PROJECT DELIVERABLE REPORT

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D5.1 Use Case Demonstration Plan (rev. 2.0)

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Participating partners	Brunel University (BUL), Technovative Solutions (TVS), TPI Composites (TPI), ALMAS Partecipazioni Industriali S.P.A. (ADL), Centro Ricerche Fiat Scpa (CRF), Precision Varionic International Limited (PVI), Zorlu Enerji Elektrik Uretim As (ZOREN), Univerzita of Pardubice (UPCE), Vorarlberg University of Applied Sciences (FHV)
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Dissemination Level		
PU	Public	✓
PP	Restricted to other programme participants (including the Commission services)	
CO	Confidential, only for members of the consortium (including the Commission services)	
SEN	Sensitive, limited under the conditions of the Grant Agreement	

Contents

Executive Summary

This report presents the WP5 overall use case planning within the JIDEP project. A use-case demonstration plan, in the context of JIDEP, is a document that outlines the steps and procedures for demonstrating the software's capabilities to potential users or customers. It includes information on the purpose of the demonstration, the specific use cases to be demonstrated, the audience for the demonstration, the equipment and resources needed, and the schedule for the demonstration. The plan also includes any preparation that needs to be done prior to the demonstration, such as setting up test data or configuring the software to meet the needs of the audience. Normally, it includes the roles and responsibilities of the individuals involved in the demonstration, however, these individuals are being represented by the consortium members and have already been given specific roles while structuring WP5. Finally, the use-case demonstration plan anticipates follow-up actions that need to be taken after the demonstration is complete.

This document aims to provide an overview of the main planned activities, a description of certain project management-related topics and high-level specifications of the technologies involved in the WP5 demonstration. The first part of this document includes the Introduction, project background, detailed Use-case demonstration roadmap and Use-case end-user expectation list. The second section provides details about each of the three use cases within the scope of WP5. It includes a brief description of each use case, its objectives, scenarios and collaboration schemes.

The main challenge of JIDEP use-case test plan implementation is the duality of the solution. JIDEP is a software solution, however, it relies explicitly upon industrial data gathering which requires real-time industrial micro-projects to be implemented. Testing is further complicated due to the presence of the 3 distinct use cases (to validate data exchange within different industries). Finally, software testing must also take place. So, use-case planning must emphasize 2 different layers of planning - the software layer and the use-case layer. Although these are sequentially bound, the same end-users will be mandated to verify the solution as software testers as well as use-case validators.

1. Introduction

Work Package 5 is divided into 7 main objectives. These objectives serve as fundamental tasks that must be accomplished in order to facilitate effective collaboration among the diverse stakeholders of the value chain within the consortium. These objectives are a crucial component of the core functionality of the JIDEP platform:

i. Leverage the JIDEP solution in a series of use cases for realizing the demonstration methodology;
ii. Organize JIDEP use-case working groups;
iii. Prepare demonstration scenarios which are aligned with appropriate states of JIDEP development;
iv. Validate use cases in a series of demonstrations;
v. Consolidate use-case outcomes for evaluating the final impacts;
vi. Ensure regular interfacing (feedback) to WP4;
vii. Ensure regular interfacing (dissemination and exploitation material) to WP6 and WP7.

Under task T5.1, planning and organizational activities were executed. A task leader organized three working groups, each corresponding to one of the three identified use cases. The members of each working group evaluated potential demonstration scenarios and anticipated outcomes of the JIDEP platform. The consortium partners have now fully established a development roadmap to achieve demonstration results, which is aligned with the plans for the development of work packages 3 and 4.

2. Overall Approach

Because it is impossible to define a detailed software test plan without software graphics, data, installation, implementation architecture and design available, the use-case demonstration test plan will come in two versions – v1.0 – initial version and v2.0 – final version.

The initial version focuses on the timelines of the testing and:

1) Identifies test leads (the Who);
2) Explains how the tests will be performed as well as their pre-requisites (the How);
3) Articulates the test scope and categorizes the test modules (the What);
4) Sets time boundaries for the test results (the When);

The initial version will capture the time-bound testing roadmap as a series of generic steps. Then, once the software development begins, the end-users will participate in regular testing and feedback collection. The final use-case demonstration plan will be released together with V1.0 of the software, confirming the end users are happy with the product and are good to proceed with its real-life validation.

