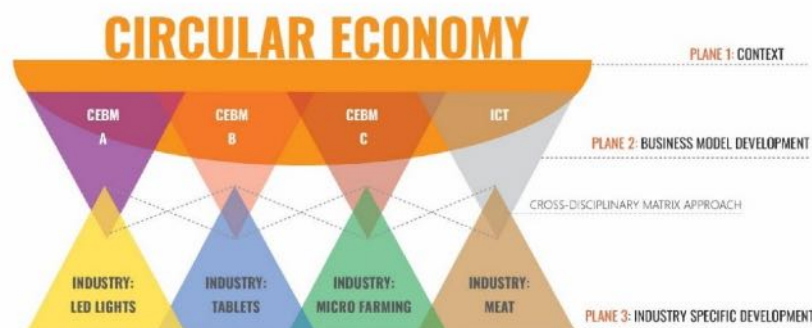


Figure 12 Matrix structure of CIRC4Life OIC

Another distinctive OIC characteristic is a **careful selection of participants**. Unlike other co-creation and open innovation events which are open to any person, CIRC4LIFE OIC utilizes a thorough selection process based on an application process. This process allows to incorporate specific requirements (such as type of a stakeholder,

domain knowledge, as well as socio-demographic characteristics) into the selection of the experts, thus ensuring maximum diversity. Application process also helps to eliminate passive participants and select experts with a passion and desire to contribute.

Moreover, OIC differs from other co-creation events by a structured approach and pre-defined roles among all participants and the organizers. By structured approach we mean detailed “scripted” program and carefully planned group interaction between complimentary actors, with clearly defined goals of each iterative round. Each discussion has a goal, each participant has a role, and each round provides inputs to the next round. The main OIC participants (?) roles are presented in the Table 1.

Table 1 OIC roles

Role	Definition	Main tasks during the OIC
OIC Orchestrator	The main organizer who is setting the frame of the OIC and acting as a mediator between other involved parties. Similar to Camp Convener role (See Rissola et al, 2017, p.57)	<ul style="list-style-type: none"> <li>- Overall content and outcomes planning, coordination and practical arrangements</li> <li>- Recruitment of challenge owners, facilitators and participants</li> <li>- Being a host and main point of contact during the OIC</li> </ul>
Group Owner	Representative of an organization to which the challenge is of a strategic importance, who sets up the scope of a challenge, and who is motivated, direct interest, and means for solving the challenge. Have substantial understanding of the given challenge. Similar to a challenge owner, case owner or product owner used in design sprints.	<ul style="list-style-type: none"> <li>- Create background materials for the challenge</li> <li>- Introduce the challenge to the team during OIC</li> <li>- Help the team to answer content-specific questions during creative process</li> <li>- Experts in the challenge field.</li> </ul>
Facilitator	Person who facilitate people's expressions of creativity at all levels (Sanders et al, 2008). Experts in service design and co-creation.	<ul style="list-style-type: none"> <li>- Ensure that creative process is implemented according to the plan</li> <li>- Ensure that the right set of service design tools is used to unleash the co-creation potential of a diverse group of experts</li> <li>- Bring people into the design process in the ways most suitable to their ability to participate</li> </ul>
Participant	People taking part in OIC. OIC participants are internationally recognized experts in their field and end-users who have been selected based on the participant diversity management framework presented in section 2.2	<ul style="list-style-type: none"> <li>- To bring the expertise based on the role he/she is representing in the OIC</li> <li>- To share their knowledge with other and co-create new ideas towards solving the challenge</li> </ul>

The four defined roles can be further divided into subgroups. For example, the role of an orchestrator can be shared between different stakeholders, one being responsible for practical arrangements and OIC logistics, and another one for content and facilitation. Also, the challenge group owner role in case of a challenge related to a specific business model, or consumer understanding, can be performed by a researcher or a consultant, whereas group owners of sectoral/industry-specific challenges are usually represented by business decision-makers (Santonen et al 2020). Participants are also usually divided into subgroups, based on their field or research expertise, as well as their role in Quadruple Helix of academia, businesses, citizens and policy makers.

As a summary, CIRC4LIFE OIC is a novel approach to rapid engagement of diverse stakeholders into the innovation process used to collect and benefit from the stakeholder knowledge. Carefully designed structure with numerous interaction rounds between different groups allows for breaking the silos and addressing complex societal challenges such as CE from a multistakeholder perspective in a short time. OIC produces lasting effects and impact further development efforts, but also generate new knowledge to all participants and thus provide added value not only to the challenge owners but to all participants of the Camp. Finally, to support further exploitation and utilization of the concept of Open Innovation Camp, a digital playbook and *Guidelines for Planning and Implementing Innovation Camps* (Salminen, L. 2021) has been delivered in a format Master thesis, as a combination of Task 7.3 and Laurea's educational integration efforts, Task 8.5.

## 1.10 OIC implementation principles

This chapter includes CIRC4Life Innovation Camp event planning, goals specifications, results collection and analysis, as well as collecting participants' feedback. As in any event, we divide the implementation into three parts:

1. **Event planning**, covering the planning process, methodological choices, scheduling and resource planning, as well as the content development. The roles and responsibilities of CIRC4life Consortium partners are defined in this part. It also includes the process of stakeholder recruitment and selection;
2. **Implementation**, including the agenda as well as initial concepts presented by the group owners, and their final presentations;
3. **Feedback and lessons learnt**, including feedback received after the OIC from the participants, as well as suggestions and recommendations for planning and implementing Innovation Camp 2021.

### Before the event – Planning phase (up to 6 months before the event)

- Collaboratively defining the topics which needs to be addressed during the Camp days in order to achieve the CIRC4Life project goals
- Collaboratively creating the background information and materials to support the tasks during the camp days
- Collaboratively defining and recruiting participants based on what complementary expertise is needed to solve the tasks
- Creating the workflow and methodology, tools and templates for each of the working sessions
- Facilitation planning in conjunction with the goals and methodology
- Arranging training program for the facilitating group

### During the event – Live phase (days of the event)

- Creating the team spirit and enabling creative atmosphere
- Understanding the demonstrations and CEBMs conditions and ecosystem as a group and individually
- Conducting the creative tasks individually, in groups and in cross-groups to solve the defined challenges
- Finalizing and concluding the outcomes for demonstrations and CEBMs for further development

### After the event – Reporting phase (within a month after the event)

- CIRC4Life project plan adaption to Camp outcomes
- (If possible) engaging the camp participants as stakeholders for Demonstration and Living Lab activities
- Collecting feedback from the participants
- Reporting lessons learnt.

## 1.11 Recruitment and selection of OIC participants

The recruitment and selection of the external participants was implemented in compliance with ethical requirements set up in the **Deliverable 11.1: H - Requirement No. 1** (NTU). According to the D11.1, *“as regards ACSI activities for WP7, the purpose of ACSI workshops, materials and criteria for identification/recruitment of stakeholders will be developed within the cooperation with consortium partners, especially leader of WP7 and demonstrator leaders, because the results of ACSI events will support development/validation of demonstrators. The recruitment procedures will be also decided. It will be a part of work within the Task 7.3”*.

Multi-stakeholder engagement, balanced representation of Quadruple Helix (QH) stakeholders and inclusive approach to the selection are the keys to participant management in the OIC. In line with open innovation practices, OIC is open to the world and any person passionate about Circular Economy and willing to contribute to the project results can apply. However, to ensure quality representation and active participation, a set procedure has been established via an application process to select the leading CE experts. An application process, as opposed to an open registration used in many other service design events, also allows to shortlist

most relevant candidates with complimentary knowledge and experience. For example, often co-creation events attract researchers and consultants, but representation of policy-makers and industry is relatively low. An application process allows to screen the right candidates and select experts, taking into consideration their QH role.

Recruitment and selection of the participants have been implemented based on the Ethical requirements and transparent eligibility criteria set up by Laurea UAS in cooperation with the CIRC4Life consortium partners (D11.1). In order to ensure a fair and transparent participants' recruitment procedure, the following issues were taken into account, clearly communicated and forwarded to stakeholders:

#### **I. Eligibility Criteria:**

All participants must fulfil pre-established criteria which include:

- 1) Cultural and demographical diversity;
- 2) Disciplinary and cross-disciplinary expertise;
- 3) QH diversity and organizational diversity.

#### **II. Quality Assessment:**

In addition to the eligibility criteria, a set of quality indicators have been used in the selection process, including the following criteria:

- 1) Experience and relevance of the applicant's background, specialisation, practice, research area, etc. of potential stakeholders;
- 2) Contribution to the aims of the OIC;
- 3) Individual motivation to participate.

In addition, the selection process took into account an ability of an applicant to disseminate the OIC outcomes.

During the first OIC CIRC4Life consortium partners had a possibility to invite relevant stakeholders without the application process. However, it has been admitted that mixing invitation and application process contradicts an open and transparent approach to selection of the CE experts and creates extra work. For this reason, in the second OIC it was decided that all interested experts shall undergo an application process.

Over 500 high profile applicants from all over the world applied to the first CIRC4Life innovation Camp. The selection of the 37 participants was done based on the applicant's expertise and its relevance to one of the challenges to be addressed during the Camp. In addition to the expertise, we took into consideration balanced representation of Quadruple Helix roles (having representatives from academia, industry, civil society and policy. makers); as well as gender and geographical balance. In the second OIC 83 applications have been submitted in total, however almost 50% of these applications were not eligible due to the fact that they were not filled in correctly. Finally, 28 experts were selected to participate in the second OIC and assigned to a homegroup based on their QH role and CE expertise (See Appendix 8.)

### **1.12 First Open Innovation Camp: co-creation and concept development**

First CIRC4Life Open Innovation Camp took place in November 2018 in Krakow, Poland. The event featured 80 participants, 43 of which represented consortium members and 37 were selected external experts in different aspects of Circular Economy. Participants came from 17 different countries, including China, Russia and South Africa. However, majority of the participants came from EU member states, in line with Horizon2020 priorities.

The Innovation Camp 2018 was a 4-day open innovation and co-creation event that gathered circular economy experts, policy-makers, co-creation experts, academia and industry to address critical challenges of developing circular economy business models. Laurea University of Applied Sciences, Finland, co-organized the Camp together with Institute for Ecology of Industrial Areas, Poland. Participants co-created solutions for transition towards circular economy in LED lighting industry, electrical and electronic products and agri-food/farming

sectors. The CIRC4Life Innovation Camp was a concept development exercise to better understand the needs and main challenges of developing circular economy business models in all stages of the circular economy.

Within the context of the CIRC4Life project, the “predefined topics” included the three circular economy business models (i.e. CEBMs):

- CEBM 1: Co-creation products and services (WP1, WP leader NTU)
- CEBM 2: Collaborative recycling and reuse (WP2, WP leader CIR)
- CEBM 3: Sustainable consumption (WP3, WP leader ALIA)

In practice the development tasks related to CEBMs were aligned and contextualized via CIRC4Life demonstrations, which represent the real-world ecosystems in which sustainable CEBMs must be developed and implemented. The demonstrations included following groups:

- GROUP 1: Domestic and industrial LED lighting (ONA / KOS)
- GROUP 2: Recycle and reuse of tablets (IND/REC)
- GROUP 3: Micro farm (JS)
- GROUP 4: Meat supply chain (ALIA)

In addition, ICT-related sub-group (ICCS) was included as a cross-cutting topic relevant to all Demonstrations groups. Below set of questions was prepared to be used by group owners and facilitators during the team work. The questions were indicative, and they changed based on the results of each round of iterations during the Camp. The CEBM and demonstrator specific main questions and covered key issues are presented in Table 2, Table 3, Table 4 below.

Table 2: Overall challenge for CE Business Models: to define a comprehensive list of CE strategies for CEBMs

<i>CEBM</i>	<i>Main question</i>	<i>Key issues</i>
<b>CEBM A</b> <b>Co-creation</b>	How can we bring together end-users, key stakeholders and CIRC4Life demonstrators to co-create novel solutions for all stages of circular economy?	1) How co-create products with reduced eco-points in all stages of circular economy? 2) How to engage stakeholders and customers in co-creation of all stages of CE, with the help of living labs? 3) How IT tools/platforms can help engaging stakeholders in co-creation and innovation?
<b>CEBM B</b> <b>Recycle/reuse</b>	What are the key characteristics to develop and form interconnected infrastructures for circular economy in context of CIRC4Life demonstrations?	1) How to develop a system for stakeholders to interact with each other in recycling processes? 2) How and what kinds of incentives to develop to award recycling behaviour? 3) How to develop an internet-based recycling system?
<b>CEBM C Sustainable Consumption</b>	How to engage and motivate consumers and B2B-customers to make more sustainable purchase decision?	1) How the eco-points can be presented to the users in order to influence their consumption patterns? 2) How to raise awareness about sustainable consumption among different customer groups? 3) How to facilitate users to buy more sustainable products?

Table 3: Overall challenge for DEMOs: how to (co)- create sustainable solutions which integrates three business models for each DEMO?

<i>DEMO</i>	<i>Main question</i>	<i>Key issues</i>
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<b>DEMO1: LED lights</b>	How to develop circular economy solutions for domestic and industrial LED lighting throughout the value chain?	1) What are the key stakeholders to be involved in the demonstration? 2) What are the key activities to be included into the demonstrations?
<b>DEMO2: Electronic tablets</b>	How to recycle and reuse electronic tablets in schools?	1) What are the key stakeholders to be involved in the demonstration? 2) What are the key activities to be included into the demonstrations?
<b>DEMO3: Micro-farming</b>	How to co-create low-environmental and high-social impact vegetable production, consumption and waste management?	1) What are the key stakeholders to be involved in the demonstration? 2) What are the key activities to be included into the demonstrations?
<b>DEMO4: Meat production</b>	How to co-create sustainable meat products, and create new ways of meat recycling?	1) What are the key stakeholders to be involved in the demonstration? 2) What are the key activities to be included into the demonstrations?

Table 4: Matrix structure for matching CEBMs and DEMO's specific challenges

	<b>CEBM A</b>	<b>CEBM B</b>	<b>CEBM C</b>	<b>ICT/Traceability</b>
<b>DEMO1</b>	<p>How to co-develop <b>domestic</b> LED products and services together with customers?</p> <p>How to develop <b>industrial</b> LED light products and services together with customers?</p> <p>How and why to engage end-users and stakeholders at different stages of co-creation process?</p> <p>What activities should be included in every stage of co-creation process for LED lights products? (product specification; design, manufacture, retail, use, recycle, reuse)</p>	<p>What are the new ways to recycle <b>domestic</b> LED lights?</p> <p>What are the new ways to recycle <b>industrial</b> LED lights?</p> <p>How different stakeholders (e.g. recycling centers) can be involved in the recycling process via logistics system?</p> <p>What are the benefits and obstacles in using leasing of industrial lights as collaborative use model?</p>	<p>What eco-information should be available for <b>domestic</b> lights consumers?</p> <p>What eco-information should be available for <b>industrial</b> lights customers?</p> <p>How can eco-points be promoted in LED lights to encourage sustainable purchase, consumption and reuse?</p> <p>What are other methods to encourage sustainable consumption of LED lights?</p>	<p>How can IT solutions/platforms be used for creating more sustainable LED light products and services?</p>
<b>DEMO2</b>	<p>Within the context of co-creation/circular business, how the profit/business performance are changed compared with the traditional/linear business model? If profit is decreasing for manufacturer, is there any solution that can be used to increase/sustain the profit (to motivate manufacturers)?</p> <p>How tablet eco-design can lead to reuse and improve recycling ratios when the components of tablets are less recyclable (i.e. efficient dismantling operations of WEEE for the recovery of components)?</p> <p>What are the impacts of tablets co-creation business model for</p>	<p>What are the incentives (e.g. taxes and fees) for engaging different stakeholders into recycling?</p> <p>How can we prevent incentives from encouraging the purchase of new products?</p> <p>How to integrate local initiatives of incentives for users into large-scale strategies?</p> <p>Producers see reuse and remanufacturing as threats. Can they be involved in it in any way? Could be "the leasing or renting of EEE launched by producers" an interesting initiative? Can the</p>	<p>How European policies are involved in the promotion of the remanufacturing practices?</p> <p>How to link incentive schemes and public campaigns in order to improve reusing and recycling ratios?</p> <p>How can municipalities and local/regional governments promote and raise collection ratios of waste in their areas?</p> <p>What are the best awareness methods for schools to encourage sustainable</p>	<p>How can IT solutions/platforms be used for creating more sustainable reuse of tablets?</p>

	<p>the social perspective? There are five stakeholder group can be considered: workers; local community; society; consumers and value chain actors.</p> <p>How to integrate life cycle analysis approach, and reuse and recycling concepts within the current academic programs. Can schools be a source of information for co-creation?</p>	<p>business models of servicing and collaborative economy enhance remanufacturing?</p> <p>What are the future challenges related to the recycling of tablets, and barriers detected according to their components?</p>	<p>behavior and recycling of tablets?</p>	
<b>DEMO3</b>	<p>How do you match consumers' expectations/preferences with your business parameters? Changing your business model and potentially reducing profitability is a challenge. Something preferable to your customers may not be preferable to your business</p> <p>How to engage B2C /B2C customers (locals and tourists, restaurants) into co-creation process?</p> <p>What are the needs and motivations of different actors in vegetable supply chain (Inc. consumers, producers, retailers and other actors) in buying low-impact vegetables?</p> <p>How can supply chain be reduced through co-creation options?</p> <p>Can community-based models be also financially profitable?</p>	<p>How to create new business opportunities from soil and vegetable waste (aiming at no waste!)</p> <p>How can waste management and reduction be implemented on a small scale, so that it is cost effective and practical?</p> <p>What are the incentives for restaurants and walk-in consumers to improve waste recycling?</p>	<p>How do you demonstrate and communicate the environmental impact of products?</p> <p>How do you demonstrate and communicate social impacts of products?</p> <p>How can positive waste measures impact consumers to reduce consumption, waste, recycle and reuse?</p>	<p>How can IT solutions/platforms be used for creating more sustainable micro-farming products and services?</p>
<b>DEMO4</b>	<p>How co-create meat products (pork sausages) in a low-impact way in all stages of circular economy?</p> <p>How to engage various stakeholders in the value chain into the co-creation process?</p> <p>How to reduce environmental impacts of all stages in the meat production value chain?</p> <p>What are the benefits and barriers in involving value chain actors and customers into co-creation process?</p>	<p>What are successful examples of food/meat waste reuse and recycling? (including utilization of manure and dead corpses)</p> <p>How to create new business opportunities from food/meat waste (aiming at no waste!)</p> <p>How to encourage consumers to reduce the amount of food/meat waste?</p> <p>What are the ways to minimize the amount of packaging waste and use of materials? What are the benefits and obstacles in using "intelligent bins" for meat recycling?</p>	<p>What are the ways to promote and communicate eco-information to consumers of meat products?</p> <p>How to encourage consumers to use eco-points when shopping in supermarkets/shops?</p> <p>How to raise awareness about sustainable consumption of meat among different customer groups (without turning them into vegetarians)?</p>	<p>How can IT solutions/platforms be used for creating more sustainable LED light products and services?</p>

The above challenges and questions were then aligned together in the OIC programmed (see Appendix 1) and developed into a methodology, which followed a main outline illustrated in Figure 13 below and was carefully structured to meet the requirements of a matrix structure, as shown in Appendix 2.





Figure 13 First OIC process

The final presentations prepared by each Group owner based on the Camp workshops are available at [CIRC4Life website](https://www.circ4life.eu/). In addition to input provided within the teamwork, each participant had a possibility to comment on other teams' presentations through the [Mentimeter tool](https://www.mentimeter.com/). Overall, 138 comments were received from the Camp participants, with questions, comments, suggestions and critical assessment. The comments concentrated on the need to disrupt existing models, and on the need to demonstrate the added value and circularity of proposed business models. Below is the summary of main findings from the comments:

#### **CEBM A: Co-creation and end-user engagement:**

- the need for collecting customer insights to ensure that the customer is in the center of co-creation
- use of participatory methods to engage customers, such as end-user workshops, in the design stage
- understanding real user needs and demands is the key
- end-users have to be involved in the early stages, not just asked to comment on products

#### **CEBM B: Recycling and reuse:**

- public procurement creates a demand for secondhand products (e.g. open database with repair instructions), creating partnerships around green procurement is needed
- recycling logistics should be addressed in business model development
- models are needed to create secondhand markets (c2c, Amazon for used products)
- recycling and reuse will reduce sales, so how to convince a producer?
- new business models for reuse are needed

#### **CEBM C: Sustainable consumption:**

- understanding sustainable consumer profiles is a must
- how to communicate a positive message to consumers is the key
- consumption should be reduced at all levels, and especially in meat

#### **Eco-points:**

- concerns on the value of eco-points for end-users, not clear how consumers will use eco-points
- unclear why the assumption is made that eco-points are important for consumers, need for evidence and clear communication of benefits
- legal framework of eco-points is critical
- eco-point can be an important tool to assess products' environmental and social impacts, but it is not clear how to compare e.g. eco impact of new vs second hand products
- eco-points are a minor part of consumer behavior
- unclear how eco-points will be certified and calculated, and how eco-points change with time
- use of Living Labs is needed to assess the user behaviour based on eco-points.

**DEMO-specific comments:**

A number of comments addressed the concerns that demonstrations were yet unclear. Despite multiply ideas being presented, it remained unclear to the commenters, what were the goals and the objectives of the demonstrations, and how these objectives were related to circular economy. Suggestion was made to simplify the demos.

**DEMO1: LED**

- study experiences from recycling and refurbishing and use them in design phase
- concentrate on developing secondhand markets as a new business opportunity
- can “premium” design be circular? Overall concerns about ONA’s demo not addressing circular economy

**DEMO2: Tablets/ WEEE**

- incentives need elaboration
- minimum viable size of tablet recycling business needs to be calculated
- energy consumption for tablet recycling can be unsustainable

**DEMO3: Micro Farming**

- composting models to be developed, e.g. as community composting or crowd sourced waste models; use of manure for heating, local composting
- compost should be returned to improving the soil not used as biogas
- scaling and replication model is needed for small farming operations
- stakeholder engagement models are needed for waste management and marketing
- ICT solutions are not relevant to micro-farming

**DEMO4: Meat recycling**

- smaller meat portions to avoid meat waste
- explore how to overcome legal barriers of meat recycling
- cooperation with local food hubs
- meat is unsustainable. Instead of meat recycling we have to switch to reducing meat consumption
- ethical issues should be considered and well communicated (including employee education, animal welfare and slaughter conditions).

Above mentioned results have been delivered to CEBM, DEMO and solution developers to consider in their further development efforts. The most critical outcome of the first OIC 1 was shift from meat recycling to bio-waste recycling in the meat supply chain demonstration, resulting in an amendment to the project. Another significant finding was initial skepticism and lack of understanding and thus, acceptance, towards the eco-point concept, which created a lot of discussions and concerns over the usefulness of the concept. OIC results were further explored in the later Living Lab activities.

**1.13 Second Open Innovation Camp: validation and evaluation**

The second Open Innovation Camp concentrated on evaluating and validating the demonstrated solutions and on giving guidelines for future development and market introduction. The goal of the OIC was to help DEMO and solution developers in delivering validated solutions with market potential. The OIC can be considered as the final showcase for developed solutions, including the progress, starting from initial concept towards the versions and finally final outcome.

### 1.13.1 Development of the OIC validation framework

After Covid-19 resulted in drastic changes in the operating environments of demonstrating companies and the demonstration plans, the key performance indicators (KPIs) and corresponding validation framework developed by WP6, was no longer suitable for its purpose. Same applied for the structure, plans and tools Laurea had previously developed for conducting the OIC in a physical environment. Therefore, there was a need for developing new OIC validation framework and structure, as well as identifying suitable tools for running the virtual camp.

