EXAV4.0

THE EXCELLENT ADVANCED MANUFACTURING 4.0

LABS FOR ADVANCED MANUFACTURING Validation Report

Piloting the Advanced Manufacturing workshop 4.0

01

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EXAM 4.0 partners:

TKNIKA – Basque VET Applied Research Centre, CIFP Miguel Altuna, DHBW Heilbronn – Duale Hochschule Baden-Württemberg, Curt Nicolin High School, Da Vinci College, AFM – Spanish Association of Machine Tool Industries, 10XL, and EARLALL – European Association of Regional & Local Authorities for Lifelong Learning.

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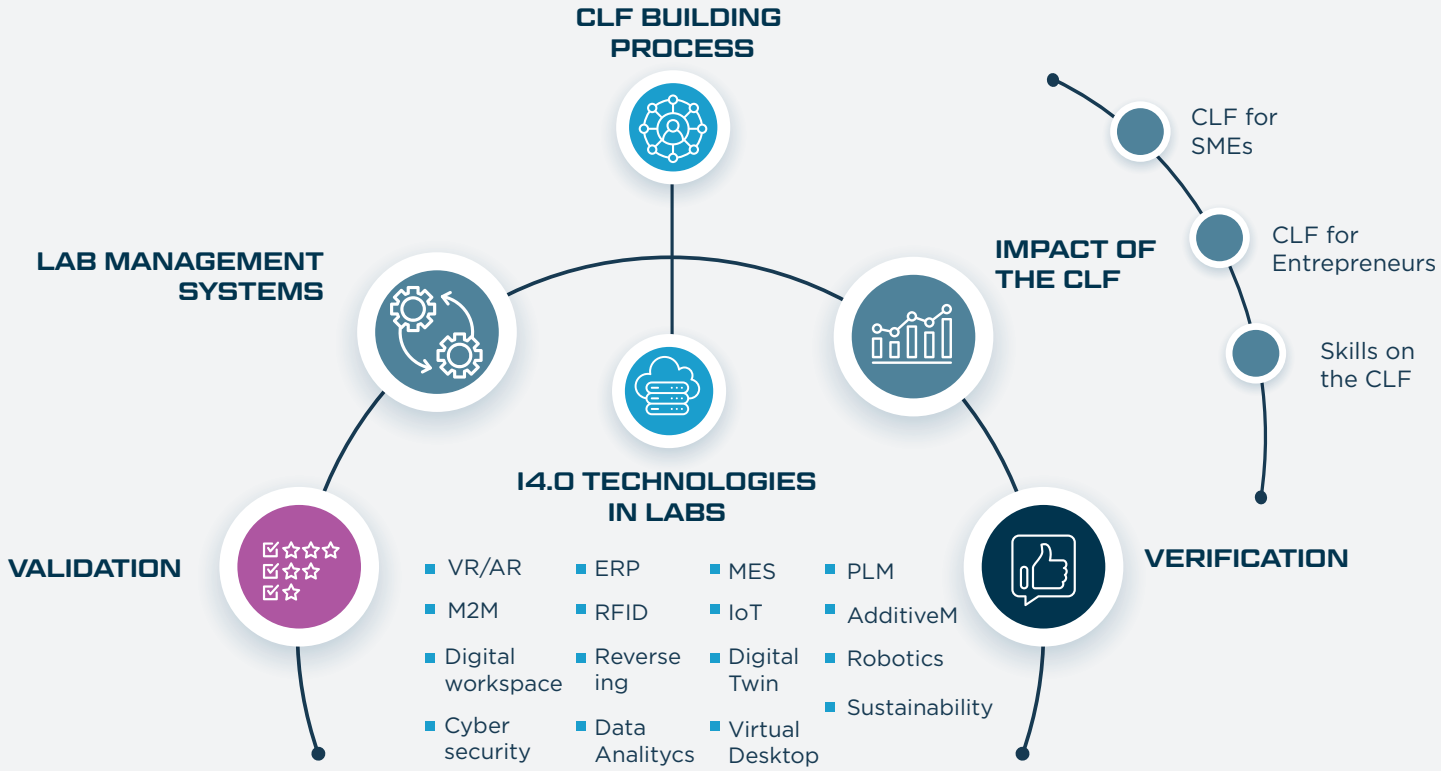
Introduction

EXAM 4.0, defines and describes the main features a lab for Advanced Manufacturing education should have (EXAM4.0 , 2020). It also proposes the technological and competence frameworks for Advanced Manufacturing education in VET (EXAM4.0 Framework, 2020). Based on those descriptions, the so called **EXAM4.0 Collaborative Learning Factory** has been defined to pilot the mentioned frameworks and concepts.

EXAM4.0 wp5 has focused on piloting the advanced manufacturing workshops defined in previous WPs. We have generated a number of reports documenting the work we have carried out. The structure of the piloting process is as follows, where each “ball” refers to a specific report:

Labs for Advanced Manufacturing-CLF



The present report is the validation of the proposed concept by EXAM4.0 stakeholders.

Validation of the EXAM4.0 activities.

The pursued objective of the study is to gather information from stakeholder groups referring to students & alumni, employees and representatives of HVET/VET and PHE institutions. Moreover, the survey should validate the services and activities developed in the **"Cooperative Learning Factory"**, also referred to as CLF, built for learners and individuals. The CLF is the approach that the EXAM4.0 consortium has used to pilot The Advanced Manufacturing Labs/Workshops 4.0's design. Readers can find the detailed description of the CLF approach in the document "EXAM4.0 Collaborative Learning Factory approach" in **www.examhub.eu.**

The summary of the study will inform the research consortium about users' perspectives, collaboration possibilities and the use of services on an Advanced Manufacturing Platform.

Methodology used in the survey was creating a universal questionnaire that was utilised by each of the project partners to compare as well as to validate the estimates of the participating representatives. In advance of filling in questionnaires, participants were introduced to the European research project EXAM4.0 and the CLF within the course of workshops.

Regarding the surveys, the questionnaires are structured into three pillars concerning the Advanced Manufacturing Platform. The three pillars imply:

- Exam 4.0 Platform
- Exam4.0 Learning factories and Labs
- Learning and education of Advanced Manufacturing

Furthermore, within the different pillars there are three aspects covered referring to the services and activities the platform, labs and trainings should provide, including:

- Technology, knowledge and data services
- Tools and Methodologies
- Events and News

The results of the survey shall contribute to identify the most relevant services and activities provided in the labs, trainings and on the platform.

The workshops have taken place online between June and August 2021.

In total, 41 representatives of stakeholder groups participated in the online workshops and did fill in the survey, among 18 employees from large companies and 23 representatives of H/VET institutions.

The results of this study do not represent quantitative but rather qualitative research. However, the selected participants of companies and institutions are sufficiently enough to obtain and represent relevant information to be included in WP5.1 of EXAM4.0.

Focus groups meeting results June- September 2021

Respondents

Employees:

13 companies, referring to the IT, automation and manufacturing sector, 1 sectoral cluster, 1 innovation agency.

Total respondents: 18

Institutions:

8 HVET Centres, 6 VET centres, 4 VET associations, 1 Chamber of Industry and Commerce.

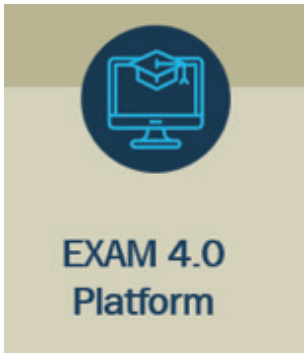
Total respondents: 23

1 EXAM 4.0 PLATFORM

The results of the surveys with employees and institutional representatives are presented separately in the report, starting with the estimates of employees. The first section refers to the EXAM 4.0 platform. On the platform there will be different services and activities offered for users that can be categorised in three aspects concerning technology, knowledge & data services, tools & methodologies and events & news.

1.1. Employees

The participants were asked to give their opinion on the items shown in the table below, regarding the EXAM 4.0 platform. Each respondent selected the three most relevant items from each block.



EMPLOYEES' VIEW

Technology, knowledge and data services	1. Latest trends and research information in AM 2. Use cases from leading industry describing I4.0 technology implementation 3. Challenges to implement AM technologies 4. Future skills demands and industry needs 5. Micro-credentials and online courses
Tools and methodologies	1. Forum for user-groups based on technologies and projects 2. I4.0 technological framework 3. I4.0 competence framework 4. Skills assessment tool 5. Identification of skills miss-matches 6. Support on the definition of learning paths for employees
Events and news	1. Focus group meetings organised by peer groups 2. Regular focus group news about education and training of staff (LLL) 3. Online trade fairs

Results and findings (employees):

Regarding the first section of services grouped as “Technology, knowledge and data services” the ranking made by the respondents is shown below. The most valued item for the platform within this block is “**future skill demands & industry needs**”. Use cases from companies on implementing I4.0 technologies also represent an important activity to offer on the platform, thus it is interesting and beneficial for companies to obtain information on other organisations’ structure and methods.

Furthermore, the participants also added to provide linkages to job profiles and competencies.

Technology, knowledge and data services - Platform	No. of answers
4.- Future skills demands and industry needs	13
2.- Use cases from leading industry describing I4.0 technology implementation	12
1.- Latest trends and research information in AM	8
3.- Challenges to implement AM technologies	7
5.- Micro-credentials and online courses	6

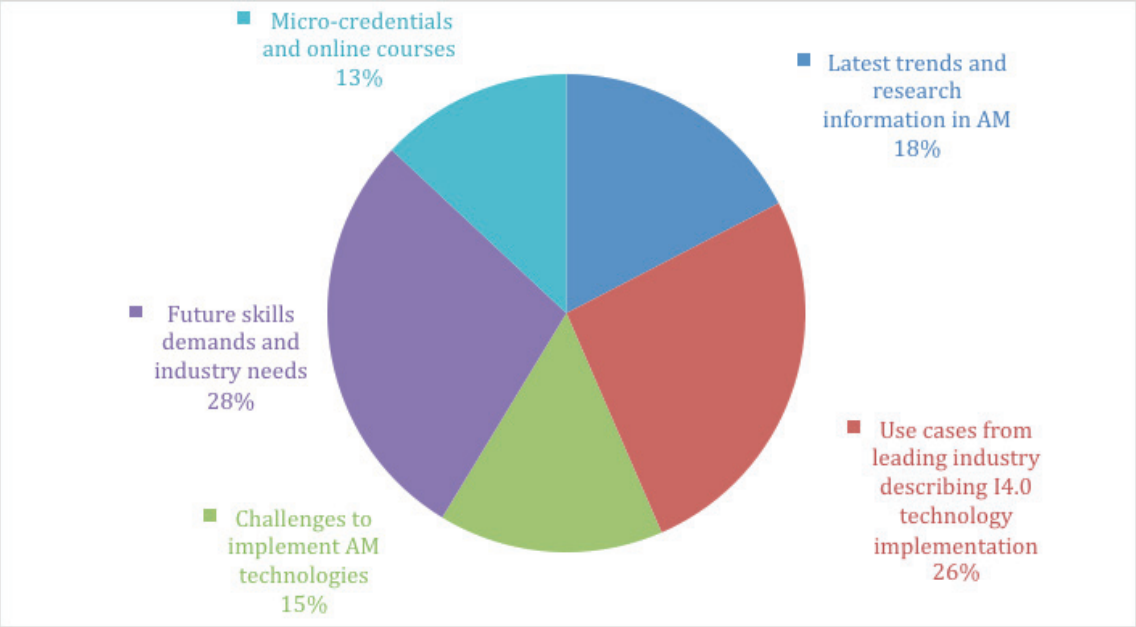


Figure 1: Employees View on services concerning Technology, knowledge and data services on the Platform

The second section of activities offered on the platform concerns “tools and methodologies”. In the table below the ranking made by employees presents the most relevant offers being skills assessment tools and the definition of new skills. Moreover, participants also selected the impact of implementing new technologies and supporting employees to define their individual career paths as relevant services on the platform. The results show that companies attach importance to knowing the actual effect of the introduction of I4.0 technologies on jobs and tasks.

Tools and methodologies - Platform	No. of answers
6.- Skills assessment tool	11
5.- Definition of new skills	10
3.- Impact of the implementation of certain I.40 technology on jobs/tasks	8
8.- Support for the definition of learning paths for employees	7
7.- Identification of skills miss-matches	5
2.- I4.0 technological framework	3
1.- