DIGITAL PLATFORM FOR CIRCULAR ECONOMY IN CROSS-SECTORIAL SUSTAINABLE VALUE NETWORKS

DigiPrime

Digital Platform for Circular Economy in Cross-sectorial Sustainable Value Networks

Circular Economy for the Built Environment
Bergamo (IT), 27th October 2020

Presenter: Elena Mossali

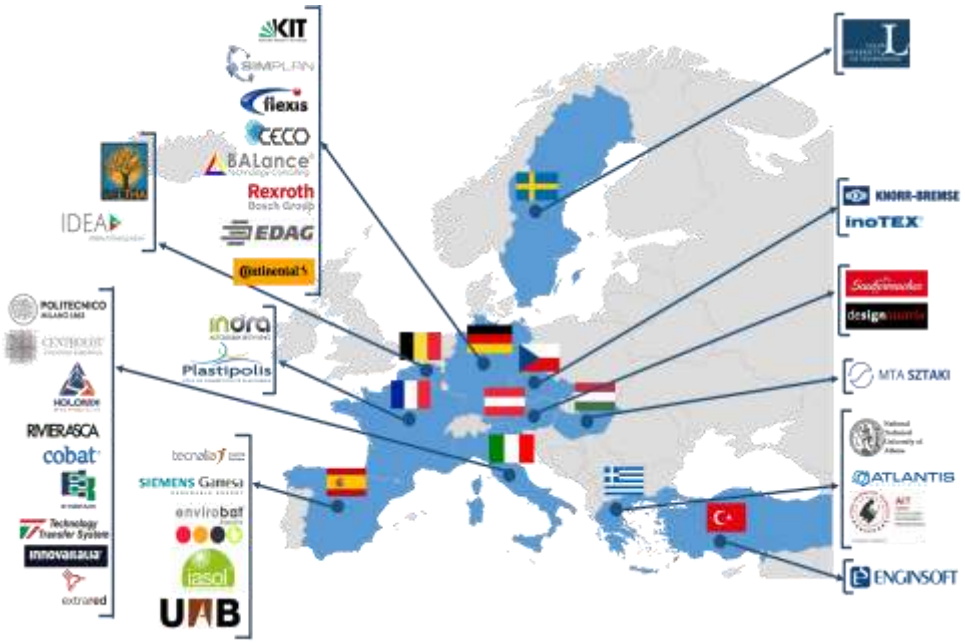
Politecnico di Milano

STIIMA CNR

Funded by the Horizon 2020 framework programme of the EU
GA n° 873111

Project coordinator: Marcello Colledani
marcello.colledani@polimi.it

The DigiPrime project



- 36 European organizations from 11 EU states;
- 6 manufacturing sectors;
- 25 **industrial partners**, 18 of which are SMEs;
- 8 **academic and research partners.**

CALL

H2020-DT-ICT-07- 2018-2019

Digital Manufacturing Platforms for Connected Smart Factories

BUDGET

Project costs: *19.257.130,00€*
Funding: *15.963.173,50€*

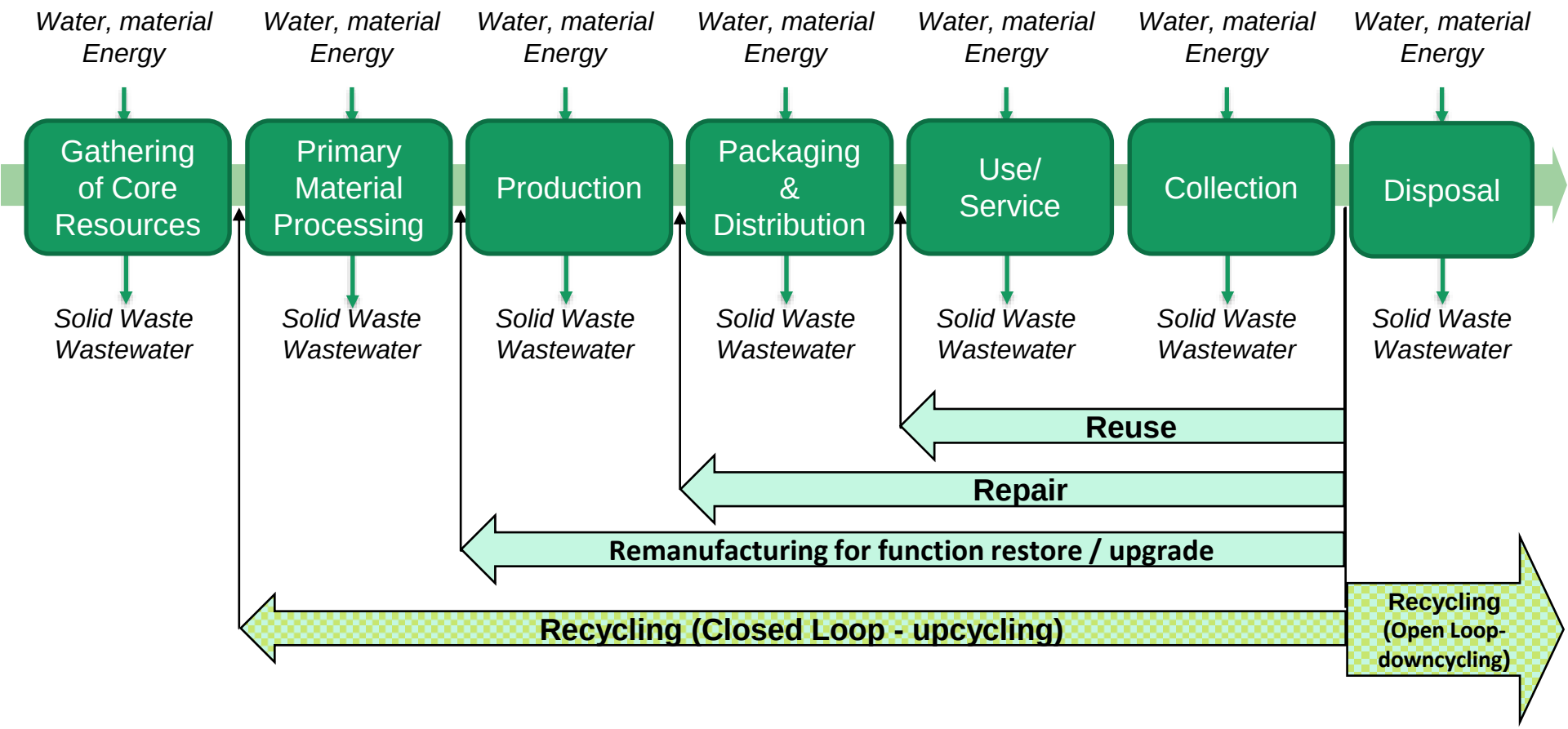
DURATION

January 2020 – Dec 2023

OBJECTIVE

To develop a new concept of Circular Economy digital platform overcoming current information asymmetry among value-chain stakeholders, in order to unlock new circular business models based on the data-enhanced recovery and re-use of functions and materials from high value-added post-use products with a cross-sectorial approach.

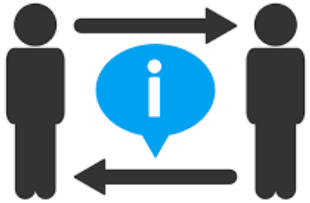
Why DigiPrime? - the context



- Product data and knowledge is not exchanged among manufacturers and de-and remanufacturers, as well as among sectors leading to unlocked cross-sectorial material re-use opportunities.
- Lack of certification protocols for secure re-used materials and components transfer among sectors.
- Poor acceptability of products embedding recycled materials by end-customers.

Why DigiPrime? - the objectives

To solve current **information asymmetry** among value-chain stakeholders



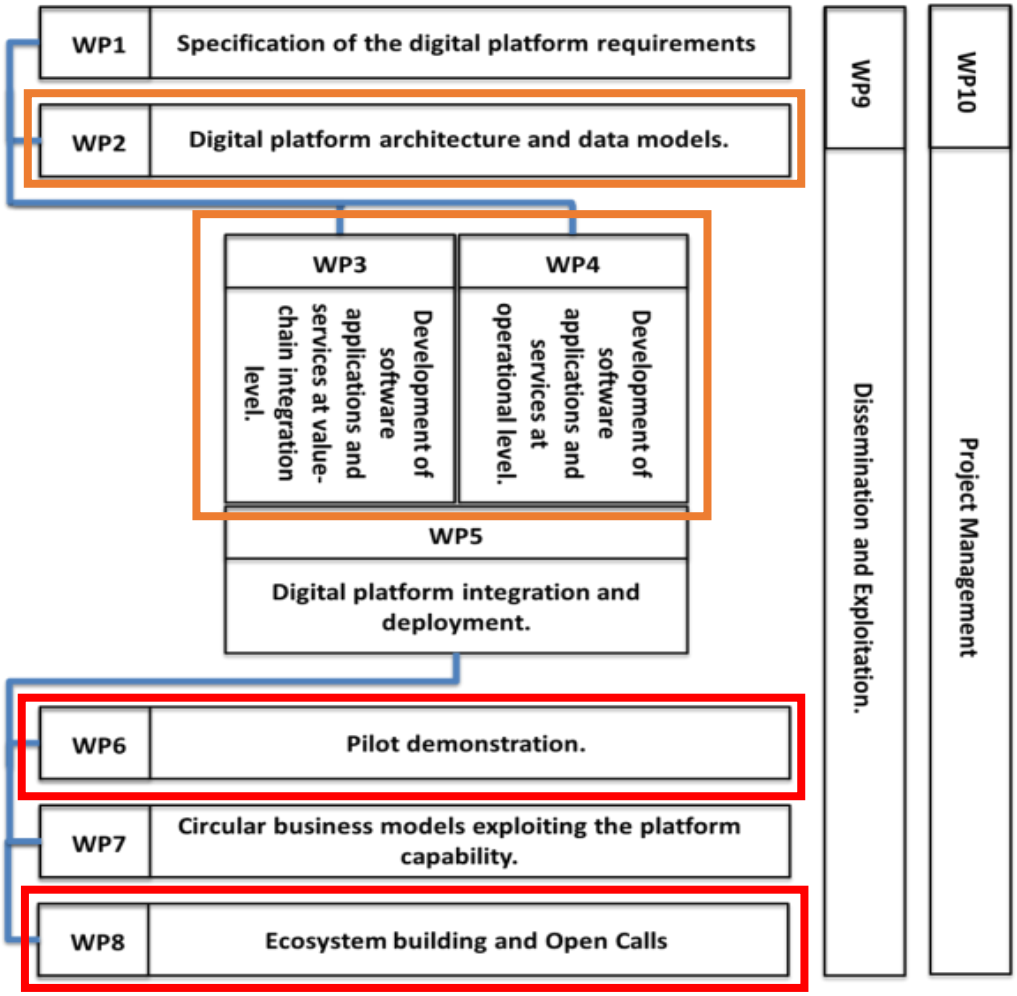
To establish **four new cross-sectorial circular European value-chains** for the remanufacturing and re-use of high added-value components

To leverage on existing platforms and components, still **ensuring scalability, reusability and interoperability**

To support **standardization and legislation**

To demonstrate the economic, social and environmental sustainability of **new circular business models and services** at EU scale

DigiPrime Workplan



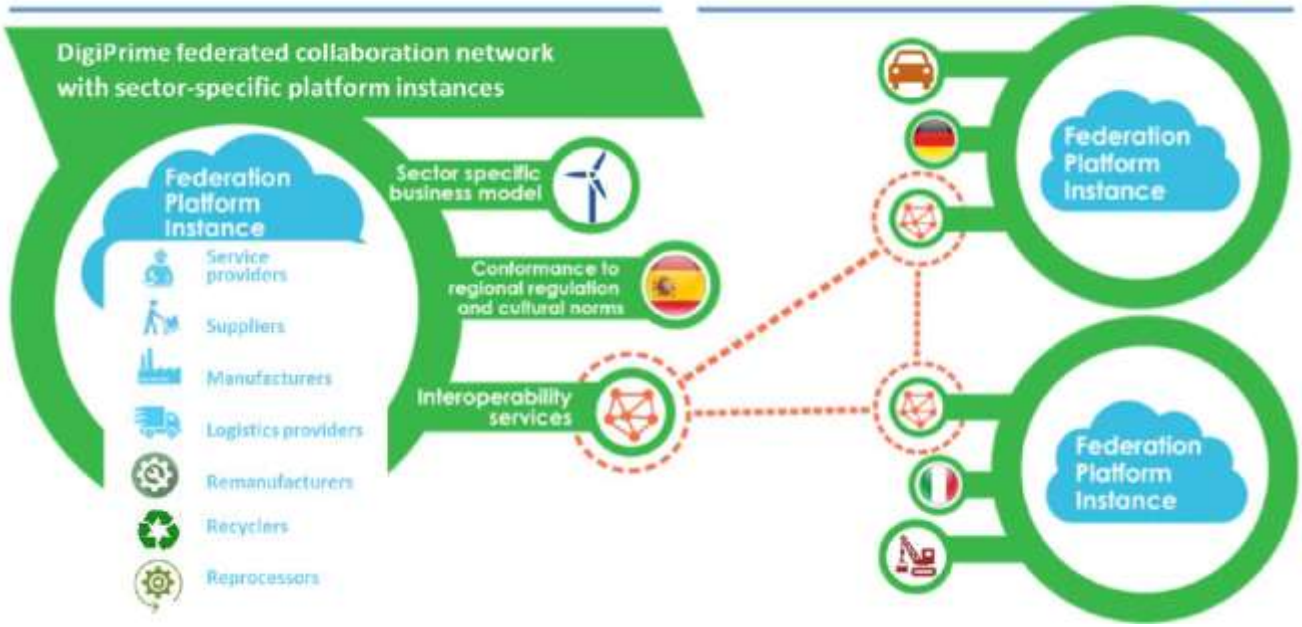
The WP structure reflects a **clear industrial orientation** towards the implementation and the demonstration of project technical solutions (WP6).

	1. Year				2. Year				3. Year				4. Year			
	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV
WP1																
WP2																
WP3																
WP4																
WP5																
WP6																
WP7																
WP8																
WP9																
WP10																

Platform Architecture

WP2	Digital platform architecture and data models.

A **multi-node federation structure** facilitates the sharing of data and the interactions between the different sectorial stakeholders.

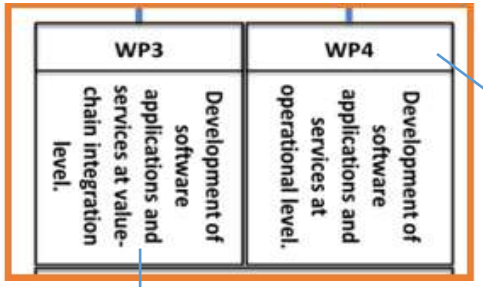


Combination of centralized and de-centralized approaches increase architecture simplicity, trustworthiness and data protection. The latter is obtain through the **Block-chain technology**.

Semantic data infrastructure to manage and standardize the Babel of information coming from heterogeneous nodes

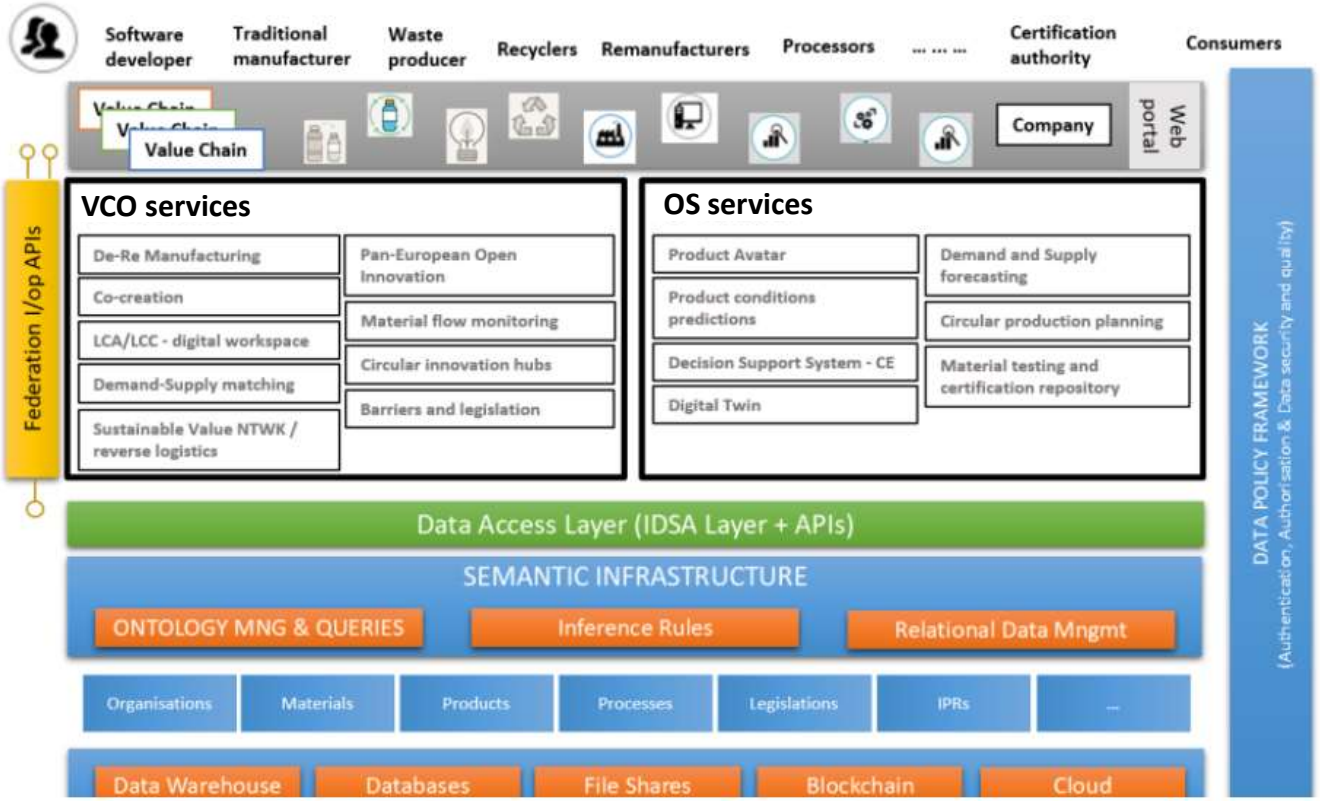
Data Policy Framework to ensure privacy, security, authentication and authorization policies

The DigiPrime Services



Operational Services (OS) are **vertical** services, used by companies internally, mainly to support decision- making aiming at improving the effectiveness and profitability of the circular business processes.

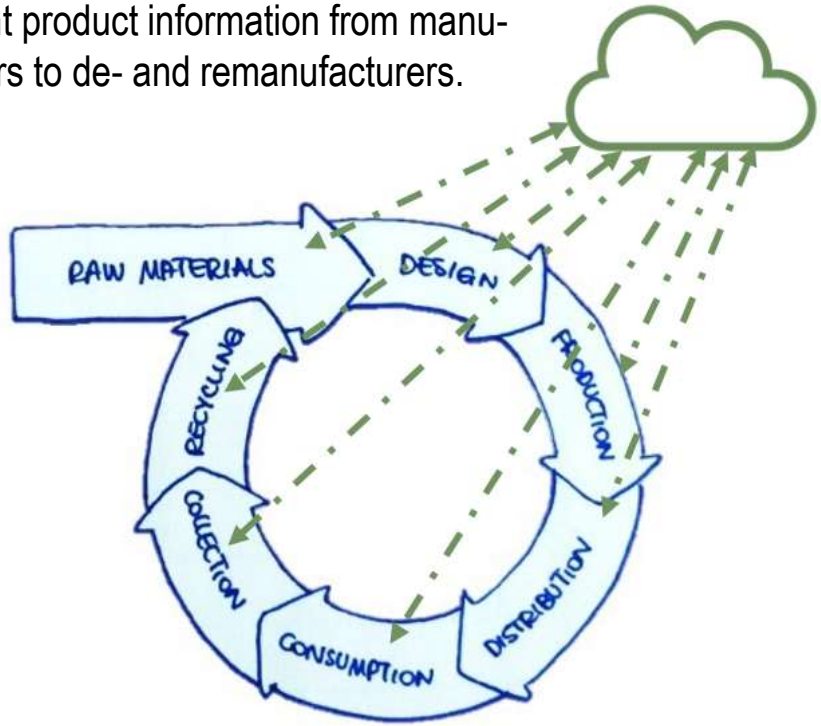
Value-chain oriented services (VCO) are **horizontal** services that can be made accessible to other nodes of the federation, to offer access to information of interest to stakeholders across sectors.

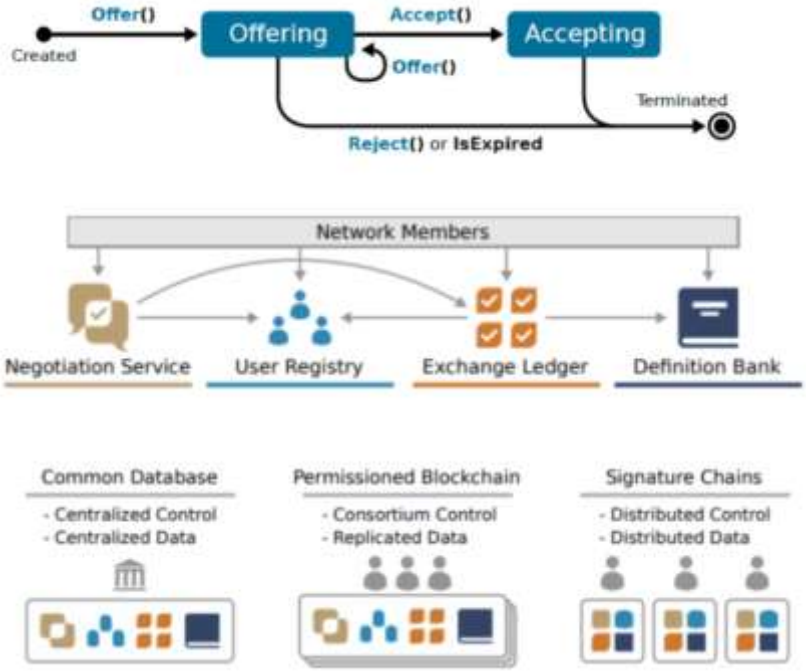


VCO Services: examples

DE- AND REMANUFACTURING DATA MANAGEMENT AND SHARE

Product data and knowledge is not exchanged, leading to unlocked cross-sectorial material re-use opportunities. The service boosts a collaborative approach between stakeholders in the cross-sectorial value-chain based on the transfer of relevant product information from manu-facturers to de- and remanufacturers.





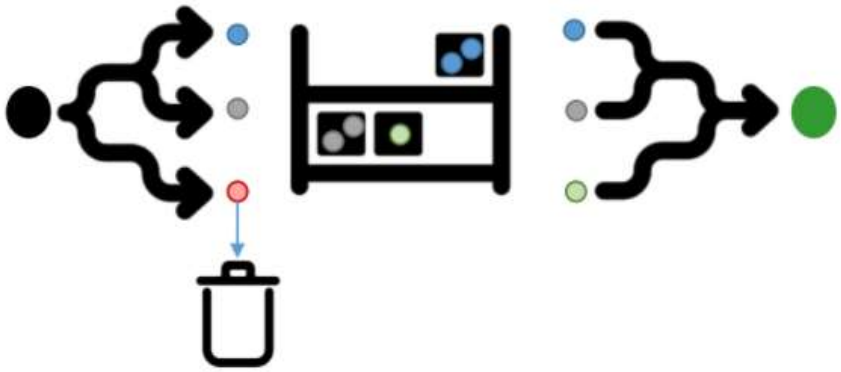
DEMAND-SUPPLY MATCHING TOOL

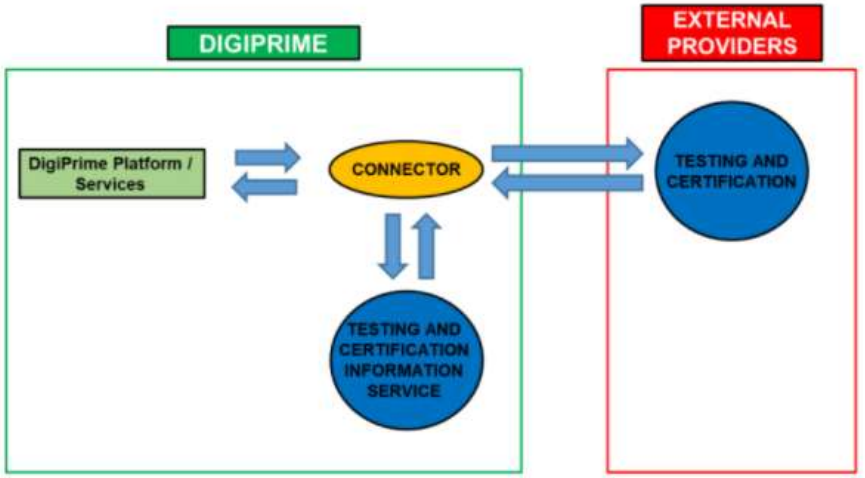
The service provides search criteria on products and support to negotiation and traceability between suppliers of post-use components and de- and remanufacturing actors, involving the whole network even across different value chains expanding exponentially opportunities.

OS Services: examples

CIRCULAR PRODUCTION PLANNING AND CONTROL

The planning service considers the value stream of the production system with the recycling system and the periodic demands, resulting in economic and strategic recommendations for the planning of recycling and product manufacturing. It takes into account typical uncertainties in cyclic material flows (e.g instability in post-use product quantity and quality, demand turbulence).





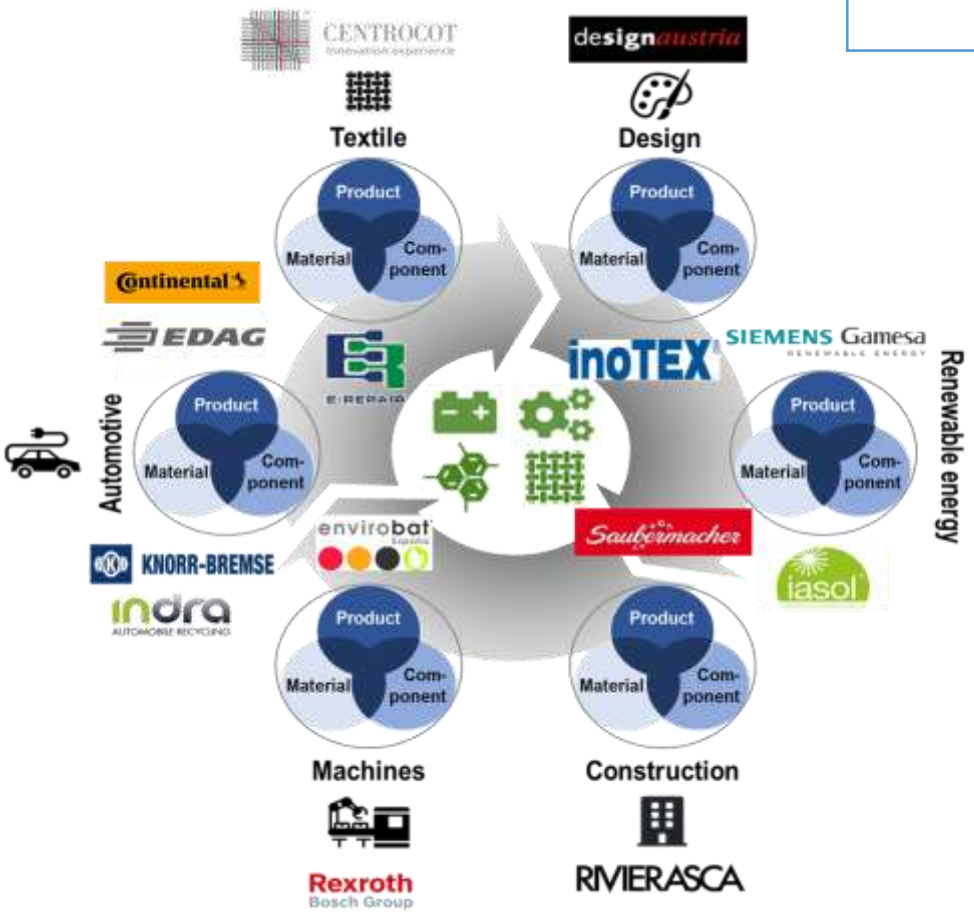
MATERIAL TESTING AND CERTIFICATION

The service facilitates the testing and certification of recycled materials/components in order to support cross-sectorial use under controlled and trustful business relations. It ensures circular technologies are in compliance with various regulations, including process standards, environmental standards, safety standards and expected service standards.

The DigiPrime Pilots (1/2)

WP6	Pilot demonstration.

The platform and the related service applications will be adopted and validated within the six DigiPrime **cross-sectorial pilots**



Four pilots will be dedicated to demonstrating specific innovative circular business-cases connecting six key sectors (e-mobility, renewable energy, textile, design, construction and smart machining systems):

1. BATTERIES
2. MECHATRONICS AND ELECTRONICS
3. COMPOSITES AND TECHNO-POLYMERS
4. TEXTILE PRODUCTS

PILOTS ADDED VALUE

The demos for specific use-cases test:

- The **interoperability** with the company pre-existing ICT infrastructure;
- The continuous **interaction** with the platform modules and services;
- The **generated data** to populate the platform;
- The **industrial feedback** on Digiprime services.

The DigiPrime Pilots (2/2)

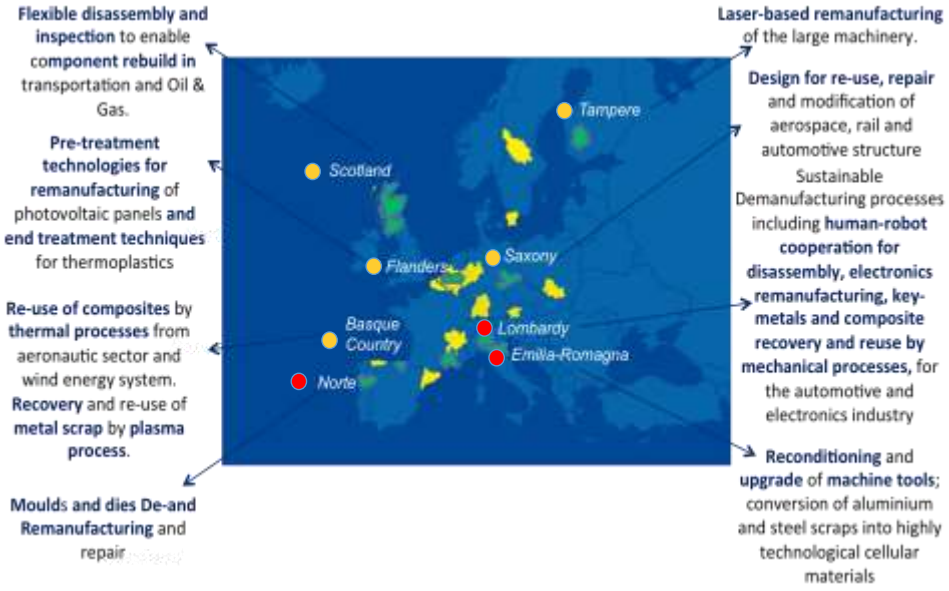
The last two pilots are dedicated to support **strategic initiatives of EU scale**, exploiting the platform for identifying emerging cross-sectorial CE value-chains and for supporting scaling-up and transfer to industry

PILOT 5 will demonstrate the benefits of a new systematic approach for identifying cross-regional, cross-sectorial value chains in Europe, that could upscale into promising business cases to be operationally supported by the DigiPrime platform.

→ SCREEN METHODOLOGY

PILOT 6 will demonstrate the DigiPrime role in supporting the integration and business operation of EU networks of Circular Innovation Hubs integrated pilot plant solutions, needed by industry to validate high-risk investments in circular economy businesses before the industrial implementation.

→ VANGUARD INITIATIVE

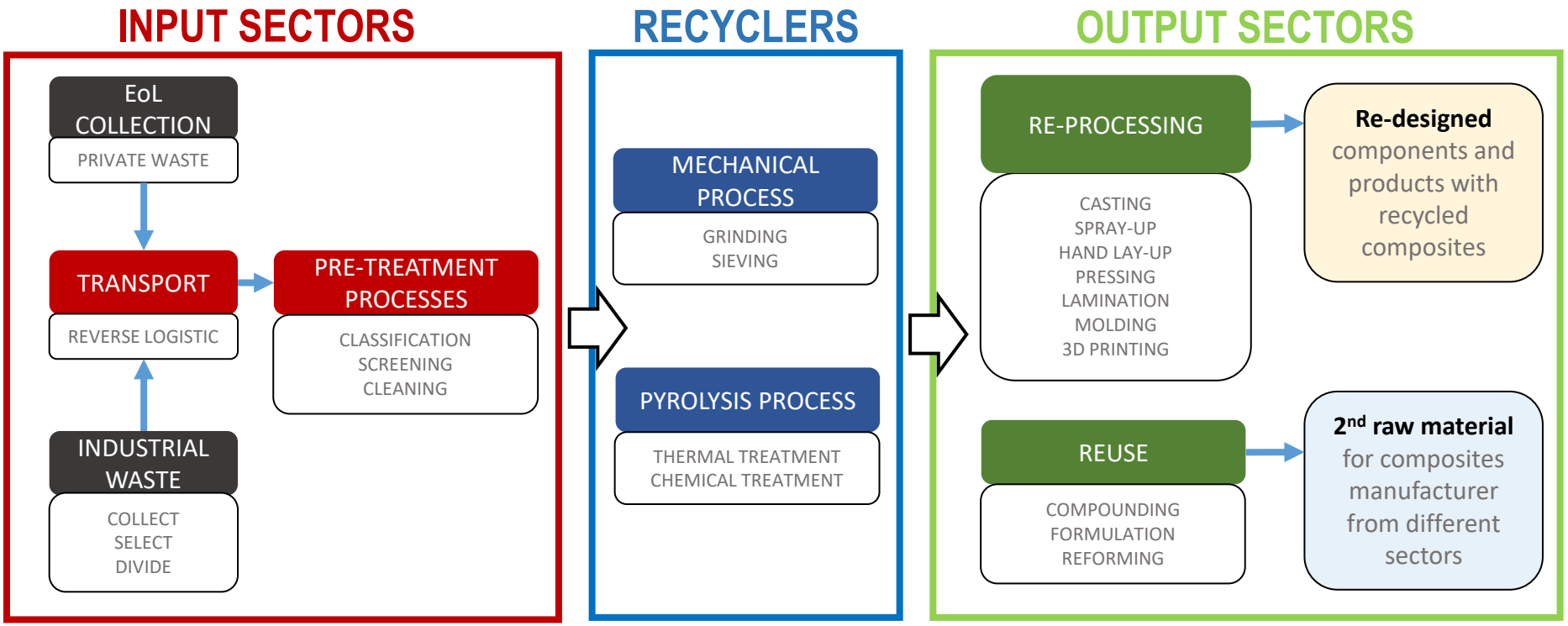


DigiPrime and Construction: Pilot 3

Pilot 3: Composites and Techno-polymers				
Involved sectors: ***automotive, construction, renewable energy, design products***				
Components: ***chassis, clutch pedal, wheel covers, rear panel, seat structure, front-end, leaf spring, roof, dashboard, bumper, fender, wind blades, design products, roof tops***				
Industrial Partners: EDAG, RIV, SGRE, DA, COT, SDAG				
Use-Case	**CE strategy**	**Involved partners**	**Input sectors**	**Output Sectors**
3.1	Recycling	EDAG, RIV, COT, SDAG	Automotive	Construction
3.2	Recycling	EDAG, DA, COT, SDAG	Automotive	Design
3.3	Recycling	EDAG, SDAG, SGRE, COT	Renewable energy	Automotive
3.4	Recycling	RIV, SGRE, COT, SDAG	Renewable energy	Construction
3.5	Recycling	SGRE, DA, SDAG	Renewable energy	Design
3.6	Recycling	RIV, SDAG	Construction	Construction
3.7	Recycling	DA, SDAG	Design	Design
3.8	Recycling	RIV, DA, SDAG	Construction	Design

The composites and techno-polymers pilot is **strongly cross-sectorial**. **Inputs** will come from different sectors as **construction, renewable energy, design products and automotive itself**, while **output** sectors will be **construction and design products** through recycling. Eight use-cases will be demonstrated.

Pilot 3: process chain



The main **CONSTRAINTS** are:

- Insufficient technical and batch uniformity guarantees
- Economically unfeasible activities, such as disassembly, separation and classification
- Technical and industrial limitations of some demanufacturing processes
- Lack of information between stakeholders regarding needs and valorization opportunities

Pilot 3: targets

Digiprime services are expected to facilitate the achievement of the following targets:

- Increase in market penetration of products embedding **recycling materials**,
- Increase in the **supply** of post-use composites,
- Improved **manufacturing** energy consumption and reduced virgin CF usage,
- Improved mechanical and physical **properties**,
- Increase **recycling rate**,
- Increase in **market acceptability** of remanufactured parts from composites.

Pilot 3 services will link **DIFFERENT ACTORS** working in **DIFFERENT SECTORS** in order to enable a synergetic collaboration in the value-chain.

COMPOSITES MANUFACTURER
Raw material producer

DESIGNER
Product conceptualization

WASTE/EOL OWNER
Component/product manufacturers

WASTE MANAGER
Logistic

RECYCLER
Recycling facilities

PUBLIC BODIES & POLICY MAKERS
Legislation

INNOVATION HUBS CE INDUSTRIES
Startups and business communities

Pilot 3: services

Value-chain oriented services (VOS) and *operational services* (OS)

	SERVICES	PILOT 3
VOS	De- and Remanufacturing Data Management and Share	✓
VOS	Co-Creation Environment to Collect and Share Ideas on New Product/Processes	✓
VOS	LCA/LCC Tool Coupled in DigiPrime with a Digital Collaboration Workspace	✓
VOS	Demand-Supply Matching Tool	✓
VOS	Value-Network Configurator	✓
VOS	Pan-European Open-Innovation Suite	✓
VOS	Value Chain Identification	
VOS	Material Flow Monitoring System	✓
VOS	Circular Innovation Hubs Integration Software	
VOS	Support Tool for Barriers and Legislation	✓
OS	Product Avatar Tool	
OS	Product Conditions Prediction	
OS	Decision Support System for CE	✓
OS	Digital Twin	
OS	Demand and Supply Forecasting Tool	✓
OS	Circular Production Planning	✓
OS	Material Testing and Certification	✓

The match-making method is based on the identification of potential business-link between the registered stakeholders, and the auction mechanisms to achieve a market equilibrium between suppliers and demanders.
INPUTS: information about different waste types and actual and expected availability of the requested materials by logistics operators. Requirements for the input recycled materials and input waste materials by composite manufacturers and recyclers respectively.
OUTPUTS: demand and supply match-making for establishing dynamic circular economy networks Additionally, negotiation support, traceability of transactions and contracts definition.

Composite manufacturers and recyclers use the service in order to optimize their production planning and process configurations.
INPUTS: required composite products, target production volumes and resources availability.
OUTPUTS: info on optimal production strategy, scheduling, sequence, etc.

Pilot 3: Use case 3.6-3.8

Recycling	RIV, SDAG	Construction	Construction
Recycling	RIV, DA, SDAG	Construction	Design

BUILDING OWNER/OWNERS

FACADES PANELS
COVERING SHEETS
PULTRUDED PARTS
FRP PIPING

Construction and Maintenance company

DISMANTLING
Materials SORTING

WASTE MANAGER

TRANSPORTATION

RECYCLERS

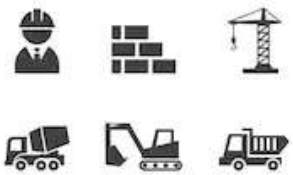
RECYCLING TREATMENT

Pilot 3: Use-cases outputs

Use case 3.1 - 3.2
AUTOMOTIVE

Use case 3.3 - 3.4 – 3.5
WIND BLADES

Use case 3.6 - 3.8
CONSTRUCTION



RECYCLING FACILITIES

Use case 3.2
DESIGN
Interior design

Use case 3.1
CONSTRUCTION
Cable cover

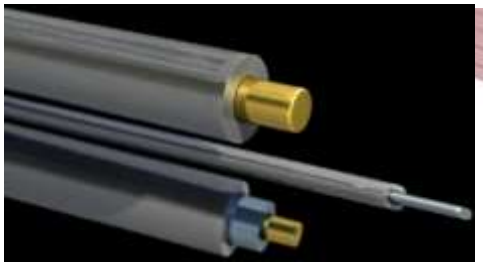
Use case 3.5
DESIGN
Shop furniture

Use case 3.4
CONSTRUCTION
Roof sheets

Use case 3.3
AUTOMOTIVE
Clutch pedal

Use case 3.8
DESIGN
Office furniture

Use case 3.6
CONSTRUCTION
Facade panels



Open Calls: mechanism

WP8	Ecosystem building and Open Calls

The objective of Digiprime Open Calls is the involvement of SMEs as **users and validators** of the project quality and as **contributors** to the offered services, customizing and deploying the developed project solutions.
The competitive Open Call process is aimed at implementing new Pilots and expand the marketplace and service lists.

2M€ CALLS

SMEs
SMEs + RTO

2 MONTHS CALLS

2022-2023

Open Call Launch

- Guide for Applicants
- Guide for Evaluators
- Dedicated webinars
- Helpdesk service

Proposals Evaluation

- Experts' evaluation on INNOVATION, IMPACT and IMPLEMENTATION criteria
- Proposals ranking

Assignment

- Contract signature
- Platform training with mentors

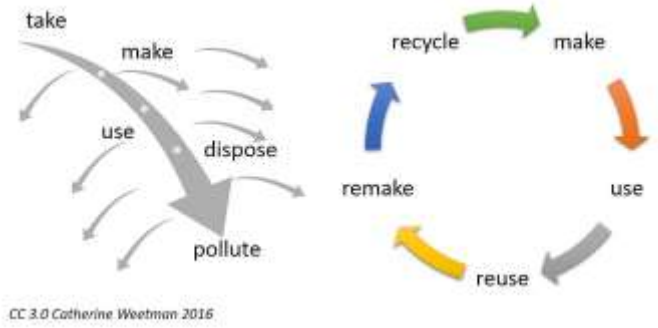
Open Calls: budget

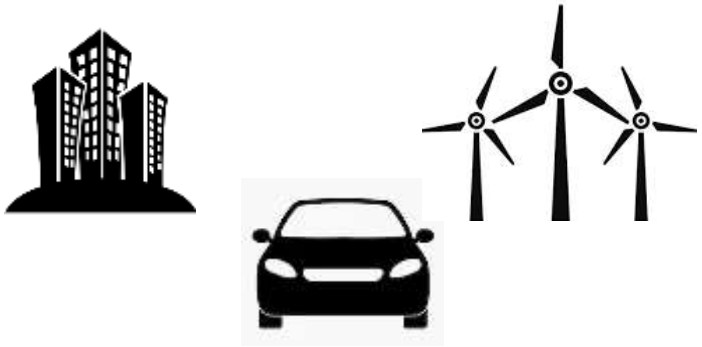
The total amount of 2M€ of the Open Calls will be distributed among **12-17 participants**, as SMEs or small consortium, and will be available also for non EU countries.

TYPE OF CALL	OBJECTIVES	INDICATIVE DATES		BUDGET	# THIRD-PARTIES
TYPE A Development of new operational services, focusing on implementation of new requirements and functionalities defined in the Impact Framework	• Validate Digiprime expandability • Complement existing Pilots with added-value features and functionalities • Expand DigiPrime solutions portfolio in the market platform	Launch: M28 APR 2022	Closure: M30 JUN 2022	TOT: 1M€ (100-150K)	7-10
TYPE B Development of Pilots in new sectors using the DigiPrime platform, models and open APIs.	• Validate Digiprime concept, platform and APIs in area beyond the Pilots of Consortium partners • Demonstrate end-to-end Autonomous quality in a cross-border pilot • Attract SME Manufacturers and Solution Providers to the project	Launch: M35 NOV 2022	Closure: M37 JAN 2023	TOT: 1M€ (150-200K)	5-7

Conclusions

The overall ambition of DigiPrime project is to boost the systematic development and implementation of **cross-sectorial circular value-chains in Europe** by exploiting the platform capabilities and the related services, thus solving the current information asymmetry bounding the transition to circular business.





The demonstration of DigiPrime services and capabilities will be performed through **6 Pilots**, whose Pilot 3 is dedicated to composites and technopolymers coming from automotive, renewable energy, design and construction sectors.

The launch of **Open Calls** will allow to demonstrate and validate DigiPrime Platform functionalities and to extend developed services and solutions to other sectors and pilots.

DigiPrime

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THANK YOU FOR THE ATTENTION

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POLITECNICO DI MILANO

STIIMA
Sistemi e Tecnologie Industriali Intelligenti per il Manifatturiero Avanzato
Consiglio Nazionale delle Ricerche

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