



## **D5.12 - Collaborative Testing and Training 2**

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## Executive Summary

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D5.11 described the initial steps for defining and identifying how collaborative services in the iProduce cMDF environments could look like. For this, the document described exploratory studies of the German and French cMDF and then the first service prototypes of the German cMDF, since this cMDF has a dedicated focus on service definition. D5.12 extends this work to the other cMDFs by presenting the conducted collaborative services and training sessions of the Spanish, Italian, Greek and French cMDF. At the same time, this document reports on the finalization of the collaborative service development of the German cMDF.

The Spanish cMDF focused on discussing the iProduce platform with potential users. Besides some suggestions for improvement, the important feedback was that the platform and ideas are of interest for the intended user group. In addition, prototypes for the Habitat Fair were produced.

The Italian cMDF achieved to establish a preliminary community over a set of introductory workshops. This community started experimenting with the use cases of the Italian cMDF and disseminating the activities of the established core group.

The Greek cMDF continuously conducted user workshops during the development of several medical products. This user engagement led to the production of fully functional prototypes of an orthopedic back brace, splints for fractures, splints for pets and customized face shields. In a training session with 5th and 6th grade school students, their engagement in the creation and manufacturing of real objects was encouraged by enabling the students to come closer to cutting-edge technologies. A consultation workshop with an ambassador could be used to collaboratively test and train local communities to use the digital tools and collect feedback for user experience and usability aspects.

Through a set of collaborative workshops, the French cMDF achieved to highlight the interesting contribution that a FabLab could have in consumer goods development. At the same time, it was possible to showcase the importance of collaboration between different stakeholders, support the role of knowledge exchange and transfer for entrepreneurs in gaining extra skill sets while developing their product. Lastly, the workshops promoted how a FabLab can positively impact the design, the thinking process and decision making in a consumable and innovative product development. Furthermore, in a second series of collaborative manufacturing workshops, the French cMDF managed to have a group of citizens without prior knowledge to build a functional wooden bike.

The German cMDF translated the concepts of two novel services into actual workshops that were tested with external customers. While the Nerd Testing service did not prove to provide enough additional value, the Live Prototyping / Produktschmiede service was continuously evolved over the set of four test runs. This resulted in a stable evaluated novel service format, ready to be provided by the German cMDF. An external company (Rossbach-Wojtun), which acted as test client during the second workshop, joined the team as part of the German cMDFs core group. Rossbach-Wojtun provides one part of the 3-step process of the service.

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## List of Abbreviations

Abbreviation	Definition
3D	Three-dimensional
AMU	Additive Manufacturing Unit
CAM	Computer-aided manufacturing
CEO	Chief Executive Officer
cMDF	collaborative Manufacturing Demonstration Facility
DIY	Do it yourself
IoT	Internet of Things
IPR	Intellectual Property Rights
ISO	International Standards Organisation
MMC	Manufactures, Makers and Consumers
MVP	Minimum viable product
OpIS	Open Innovation Space
PCB	Printed circuit board
SME	Small or medium-sized enterprise
UC	Use case

## 1. Introduction

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The first version of this Deliverable - D5.11 Collaborative Testing and Training Sessions - described the initial steps for defining and identifying how collaborative services in the iProduce cMDF environments could look like. For this, the document described exploratory studies of the German and French cMDF and then the first service prototypes of the German cMDF, since this cMDF has a dedicated focus on service definition.

The present version of the Deliverable - D5.12 Collaborative Testing and Training Sessions 2 - now extends this work to the other cMDFs by presenting the conducted collaborative services and training sessions of the Spanish, Italian, Greek and French cMDF. At the same time, this document reports on the finalisation of the collaborative service development of the German cMDF.

### 1.1. Structure of the Deliverable

This deliverable is structured by cMDFs. Each cMDF's activities are described within one chapter. After a note on the discontinuation of the Danish cMDF in Chapter 2, the Spanish cMDF's activities are described in Chapter 3, followed by the Italian cMDF in Chapter 4 and the Greek cMDF in Chapter 5. The French cMDF follows in Chapter 6 before the German cMDF closes in Chapter 7.

## 2. Collaborative Testing and Training within the Danish cMDF

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A significant deviation has been the exit of BETAFACTORY from the Consortium, due to a liquidation procedure caused by bankruptcy. The company was actively involved in the early phases of the project to assist partners in requirements gathering, architecture design, stakeholder analysis and business modelling. Unfortunately, BETAFACTORY could not sustain its business and filed for bankruptcy (communication from 27/10/2021). The fact that BETAFACTORY was the key member of the Danish cMDF (Collaborative Manufacturing Demonstration Facility) strongly compromised the activity of this cMDF, which led to a rearrangement of the project structure, since the consortium decided to halt the Danish cMDF activity.



### 3. Collaborative Testing and Training within the Spanish cMDF

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The Spanish cMDF consists of 3 partners: AIDIMME (a research technology institute related to metal-processing, Wood, furniture, transport and packaging), Océano Naranja (a FabLab), and LAGRAMA (a furniture manufacturer).

The Spanish cMDF aims to provide a physical space for MMC communities to stimulate, promote, and develop innovative customer-driven product ideas in a collaborative way. It acts to transform ideas into real furniture products in order to be commercialised.

The Spanish cMDF is supported by two influential members - AIDIMME and Océano Naranja - both working in the furniture sector among others. AIDIMME has over 700 associated members and disseminates a great deal of news related to the furniture sector through their social media channels. Océano Naranja is connected to many FabLabs and makerspaces through the FabLab network. The two entities actively conduct and promote iPRODUCE activities, events and services using their large existing networks and public relations channels. LAGRAMA is acting as “consumer” of the platform testing and providing very good feedback from the manufacturing perspective.

The main services offered by the Spanish cMDF are: Digitized training process for equipment, Product Ideation processes, Product prototyping workshops, Ideation workshops, 3D-Printing, Woodworking / DIY services and Engineering processes.

#### 3.1. Workshop with Pupils from Superior School of Art and Design

AIDIMME and FabLab VLC Océano Naranja organized a Workshop titled “Social Manufacturing y soluciones digitales”, on May 19th 2022, aimed at students of the **Official Master's Degree in Creativity and Product Development** in the Escola d'Art i Superior de Disseny de València (Superior School of Art and Design) in the specialty of product design, in which the advances of the iPRODUCE project was presented along with the tools developed to date.

We contacted this school because the students are potential users of the platform and their feedback at this stage of platform development would be really fundamental for having a real and useful platform. Do Sánchez from Océano Naranja made the introduction to the audience (students, professors) about why this workshop has been arranged with them. Maria José Núñez from AIDIMME made an overall overview of the projects, explaining the scope, challenges, the cMDFs and in particular about the Spanish cMDF and the use cases. Afterwards a demo of the platform following a **user's journey**, taking as a user a product designer, and we showed all tools in the OpIS. The demonstration was made by Daniel Ivaylov and María José Nunez. A lot of questions arose, and the final discussion was really very interesting.

We started with the following agenda:



Figure 1: Agenda of the Workshop



Figure 2: Welcome to the workshop



Figure 3: Presenter of the workshop



Figure 4: Spanish cMDF presentation



Figure 5: Spanish Use Cases presentation

The way to show the platform and their tools was following a **user's journey** with the registration and login explaining how to create a team finding suitable people to contact with for the co-creation of an innovative chair as an example, with some specifications.

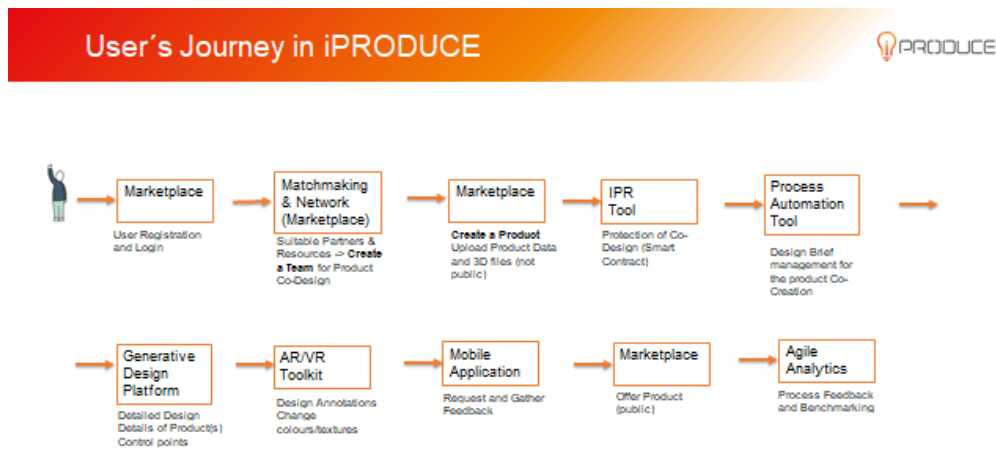


Figure 6: Spanish Use Cases presentation

After contacting and having a positive answer we created in the marketplace the team and the product data needed for starting the co-design phase through the OpIS tools.

We explained the need for the IPR part, and the professors agreed on the importance of such aspects. We went through the Generative Design Platform, the VR/AR toolkit for the different possibilities we can get from them. Finally, we offered the product in the Marketplace.



Figure 7: Marketplace presentation



Some feedback to highlight regarding:

- IPR: When signing a confidentiality agreement, it is very important to have all the aspects in the same document and the timestamp in which it occurred in the event of any problem with the ownership of the co-design.
- VR/AR toolkit: great tool and needed to have a common chat for annotation
- Business model: which one is the business model of the platform? What does the platform give me (as a product designer)? Of course, create synergies with people you don't know.
- Scoring to users and teams for further contact.

It was really very enriching and comforting to know that the objective of the project is very interesting for product designers who are very eager to open up their ideas and everything that encourages collaboration is necessary in this segment.



Figure 8: Group picture

### 3.2. Collaborative Testing Activities in the Spanish cMDF

Among the three partners of the Spanish cMDF: AIDIMME, FabLab VLC Océano Naranja and LAGRAMA a Workshop was organised in AIDIMME in 2 separate dates with two different approaches:

- 1) June 1st 2022: testing the tools working collaboratively in the Smart Headboard (UC1) specifications
- 2) June 22nd 2022: co-working the creative ideas using the tools and the board.

We made a tour of the tools based on a user journey focused on UC1 with the main actor: LAGRAMA.

