TRASH 2 CASH

Utilising zero-value waste textiles and fibres with design-driven technologies to create high quality products

First Milestone Report

D9.2

Author: SP Technical Research Institute of Sweden

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First Milestone Report

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1. Summary

Trash-2-Cash is an EU funded project under the Horizon 2020 research programme that started in June 2015 and will be running until November 2018. The project is applying Design-Driven Material Innovation (DDMI) as tool for the development routes within design, material research and manufacturing of new materials, services and products. The overall objective of the Trash-2-Cash project is to develop new materials and products *via* creative design from waste materials and industrial side or by-products from the textile and paper industries and to promote development within the creative sector by providing technology solutions for exploitation of waste streams and design for recycling. 18 partners, from 10 countries have formed a cross-disciplinary team of designers, material researchers, and manufacturers and in combination with the specialist on behavioural research and cost and environmental assessments they constitute the full consortium. Having all of these specialists on board means that waste materials can be used to create new fibres that can be spun and woven, knitted or formed, into high performance textiles and composites, which can then be made into innovative new products. The full chain is represented within the project.

The design team drives the material innovation in close collaboration with the material R&D team and manufacturer team. The project flow has three iterative phases called “Cycles” that repeat specific steps. The end/begging of each Cycle corresponds with a milestone, the delivery of prototypes. The first Milestone has now been reached for the Trash-2-Cash project by finalizing the first Cycle, Cycle A, meaning that we have produced the first prototypes. These are regenerated cellulose fibres and regenerated polyester fibres that have been made from waste materials. The prototypes produced during Cycle A will be evaluated by Life Cycle Analysis and Life Cycle Cost to facilitate communication of the potential of the product. A study on the perception by the potential consumer by the prototypes has been initiated through consumer behavioural research. The prototypes will be improved during the next Cycle, Cycle B, in order to refine the material development process. The DDMI approach gives the design team the assignment to influence the further development of these materials into high quality products.

2. Introduction

The Trash-2-Cash project

Trash-2-Cash is an EU funded project under the Horizon 2020 research programme that started in June 2015 and will be running until November 2018. The full title for the project is “Designed high-value products from zero-value waste textiles and fibres *via* design driven technologies”. The project is applying Design-Driven Material Innovation (DDMI) as tool for the development routes within design, material research and manufacturing of new materials, services and products.

The budget for the project is € 8,928,995 and the European Commission is supporting the project with € 7,933,461.

Objectives

The overall objective of the Trash-2-Cash project is to develop new materials and products *via* creative design from waste materials and industrial side or by-products from the textile and paper industries and to promote development within the creative sector by providing technology solutions for exploitation of waste streams and design for recycling.

The general goals of the project are to:

- Integrate design, business and technology into a coherent discipline to establish new creative industries
- Develop new material and product opportunities *via* creative design from waste or process byproduct
- Reduce the utilization of virgin materials; improve material efficiency, decrease landfill volumes and decrease the energy consumption
- Use design for recycling with the vision of closing the material loop
- Create new business opportunities by adding the return loop of the discarded goods to be recycled into attractive products
- Promote development of the creative sector by providing technological solutions for exploitation of waste streams
- Demonstrate viable technical routes for value-chains in the creative industry.

Consortium

A design-driven cross-disciplinary consortium combining science, technology, design and end-user is formed for the development of creative interior and fashion products from waste textiles, waste paper fibres and industrial by-products and scraps. Industrial and academic partners from the areas of textile and paper waste, processing, retailing and design set up this consortium. The full chain is represented: academic and industrial designers defining the demands and initiating the material development processes, researchers applying new technologies to bring about new material solutions from the waste materials (provided from textile waste suppliers and paper waste suppliers), and industrial partners, both SMEs and larger enterprisers, connected to various end-production sectors.

List of partners

COUNTRY	PARTNERS	EXPERTISE
Sweden	SP Technical Research Institute of Sweden (Coordinator)	Development of new cellulosic materials, LCA
	TEKO	Swedish Textile & Clothing Industries' Association
	SCA Obbola	Personal care and forest products
	Swerea IVF	Research on fibrous, polymeric materials
Finland	VTT Technical Research Centre of Finland	Material Science
	Reima	Children's outdoor clothing
	Aalto University	Lignocellulose and cellulose fibre. Design research
Italy	Grado Zero Innovation	Advanced materials research and prototyping
	Material ConneXion Italia	Research and consulting on materials
	SO.F.TER SPA	Production of thermoplastic materials
Spain	Cidetec	Industrial innovation
	Maier	Aesthetical plastic component supplier for the automotive industry
Netherlands	VanBerlo	Design agency
UK	University of the Arts London	Arts, fashion and design
Denmark	Copenhagen Business School	Sustainable consumer behaviour
Turkey	Söktas	Designer and producer of cotton and blended fabrics
Slovenia	Tekstina	Supplier of design & engineered fabric solutions
Germany	Soex Group	Used textile marketing and recycling

3. Project description

The Trash-2-Cash project aims to progress us towards the sustainable textile industry of the future, one that benefits both people and the planet. Growing problems with paper fibre waste from the paper industry and textile fibre waste, originating from continuously increasing textile consumption, is challenged through design-driven innovation.

Every year we throw away over 3 million tonnes of textiles in the EU28 countries. In this unique collaboration between designers, scientists and manufacturers, the Trash-2-Cash project will

tackle the growing problem of textile waste by developing state-of-the-art fibre recycling methods, to create profitable new high-performance fibres.

Designers, design researchers, scientists, raw-material suppliers and end-product manufacturers from across Europe make up this cross-disciplinary and cross-sectorial consortium. 18 partners, from 10 countries, are working on this Design-Driven Material Innovation (DDMI) project, where the whole supply chain is represented. Having all of these specialists on board means that new fibres can be spun and woven, knitted or formed, into high performance textiles and composites, which can then be made into innovative new products.

The partners are working together to develop state-of-the-art textile recycling technologies to produce new fibres that are “designed” for the kinds of products people want. The aim is that the new Trash-2-Cash fibres will not only “be made from waste” but will also be desired and used well before going into future recycling processes.

