March 2023

IO4 Pilot validation and mainstream of the innovative tools for the interconnection of CTCIs through 3D Printing

Final piloting report

access-3DP

Art & Creative Craft Enterprises for Successful Streaming of 3D Printing

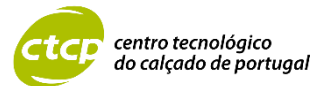| Authors and contributors	
Chamber of Crafts of the Auvergne Rhône Alpes region	France
Technical Research Centre of Furniture and Wood of the Region of Murcia	Spain
Portuguese Footwear Technological Centre	Portugal
Technical University of Kosice	Slovakia
Styrian Technology Park	Slovenia

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INTRODUCTION

The [ACCESS-3DP](#) course was designed to deliver training material related to Advanced Manufacturing (AM), concretely 3D printing and Advanced Industrial Robotics. It is aimed for different target groups: professionals, workers, entrepreneurs, students, VET providers, universities, unemployed, local education authorities, policymakers, and other relevant stakeholders from traditional sectors.

It comprises six modules and each module ends with a test of knowledge assessment.

The features as well as the content of [ACCESS-3DP e-learning platform](#) which is the main supporting tool for the course were tested not only by the project team members of particular cooperating countries but also by the future potential users, representatives of the target groups.

The following document provides the data and their description about the feedbacks received and potential change requirements, which have been identified during the pilot testing of the platform.

1. PILOT TESTING: THE APPROACH ADOPTED IN THE PARTNER COUNTRIES

The testing phase was conducted in all countries participating to the ACCESS 3DP project – France, Portugal, Slovakia, Slovenia and Spain during the period from November 2022 till the mid-February 2023.

Within the following sections you can find more details about the methodological approach adopted and the results achieved.

FRANCE

Coordinated by Chamber of Crafts of the Auvergne Rhône Alpes region (CMAR ARA)

First, the project team contacted colleagues from different departments who have an interest in 3D printing applied to the craft sector and invited them to test the platform. This was important for the Chamber, as nowadays it is a much larger organization with respect to the beginning of the project: before the merging, the coordinator were covering only one local department (Rhône). Today, the chamber is extended to the whole Auvergne Rhone Alpes region, covering all its 12 departments.

The project team also contacted craft entrepreneurs in the CMA network who had already expressed an interest for the topics of this project – mainly by phone and email.

In addition, the team contacted local and international actors with different profiles, such as engineers, local development officers, industrial experts, who were potentially interested in the contents of the platform

Finally, the team followed up all the target users, mainly by phone and email, to get feedbacks on their user experience on the platform, the format and contents proposed, the translated version, etc.

SLOVENIA

Testing phase in Slovenia was coordinated by Styrian Technology Park (STP).

To test the new e-platform in the ACCESS-3DP project, STP approached all those who would be interested in training and expressed an interest in 3D printing, in two ways:

- The first way was through our mailing list, where all the partners, stakeholders we have worked with so far in the Styrian Technology Park are listed.
- The second way was through social networks (via our facebook page), where we invited everyone to participate in the e-learning content and website that we prepared in the project. For this reason, since most people use social networks, we decided to present and increase the visibility of the ACCESS-3DP project.

SPAIN

Testing phase in Slovenia was coordinated by Technical Research Centre of Furniture and Wood of the Region of Murcia (CETEM) with a double approach:

- Contacting their network by email to invite them to take part in the course.
- A more generic approach of attracting more stakeholders through social media.

PORTUGAL

The pilot in Portugal was coordinated by Portuguese Footwear Technological Centre and included 3 different approaches:

1) To launch the online course to CTCP companies, VET providers, associations and other stakeholders database. CTCP used its regular channels – newsletter, website, circulars to the industry, social media, association monthly journal ([Formação Online em Impressão 3D | Noticias | CTCP](#) ; [CTCP NOtícias](#) ; [CTCP Notícias](#) ; [CTCP promove ciclo de workshops sobre ferramentas digitais 3D | Noticias | CTCP](#) ; [Jornal APICCAPS - Publicações | APICCAPS](#)) - to communicate the ACCESS 3DP online course and the related training opportunity. This communication envisaged to motivate the potential users to experiment

the online course, to register and to select the most adequate training path and to provide feed-back for future improvements.