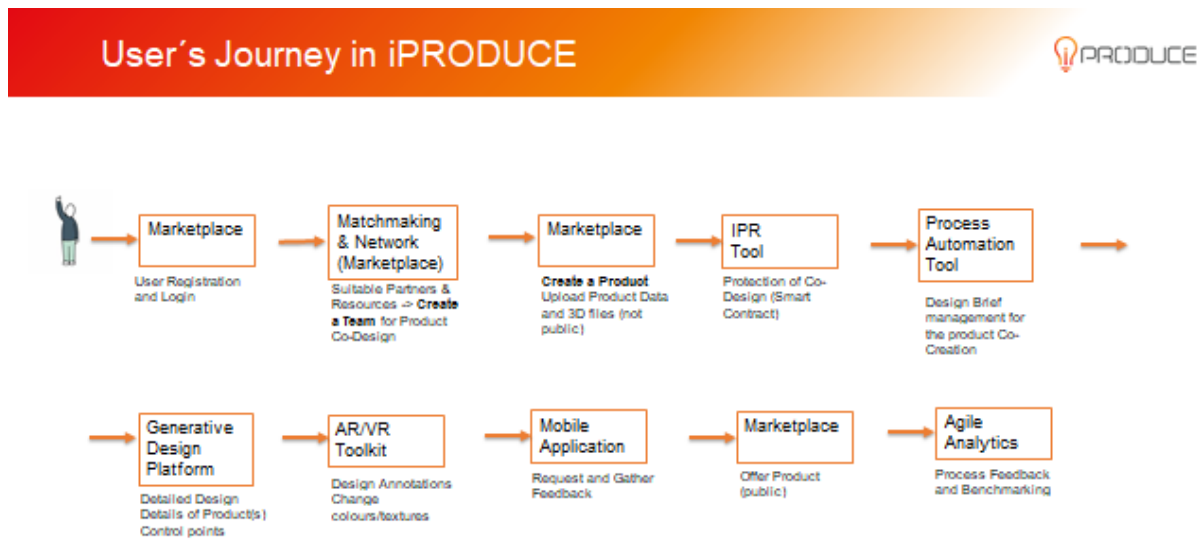


Figure 9: User Journey (login as Manufacturer)

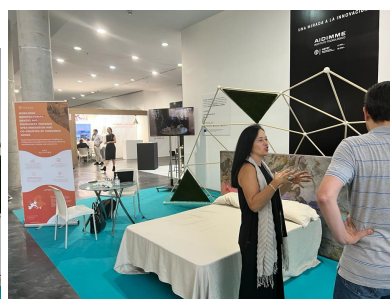
We did the tour from the point of view of a main actor in our ecosystem: the furniture manufacturer. Joan, as the director of the company, logged in and started to create a team based on what she needs: someone to help her with the design of the integration of electronic components and someone to advise her when it comes to what electronic components can be used under a series of specific requirements.

Some of the tools are not available and the complete navigation could not be done, but others are, and we have advanced a lot in detecting problems and new functionalities.

New possibilities were raised in the UCs for co-design with a view to the Habitat Fair in September 2022. From June 22 we were working on the co-design of the smart headboard according to the materials and functionalities agreed in the testing sessions. As well, we decided to create a geodesic dome with a specific 3d printed component, creating a nice environment in the Habitat Fair Exhibition where the attendants to the fair showed interest in our developments.



Figure 10: Session 1 and 2 settings



Result of the Testing activities in the Habitat Fair 22



## 4. Collaborative Testing and Training within the Italian cMDF

The collaborative testing and training activities within the Italian cMDF started with the creation of a Core Group: the group involved members from the iPRODUCE Italian partners (namely Trentino Sviluppo and ProM, Energy@Work and Hub Innovazione Trentino (HIT)) and interested external partners (Noitech Makerspace<sup>1</sup>, FabLab Bitonto<sup>2</sup>, MUSE FabLab<sup>3</sup>, BITZ Fablab<sup>4</sup>, FabLab Frosinone<sup>5</sup> and UniTN-Fablab<sup>6</sup>). The core objective was to widen the pilot partners for testing by also involving makers, students, consumers, designers, engineers, architects etc. from manufacturing SMEs.

In order to reach this goal, the Lean Operational Model was established to determine the interactions between users, the OpIS platform and the Italian cMDF's members. Also, a series of collaborative testing and training sessions were carried out in the period July 2021 - July 2022.

### 4.1. Collaborative Workshop – Kick-off with External Interested Partners

The kick-off meeting took place in Rovereto on the 29<sup>th</sup> of July 2021 in a hybrid (phygital) form and counted 11 participants, not only internal to the project.



Figure 11: Kick-off meeting in Rovereto, 29th July 2021

During the event, in fact, iPRODUCE was presented to the external participants, with the main purpose to show a preliminary scenario of the project's mission, representing the possible implementation of a set of use cases and explaining the characteristics of the pilots. Feedback and manifests of interest was collected, including ideas on possible roles of participants not already part of the pilots.

<sup>1</sup> <https://makerspace.noi.bz.it/>

<sup>2</sup> <http://www.Fablabbitonto.org/>

<sup>3</sup> <https://Fablab.muse.it/>

<sup>4</sup> <https://bitzFablab.unibz.it/>

<sup>5</sup> <https://www.Fablabfrosinone.org/>

<sup>6</sup> <https://Fablab.unitn.it/>

The first meeting was thus successful in engaging stakeholders and possibly future partners of the Italian cMDF, having a different type of belonging background (i.e., students, industries, citizens etc.) and different business models. However, these key differences did not hinder the possibility of future collaboration inside iPRODUCE.

On the 21st of October 2021, another event was organized in Trento in phygital mode, counting 12 participants. The event focused on technical discussion, in particular on the use case pilots and how to expand the cMDF's members even in geographical terms. Moreover, the focus was on a better understanding of the pilot activities and on the listing of new potential members of the cMDF and future iPRODUCE ambassadors.

## 4.2. Collaborative Session: Test OpIS Platform (T9.4)

All the collaboration and testing activities carried out by the Italian cMDF led to the launch of an open competition called i-Novation on the 21<sup>st</sup> of July 2022. This open innovation call was organized by HIT and was intended for Italian members of the makers' community, and it was organized also in collaboration with other national entities - namely E@W, University of Trento, BITZ FabLab, MUSE; FabLab Frosinone, FabLab Mantova and FabLab Bitonto). Eight teams participated in the call, formed by stakeholders, companies, students and mechanical, electronics and design enthusiasts. Three winning projects were announced: an innovative tool to speed up the preparation of an electroencephalogram, a bra for women who have had a mastectomy and soundproofing panels of mycelium. The winners received specific training, tutoring and study tours on the Italian market spaces and FabLabs.



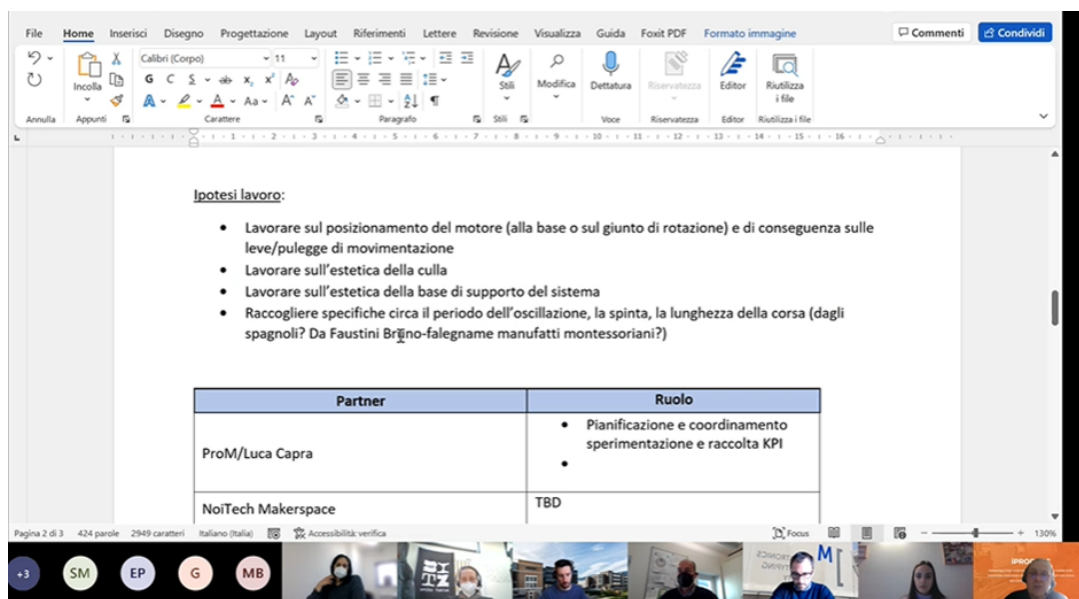
Figure 12: Winners of the i-Novation open call

## 4.3. Collaborative Testing and Training Session: Lifecycle Management

The official warm-up workshop of the enlarged Italian Core group was organized on the 1st of February 2022. The meeting was online with 17 participants. The event began with a round of presentations of the participants, focusing on expertise and the main area of activities, in which the



newer partners were introduced to the rest of the cMDF. Afterwards, the workshop focused on the presentation of the latest updates of the platform, with a specific reference to the use case implementation. During the event, a working document was presented to better explain the two use cases chosen for the experimentation of the Italian cMDF (the mechatronic cradle and the irrigation system) and to start collecting manifests of interest in the different roles the members might play in the implementation of both the use cases, based on their specific competences. All the participants were very interested in the development of a collaborative platform, due to being small-to-medium sized FabLabs, by suggesting the roles they might play thanks to their abilities gained by internal work or in partnership with other entities. This document will be updated following the progress of the developments of the platform and use-cases testing activities.



Ipotesi lavoro:

- Lavorare sul posizionamento del motore (alla base o sul giunto di rotazione) e di conseguenza sulle leve/pulegge di movimentazione
- Lavorare sull'estetica della culla
- Lavorare sull'estetica della base di supporto del sistema
- Raccogliere specifiche circa il periodo dell'oscillazione, la spinta, la lunghezza della corsa (dagli spagnoli? Da Faustini Brèno-falegname manufatti montessoriani?)

Partner	Ruolo
ProM/Luca Capra	<ul style="list-style-type: none"> <li>• Pianificazione e coordinamento sperimentazione e raccolta KPI</li> </ul>
NoiTech Makerspace	TBD

Figure 13. Fulfilment of the word document by collecting suggestions of the participants

Moreover, a demo session was showcased, briefly presenting the features of the OpIS platform developed until that time. The work and the collaboration established until now in the Italian cMDF core group will continue in the future, as more events will be organized when there will be a more stable version of the platform ready to be tested by the members.