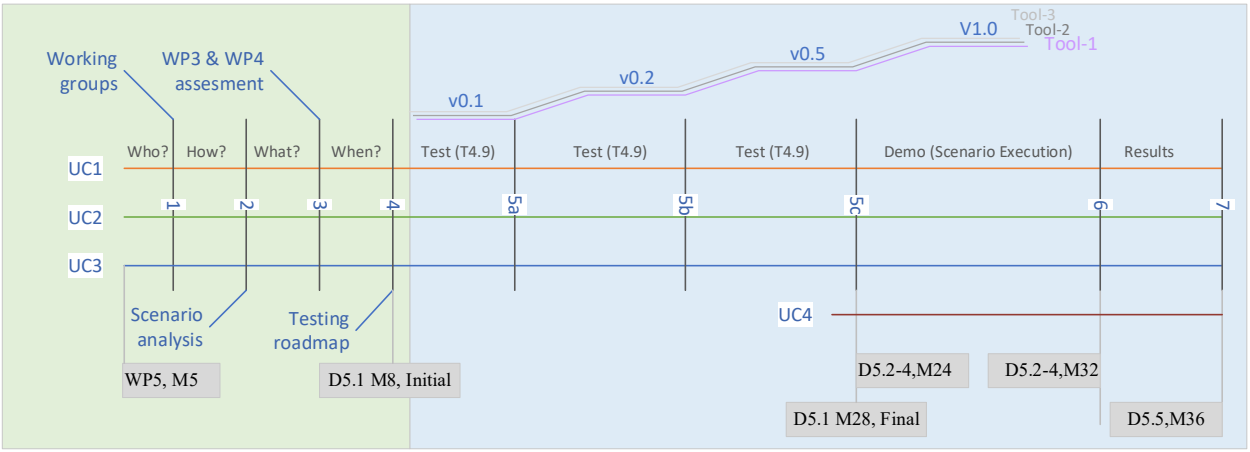

Figure 1 JIDEP use-case demonstration progress.

2.1 Working Groups (End User Test Participants)

The project distinguishes 17-20 end user testers. This number will vary slightly because certain people might leave an organization, while the onboarding of new employees might have delays, or the position might get terminated entirely. Altogether, these primary testers will represent 6 industrial partners: ZOREN, TPI, ADS, ADL, CRF, and PVI. Accordingly, partners are grouped according to the use-case demonstration scenario. Each organization nominates a testing team leader who will be the point of contact, responsible for arranging the testers from their company, and will pro-actively participate in the testing activities, reporting, training sessions and final demonstration. ADS is the common participant in testing activities of all 3 use cases, therefore it is leading the entire work package and T5.1. Likewise, Table 4 represents external participants from other partners, how, although do not represent the industry, are active stakeholders in e.g. communication and exploitation activities (BUL), are research performers (CAM), coordinate the project (FHV) or lead the software development (TVS).

Table 1 Use Case-1 testing participants and their roles (1st working group)

Organisation	Person / Contact	Role
ZOREN	Zeynep.Korkmaz@zorlu.com	Zeynep Korkmaz (test lead)
ZOREN	ural.halacoglu@zorlu.com	(participant)
ZOREN	mert.ozhan@zorlu.com	(participant)
TPI	itopuz@tpicomposites.com	(participant)
TPI	u.tiric@tpicomposites.com	(participant)
TPI	baydogan@tpicomposites.com	Berkay Aydoğan (Lead)
TPI	SYildiz@tpicomposites.com	(participant)
TPI	mkamay@tpicomposites.com	(participant)
ADS	donatas.g@adscensus.tech	Donatas Gendvilas (Lead)
ADS	saule.k@adscensus.tech	(participant)

Table 2 Use Case-2 testing participants and their roles (2nd working group)

Organisation	Person / Contact	Role
ADL	nicoletta.lalli@adlergroup.it	(participant)
ADL	laura.dicesare@adlergroup.it	Laura Dicesare (Lead)
ADL	roberta.caldarelli@adlergroup.it	(participant)

ADL	lino.mondino@adlergroup.it	(participant)
CRF	andrea.pipino@crf.it	Andrea Pipino (Lead)
CRF	alessandra.bugaudi@crf.it	(participant)
ADS	donatas.g@adscensus.tech	Donatas Gendvilas (Lead)
ADS	saule.k@adscensus.tech	(participant)

Table 3 Use Case-3 testing participants and their roles (3rd working group)

Organisation	Person / Contact	Role
PVI	oliverbuchan@pvi.co.uk	Oliver Buchan (Lead)
UPCE (not industry)	Tomas.Syrovy@upce.cz	Tomas Syvory (Lead)
ADS	donatas.g@adscensus.tech	Donatas Gendvilas (Lead)
ADS	saule.k@adscensus.tech	(participant)

Table 4 Other testing participants and their roles

Organisation	Person / Contact	Role
BUL	Nithin.AmirthJayasree@brunel.ac.uk	Spectator, independent participant
BUL	Faranak.Bahrami@brunel.ac.uk	Spectator, independent participant
CAM	msff2@cam.ac.uk	Spectator, independent participant
FHV	florian.maurer@fhv.at	Spectator, independent participant
FHV	jens.schumacher@fhv.at	Spectator, independent participant
TVS	arman@technovativesolutions.co.uk	Test co-lead and organizer
TVS	rasel@technovativesolutions.co.uk	Test co-lead and organizer

2.2 Use Case Demonstration Methodology

The main goal of use case demonstrations is to employ JIDEP platform for realizing real-life industrial data exchange-driven collaboration.