Together the collaborators are defining material properties and evaluating newly developed eco-efficient cotton fibre regeneration processes and polyester recycling techniques. Novel materials will be constructed – starting at the molecular level – in order to generate new textile fibres and other products that will be compatible with the environment for a sustainable future. Prototypes – for high quality fashion, interiors and automotive contexts - will be produced in a realistic test production environment. A schematic representation of the Trash-2-Cash concept can be found in Figure 1.

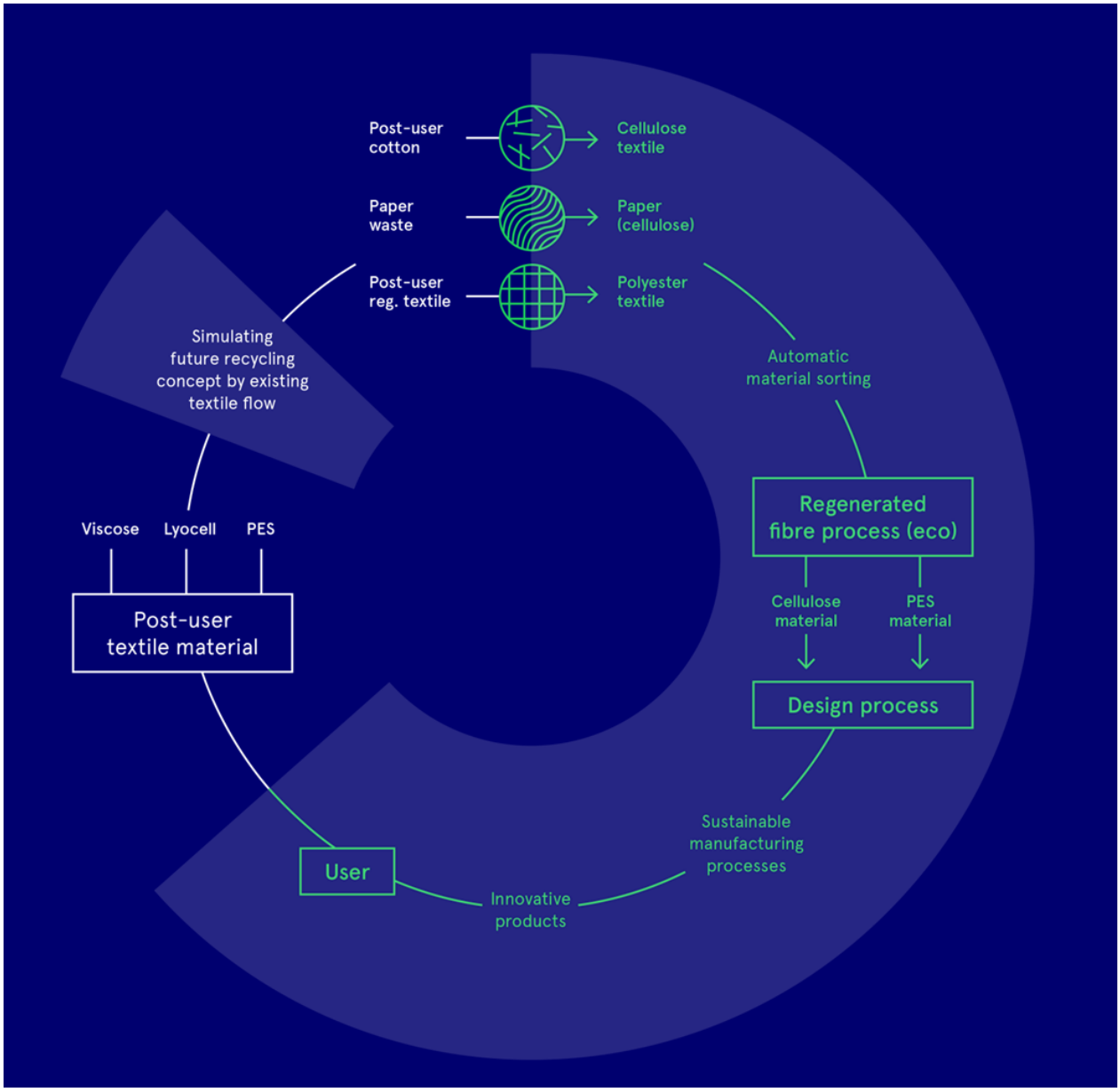

Figure 1: The Trash-2-Cash concept

The Trash-2-Cash team is not just aiming to create amazing new regenerated fibres, it is also pioneering Design-Driven Materials Innovation a whole new approach to developing materials.

The design team drives the material innovation in close collaboration with the material R&D team and manufacturer team. The project flow has three iterative phases called “Cycles” that repeat specific steps. The end/begging of each cycle corresponds with a milestone, the delivery of a prototype. Figure 2 shows a schematic overview of the work packages and the iterative Cycles. In addition to these work packages, 2 work packages related to Dissemination, Exploitation and Networking (WP8) and Management and Coordination (WP9) constitute the work plan.