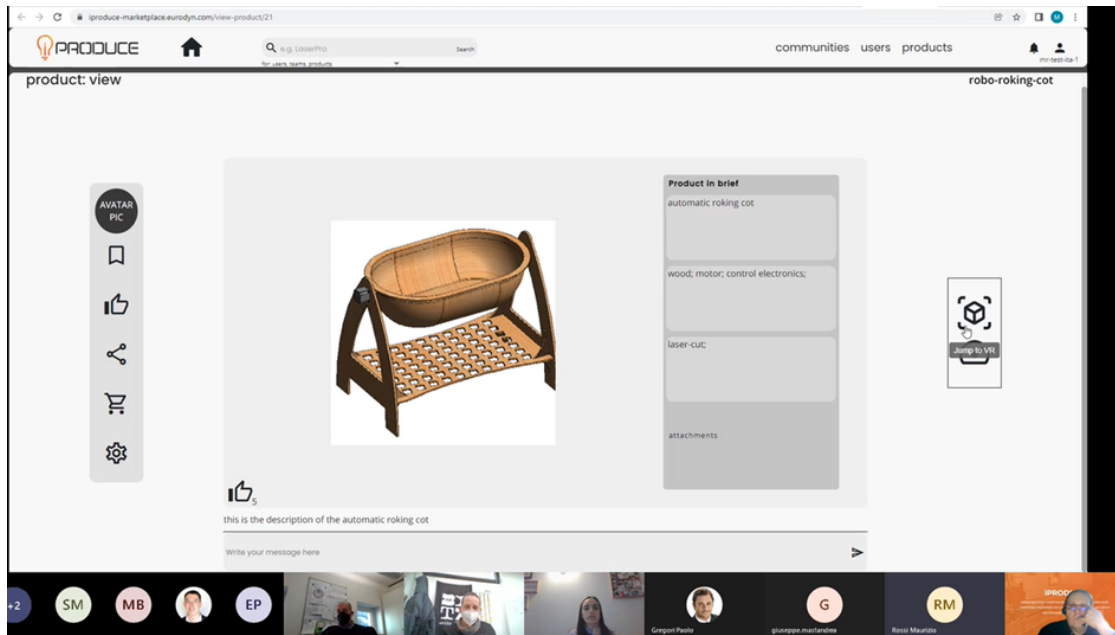


Figure 14. Demo of the OplS platform, 1st February 2022

The outcome of this meeting was the creation of a preliminary community that started experimenting with the use cases of the Italian cMDF and disseminating the activities of the established core group.

With the aim to inform, present and involve other participants in the collaborative testing activities of the OplS platform, on the 31st of May 2022 Trentino Sviluppo created and uploaded on YouTube a video tutorial on the platform (accessible at this link: <https://www.youtube.com/watch?v=KNCyfVimq18>). It is a webinar that starts with a general presentation of the project and the main features of the platform and then goes into details of each tool also with a live demo session. The video is clear and concise, so that viewers can easily understand the capabilities of the platform, and eventually ask for more detailed information or contacts to collaborate on the project.

## 5. Collaborative Testing and Training within the Greek cMDF

The Greek cMDF consists of two partners:

- AidPlex which is a Greek medical start-up, providing innovative solutions in orthopedics.
- CERTH is a Greek research institute with important scientific and technological achievements in various fields, including Additive Manufacturing, Artificial Intelligence, Advanced Robotics, Internet of Things, Sustainable Energy etc.

The Greek cMDF aims to bridge the gap between SMEs and Makerspaces in various collaborative product development projects by organising innovative workshops. AidPlex, with expertise in the medical sector, will offer better treatment experience to potential customers. Apart from the medical sector, CERTH will expand the provided services on micro-manufacturing and rapid prototyping related to several sectors, such as robotics, agile tools, electronics and consumer lifestyle goods.

The main services offered by the Greek cMDF are: Custom 3D Product Design, IoT solutions, AR/ VR, 3D Scanning, 3D Printing, and Training Workshops for prototyping and DIY activities with state-of-the-art technologies.

### 5.1. Workshops on Testing the Medical Products

#### 5.1.1. IoT-based orthopedic back brace

The orthopaedic back brace solution is designed by AidPlex with the aim of higher comfort levels and retrofitting the resulting design with IoT sensors, for scoliosis, kyphosis, or similar spinal deformities. The overarching goal is to finetune the design of a back brace by examining aspects like weight distribution, modularity, size adaptability and overall comfort, whilst IoT sensors will help patients self-assess and adapt their back braces leading to higher degrees of adherence and outcome.

With the IoT system, the doctor and the patient will be informed when the right time for a new brace has come, due to the child's growth, achieving the best possible fit of the medical device. The IoT component of the solution will also support gamified processes which stand to help patients follow through treatment and exercises more diligently achieving better results and subsequently increase their quality of life.

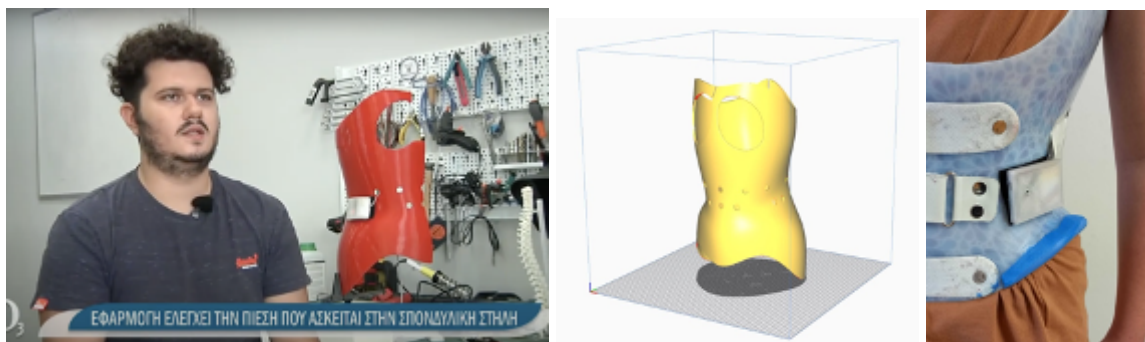


Figure 15. Back brace for scoliosis treatment



Figure 16: Connected patient and doctor web app to the IoT device

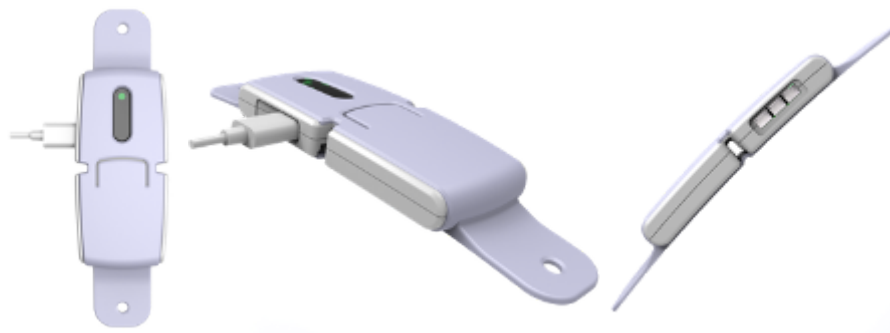


Figure 17: ScolioSense: Monitoring IoT device for monitoring of Scoliosis treatment

Different user workshops were set up for developing this product. An overviewing history of those is presented in the following.

iProduce partner AidPlex collaborated with different partners in this workshop series, namely Dr. E. Samoladas, Scoliosis SLC, Rachis Spine Clinic, Aristotle University of Thessaloniki, University of Ioannina, Dr. Gelalis as well as different patients. The workshops lasted over 18 months and took place in Thessaloniki, Athens, Kavala, Ioannina and Online due to Covid-19 Restrictions.

From 2020 on, AidPlex has been able to identify patients' problems, create a prototype, test it with many patients and deliver a patent-pending product to the market. From 03/2020 to 06/2020, AidPlex alongside with Rachis Spine Clinic and patients identified their pain points and designed mockups. Then, from 06/2020 to 08/2020, AidPlex presented mockups (Hardware, mobile app & web app) to the end users (patients, patient's families, clinicians). After that, from 09/2020 to 01/2021, AidPlex created a fully functional prototype and tested it with 3 patients and clinicians. Consequently, from 02/2021 to 10/2021, AidPlex created a product (Smaller PCB, calibrated sensors, mobile application for IOS & Android and 3D printed back brace). Finally, from 11/2021 to 01/2022, AidPlex ran a pilot with the largest brace manufacturer in Greece, Scoliosis SLC. During the pilot, the 10 patients found some minor bugs and they made suggestions for further development.

### 5.1.2. Splints for fractures

AidPlex, Doctors and patients are going to design new sizes & designs for children, in order to provide the best possible treatment experience. In addition, the patient can select not only the possible size but the color of the splint and the type of the strap. AidPlex's team designs its products based on patients' needs during the healing procedure. The main features of splint are: waterproof, lightweight and skin friendly. First of all, patients can easily bathe themselves without the use of plastic covers around their broken bones. In addition, we offer a 6 times lighter solution, giving to patients a more useful splint in a very difficult period of their life. AidPlex's splint has a lot of holes, therefore patients' skin can breathe normally and eliminate the chance of skin irritation problems. Finally, it is ideal for children. Sometimes Doctors may prescribe drugs to children in order to easily splint their broken bone. Our quick and easy-to-apply solution helps on the one hand healthcare professionals do their job easier and on the other hand, avoiding drug delivery to children.

Different user workshops were set up for developing this product. An overviewing history of those is presented in the following.

iProduce partner AidPlex collaborated with different partners in this workshop series, namely Dr. E. Samoladas, Scoliosis SLC, Rachis Spine Clinic, Aristotle University of Thessaloniki as well as different patients. The workshops lasted over 18 months and took place in Thessaloniki.

From 2020 on, AidPlex has been able to identify patients' problems, create a prototype, test it with many patients and create a patent-pending product for the market. From 03/2020 to 06/2020: AidPlex alongside with Rachis Spine Clinic and patients identified their pain points and designed mockups. Then, from 06/2020 to 08/2020, AidPlex presented mockups to the end users (patients, patient's families, clinicians). Finally, from 09/2020 to 01/2021, AidPlex created a fully functional prototype and tested it with 3 patients and clinicians

### 5.1.3. Splints for pets

AidPlex and Vets are going to design new designs for pets, in order to provide the best possible treatment experience. In addition, the owners can select not only the possible size but the colour of the splint and the type of the strap. AidPlex's team designs its products based on patients' needs during the healing procedure. The aim features of the splint are: Waterproof, Lightweight and Skin Friendly. First of all, patients can bathe themselves easily without the use of plastic covers around their broken bones. Furthermore, we offer a 6 times lighter solution, giving to patients a more useful splint in a very difficult period of their life. AidPlex's splint has a lot of holes, therefore patients' skin can breathe normally and eliminate the chance of skin irritation problems. Finally, it is ideal for pets! Sometimes, pets pee their splint and then there is a need for change of the splint. Our waterproof & quick and easy-to-apply solution helps professionals do their job easier.

Different user workshops were set up for developing this product. An overviewing history of those is presented in the following.

iProduce partner AidPlex collaborated with Vets: Vlachonikolou & Gonios. The workshops lasted over 18 months and took place in Thessaloniki.

From 2020 on, AidPlex has been able to identify patients' problems, create a prototype, test it with many patients and create a patent-pending product. From 09/2020 to 01/2021: AidPlex alongside Vets identified their pain points and designed mockups. Then, from 02/2021 to 10/2021, AidPlex presented

mockups to the end users (pets, pet's families, clinicians). Finally, from 11/2020 until now: AidPlex created a fully functional prototype and is planning to test it with 2 pets and vets.

#### 5.1.4. Customized face shields

Customized protective face shields can be designed and fabricated for both adults and kids in the fight against COVID-19. The face shield is one of several projects being run by the COVID-19 Response Greece action. This project aims to make the design of protective gear open source and available to everyone that has relevant production facilities, under the license terms of Creative Commons (4.0 International License) Attribution-Non-Commercial, offering high levels of protection.

Different user workshops were set up for developing this product. An overviewing history of those is presented in the following.

iProduce partner AidPlex collaborated with different clinicians. The workshops lasted over 18 months and took place in Thessaloniki, Athens, Kavala, Ioannina and Online Due to Covid-19 Restrictions.

From 2020 on, AidPlex has been able to identify patients' problems, create a prototype, test it with many patients and deliver a patent-pending product to the market. From 03/2020 to 04/2020, AidPlex alongside clinicians identified their pain points and designed mockups. Then, from 04/2020 to 05/2020, AidPlex presented to the end users (clinicians). Finally, from 05/2020 to 12/2020, AidPlex created a fully functional prototype and tested it with 3 patients and clinicians

## 5.2. Training Workshop: "3D Collaborative Manufacturing in Education & Culture" with Students

On the 26th of May 2022, the Greek cMDF composed of the Information Technologies Institute (ITI) of the Centre for Research and Technology Hellas (CERTH) and the start-up AidPlex, in collaboration with the Union of Parents & Guardians Association, of Primary & Secondary Education of the Municipality of Chalkidona, co-organized a training workshop, within the framework of the EU H2020 iPRODUCE project implementation.

The training workshop was conducted on the occasion of the successful completion of the Greek competition – iPRODUCE "3D Collaborative Manufacturing in Education & Culture" on 30th April, which has received 9 submissions from numerous students of the 5th and 6th grade of Elementary Schools, of the Region of Central Macedonia of Greece. The representatives of the jury from CERTH/ITI, AidPlex and local ambassadors evaluated the submissions, and the prizes were distributed to three winning schools. An award ceremony was held at the beginning of the event, where 40 students of the three schools were announced as the competition winners. They received 3D printed medals (gold, silver, bronze), with engraved logo of iPRODUCE project as an award.

Additionally, the best idea (1st prize) was manufactured using diverse 3D printing technologies. The students had the chance to have a guided tour on the infrastructures of Additive Manufacturing Unit (AMU) of CERTH/ITI and a training workshop with real-time demonstration of the manufacturing process of their idea, including the 3D design, the 3D printing and the post-process procedures. Afterwards, they had the opportunity to attend a demonstration of the OpIS platform of iPRODUCE, in order to co-create their idea by utilizing the different available tools of the platform. In particular, the representatives of the Greek cMDF presented a user's journey on OpIS platform on a specific use case scenario (UC5: 3D Printed Smart Luminous Artifact), by developing the idea of the students.



In conclusion, through this workshop, an innovative way of lifelong learning education approach was promoted, by enabling the students to come closer to cutting-edge technologies. Specifically, the training workshop encouraged student's engagement in the creation and manufacturing of real objects, by incorporating OpIS tools, i.e., Marketplace, Matchmaking, IPR Authoring Toolkit, Generative Design Platform, Agile Data Analytics & Visualisation Suite, and AR/VR Toolkit.



Figure 18: Promotion material “3D Collaborative Manufacturing in Education & Culture”



Figure 19: Agenda of "3D Collaborative Manufacturing in Education & Culture"

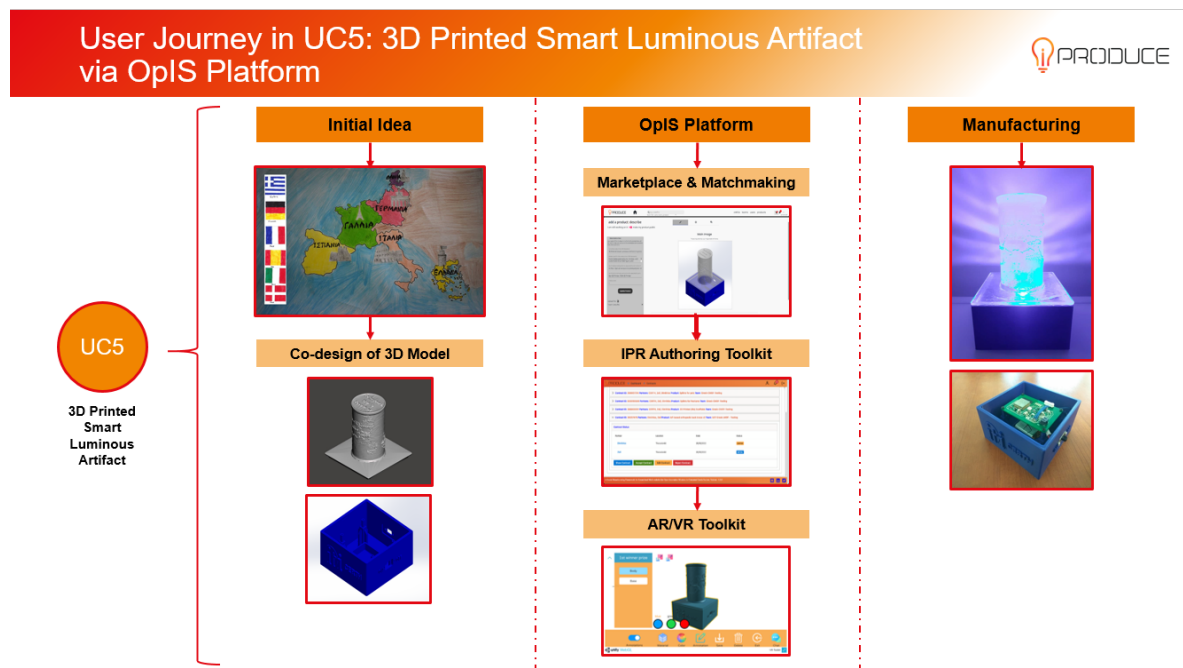


Figure 20: User journey in UC5: 3D Printed Smart Luminous Artifact via OpIS Platform





Figure 21: Photos from the Training Workshop in CERTH's infrastructures



Figure 22: Photos from the Training Workshop



Figure 23: Photos from the Training Workshop - Demonstration of OpIS platform



Figure 24: Photos from the Training Workshop - Demonstration of equipment in Additive Manufacturing Unit (AMU) of CERTH/ITI



### 5.3. Consultation & Training Workshop: “Co-Creation of Splint for Fractures” with Ambassador

On the 23<sup>rd</sup> of November 2022, the Greek cMDF composed of the Information Technologies Institute (ITI) of the Centre for Research and Technology Hellas (CERTH) and the start-up AidPlex, co-organized a consultation workshop with an ambassador, within the framework of the EU H2020 iPRODUCE project implementation.

The ambassador participated in a guided tour to the infrastructures of AidPlex and in a training workshop with real-time demonstration of the manufacturing process of a specific use case of a splint for fracture, including the 3D design, the 3D printing and the post-process procedures. Afterwards, the ambassador had the opportunity to attend a demonstration of the iPRODUCE OpIS platform in order to co-create a splint for fractures, by utilizing the available OpIS tools.

In conclusion, the main objective of this workshop was to promote the co-design & co-creation activities via diverse technologies by reinforcing the ambassador’s awareness about the local cMDF’s structure and operation. Additionally, through this consultation workshop, the ambassador was informed about the iPRODUCE OpIS platform, and this was a great opportunity to collaboratively test and train local communities to use the digital tools and collect feedback for user experience and usability aspects and gather insights with regards to the community structures and products of iPRODUCE.



Figure 25: Agenda of the Consultation Workshop with Ambassador

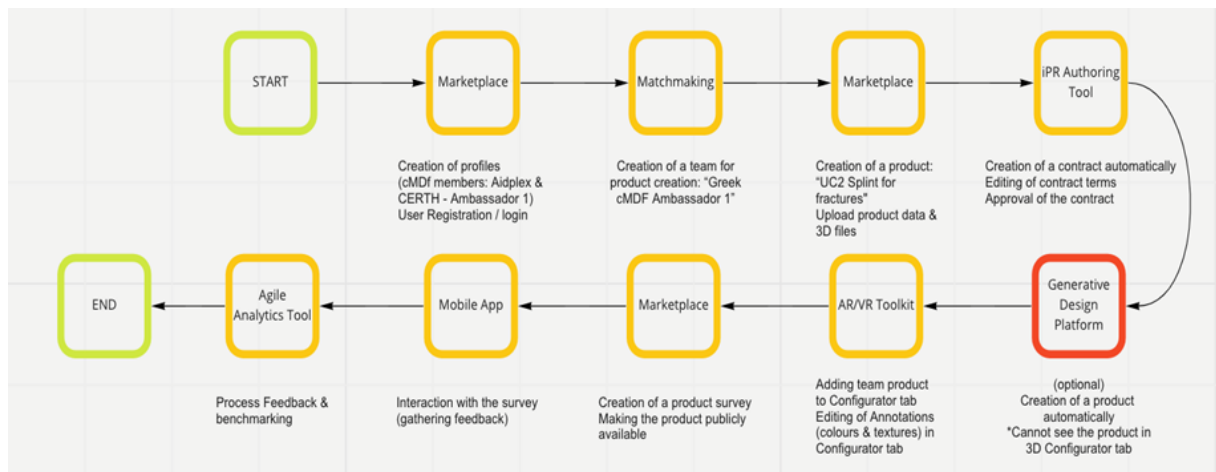


Figure 26: User Journey of UC2 – Splints for fractures during the Consultation Workshop with Ambassador

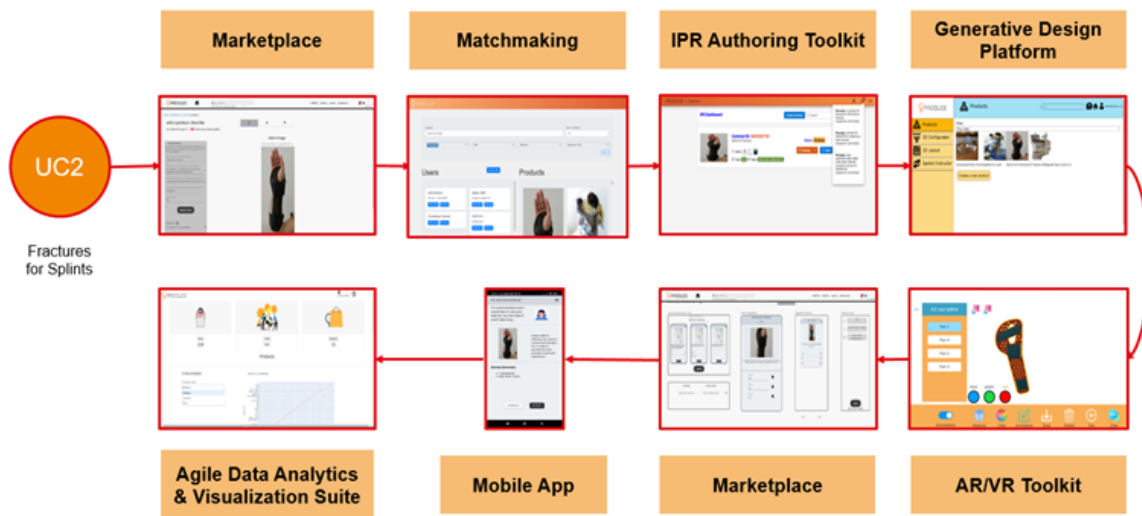


Figure 27: User Journey of UC2 – Splints for fractures during the Consultation Workshop with Ambassador