3) To organise physical workshops dedicated to different modules of the ACCESS 3DP course, namely: Design 3D, 3DP technologies and materials, and 3DP different applications 3DP and Advance Industrial Robotics; Design Thinking. This approach has also two purposes: first to test the training material in a face-to-face format, converting the online presentations into short term workshops of 3 hours each; second to motivate the target-audience to enrol in the e-learning experience. Both formats envisaged to capture feed-back of the target-audience and to provide inputs for a possible improvement of the deliverables, during project lifetime. This pilot approach consisted in 6 short-term workshops held in 2 different locations - 4 in CTCP premises in S. João da Madeira, the headquarters, covering the previously mentioned training modules, and more 2 in Felgueiras, dedicated to Design 3D and 3DP technologies and materials. Some of the participants attended all the workshops. Together more that 50 participants attended the physical workshops.
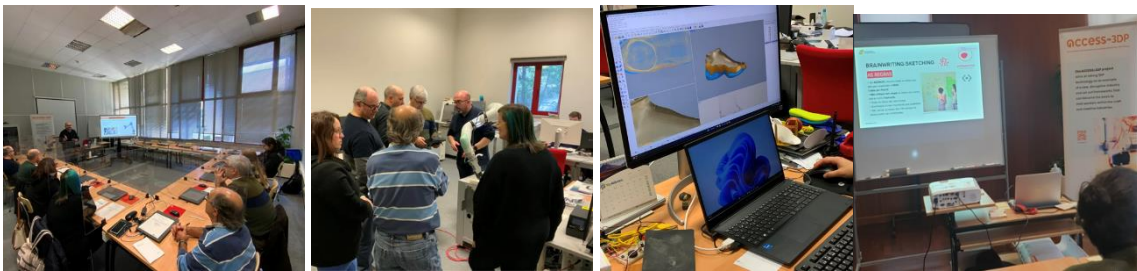
3) To hold a final seminar where the project and deliverables have been disseminated and the 3D Printing technology, materials and application have been discussed by experts and companies technicians and entrepreneurs. The feed-back of the training experience collected from target-audience enrolled after the final seminar came to confirm the interest and adequacy of the online course for the industry, specially for footwear, components and leather goods industry in Portugal.

SLOVAKIA

Under the leadership of the project team representing Technical University of Kosice (TUKE) the testing of the training course has been conducted. For dissemination and cooperation we have been searching for the potential interested future users mainly via traditional channels presenting the activities of the innovation activities within our region as our

institutional website and social media accounts presenting the university and also our **University Science Park TECHNICOM**.

Created was also the special website https://creative3dp.eu/ dedicated not only to the access-3DP project but generally to the topic of 3D-printing and additive manufacturing in general providing the **thematic content in national – Slovak language**.

Very effective was also cooperation with our regional stakeholders – members of regional innovation ecosystem, as e.g. Slovak Business Agency – the main business support entity in Slovakia providing wide range of services for the SMEs.

2. OVERVIEW OF RESULTS GATHERED VIA THE EVALUATION SURVEY

Once tested the platform, during the pilot phase the users were invited to fill an evaluation survey (see Annex 1). The results of it are presented in the following chapters.

Overall, the first version of the course was assessed within the questionnaire by 39 users, with the most participants coming from Slovakia and Spain.

Table 1 Age and country of the pilot users

Age and country of the pilot users						
	France	Portugal	Slovakia	Slovenia	Spain	Total
18-22 years old		2			1	3
23-32 years old	3	2	3	2	3	13
33-42 years old	2	1	5	3	3	14
43-52 years old			1	3	2	6
53 or older		1	1		1	3
Total	5	6	10	8	10	39