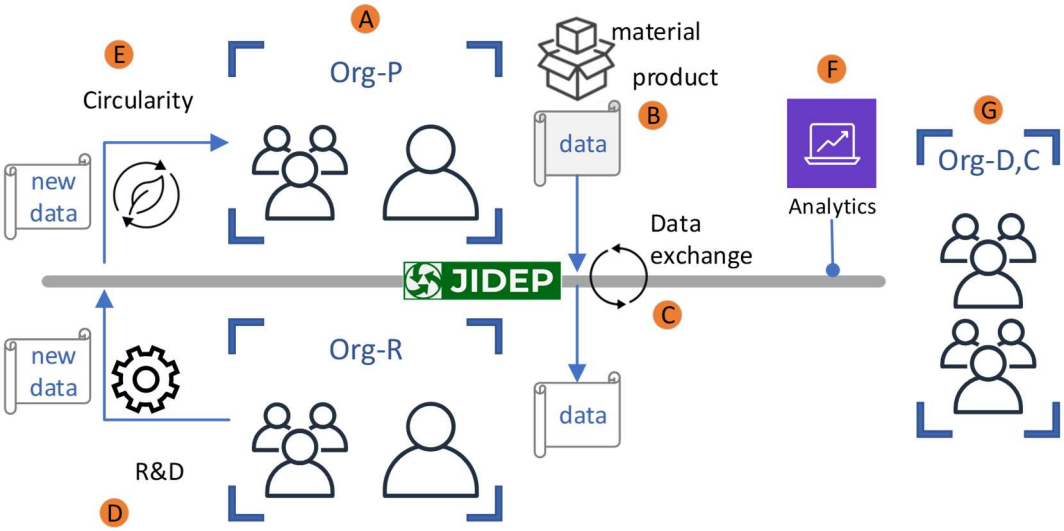

Figure 2 JIDEP use case demonstration overall approach.

For this reason, each use-case demonstration includes participants (c.f., *Figure 2*) who are mutually dependent on data exchange. Henceforth, each use-case demonstration anticipates the following steps:

A) An information providing organization (Org-P) shares information related to a real physical product it produces (or the product which it has been producing that has reached its EOL). This information must be uploaded into the JIDEP platform's Material Passport module. Org-P grants access to its proprietary data for Org-R (receiving organisation).
B) Product data includes minimum required material information (§2.7), that is sufficient to perform ontology analysis to retrieve, classify and map material properties.
C) The receiving organization (Org-R) leverages JIDEP's secure data exchange infrastructure. It analyses the received product and material information.
D) The receiving organization (Org-R) begins physical R&D activities related to the particular use case scenario. It thus becomes the creator of new data, that relates to e.g. recycled raw material properties, circularity cost, and environmental impact cost. It also becomes a producer of secondary materials and products.
E) The initial information providing organization (Org-P) becomes beneficiary of information, that enables it to meet appropriate analytical or circularity targets.
F) Activities D and E are not straightforward. All information is uploaded and processed within JIDEP, where complementary analytical packages are being employed. Each of these packages must be tested and validated by all actors, across all 3 use cases. The list of analytical modules is provided in *Table* 6.
G) These analytical packages are delivered by the delivering organisation (Org-D) – software services provided. Also, number of contributing organizations (Org-C) are pro-actively engaged in the development and validation process because they might be providers of certain algorithms (ontology), and might be engaged in communication, dissemination and exploitation of project results.

Although it's a high-level plan. The thorough information exchange activities, specific objectives of each use-case demonstration and means of validation are listed in (§3).

2.3 JIDEP platform Validation Planning

End-user inclusion is a very important step in validating JIDEP's functions (Figure 3), as per initially specified end-user requirements (D1.2).

Figure 3 JIDEP platform validation planning

However, this is only anticipated for the last, final demonstration. Other activities, such as exploratory testing, bug reporting and overall user satisfaction are due to be carried out by T4.9 – "Systematic validation of JIDEP by end-users" is foreseen. Nevertheless, during the preparatory activities for the demonstrations, as well as during the demonstrations themselves, there will be many occasions, when users might observe system malfunction, notice gaps in the design of a graphical interface, face issues with accessing the system, data uploads and many more. For that reason, use-case validation anticipates interface into T4.9, via 3 main periodic activities:

1) Software testing by carrying out real R&D work:
    a. Submission of material passport data
    b. Generation of material QR-codes
    c. Capture of process performance parameters from laboratory
2) Software testing and feedback (F-phase) – to avoid unnecessary "bombardment" of WP5 and WP4 task leads, a nominated use-case test lead from each organization will collect inputs from his team in a month-long window
3) Quarterly software test review and planning meetings (M-phase) – where use-case test leads will share collected information related to exploratory and functional testing and will hand it over to the WP4 lead (TVS) for implementation

2.4 Joint use-case demonstration schedule

The main idea behind WP5 activities during the software development life-cycle is to provide regular testing (T) within T4.9 and collect feedback (F) from each industrial end-user. Then, ensure that end-users and software developers communicate with each other by performing quarterly progress meetings (M).

Once JIDEP has matured to v1.0, the final pre-demonstration meeting will take place, where a final use-case demonstration plan will be presented. A small contingency window is left for the end-users to test JIDEP v1.0 (as the integration still goes on under T4.7). Then, use-case demonstration begins (D), ensuring at least one month is available for executing each small physical activity (incl. the shipping of e.g. material samples to the receiving partner).

Table 5 Joint use-case demonstration plan Gantt chart indicating WP4 and WP5 work group roadmap.

		2022							2023											2024											2025				
	Calendar Mont \ Project Month	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5
WP4	**Domain Specific Tool Development and Platform Integration**	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12
T4.1	Development of Environment analysis tools														0.1					0.2				0.5			1.0									
T4.2	Development of Material Passport												0.1					0.2			0.5					1.0									
T4.3	Development of Circular Analytic tool														0.1					0.2				0.5			1.0									
T4.4	Development of the Collaborative Space												0.1					0.2			0.5					1.0									
T4.5	Development of analytical tool for composite material structures																																				
T 4.6	Development of PCB Analytic Tool																																				
T4.7	JIDEP Platform Integration and Deployment																																				
T4.8	Technical Verification and Testing																																				
T4.9	Systematic validation of JIDEP by end-users													T		T		T		T		T		T			T									
WP5	**Industrial Application and Validation**																																				
T5.1	Design and planning of JIDEP demonstrations														M		M		M		M			M			D									
T5.2	Sustainable wind energy lifecycle pilot													F		F		F		F		F		F			D					D				
T5.3	Sustainable automotive lifecycle pilot													F		F		F		F		F		F			D					D				
T5.4	Sustainable industrial electronics lifecycle pilot													F		F		F		F		F		F			D					D				
T5.5	Incremental use-case analysis and final impact assessment																																				D

Legend	
Software version	0.1 … 1.0
Software testing feedback phase	F
Quarterly test review and planning meeting	M
Software testing phase	T

Table 6 JIDEP implemented tools testing, end-user feedback collection and review meetings roadmap.

Tested component	**Test start date (T)**	**Feedback collection period (F)**	**Review meeting date (M)**
Env. Impact analysis tool - v0.1	2023 08	2023 08	2023 09
Env. Impact analysis tool - v0.2	2023 12	2023 12	2024 01
Env. Impact analysis tool - v0.5	2024 04	2024 04	2024 05
Env. Impact analysis tool - v1.0	2024 06		
Material passport – v0.1	2023 06	2023 06	2023 07
Material passport – v0.2	2023 10	2023 10	2023 11
Material passport – v0.5	2024 02	2024 02	2024 03
Material passport – v1.0	2024 06		
Circular analytic tool - v0.1	2023 08	2023 08	2023 09
Circular analytic tool - v0.2	2023 12	2023 12	2024 01

Circular analytic tool - v0.5	2024 02	2024 04	2024 05
Circular analytic tool – v1.0	2024 06		
Collaborative space - v0.1	2023 06	2023 06	2023 07
Collaborative space - v0.2	2023 10	2023 10	2023 11
Collaborative space - v0.5	2024 02	2024 02	2024 03
Collaborative space – v1.0	2024 06		

2.5 Use-Case End-User Expectation

End user expectations for a collaborative space and material passport include:

- **Ease of use:** Technical recycling projects involve a wide range of stakeholders, including engineers, technicians, and managers. These stakeholders may have varying levels of technical expertise and experience, so the collaborative space should be easy to use and navigate, with clear instructions and a user-friendly interface. The material passport should be easy to use and navigate, with clear instructions and a user-friendly interface.
- **Accessibility:** This technical recycling project will be accessing large amounts of data and complex systems. Therefore, the collaborative space should be accessible from any device, at any time, and from any location to allow stakeholders to access and analyze data, collaborate and communicate effectively. The material passport should be accessible from any device, at any time, and from any location, to allow stakeholders to access and track the materials' information.
- **Collaboration and communication:** Technical recycling projects often involve multiple teams and stakeholders working together. Therefore, the collaborative space should provide tools and resources for real-time collaboration, communication and document sharing. The material passport should allow for real-time collaboration and communication between stakeholders, such as suppliers, manufacturers, and recyclers.
- **Traceability:** The material passport should enable tracking of materials' properties and performance throughout their lifecycle, providing traceability from the origin to the end of life.
- **Data management and analysis:** Technical recycling projects involve the collection, analysis and management of data, thus the collaborative space should provide robust data management and analysis capabilities.
- **Security and privacy:** JIDEP project will involve sensitive data and information that should be secure and protected from unauthorized access. Therefore, the collaborative space should provide robust security and privacy features, such as access controls and encryption.
- **Customization:** JIDEP platform users may have different requirements and workflows, thus the collaborative space should be customizable to meet the specific needs of each project and each stakeholder.
- **Compliance:** The material passport should meet relevant regulations and standards for tracking materials' information, such as circular economy regulations.

- **Integration:** The material passport should integrate with other tools and systems, such as supply chain management software, to streamline workflows and improve efficiency.
- **Support:** JIDEP users may have complex workflows and unexpected work interruptions, therefore, the collaborative space should have a dedicated support team to assist stakeholders with any technical issues or questions that may arise.

It's important to understand the end-user expectations and tailor the collaborative space accordingly. It's also important to gather feedback from end-users regularly and make necessary changes to meet their expectations.

2.6 Pre-Requisites for the Testing

Before the software testing can begin, series of preparatory actions must be taken, i.e.:

1. **Software requirements and specifications** - detailed description of what the software is expected to do:
    a. Initial requirements specification document already (D2.1) **complete;**
    b. Final requirements specification document (D2.1) **due by 2023 06**.
2. **Test environment setup** – a physical or virtual environment where the software is tested:
    a. Delivered by WP4 **due by 2023 05.**
3. **Test cases and test plan** - a set of conditions or steps to be followed to test the software, and a plan outlining the approach to testing:
    a. Software test cases will be implemented in the final version of this document due **by 2025 05.**
4. **Test data preparation** - preparation of necessary data to be used during testing:
    a. Early data analytics tools (algorithms) to be included in WP4 deliverables **by 2023 06;**
    b. Initial data templates to be included in the final version of this document **due by 2025 05.**
5. **Test tools and resources** - technical resources and tools required for testing, such as software testing tools and hardware resources:
    a. Software hosting environment to be made available **by 2023 06.**
6. **Defined testing scope** – clear definition of what will be tested and what will not be tested:
    a. Use case testing plan already included in the initial version of this document;
    b. Software validation questionnaires to be included in the final version of this document **by 2025 05.**
7. **Appropriate permissions and access** - ensuring that all necessary permissions and access have been granted to individuals involved in the testing process:

Permissions for the test users granted **by 2023 06.**

2.7 Dataset Scope Used for Data Exchange During Preliminary and Final Demonstrations

Each industrial partner is required to ensure minimal data quality and quantity compliance, which must cover physical, temporal, thermal, biological, and compositional properties. The following properties of products and components should be included in their material (product) passports:

1. **Identification Properties**
    a. Name
    b. Level (It can be 1, 2, 3, etc. For example, while providing input about monocoque, which can be represented as a product, the user will assign 1, but for cross beam 1RH, which is a component of monocoque, the user will assign 2)
    c. Part of (A component can be part of another product/component. For example, cross beam 1RH is part of monocoque)
    d. Trade name
    e. Brand name
    f. Manufacturer
    g. Manufacturer name
    h. Registration number
    i. Registration country
    j. GTIN
    k. EAN
    l. Functionality
    m. Automatic tracking/scanning
    n. Image
    o. URL

2. **Physical Properties**
    a. Density [g/cm-3]
    b. Dimension
    c. Height [cm]
    d. Width [cm]
    e. Length [cm]
    f. Resistance
    g. Compressive strength [Pa]
    h. Shear strength [Pa]
    i. Tensile strength [Pa]
    j. Rigidity
    k. Shear modulus [Pa]
    l. Young's modulus [Pa]
    m. Mass [g]

3. **Thermal Properties**
    a. Heat transfer coefficient
    b. Thermal conductivity [W/(m-K)]

4. **Temporal Properties**
    a. Expected lifetime [y]
    b. Service life [y]

5. **Biological Properties a. Biodegradability**
    a. Decomposability
    b. Compositional Properties
    c. Chemical composition
    d. Ingredient [g]
    e. Recycled content [g]

Considering the aforementioned data types and categories, use-case partners are expected to provide the following datasets during the demonstration:

Table 7 Use-Case-1 data exchange

Organisation	Material\Product properties	Data Entries
ZOREN	Wind-turbine blade	Product passport
TPI	Wind-turbine blade	Material passport
ADS	Recycled glass fiber	Material passport

Table 8 Use-Case-2 data exchange

Organisation	Material\Product properties	Data Entries
CRF	Composite car chassis beam	Product passport
ADL	Composite car chassis beam	Material passport
ADS	Recycled carbon fiber	Material passport

Table 9 Use-Case-2 data exchange

Organisation	Material\Product properties	Data Entries
PVI	WEEE PCB Board	Product passport
ADS	Recycled glass fiber	Material passport

3. Use-case analysis and planning

This section presents the approach toward the use case analysis and planning

3.1 Detailed Analysis and Planning of the Wind Turbine Lifecycle use case

The use case examines how the advanced recycling methods provided by the JIDEP platform, such as the collaborative space, material passport, circularity calculator, and environmental analysis tools, can effectively address the technical and regulatory challenges associated with recycling used wind turbine blades. As the first generation of wind turbines installed in the 1990s reaches the end of their life, it is estimated that 5,700 such turbines will be replaced in Europe by 2030. These blades, each weighing up to 10 tons and measuring 40 meters in length, pose significant challenges for mechanical recycling. The potential waste generated by these blades could equate to 0.015% of all current municipal solid waste sent to landfills by 2050. The use case aims to simulate a real-world scenario and present new tools of JIDEP to address this emerging issue and meet regulations and the EU's green direction. If successful, this use case serves as an example of how multiple market members can collaborate to achieve difficult goals and benefit from it on a specialized digital platform.

3.1.1 Objectives

i. Demonstrate the feasibility of JIDEP's collaborative spaces;
ii. Demonstrate the capability of JIDEP's material passport;
iii. Demonstrate the capability of JIDEP's circularity calculator;
iv. Demonstrate the capability of JIDEP's environmental analytical tool.

3.1.2 Demonstration Plan

With the help of the collaborative spaces of JIDEP, ADS will be informed about the availability of EOL wind turbine blades from ZOREN. ADS will benefit from JIDEP's material passport to determine the chemical properties of turbine blades. ADS will purchase the available turbine blades and will disintegrate those thus extracting raw materials. It will then advertise within the collaborative spaces about the availability of high quantities of cheap glass fibers. TPI, also a subscriber within collaborative spaces, will receive a notification. TPI will purchase available glass fibers from ADS and will produce new blades. ZOREN will purchase these new blades. Also, ADS and TPI will proceed with collaborative research under the collaborative spaces, to study the inclusion of thermoplastics into the composite fabrication, engaging BUL, an R&D partner, who will analyze feasibility and circularity indexes such as recyclability, durability, and reusability as well as other circularity indexes using the circularity calculator. Finally, ZOREN will re-evaluate the environmental impact based on circularity options created by the environment analytical tool from the JIDEP platform (*Figure 4*).