After a careful research evaluation existing options and platform, Laurea designed and facilitated a full-day online event for the CIRC4Life consortium (Event #45 in Appendix 6), where the project results were collaboratively evaluated and discussed, and key-innovations and CEBM specific solutions were identified. The pre-defined and facilitated decision making process resulted in defining the CIRC4Life projects main achievements to be presented at the OIC, connections between key innovations and CEBMs, as well as the objectives for the OIC evaluation. Based on this experience, the facilitated co-creation process on HOWSPACE platform was also recognized to be suitable for running the virtual OIC by the whole consortium.

The OIC2 validation framework was further designed to answer the question: **“Is it the right solution to the problem?”** and based on the evaluation of implementation of CEBMs (as a whole) and separate elements in demonstrators. The validation process in OIC was based on the following key questions:

- **What has worked;**
- **What has not worked;**
- **What are the lessons learnt?**

Based on the results of co-creation day, the CEBM descriptions were revised, and the key innovations were embedded, presented and evaluated through the three CEBMs during the OIC, as described below:

#### Co-creation of Products and Services (CEBM A):

This business model helps to bring end-users closer to design and production stages using user-centric methods. Benefiting from the co-creation features, sets of sustainable production methods have been implemented and new products/services have been created. **The key innovation of this CEBM are the [eco-cost method](#), [use of online LCA](#), and [a decision-making and impact assessment tool](#)** for the value chain actors.

#### Sustainable Consumption (CEBM B):

By presenting the customer with options and the right methodology to assess the environmental impact of products, this model enables the consumer to make a more sustainable decision. The model also provides a traceability solution to monitor a product's sustainability along the value chain and supports end-users and stakeholders to actively implement the circular economy via awareness raising and knowledge sharing activities. **The key innovations of this CEBM are the [CIRC4Life consumer app](#), the eco-label, [the traceability module](#), and the [consumer awareness raising and capacity building activities](#).**

#### Collaborative Recycling/Reuse (CEBM C):

This model is based on a user-friendly waste collection system. It includes a system for stakeholders to interact with each other to facilitate the use/reuse of end-of-life products and reduce waste, and implements an [eco-credits awarding scheme](#) to encourage people to recycle/reuse. **The key innovations of the CEBM are the [ICT based reuse/recycling system](#); an eco-credit/eco-cost based consumer app; [incentive schemes for reducing, reusing and recycling](#); and awareness activities.**

Through the results of the co-creation of internal validation and further review of DoA, the CEBM specific validation questions were defined as presented in the Table 5 below.

Table 5: CEBM validation and evaluation viewpoints

CEBM	Main question of the specific CEBM	Key issues to considered in validation* * whether or not CEBM is appropriate for its purpose
<b>CEMB A Co-creation</b>	<i>Does co-creation at the early stage of product development enhance circularity and create sustainable business?</i>	<ul style="list-style-type: none"> <li>Is the business model innovative?</li> <li>Is the business model circular and sustainable?</li> <li>Does the business model generate high business potential?</li> <li>Does the business model have wide industry applicability?</li> </ul>
<b>CEBM B Sustainable Consumption</b>	<i>Does the CEBM have the potential to create behavioural changes in consumers towards more sustainable choices?</i>	<ul style="list-style-type: none"> <li>Is the business model innovative?</li> <li>Is the business model circular and sustainable?</li> <li>Does the business model generate high business potential?</li> <li>Does the business model have wide industry applicability?</li> </ul>
<b>CEBM C Recycle/reuse</b>	<i>Does the CEBM help to close the loop and improve waste management?</i>	<ul style="list-style-type: none"> <li>Is the business model innovative?</li> <li>Is the business model circular and sustainable?</li> <li>Does the business model generate high business potential?</li> <li>Does the business model have wide industry applicability?</li> </ul>

The evaluation of the CEBMs was designed to be performed through the scaling presented in the Table 6 below, while the results of validation was concluded based on the corresponding scale on the right side, based on the average scores.

Table 6: Evaluation and validation scales for CEBMs

Score	Evaluation scale for statements	Avr. score	Validation scale
1	Strongly disagree		Not Validated
3	Disagree	1.0 - 3.9	Not Validated
5	Neither agree nor Disagree	4.0 - 6.9	Partially Validated
7	Agree	7.0 - 10.0	Validated
10	Strongly agree		Validated

Together with CIR4Life partner EECC, a visual [online business model validation tool](#) was also developed in conjunction with the OIC validation methodology, and tested during the final validation stage at OIC (Figure 14).

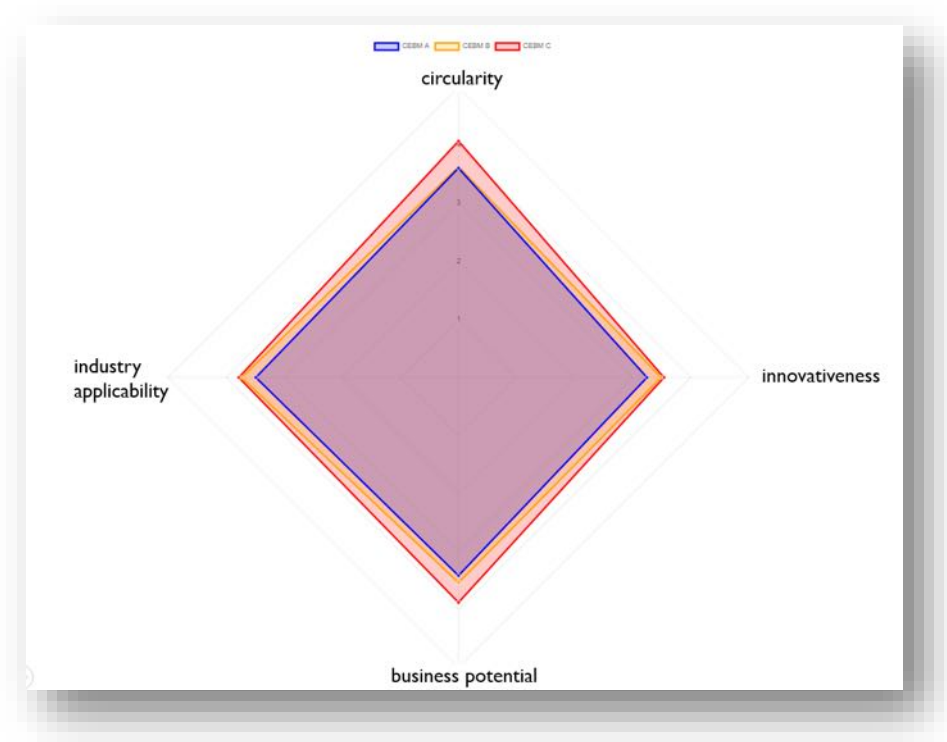


Figure 14: CEBM validation tool

The final structure of the CEBM validation, presented in Figure 15 below, was eventually structured to cover the above key aspects and requirements of OIC methodology (matrix structure), while keeping in mind the restricting conditions set by the online environment and non-incentivized participation of external experts.

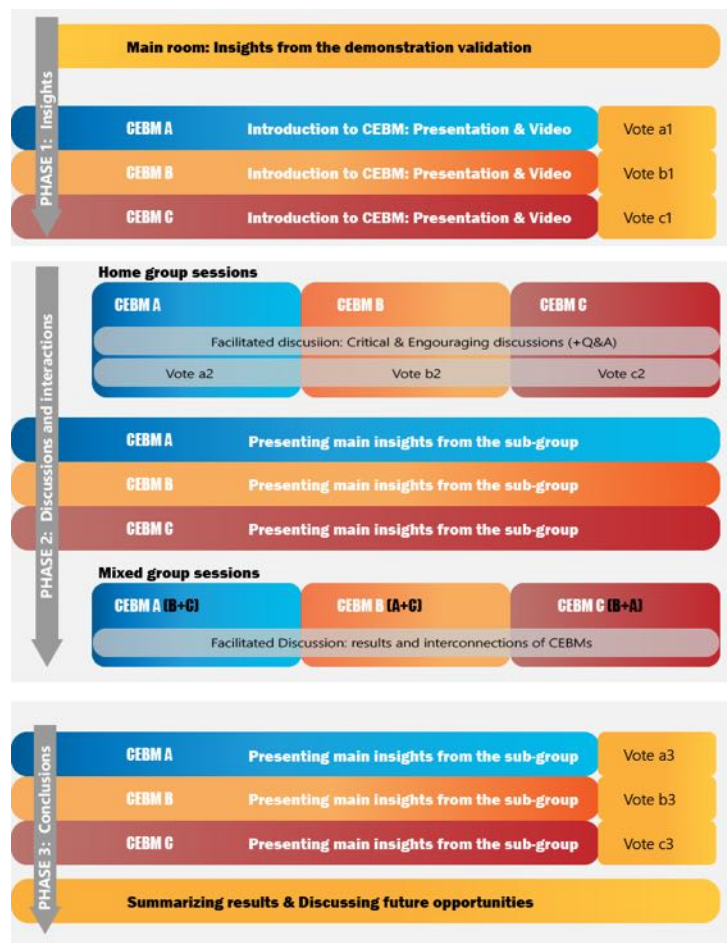


Figure 15: Structure of the CEBM validation process at OIC

Specific demonstration validation questions were defined as presented in the Table 7 below and were designed to form the foundation for the CEBM validation.

Table 7: Overall validation question for DEMOs

DEMO	Overall question for DEMOs:	Key issues considered in validation*
DEMOS 1-4	Have demonstrators achieved successful demonstration of a circular economy approach which integrates three CEBMs?	<ul style="list-style-type: none"> <li>- Has the company successfully applied CEBM A) Co-creation of products and services?</li> <li>- Has the company successfully applied CEBM B) Collaborative recycle and reuse?</li> <li>- Has the company successfully applied CEBM C) Collaborative recycle and reuse?</li> <li>- Has the company generated new services and/or products?</li> <li>- Has the company managed to transit towards more circular business during the project?</li> </ul>

The final outline and structure of the OIC event, presented in Appendix 4 and in Figure 15 below, was designed to cover the above topics and requirements, while keeping in mind the restricting conditions set by the online D7.2: Report of implementing living labs and ACSI-events

environment and non-incentivized participation of external experts. The most drastic decision made based on these restrictions was to perform the evaluation and validation of demonstrations internally among the consortium partners, while utilizing these results as the basis of the CEBM validation during the second day of OIC. In an ideal non-Covid setting, the 2<sup>nd</sup> OIC would have been arranged as physical event respectfully to the 1<sup>st</sup> OIC, which would have enabled full, multi-day participation and engagement of external experts through its value offerings, as discussed in Chapter 3.5.7 Conclusions and remarks regarding validation at OIC.



Figure 16: OIC agenda

Finally, the overall OIC structure was built on the [HOWSPACE platform](#), consisting of separate pages, sections, tasks and tools for each of the co-creation sessions and sub-groups, as well as digital CIRC4Life showroom and sections for the Welcome event, networking, general information and help. Examples from the OIC HOWSPACE platform are presented in Appendix 5.

### 1.13.2 Results of demonstration evaluation and validation at OIC

According to the results of the internal evaluation of demonstrations presented in the Table 8. below, it can be concluded that overall, the CIRC4Life demonstrations have been successful in implementing the three business models and especially in the new product and service development. In addition, in all of the demo cases the project participants considered that the companies had managed to transit towards more sustainable businesses.

Table 8: Percentage of the participants that agreed or strongly agreed

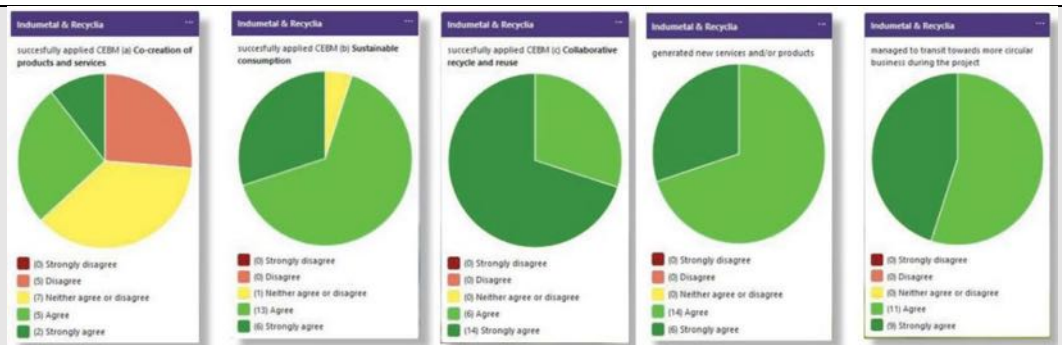
	Implementation of CEBM(A)	Implementation of CEBM(B)	Implementation of CEBM(C)	Generated new products	Increased sustainability
<b>D1a:</b> Domestic LED lightings (Ona)	53,85	53,85	38,46	76.92	53,85
<b>D1b:</b> Industrial LED lightings (Kosnic)	81, 25	87,50	73,33	93.33	86,67
<b>D2:</b> WEEE/tablets (Indumetal & Recyclia)	36,84	95,00	100.00	100.00	100.00
<b>D3:</b> Vegetable supply chain (Scilly Organics)	91.67	91.67	83.33	83.33	91.67
<b>D4:</b> Meat supply chain (Alia)	86.36	86.36	63.64	77.27	90.90

The two exceptions, scoring below 50% in the general acceptance, are highlighted in the Table 8 with an orange color. The first one concerns Demo 2, Indumetal's & Recylia's implementation of the CEBM(a) Co-creation of products and services. Evidently, the company representative noted during their presentation that their demonstration had concentrated on CEBM B) and CEBM C), as their business merely covers the later stages of circular economy. The second exception concerns demo 1a, Ona's implementation of CEBM(C) Collaborative recycle and reuse model. The low acceptance score (38,46%) can be interpreted as resulting from the company's unwillingness to provide further evidence on the practical implementation of this business model during the Q&A sessions, especially on the volume of the purchased and recycled products. Further results of demonstration validation are described in the Table 9 below.



Table 9: Results of the DEMO validation

<b>D1a: Domestic lightings (Ona)</b>	<p>Ona's demonstration received positive comments and feedback especially on the implementation of CEBM(A) Co-creation of products and services, as well as the visual appearance and the implementation of eco-cost on the webshop (CEBM B). The participants valued Ona's approach in sustainable lighting design - the utilization of the supply chain partners waste materials, and the design being informed by customer preferences.</p> <p>The critical questions and comments were focused on transparency of Ona's demonstration, as at the time, OIC taking place during the demonstration phase, company chose not to provide statistics (sold items, new customers, revenue, impact of incentives, sustainability of the vehicle-based take-back scheme). Due to this, especially the actual implementation, feasibility, and sustainability of the collaborative recycle (CEBM c) model was left unclear to the participants.</p>
<b>D1b: Industrial lightings (Kosnic)</b>	<p>Kosnic received positive feedback on the utilization of the LCA data in PDS development, and their holistic approach on leasing service eco-system, combining modular lighting design and a leasing service with full maintenance. Their approach in involving stakeholders in the development processes through surveys and workshops was also appreciated.</p> <p>The lack of actual customers and real-life implementation of the developed service was found to be the most prominent shortcoming of the demonstration, resulting in uncertainty in evaluating the potential acceptance of the solutions.</p>
<b>D2: WEEE (Indumetal &amp; Recyclia)</b>	<p>The most appreciated aspects of the demonstration were the extensive utilization of the CIRC4Life innovations and tools (traceability module, consumer application, incentives &amp; eco-credits) as well as the educational collaboration in local schools and the successful co-operation with the municipality and a local retailer. The participants also highlighted the success of the tree planting as the incentivizing approach developed during the project based on end-user feedback. Finally, <b>Demo 2 was selected as the most successful CIRC4Life demonstrator in the final voting.</b></p> <p>The identified development issues concerned the technical aspects, especially regarding the application and eco-credit/incentive scheme, and requirements for developing the overall process towards requiring less effort.</p>



Silly Organics received positive feedback on their consultative approach to the knowledge sharing, integration of the carbon calculator to the eco-label, as well as the bio-plastics usage in the packaging.

The discussed limitations concerned the lack of involvement of consumers and citizens, especially on the stages of recycle and reuse, while utilizing biowaste in soil improvement processes.

### D3: Mirco Farming (Silly Organics)



### D4: Meat (Alia)

The most appreciated aspects of the demonstration were the holistic usage of CIRC4Life tools and innovations (especially eco-label and LCA) and the systematic involvement of end-users and other stakeholders throughout the development process. In addition, the participants valued the changes made in production, as they resulted in the products being significantly more sustainable than the average product.

However, the participants raised the question of utilizing already existing eco-label instead of creating a new one, and the overall sustainability of meat consumption and production was discussed. **Finally, Demo 4 was selected as the second most successful CIRC4Life demonstrator in the final voting.**



### 1.13.3 Results of CEBM evaluation and validation at OIC

Moreover, results of evaluation and validation of the CIRC4Life CEBMs, presented in the Table 10 below, go on to show that all three CEBM's reached the desired validation level ( $> 7.0$ ) on their average scores and **can be considered validated by the Camp participants**. The highest average score of 8,25 was received by CEBM C), Collaborative Recycle and Reuse model for sustainability and circularity, and the lowest (7,02) by CEBM A) Co-creation, for innovativeness.

Table 10: The average score (1-10) for each evaluation criteria

	CEBM A (N=49)	CEBM B (N=50)	CEBM C (N=48)
The CEBM is innovative	7.02	7.36	7.67
The CEBM is sustainable and circular	7.53	7.84	8.27
The CEBM generates high business potential	7.29	7.56	8.06
The CEBM has wide industry applicability	7.59	8.12	7.98
<b>** Validation is concluded at <math>&gt;7.0</math> level</b>	<b>7.36</b>	<b>7.72</b>	<b>8.00</b>

The results of the three CEBMs are further reviewed and presented in the following pages through 3 individual groups: **G1)** all participants, **G2)** external experts, and **G3)** project partners, excluding the representatives of the developer/owner organization.

### 1.13.4 CEBM A

According to the validation results of CEBM A presented in the Table 5 below, there seems to be a variance concerning the validation of the business model A) depending in the evaluation group. While the results of all participants (G1), including the self-evaluation by the developer organization, reached above the desired validation score ( $<7.00$ ) in all four evaluation criteria, the group of external experts (G2) indicated acceptance merely for CEBM A) being **sustainable and circular**, while **innovativeness**, **industry applicability** and **business potential** scores remained under the validation threshold. The overall average (6.87) of the expert group remained 0.13 points under the validation threshold.

Both, the highest average score (7.61\* for industry applicability) and the lowest score (6.57\* for innovativeness) were received from the group of project participants (G3).

Table 11: Validation of CEBM A

<b>CEBM A</b>	<b>G1</b> (All)	Std	<b>G2</b> (Externals)	Std	<b>G3</b> (Project partners)	Std
<i>N =</i>	49		16		28	
The CEBM A) is innovative	7.02	1.98	6.88	1.89	6.57*	1.77
The CEBM A) is sustainable and circular	7.53	1.85	7.00	1.83	7.39	1.70
The CEBM A) generates high business potential	7.29	1.87	6.63	1.89	7.18	1.61
The CEBM A) has wide industry applicability	7.59	1.87	6.81	2.10	7.61*	1.52
<b>** Validation is concluded at &gt;7.0 level</b>	<b>7.36</b>		<b>6.83</b>		<b>7.18</b>	

### 1.13.5 CEBM B

According to the group-based validation results of individual statements (Table 12), the only exception in reaching the validation threshold (> 7.00), was received from the group of external experts (G2) for CEBMs capability for **generating high business potential** (6.88\*). In contrast, the highest score (8.30\*) was received from the group of project partners (G3), for **wide industry applicability**.

Table 12: Validation of CEBM B

<b>CEBM B</b>	<b>G1</b> (All, N=50)	Std	<b>G2</b> (Externals, N=17)	Std	<b>G3</b> (Project partners, N=30)	Std
The CEBM B) is innovative	7.36	1.97	7.05	1.89	7.30	1.99
The CEBM B) is sustainable and circular	7.84	1.49	7.76	1.30	7.70	1.56
The CEBM B) generates high business potential	7.56	1.98	6.88*	2.32	7.77	1.72
The CEBM B) has wide industry applicability	8.12	1.55	7.47	2.03	8.30*	1.06
<b>** Validation is concluded at &gt;7.0 level</b>	<b>7.72</b>		<b>7.29</b>		<b>7.77</b>	

### 1.13.6 CEBM C

As shown in the Table 13 below, CEBM C) Collaborative recycle and reuse model, reached the validation threshold (> 7.00) in all four evaluation criteria, within all three groups (G1, G2, G3) . The highest score (8.47\*) was received from the group of project partners for **sustainability and circularity**, whereas the lowest score (7.06\*) was concluded by the group of external experts for **innovativeness**.

Table 13: Validation of CEBM C

<b>CEBM C</b>	<b>G1</b> (All, N=48)	Std	<b>G2</b> (Externals, N=16)	Std	<b>G3</b> (Project partners, N=30)	Std
The CEBM C) is innovative	7.67	1.74	7.06*	1.84	8.00	1.55
The CEBM C) is sustainable and circular	8.27	1.49	7.81	1.87	8.47*	1.25
The CEBM C) generates high business potential	8.06	1.46	7.50	1.59	8.30	1.34
The CEBM C) has wide industry applicability	7.98	1.66	7.44	1.82	8.23	1.52
<b>** Validation is concluded at &gt;7.0 level</b>	<b>8.00</b>		<b>7.45</b>		<b>8.25</b>	

### 1.13.7 Conclusions and remarks regarding validation at OIC

There is a need for highlighting that the results of internal demonstration validation are formed by project partners and reflect their general attitudes and perception towards the demonstrations and implementation of CEBMs based on brief 10-minute introductory videos and time-intensive discussions and Q&A sessions with the company representatives. In other words, the results of the demonstration validation are not formed based upon participation or real experiences in the demonstrations, nor specific statistical evidence on the business cases. Therefore, the liability of the overall results cannot be confirmed to the level of forming a basis for solid evidence of the success of the demonstrations and implementation of business models. However, the validation through demonstrations is holistically concluded and presented by WP6 in D6.5 Report on demonstrations of CEBMs. Consequently, as the results and conclusions of the CIRC4Life demonstrations served as a basis for CEBM validation at OIC, the issues mentioned above apply, and evidently had a great impact on the liability and applicability of the CEBM validation results.

Due to the Covid-19 outbreak, 2<sup>nd</sup> OIC was arranged virtually, which had a major impact on the participant engagement and the used OIC validation methodology. While the physical Open Innovation Camp, arranged in Krakow 2018, attracted hundreds of external applicants, and engaged 80 participants for 4 days of intense work while receiving excellent feedback, the online OIC attracted merely tens of external applicants, and the one-day event was considered to be suitable duration-wise. Moreover, while the overall amount of people participating in the camp during the keynotes and Zoom discussion sessions was approximately 70, merely 50 people participated in the final voting-based evaluation of CEBMs. Thus, maintaining the active engagement and concentration throughout the event remains a significant challenge in the online environment.



Finally, the extremely limited timeframe set by the online environment and the overall conditions of non-incentivized participation of external experts can be considered another main challenge of the virtual OIC and the co-validation methodology, especially when covering complex, interconnected topics such as circular economy business models in CIRC4Life. Due to the previously mentioned aspects, the co-evaluation and validation process of CEBMs (Figure 14), including the presentations, lasted merely for 3 hours and consisted of several working groups and a matrix structure respectfully to the OIC methodology (Santonen et al, 2019). Therefore, enabling the participants, especially external ones, with comprehensive knowledge enough within the timeframe can be considered the most critical key success factor, and is vastly dependent on the quality and depth presented information, and systematic utilization of KPIs throughout the project.

Despite the mentioned challenges, the received participant feedback was very positive, as 100% of the respondents on the Howspace platform evaluated their experience as **Excellent** (19/28) or **Good** (9/28) and 89,6% of the feedback survey respondents ( $N=19$ ) stated that they would, or already have, recommended the virtual Open Innovation Camp to others and would likely participate in a similar event again.



Figure 17: OIC Live drawing by Cartoonbase Ltd

According to the open comments, the event had been successful in providing the participants with new insights on designing successful circular business models, especially through researcher Erwan Mouazan's keynote, as well as delivering perspectives on the developed CIRC4Life CEBMs (Figure 17). The event was also considered an excellent networking opportunity for future collaborations, while also delivering interesting information about Horizon Europe CE grant opportunities through the keynote of Hans-Christial Eberl, Policy Officer of European Commission.

The received development aspects related to quality of the presented information, limitations for open interaction and free discussions around the topics, as well as the limited amount and duration of breaks.



## Impact of COVID-19 on CIRC4Life Living Labs

Implementation of CIRC4Life Living Labs started in the beginning of 2019 and was initially supposed to finish in the winter 2021. However, none of the plans were executed as initially planned. In year 2020 COVID-19 pandemic drastically changed the operating environment and prevented close social contacts, travel and gatherings. This caused significant challenges for the living lab activities, which are heavily grounded on the social interaction, but also for other project activities, in particular, WP6 demonstrations. As the response to COVID-19 pandemic, CIRC4Life project was prolonged for 6 months, including prolongation of the Living Labs.

Due to the pandemic, the project activities involving physical participations from March 2020 have been postponed or canceled. In particular, Living Lab activities related to testing and small-scale piloting have been affected, due to the fact that all the demonstrators are in Spain and UK, two of the most seriously affected countries, and, hence, the planned activities for the living labs and demonstrations were heavily delayed. For example, the micro-farming demonstrator is located on the Isles of Scilly, just off the coast of Cornwall, UK, with its business very much related to tourism in the summer, and due to the lack of tourists this summer caused by the pandemic, the demonstrator's living lab activities and onsite demonstration with tourists, restaurants and hotels have to be postponed to the next year summertime (M37-M40). The end-user feedback collection and workshop for industrial LED lighting demonstrator was planned to conduct during the lighting fair in Frankfurt in March 2020, but the fair has been canceled. The school training activities of WEEE recycling demonstrator in Basque country in Spain planned in April 2020 were cancelled. The living lab workshop with citizens to test the Implementation of eco-shopping at the store of a meat supply chain demonstrator in southern Spain initially planned in April 2020, as well as the incentive arrangement with the local authority, had to be rescheduled and replanned.

Mitigation activities consisted e.g. online based testing by using storyboards and surveys. An example of a developed storyboard used for the testing purposes is presented in Appendix 3. Furthermore, cancellation of international tradeshow events were partially replaced by arranging showroom event in university premises in a country, which had less restrictions for close contacts (Finland). Obviously, the replication of the real-life setting was impossible to fully achieve, and thus some Living Lab activities, such as testing of an optimal location of an intelligent bin, were not possible to implement within the project.

The impacts of COVID-19 on the Living Lab and OIC implementation are the following:

- **Increased personnel costs:** The iterative Living Lab approach is generally more laborious compared to liner methodologies of closed innovation, but unexpected events such as travel and gathering restrictions create extra work related to replanning and arranging alternative ways of reaching the Living Lab goals. As a result, Living Lab implementation required extra resources for the troubleshooting, re-planning, re-scheduling and coming up with new way of implementing Living Labs.
- **Changes in the Living Lab budget/travel costs:** Due to travel and meeting restrictions, it was not possible to arrange travel and accommodation for invited experts for the focus groups for the Living Lab events. Therefore, Laurea developed new ways of engaging end-users and other stakeholders (such as digital co-creation, use of storyboards and surveys, and local testing and showroom events). The new ways of engaging end-users do not require travel costs, which are often the main cost item in the Living Labs, but instead require reallocation of the Living Lab budget to e.g. technology licenses and producing digital materials to support virtual co-creation.
- **Reliance on digital tools and platforms:** One of the weaknesses of the CIRC4Life Living Lab approach has been in the dependency of physical encounters, including co-creation workshops, observations, prototyping and testing sessions. In light of COVID-19 restrictions, one key question was exploring digital co-creation options, but also digital testing and prototyping options. One of the most widely used digital co-creation platforms was Miro (<https://miro.com/>) which was utilized by Laurea both as the Living Lab planning and monitoring tool, but also for example in the Living Lab activities using online

version of [CELLL](#) (Circular Economy Laurea Living Lab tool) developed by Laurea team. More information about CELLL can be found in Purola et al 2019b and Santonen 2020. In addition to Miro, Survey Monkey (<https://www.surveymonkey.com/>) has been widely utilized to collecting consumer preferences and getting feedback concerning their attitudes and understanding of the eco-point/eco-cost concept, customer journeys for recycling and eco-shopping using storyboards, as well as evaluation of the new LED lamps. Development was performed to integrate the functionalities of feedback and surveys into a selection of tools developed during the CIRC4Life project, consumer tools the most important one. Finally, Howspace (<https://www.howspace.com/>) digital collaboration platform was picked up for the internal validation activities with the consortium partners which took place in February 2021, and, based on the very positive feedback of the consortium partners, it was also utilized for the validation OIC.

While COVID-19 created risks for the Living Lab implementation, it also generated new and creative opportunities. For example, new ways of arranging both physical and digital showrooms introducing project results at their different stages of market readiness have been developed and implemented in the project.

## Recommendations in utilizing Living Lab approach in future Circular Economy efforts

### 1.13.8 Recommendations regarding Open Innovation Camp

*These suggestions are grounded Santonen, T., Nevmerzhitskaya, J., Puroila, A. and Haapaniemi, H., 2019. Open Innovation Camp (OIC)–A Tool For Solving Complex Problems Rapidly. In OpenLivingLab Days 2019 Conference Proceedings. European Network of Living Labs study results.*

Open Innovation Camp (OIC) proposed is a good tool to (1) rapidly establish new collaborative relationships and (2) discover new insights by sharing knowledge and co-creating novel solutions by a diverse set of quadruple helix stakeholders. Since the OIC is grounded on facilitated and well-structured collaboration, the camp participants can concentrate on the interaction and idea exchange, while the process will ensure reaching the set goals. They can devote all their efforts to co-creation activities and focus on establishing new collaboration and relationships with each other. Since the participants are carefully selected based on a predefined quadruple helix (HQ) profile, the OIC can certainly offer new and interesting contacts for all participants beyond their regular networks. As a result, it is recommended that in each OIC co-creation activity, there should be all quadruple helix stakeholder groups present, to ensure that all critical viewpoints will be considered when discussing novel solutions. Based on the research findings of an OIC post-survey, most of the respondents had found new contacts initiated by the OIC and the participants were able to apply new insights to their work. This provides strong evidence on OIC networking and knowledge sharing/creation capabilities. It is highlighted that maintaining these new relationships will require ongoing relationship management. OIC can be considered only as an initiator and starting point for a new collaboration relationship.

When formulating an open call to participate in OIC, the organizer should carefully define the key expected expertise, which participants are expected to have, which naturally will differ between quadruple helix stakeholder groups. The careful profiling will also minimize the responses from persons who are not meeting the selection criteria and therefore reducing unnecessary work to go thru unsuitable applications. Anyhow, identifying and selecting suitable participants for OIC and defining fluent workflow across subgroups during the OIC days is a demanding task, which requires careful planning. As a result, the OIC organizer should start planning the OIC participants and agenda at least 6 months before to ensure a representative sample of participants, especially if the aim is to recruit high-profile participants. The success of an OIC is dependent on creating the matrix structure, which enables a systematic co-creation process, where results of one subgroup interaction are reflected and further developed by the following subgroups. In practice, this is a relatively difficult task, considering the limited time per day. A good practice is to 'dry-run' the suggested agenda among facilitators and key project partners (e.g. group owners) a few times to make sure that each key participant understands their role and is well prepared for OIC. The snowballing sample – a process where already identified participants suggest new participants from their networks – can also be a very effective tool to recruit OIC participants. However, snowballing sample approach should be utilized carefully, since there is a higher risk of biased participant selection if the final selection is dominated by snowballing sample participants. Biased selection will lead to unbalanced stakeholder representation, and in the worst case, into a silo-effect where special interest groups are forcing their agenda.

We also recommend using OIC at the very beginning of a project, or preferably already during the project planning phase, to create a sense of shared responsibility among different stakeholders, and a common understanding of a challenge and possible solutions. This suggested approach can easily identify key risks and challenges already at the very beginning of the project. For example, in the case of CIRC4Life, one of the outcomes of the camp was a strong suggestion to terminate the meat recycling sub-task, which eventually was replaced with biowaste recycling. When using OIC at the very beginning of a living lab project, it has the greatest likelihood to provide the most value, since, in the early phase of the innovation process quality, costs, and timings of the innovative solution are mostly defined.

Finally, without the follow-up Living Lab processes focusing on co-creating and testing with real users and other relevant stakeholders, OIC can merely generate concepts or early phase mock-ups, in which genuine user acceptance and market value are not verified.

At the end of a project, OIC can be utilized for dissemination and exploitation purposes. In this case, it is highlighted that the focus for end-of-project OIC event should not be merely validating the project results, which should happen already during the validation period, but focusing on discussing and co-creating the scalability, access to the global market, and initiate new project proposal based on the prior experiences.

### 1.13.9 Living lab activity type discussion

*These suggestions are grounded Santonen, T. and Purola, A, (in review) Living lab research designs in Circular Economy projects: A multiple case study and Santonen, T. (2020) Living labs and Circular Economy: A multiple case study. Proceedings of ISPIM Connects Global 2020: Celebrating the World of Innovation - Virtual, 6-8 December 2020.*

Case companies had only a modest prior experience on co-creation and living lab approach, which also influenced the living lab research design choices. The living lab approach was perceived as more laborious than originally expected. In some cases, companies argued that they were under-resourced for living lab tasks. In all, the project results show the varying level of co-creation engagement among different case companies, which could be merely partially explained by COVID-19 impacts. It is suggested that significant efforts should be devoted at the very beginning of the project to create a shared understanding of what kind of preconditions come with the living lab process, and what is the key difference, if any, between living lab activities and demonstration activities. Based on the experiences from CIRC4Life, the feedback collection tools, and systems developed in living labs were suitable, and vastly utilized by the demonstration task.

Moreover, the project's WP and task structure were not fully compatible with the iterative development approach required by living labs. The feedback collected from users resulted a series of identified problems requests for novel features, which required developers' attention. The value of the Living Lab approach comes from the identification of user and stakeholder needs, turning them into specifications and requirements, and being able to incorporate these requirements into the development cycle to ensure customer acceptance and usability of the final solutions. However, all development projects and teams are faced with the constraints of the limited resources allocated to the development work. Thus, there is a constant need to prioritize the identified development issues - feeding the most critical ones back to the development circle while some issues are consciously left unaddressed. Occasionally, the lack of resources can create a conflict between the features and requirements brought up by the users and the issues considered critical by the developing side. To fix this problem, in the project planning phase, more resources should be devoted for the development and implementation phases, not only to fixing the identified problems but also to developing new features based on the identified user feedback.

It can be concluded, that the living labs research design choices depend on several factors, including (1) a company customer knowledge; (2) their understanding of user-centered design and open innovation; (3) knowledge and acceptance of co-creation and iterative development approach, and (4) readiness and ability to engage relevant stakeholders and (5) transfer the collected insights into development decisions and product specifications. Mastering the iterative user-centered design and open innovation process requires time and devotion from the company, and there are no shortcuts. Each of the case companies made clear progress on their journey to become more user-centered, while their journey has only just begun.

Moreover, the project's focus shifted due to the collected end-user feedback and COVID-19, leading to amendment requests according to European Commission procedure. As being European Commission funded H2020 project, it was a relatively long process to get the amendment request agreed upon among consortium members and accepted by European Commission authorities. Thus, it is argued that currently, H2020 funding

system is not as compatible with the iterative co-creation process as e.g. in privately funded development projects, where decisions can be made by a single company much more rapidly. Therefore, it is suggested that within the project plan, there should be more flexibility to explore different objectives and possible outcomes at the beginning of the project, and only after the initial phase lock in the final objectives, to leave more space to impactful end-user and stakeholder involvement.

Some of the initially proposed and planned living lab activities were discarded either due to reluctance from a project partner or unexpected events, such as COVID-19. In H2020 project settings, some of these situations can be overcome if the living lab 'orchestrator/facilitator' takes a leading role and conducts the additional activities independently. However, the possibilities in such cases are limited, since the 'orchestrator/facilitator' doesn't have direct access to relevant end-users and other key stakeholders of a specific value chain. Also, some of the method choices, such as Open Innovation Camp (OIC) cannot be executed by a single SME company due to significant resource-factor. In all, the available resources are limiting the number of iterations and the selection of living lab methods to be used for co-creation and testing. Therefore, public funding such as H2020 plays a critical role as an enabler for more ambitious SME-driven living lab projects, such as CIRC4Life.

The results of a systematic examination of the CIRC4Life project revealed that ca. 80 percent of all individual living lab activities addressed more than one CE phase during the particular activity, the most dominant "CE phase pair" in this study was (CEP5) Consumption & use and sharing and (CEP6) Collection & disposal. This finding could be explained by case companies' development objectives, which were associated either with sustainable product development (modular LED lamps, webshop, meat, and farming products) or service system (take-back scheme, electronic waste collection, eco-label, application to manage eco-point information and incentives). The outcome of the CE phase division would have been significantly different if emphasis had been e.g. the development of (CEP1) material sourcing (CEP3) sustainable manufacturing processes, or (CEP9) circular inputs. Our results highlight the importance of covering more than one CE phase during the one living lab activity but also, from time to time, cover all CE phases in one event to keep the full CE circle in mind. Consequently, the OIC is suggested as an excellent option for covering all the phases.

The division between multi-stakeholder activities (i.e. more than one quadruple helix group was present during the activity) and single stakeholder activities was in favor for single stakeholder events (26.5 percent vs. 73.5 percent). The most dominant stakeholder group in the living lab activities (N=2718, 90.4 percent) were the consumers (a.k.a. end-users) followed by business partners (N=136, 4.5 percent), academia (N=130, 4.3 percent), and public authorities (N=23, 0.8 percent). As a result, it is good to keep in mind that at the project level the collaboration between quadruple helix stakeholders can be implemented by combining multi-stakeholder and single stakeholder activities. Multi-stakeholder participation occurred in many forms, while the combination of the participants varied greatly between the activities and demonstrations. Both, one-way (e.g. survey) and two-way interactive (e.g. workshop, design sprint) methods were utilized to engage relevant stakeholders depending on the information need and innovation process stage. Importantly, it is good to remember that multi-stakeholder participation can occur in one event (e.g. in workshop or design sprint) or by conducting multiple events in series (e.g. via workshop series with different stakeholder groups such as consumers vs. public authorities). Based on case company (Ona, Kos, IND&REC, JS, ALIA) interviews, it was evident that early phase data collection focusing on end-user needs and preferences via survey without genuine real-life or simulated setup is also a highly valuable approach and could lead to significant changes. Thus, it is suggested that living lab process requirements should be assessed as a whole. Even if some of the individual activities might not fulfill all the living lab requirements at once, satisfactory results can be obtained by combining multiple research approaches during the project.

The very first innovation process phase "Concept creation (including also need assessment)" became the most popular innovation process phase to execute living lab activities while the second most popular phase was the very last one "(IP6) real-life testing with externals". It is argued that the strong emphasis on the first (IP1) Concept creation phase will pay out in the later stage, since already from the start, the proposed solution is including features and functionalities, which end-users are preferring. Therefore, concepts including end-user suggested features are more easily accepted, which reduces the need for multiple follow-up tests in different

phases. However, since early-stage concepts typically don't allow genuine user interaction, it is sometimes difficult to reliably assess e.g. the usability or design of the solution, which both have a great impact on user acceptance. Therefore, also cost-effective mock-ups are a good way of experimenting with different alternative development choices. Among the CIRC4Life case companies, concept and mock-up LL-tests gained somewhat similar interest and were closely followed by a prototype test. Before revealing the solutions to public testing, small-scale real-life facilitated tests were executed in a secure environment to verify that everything was functioning well. This kind of innovation process is typical among living lab approaches.

Finally, at the later stages of the project COVID-19 played a critical role in the project activities and revealed how dependent the living lab approach is on face-to-face, physical interaction in a real-world context. The original living lab plans had to be changed and adapted multiple times, in order to seek the best possible alternative solutions for interaction in the novel COVID-19 setting. Thus, the CIRC4Life living lab methodological choices don't represent the 'optimal execution' of a living lab project taking place in a non-COVID period, while they offer good insight on the potential of the adaptivity and flexibility of the approach within unpredictable circumstances.

## Conclusions

To sum up the findings from various living lab activities, innovation and design literature, the initial phase of living lab process should include gathering information and insights about the various challenges, needs and opportunities among the users and customers within a targeted market environment. The discoveries from initial process phase represent possible business opportunities, which have not yet been fulfilled. The follow-up process phases should iteratively co-create and test multiple alternatives for defined development challenges, starting from high-level ideas and evolving to concepts, prototypes and finally ending to fully functional final solution ready to be commercialized. It needs to be highlighted that in a long duration living lab-based project requires adaptive management and willingness change plans based on user feedback and analysis of the results, which should be already taken into consideration when designing project outlines. This should be taken into consideration already when planning and evaluating the innovation projects, as combining the traditional and linear 'waterfall model' with living lab approach is likely to cause issues during the process. The possibilities of operating in real-life environments and engaging the targeted end-users and other relevant stakeholders in project planned activities, are closely intertwined with the opportunities offered by the local innovation network. Therefore, one should always critically evaluate in what kind of partner network (a.k.a. innovation network) a given living lab is operating.

Based on demonstrator interviews it was evident, that early phase data collection focusing on end-user needs and preferences via survey without genuine real-life or simulated setup is also highly valuable approach and could lead to significant changes. Thus, it is suggested that living lab process requirements should be assessed as a whole. Even if some of the individual activities might not full fill all the living lab requirements at once, satisfactory results can be obtained by combining multiple research approaches.

Finally, as discussed in Deliverable 6.6. Report on lessons learned from the Demonstrations of CEBMs and recommendations, co-creation activities were considered as one of the most valuable aspects within the CIRC4Life project. These activities were found remarkably useful in designing products and services that are informed by customer needs and requirements, but also in learning new ways to engage different actors and stakeholders in the development processes - vital skills in the transition towards circular economy-based business ecosystems.



## Appendix 1. 1<sup>st</sup> OIC Agenda



**CIRC4Life: A circular economy approach for lifecycles of products and services**

**CIRC4LIFE Innovation Camp 2018**  
12-15 November 2018, Cracow Poland

### Tuesday 13<sup>th</sup> November

9:00 - 10:55	Group rooms	<b>ROUND 1: Developing Circular Economy Business Models (CEBMs) for the demonstration 1 to 4</b>  The DEMO and CEBM working groups co-create the CEBMs for each demonstration. Since the Innovation camp activities are based on matrix model, the CEBM working group members are circulating across the DEMO working groups during the Tuesday 13th and Wednesday 14th. Each development round consist ca. 2 hours of develop activities in which a series co-creation tools and methods are applied. The methods and tools can vary across the working groups due the different shared commitment and demonstration conditions.  Development activities for DEMO group 4 will be announced later.			
		<b>CEBM A group with</b>	<b>CEBM B group with</b>	<b>CEBM C group with</b>	<b>Traceability/ICT</b>
		<b>DEMO GROUP 1</b> "Domestic and industrial LED lighting" working group developing The Co-creation of Products and Services model in collaboration with CEBM A working group.	<b>DEMO GROUP 2</b> "Recycle and reuse of tablets" working group developing The collaborative recycling and reuse model in collaboration with CEBM B working group.	<b>DEMO GROUP 3</b> "Micro farming" working group developing the sustainable consumption model with CEBM C working group.	<b>DEMO GROUP 4</b> "Meat product supply chain" working group with Traceability/ICT working group.
10:55 -11:00		<b>5 minute transit time</b>			
11:00 - 12:00	Main room	<b>ROUND 1: Cross group reflection and learning based on– Collectively reviewing the proposed Circular Economy Business Models (CEBMs)</b>  The innovation camp is all about sharing the knowledge and learning from each other while critically reviewing the suggested ideas against the shared commitment. The combined DEMO and CEBM groups are showcasing their contributions.  After the each presentation, innovation camp members will subjectively assess and complement the presented CEBMs concepts via crowd commenting and voting tools. For that each participant is expected to have either computer or mobile internet access via provided innovation camp wlan connection.  CEBMs presentations are as follows			
		<b>1 A</b>	<b>The Co-creation of Products and Services model (CEBM A) within Domestic and industrial LED lighting (DEMO 1)</b>		
		<b>2 B</b>	<b>The Collaborative Recycling and Reuse model (CEBM B) within Recycle and reuse of tablets (DEMO 2)</b>		
		<b>3 C</b>	<b>The Sustainable Consumption model (CEBM C) within Micro farming (DEMO 3)</b>		
		<b>4</b>	<b>Traceability/ICT working group within Meat product supply chain (DEMO 4)</b>		
12:00 -13:00		<b>Networking lunch</b>			





## CIRC4Life: A circular economy approach for lifecycles of products and services

**CIRC4LIFE Innovation Camp 2018**  
12-15 November 2018, Cracow Poland

13:00 - 15:00	Group rooms	<b>ROUND 2: Developing Circular Economy Business Models (CEBMs) for the demonstration 1 to 4</b>  Respectively to ROUND 1 but now CEBM group members will change to the different DEMO working group. As prior, the methods and tools can vary across the groups due the different shared commitment and demonstration conditions.  Development activities for DEMO group 1 will be announced later.						
		<b>Traceability/ICT</b>	<b>CEBM A group with</b>	<b>CEBM B with</b>	<b>CEBM C group with</b>			
		<b>DEMO GROUP 1</b>	<b>DEMO GROUP 2</b>	<b>DEMO GROUP 3</b>	<b>DEMO GROUP 4</b>			
		"Domestic and industrial LED lighting" working group with Traceability/ICT working group.	"Recycle and reuse of tablets" working group developing the Co-creation of Products and Services model in collaboration with CEBM A working group.	"Micro farming" working group developing the collaborative recycling and reuse model in collaboration with CEBM B working group	"Meat product supply chain" working group developing the sustainable consumption model with CEBM C working group.			
15:00 -15:30		<b>Coffee break</b>						
15:30 - 16:30	Main room	<b>ROUND 2: Cross group reflection and learning based on– Collectively reviewing the proposed Circular Economy Business Models (CEBMs)</b>  Respectively to ROUND 1 reflections, innovation camp members will subjectively assess and complement the presented CEBMs concepts via crowd commenting and voting tools.  CEBMs presentations are as follows						
		<b>2</b>	<b>A</b>	<b>The Co-creation of Products and Services model (CEBM A) within Recycle and reuse of tablets (DEMO 2)</b>				
		<b>3</b>	<b>B</b>	<b>The Collaborative Recycling and Reuse model (CEBM B) within Micro farming (DEMO 3)</b>				
		<b>4</b>	<b>C</b>	<b>The Sustainable Consumption model (CEBM C) within Meat product supply chain (DEMO 4)</b>				
		<b>1</b>		<b>Traceability/ICT working group within Domestic and industrial LED lighting (DEMO 1)</b>				
16:30 - 18:00	Group rooms	<b>Refining the CEBMs based on ROUND 1 and 2 insights within each DEMO and CEBM home groups – Defining Concept version 2</b>  The development activities will be divided back to the seven basic working groups (DEMO groups 1 to 4 and CEBM groups A to C).  Each of the seven groups are refining and re-composing their initial CEBM concepts based on Tuesday's 13 <sup>th</sup> insights. By the end of the day, seven improved concept versions (V2) are published and distributed among the Innovation camp members.						
		<b>DEMO 1</b>	<b>DEMO 2</b>	<b>DEMO 3</b>	<b>DEMO 4</b>	<b>CEBM A</b>	<b>CEBM B</b>	<b>CEBM C</b>
		Domestic and industrial LED lighting applying CEBM A.	Recycle and reuse of tablets applying CEBM A and B.	Micro farming applying CEBM B and C.	Meat product supply chain applying CEBM C.	The Co-creation of Products and Services model applying DEMO 1 and DEMO 2 insights.	The Collaborative Recycling and Reuse model applying DEMO 2 and DEMO 3 insights.	The Sustainable Consumption model applying DEMO 3 and DEMO 4 insights.
19:00		<b>Dinner and acknowledgements of the day. Participation to the dinner is optional.</b>						





## CIRC4Life: A circular economy approach for lifecycles of products and services

**CIRC4LIFE Innovation Camp 2018**  
12-15 November 2018, Cracow Poland

### Wednesday 14<sup>th</sup> November

9:00 - 10:55	Group rooms	<b>ROUND 3: Developing Circular Economy Business Models (CEBMs) for the demonstration 1 to 4</b>  Respectively to ROUND 1 and 2, CEBM group members will change to the different DEMO working group. As prior, the methods and tools can vary across the groups due the different shared commitment and demonstration conditions.  Development activities for DEMO group 2 will be announced later.			
		<b>CEBM C group with</b>	<b>Traceability/ICT</b>	<b>CEBM A with</b>	<b>CEBM B group with</b>
		<b>DEMO GROUP 1</b>	<b>DEMO GROUP 2</b>	<b>DEMO GROUP 3</b>	<b>DEMO GROUP 4</b>
		"Domestic and industrial LED lighting" working group developing the sustainable consumption model with CEBM C working group.	"Recycle and reuse of tablets" working group with Traceability/ICT working group.	"Micro farming working group" developing the Co-creation of Products and Services model in collaboration with CEBM A working group.	"Meat product supply chain" working group developing The collaborative recycling and reuse model in collaboration with CEBM B working group
10:55 -11:00		<b>5 minute transit time</b>			
11:00 - 12:00	Main room	<b>ROUND 3: Cross group reflection and learning based on– Collectively reviewing the proposed Circular Economy Business Models (CEBMs)</b>  Respectively to ROUND 1 and 2 reflections, innovation camp members will subjectively assess and complement the presented CEBMs concepts via crowd commenting and voting tools.  CEBMs presentations are as follows:			
		<b>3 A</b>	<b>The Co-creation of Products and Services model (CEBM A) within Micro farming (DEMO 3)</b>		
		<b>4 B</b>	<b>The Collaborative Recycling and Reuse model (CEBM B) within Meat product supply chain (DEMO 4)</b>		
		<b>1 C</b>	<b>The Sustainable Consumption model (CEBM C) within Domestic and industrial LED lighting (DEMO 1)</b>		
		<b>2</b>	<b>Traceability/ICT working group within Recycle and reuse of tablets (DEMO 2)</b>		
12:00 -13:00		<b>Networking lunch</b>			







## CIRC4Life: A circular economy approach for lifecycles of products and services

**CIRC4LIFE Innovation Camp 2018**  
12-15 November 2018, Cracow Poland

13:00 - 15:00	Group rooms	<b>ROUND 4: Developing Circular Economy Business Models (CEBMs) for the demonstration 1 to 4</b>  Respectively to ROUNDS 1 to 3, CEBM group members will change to the different DEMO working group. As prior, the methods and tools can vary across the groups due the different shared commitment and demonstration conditions. Development activities for DEMO group 3 will be announced later.						
		<b>CEBM B group with</b>	<b>CEBM C group with</b>	<b>Traceability/ICT</b>	<b>CEBM A group with</b>			
		<b>DEMO GROUP 1</b>	<b>DEMO GROUP 2</b>	<b>DEMO GROUP 3</b>	<b>DEMO GROUP 4</b>			
		"Domestic and industrial LED lighting" working group developing the collaborative recycling and reuse model in collaboration with CEBM B working group.	"Recycle and reuse of tablets" working group developing the sustainable consumption model with CEBM C working group.	"Micro farming" working group with Traceability/ICT working group.	"Meat product supply chain" working group developing the Co-creation of Products and Services model in collaboration with CEBM A working group.			
15:00 -15:30		<b>Coffee break</b>						
15:30 - 16:30	Main room	<b>ROUND 4: Cross group reflection and learning based on– Collectively reviewing the proposed Circular Economy Business Models (CEBMs)</b>  Respectively to prior ROUNDS 1 to 3, innovation camp members will subjectively assess and complement the presented CEBMs concepts via crowd commenting and voting tools.  CEBMs presentations are as follows						
		<b>4</b>	<b>A</b>	<b>The Co-creation of Products and Services model (CEBM A)</b> within Meat product supply chain (DEMO 4)				
		<b>1</b>	<b>B</b>	<b>The Collaborative Recycling and Reuse model (CEBM B)</b> within Domestic and industrial LED lighting (DEMO 1)				
		<b>2</b>	<b>C</b>	<b>The Sustainable Consumption model (CEBM C)</b> within Recycle and reuse of tablets (DEMO 2)				
		<b>3</b>		<b>Traceability/ICT working group</b> within Micro farming (DEMO 3)				
16:30 - 18:00	Group rooms	<b>Refining the CEBMs based on ROUNDS 1 to 4 insights within each DEMO and CEBM home groups – Defining Concept version 3</b>  The development activities will be divided back to the seven basic working groups (DEMO groups 1 to 4 and CEBM groups A to C).  Each of the seven groups are refining and re-composing their initial CEBM concepts based on Wednesday 14 <sup>th</sup> insights. By the end of the day seven concept versions (V3) are published and distributed among the Innovation camp members.						
		<b>DEMO 1</b>	<b>DEMO 2</b>	<b>DEMO 3</b>	<b>DEMO 4</b>	<b>CEBM A</b>	<b>CEBM B</b>	<b>CEBM C</b>
		Domestic and industrial LED lighting applying all CEBMs insights.	Recycle and reuse of tablets applying all CEBMs insights.	Micro farming applying all CEBMs insights.	Meat product supply chain applying all CEBMs insights.	The Co-creation of Products and Services model applying all DEMO insights.	The Collaborative Recycling and Reuse model applying all DEMO insights.	The Sustainable Consumption model applying all DEMO insights.
		<b>Dinner and acknowledgements of the day. Participation to the dinner is optional.</b>						





## CIRC4Life: A circular economy approach for lifecycles of products and services

**CIRC4LIFE Innovation Camp 2018**  
12-15 November 2018, Cracow Poland

### Thursday 15<sup>th</sup> November

9:00 – 10:00	Main room	<b>Understanding and collectively reviewing the Circular Economy Business Models (CEBMs) demonstration specific characteristics</b>  The three CEBMs working groups are showcasing their holistic CEBMs concepts (version 3) while highlighting the outcomes of the cross-demonstration analysis. Similarities and differences between the four demonstration are presented in order to understand which of the conceptual characteristics are assumed to be domain specific and which ones are universal (at least in context of the four demonstrations). This is the final opportunity for cross-case learnings before finalizing the demonstration specific CEBMs.  After the each CEBM presentation, innovation camp members will subjectively assess the presented CEBMs concepts against the collaboratively defined objectives, vision and Key Performance Indicators (KPIs) via crowd voting method. The crowd voting results are acting also as a concept test to verify and prioritize the use case scenarios during the follow-up stages of CIRC4Life project.  CEBMs presentations are as follows:			
		A	The Co-creation of Products and Services model (CEBM A) <b>Daizhong Su</b> , Nottingham Trent University		
		B	The Collaborative Recycling and Reuse model (CEBM B) <b>Abel Ortego</b> , CIR		
		C	The Sustainable Consumption model (CEBM C) <b>Lahila de Sola</b> , ALIA		
10:00-10:05		<b>5 minute transit time and group formation</b>			
10:05 – 12:05	Group rooms	<b>Finalizing the demonstration specific CEBMs</b>  CEBMs owners and group members will join the demonstration working groups in order to finalize and prioritize the three CEBMs within each demonstration. By the end of the workshop, the final concept versions (V4) of the given demonstration specific CEBMs are locked. .			
		DEMO GROUP 1 Domestic and industrial lighting	DEMO GROUP 2 Recycle and reuse of tablets	DEMO GROUP 3 Micro farming	DEMO GROUP 4 Meat product supply chain
12:05-12:20		<b>Coffee break and transit time</b>			
12:20 – 13:20	Main room	<b>Presenting and collectively reviewing the finalized CEBMs from each demonstration</b>  Respectively to CEBMs showcases, the demonstrations are presenting their finalized CEBM concepts (version 4) which are to be implemented and tested via various Living Lab activities during the later stages of the CIRC4Life project. Final crowd voting and commenting takes place.  Demonstrations are as follows:			
		1	Domestic and industrial LED lighting (DEMO 1) <b>Ming Ma</b> , Kosnic Lighting Ltd. and <b>Juan Costa</b> , ONA		
		2	Recycle and reuse of tablets (DEMO 2) <b>Goio Borge</b> , Indumetal Recycling S.A.		
		3	Micro farming (DEMO 3) <b>Jonathan Michael Smith</b> , Scilly Organics		
13:20 -13:30		4	Meat product supply chain (DEMO 4) <b>Juan Carlos Segura Ruiz</b> , ALIA		
		<b>Innovation camp closing remarks and acknowledgements</b> <b>Tuija Hirvikoski</b> – Innovation camp host, Laurea University of Applied Sciences			
13:30		<b>Networking lunch</b>			







## CIRC4Life: A circular economy approach for lifecycles of products and services

**CIRC4LIFE Innovation Camp 2018**  
12-15 November 2018, Cracow Poland

### 5. Innovation Camp Final Agenda

#### Monday 12th November

From 11:00		<b>Delegate registration</b> Delegation registration starts from 11:00 and continues until 16:00 when all participants are expected to arrive by latest.	
12:00 – 14:00		<b>Networking lunch – Learning know each other</b>	
14:00 – 14:20	Main room	<b>CIRC4Life project and Innovation Camp welcome</b> What is CIRC4Life-project all about and why there is a need for a change? <b>Daizhong Su</b> – CIRC4Life consortium leader, Nottingham Trent University What is CIRC4Life Innovation camp and what will happen during the next days? <b>Tuija Hirvikoski</b> – Innovation camp host, Laurea University of Applied Sciences	
14:20 – 14:50	Main room	<b>Introduction to CIRC4Life Circular Economy Business Models (CEBMs)</b> The CEBM owners are presenting the predefined CEBMs ( <b>version 1</b> ) as a starting point and an orientation material for the Innovation camp. These teaser presentation as well as the background materials are forming the foundation for the innovation camp co-creation activities.	
		<b>A</b>	<b>The Co-creation of Products and Services model (CEBM A)</b> <i>Daizhong Su</i> , Nottingham Trent University
		<b>B</b>	<b>The Collaborative Recycling and Reuse model (CEBM B)</b> <i>Abel Ortego</i> , CIR
		<b>C</b>	<b>The Sustainable Consumption model (CEBM C)</b> <i>Lahila de Sola</i> , ALIA
14:50 – 15:30	Main room	<b>Introduction to CIRC4Life demonstrations</b> The demonstration owners are highlighting the key characteristics, objectives and challenges regarding their demonstrations. The presentations serves as a brief orientation to the CIRC4Life demonstrations.	
		<b>1</b>	<b>Domestic and industrial LED lighting (DEMO 1)</b> <i>Ming Ma</i> , Kosnic Lighting Ltd. and <i>Juan Costa</i> , ONA
		<b>2</b>	<b>Recycle and reuse of tablets (DEMO 2)</b> <i>Goio Borge</i> , Indumetal Recycling S.A.
		<b>3</b>	<b>Micro farming (DEMO 3)</b> <i>Jonathan Michael Smith</i> , Scilly Organics
		<b>4</b>	<b>Meat product supply chain (DEMO 4)</b> <i>Juan Carlos Segura Ruiz</i> , ALIA
15:30 – 15:40	Main room	<b>Explaining the World Cafe Method guidelines and group compositions</b> Laurea University of Applied Sciences Two rounds of World Cafe Method (also known as Knowledge or learning café) is applied to setup a structured process to define shared objectives, vision and Key Performance Indicator (KPI) for the Innovation Camp deliverables which are to be presented on Thursday 15 <sup>th</sup> . A set of ice breaker methods are also applied to help camp members to get to know each other beyond their “own home working group”.  <b>Camp members are now divided in seven predefined groups</b> based on their registration profile in order to ensure participant heterogeneity within each working group. Working groups consist ca. 10 persons and each round last for 30 mins and is repeated once.	
15:40- 15:45		<b>5 minute transit time and group formation based on group composition 1</b>	





## CIRC4Life: A circular economy approach for lifecycles of products and services

**CIRC4LIFE Innovation Camp 2018**  
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15:45 - 16:15	Group rooms	<b>World Cafe ROUND 1: Learning to know each other while gaining the shared understanding relating demonstrations (DEMOS) and Circular Economy Business Models (CEBMs) objectives, vision and KPIs</b>  The Round 1 includes 1) introduction of the group members, 2) introduction of the DEMO or CEBM specific context and questions and 3) exchange the individual knowing in order to gain shared understanding. Working groups are based on predefined group composition 1.						
		<b>DEMO 1</b>	<b>DEMO 2</b>	<b>DEMO 3</b>	<b>DEMO 4</b>	<b>CEBM A</b>	<b>CEBM B</b>	<b>CEBM C</b>
		Domestic and industrial LED lighting	Recycle and reuse of tablets	Micro farming	Meat product supply chain	The Co-creation of Products and Services model	The Collaborative Recycling and Reuse model	The Sustainable Consumption model
16:15- 16:20		5 minute transit time and group formation based on group composition 2						
16:20 - 16:50	Group rooms	<b>World Cafe ROUND 2 based on group composition 2</b>  The Round 2 is executed respectively as Round 1 but with different predefined group composition 2.						
		<b>DEMO 1</b>	<b>DEMO 2</b>	<b>DEMO 3</b>	<b>DEMO 4</b>	<b>CEBM A</b>	<b>CEBM B</b>	<b>CEBM C</b>
		Domestic and industrial LED lighting	Recycle and reuse of tablets	Micro farming	Meat product supply chain	The Co-creation of Products and Services model	The Collaborative Recycling and Reuse model	The Sustainable Consumption model
16:50 –17.10		Coffee break and transit to the home groups. NOTE: Refreshments are available all the time during the camp days.						
17.10 – 18.30	Group rooms	<b>Team building and committing to the shared understanding – Defining the shared objectives, vision and KPIs for the each DEMO and CEBM home groups</b>  Camp members will now join their “home group” in order to collectively define the shared objectives, vision and Key Performance Indicator (KPI) for their home group. The work is heavily grounded on the harvested knowledge of the World Cafe methods rounds 1 and 2 as well as background materials provided by DEMO and CEBM group owners.  The session includes: 1) introduction of the group members, 2) introduction of the DEMO or CEBM specific context and questions, 3) reviewing of the World Cafe round 1 and 2 outcomes and 4) co-creation of the shared objectives, vision and Key Performance Indicators KPIs, which together are forming the foundation for the shared commitment.  The shared commitment - outcome will be used as a benchmarking tool for reviewing the generated ideas during the innovation camp as well as later on the CIRC4Life project when the developed CEBMs are implemented via demonstration specific Living Labs.						
		<b>DEMO 1</b>	<b>DEMO 2</b>	<b>DEMO 3</b>	<b>DEMO 4</b>	<b>CEBM A</b>	<b>CEBM B</b>	<b>CEBM C</b>
		Domestic and industrial LED lighting	Recycle and reuse of tablets	Micro farming	Meat product supply chain	The Co-creation of Products and Services model	The Collaborative Recycling and Reuse model	The Sustainable Consumption model
19:30		Dinner and acknowledgements of the day. Participation to the dinner is optional.						



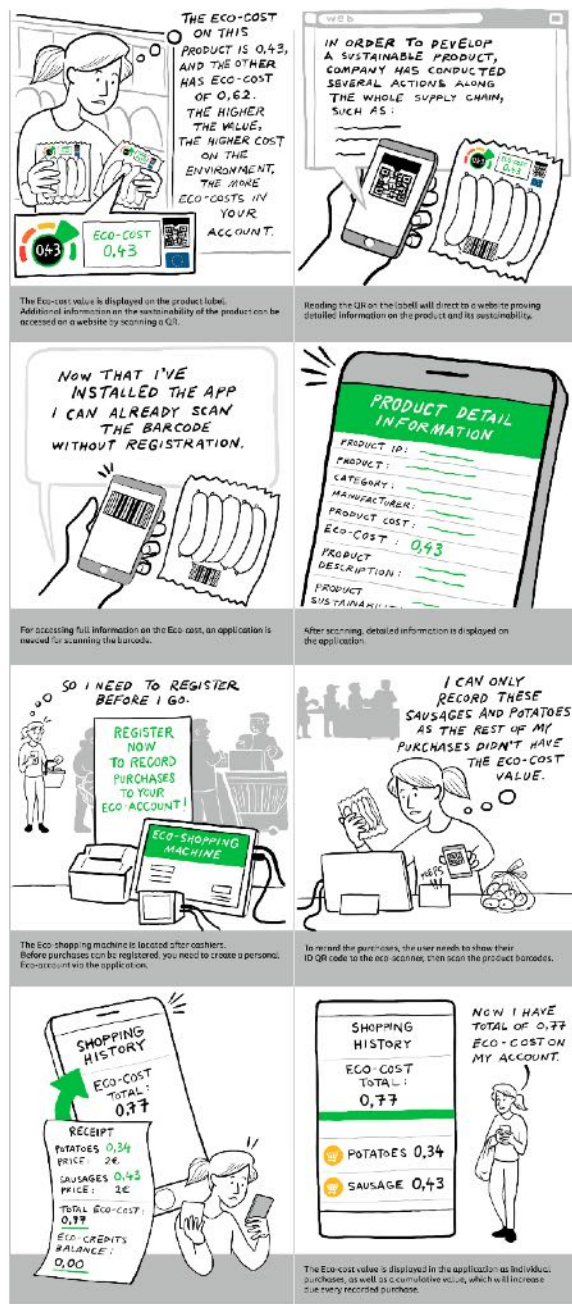


## Appendix 2. Matrix structure and outline of 1<sup>st</sup> OIC

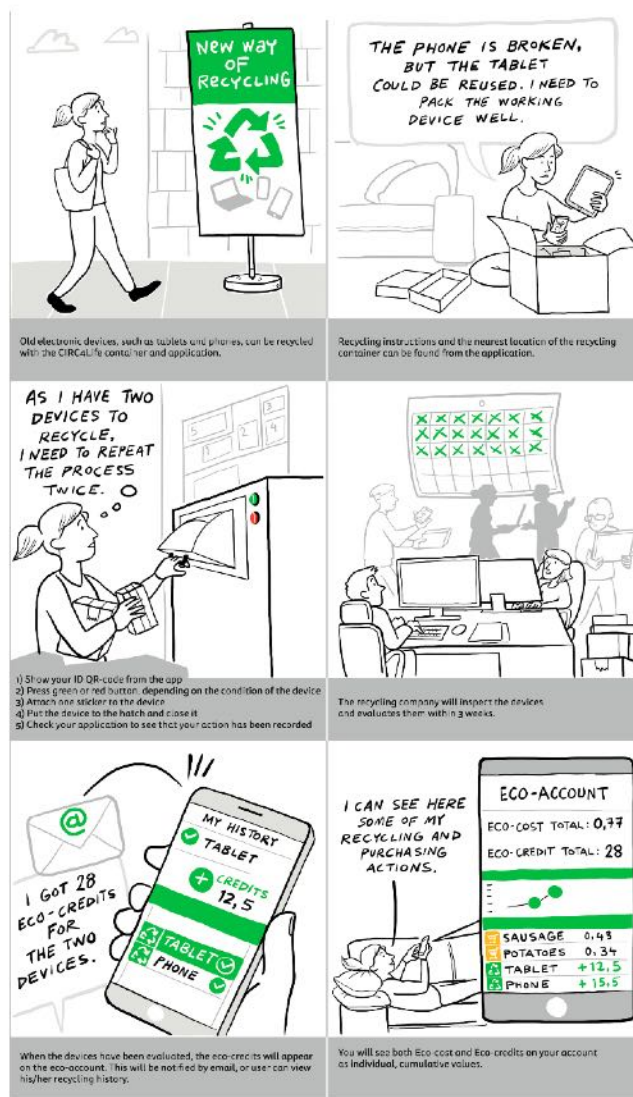


## Appendix 3. Examples of Storyboards developed for concept testing

### ECO-SHOPPING



### ECO-RECYCLING



## Appendix 4. Agenda for 2<sup>nd</sup> OIC



**Friday 28th May**

**9:30-  
10:30**

**CIRC4Life project and Innovation Camp introduction**

[Zoom-link for introduction event and workshops](#)

Welcome and opening words

Julia Nevmerzhitskaya, Open Innovation Host, Laurea University of Applied Sciences, Finland

CIRC4Life approach to CEBMs

Dr. Daizhong Su, CIRC4Life project Coordinator, Nottingham Trent University; UK

Key insights from the demonstrators

Hanna Nilsson-Lindén and Karin Wilson, RISE Research Institutes of Sweden

Keynote: Designing Successful Circular Business Models

Erwan Mouazan, Circular Economy Researcher, Creative Sustainability Consultant, Director of Ecovala, Finland

**10:30-  
10:40**

**Break**

**10:40-  
10:45**

**Introduction to the co-creation workshop**

Jaakko Hannula, Laurea University of Applied Sciences

Open Innovation Camp lead facilitator Jaakko Hannula will introduce the workshop structure and goals

**10:44-  
11:30**

**CEBM presentations**

The CEBM owners will give a presentation of their CEBM and related key solutions

After each presentation all the participants will vote on three validating questions concerning the presented CEBM



**The Co-creation of Products and Services model**

Dr. You Wu, Nottingham Trent University



**The Sustainable Consumption model**

Lahila de Sola, ALIA



**The Collaborative Recycling and Reuse model**

Fernando Cíez Oto, CIRCE Foundation

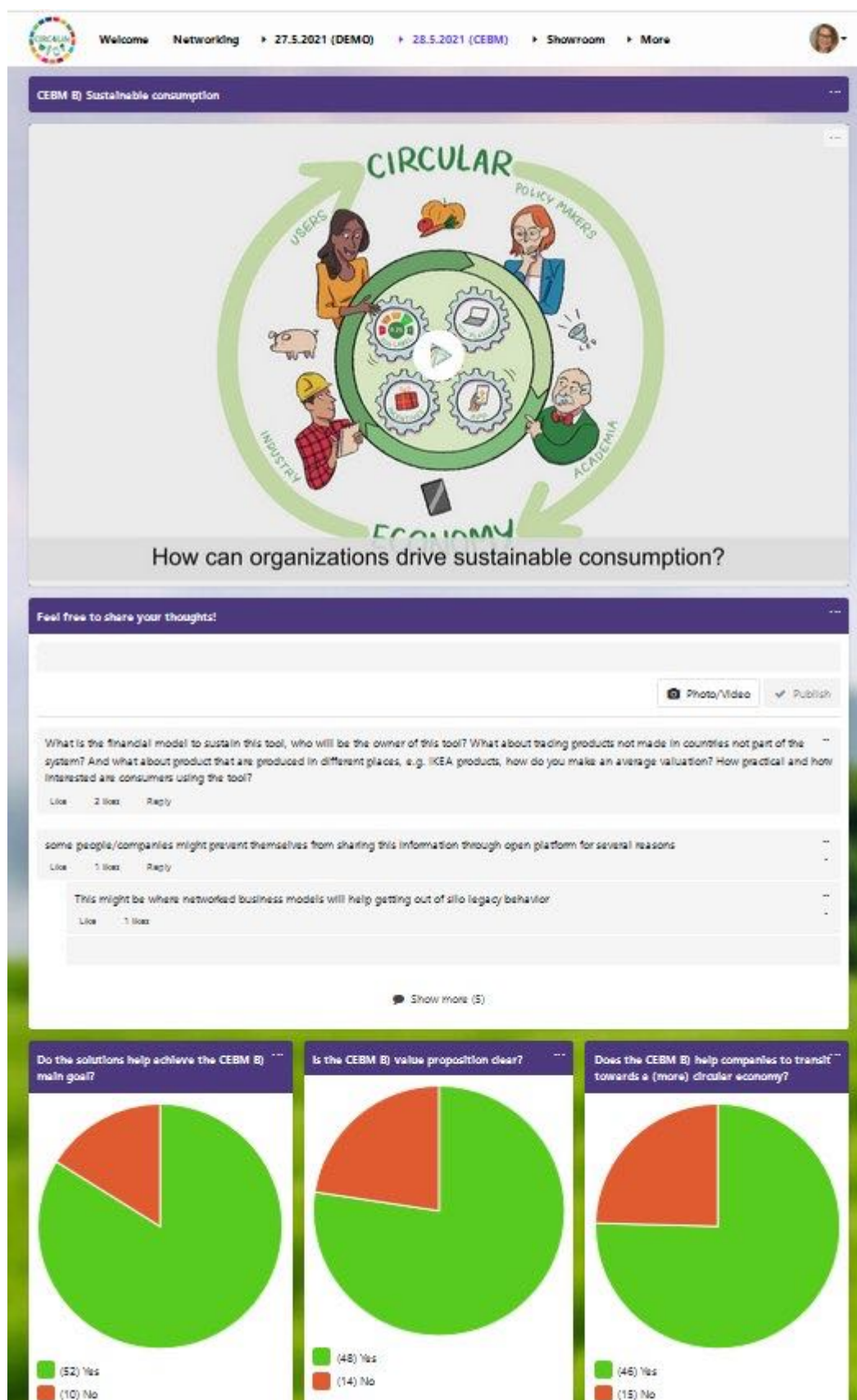
17



<b>11:30-12:05</b>	<p><b>CEBM co-creation workshop 1</b></p> <p>The participants will be three CEBM home subgroups</p> <p>During the workshop the participants will present critical and encouraging comments and questions to the CEBM owner</p> <p>After the questions and comments the participants will vote and comment to evaluate the success of the CEBM</p> <div> <div>A</div> <div>B</div> <div>C</div> </div> <p>The Co-creation of Products and Services model</p> <p>The Sustainable Consumption model</p> <p>The Collaborative Recycling and Reuse model</p>
<b>12:05-12:20</b>	<p><b>Coffee Break</b></p>
<b>12:20-12:50</b>	<p><b>Presentation of workshop 1 results</b></p> <p>Facilitators present the results of workshop 1 in the main lobby</p>
<b>12:50-13:10</b>	<p><b>CEBM co-creation workshop 2</b></p> <p>The CEBM home group members will be mixed together to form three new groups to discuss interconnections between the CEBMs and to provide new comments to the CEBM owner in a facilitated discussion</p> <div> <div>A</div> <div>B</div> <div>C</div> </div> <p>The Co-creation of Products and Services model</p> <p>The Sustainable Consumption model</p> <p>The Collaborative Recycling and Reuse model</p>
<b>13:10-13:30</b>	<p><b>Presentation of results and voting</b></p> <p>The facilitators present the results of workshop 2 and the participants vote again to validate and evaluate each CEBM</p>

<b>13:30-14:15</b>	<b>Lunch Break</b>
<b>14:15-15:15</b>	<b>Future directions and market opportunities</b> Moderated discussion led by Tim Bartram, Senior Manager Collaborative Research Projects, and Sarah Leick, Manager Competence Center Sustainability, GS1 Germany GmbH
<b>15:15-15:30</b>	<b>Circular Economy funding opportunities in Horizon Europe</b> Hans-Christian Eberl, Policy Officer at European Commission
<b>15:30-16:00</b>	<b>Grand OIC closing and virtual raise the glass</b> Time to celebrate together! Opportunity for participants to network and plan further collaboration opportunities, provide us feedback on the Camp, or simply stay online and raise a glass for the successful Open Innovation Camp.
<b>17:00</b>	<b>Thematic rooms open for collaboration and discussion - open access:</b> <div> <div><b>A</b></div> <div>The Co-creation of Products and Services  <a href="https://laurea.zoom.us/j/64554134496">https://laurea.zoom.us/j/64554134496</a> </div> <div><b>B</b></div> <div>The Sustainable Consumption  <a href="https://laurea.zoom.us/j/63161122209">https://laurea.zoom.us/j/63161122209</a> </div> <div><b>C</b></div> <div>The Collaborative Recycling and Reuse  <a href="https://laurea.zoom.us/j/69364795767">https://laurea.zoom.us/j/69364795767</a> </div> </div>

Appendix 5. Screenshots from the 2<sup>nd</sup> OIC HOWSPACE





**Sustainable Consumption:**

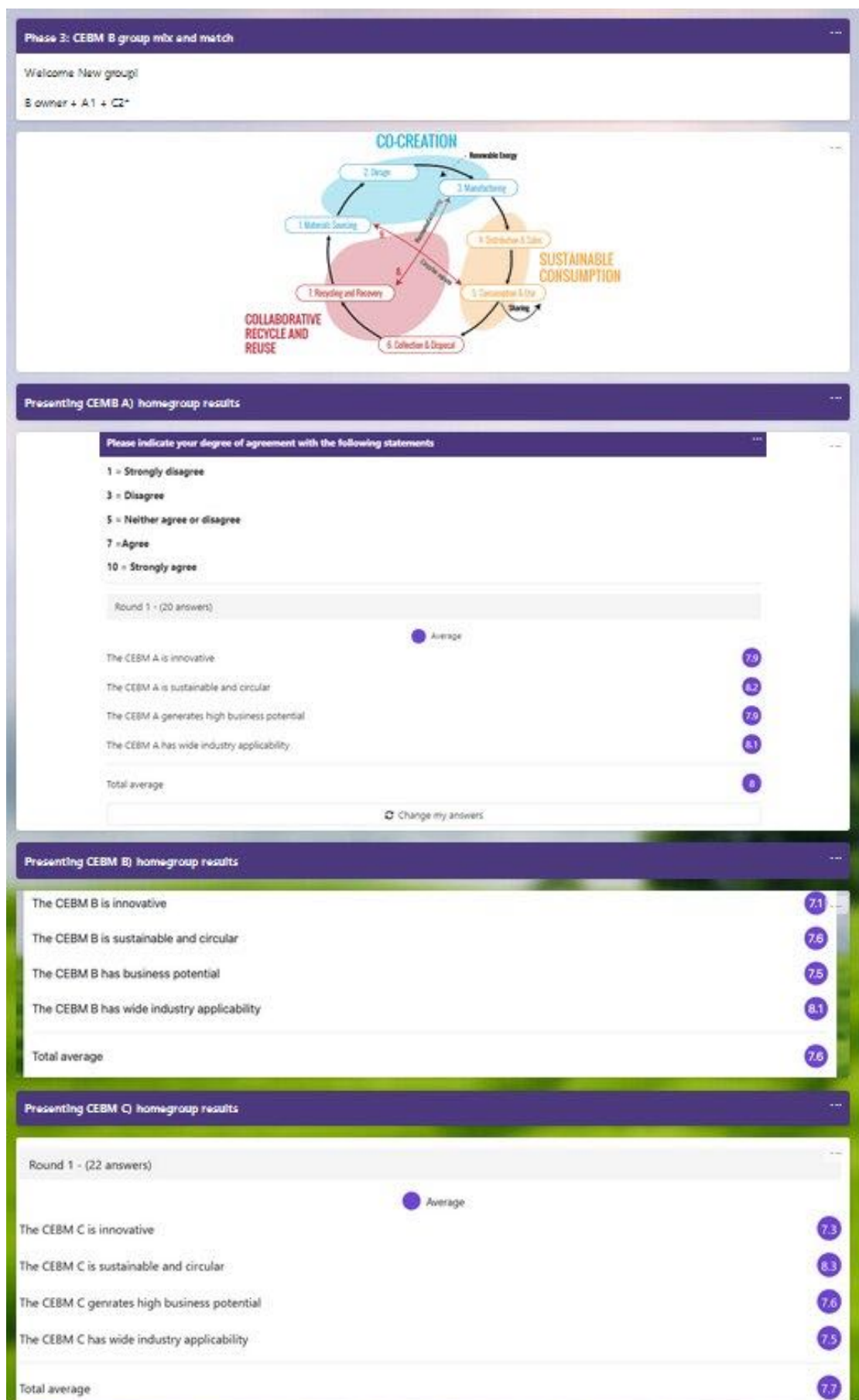
By presenting the customer with options and the right methodology to assess the environmental impact of products, this model enables the consumer to make a more sustainable decision. The model also provides a traceability solution to monitor a product's sustainability along the value chain and supports end-users and stakeholders to actively implement the circular economy via awareness raising and knowledge sharing activities. The key innovations of this CEBM are the [CIRC4Life consumer app](#), the eco-label, the [traceability module](#), and the [consumer awareness raising and capacity building activities](#).

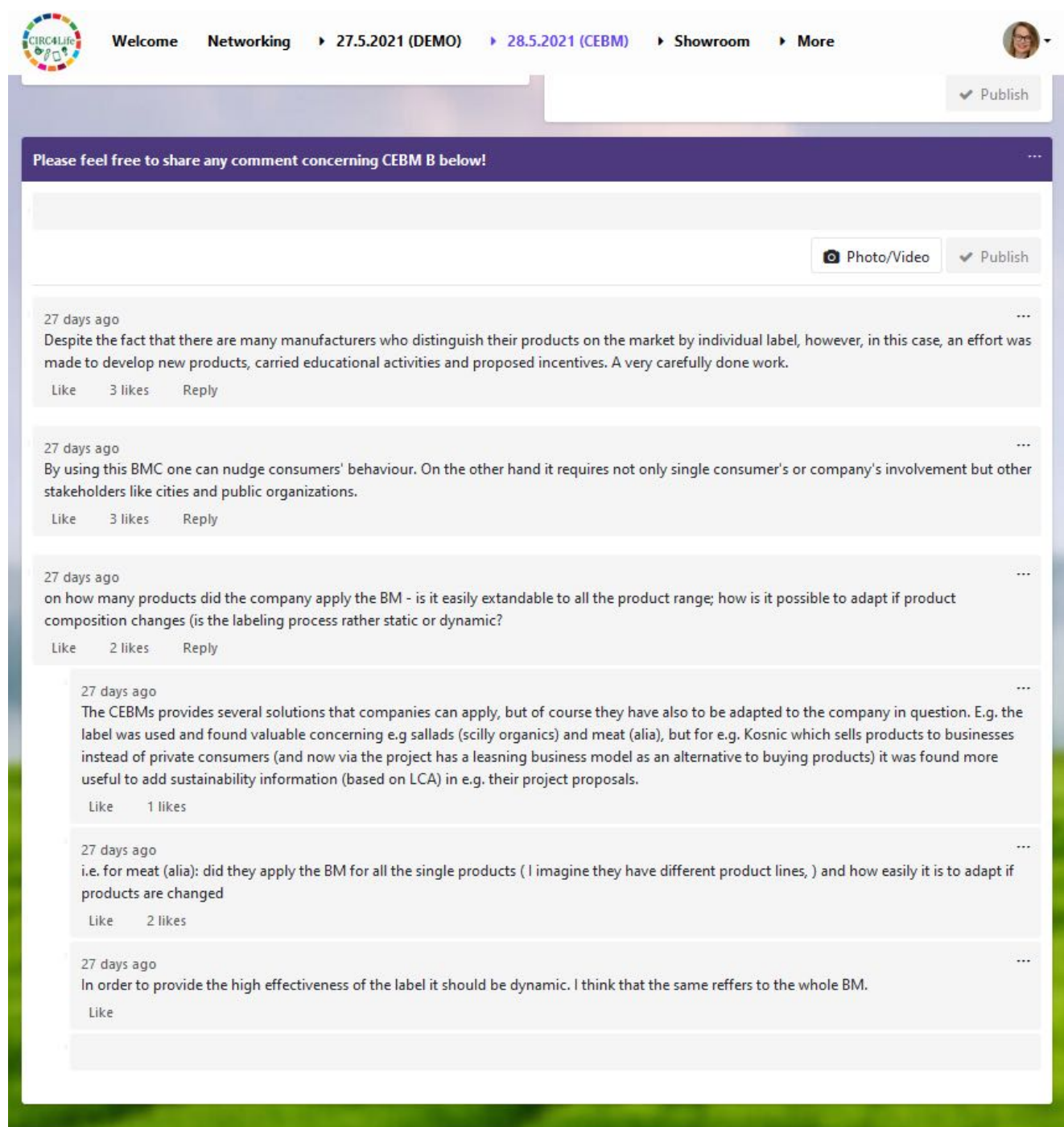
*Does the CEBM have the potential to create behavioural changes in consumers towards more sustainable choices?*

Critical and encouraging comments and questions for the owner

Critical comments and questions

Encouraging comments and questions





The screenshot shows a web interface for the CIRC4Life project. At the top, there is a navigation bar with the CIRC4Life logo, a 'Welcome' button, and a series of links: 'Networking', '27.5.2021 (DEMO)', '28.5.2021 (CEBM)' (highlighted in purple), 'Showroom', and 'More'. A user profile picture is visible in the top right corner. Below the navigation bar, there is a 'Publish' button. A purple banner with white text reads: 'Please feel free to share any comment concerning CEBM B below!'. Below this banner is a form for posting comments, with a 'Photo/Video' icon and a 'Publish' button. The comments section displays five entries, each dated '27 days ago' and followed by a 'Like' button and the number of likes. The comments discuss the application of CEBM B, the labeling process, and the adaptability of the business model.

**Welcome   Networking   ▶ 27.5.2021 (DEMO)   ▶ 28.5.2021 (CEBM)   ▶ Showroom   ▶ More**

✓ Publish

**Please feel free to share any comment concerning CEBM B below!**

27 days ago  
Despite the fact that there are many manufacturers who distinguish their products on the market by individual label, however, in this case, an effort was made to develop new products, carried educational activities and proposed incentives. A very carefully done work.

Like   3 likes   Reply

27 days ago  
By using this BMC one can nudge consumers' behaviour. On the other hand it requires not only single consumer's or company's involvement but other stakeholders like cities and public organizations.

Like   3 likes   Reply

27 days ago  
on how many products did the company apply the BM - is it easily extendable to all the product range; how is it possible to adapt if product composition changes (is the labeling process rather static or dynamic?)

Like   2 likes   Reply

27 days ago  
The CEBMs provides several solutions that companies can apply, but of course they have also to be adapted to the company in question. E.g. the label was used and found valuable concerning e.g. sallads (scilly organics) and meat (alia), but for e.g. Kosnic which sells products to businesses instead of private consumers (and now via the project has a leasing business model as an alternative to buying products) it was found more useful to add sustainability information (based on LCA) in e.g. their project proposals.

Like   1 likes

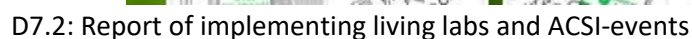
27 days ago  
i.e. for meat (alia): did they apply the BM for all the single products ( I imagine they have different product lines, ) and how easily it is to adapt if products are changed

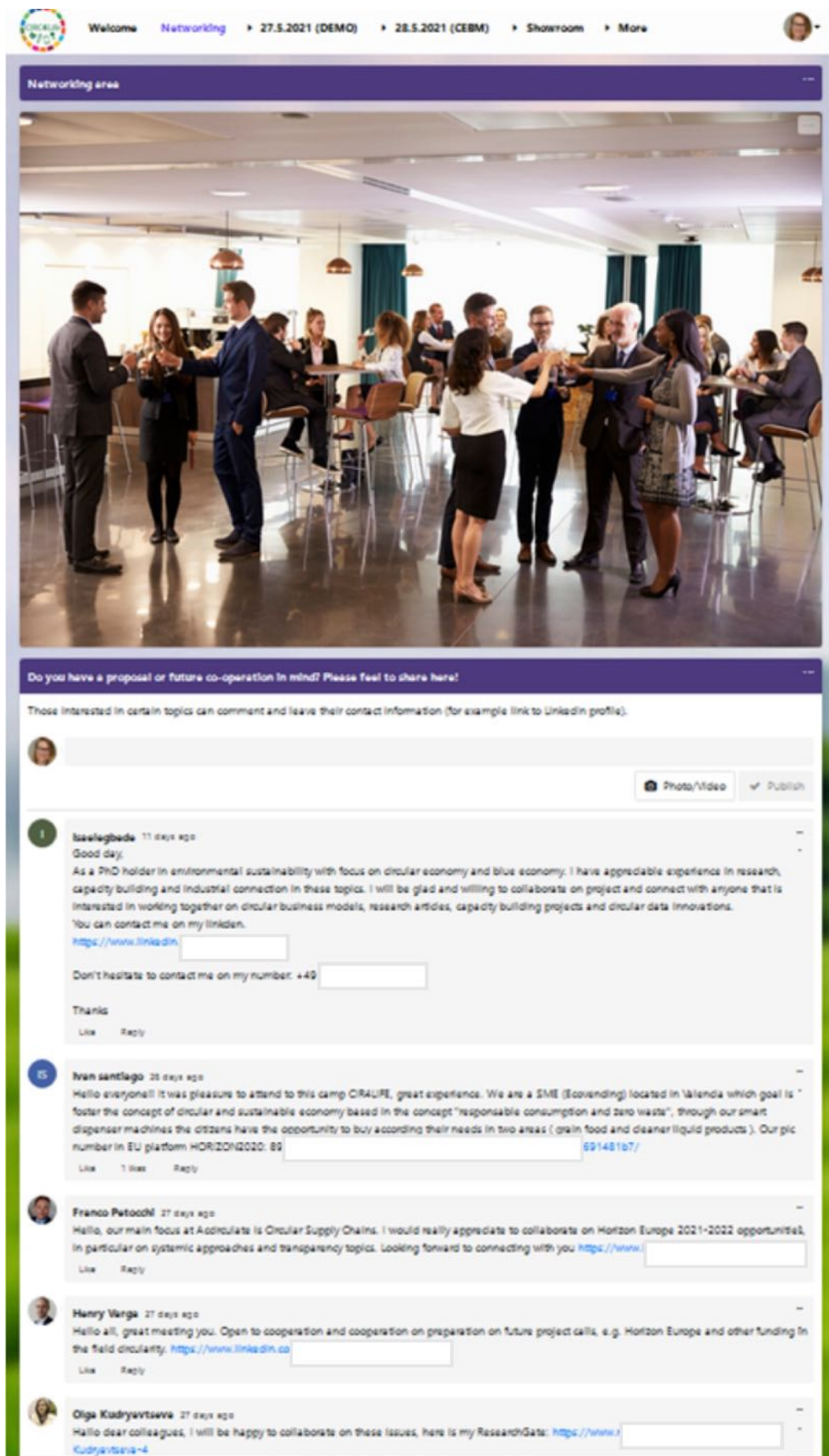
Like   2 likes

27 days ago  
In order to provide the high effectiveness of the label it should be dynamic. I think that the same refers to the whole BM.

Like







D7.2: Report of implementing living labs and ACSI-events

## Appendix 6. User and Stakeholder Engagement activities in WP7


Activity #1 details:	
CIRC4LIFE partner(s) involved:	Lau + ALL
Engagement Activity	<b>Open Innovation Camp 2018</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	12 <sup>th</sup> -15 <sup>th</sup> November 2018 Krakow, Poland
Participants	80 experts took part in the Innovation Camp.  Participants were experts in their respective areas and stakeholders of the specific challenges (companies, associations, universities and research institute and policy bodies), and have been selected by the organisers. Participants were divided into seven groups, each one addressing a specific demonstration or circular economy business model. Participants came from 17 different countries, including China and South Africa.
LL activity details	Participants co-created solutions for transition towards circular economy in electrical and electronic products and agri-food/farming sectors. The CIRC4Life Innovation Camp was a concept development exercise to better understand the needs and main challenges of developing circular economy business models in all stages of the circular economy.
Main results	See Chapter 3.


Activity #2 details:	
CIRC4LIFE partner(s) involved:	ONA, LAU
Engagement Activity	<b>Co-creation with producer and suppliers relating usage of waste materials</b>
Linkage to CEBM(s)	CEBM A)
Activity date and place	March 2019 Valencia. Spain
Participants	4 supplier companies from Ona's value chain
LL activity details	Observations at the production scene, semi-structured interviews with suppliers to identify suitable materials from different waste streams for the development of sustainable lighting product.
Main results	<p>Most potential streams and production methods were identified. ONA decided to use 4 possible materials taking into account their most important suppliers: wood, glass, metal and plastics.</p> <p>All pieces are made in the same local companies that supplies the materials to ONA so the impact in transport is reduced.</p>



Activity #A2 details:	
CIRC4LIFE partner(s) involved:	LAU, KOS
Engagement Activity	<b>Leasing business model survey for value chain partners</b>
Linkage to CEBM(s)	CEBM A, CEBM B, CEBM C
Activity date and place	Online, March 2019
Participants	45 responses Value chain actors of industrial led lighting company
LL activity details	A survey was created by LAU in collaboration with KOS to collect and define value chain partners potential interest towards the proposed leasing service and modular products.
Main results:	LaaS (lighting as a service) is perceived more expensive and risky compared to product ownership, Leasing model is not an attractive for construction companies at the moment

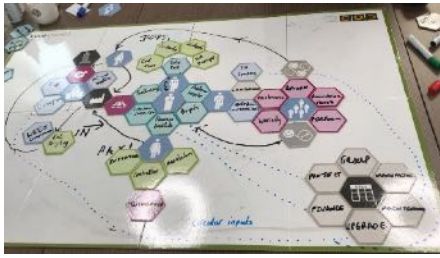
Activity #3 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>INTERVIEWS, PROTOTYPING</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	March-April 2019 Laurea Leppävaara, Vanha maantie 9, Espoo
Participants	End-users 4 ppl
LL activity details	Two LAUREA information technology students conducted end-user interviews to develop requirements and specifications for the end-user application. An application prototype was developed and tested.
Main results	Key features were identified, flowchart and UI prototype was created.