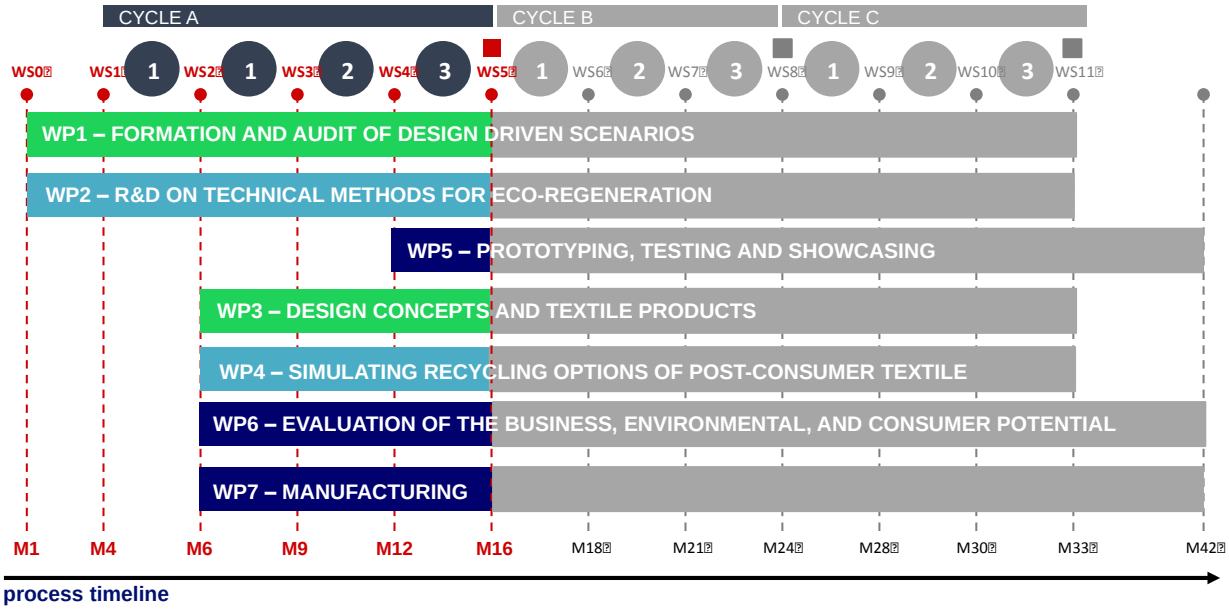

Figure 2: Overview of the work packages and the Cycles in the Trash-2-Cash project. Cycle A is the first Cycle.

4. The first Cycle and the first Milestone

Overall work

The overall work during Cycle A has been focussed on setting up the activities and connecting the work packages in a beneficial way. Also to align the three different streams: Design Research Stream, Science and Technology (S&T) Stream, and Manufacturing Stream in order to be coherent and to work towards the same objective has been very important.

The work within the first Cycle, combining the knowledge of the three streams, has resulted in the first prototype, which is connected to the first Milestone of the project. The design team, consisting of both academic and industrially connected designers, have refined the prototype material through an exchange with the S&T team. The design team also have had a two-sided exchange with the Manufacturing team. This team have started drawing up the manufacturing and showcase production during Cycle A. The Manufacturing team has been in continuous communication with the designers in order to adjust the design to production conditions and vice versa. The prototypes produced during Cycle A will be evaluated by LCA and LCC to facilitate communication of the potential of the product. A study on the perception by the potential consumer by the prototypes has been initiated through consumer behavioural research. The overall exchange process is described in Figure 3.

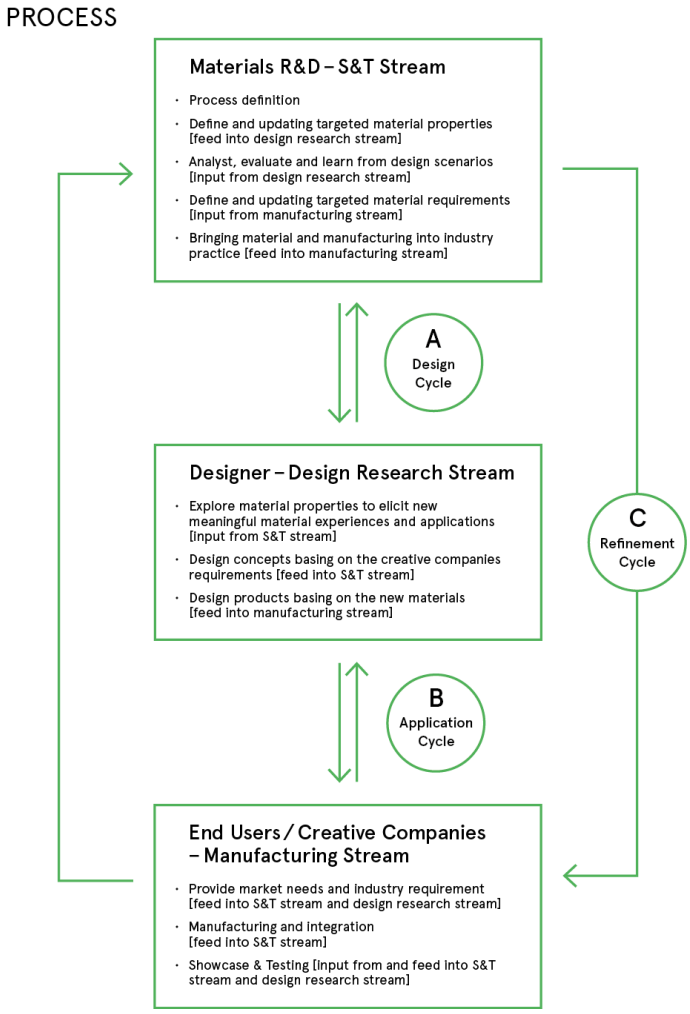

Figure 3: The Trash-2-Cash process, including the three streams: Design Research Stream, S&T Stream, and Manufacturing Stream

By finalizing Cycle A, the first Milestone has been reached for the Trash-2-Cash project, meaning that we have produced the first prototypes. These are regenerated fibres that have been made from waste materials. The prototypes will be improved during the next Cycle, Cycle B, in order to refine the material innovation process.

Work within the work packages

A summary of the work performed within the work packages (WPs) 1-9 can be found below.

WP1 Formation and audit of design driven scenarios

WP leader: Material ConneXion Italia

Aim of WP

WP1 has the main aim to set up and manage the material researcher-designer-manufacturer dialogue in the overall project. It means to support, facilitate and create the exchanges among

the Work Packages related to the S&T implementation activities (WP 2, 3, 5, and 6) during specific meetings (workshops) and also during the actions of each task that run in parallel between one meeting and the next one.

WP1 has the role to assure an effective, consistent and constant exchange process among the three streams (R&D, design, manufacturing) on a solid framework, in order to allow to designers and manufacturers to take part into the S&T implementation process and affect the R&D of new eco-fibres.

The project flow has three iterative phases called “Cycles” that repeat specific steps. The end/begging of each Cycle corresponds with a milestone and specific outcomes. These project structure (Cycles, steps, workshops) is helping WP1 to audit the knowledge transfer processes, the proper exchange of information in accordance with activities and tasks.