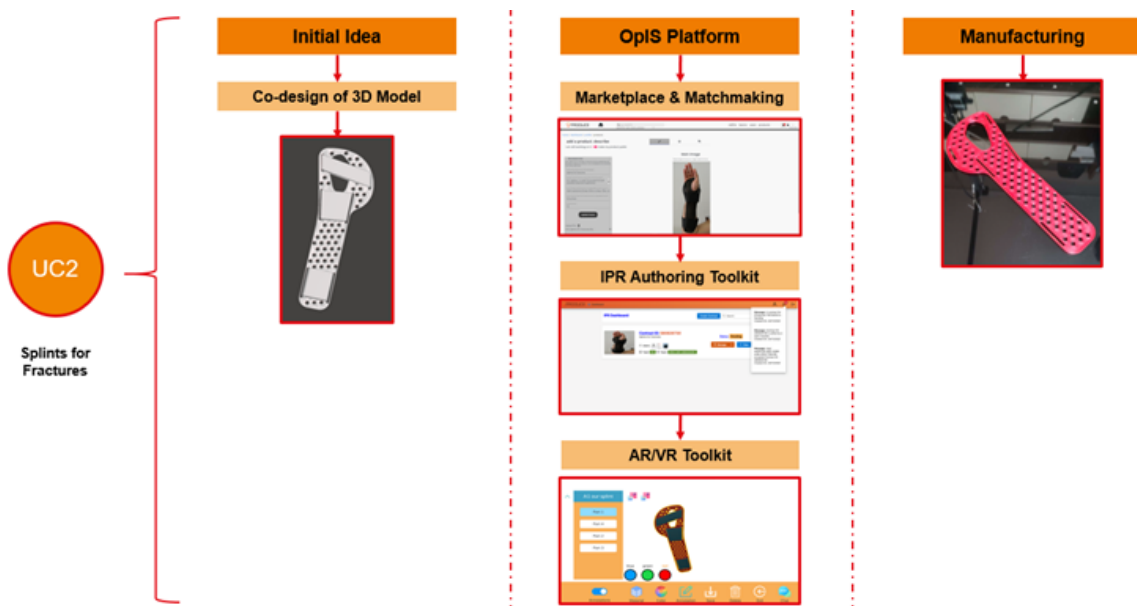


Figure 28: User Journey of UC2 – Splints for fractures during the Consultation Workshop with Ambassador

## THE QUESTION BOARD

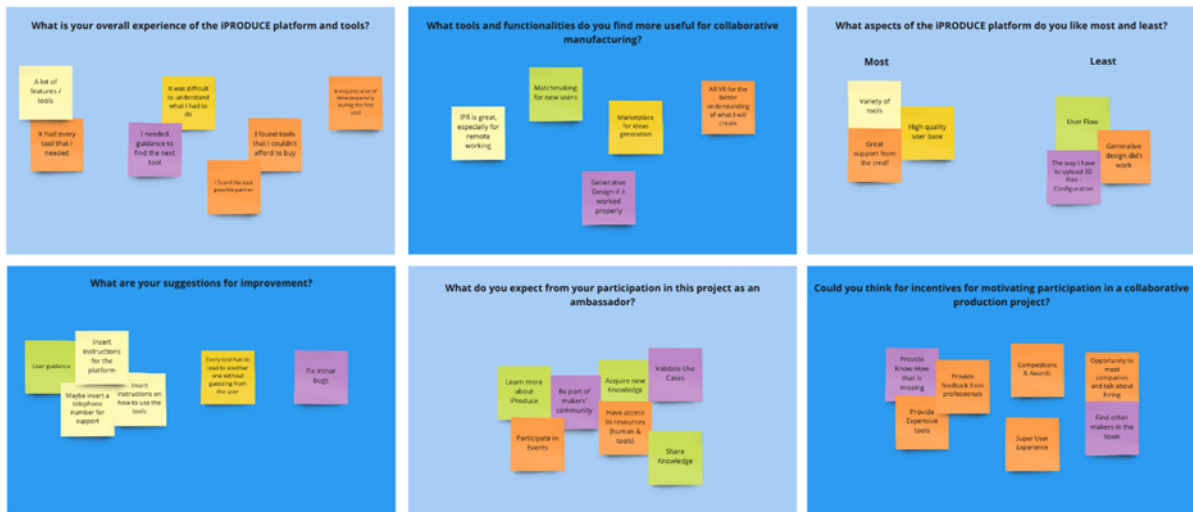


Figure 29: iPRODUCE Platform Evaluation –Question Board

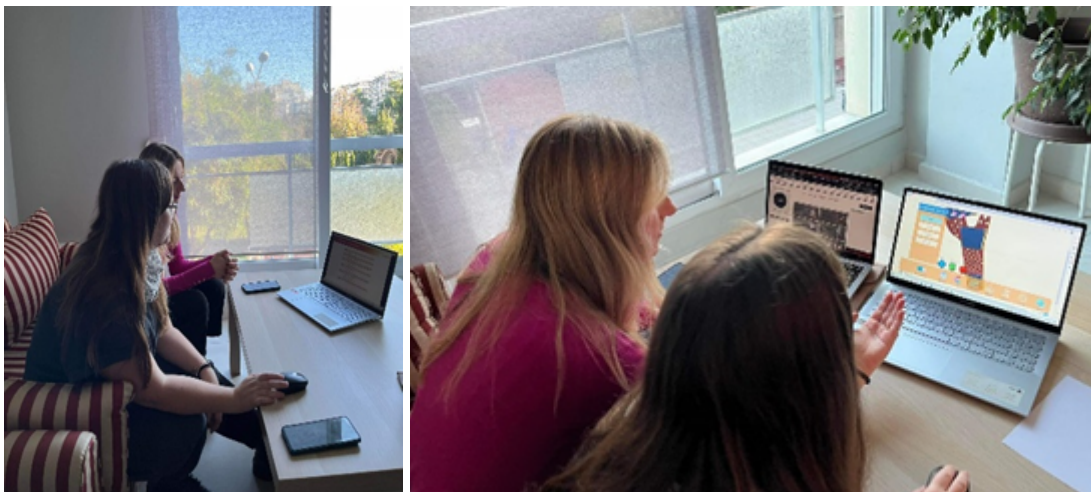


Figure 30: Consultation Workshop with Ambassador

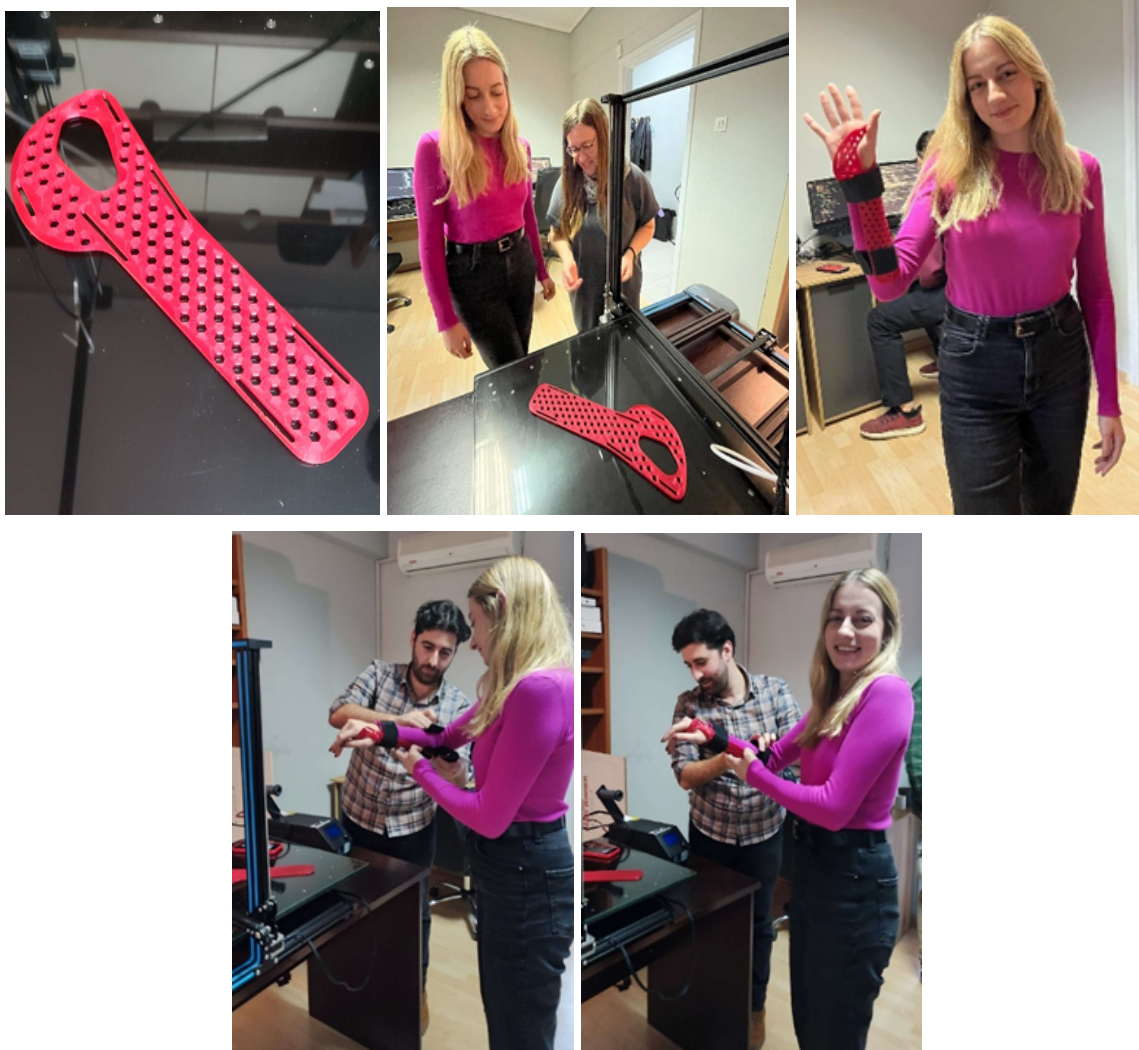


Figure 31: Photos of the Consultation Workshop with Ambassador

## 6. Collaborative Testing and Training within the French cMDF

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The French cMDF consists of three partners:

- Excelcar (EXC) which is an industrial FabLab specialised in the Mobility sector. They are involved in the support of entrepreneurs in developing mobility products and related accessories. They have as well a strong expertise in the Industrie 4.0 area
- FabLab Vosges (FLV) is the general public and professional FabLab of the French cMDF. They work with makers as well as entrepreneurs in order to interconnect users, exchange knowledge and share technologies and methodologies
- Materialia (MAT) is the business incubator of the cMDF. They have a strong expertise in materials and funding opportunities and good connections with local stakeholders

The main objectives of the collaborative workshops held within the French cMDF are to highlight the interesting contribution that a FabLab or an open social manufacturing platform could have in a consumable product development, focus on the importance of collaboration between different stakeholders, support the role of knowledge exchange and transfer for entrepreneurs in gaining extra skill sets while developing their product, and promote how a FabLab can positively impact the design, the thinking process and decision making in a consumable and innovative product development.

The workshops also helped promoting the French cMDF partners (the one mentioned above as well as the new joiners) and their skills/potential offered services, disseminating the cMDF's future activities within iPRODUCE, and identifying project holders and SMEs that could possibly be interested in collaborating based on the French cMDF service offer.

Due to the COVID-19 restrictions, many of the activities were held online. Practical workshops took place face-to-face.

### 6.1. Workshop 1: Importance of Collaboration in FabLabs for Consumer Product Developments

The first webinar that the French cMDF organised took place on the 23rd of November 2021 and was focused on promoting the “collaborative manufacturing” as a crucial, innovative and competitive engine in the consumer product developments.

For this end, we launched an online event/workshop via Zoom, where we hosted a FabLab and a startup to share their stories and experiences with collaboration methods and social manufacturing activities.





Figure 32: French workshop 1 webinar

We started the workshop by introducing iPRODUCE and its main objectives and challenges, since not all participants were familiar with the concept and what the project is trying to emphasize. Then, the representatives of the hosted FabLab “FabLivingLab”, Mr. Laurent Dupont, and the startup, Mr. Damien Subit, started sharing their experiences. We finished the event with a projection into our future actions and the opportunities that could be found in a project such as iPRODUCE.

Table 1: Participants and agenda of French workshop 1

Participants			
Registered	General Public & Makers	Startup	SME
22	17	2	3
Agenda			
11H00	MAT	- Presentation of the iPRODUCE project and French cMDF's partners	
11H10	FabLivingLab	- Feedback and presentation about what a FabLab could contribute to product development	
11H45	Tenkey	- Presentation of their experience having been supported by an industrial FabLab	
12H20	EXELCAR, VOSGES, MAT	- End of the official presentation - Opportunities for questions and interactions - Next steps and actions within iPRODUCE and French cMDF	

### 6.1.1. Workshop Contents

#### 6.1.1.1. Introduction to iPRODUCE

The webinar started with a brief iPRODUCE introduction, sharing with the participants different objectives and deliverables results related to the activities within this European project, presenting the French cMDF and its respective use cases and service offer, and introducing the other cMDFs and their activity sectors.

The main points that were discussed during those 15 mins introduction are:

- iPRODUCE project partners
  - 20 partners from 9 European countries
  - Partners composed of FabLabs, research centers, companies, SMEs, Industrials, Universities, etc.)
  - cMDF per country and sector
- Digital Platform
  - Introduction to the collaboration tools
  - Presentation of the platform's objectives : increase the engagement between the makers, entrepreneurs and stakeholders in a collaborative way, and make it easier and faster to co-develop a consumer product
  - Who has access to the platform and how its use could be helpful
- French cMDF's service offer
  - Strategic and financial support in the product development
  - Co-Design of the mobility product with the different French cMDF partners
  - Co-Prototype with the facilities and know-how of the cMDF FR
  - Testing and experimentation of the design/prototype with future potential customers
  - Manufacturing of the product thanks to the industrials network provided by the French cMDF stakeholders
  - Gaining and increasing the skill base during the process
  - Explanation of how the OpIS platform would contribute in each of these development steps

#### 6.1.1.2. FabLivingLab - Experience sharing

Starting with our hosted structures, the "Lorraine FabLivingLab" is a local FabLab from the east region of France that has a large experience in the support and development of innovative projects, from the idea to a prototype or product. Giving the fact that this webinar aimed to highlight the importance of collaboration in a social manufacturing platform such as a FabLab, the materials provided by the

speaker were just on point and focused on how the grouping of ideas and experiences from different makers within a social manufacturing platform could be beneficial on an industrial or professional level.

This first intervention was kicked off by a brief and quick presentation of the “FabLivingLab” which was created in 2014. It has added into its activities some known concepts such as the Open innovation, DIY, maker culture, Open-source hardware, user driven innovation, etc.

The “FabLivingLab” creates networks with different partners and stakeholders, connects them with the supported startup/enterprise and therefore accelerates the project development and the process behind it. In fact, they start by co-creating while implicating the users. This is usually done during a 48 hours brainstorming session at the end of each week, where hundreds of ideas would be emerged and proposed around specific problems, subjects or issues (Here we are talking about 2D sketches, or just idea description texts). Those ideas would later be sorted out, and the selected ones would pass to the prototyping phase where they are physically shaped (3D models and physical prototypes), tested by users, evaluated accordingly (Here we are considered in a 4D step where the product/idea could evolve with respect to time and users’ feedback), and verified with the project holders if they want to go further and industrialise those prototypes, because we can reach a complete but complex product which manufacturing could not be as profitable as hoped.

Applying the above strategy of development, the “Lorraine FabLivingLab” conducted several professional projects in different fields: IoT sensors to locate the bikes in cities, MoveGoo that focused on co-creating a new camera support that remains stable even when the cameraman is moving, etc.

Below some outcomes of the “Lorraine FabLivingLab” during their open innovation and collaboration projects:

## Societal outcomes

- Around 80 volunteers involved
- Complementarity between Living Lab & FabLab
- Complex Public Private People Partnership (PPPP) - culturally, geographically, technologically and temporally distributed
- Some challenges remain unsolved
- Maintain stakeholders’ motivation during a long-term process
- Industrial project with strong uncertainty (political, environmental, economical, etc.)

## Scientific outcomes

- Exploration of new questions
- Open-source hardware approach
- Tools and Methods for Collaborative Innovation Projects Engaging open communities describe in several scientific papers

Voir les publications sur : <http://linkybymakers.fr/>

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Figure 33: Outcomes of the “Lorraine FabLivingLab” during their open innovation and collaboration projects

### 6.1.1.3. TENKEY - Experience sharing

Passing into our next guest of this webinar, the startup “Tenkey” took the chance to present their new mobility product idea, the difficulties they had faced and in what did the collaboration help them accelerate their development.

In fact, the startup was aiming to produce “SideBIKE”, a new concept of urban transportation, specifically for bikes, by trying to add a new structure to it which would give the bike owner the chance of transporting kids, groceries, relatively heavy objects, etc.

First, they started by presenting the targeted market and customer bases and listing the major differences between soft and fuel engine mobilities highlighting the advantages and disadvantages of each with respect to their uses. Then, one of the co-owners went explaining how they got to meet with the industrial FabLab EXCELCAR, where they were introduced to the concept of “collaboration for innovation”.

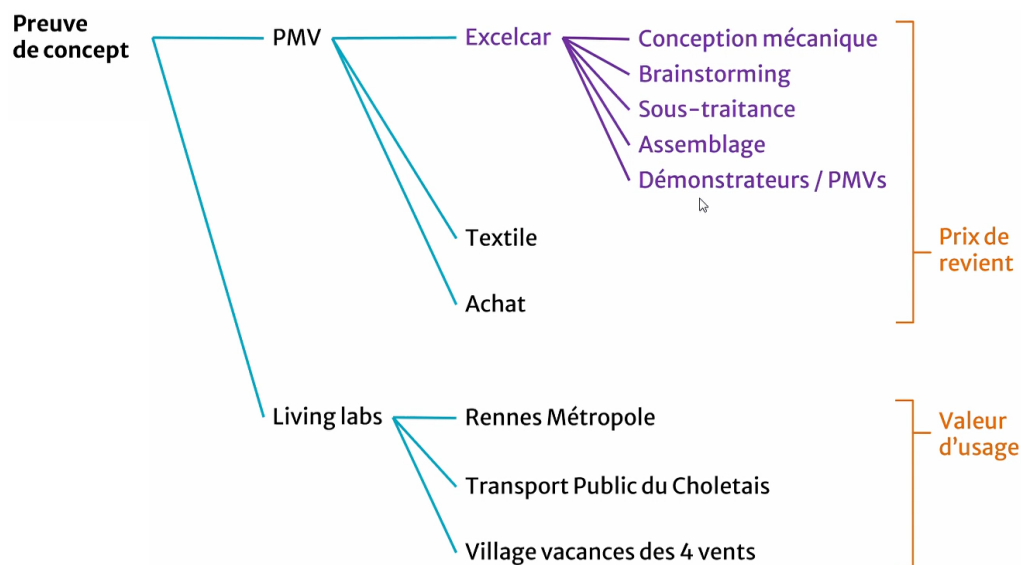


Figure 34: Market and consumer base of TENKEY

In fact, as every startup, “TENKEY” started by validating and proving the concept during many presentations they held with potential future users and mobility communities, then they decided to take the next step which consists of making a real size prototype considered as an MVP (Minimum viable product).

What they were searching for was a FabLab, given the fact that they needed a place where they could benefit from the experience of the stakeholder, work in a collaborative environment, and profit from an industrial background in the fields of engineering design, brainstorming, manufacturing, assembling, etc. So, they chose to partner with the industrial FabLab “EXCELCAR”.

How did they benefit from the collaboration they gained by working with the FabLab?

Since the startup’s product idea was just starting to rise, the list of specifications was incomplete and fluctuating in a sense that it varied and changed along with the process of development. In a case like this one, it was extremely difficult for them to find a manufacturer that’s ready to adapt with respect to the decisions taken during discussions and the market studies. The collaboration with the industrial FabLab was a great step since it gave them the chance of developing their idea while not being limited by mandatory immutable specifications.

### 6.1.2. Conclusion

This workshop greatly highlighted the impact that the collaboration could make in a professional product development, especially that the information came from the experience of experts and the feedback of actual project holders.

One of the advantages of simultaneous collaborations in the development phase is that it is relevant and highly recommended, in particular for new project ideas, because this can help accelerate the evolution of the product.

However, the disadvantage would be the ratio time/cost that could be relatively important in such collaborations. But this is common in mobility product development which is a bit critical given the certifications and standards that should be met in this field and activity sector.

## 6.2. Workshop 2: General Public Collaboration Workshop for a “DIY Wood Bike” Development



Figure 35: Final DIY Wood Bike

Basing our effort on the 2nd French cMDF use case, our next “collaborative training” was launched in the FabLab-VOSGES with the aim of testing what the general public and makers can achieve in the first place, and measure the impact that collaboration could make when working on a real life product idea, mainly in the mobility field, since it consists the core activity sector of the French cMDF second use case.

### 6.2.1. Workshop Contents

#### 6.2.1.1. Launching

The workshop specifications and conditions were prepared internally by FabLab-Vosges, under the same scope of the French cMDF partners as well as the iPRODUCE project. Those kinds of activities are often carried out in the FabLab, but this time we decided to put one of them under one iPRODUCE umbrella which is “collaborative workshop for innovation”, and to target a specific market in the mobility field: the Bikes customer base.

The workshop's conditions and specifications were to design, manufacture a prototype/sample of a micro mobility product, fully made in a social manufacturing platform such as a FabLab. This prototype will later be served as an example for testing with potential future users and a base on which a startup could rely to launch its activity.

The idea of the product should be innovative, uniquely designed, interesting and different from what's actually on the market.

### **6.2.1.2. One team, many contacts**

Once the participants started applying for a participation in that workshop, the members of the FabLab began selecting applications and grouping the makers in order to form one general team and many sub-teams, each would be in charge of a specific task in the work carried on.

A team of 10 makers was formed and was asked to finalise the development activities in only 2 and half weeks, taking into consideration that they only worked 4 hours per day on the project. However, the makers weren't alone in this mission. Instead, they had been put in contact with entrepreneurs, not exactly in the mobility field, who helped them think in a more business way, not only focus on the technical aspects, and rethink their decisions many times before confirming them.

They were also taking pieces of advice from experts in the wood industry, regarding which type of wood material would best suit their product, in terms of strength and cost.

### **6.2.1.3. Development phases**

The team members were grouped together to finalise the project in the best possible way. They were first briefly introduced to the iPRODUCE objectives, social manufacturing and the different partners within the project, talking through this presentation about the use cases under development and testing.

Secondly, instructions were given to them about how to conduct the multiple tasks related to the workshop, while highlighting and focusing on collaboration and innovation.

With the help of experts and entrepreneurs in the industrial field (not specifically in the mobility sector), the design phase began by matching and crossing ideas, selecting the best design that meets with the team's expectations, visiting industrials in the East region in France as "CIRTES", "INORI", "In'bô" and the mechanical engineering school "InSIC", benefiting from their know-how and expertise in the domain, searching and evaluating the appropriate materials to use, taking decisions during regular internal meetings and coming up in the end with the best possible design, given the fact that they are general public makers and not product designers.



Figure 36: Designing the bike



Carrying on, the next steps were respectively the programming of the manufacturing using CAM (Computer aided manufacturing) software, launching the manufacturing, assembling the different components and experimenting the functionality of the bike prototype that they have been able to finalise, in collaboration with the external stakeholders.



Figure 37: Bike construction

### 6.2.2. Results and conclusion

Creating professional working environments and connections for inexperienced mobility makers has been fruitful for both FabLab-Vosges and the general public team. In fact, to give more scope to this, the ultimate purpose for collaboration in the industrial field is to accelerate and help any project holder or entrepreneur efficiently develop their product idea, with or without having previous knowledge in the field they are working in. This workshop was for us a great example for testing this process and seeing how it actually meets our expectations.

The makers in fact put themselves in the place of the inexperienced project holder / client, coming up with a new concept that could be adopted as a startup idea later on.

However, having no experience in making a functional bike, the exchanges they had been able to have with the stakeholders listed above and the collaborative work helped them understand many critical aspects in bike developments, gain extra experience along the way and accelerate the process in order to meet the deadline we've fixed.

## 7. Collaborative Testing and Training within the German cMDF

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The German cMDF consists of three partners:

- Fraunhofer FIT (FIT). Fraunhofer is the largest society for applied research in Europe. The department Human-Centered Engineering and Design is focussing on all services that put humans in the center of technical developments. FIT is seeking to research novel ways of human-centered methodologies to build commercial services upon them.
- Makerspace Bonn (MSB) is the only open maker space in the city of Bonn. They provide know-how for many different kinds of prototyping methods. MSB offers different prototyping machinery and the know-how to use them. MSB is looking to professionalize their service portfolio.
- Zenit (ZENIT) is a business network, mainly focussing on the federal state of North Rhine-Westphalia. They provide the contacts that might be interested in the services, which are developed within the iProduce project.

Besides these three iProduce partners, Rossbach-Wojtun, one of the members of the German cMDFs core group, is important for the live prototyping service described in this document. Rossbach-Wojtun is a small company which focuses on professional assembly of components and coaching of solution strategies. After being customer in the second test run of the Live Prototyping service, they joined the team to develop this service further.

The main objective of the German cMDF within the iProduce project was to work out novel service formats that exploits the unexploited potential of maker spaces based on the example of the Makerspace Bonn. As such, the activities within Task T5.1 and Task T5.6 were to a huge amount driven by the German cMDF. Until M18, several service format concepts were thought up after a deep analysis and exploration phase. The second half of the project was used to set these concepts up as workshops and refine them iteratively. For this, several test runs with real external customers were performed. If the concepts proved to be useful, their drawbacks were analyzed and improved. If hard-to-overcome structural problems were identified during the test runs, these concepts were discontinued.

This chapter reports about the actual test runs of the two main services “Nerd Testing” and “Live Prototyping / Product Forge”. The actual analysis of the test runs and the resulting evolution of the concepts is described in Deliverable D5.2 - Assistive and Collaborative Designing Methods and Tools.

### 7.1. Nerd Testing Service

On 20 September 2021 the German cMDF organised a “Nerd testing” with the web-based app, [shapz.tv](https://shapz.tv). The service “Nerd Testing” means that software or hardware is tested by makers early on to find potential for the technical product optimization. The name “Nerd Testing” reflects the particular user group that makers constitute. Makers embody a special, very technology-savvy and open-minded user group. Companies can test their product with these people to find potentials to improve the usability and user experience of the product.



The “Nerd Test” was conducted to evaluate the product “ShapzTV”. “ShapzTV” is an online shopping platform under development. Products, mainly food, are presented by sellers in a livestream. Shoppers can buy the products during the presentation, sometimes cheaper than usual. The potential sellers are local food producers and suppliers. The potential buyers are people who want to interact with store owners and friends while shopping online. As the product development was still in an early stage, technical barriers, among other things, should be found and technically open-minded users addressed first. For this reason, the case was suitable as a test for the “Nerd Test”.

There were several steps to plan, conduct and document the “Nerd Test”. The first step was a preliminary meeting with the CEO and Co-founder of ShapzTV. The goal of this meeting was to get to know the product “ShapzTV”. This includes information about the potential user group, what the product is actually used for and in which context it is used. Moreover, the technical maturity level of the product was relevant. Based on this information a test-guide with a scenario and several test tasks was created and aligned with the founder. Makers from Makerspace Bonn were then recruited to conduct “nerd tests”. They had never heard of the product “ShapzTV” before, so they were not biased in this way. On September 20<sup>th</sup>, 2021, on-site tests, each lasting 60 minutes, were conducted with two makers. First of all, the makers received the printed scenario description and test tasks. They were given a smartphone and asked to read the scenario and perform the tasks one by one using the web-based app of “ShapzTV”. At the end, they were asked questions, among others, about the technical evaluation of the app. They were asked to speak all their thoughts aloud (via the thinking aloud method).

Two people from German cMDF performed the tests. One person moderated the test, and the other person documented the observation. All observations were listed in an Excel file. In the documentation of the test results, the violated interaction principles based on ISO standard 9241-110 were assigned to each of the critical findings (i.e., usability problems).

### 7.1.1. Scenario and Tasks

The following scenario and test tasks were given to the participants:

#### Scenario

*You are a coffee lover and want to buy special coffee beans regionally in your city. You prefer to buy items directly from your smartphone from your sofa, but you want a real shopping experience to see the environment live at the producer or retailer of the food.*

*A friend recently told you about the app “shapz.tv”, through which you can see products presented live via a vendor stream and also buy them directly, offering an interactive shopping experience from the comfort of your home.*

#### Test tasks

1. You want to see what “Shapz.tv” has to offer.  
Please go to the Shapz.tv website on your smartphone: <https://app-test.shapz.tv>.
2. You want to see coffee products from your favourite retailer Café Colonia.  
Please find a way to view coffee products from your favourite retailer Café Colonia.
3. Now you can start shopping.  
Please take a look at the picture of Café Colonia's products.

4. *You would like to have a look at the Coffee Crema in detail.*  
*Please look for a way to ask the seller for a demonstration in detail.*
5. *You think that your friends would also be interested in seeing the coffee presentation.*  
*Please invite your friends to the coffee presentation.*
6. *You would like to buy a Coffee Crema 500g.*  
*Please select the Coffee Crema 500g to buy.*
7. *You want to order the Coffee Crema now and have it delivered to your home.*  
*Please check your purchase and complete the order.*

*Thank you for your participation!*

### 7.1.2. Conclusion

Through the Nerd Testing, some critical findings were discovered that helped ShapzTV founder to further develop the product. During the testing, the test subjects assumed the role of "user" and "purchaser", respectively.

Concluding the feedback received from testers, when asked specific questions about the technical evaluation of the product, it was difficult for them to change their role from "user" to "technical expert." They focused exclusively on the interfaces and commented on the design, layouts and functionalities. Thus, the main learning is that usability tests performed by "nerds", dedicated tech-savvy users using think aloud methodology are well suited to identify critical use incidents. However, evaluating a product in the course of a nerd testing, both as a user *and* as a technology expert, is challenging and does not provide additional value. Therefore, this service offering has been neglected.

## 7.2. Live Prototyping Service - V2.0

The Live Prototyping Service (later renamed to "Produktschmiede" / Product Forge) was evolved over 4 test runs with different external customers. This section describes the actual test runs. For a detailed analysis of the Service Development, see the related chapter in D5.2.

### 7.2.1. Implementation of the first "Live Prototyping Service" with Company A (Name anonymized due to a non-disclosure agreement)

The goal of the "Live Prototyping Service" is to help companies with Design Thinking methods and prototyping skills and equipment to generate prototypes out of their ideas. Companies from the surrounding area come to the Makerspace Bonn to further develop their ideas in the live prototyping service.

The first company who was recruited for this was the company owned by Mr A. On 01.07.2021 a preliminary meeting was held. The goal of the meeting was to find out whether the "Live Prototyping Workshop" would support Mr. A. in the evolution of his company and should therefore be conducted with him. In 2020, Mr A. founded a company to bring products to the market in very broad fields. So far, he had many ideas, some of which are already in prototype status. Originally, Mr A. comes from the craft sector, as he had a sanitary company. Result of the preliminary meeting was the confirmation that the setting fits and that the "Live Prototyping Workshop" will be conducted with Mr. A. He assumed that structuring his ideas and developing a prototype would help him to develop his company further.

The “Live Prototyping Workshop” was held on 13.07.2021 at the Makerspace Bonn. After a short introduction, Mr A. shared essential information about his ideas. Mr A. was interviewed on his ideas and the value of the ideas for different stakeholders. The most important aspects of his idea were described and visualised. In the second phase of the workshop, the Innovation Matrix was introduced. This is a method to prioritise ideas based on the effort to realise them and the value of the idea for its user/customer. It turned out that Mr. A. had difficulties in applying the method. The reasons for this were that he found it difficult to evaluate his ideas according to "value for the customer". He himself felt that all ideas had a very high value for potential customers. By comparing high value to the customer with the increase in that person's quality of life from the product, the ideas could be placed in the matrix. In the end one idea with a high value for the user/customer and a low effort was selected.

Afterwards, Mr A. received a guided tour of the Makerspace Bonn. The employees of the Makerspace Bonn showed some projects. During the lunch break, different prototyping methods were discussed. After noon, the selected idea was presented by Mr A. Requirements for the product were defined and Mr A. and two employees from the makerspace started to build prototypes. With the help of various materials, for example, folding techniques were discussed that could be used for the product. Almost two hours later, Mr A. gave feedback and the workshop ended.



Figure 38: Prioritisation, using the Innovation Matrix



Figure 39: Prototyping Session at Makerspace Bonn

The methodical approach was intended to help Mr. A. prioritise his ideas and develop an idea further. However, it turned out during the workshop that Mr. A. would have rather expected a product pre-series as a result of the workshop.

### 7.2.2. Implementation of the second Live Prototyping Workshop with Rossbach-Wojtun

On 2 and 12 November 2021, the German cMDF organised a Live Prototyping workshop with Rossbach-Wojtun, an SME with approximately 10 employees in Rheinbach near Bonn (<https://rossbach-wojtun.de/>). The Live Prototyping Service was performed while having two all day in-person meetings in two stages.

The first meeting happened at the company premises. Two people from Fraunhofer FIT and one person from Makerspace Bonn went to Rheinbach. During the first hour of the meeting, the company owner presented the facilities and introduced his challenge. The focus of the first service stage lay on ideation and prioritisation.





Figure 40: Rossbach-Wojtun facilities



Figure 41: Results on the walls of the meeting room

During the next two hours, the three people from the cMDF, Mr. Wojtun (the CEO and owner of the company) and his deputy CEO gathered in a company meeting room and collected documentation of

the current product innovation process on post-it notes. This activity was based on journey mapping methodologies and moderated by Fraunhofer FIT. The session took 1,5 hours. While the initial intention of this exercise was to identify and prioritise the steps of the product innovation process that should be improved, the group realised during the discussion that expectations of the CEO had been different. The company's actual need was much more focused on understanding the opportunities related to 3D-printing technology.

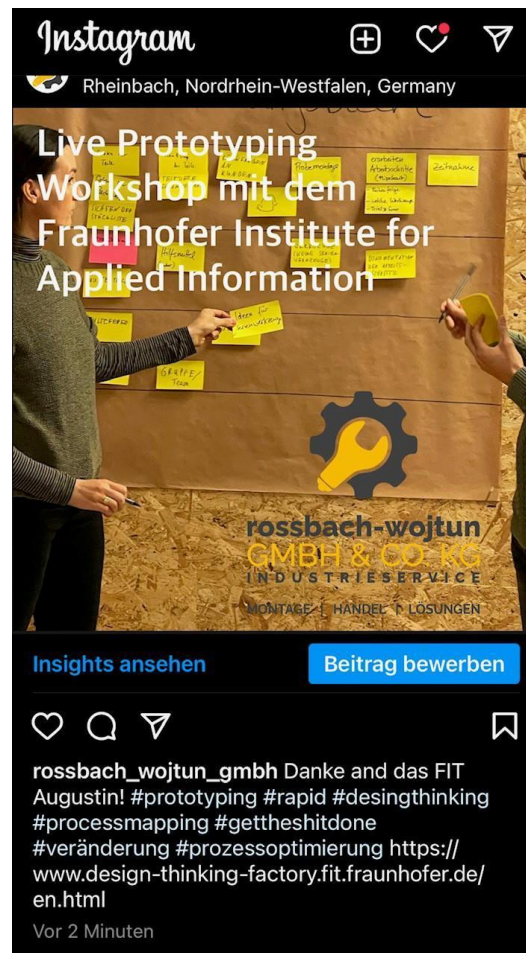


Figure 42: Instagram post from Rossbach-Wojtun, thanking the German cMDF for the workshop

Therefore, the second meeting was held at the premises of Makerspace Bonn. This 3-hours session provided the CEO with a deep-dive consultation on 3D-printing technology and allowed a satisfactory service experience. Additionally, the CEO of Rossbach-Wojtun showed interest in further contributing to improving the service offered by the German cMDF.

### 7.2.3. Implementation of the third Live Prototyping Workshop with Lisios

Lisios is a start-up, which plans to enter the market with a device that detects leakages in water pipes of buildings. The device shall be easily installable at a central position. It measures water flow and uses AI to detect pipe breaks and micro leaks.

A rough prototype already exists. The electronics are largely defined, i.e., there is a corresponding circuit board with the most important components and sensors. The backend infrastructure is in place,



so it can accept, store and process data from the device. The detection algorithm is designed, programming has to be done.

At the initial talk, Lisios made clear that they want to focus with us on the design of the actual device. There were still open questions about some components or functions (e.g., Bluetooth yes/no, which vibration sensor). The case design and material were still open. The mounting mechanism was not yet determined. Usability and handling issues should be focused when exploring these aspects.

We decided that the described setting does not need the full 3-day setup in which the Produktschmiede service is currently designed. The first day is usually about exploring and challenging a rough idea. Lisios had already completed this step by themselves before approaching us. Their main focus - details about the construction of the device prototype - is clearly equivalent to the second day of the Produktschmiede service.

So, on September 12th 2022, the two Lisios founders visited Makerspace Bonn. One Person from Makerspace Bonn was there to lead through the day. Also, one person from Rossbach-Wojtun joined. He could give input for details of series production. Also, he was there to gain background knowledge in case the third Produktschmiede day with Lisios would follow up.

The day started with a guided tour through Makerspace Bonn. During this session, Lisios and the Produktschmiede partners already explored which production machinery would work for the Lisios prototype. After that, the prototyping began. A prototype was iteratively produced in a combination of 3D printing and discussions.

At the end of the day, the partners agreed that Makerspace Bonn will produce a final prototype in the aftermath of the workshop.

#### 7.2.4. Implementation of the fourth Live Prototyping Workshop with Vintus

Vintus is a start-up company that is planning to introduce an intelligent desk chair into the market soon. The desk chair has movable parts, such as the seat or the armrests, which can be moved in order to trigger movements of the person sitting on it. The chair's goal is to initiate more movements for people who sit a lot during their workday, for a better health setting. A prototype of the chair exists. Vintus wanted to use the Produktschmiede service for exploring with us how a lower-priced solution for the same goal of healthier conditions at desks could look like.

On September 25th 2022, two persons from FIT and one person from Makerspace Bonn went to the Vintus office to hold the first workshop day with the two Vintus founders. The Makerspace Bonn employee acted as participant in all sessions, providing an unbiased outside point of view on the domain. At the same time, this participation helped him better prepare the planned second day of the Produktschmiede service. The two FIT people shared their job to act as moderator and additional participant.



Figure 43: User Journey Map Session



Figure 44: Target Definition Session

The group started with a User Journey Map for analysing the process, pain points and touchpoints of typical office work. After collaboratively defining a “How might we...” question, they came up with first ideas in a Design Studio session. The results were then structured using an Innovation Matrix. Since the two founders were not able to make a decision on what to prototype on the other two days of the Produktschmiede service, we added a Round Robin session for trying to overcome the question of how to implement the preferred underlying idea in a different device.



We ended with a retrospective and an inspection of the existing chair prototype.

A final decision on what to prototype on the second day of the Produktschmiede service was not taken by the founders. We agreed that they should follow-up with that decision in a week's time. One week later, Vintus informed us that they don't need the other Produktschmiede days at the moment because all of the promising ideas don't involve hardware prototyping.

## 8. Conclusions

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This deliverable extends and completes the explorative and conceptual work that has been carried out in the first half of the iProduce project in Task T5.6, which was described in Deliverable D5.11 - Collaborative Testing and Training Sessions.

D5.11 described the initial steps for defining and identifying how collaborative services in the iProduce cMDF environments could look like. For this, the document described exploratory studies of the German and French cMDF and then the first service prototypes of the German cMDF, since this cMDF has a dedicated focus on service definition. D5.12 has shown how this work was extended to the other cMDFs by presenting the conducted collaborative services and training sessions of the Spanish, Italian, Greek and French cMDF. At the same time, this document has reported on the finalization of the collaborative service development of the German cMDF.

The Spanish cMDF focussed on discussing the iProduce platform with potential users. Besides some suggestions for improvement, the important feedback was that the platform and ideas are of interest for the intended user group. In addition, prototypes for the Habitat Fair were produced.

The Italian cMDF achieved to establish a preliminary community over a set of introductory workshops. This community started experimenting with the use cases of the Italian cMDF and disseminating the activities of the established core group.

The Greek cMDF continuously conducted user workshops during the development of several medical products. This user engagement led to the production of fully functional prototypes of an orthopedic back brace, splints for fractures, splints for pets and customized face shields. In a training session with 5th and 6th grade school students, their engagement in the creation and manufacturing of real objects was encouraged by enabling the students to come closer to cutting-edge technologies. A consultation workshop with an ambassador could be used to collaboratively test and train local communities to use the digital tools and collect feedback for user experience and usability aspects.

Through a set of collaborative workshops, the French cMDF achieved to highlight the interesting contribution that a FabLab could have in a consumable product development as well as to focus on the importance of collaboration between different stakeholders, support the role of knowledge exchange and transfer for entrepreneurs in gaining extra skill sets while developing their product, and to promote how a FabLab can positively impact the design, the thinking process and decision making in a consumable and innovative product development. Furthermore, in a second series of collaborative manufacturing workshops, the French cMDF managed to have a group of citizens without prior knowledge to build a functional wooden bike.

The German cMDF translated the concepts of two novel services into actual workshops that were tested with external customers. While the Nerd Testing service did not prove to provide enough additional value, the Live Prototyping / Produktschmiede service was continuously evolved over the set of four test runs. This resulted in a stable evaluated novel service format, ready to be provided by the German cMDF. An external company (Rossbach-Wojtun), which acted as test client during the second workshop, joined the team as part of the German cMDFs core group. Rossbach-Wojtun provides one part of the 3-step process of the service.



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