Activity #4 details:	
CIRC4LIFE partner(s) involved:	LAU, MMM, ENV, ICCS
Engagement Activity	<b>LAUREA Circular Economy JAM</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	27th-28th March 2019 Laurea Leppävaara, Vanha maantie 9, Espoo
Participants	End-users 65 participants
LL activity details	<p>During the two-day event, participants shared insights, discovered new possibilities and developed new circular economy ideas based on the following challenges:</p> <ul style="list-style-type: none"> <li>- How can we decrease food waste?</li> <li>- How can we make recycling and eco-information appealing and easy to grasp?</li> <li>- How can we decrease e-waste?</li> </ul>
Main results	<p>Solution concepts for each challenge were created by the multidisciplinary teams through the facilitated service design process, including 2 application prototypes, wee-collection system and eco-label. Based on the survey conducted during the event, Laurea developed CE-specific persona tools (see Appendix 7.)</p> 

Activity #5 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	<b>Rural area municipal driven bio/meat recycling workshop with intelligent bin</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	4th April 2019 Abarán, Spain
Participants	End-users 12 participants
LL activity details	<p>The main objectives of the workshop:</p> <ul style="list-style-type: none"> <li>- evaluate the interaction with the intelligent bin mock-up with the end-users</li> <li>- study which are the most appropriated incentives for the citizenship of Abarán and to</li> <li>- define possible locations of the intelligent bin</li> </ul> <p>Additionally, it was important to evaluate the interest of the inhabitants of Abarán towards the pilot recycling project.</p>
Main results	 <p>Regarding the interaction with the bin mockup developed, there was no important difficulties, maybe the position of the door was too high for some of the participants. Three main aspects raised as things to be solved: visual impact of the bin, when to receive the incentives or how the waste management of this waste will be performed. For the visual impact, to integrate the intelligent bin in the environment and culture of the municipality, the idea of involving local artist or students in order to decorate was suggested.</p>

Activity #6 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	<b>Rural area municipal driven bio/meat recycling with intelligent bin WITH Local authorities</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	9th April 2019 Abarán, Spain
Participants	Local authorities 7 participants
LL activity details	The main objective of the workshop was to evaluate the results obtained from the workshop with end-users to the local authorities and to obtain their feedback
Main results	Potential recycling points (identified with end-users) were discussed and agreed upon with local authorities. Practical implementation of demonstration was discussed.

Activity #7 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	<b>Co-creation workshop with end-users about eco-information and product concepts</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	29 <sup>th</sup> May 2019 Lorca, Spain
Participants	End-users 21 participants
LL activity details	<p>The workshop was focused in three different themes from the end-user viewpoint:</p> <ul style="list-style-type: none"> <li>- Product development and packaging of sustainable meat product</li> <li>- Eco-information and visualizations</li> <li>- Marketing + product's story</li> </ul>
Main results	<p>Ideas collected concerning product and packaging:</p> <ul style="list-style-type: none"> <li>- To avoid using harmful additives.</li> <li>- To respect health and animal welfare.</li> <li>- Local production, km 0.</li> <li>- Remove plastic from the packaging.</li> </ul> <p>Eco-label insights and new version was generated:</p> <ul style="list-style-type: none"> <li>- The eco-information should be simple, clear and intuitive.</li> <li>- The QR code is really important. To define which aspects, we should include there is also crucial, as we cannot include everything in the app/website and it is not useful either.</li> <li>- To include a guarantee seal is vital.</li> <li>- To include the word 'sustainable'.</li> </ul> <p>To change the message considering the kind of public we are focusing on.</p>

Activity #8 details:	
CIRC4LIFE partner(s) involved:	KOS, NTU, LAU
Engagement Activity	<b>Co-creation workshop of the leasing business model</b>
Linkage to CEBM(s)	CEBM A)
Activity date and place	28 <sup>th</sup> May 2019, Telford, UK LIA (Lighting Industry Association), Stafford Park 7, Telford, Shropshire, TF3 3BQ
Participants	Value chain partners & lighting industry specialist 12 participants
LL activity details	Identifying new business opportunities within the circular economy and helping KOSNIC to create a leasing business model, which would equally benefit all the stakeholders in the business ecosystem
Main results	 <p>A model for 'ideal' leasing business model was created in collaboration with stakeholders. Actors, value proposition and challenges were identified.</p>



Activity #9 details:	
CIRC4LIFE partner(s) involved:	KOS, NTU, LAU
Engagement Activity	<b>Co-Creation workshop for developing modular LED lamp</b>
Linkage to CEBM(s)	CEBM A), CEBM C)
Activity date and place	29 <sup>th</sup> May 2019, Telford, UK LIA (Lighting Industry Association), Stafford Park 7, Telford,
Participants	Value chain partners & lighting industry specialist 15 participants
LL activity details	Topics addressed during the workshop: 1) Modularity, customizability, refurbish ability 2) Sustainability & recyclability (materials) 3) Logistics 4) Installation & demolition
Main results	Insights for each of the 5 topics were identified, discussed and classified  Idea raised for developing a <b>new luminaire</b> with modular components and structure that incorporates recyclable materials. KOS Produces a new and innovative luminaire that has been constructed using recycled and reusable components. This new solution would be disruptive and ground-breaking to the lighting industry.

Activity #10 details:	
CIRC4LIFE partner(s) involved:	IND / LAU
Engagement Activity	<b>Community involvement and capacity building for demonstrations in schools</b>
Linkage to CEBM(s)	CEBM B)
Activity date and place	6 <sup>th</sup> June 2019 Aula Ambiental (Getxo, Spain)
Participants	5 school representatives: <ul style="list-style-type: none"> <li>- 1 person from Udalsarea 2030 (Environment for municipalities)</li> <li>- 2 persons from Aula Ambiental (local staff for developing environmental agenda in schools)</li> <li>- 1 person from San Nikolas Ikastola (local school)</li> <li>- 1 person from Trinitarias Algorta (local school)</li> </ul>
LL activity details	Presentation of CIRC4Life proposals for activities to be carried out in Getxo schools. Obtaining answers and modifications from the schools.
Main results	Interest of schools and acceptance of participation in the project by schools was reached. Involvement of schools in the design of necessary activities and materials was discussed.

Activity #11 details:	
CIRC4LIFE partner(s) involved:	JS, LAU, NTU
Engagement Activity	<b>Community involvement / Semi-structured Interview</b>
Linkage to CEBM(s)	CEBM A) CEBM B), CEBM C)
Activity date and place	18 <sup>th</sup> June 2019 Isles of Scilly
Participants	Isles of Scilly Council Members 3 participants + 4 project partners
LL activity details	Objective: Engage local stakeholder and finding out present activities of council concerning Circular Economy and Sustainable development activities
Main results	Future waste management mechanisms were discussed in the local setting. Cooperation possibilities were discussed for example in a form of co-creation camp in the Isles between Islands' stakeholders. At the moment there are several projects which have similar goals compared to Circ4Life so from projects point of view it would be resource efficient to have cooperation with those. From Council's point of view it could be beneficial have Circ4Life supported co-creation event among current stakeholders for which LAU together with JS could provide neutral facilitating and methods.


Activity #12 details:	
CIRC4LIFE partner(s) involved:	JS, LAU, NTU
Engagement Activity	<b>Community involvement / Semi-structured Interview</b>
Linkage to CEBM(s)	CEBM A) CEBM B), CEBM C)
Activity date and place	18 <sup>th</sup> June 2019 Isles of Scilly, St Mary's
Participants	Island Partnership (Tourism Board) 2 participants + 4 project partners
LL activity details	Objective: Engage local stakeholder and finding out present activities of council concerning Circular Economy and Sustainable development activities
Main results	Potential Cooperation on LL activities with Island Partnership was discussed. Current activities of Island partnership on tourism and especially on sustainable tourism development were identified and discussed.

Activity #13 details:	
CIRC4LIFE partner(s) involved:	JS, LAU
Engagement Activity	<b>Community involvement / Semi-structured Interview</b>
Linkage to CEBM(s)	CEBM A) CEBM B), CEBM C)
Activity date and place	19 <sup>th</sup> June 2019 Isles of Scilly
Participants	Local commerce 2 participants + 4 project partners
LL activity details	Objective: Engage local stakeholder and finding out present activities of JS business partner concerning Circular Economy and food supply chain
Main results	Cooperation on LL activities with Seven Stones Inn was discussed. The operating environment of local stakeholders was defined.

Activity #14 details:	
CIRC4LIFE partner(s) involved:	ONA, LAU
Engagement Activity	<b>Co-creation workshop: new product concepts developed with university students</b>
Linkage to CEBM(s)	CEBM A)
Activity date and place	1 <sup>st</sup> – 4 <sup>th</sup> of July 2019 Alfara del Patriarca, Valencia
Participants	Design Students, Master Level 11 participants
LL activity details	ONA carried out a co-creation workshop with university students focused in different themes: <ul style="list-style-type: none"> <li>1) Recycled, re-use and co-creation</li> <li>2) Circular Economy</li> <li>3) Lifetime of Products</li> <li>4) ONA products</li> </ul>
Main results	Ona received opinions and ideas about the company brand and vision and the philosophy currently applied in the sustainable lighting products.



Activity #15 details:	
CIRC4LIFE partner(s) involved:	ONA, LAU
Engagement Activity	<b>Survey, carried out by Valencia University Masters students</b>
Linkage to CEBM(s)	CEBM A); CEBM B), CEBM c)
Activity date and place	July 2019 Alfara del Patriarca, Valencia
Participants	End-User focus group: 35+ years, high income 55 participants
LL activity detail	Collecting end-user attitudes and feedback on sustainable buying and eco-design aspects related to lighting products.
Main results	Sustainable features are preferred but end-users are not necessarily actively thinking about all features during purchase. Focus is towards sustainability of the lamp when in use, such as energy efficiency and bulb type.

Activity #16 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	<b>Real-life testing of the eco-label (1)</b>
Linkage to CEBM(s)	CEBM B)
Activity date and place	7 <sup>th</sup> - 15 <sup>th</sup> September 2019 Lorca, Spain
Participants	End-users 17 participants
LL activity details	Collecting feedback on end-user attitudes and preferences towards the eco-label concepts developed in CE Jam 2019, and end-user workshop held on 29 <sup>th</sup> May, by applying the label on the actual packaging and presenting it at the food fair.
Main Results:	 <p>'Traffic light' color-scheme well understood in label design. Eco-point value not understood. No clear preference in the visual design.</p>


Activity #47 details	
CIRC4LIFE partner(s) involved:	LAU, NTU
Engagement Activity	<b>CIRC4Life Design Challenge 2019 (Co-creation of the label)</b>
Linkage to CEBM(s)	CEBM A), CEBM B)
Activity date and place	Online 10 <sup>th</sup> July – 24 <sup>th</sup> October 2019
Participants	End-users, 14 registered participants 190 votes given during the competition period
LL activity details	Inviting citizens to participate in the development of the eco-label by encouraging them to send their ideas and proposals, and presenting label options on the project website for collecting feedback
Main results	 <p>#1</p> <p>#2</p> <p>#3</p>

Activity #18 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Series of co-creation workshops on sustainable end-user preferences</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	August, 2019 Leppävaara, Finland Tikkurila, Finland
Participants	End-users 92 participants  5 Service Design specialists
LL activity details	Collecting end-user preferences and attitudes, and ideation on: <ol style="list-style-type: none"> <li>1) How to minimize and collect e-waste from end-users?</li> <li>2) How to encourage sustainable eating habits in restaurants?</li> <li>3) Concept for sustainable lighting product?</li> <li>4) How to encourage consumers towards more sustainable shopping behavior?</li> </ol>

Main results



Prototypes of solution concepts were created for each challenge based on facilitated service design process.


Activity #19 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Workshop: Ecosystemic Circular Economy business model tool (CELLL) at ENoLL conference</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	3 <sup>rd</sup> - 5 <sup>th</sup> September 2019 Thessaloniki, Greece
Participants	Participants were experts in their respective areas: <ul style="list-style-type: none"> <li>- business</li> <li>- associations</li> <li>- universities and research institute</li> </ul>
LL activity details	A concept development exercise to better understand the needs and main challenges of developing circular economy business models in all stages of the circular economy, and to test a tool (CELLL) developed to support this process in CIRC4Life project.
Main Results	<p>Participants provided valuable inputs for the development of demonstration's by creating CE-based business eco-systems for demo 1, demo 3 and demo 4.</p> 



Activity #20 details:	
CIRC4LIFE partner(s) involved:	LAU (Suvi Seikkula Thesis)
Engagement Activity	<b>Co-creation workshop: Identification of the business value of co-creation</b>
Linkage to CEBM(s)	CEBM A)
Activity date and place	17 <sup>th</sup> September Helsinki, Finland
Participants	Participants were experts in their respective areas: <ul style="list-style-type: none"> <li>- business</li> <li>- universities and research institute</li> <li>- policy bodies</li> </ul>
LL activity details	<p>The workshop is part of a design process where the goal is to develop an efficient model for showing the business benefits of co-creation and to define the most effective way to communicate this value to different stakeholders.</p> <p>Results are presented in Seikkula et al. 2020.</p>

Activity #21 details:	
CIRC4LIFE partner(s) involved:	LAU, IND, REC
Engagement Activity	<b>Co-creation of the incentives scheme for WEEE</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	24 <sup>th</sup> September 2019, Gexto, Spain
Participants	Public administration, consumers associations and local commerce (3ppl)
LL activity details	Capacity building on circular economy, development of the incentives scheme with the local commerce
Main Result:	Collaboration with Gordevi Expert retailer was established

Activity #22 details:	
CIRC4LIFE partner(s) involved:	LAU, ONA, IND, ALIA, REC, GS1G, EECC, MMM, ENVIRO, CEPS
Engagement Activity	<b>Business Model implementation and demonstration planning workshop</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	25 <sup>th</sup> – 26 <sup>th</sup> September 2019 Gexto, Spain
Participants	Project partners: 21 participants
LL activity details	Identifying implementation opportunities within the developed Circular Economy business models and defining the elements for demonstration cases, with the support of the ecosystemic circular economy business model tool (CELLL).
Main results:	New business model ecosystems were created with CELLL toolkit in collaboration for demonstrators: Ona, Indumetal&Recyclia, and Alia

Activity #23 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	<b>Real-life testing of the eco-label (2)</b>
Linkage to CEBM(s)	CEBM B)
Activity date and place	7 <sup>TH</sup> – 15 <sup>TH</sup> October 2019 Lorca Spain (SEPOR FOOD FESTIVAL)
Participants	End-users 19 participants
LL activity details	Collecting feedback on end-user attitudes and preferences towards the eco-label concepts selected based on the Design Challenge 2019 results, by applying the label on the actual packaging and presenting it at the SEPOR food fair.
Main Result	 <p>'Traffic light' color-scheme well understood in label design. Eco-point value not understood. No clear preference in the visual design.</p>

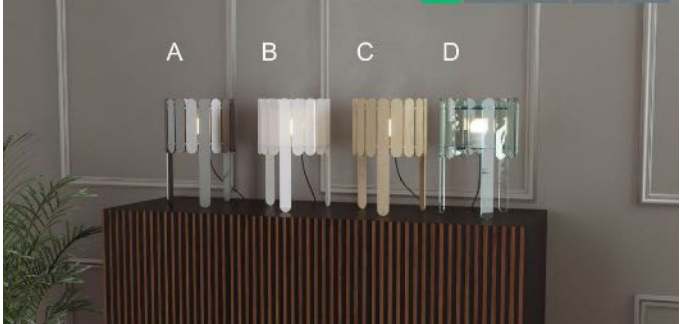
Activity #24 details:	
CIRC4LIFE partner(s) involved:	ONA, LAU
Engagement Activity	<b>End-user workshop (1) on product design and take-back</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	November 26 <sup>th</sup> 2019 Valencia
Participants	14 end-users
LL activity details	<p>The workshop was focused in:</p> <ol style="list-style-type: none"> <li>1) Product (Materials, Design)</li> <li>2) DEMO (Take back system, eco-points)</li> </ol> <p>What we wanted to achieve with this workshop was not only to present the product but to explain the business model and obtain open comments with future clients.</p>
Main results:	Information and feedback was collected to understand which are the sustainable preferences, opinions and ideas in the product regarding the product development. To define an idea on how the information should be shown so that the consumer understands the method and to know if the sustainable information has value for them.



Activity #25 details:	
CIRC4LIFE partner(s) involved:	LAU, IND, REC
Engagement Activity	<b>Simulated real-life test: end-user application and container interaction</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	13 <sup>th</sup> – 17 <sup>th</sup> January 2020 Bilbao, Spain
Participants	End-users 9 participants
LL activity details	<p>The testing focused on:</p> <ol style="list-style-type: none"> <li>1) performance, perceived usability and acceptance of the developed end-user application</li> <li>2) performance, perceived usability and acceptance of the intelligent recycling container proposed for WEE</li> <li>3) communication materials and information campaign for WEEE</li> </ol> <p>Testing was conducted in a simulated environment, where users went through the proposed WEEE-recycling scheme by use-cases.</p>
Main results:	Recycling process with the container was perceived to be rather simple, while using the existing application UI was impossible without direct assistance. Guidelines for on-bin-instruction and communication as well as application UI and design toolkit were developed by Lau based on the results.

Activity #A1 details:	
CIRC4LIFE partner(s) involved:	NTU, ONA
Engagement Activity	<b>Focus group workshops</b>
Linkage to CEBM(s)	CEBMA, CEBMB,
Activity date and place	Nottingham Trent University January to April 2020.
Participants	14 end-users
LL activity details	The aim of this research was to see how potential buyers and users for ONA Emotion's products felt about their existing table-lamp product line currently available online, as well as the new prototype. The areas of interest were design and sustainability feature. The focus groups were divided into 3 groups instead of one large group.
Main results	<p>The first series of questions were directed towards ONA's existing product line currently available online. The participants were shown pictures of the Dottie lamp sourced from ONA's website to allow them to answer the questions about it.</p> <p>The second series of questions were directed towards the new prototype. The participants were able to physically handle the aluminium prototype and were shown additional photos of the acrylic and timber prototypes. These questions aimed to find out if users liked the original base design, their opinions on making it flat-pack, opinions on sustainability in the design and ways of improving the prototypes design.</p>

Activity #26 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Simulated product concept test and co-creation task: end-user preference on the ONA lamp concepts, take-back, and incentives</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	16 <sup>th</sup> March 2020 Finland (Online)
Participants	End-users 12 participants
LL activity details	<p>The testing focused on:</p> <ol style="list-style-type: none"> <li>1) End-user preferences on the lamp concept on general level, proposed sizes and materials</li> <li>2) End-user attitude towards take-back scheme</li> <li>3) End-user attitudes towards proposed incentives</li> <li>4) End-user attitudes towards proposed eco-account Scenario</li> <li>5) Price</li> <li>6) Eco-label preference (A/B testing)</li> </ol> <p>Testing was conducted in a simulated survey-based environment, where users perceived images of the products and answered questions accordingly.</p>

<p>Main results:</p>	<p>Users created advertisements for the wooden lamp concept, including product description, name and prize.</p>  <p>The results indicate, that one third of the respondents would consider purchasing one of the lamps, while their price being below 100 €. Most appealing sizes were considered to be M and S.</p> <p>Majority of the respondents indicated <b>willingness to return a broken lamp to the manufacturer</b>, if postal fees would be covered, and would be interested in receiving the same lamp back after it had been repaired. Additionally, maturity of the respondents would be interested in receiving a discount from a next purchase, as a compensation for retuning a product.</p>
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Activity #27 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>ONA ONLINE STORE TESTING 1</b> user experience testing
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	2020, 13 <sup>rd</sup> March Finland (Online)
Participants	27 participants End-users / students
LL activity details	10 groups of Laurea's students were assigned to access the Ona webshop and fill in an evaluation template while performing pre-defined tasks.
Main results:	<ul style="list-style-type: none"> <li>• SEO needs to be taken care of; webshop can't be found easily on Google search by an external person, who doesn't know the exact page address</li> <li>• Users like the webshop design (visual appeal) of the shop</li> <li>• The webshop is currently heavy; items upload slowly which affects usability</li> <li>• Some users had usability problems with the mobile version (scaling issues, slow)</li> <li>• Some sections are displayed only in Spanish, even though English is selected</li> <li>• Search feature doesn't work</li> <li>• FAQ needs further elaboration</li> </ul>

Activity #28 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>ONA ONLINE STORE TESTING 2, customer experience</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	2020, 24 <sup>th</sup> March Finland (Online)
Participants	24 participants End-users / students
LL activity details	<p>Testing Ona webshop, and sustainable shopping (eco-points)</p> <p>LAU Students were assigned to access ONA webshop and browse it while filling in a Survey template for documenting their experience based on the set requirements.</p>
Main results:	<p>The results show that the overall shopping experience was rated satisfactory by the test users, however, eco-point concept remains unclear to the users. Also information about the take-back process was missing from the web shop. As a recommendation, further development is needed in communicating the eco-points to the consumers, as well as clarifying how the eco-point concept will be practically used. This would include clear and easy description of the following aspects:</p> <ul style="list-style-type: none"> <li>- Eco-points</li> <li>- Where and how the eco-credits and eco-debits of an individual customer are presented?</li> <li>- What is the relationship between eco-points, eco-credits and eco-debits and how this will be displayed on the eco-account? (E.g. how the customer can simultaneously gain -27 eco-debits and 10 eco-credits by purchasing an item)</li> <li>- How gained eco-credits can be used by the customer?</li> </ul>



Activity #29 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Survey on new ONA product concepts</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	2020, 13 <sup>th</sup> – 24 <sup>th</sup> April (Online)
Participants	76 participants End-users
LL activity details	Survey study was designed to measure the user acceptance and preferences of the new product concepts designed by Ona Emotions. The evaluated lighting concepts were presented as rendered images of the 3D models.