As we can see on the chart below, the topic was the most attractive for middle-aged professionals while older participants were just a few. The share of young people taking part in the pilot phase is quite low, which is in line with the fact that the learning course was designed primarily for professionals and active representatives of the craft and creative industry.
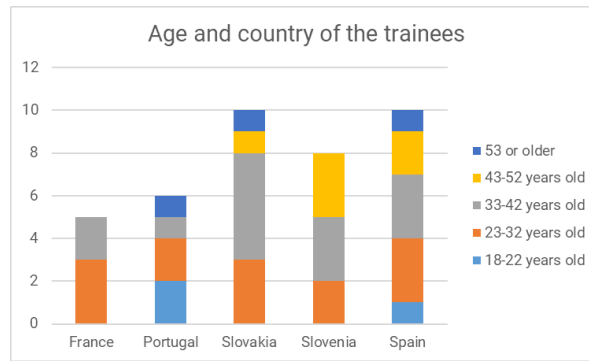
Figure 1 Age and country of the trainees
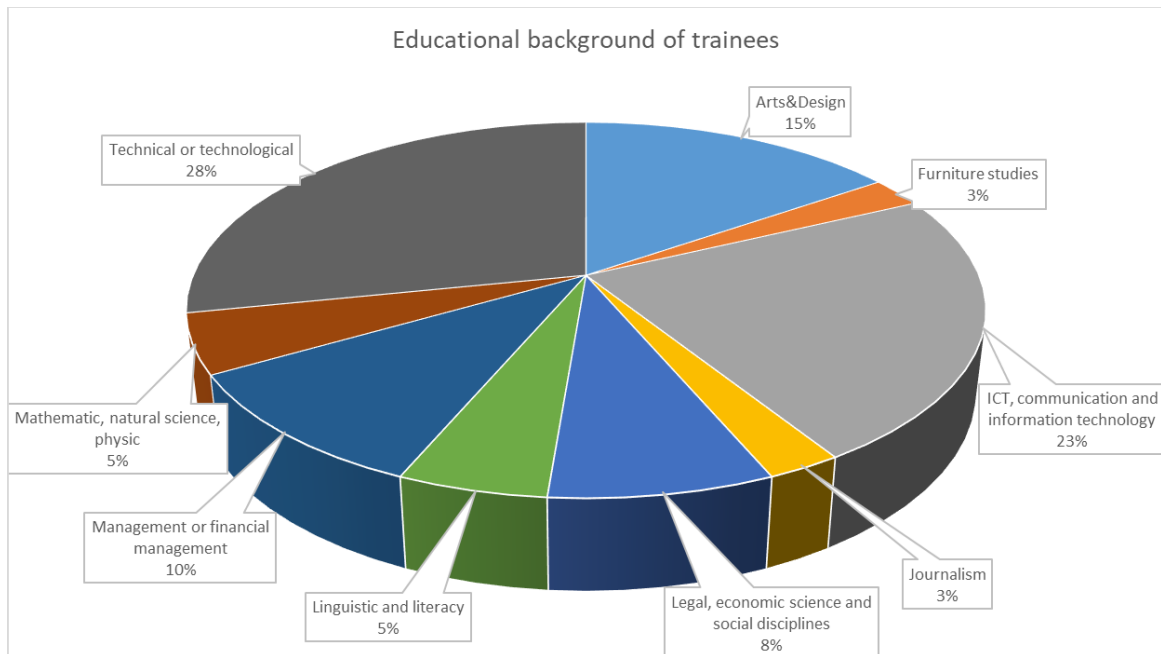

Figure 2 Educational background of trainees

Most of the participants have previous experience with the 3D printing training, though approximately 30% of users had no previous experience. Overall, we can consider it as a good testing pool.
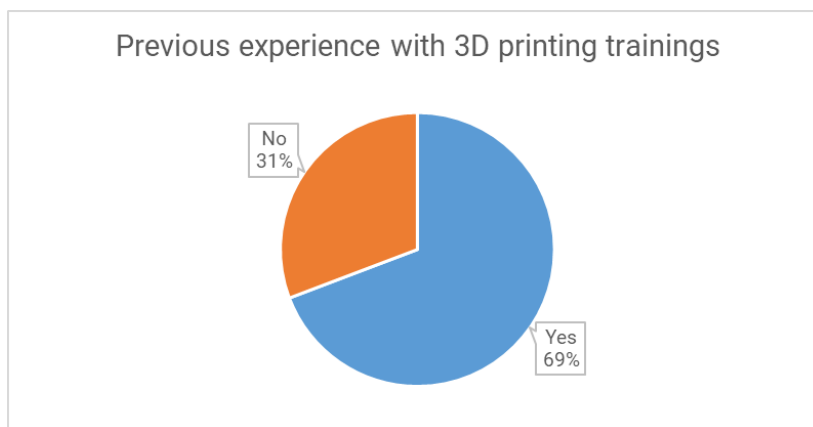
Figure 3 Previous experience with 3D printing trainings

As for training paths tested, the most demanded were, "*TP1: ACCESS-3DP for professionals, workers and entrepreneurs*" and "*TP2: ACCESS-3DP for students, VET providers, universities and unemployed*". They were both assessed by 12 survey participants.