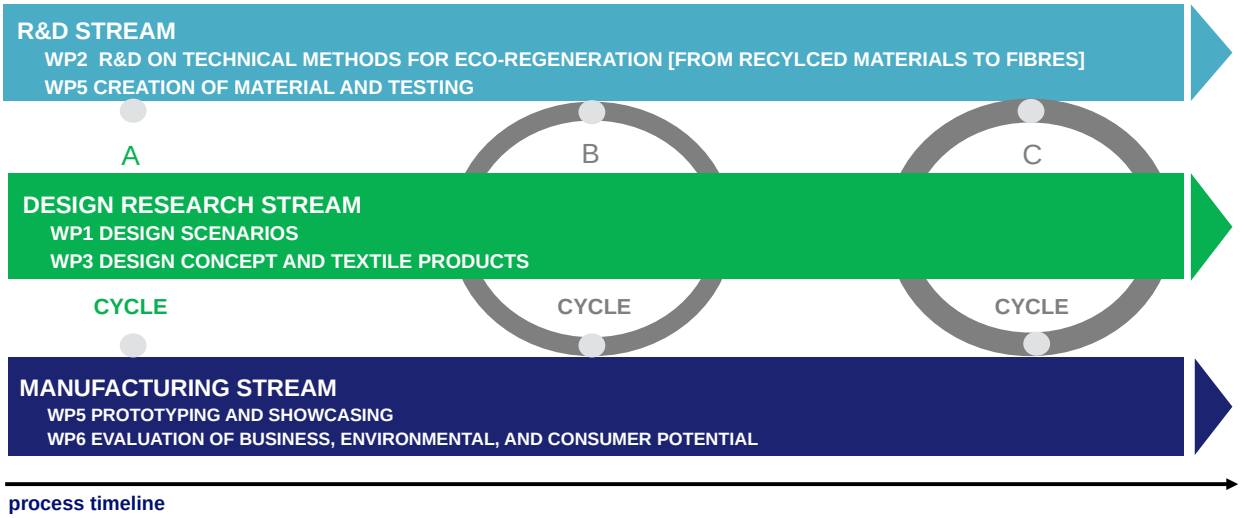

Figure 4: Schematic representation of the 3 streams and the WPs related to the implementation of the S&T process

Specifically task 1.1 (Set up and monitor the material researcher-designer-manufacturer exchanges) has to constantly implement and refine the dialogue among the three streams for the whole project, and have to monitor the process exchange itself, having under control the progress of the DDMI methodology.

The dialogue among the 3 streams is mainly achieved through regular workshops, a total of 12, 4 for each Cycle, in which all partners are involved and have an active role. The workshops are set up as hands-on sessions with specific outcomes, and as “platforms of discussion” to achieve knowledge transfer process. Each workshop is planned case-by-case with specific aims, basing on the specific phase of the project and considering specific actions and outcomes.

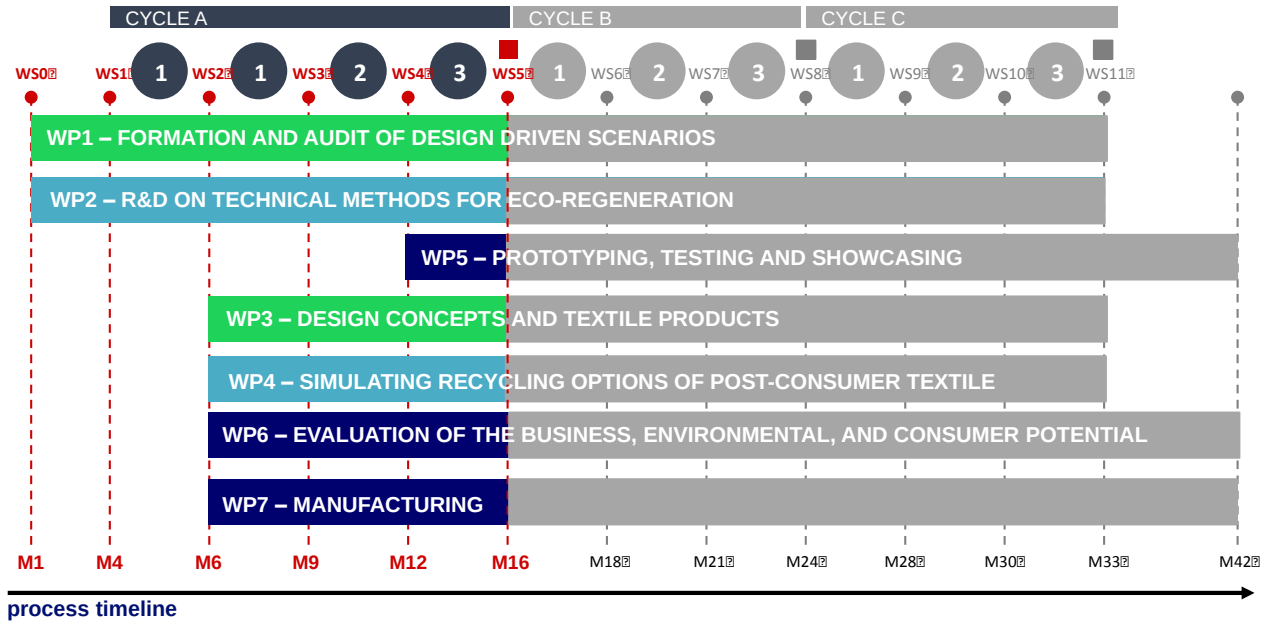

Figure 5: Schematic overview of the project flow basing on workshops in relation with months, cycles, steps, work packages

Tasks during Cycle A

During Cycle A, all the 5 tasks of WP1 have started, and 4 of them are fully executed. The Task 1.1 ("Set up and monitor the material researcher-designer-manufacturer exchanges") is the ongoing one and deals mainly with the preparation and set up of workshops (WS) and activities have to be executed in each meeting, in order to ensure: effective knowledge transfer activities, fruitful hands-on sessions with specific outcomes, and constructive discussions.

Beyond the start meeting (WS0) and the kick off meeting (WS01), the WP1 partners have organized and set up 4 WSs within Cycle A, from the 4th to the 16th project month, associated to the 3 steps of the cycle (1-analyse potentialities; 2-define requirements; 3- develop solutions).

Below follows a short description of the 4 WSs:

WS02 – Knowledge sharing and transfer

24th-25th November 2015 in Prato (Italy) - Host partner: Grado Zero Innovation

Main objectives and activities: Exploration and discussion about the limits of the polyester and cellulose fibres commercially available and about the consumer perception in relation to recycled products. The WS gives the opportunity to designers/manufacturers teams to understand the technical process and to discuss about the range of interventions possible in the characterisation of the fibres.

Figure 6: Photo of activities during workshop 02 in Prato, Italy

WS03 – Creating and working on *scenarios*

3rd - 4th March 2016 in Helsinki (Finland) – Host partner: VTT Technical Research Centre of Finland

Main objectives and activities: work on “design scenarios” gathering perspectives from all partners to refine and revise them and fill in any gaps: tech-perspective as fibre properties, manufacturing perspective as material properties and market potentials, design perspective as mega-trends.

WS04 – Selecting scenarios and defining material attributes

24th - 25th May 2016 in Milan (Italy) – Host partner: Material Connexion Italia

Main objectives and activities: to assess/select the most promising “design scenarios” for the new fibres in relation with: the development of the technology stream (new constraints, technology challenges, new potentials, etc.), primary findings about market potentialities, primary design-driven material requirements.

WS05 – Taking in charge design concept areas

12th - 13th September 2016 in Copenhagen (Denmark) – Host partner: Copenhagen Business School

Main objectives and activities: to discuss and analyse Prototype 1-Milestone and to work on design briefs and design concept areas, in order to provide inputs and set up a valorisation plan, treatment finishing experimentations, and primary testing activities.

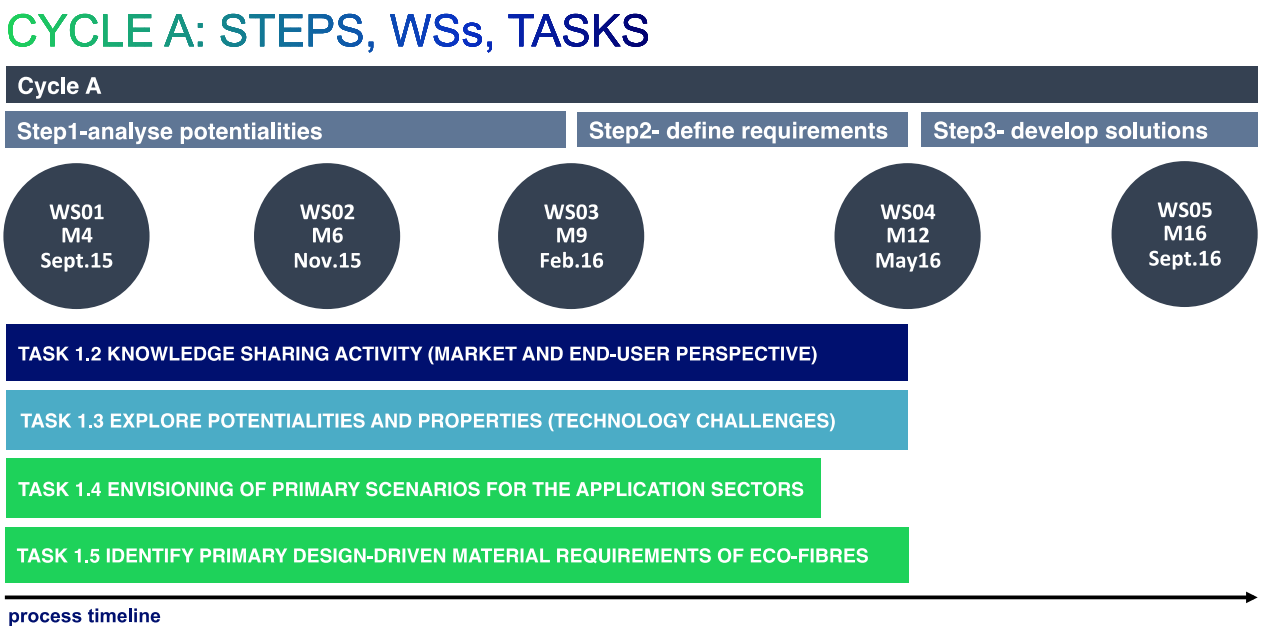

Figure 7: Schematic overview of the project flow in Cycle A basing on workshops in relation with tasks and steps

Thanks to task 1.2 (Knowledge sharing activity to feed design R&D - market and end-users needs), task 1.3 (Explore potentialities and properties - technology challenge) developed in Cycle A within WP1, partners have had the possibility to initiate the knowledge sharing activities basing on the inputs from different streams. Basically thanks to these tasks, the technological, manufacturing and business dimensions provided the initial inputs to the designers about the state of the art of eco-fibres. Values, user perception, market trends, possible applications in the field of eco-fibres have been explored in order to elicit primary material characterization and to envision general scenarios (limits and potentialities).

The execution of Task 1.4 (Envisioning of primary scenarios for the application sectors) and task 1.5 (Identify and define primary design-driven material requirements and characterization of the eco-fibres) summarized these inputs and provided the design perspective and inputs, that is design scenarios and primary design-driven material requirements.

The execution of the 4 tasks (1.2, 1.3, 1.4, and 1.5) in WP1 produced 4 main reports:

- Final report on market potentialities
- Report on primary technological challenges of the 2 tech-eco-methods
- Report on primary scenarios for 2 eco-fibres
- Report on design-driven material requirements of the 2 eco-fibres

These reports have been useful to start and ensure the knowledge transfer process among the different streams/competencies during Cycle A.

Further work and tasks in progress

Task 1.1 (Set up and monitor the material researcher-designer-manufacturer exchanges) will run until the achievement of milestone. The task will go ahead with 2 main objectives: to organize and define the workshop activities and related tools, and to audit the overall project process basing on the design-driven methodology developed within the project.

Three workshops have to be set up and managed in Cycle B to achieve Milestone 2, and 3 workshops have to be set up and managed in Cycle C to achieve Milestone 3. The workshops

will still be organized considering a multidisciplinary approach in order to ensure the balanced integration of the 3 streams and the different competencies in the project.

WP2 R&D on technical methods for eco-regeneration (from recycled materials to fibres)

WP leader: VTT Technical Research Centre of Finland

Tasks during Cycle A

The work package has provided recycled/waste raw textile materials to become upgraded or refined materials, cotton and polyester textiles, to be dissolved and spin cellulose-based materials and to melt spin polyester or injection mould it. The work also includes concept development. All the achieved materials have been characterized using chemical analysis. The materials included both pre-consumer and postconsumer textiles.

The target of the work is to adapt the raw materials to fulfil the quality requirements of the regeneration processes by utilizing combination of different mechanical and chemical treatments. The refining sequences for the various raw materials have been developed and the technical feasibility of sequences has been estimated. Cotton materials dyed with reactive dyes were able to be bleached with used refining sequences. Some materials have been available with some limitations.

The pre-consumer cotton has typically a low degradation during the treatments, which may cause limitations for the fibre spinning step (due to high viscosity). The printed colored cotton caused problems because that polyurethane fibres were present (known also as elastane), which is expected to be a challenge in general. Some fixated reactive dyes seem to cause problems in the alkaline process, but the reason why is not fully understood at this point.

White polyester-cotton blend garments were possible to be chemically separated with both the cellulose carbamate and Ionic liquid methods.

Further have been applied recycled paperboard fibres from corrugated paper cardboard. This cellulose-containing fraction was successfully used to spin fibres using ionic liquids. However, hornification of the material (irreversible drying of the fibre) seems to affect their spinnability negatively.

Attempts to degrade polyester and in a further step rehabilitate the polymer into a polyester quality suitable for fibre spinning have been successful.

Due to experienced problems to find a grinding apparatus that could grind the polyester to a suitable particle size for compounding this recycling path has been somewhat delayed.

WP3 Design concepts and textile products

WP leader: Aalto University, School of Arts, Design and Architecture

Aim of WP

WP3 includes the design tasks related to recycling and manufacturing. It consists of scenarios building and model constructing for design for recycling and life cycle design. Further, it includes mapping the attributes for futures materials for main application sectors; car interior, fashion textiles, and technical textiles. Based on aforementioned knowledge, building the design brief for technical development of the materials is one task in this WP. In addition the knowledge transfer between science, technology and design is created and a new design methodology is proposed. The work package feeds from information in WP1, and into WP5 and WP8.

Tasks during Cycle A

WP3 Deliverable The brief/Material attributes

The first deliverable of this package was Deliverable 3.1 The First Brief, in July 2016. The aim was to gather the data generated in WP1 (Visions and pre-scenarios) and the knowledge of technology from science (R&D stream) and end-users (Manufacturing stream) in order to generate the first brief for WP2 (fibre and yarn manufacturing) and WP5 (fabric prototyping and testing). The brief gives the input for yarn spinning and preparing sample fabrics (Prototype 2) but it also indicates the properties to be developed at the fibre level (Prototype 3).

The data gathering started from WS02 (Prato) where first envisioning of scenarios and material attributes were created. Meetings with scientists, designers and end-user companies were held during the winter - spring 2016 before WS03. The work with scenarios continued and technical properties of the material/product properties were discussed with all partners in WS03 (Helsinki). After the workshop a questionnaire about the most important material properties to the end-user companies in the project was distributed. Between WS03 and WS04 there were 4 deliverables from WP1, and information from these reports has been incorporated into this brief. Again in WS04 the scenario work was continued and technical limitations were discussed.

This first brief creates the base by setting the goals for needed and valuable material properties in the final textile product. It is an iterative process where the next briefs, the second brief and the third brief are refined or updated based on results and new knowledge from earlier prototypes.

A lot of effort and time has been allocated to construct the shared knowledge from the content and goals in WP3. The more detailed descriptions of each task were made followed by description of the sub-tasks for tasks. The roles of every partner (MCI, UAL and VanBerlo) and every person have been crystallized in each task and subtask. The tasks' relations to other tasks' in work package 3 but also their relations to other work packages (WP2 and WP5) have been clarified.

WP4 Simulation recycling options of post-consumer textiles

WP leader: SP Technical Research Institute of Sweden

Tasks during Cycle A

The large amount of non-wearable textile streams needs to be adapted for chemical recycling such as the Trash-2-Cash concept. To fulfil an effective value circle there is a need to adapt and optimize the automatic sorting technologies to sort on fibre composition. One of the tasks in Trash-2-Cash deals with the online-sorting of mixed textile post-consumer waste. The task objective is to test various sorting techniques available on the market in their present form and evaluate the technical potential in recognizing and sorting garments by their material contents. Clothing can be rather complex with many layers and attributes. In this evaluation only monolayer garment will be considered. When there is doubt due to the fiber content of the textile, chemical analysis will be performed. This could be an effect of the recognition result, but also due to mislabeling of the garments. The evaluation results will be presented in a public report in March 2017.

WP5 Prototyping testing and showcasing

WP leader: Cidetec

Aim of WP

WP5 started in month 12 of the project, being the main objective of the WP5 to generate the material samples for Prototype 2 (Application Cycle B), Prototype 3 (Refinement Cycle C) and dissemination purposes (exhibitions, photographs, videos, etc.).

Tasks during Cycle A

The activities started during this period are:

Task 1. Valorisation of materials for Prototype 2: A preliminary valorisation plan for regenerated cellulose and regenerated polyester has been already defined and discussion among different partners to complete the plan is in progress.

Task 2. Finishing technologies step 1: A preliminary finishing testing plan for regenerated cellulose and regenerated polyester has already been defined and discussion among different partners to complete the plan is in progress.

Task 3. Creation of material samples for Prototype 2: The organization for production of different typologies of samples has begun.

WP6 Evaluation of the business, environmental, and consumer potential of developed design concepts

WP leader: Copenhagen Business School

Tasks during Cycle A

Industrial relevance and impact of research efforts

This task started in March 2016 with the identification of the production processes/steps needed for manufacturing the design concepts developed within the Design stream. Identification of the needed processing steps and defined manufacturing chains for every design concept developed, enable extrapolation of the process parameters for industrial up-scale, and the parameters are also needed for obtaining optimized manufacturing protocols.

The actual work is also focusing on:

- Analysis/evaluation of the properties assessed during the characterisation of the collected used/scrapped fibres, and definition of a valorisation plan/report for the waste raw materials between collection and fractionation. The plan/report will be specific for each of the waste raw materials, and will include the specific required pre-treatment or inter-treatment process and the data-sheets for their analytical validation including parameters needed for reproducibility and quality assurance.
- Preparation of Questionnaires by which gather data about the industrial and environmental relevance and impact of materials and processes.

Environmental performance

The work has been focused on compiling environmental data that can be useful for the other parts of the project when developing technology, materials and products. The purpose has been to give some first insights on which fibers (and materials) that are the most promising in environmental terms.

The first task consists of a report including a review of database and literature data of potential relevance for further life cycle assessment work in Trash-2-Cash. The review covers life cycle inventory as well as life cycle impact assessment data of textile fibres, yarns and fabrics. Life cycle inventory data is data on the resource use of, and/or emissions from, processes in product life cycles (i.e. the input data to the Life cycle inventory phase, the second of four life cycle assessment phases). Life cycle impact assessment data, on the other hand, is the characterised

potential environmental impact (i.e. the output from the life cycle impact assessment phase, the third of four life cycle assessment phases). To review the currently available knowledge about the environmental impact of textile fibres (and some yarns and fabrics), and to summarise the key conclusions from such work, was deemed to be the most relevant and useful output from the first life cycle assessment task in Trash-2-Cash ("iteration zero"), because: (i) The identified data may be directly useful as input to the life cycle assessment modelling for future life cycle assessment tasks (Cycles A-C); (ii) Knowledge about data gaps is necessary for assessing to what extent data has to be produced within the project (in the life cycle assessment tasks, or in other tasks); (iii) Current knowledge about the environmental advantages and disadvantages of various types of fibres, yarns and fabrics may be relevant input to both the technical and design work packages involved in selecting and developing the Trash-2-Cash prototypes.

Consumer behavior – potentials of recycled textile products

The main objective is to explore consumers' acceptance towards recycled textile products. Consumer's acceptance of new products depends strongly on their perceptions. Hence, in a first step, barriers regarding dimensions such as material, design, distribution channels or social norms are investigated. Consumers' awareness of recycled products is low which can be reasoned in their low availability and accessibility. For this reason focus group interviews have been carried out in Germany in June 2016. The three groups varied by age, educational background and their clothing consumption behavior. On a general level, participants discussed what they connect with products made from recycled material followed by a more specific level where clothing was introduced and participants were asked whether they would buy these products and which concerns they would have. Barriers towards recycled textile product consumption were uncovered. These findings fed into a representative survey that was developed from January – September 2016 aiming at identifying general tendencies among consumers across four countries (Sweden, Germany, Poland, United States). The data will be collected in September/October 2016 and first results are expected for December 2016. Parallel to the survey, material developers and designers within and outside the project will be interviewed to identify whether barriers are merely perceived by consumers or whether these barriers really exist. This gathered knowledge is essential for tailored communication towards consumers to promote recycled textile product consumption.

WP7 Manufacturing

WP leader: Grado Zero Innovation

Aim of WP

- Analysis of the manufacturing processes to scale-up materials and technologies used to make the prototypes from lab- and pilot scale (as used in WP5), to industrial scale.
- Validation of the manufacturing processes in real industrial environments.
- Gathering all the relevant information for creating and growing business and commercial opportunities based on recycled textile fibres, and on the derived (eco-)products.

Tasks during Cycle A

Task 1: Conceptualising scalability of the future benign processes

In this task the concepts worked out within earlier WPs are assessed and conceptualised/modelled in order to give the prerequisites for investigating scale-up parameters as required for the final products (*Technical Garments*, *Novel Garments*, *Plastic and Reinforced Plastic Parts*).

Task 2: Scale-up analysis for manufacturing the new products on industrial volume

According to the specifications established by end-users (in WP3), and the prototypes developed (in WP5), methods for scaling-up the new concepts are carried out. This task will lead to the final scaling-up parameters for mass production. Manufacturing data will be communicated to WP6.

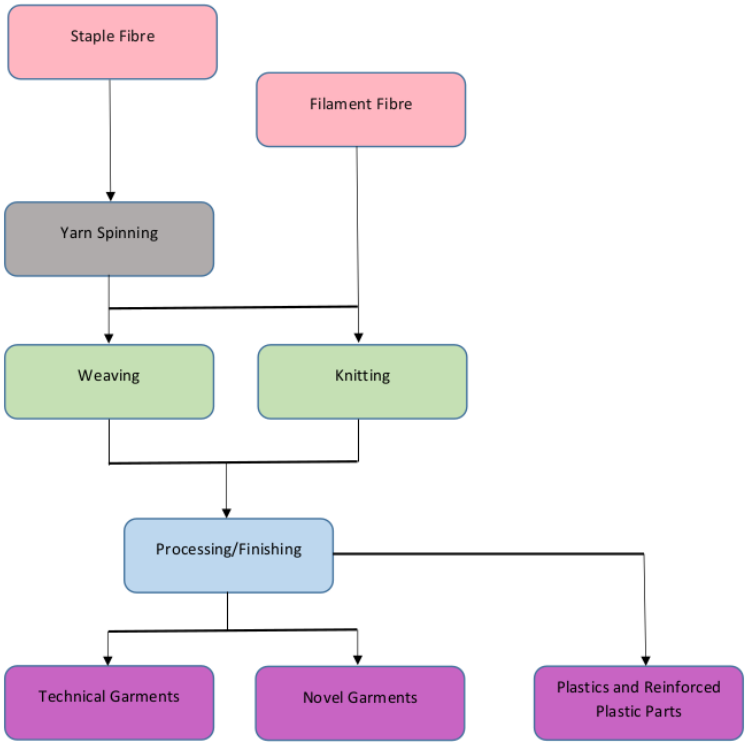

Figure 8: Value chain for the 2 eco-fibres

A Deliverable 7.1 “Processes needed for end products” was completed in May 2016.

Newly Started Activities:

- **3 new tasks started in June 2016**: (1.2) Conceptualizing processes; (2.1.1) Scalability; (2.1.2) Composites manufacturing.
- Coordinate activities between WP2, WP4, WP5, WP6 and WP7:
  - (with WP2) for coordinating R&D activities on materials with the aim to valorize processes needed for P2 production, including specific required pre-treatment or inter-treatment processes and for providing the data-sheets for their analytical validation: **reproducibility and quality assurance**.
  - (with WP4) for **identifying recycling factors and options influencing the up-scaling** of fractionation/regeneration and up-cycling for the 2 eco-fibres.
  - (with WP5) for aligning the second iteration cycle of prototyping activities with the up-scaling analysis of the manufacturing processes needed.
  - (with WP6) for capturing and transferring the necessary insights to obtain a fully integration of the individual processes into complete value chains with business potentialities. Specific Questionnaires have been prepared by which gather data/information for **assessing** (evaluating/benchmarking) **industrial relevance and environmental impact of materials and processes**.

Further work

Task 3: Validation of strengths and weaknesses of the new product concepts for industrial scale production

In this task the quality of the prototypes/showcases manufactured in WP5 is verified and validated. Qualification of systems and equipment will be part of this validation, as well as the supervision of all the manufacturing processes.

WP8 Dissemination, exploitation and networking

WP leader: The University of the Arts London

Tasks during Cycle A

1.1 To establish a Dissemination Board focused on strategies aimed at ensuring that the project will evolve as a sustainable initiative to down-stream results beyond the project completion and developing a credible plan/roadmap for use, transfer, diffusion and take-up of results.

Formation of the Dissemination Board

In May 2016 during Workshop 04 the Dissemination Board was officially launched with a collaborative session to understand the 'state of the art' of dissemination activities among the different sectors represented in Tras-2-Cash. The Dissemination Board is made up of representatives from design, science, and manufacturing, in academia and industry. The first meeting of the dissemination board was held in August 2016 and further meetings will take place monthly and at each workshop.

1.2 To develop clustering and coordination with activities with relevant projects active in the circular economy and factories of the future for cross-fertilising and sharing data, experience and results.

Logo & Identity

Creating a strong and consistent visual identity for the project is important to establish professionalism and credibility, particularly with the public and design audiences (who are predominantly visual communicators). The identity was designed by graphic design agency *Polimekanos* in accordance with EU protocol relating to outsourcing services.

The Trash-2-Cash project is identified with the logo shown in Figure 9

The logo references a broader theme of the circular economy with the space of the project in this loop replaced with the circle and arrow devices traditionally associated with recycling. The resulting ensemble represents the design and application cycles between the concepts of 'Trash' and 'Cash'.

Website, Blog and Social Media Channels

The project has a public-facing website featuring a blog-style homepage as well as information about the work packages and partners. There are also links to social media where the majority of current content is disseminated, driving traffic back to the website.

Figure 9:Trash-2-Cash brochure featuring the logo

1.3 To facilitate transfer of knowledge developed to designers, educators and relevant stakeholders.

Communications Strategy Document

The communications strategy document was finalised in May 2016. The strategy outlines a 'podcast-first approach' whereby interviews with project partners are recorded, edited and made publically available through iTunes. These interviews aim to draw general interest in the project in the early phases while there are few project results to communicate. These podcasts also build a sense of community among the partners and feed the methodology research which is people-focused.

Mobile Materials Sample Case

Two project suitcases have been created to archive and transport project materials samples between workshops so that they are always available for partners during collaborative activities. This is seen as a significant innovation in a project of this type as interaction with actual materials is such an important part of the methodology. These will also be used at dissemination events later in the project.

1.4 To identify and produce suitable dissemination products for the needs and goals of the project.

Promotional Material and Templates

The brochure has been made available to all partners to distribute during their own events and with their customers and other stakeholders. In addition, we have created PowerPoint and poster templates and made project logos available to partners so that the project can be communicated coherently across all platforms.

Exploitation Strategy Seminar

Following Workshop 05 in September 2016, the project coordinator organised an exploitation seminar (provided as part of the EU H2020 project scheme). This was a very useful for developing and better understanding our Key Exploitable Results (KER). The resulting report will support the updated Exploitation Plan.

Deliverables submitted:

- Dissemination Plan
- Draft Exploitation Plan

Results and next steps

Website

The website content is now building through podcast reports and workshop reports. This will be broadened to represent more of the project partners over the next 12 months.

Podcast Series

So far there have been two podcasts published, two more have been recorded and will be published by November 2016. Two more have been scheduled to be recorded and published before January 2017. These will feed the public domain (website and social media) with original content from the project, building general interest for when we start to disseminate project results.

Project Promotion

The project has been promoted by project partners at:

- Premier Vision (Paris)
- Shirt Avenue (Milano)
- AITEX (Ljubljana)
- Swedish political festival (Almedalen)
- Aalto Arts (Helsinki)
- FIT Summer School, Industry (New York)

Further work and tasks in progress

Stakeholder Newsletter

While the focus of project communication in Cycle A has been on generating general interest in the project, Cycle B will involve more tailored and direct communication. A newsletter is being developed to be distributed through partners' existing mailing lists which will report project progress, the key project results and updates on events after each workshop.

Circular Transitions Conference

The first results from the Design steam will be presented at the Circular Transitions textile design conference to be hosted by Trash-2-Cash partner UAL on 23rd-24th November 2016. An exhibition is also planned which will hopefully include other results from WP2 (materials) WP4 (textile waste sector).

Conference paper titles accepted being presented:

- What Else do we know? Exploring the application of design knowledge and skills for the circular economy beyond materials selection and design for production.
- Can Design-Driven Material Innovation also drive circularity?
- Whole Circles: design research leadership for the circular economy

An invited keynote will also be given by Professor Rebecca Earley (UAL) at the Sustainable Innovation conference in November 2016, *Postcards from the Edges: Exploring Regenerated Cellulosic Fibre Development and Design Driven Material Innovation Approaches in the Trash-2-Cash Project.*

Cycle B dissemination events

A dissemination seminar is planned for autumn 2017. The aim is to invite key stakeholders and cluster project representatives to share early results from Trash-2-Cash and receive feedback to inform the exploitation strategy.

Deliverable due in the next 12 months:

- Updated Exploitation Plan

WP9 Management and coordination

WP leader: SP Technical Research Institute of Sweden

Tasks during Cycle A

The work package is handling the management and coordination of the Trash-2-Cash project. Tasks during the first Cycle have included setting up the workshops in collaboration with WP1 and the planning and reporting of deliverables to the European Commission. Handling of the financial and IP management has also been major tasks during the first part of the project.

5. Further work

The design briefs are under development and will direct the further work with the prototypes achieved during Cycle A. The first Milestone is not only the end of Cycle A, but also the start of Cycle B, the application Cycle. During this Cycle the work of designers intervening in the making of the second prototype and its production will be resulting in achieving prototype 2 and Milestone 2.