Main results:	<p>The overall results indicate that approx. 30% of the respondents would consider purchasing one of the lamps, while their price being below 100 €. The concept was associated with adjectives such as <b>modern, interesting, cheap, unnecessary</b>, and <b>unstable</b>. Most preferred materials were <b>wood</b> and <b>metal</b>, which were also considered as the most sustainable. Most appealing <b>sizes were considered to be M and S</b>.</p> <p>Majority of the respondents (over 90%) indicated <b>willingness to return a broken lamp to the manufacturer</b>, if postal fees would be covered, and over 80% would be interested in receiving the same lamp back after it had been repaired. Additionally, more than 70% of the respondents would be interested in receiving a discount from a next purchase, as a compensation for retuning a product.</p> <p>Modularity was concerned with a mixed response, as only one third indicated being interested in self-assembly product, while it was generally expected to be 10-30% cheaper than a normal product. However, when presented with a sustainability statement concerning modularity, more than 80% replied, that it would have a positive impact on their buying decision.</p> <p><b>More than 50%</b> of the respondents stated, that they understand the eco-point/credit/debits in practice, <b>while merely 14%</b> were actually able to answer correctly in the follow-up questions related to eco-points.</p>
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Activity #30 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Simulated usability test: end-user application</b> Testing method: <b>self-administered survey</b>
Linkage to CEBM(s)	CEBM C)
Activity date and place	26 <sup>th</sup> March – 2 <sup>nd</sup> April 2020 Online
Participants	The results summarize 16 test cases, conducted by CIRC4Life partners (12) and external users (4).
LL activity details	<p>Application testing was conducted to collect feedback on the app with the purpose to test its readiness for large-scale demonstration, and to identify development needs. The goal of the testing was to ensure that the app is bugs-free and is addressing minimum user requirements.</p> <p>The testing only covered account management, as well as interpretation of instructions in the app. The testing did not include eco-shopping and recycling activities, neither incentive management, which are also critical elements to test before the demonstration.</p>
Main results:	<p>The results show that the usability of the usability of the app is highly affected by the model, and currently not compatible with all devices. Users provided feedback on issues related to bugs, security and usability issues.</p> <p>Over 80% of respondents <b>Strongly disagreed or Disagreed with the statement</b> “I think this application is ready and can be introduced to the general public.”</p> <p>Further development needed to solve the reposted issues.</p>

Activity #31 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Conceptual testing of eco-point scheme: STORYBOARDS</b>
Linkage to CEBM(s)	CEBM A) CEBM B) CEBM C)
Activity date and place	May 2020 Online
Participants	110 participants (51 answers were filtered for the analysis based on completing to full survey correctly)
LL activity details	<p>Testing method: <b>self-administered survey + STORYBOARDS</b></p> <p>The questions measured how eco-point concepts were perceived, and included measuring the <b>attitude towards the concept</b>, before and after finishing the survey, <b>intention to use</b> the system and evaluation of how <b>effortful this would be</b>, <b>ease of use</b> and <b>usefulness</b> of the system. The study was constructed to conclude, whether the Eco-point concept is perceived to potentially have a positive impact on consumers' behaviour by making the impact of individual actions visible and incentivizing positive behaviour.</p>

Main results:	<p>According to the results, the user acceptance and adaptation of the eco-points could be improved with further development according to the indications of conditions which are contradicting with the current state of the concept. <b>Most importantly, the eco-point system should be automated and integrated to the existing infrastructures related to shopping, so that all purchases would be recorded to the consumer's eco-account automatically.</b></p> <p>Additionally, there is a need to ensure that the eco-point system, including its incentivizing mechanisms, will not encourage users towards unsustainable consumerism, otherwise it will decrease trust towards the system.</p>
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Activity #32 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Conceptual testing of eco-point scheme: STORYBOARDS</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	June 6 <sup>th</sup> , 2020 Online
Participants	630 respondents (539 answers were filtered for the analysis based on completing to full survey correctly)
LL activity details	<p>Testing method: <b>self-administered survey + STORYBOARDS</b>  <b>Language: SPANISH</b></p> <p>The questions measured how eco-point concepts were perceived, and included measuring the <b>attitude towards the concept</b>, before and after finishing the survey, <b>intention to use</b> the system and evaluation of how <b>effortful this would be</b>, <b>ease of use</b> and <b>usefulness</b> of the system. The study was constructed to conclude, whether the Eco-point concept is perceived to potentially have a positive impact on consumers' behaviour by making the impact of individual actions visible and incentivizing positive behaviour.</p>



Main results:	<p>The overall results of the study suggest that the Eco-point concept, can be considered as <b>easy to use</b> and being <b>useful</b>, while also having <b>good fit-for-life when presented through storyboards</b></p> <p>Getting to know the concept more during the questionnaire did not result in positive attitude change.</p> <p>Demo-specific conditions that might affect demo phase identified. Terminology is considered challenging and hard to remember. The eco-point system should be automated and integrated to the existing infrastructures related to shopping, so that all purchases would be recorded to the consumer's eco-account automatically.</p> <p>The eco-point system, including its incentivizing mechanisms, shall not encourage users towards unsustainable consumerism, otherwise it will decrease trust towards the system.</p>
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Activity #33 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>Conceptual testing of eco-cost scheme: STORYBOARDS</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	July, .2020 Online
Participants	684 respondents, 343 used for the analysis
LL activity details	<p>Testing method: <b>self-administered survey + STORYBOARDS</b>  <b>Language: ENGLISH</b></p> <p>The questions measured how eco-cost concept was perceived, and included measuring the <b>attitude towards the concept</b>, before and after finishing the survey, <b>intention to use</b> the system and evaluation of how <b>effortful this would be, ease of use</b> and <b>usefulness</b> of the system. The study was constructed to conclude, whether the Eco-point concept is perceived to potentially have a positive impact on consumers' behaviour by making the impact of individual actions visible and incentivizing positive behaviour.</p>
Main results:	<p>The overall results of the study suggest that the Eco-cost concept, can be considered as <b>easy to use</b> and being <b>useful</b>, while also having <b>good fit-for-life when presented through storyboards</b></p> <p>Demo-specific conditions that might affect demo phase were identified. Effort should be minimized to ensure acceptance. The eco-point system should be automated and integrated to the existing infrastructures related to shopping, so that all purchases would be recorded to the consumer's eco-account automatically.</p> <p>The eco-point system, including its incentivizing mechanisms, shall not encourage users towards unsustainable consumerism, otherwise it will decrease trust towards the system.</p>

Activity #34 details:	
CIRC4LIFE partner(s) involved:	ALIA
Engagement Activity	Collection of feedback from consumers. Test of the “final” version of the eco-label and eco-point approach.
Linkage to CEBM(s)	CEBM B)
Activity date and place	April-May 2020 Lorca. (Sustainable products were on place, until end of October
Participants	50 participants Consumers / End-users
LL activity details	The eco-label and eco-point concept were tested at ALIA’s shop, an external shop, and in some events ALIA performed for the promotion of the products with several organizations (Activity #2)
Main results:	<p>Two main outputs were obtained: eco-point <b>concept is not useful and not well understood in the label</b>, and sustainable <b>products were appreciated by consumers</b>.</p> <p>The inclusion of the sustainability aspects, as local ingredients were seen as really positive by consumers. Although people reacted in a good way to the eco-label, the results clearly showed <b>that the numbers were not understood. People related the more eco-points with the better product</b>. Furthermore, apart from the surveys, some consumers (the more involved ones) told ALIA’s representatives this, that the concept was wrong and difficult to understand. For sure, we are talking about the previous and original concept.</p>

Activity #35 details:	
CIRC4LIFE partner(s) involved:	ALIA
Engagement Activity	Promotion of the sustainable products
Linkage to CEBM(s)	Sustainable consumption
Activity date and place	May-June 2020 Lorca
Participants	<p>Citizenship (100)</p> <p>Association of People with Mental Illness and Relatives of the municipality of Lorca, Citizen security and emergency bodies of Lorca, and sanitarians of Lorca's hospital were the three donations made.</p>
LL activity details	<p>Several products donations were done in collaboration (some of them) with the local authorities. Products were tested, eco-label was presented and posters and leaflets regarding communication material were distributed.</p>
Main results:	<p>These events were a good opportunity to promote the project and ALIA's pilot despite covid situation, also considering local authorities' participation. In a general view, the products were appreciated and the general idea of the activities conducted for its elaboration. In addition, communication materials were easy to understand, especially the infographic of the sustainable practices along the supply chain.</p> <p>The bad thing is that this promotion has been good for project promotion but has not been so effective in the sense of selling the sustainable products, because of the restrictions.</p>

Activity #36 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	Eco-shopping module internal test
Linkage to CEBM(s)	Sustainable consumption
Activity date and place	May-June 2020. ALIA's local factory store
Participants	ALIA's staff, 8ppl
LL activity details	Internal test among ALIA's staff of the app and the eco-shopping module.
Main results:	Eco-shopping module worked well, ITC platform stable.  The app was easy to download, but not easy to understand and use for many people. Development aspects identified.

Activity 37# details:	
CIRC4LIFE partner(s) involved:	KOS
Engagement Activity	<b>1 to 1 meeting with potential business partners</b>
Linkage to CEBM(s)	CEBM A) CEBM B) CEBM C)
Activity date and place	January 2021, UK
Participants	Manging Director of RMW Electrical (Contractor)
LL activity details	Kosnic arranged one-to-one meeting with potential business partner to discuss and evaluate the real interest towards the developed leasing service model & product concept.
Main results:	<ul style="list-style-type: none"> <li>Leasing Model is very promising from the financial point of view.</li> <li>More business opportunities due to ease financial planning provided by flat payment scheme, especially for projects from local councils (such as school, leisure facility, etc.).</li> <li>All key stakeholders of industrial lighting eco-system should be included and bind together (wholesaler, Manufacturer, End User, Contract and Maintenance).</li> <li>3-to-5-year leasing term is preferred instead of longer 10-year term.</li> <li>A shorter term is better for the contractor as lots of them are self-employed.</li> </ul>



Activity #38 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>CIRC4LIFE share week (1) Tikkurila Campus</b>
Linkage to CEBM(s)	Sustainable consumption
Activity date and place	21.-25.9.2020, Laurea Tikkurila, Finland
Participants	<p>Overall, more than 90 people (students, staff, quests) visited the showroom, while 70 of them took part in one, or more of the CIRC4Life activities:</p> <ul style="list-style-type: none"> <li>- 30 people gave feedback on Ona lamps (DEMO 1)</li> <li>- 37 people took part of the label testing (DEMO 3 &amp;4)</li> <li>- 20 people tested the application (DEMO 2 &amp; 4)</li> <li>- 6 people gave feedback on the e-waste recycling scheme and marketing materials (DEMO 2)</li> </ul>
LL activity details	The showroom presented the prototypes of new modular lamps developed from industrial scrap material by the project partner ONA (Spain); collaborative recycling campaign for electronic devices developed by INDUMETAL and RECYCLIA (Spain), and offered the students, staff members and Laurea visitors a chance to test the eco-labels CIRC4Life consumer mobile application, designed to encourage people towards more sustainable consumption habits.
Main results:	Main results are concluded holistically within activity #39.

Activity #A3 + #A4 details:	
CIRC4LIFE partner(s) involved:	ALIA, LAU
Engagement Activity	<b>Sustainable shopping real life testing</b>
Linkage to CEBM(s)	CEBM B
Activity date and place	<b>Date:</b> December 2020 – January 2021 <b>Location:</b> Lorca Conducted in both, Localmente and ALIA's shop.
Participants	Localmente: 20 participants (end users) Alias Store: 8 participants (end users)
LL activity details	Aspects considered and recorded during the facilitated testing: <ul style="list-style-type: none"> <li>• Interpretation of the eco-label</li> <li>• Attractiveness of sustainable products</li> <li>• Interpretation of communication materials</li> <li>• User experience of eco-account enhanced shopping</li> <li>• Willingness to use CIRC4Life application in the future</li> </ul>
Main results:	<p>Based on these results, it can be suggested that the green colour and EU flag communicate the most information to the users instead of a numerical value in the eco-cost, and that having the label itself on the product is more effective indicator for a sustainability, than any specific piece of information that the label displays.</p> <p>At localmente, 17 out of 29 participants stated that they would scan the product QR code to access the sustainability information during shopping routine, only seven people actually scanned the QR code when they were requested about the products sustainability. General interest towards using it during shopping, the usability and interpretability of the app seem to continue to be an issue. Three participants out of eight, asked and received help from the shop employee in finding the right section in the application during the process, and all participants mentioned the employee as the main contact for solving any issues which might occur during the process. In other words, none of them noticed the contact or help features in the app. Additionally, all participants saw the app as the main object for improving their experience.</p>

Activity #39 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>CIRC4LIFE SHOWROOM week (2) Leppävaara Campus</b>
Linkage to	Sustainable consumption
Activity date and place	12.-16.10.2020, Laurea Leppävaara, Finland
Participants	<p>Overall, more than 100 people (students, staff, quests) took part in one, or more of the CIRC4Life activities:</p> <ul style="list-style-type: none"> <li>- 30 people gave feedback on Ona lamps</li> <li>- 72 people took part of the label testing</li> <li>- 31 people tested the application</li> <li>- 17 people gave feedback on the e-waste recycling scheme and marketing materials</li> </ul>
LL activity details	<p>The showroom presented the prototypes of new modular lamps developed from industrial scrap material by the project partner ONA (Spain); collaborative recycling campaign for electronic devices developed by INDUMETAL and RECYCLIA (Spain), and offered the students, staff members and Laurea visitors a chance to test the eco-labels CIRC4Life consumer mobile application, designed to encourage people towards more sustainable consumption habits.</p>

Main results:	<p>Concerning ONA's products, most appreciated materials were metal and wood, while most appealing size was considered to be S. When asked about the lamp breaking down after two months a majority of respondents answered they would try to fix it themselves if possible, which conflicts with the current decision for not enabling the customer to repair the product at home (not sending the glue). When respondents were asked whether owning the lamp for two years instead of two months affected their actions, some respondents would still aim to fix it, but fewer would contact the manufacturer for a complaint, returning the product or a repair. When requested on their attitude towards take-back opportunity, 12 out of 17 respondents would be willing send the lamp back to manufacturer. For those who would not send it back, and also including some who displayed willingness to send the lamp back, many mentioned that they would rather take the lamp back to a physical shop rather than send it via mail.</p> <p>1) Eco-label testing</p> <p>Regarding the label testing, the combination of colors and eco-cost numbers seemed to cause confusing interpretations to testers. The leading indicator for sustainability was considered to be the color scale. Respectively to the previous feedback, the eco-cost number itself, especially when presented without a possibility for comparison, is difficult to understand as the baseline for the scale is not defined clearly. However, when presenting multiple products simultaneously, more than 70% of the users were able to select the most sustainable one.</p> <p>2) IND/REC recycling process testing</p> <p>When visitors were asked to describe the e-waste recycling process based on container mock-up and roll-ups, a majority of the testers were able to describe the process in simple terms and out of those, around a half gave a detailed description of the process and demonstrated a good understanding. Similarly, most of the respondents answered that they were able to find all the necessary information about the process, while some categories of information were missing or unclear such as: recycling lifecycle, data security, location of the containers and usage of the QR code and eco-credits.</p> <p>3) Consumer app testing</p> <p>According the results, most users were able to conduct the requested tasks and use the application independently. However, 60% of the respondents Strongly disagreed or Disagreed with the statement "I think this application is ready and can be introduced to the general public.", while only 20% agreed. Less than half of respondents Agreed, or strongly Agreed with the statement "I think this application serves well its purpose". The most critical improvement aspects were identified to be unfunctional help features, difficulties in account creation, security aspects, readability and alignment of the text and elements, unnoticeable notifications, inconsistent look and feel throughout the application and difficult language and terminology.</p>
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Activity A5# details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	<b>CIRC4Life mobile application: evaluation of communication and value proposition</b>
Linkage to CEBM(s)	CEBM B)
Activity date and place	November – December 2020 Leppävaara, Finland
Participants	34 end users Master level students
LL activity details	A group of master level students were investigating the CIRC4Life mobile application within a course 'Phenomenons of decision making' and assigned six differing viewpoints.

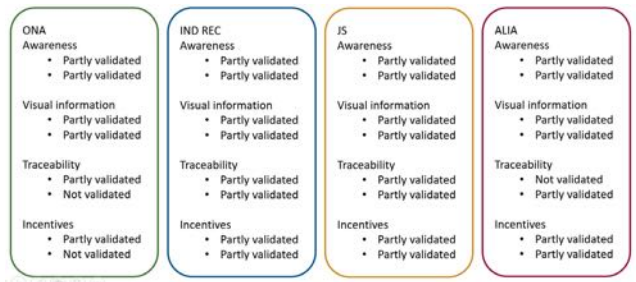
Main results:	<p><b>Group 1: A better future through sustainable choices</b></p> <p>The target group of the application should be broadened to include elderly people. The application must be easy to use for elderly people and create an experience that using it affects the future of the environment. To reach elderly people the marketing should be broadened to the relevant social environments.</p> <p><b>Group 2: Influencing the recycling of mobile phones</b></p> <p>CIRC4Life should aim to raise its recognizability by a campaign that focuses on recycling stored mobile phones. A social media campaign focusing on young people aged 18 to 29 should make phone recycling look like something favorable to do by their peers and how recycling is more popular than previously.</p> <p><b>Group 3: Social influences as drivers of behavioral change</b></p> <p>The application should include more social aspects and information about other consumers' behavior so that the users would be able to compare and compete. The application should also nudge users more towards sustainable consumption and make it easier altogether. An emphasis should be put on the user belonging to a group through using the application.</p> <p><b>Group 4: Improving usability the eco-point concept from a Finnish perspective</b></p> <p>The application should be more motivating also to users who do not think ecologically. The application should include simple gamification and social elements that are not directly connected to informing about sustainability. Physical environments of the users should be used more to make the application more accessible.</p> <p><b>Group 5: The importance of belonging to a group in creating a user experience</b></p> <p>Increasing the number of users is a key factor to influence behavior on a larger scale. To attract more users, CIRC4Life should execute a social media campaign using influencers to commit people to downloading the application as recommendations and peer experiences are effective ways of nudging behavior. The campaign should be targeted to young people.</p> <p><b>Group 6: Utilizing the eco-application as a consumption behavior change agent</b></p> <p>The application should be simpler and easier to use. The eco-point system as well as the scanning procedure should be simplified. The application should include triggers to make sustainable consumption behavior easier and it should also include an added social dimension. Use of the application could also be scaled up to relate to tax-benefits to attract a wider user base.</p>
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Activity #40 details:	
CIRC4LIFE partner(s) involved:	LAU, ONA
Engagement Activity	<b>Simulated real-life online shopping experience</b>
Linkage to CEBM(s)	CEBM B)
Activity date and place	24.2.2021, online Teams meeting
Participants	1 tester recruited by LAU, 1 ONA representative
LL activity details	<p>Demo 1 Sustainable online shopping testing was on 24.2.2021 with a test user from Finland recruited by LAU. The testing included two phases:</p> <ol style="list-style-type: none"> <li>1) Creating ONA customer account and purchasing a lamp</li> <li>2) Recycling the lamp</li> </ol> <p>The test was conducted with spoken guidance from ONA representative on how to proceed on the ONA online shop while the tester was sharing their screen on a Teams meeting.</p>
Main results:	<p>The results of the test are consistent with the previous Living Lab results and confirm <b>that there is still lack of information about the eco-costs, eco-credits and recycling process in an easy, comprehensive and user-friendly way</b>. The issues that contribute to the user confusion are:</p> <ol style="list-style-type: none"> <li>1) Language issues (mix of Spanish and English, lack of English language check, unclear structure of the sentences, ambiguous use of words)</li> <li>2) Different information in different parts of the process (for example amount of eco-costs (27vs 19 for MEDUSA Metal); email vs online form for the recycling process; difference between “Lamp break” and “Recycling” sections).</li> </ol>



Activity #41 details:	
CIRC4LIFE partner(s) involved:	LAU, ONA
Engagement Activity	<b>Simulated real-life take-back scheme test</b>
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	24.2.-5.5.2021, via email and at LAU premises
Participants	1 tester recruited by LAU, 1 ONA representative at info@onaemotion.com
LL activity details	<p>After the online shopping testing was concluded on 24<sup>th</sup> Feb, ONA representative instructed to request for a recycling for the lamp and instructions for recycling were sent to the tester. The lamp was planned for pick-up at the LAU campus but ONA scheduled the first pick-up (11<sup>th</sup> Mar) before consulting the user on a specific pick-up date even though the tester said they needed an exact date to prepare the packaged lamp for pick-up since packaging materials were not readily available. Another pick-up was at a later date (Mar 1<sup>st</sup> Apr) after LAU campus closure/remote work recommendation went on to effect because of COVID-19. The tester also was not able to get information on how to contact the courier directly and thus agree on the pick-up date more conveniently and instead all the communication went through ONA. On 5<sup>th</sup> May, the tester received a discount coupon of 10€ that did not correspond to any of the eco-costs or eco-credits mentioned earlier ("19 Ecocosts") so it unclear what that discount corresponds to. User's account on ONA website was not deleted, nor the user cannot do it themselves under their account, even though ONA promised to delete the account after testing.</p>

Main results:	<p>The results of the test are consistent with the previous Living Lab results and confirm <b>that there is considerable lack of information about the recycling process in a comprehensive and user-friendly way</b>. The issues that contribute to the user confusion are:</p> <ol style="list-style-type: none"> <li>1) Recycling process and affiliated stakeholders, such as courier company, were not describe anywhere, nor was the contact information given when asked or a reason why ONA could not do this.</li> <li>2) Packaging materials were not easily available, and the user struggled to package the lamp accordingly.</li> <li>3) The relation between the original eco-cost and the discount given is not clear.</li> </ol>
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Activity #42 details:	
CIRC4LIFE partner(s) involved:	LAU
Engagement Activity	Consumer Jam 2021
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	11 <sup>th</sup> and 12 <sup>th</sup> of February 2021 Online
Participants	40 Laurea Master's Degree students / end-users
LL activity details	<p>Participants formed eight groups to evaluate DEMOs ONA, IND REC, JS and ALIA based on the CEBM (B) Sustainable consumption assumptions, two groups per DEMO. Participants acted as experts from the consumer perspective.</p> <p>As a pre-task the participants studied a DEMO assigned to their group based on the dissemination material available prior to the Consumer Jam. During the first day participants co-created evaluation criteria and KPI's for the DEMO assigned to their group. During the second day the participants evaluated the DEMO assigned to their group based on the co-created evaluation criteria and KPIs and evaluated the validity of the implementation of CEBM (B) Sustainable consumption key assumptions in their groups DEMO: Awareness, Visual information, Traceability and Incentives</p>
Main results:	<p>The main results of the Consumer Jam were co-created KPIs for each DEMO (ONA, IND REC, JS, ALIA) and evaluation and validation of said DEMOs based on the KPIs and CEBM (B) key assumptions. Experiences of the event were used in defining contents for the OIC 2021.</p> 

Activity 43# details:	
CIRC4LIFE partner(s) involved:	ALIA
Engagement Activity	Real-life testing of the recycling process A)
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	Abarán
Participants	End -users: 25
LL activity details	<p>The study will focus on investigating how the users experience the eco-credit and eco account enhanced biowaste recycling process with two different recycling containers.</p> <ul style="list-style-type: none"> <li>• Container A) (same as INDs) is to be located in the Municipality of Araban, respectively to the feedback received in end-user workshops.</li> <li>• Users interact with the container trough the CIRC4Life application</li> <li>• Personal eco-account</li> <li>• Traceability is achieved by attaching a sticker to each bag</li> <li>• Duration 4-5 weeks</li> </ul>
Main results	<ul style="list-style-type: none"> <li>• Biowaste is being composted and the municipality and the waste management company are happy with the experience.</li> <li>• Many participants in the workshops (all of them people of more than 55) asked for a e-card instead of using the app because of its practicality. Thus, an app account was simulated for them.</li> <li>• There are not being problems with the intelligent bin use and people is interacting with them okay.</li> <li>• All the participants in the workshops were satisfied with the information provided.</li> <li>• Video of the initiative:  <a href="https://www.youtube.com/watch?v=hgVCt6WE1rA">https://www.youtube.com/watch?v=hgVCt6WE1rA</a> </li> </ul>

Activity 44# details:	
CIRC4LIFE partner(s) involved:	ALIA
Engagement Activity	Real-life testing of the recycling process B)
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	Lorca. 15/03/2021-18/04/2021
Participants	End -users: 24 families and about 70 people
LL activity details	<p><b>Container B) is to be located in the Municipality of Lorca.</b></p> <ul style="list-style-type: none"> <li>• Users interact with the container through chipped ID cards</li> <li>• Traceability is achieved by providing each family with ID equipped recycling bags</li> <li>• Shared eco-account per family</li> </ul>

Main results	<ul style="list-style-type: none"> <li>• 24 families participated.</li> <li>• All of them were active and introduced the biowaste recycling habits in their homes.</li> <li>• The comparison between our initiative and the traditional one (with no incentives and an opened bin) is being totally favorable for us. Biowaste going directly to compost and time and costs savings of sorting the biowaste.</li> <li>• 10 surveys were conducted to 10 families.</li> <li>• 80% considered the information provided very clear and the remaining 20% as pretty clear.</li> <li>• To the question Are you satisfied with the smart container or did you run into any problems? 100% answered everything was well and nobody said that there were problems on the process.</li> <li>• Regarding the easiness for the app use, 50% said very easy, 30% easy, 10% nor easy nor difficult and 10% very difficult.</li> <li>• 80% understand the logic of the eco-credits, while it is not so clear for the remaining 20%.</li> <li>• All the participants said that they would continue using the system and they would recommend it to people.</li> <li>• There were no problems using the e-card and the intelligent bin, while in the use of the app, some participants opted for not using it.</li> <li>• Something which went against the nature of the activity is that the local administration opted for giving the same incentives to the participants. This is something that was not critical though (political view).</li> <li>• This pilot activity will continue and it will be implemented in other municipality areas.</li> </ul>
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Activity #45 details:	
CIRC4LIFE partner(s) involved:	LAU + all
Engagement Activity	<b>Co-creation of OIC validation framework</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	17 <sup>th</sup> February 2021 Online: HOWSPACE PLATFORM & ZOOM
Participants	Consortium partners
LL activity details	<p>The online event was designed and executed by LAU on the HOWSPACE platform and consisted of the following steps and tasks:</p> <ol style="list-style-type: none"> <li>1. Evaluating and discussing the key innovations produced by the project</li> <li>2. Evaluating and discussing the definition and success statement for each of the CEBMs</li> <li>3. Evaluating and giving feedback to CEBM presentations/videos</li> <li>4. Evaluating and discussing the key elements of each CEBM</li> <li>5. Evaluating and giving feedback on the suitability of the workflow and the Howspace platform</li> </ol>



Main results:

Key innovation	A	B	C	None	Shall be presented as key innovation?	Conclusions and decisions
An innovative incentive scheme	3	15	29	1	Yes = 22 Don't know = 2 No = 0	The innovation will be presented at OIC as part of CEBM(B) and CEBM(C). (91,7% support)
An innovative tool for impacts, accurate measurement and decision making	20	18	4	3	Yes = 10 Don't know = 12 No = 2	Agreed to be linked to CEBM(A) and CEBM(B). No consensus whether innovation will be presented at OIC. (41,7% support)
A novel ICT platform	21	24	18	4	Yes = 19 Don't know = 4 No = 2	The innovation will be presented at OIC as part of CEBM (A), CEBM(B) and CEBM(C). (76% support)
Big-data based online mining	28	3	4	4	Yes = 4 Don't know = 9 No = 13	Agreed to be linked to CEBM(A). Agreed not to be resented at OIC, also due to existing amendment. (15,4% support)
Eco-label	2	21	13	0	Yes = 19 Don't know = 2 No = 2	The innovation will be presented at OIC as part of CEBM(B). (82,6% support)
Eco-accounting app	3	24	3	1	Yes = 19 Don't know = 5 No = 1	The innovation will be presented at OIC as part of CEBM(B). (76% support)

LAU developed the OIC 2 Validation framework based on the following results:

- CIRC4Life key innovations were defined per CEBMs
- Respectful CEBM success statements/descriptions were created for each of the CEBMs
- Howspace was accepted and selected as the OIC platform
- LAU gained knowledge on good facilitation practices on the Howspace platform, based on which facilitaton program and training was executed

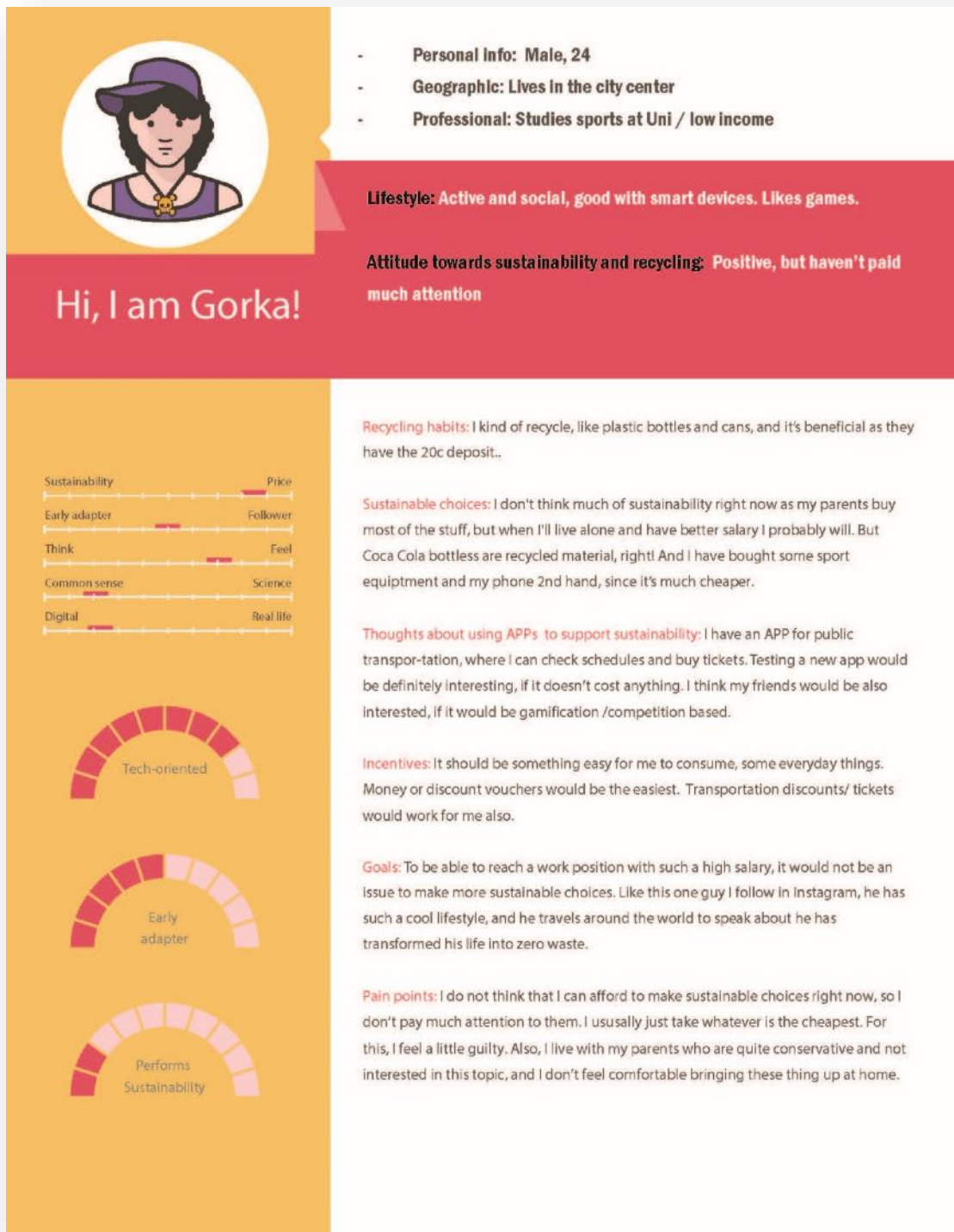
Activity 46# details:	
CIRC4LIFE partner(s) involved:	JS (Scilly organics)
Engagement Activity	<b>Real-life testing of the bio-plastic packaging and eco-label at the veggie stall</b>
Linkage to CEBM(s)	CEBM B)
Activity date and place	Local veggie stall Autumn season 2021
Participants	38 participants local residents (37.5%) and visitors (62.5%).
LL activity details	A survey of Scilly Organics individual customers was undertaken in summer 2020. An in-person survey was intended to be undertaken, but due to Coronavirus restrictions this was not possible, so an online survey was conducted instead. The survey focussed on some key questions: 1) understanding of eco labels, 2) packaging, and 3) social impacts.
Main results:	Carbon value on the label was well understood. Bio-gradable packaging well-appreciated by the respondents.

Activity 47# details:	
CIRC4LIFE partner(s) involved:	LAU, IND, REC
Engagement Activity	Real-life testing of the WEE recycling process at the Getxo town hall
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	October 2020 Getxo town hall
Participants	11 end users
LL activity details	<p>Due to COVID-19 travel restrictions, LAU team could not support the testing process in the field. For this reason, external facilitator was contracted to collect the data during the testing events. Indumetal acted as the test organizer and was responsible for the practical arrangements related to the smart bin readiness, as well as ensuring that the integration between the container and the consumer app works properly. The testing itself followed the scenarios and specific guidelines developed by LAU and was implemented by the external facilitator.</p> <p>The test focused on the following aspects:</p> <ul style="list-style-type: none"> <li>- User-bin interactions</li> <li>- Bin-app interactions</li> <li>- User-app interactions</li> </ul>
Main results:	Results indicate that there seem to be general acceptance of the recycling process, However, the testing revealed a number of critical issues to be addressed prior the full-scale demonstration.

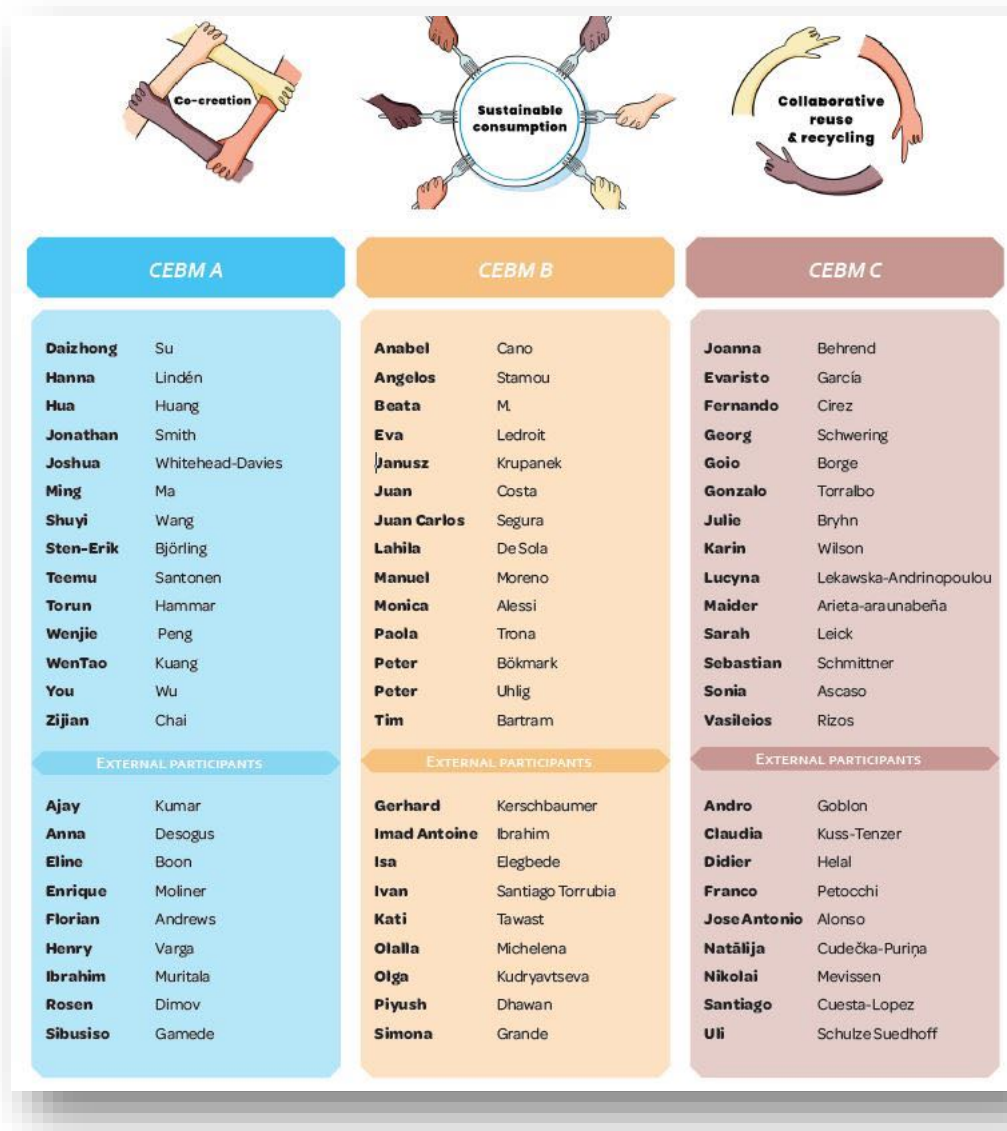
Activity 48# details:	
CIRC4LIFE partner(s) involved:	LAU, IND, REC
Engagement Activity	Real-life testing of the incentivizing process (WEEE) at the Getxo Expert Gordevi and tree planting
Linkage to CEBM(s)	CEBM B), CEBM C)
Activity date and place	November - December 2020
Participants	11 end users
LL activity details	<p>Due to COVID-19 travel restrictions, LAU team could not support the testing process in the field. For this reason, external facilitator was contracted to collect the data during the testing events. Indumetal acted as the test organizer and was responsible for the practical arrangements. The testing itself followed the scenarios and specific guidelines developed by LAU and was implemented by the external facilitator.</p> <p>Seven users decided to choose tree donation option as the incentive to spend eco-credits, while 3 users took part in the incentivized shopping at a local Expert Cordevi shop.</p> <p>Focus: 1) App notifications 2) Eco-credit value satisfaction 3) Tree donation process usability, 4) Incentivized shopping process, 5) User-app interaction, 6) Cashier-app interactions, 7) Information and communication along process</p>
Main results:	Results indicate that there seem to be general acceptance of the recycling process, and a desire to use incentives for a good cause, i.e. tree planting option. However, the testing revealed a number of critical issues to be addressed prior the full-scale demonstration.

Activity 49# details:	
CIRC4LIFE partner(s) involved:	LAU + ALL
Engagement Activity	<b>Open Innovation Camp 2021</b>
Linkage to CEBM(s)	CEBM A), CEBM B), CEBM C)
Activity date and place	27th and 28th of May, 2021 Online: HOWSPACE PLATFORM & ZOOM
Participants	70 experts (28 external experts)  Participants were experts in their respective areas and stakeholders of the specific challenges (companies, associations, universities and research institute and policy bodies), and have been selected by the organisers through an application process.
LL activity details	<p>During the first day of the Open Innovation camp participants evaluated and discussed the overall success of the five demonstrations of the CIRC4Life project, and the utilization of the CIRC4Life tools and innovations. During the second day, the focus was on evaluating and validating three circular economy business models (CEBMs), including <b>(A) co-creation of product and services, (B) sustainable consumption and (C) collaborative recycling and reuse</b>. Insights from CIRC4Life Demonstrators served as case studies for the implementation of the CEBMs.</p> <p>During the event, the CIRC4Life demonstrations and business models were showcased through a combination of displaying videos and presentations given by the company representatives, followed by interactive workshops where the results were discussed, and solutions were evaluated further.</p>
Main results	See Chapter 3.

## Appendix 7. Example of a CIRC4Life persona tool developed based on CE Jam



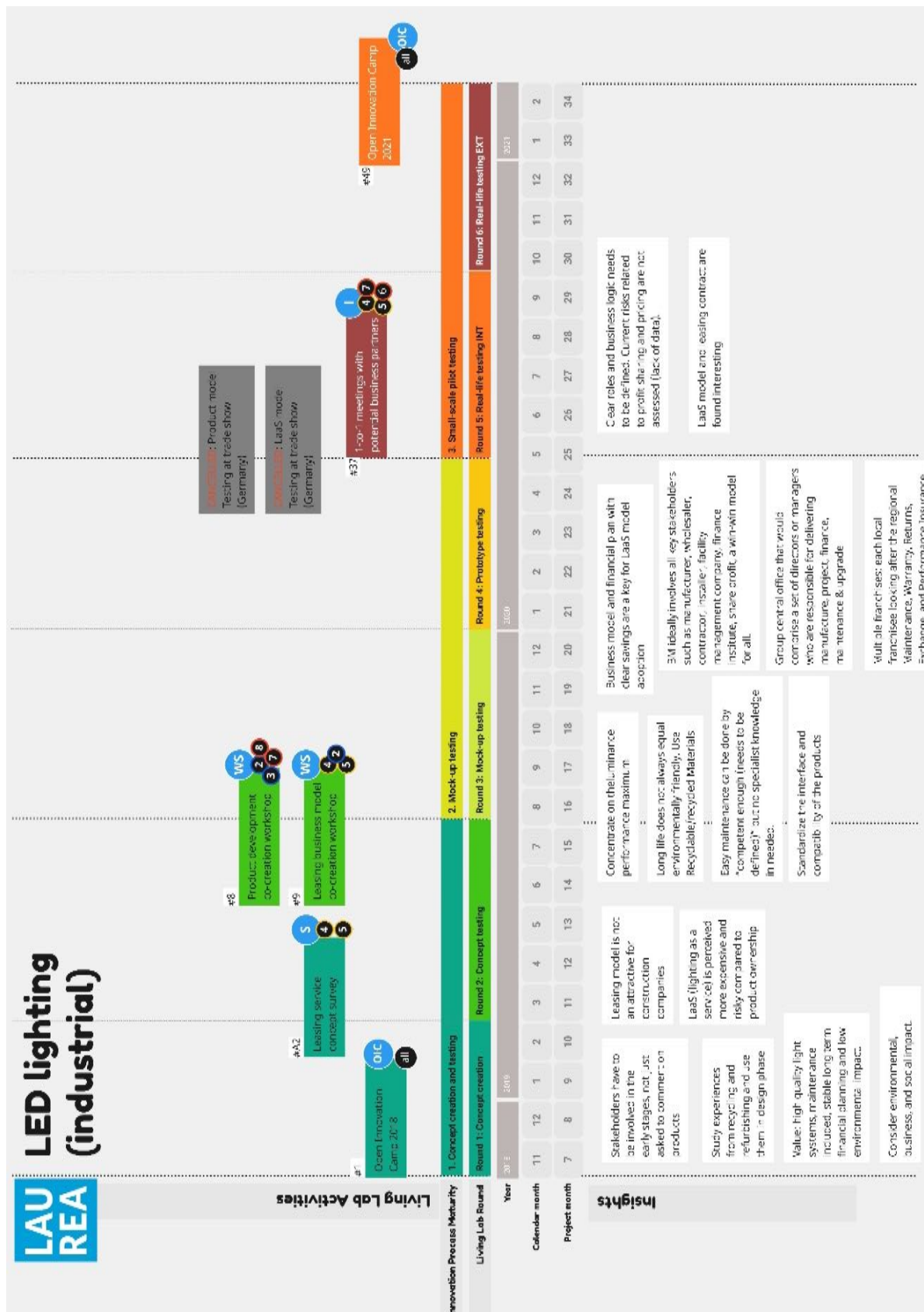
## Appendix 8. 2<sup>nd</sup> OIC homegroups and participants

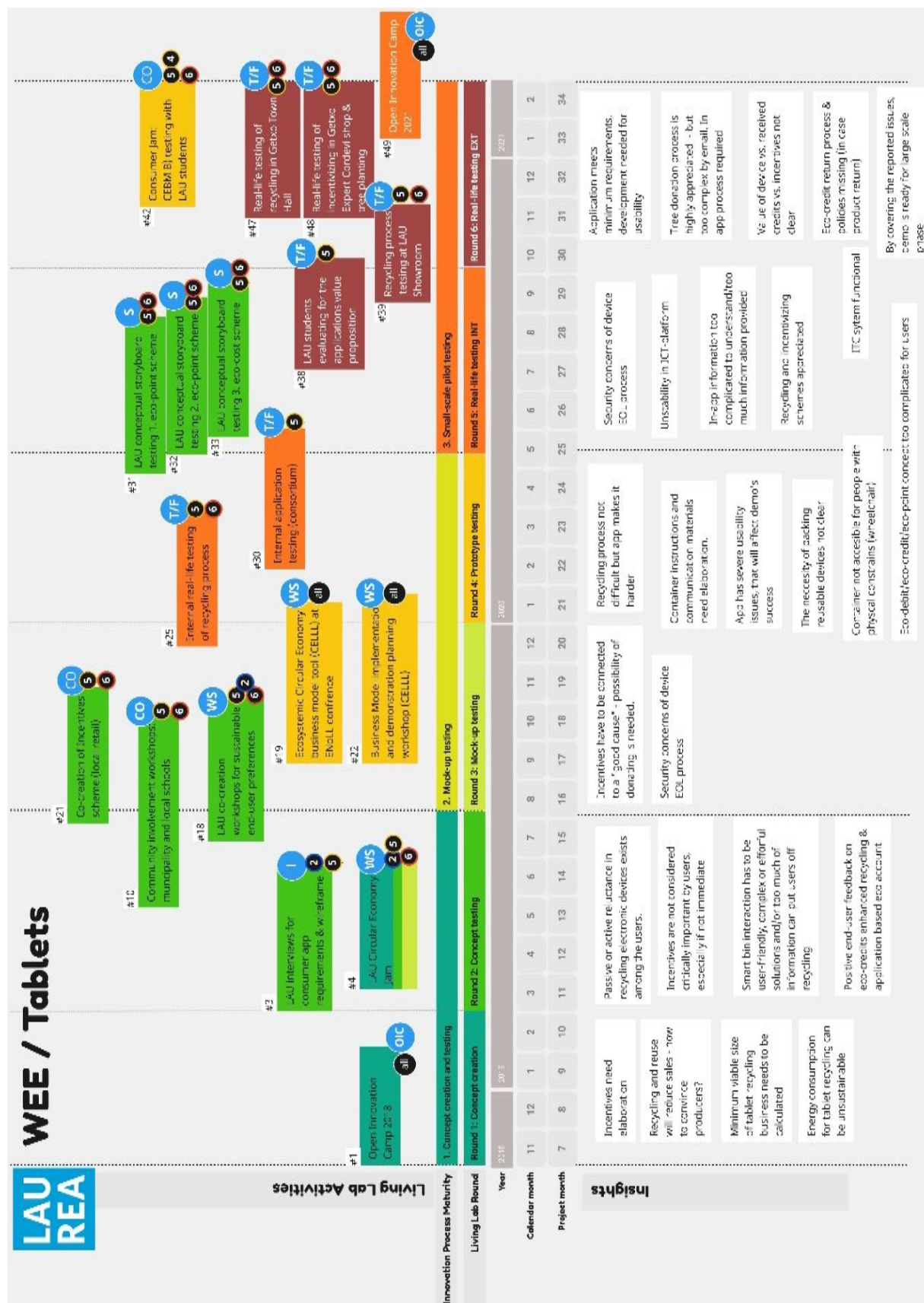




## D7.2: Report of implementing living labs and ACSI-events

## Appendix 10. Living Lab process and main insights: Demo 1 Industrial Led Lights





## D7.2: Report of implementing living labs and ACSI-events



# Vegetable Farming

#1

Open Innovation Camp 2018

OIC

all

#4

L4U Circular Economy Jam

WS

2 | 5

6

#17

Circular Design Challenge for label

CO

5

#11

Semi-structured interview  
1) Customers

I

5

#12

Semi-structured interview  
2) Retailers

I

2

4

#13

Semi-structured interview  
3) Local council

I

4

5

6

7

#45

Packaging tests at the veggie stall with bio plastics and eco-label

TIF

5

#42

Consumer Jam: CERAM B) testing with LAU students

CO

5

4

6

#38

L4U Showroom Testing (bio plastics & label)

TIF

5

#49

Open Innovation Camp 2021

OIC

all

Living Lab Round

Innovation Process Maturity

1. Concept creation and testing

Round 1: Concept creation

2. Mock-up testing

Round 2: Concept testing

3. Small-scale pilot testing

Round 3: Mock-up testing

4. Prototype testing

Round 4: Prototype testing

5. Real life testing INT

Round 5: Real life testing INT

6. Real life testing EXT

Round 6: Real life testing EXT

Year

2018

2019

2020

2021

Calendar month

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9

10

11

12

1

2

3

4

5

6

7

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Project month

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Insights

Composting (common?) models need to be developed

Sizing and real callion models is needed for small farming operations

JCT solutions are not relevant to micro-farming?

Eco information has to be presented in a very simple form (scale) to make user choices easy

Food waste can be addressed both from consumer and business side simultaneously

Rewards and possibility to compare own waste footprint possible behavioural measures

QR code on label shall contain detailed information of ECO-points

Usage of EU logo increases the trust.

Consumer interest in evaluating portions through sustainability metrics in restaurants exists

Transit on from eco-points to eco-cost value

Negative number in the salad labelling tended to confuse some users even though sustainability was perceived correctly

Label is generally well associated with sustainability

Bio plastic is appreciated by customers

Mix more plastic issues



## Appendix 14. Living Lab development process: Eco-label



D7.2: Report of implementing living labs and ACSI-events



**Eco-account**

**LAU REA**

**Living Lab Activities**

**Innovation Process Maturity**

**Living Lab Round**

**Year**

**Calendar month**

**Project month**

**Insights**

**2018**

**2019**

**2020**

**2021**

**2022**

**1. Concept creation and testing**

**Round 1: Concept creation**

**Round 2: Concept testing**

**2. Mock-up testing**

**Round 3: Mock-up testing**

**Round 4: Prototype testing**

**3. Small-scale pilot testing**

**Round 5: Real-life testing INT**

**Round 6: Real-life testing EXT**

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