Table 2 Training path selected by trainees

Training path selected by trainees						
	France	Portugal	Slovakia	Slovenia	Spain	Total
TP1: ACCESS-3DP for professionals, workers and entrepreneurs	1		4	4	3	12
TP2: ACCESS-3DP for students, VET providers, universities and unemployed	2	1	4	2	3	12
TP3: ACCESS-3DP for other relevant stakeholders from traditional sectors, local authorities, policy makers, etc.			2	1	3	6
TP4: ACCESS-3DP for open-access course	2	5		1	1	9
Total	5	6	10	8	9	39

Within the Slovakia, Spain and Slovenia participants also selected *TP3: ACCESS-3DP for other relevant stakeholders from traditional sectors, local authorities, policy makers, etc.* while the possibility for random choose of the training modules, included in *TP4: ACCESS-3DP for open-access course*, has been selected by 9 participants.
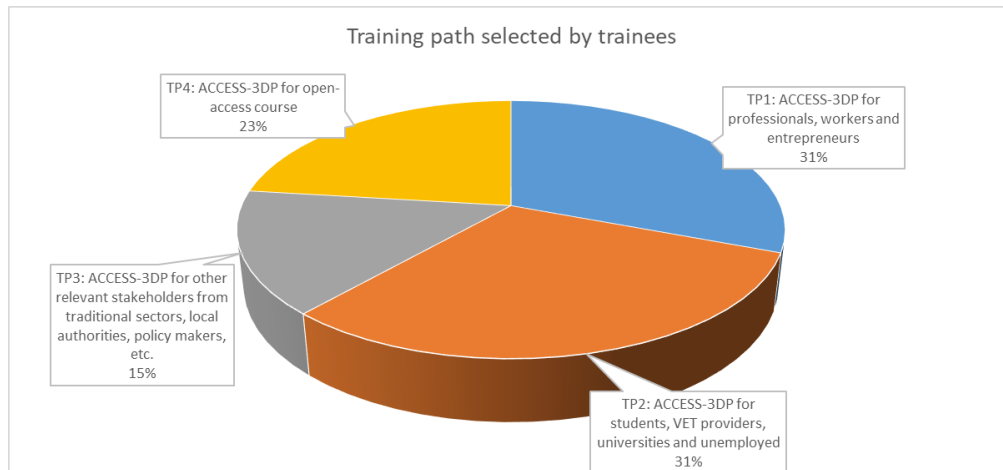
Figure 4 Training path selected by trainees

The ACCESS 3DP training course is composed by 6 thematic modules:

- M1- Innovation process applied in traditional sectors
- M2- Design Thinking & Skills
- M3- 3D Printing & Production Process
- M4- Current processes- Different fields of application
- M5- Entrepreneurship and 3D Printing – New Business Ideas
- M6- Advanced Industrial Robotics applied in crafts

The **most attractive training module** was **Module 5 Entrepreneurship and 3D Printing – New Business Ideas**, which was chosen by 38 out of 39 participants in the pilot phase.

The second most selected module was the one on Innovation process applied in traditional sectors (Module 1), selected by more than **50% of participants** who took part in the survey. Module 3 and Module 2 describing the design of the new products and services and following the 3D printing production process attracted 20 and more participants each.

Table 3 Modules completed by trainees

Modules completed by trainees						
	France	Portugal	Slovakia	Slovenia	Spain	Total
M1	2	5	10	6	8	31
M2	1	2	8	5	4	20
M3	2	4	8	5	5	24
M4	1	2	5	3	3	14
M5	6	6	10	6	10	38
M6	3	3	5	3	5	19

Among the participating countries, no major differences within the preferences have been identified.
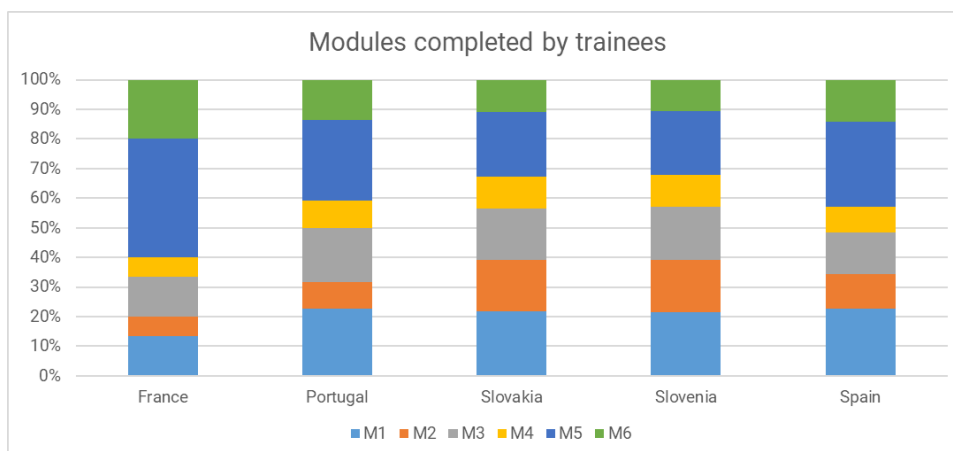