3.1.3 Partner collaboration structure and timing

Step	Demonstration activity	Activity start date
1	Extraction 2 m^2 wind turbine blade composite fragment (the fragment) (ZOREN)	2024 05
2	Chemical disintegration of the fragment (ADS)	2024 06
3	Re-fabrication of a new 2m^2 composite fragment using recycled fibers (TPI);	2024 07
4	Fabrication of a new 2m^2 composite fragment using thermoplastic bonding (TPI);	2024 08
5	Efficient disintegration of a new, known-structure fragment (ADS);	2024 09
6	Calculation of feasibility indexes (BUL);	2024 10
7	Environmental impact analysis (ZOREN)	2024 11

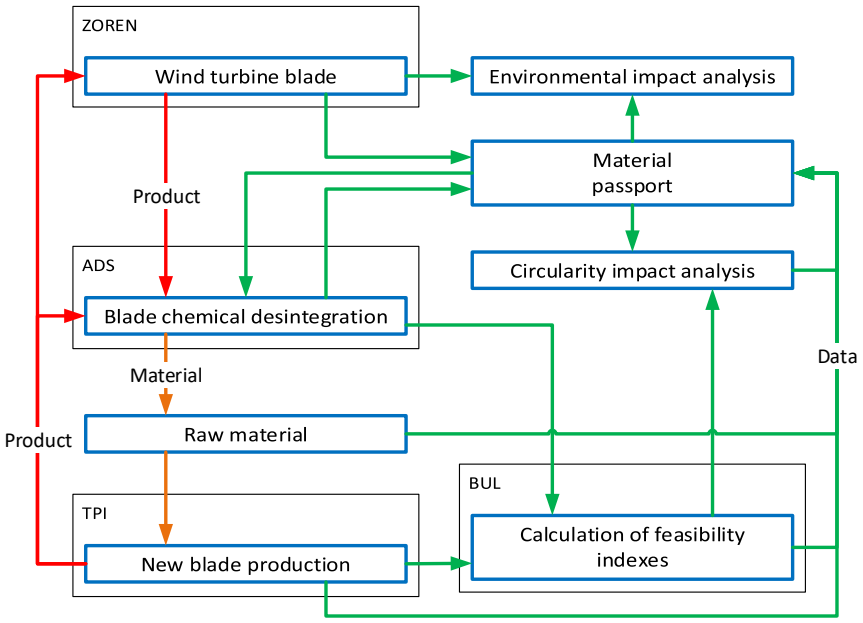

Figure 4 Partner collaboration map representing material and information movement in JIDEP platform

3.2 Detailed Analysis and Planning of the Automobile Lifecycle use case

The Automobile Lifecycle Use Case is a study of the information pipelines and processes related to the end-of-life management of vehicles, specifically with regard to the use of carbon fiber reinforced plastic (CFRP) in their construction. The increasing utilization of CFRP in the automotive industry is projected to reach 9,800 tons by 2030. In compliance with the European Union's End-of-Life Vehicle Directive, 85% of the weight of an end-of-life vehicle must be recycled or reused. However, the high energy consumption required for recycling CFRP waste, at 183-286 MJ/kg, which is 10 times higher than that of glass fiber, and the lack of effective methods and tools for recycling CFRP pose challenges for the industry in meeting these regulations. The JIDEP platform aims to address these challenges through the development of new technologies and regulations to support the efficient and cost-effective recycling of CFRP in end-of-life vehicles.

3.2.1 Objectives

i. Demonstrate the feasibility of JIDEP's collaborative spaces;
ii. Demonstrate the capability of JIDEP's material passport;
iii. Demonstrate the capability of JIDEP's circularity calculator;
iv. Demonstrate the capability of JIDEP's environmental analytical tool.

3.2.2 Demonstration Plan

The JIDEP collaborative space allows for the efficient and effective coordination of the recycling process for carbon fiber-reinforced plastic (CFRP) waste. In this scenario, a company, CRF, acts as a supplier of CFRP waste and enters into a supply agreement with

another company, ADS. Through the use of a material passport, which documents the chemical composition of the waste, ADS is able to match the waste with the appropriate method for energy-efficient decomposition of car monocoque. Following this, ADS is listed as a supplier of recycled carbon fibers within the JIDEP platform and another company, ADL, enters into a purchase agreement with them. ADL conducts preliminary stress testing on the fibers and updates the material passport to confirm that a 5% performance degradation is acceptable. ADL then proceeds with a full purchase order for the recycled fibers, which are incorporated into their CFRP product line, meeting CRF's requirements. Finally, CRF can assess their compliance with the EU Taxonomy Regulation using the provided environmental analytical tool, resulting in a mutually beneficial outcome for all parties involved (*Figure 5*).

3.2.3 Partner collaboration structure and timing

Step	Demonstration activity	Activity start date
1	Providing automobile's floor reinforcement CFRP beam (the part) (CRF)	2024 05
2	Matching the chemical solvent and disintegrating the part (ADS)	2024 06
3	Re-fabrication of a new CFRP part using recycled fibers (ADL)	2024 07
4	Confirming the technical performance of a new part (ADL)	2024 08
5	Analyzing the possible level of recycled material inclusion (CRF)	2024 09
6	Calculation of feasibility indexes (BUL)	2024 10

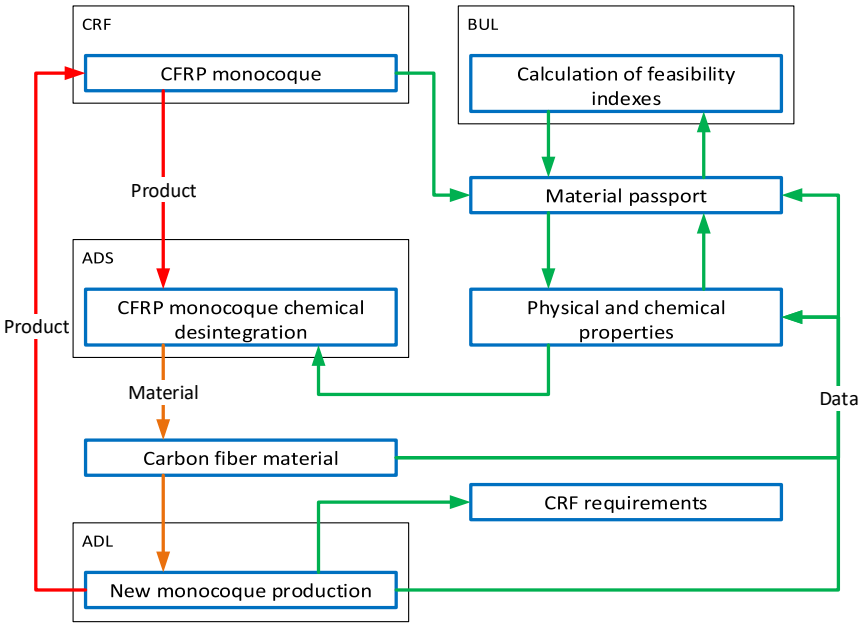

Figure 5 UC2 partner collaboration map representing material and information movement in the JIDEP platform

3.3 Detailed Analysis and Planning of the Industrial Electronics Lifecycle use case

The management of electronic waste, also known as e-waste, is a growing concern worldwide. In 2019, Europe alone produced 12 million metric tons of e-waste, yet the formal documented collection and recycling rate was only 42.5%. Among e-waste, Waste Electrical and Electronic Equipment (WEEE) is the fastest growing waste stream.

It is important to address the challenges associated with e-waste management, specifically the recovery of precious metals from PCBs, by developing more sustainable and efficient methods that minimize the negative impacts on the environment and human health. The JIDEP platform can support these efforts by providing a collaborative space for the research and development of new technologies and regulations for e-waste management.

3.3.1 Objectives

i. Demonstrate the feasibility of JIDEP's collaborative spaces;
ii. Demonstrate the capability of JIDEP's material passport;
iii. Demonstrate the capability of JIDEP's circularity calculator;
iv. Demonstrate the capability of JIDEP's environmental analytical tool.

3.3.2 Demonstration Plan

In order to address the rapidly increasing issue of Waste Electrical and Electronic Equipment (WEEE) and the precious metals contained within electronic printed circuit boards (PCBs), an industrial collaboration between three companies has been proposed. Company ADS operates a chemical decomposition plant capable of effectively disintegrating FR1-FR4 PCB laminates, preventing them from entering landfills. However, the complex nature of circuit boards and the presence of non-metallic-fractions (NMF) within analog and discrete components hinders the efficient application of chemical treatment. Company PVI is researching automated identification technology for integrated circuit (IC) elements, enabling their automated separation from PCBs. Company UPCE is developing a chemical paste to improve the detachment of IC elements from PCBs, which still needs to be tested on different layers. This collaboration would lead to PVI separating IC elements from PCBs for re-use, ADS efficiently disintegrating PCBs laminates and deactivating toxic elements while extracting large quantities of glass fibers, and UPCE implementing a de-solder for higher efficiency of PCB component segregation (c.f., Figure 6).

3.3.3 Partner collaboration structure and timing

Step	Demonstration activity	Activity end date
1	Removing SoA ICs and other components from the high-quality WEEE PCBs (the PCB) (PVI)	2024 05
2	Providing the PCB laminates to ADS for chemical disintegration (PVI)	2024 06
3	Green chemical decomposition of the PCB (ADS)	2024 07
4	Providing de-solder to PVI (UPCE)	2024 08
5	Circularity impact analysis (ADS)	2024 09
6	Environmental impact analysis (ADS, UPCE)	2024 10

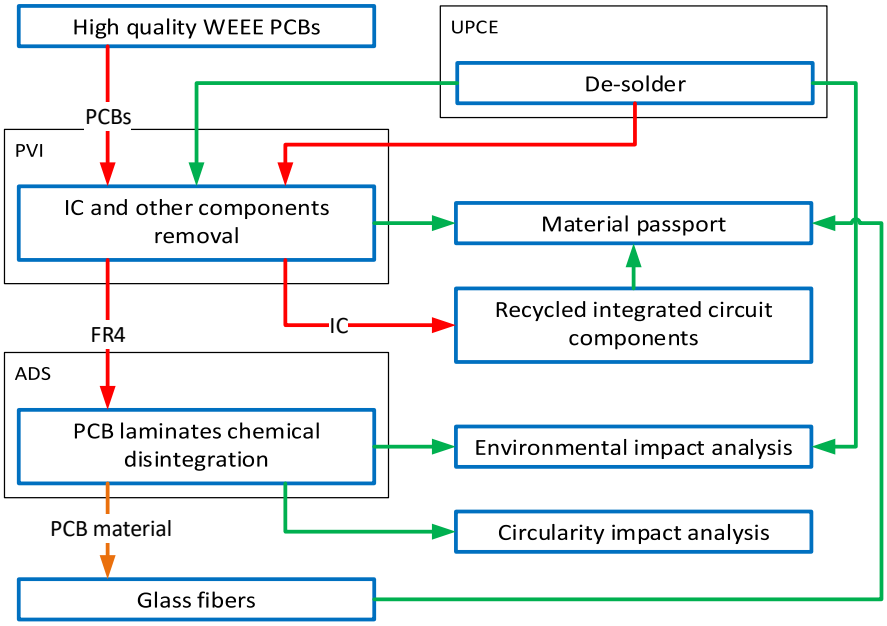

Figure 6 UC3 partner collaboration map representing material, components, products and information movement in JIDEP platform

4. Conclusion

Task T5.1 (and the deliverable D5.1) is an incremental effort towards specifying the exact activities, roles and responsibilities of JIDEP validators. For this reason, D5.1 will be revised and populated up until M28. This is because the ongoing development activities within WP2, WP3 and WP4 strongly affect the end-user validation methodology. Although (§2.4) addresses a very specific schedule for when will appropriate platform components be available for testing, it cannot take into account all the platform development activities, potential delays and unforeseen issues. It is for that reason that MS6 will mark a final D5.1 version, which is matched with preliminary demonstrations and pilot validations (initial preliminary demonstrations [i] within T5.2, T5.3 and T5.4). Milestone 8 will accordingly mark the end of all demonstrations, whereas MS10 will conclude T5.5 before the project closure.

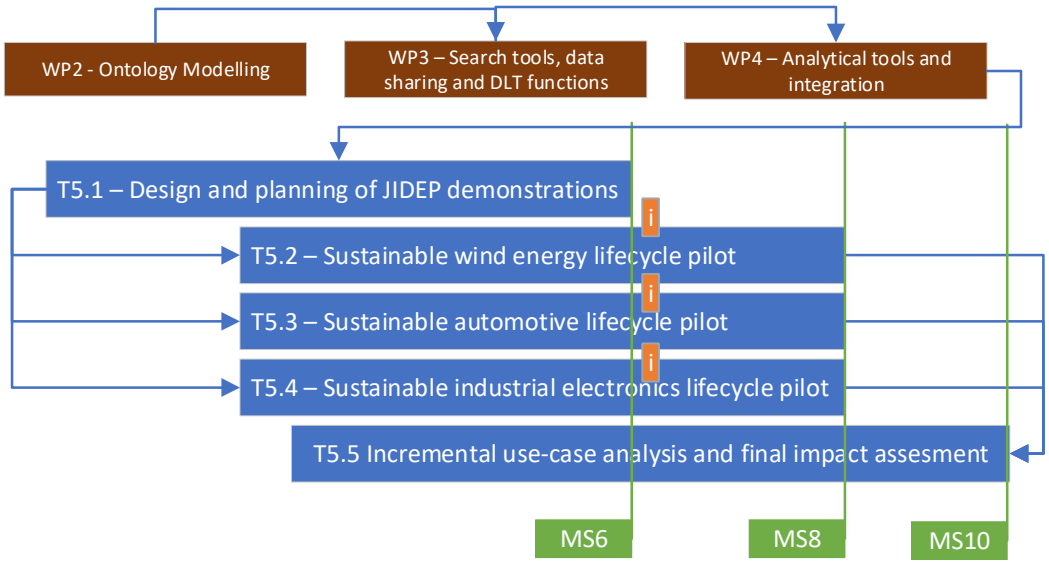

Figure 7 WP5 task relations and affinities to WP2, WP3, and WP4

It thus can be seen, that the Use case demonstration plan aims at maximum end-user engagement, as well as maximum de-risk of pilot execution. To prove this claim, R&D activities were started (as required by T5.2-T5.4 specific objectives) in the early days of the project. The data prerequisites have already been met (M18 project review) as well as the needed platform maturity to trigger the end-user validation methodology (§2.2). The highly technical WP5 work was carried out at a reduced pilot scale, working groups were proven effective and collaborative, but above all, the main technical targets were already achieved (such as chemical disintegration of materials in UC1, UC2, and automated component removal from PCB for UC3). That, with great certainty, enables to approach MS6, because TRL5 has already been achieved within UC1-UC3, and TRL6 only replicates the same processes at a larger scale. Finally, JIDEP validations are not about the technical R&D work to implement the specific objectives of the use-cases, but instead, the physical technical R&D work that leverages and employs the JIDEP platform at each step of the work.