Figure 5 Modules completed by trainees

As we can see according to the table below, 11 participants completed all 6 modules. These participants provide us with a good base for the assessment of the course. Almost 50% of the all trainees who provided us feedback within the survey succeeded to complete one or even two modules.

Table 4 Number of modules completed by trainees

Number of modules completed by trainees						
	France	Portugal	Slovakia	Slovenia	Spain	Total
All modules		2	5	3	1	11
1 module		3	2	3	1	9
2 modules		3	2	3	1	9
3 modules		1	3	1	2	7
4 modules	1				2	3
5 modules						0

In the table below we can see the rating of the agreement with the particular quotations about the specific aspects of the training. The assessments have been provided on the scheme 1-5, with **1 represents strong disagreement and 5 strong agreement**.

According to the ratios, the overall average value stands around 4 expressing an overall positive feedback of the pilot trainees.

Table 5 Rating of the agreement with the particular quotations about the specific aspects of the training

Quote	Rating

The content is well structured	4,05128
The materials complete and covers well the topic of interest	4,05128
The material is corresponding to the learning goals	4,05128
The content was interesting and informative	4,20513
Materials are designed so that learners can apply gained knowledge	3,94872
Visuals and pictures break up the text and help the learner to understand the material better	4,07692
The quality of the interactive tools and video is good and conveys effectively content and interaction capabilities	4
The different media and interactions (non-pdf) are well integrated and easy to use	3,89744
The assessment tests are clear, useful and correspondent to the learning material	3,89744
I received the necessary information, and I was able to plan my involvement in ACCESS-3DP learning process	3,87179
The estimated time to complete the learning units is realistic	3,53846
The information on how to access and navigate the platform is intuitive and easily accessible	3,94872
It is easy to understand where I am within the e-learning platform architecture	3,87179
The ACCESS-3DP training program met my expectations	3,87179

The overall positive assessment of the trainees is illustrated also by the questions for which the answers are reported below. In this case, the assessment scale was 1-10, where 1 represented extremely poor assessment and 10 excellent solutions.

Table 6 Overall assessment

Overall assessment					
France	Portugal	Slovakia	Slovenia	Spain	Total
7	7,83	8,7	8,75	7,6	**8,33**

Following the very good assessment of the trainees, it is not surprising that all of them recommend the training.

Table 7 Recommendations of the training

Recommendations of the training						
	France	Portugal	Slovakia	Slovenia	Spain	Total
Yes	5	6	10	8	10	**39**
No	0	0	0	0	0	**0**

Additional comments about the course content and platform technical features

Within the survey we have provided the participants also with the possibility to express their thoughts about possible improvements of the course and so identify problems or missing content. After the analysis of the provided feedback we have identified 4 core topics for future modification leading to the better experience of the trainees.

The first recurrent feedback coming out from the survey regards **the complexity of the training**. The trainees understand the need to present important information, but considering the amount of content, it is quite **demanding for them to stay focused**. A possible solution to improve the overall user experience could be **more detail structuring split to content into shorter segments**. By preparing more detailed topics the trainees could also have the possibility to go over the course in shorter sessions.

Regarding the **form of the study materials**, we have observed the **significant preference for videos**. The trainees demand the study content in the form of videos, which seem to be more comfortable for study purposes.

The received comments also demand more **real case studies of new business models with 3D printing and practical experience description**. Users find this type of content very useful, as it allows them to understand more easily the meaning of time and finance costs. Case studies are also regarded as a source of good inspiration for the technologies thanks to their application in various forms of products and services. Also, the thematic **aspects of circularity within 3D printing** have been mentioned in line with the demand of transition to the green economy.

As proved in other online platforms, the users can be highly motivated by **gamification features** providing the fun form of the study as well as assessment of their knowledge gained within the course. Additional **interactive questions/tests** including pictures and videos can help to increase the overall encouragement of the trainees to provide more time to study within our online course.

3. THE OVERALL PLATFORM USE DURING THE PILOT PHASE

Table 8 Platform users

Platform users	
Albania	2
Australia	1
Brazil	1

France	12
Chile	1
Italy	1
Portugal	30
Slovakia	12
Slovenia	15
Spain	18
Overall	**93**

Overall, during the pilot phase 93 users registered for the beta version. They were the first testers of the course developed during the project ACCESS-3DP. During the testing phase, the course attracted participants from the target group representatives not only from the project participating countries, but also from Albania, Australia, Brazil, Chile and Italy.

The 31 platform users did not select the training path that can be explained by their general, not specific focus on the topic, just wanted to get a little more information about the course or didn't have time to explore our training more.

Those who decided to select a concrete training path, made their choice mainly for training *TP1: ACCESS-3DP for professionals, workers and entrepreneurs* and *TP2: ACCESS-3DP for students, VET providers, universities and unemployed*.
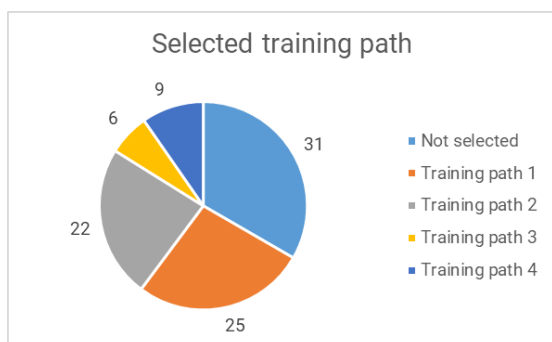

Figure 6 Selected training path

Just 6 users preferred *TP3: ACCESS-3DP for other relevant stakeholders from traditional sectors, local authorities, policy makers, etc.* while 9 users selected *TP4: ACCESS-3DP for open-access courses*.

Table 9 Selected training path

Selected training path					
	Not selected	Training path 1	Training path 2	Training path 3	Training path 4
Albania	2				
Australia					1
Brazil	1				
France		4	3		5
Chile	1				

Italy			1		
Portugal	18	8	3		1
Slovakia	2	3	4	2	1
Slovenia	4	5	5	1	
Spain	3	5	6	3	1
Overall	31	25	22	6	9

The analysis of the modules, which have been used by users, showed us that the most selected were Module n.1 Innovation process applied in traditional sectors. According to this fact, we can conclude that many participants just started their usage of the platform and education via our course.
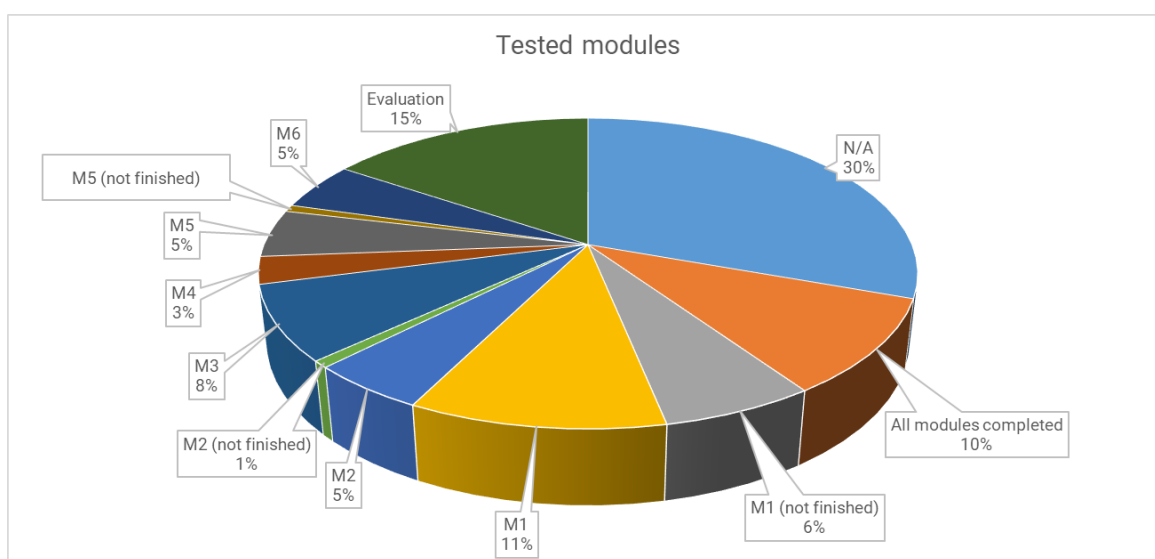

Figure 7 Tested modules

The following table provides detailed data about the selected and completed modules within the countries who took part in the testing phase.

Table 10 Tested modules

Tested modules						
	France	Portugal	Slovakia	Slovenia	Spain	Other countries	Total
N/A	2	24	2	6	5	4	43
All modules completed	2		5	4	3		14
M1 (not finished)	5	1	1		2		9
M1	1	2	4	3	3	2	15
M2	1		2	2	2		7
M2 (not finished)					1		1
M3	2		1	2	5	1	11

M4	1				3		4
M5	4				2	1	7
M5 (not finished)					1		1
M6	3				3	1	7
Evaluation	3	5	6	3	5		22

Regarding the situation among the various regions we can see that there are significant differences within the preference of the modules and the rate of completion. We can see that users from other than project countries probably just explored the course, without choosing a particular module to study. This behaviour is also observable in several users from Slovenia and Portugal.

On the other side, most of the users from Slovenia and Slovakia completed all the modules. The distribution of all modules within the rest of the users is quite balanced.
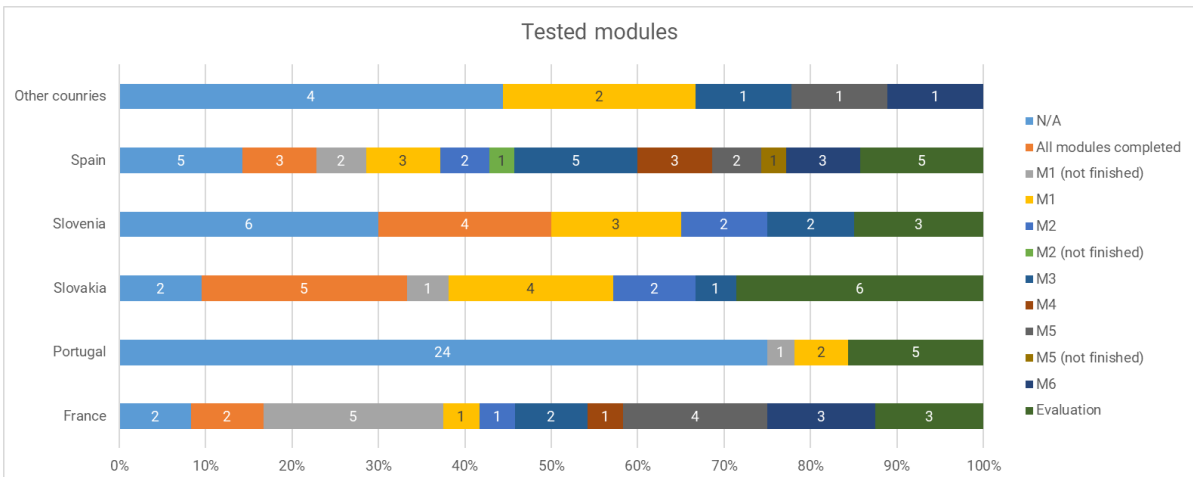
Figure 8 Tested modules - distribution within countries

4. MODIFICATIONS FOLLOWING THE PILOT PHASE

After analyzing all answers and comments received, the project consortium decided split comments and recommendations in 2 categories:

A. The ones that was possible to address immediately, i.e. before the end of the project implementation (ending in March 2023):

- The national languages courses have been simplified with only content translated to not mix and confuse users.

- Based on a final review that Partners will do of their language versions, corrections in terms of spelling and grammatical mistakes will be made to the platform.
- Website link on all the presentations have been modified for the proper one.
- Some slides where the text was overlapped with images have been modified according to a better understanding.
- Some assessment questions were modified in order to a better understanding of the meaning.

B. The ones needing more time to be addressed. Indeed, some suggestions/recommendations required actions in the medium/long-term, beyond the end of the project period. Some of them are:

- Add more practices examples
- Integration of other technologies such VR or AR to learn Advanced Manufacturing.
- Additional funding to develop new projects with the aim to continuous fostering Advanced Manufacturing (ACCESS-3DP and Advanced Industrial Robotics) through a more dynamic and disruptive approach (videos, infographic, micro-pills, etc.)

CONCLUSIONS

The pilot testing phase followed the plan defined within the project proposal and later defined in detail within the project consortium.

The participation of 39 users from various countries within the survey focusing on the content of the training course and features of the interactive educational platform provide the consortium with a very good opportunity to get the feedback from the first users. The pilot phase also allowed us to identify possible improvements for the future.

For the future, the partners will analyse the possible updates regarding the more detail structuring of the content (splitting to content into shorter segments), transfer of the study materials into the form of video recordings as well as providing additional content focusing on the demanded thematic of real case studies of new business models with 3D printing and any other practical experience description. We have also identified the importance of the transition to the green processes and so cover mode the aspects of circularity within 3D printing.

ANNEX 1 – EVALUATION SURVEY

TESTING ACCESS-3DP TRAINING EXPERIENCE

Introductory text:

The ACCESS-3DP team is committed to improving the platform and the training materials you have experienced. Therefore, after testing the ACCESS-3DP training materials and the e-learning platform, we ask you to fill in the following evaluation questionnaire.

The questionnaire will propose you some quotes and for each of them, you can report how much you agree with them using a scale from 1 (I do not agree at all) to 5 (I fully agree).

In addition, your opinion matters to us, so you will have the opportunity to write free comments and more detailed answers to better clarify your point of view and give your feedback about how to improve the ACCESS-3DP e-learning experience.

This questionnaire is in English, and we prefer answers in English, but if you are more comfortable by writing in your own language, you are allowed to do so in French, Spanish, Slovenian, Slovak and Portuguese.

Thank you!

Your profile:

1. What is your age?*
   - Under 18 years old
   - 18-22 years old
   - 23-32 years old
   - 33-42 years old
   - 43-52 years old
   - 53 or older

2. Where do you live (country)?*

3. Are you currently*…
   - Student
   - Unemployed
   - Employee or self-employed
   - Business manager
   - Researcher/Professor
   - Educator/Trainer/Teacher

- Public authority
- Consultant
- Other (please specify)

4. What is the name of your institution/company/university, etc.?

5. What is your educational background?*

   - Legal, economic science and social disciplines
   - Mathematic, natural science, physic
   - Technical engineering (mechanical, bio-engineering, plant engineering, etc.)
   - Management engineering
   - ICT, communication and information technology
   - Linguistic and literacy
   - Other (please specify)

6. Is ACCESS-3DP your first training experience into 3D printing and Advanced Industrial Robotics?*
   - Yes
   - No

Evaluation of the material:

1. Which training path did you attend?*

   - TP1: ACCESS-3DP for professionals, workers and entrepreneurs
   - TP2: ACCESS-3DP for students, VET providers, universities and unemployed
   - TP3: ACCESS-3DP for other relevant stakeholders from traditional sectors, local authorities, policy makers, etc.
   - TP4: ACCESS-3DP for open-access course

2. Which modules have you completed?*

   - M1 (Innovation Process in Traditional Sectors- Design and 3DP)
   - M2 (Design Thinking and Skills)
   - M3 (3D Printing and Production Process)
   - M4 (Current Process- Different Fields of Applications)
   - M5 (Entrepreneurship and 3DP – News business Ideas)
   - M6 (Advanced Industrial Robotics applied in crafts)

3. Please evaluate the following quotes:

	1- Strongly disagree	2- Disagree	3- Undecided	4- Agree	5- Strongly agree
The content is well structured					
The materials complete and covers well the topic of interest					
The material is corresponding to the learning goals					
The content was interesting and informative					
Materials are designed so that learners can apply gained knowledge					
Visuals and pictures break up the text and help the learner to understand the material better					
The quality of the interactive tools and video is good and conveys effectively content and interaction capabilities					
The different media and interactions (non-pdf) are well integrated and easy to use					
The assessment tests are clear,					

useful and correspondent to the learning material					
I received the necessary information, and I was able to plan my involvement in ACCESS-3DP learning process					
The estimated time to complete the learning units is realistic					
The information on how to access and navigate the platform is intuitive and easily accessible					
It is easy to understand where I am within the e-learning platform architecture					
The ACCESS-3DP training program met my expectations					

4. Do you have any recommendations to improve the learning material of the course?

…

5. If you have any comments linked to the question on content, layout or structure, please provide feedback or recommendation here.

…

6. If you have any comment linked to the time and planning of the learning, please provide a recommendation here.

…

7. If you have any comment linked to the learning platform and its technical aspects, please provide recommendation here.

…

8. All in all, how do you rate the ACCESS-3DP course?*

       1 (extremely poor) … 10 (excellent)

9. Would you recommend the ACCESS-3DP platform and training course to other people?*

-   Yes
-   No

10. Any other comment?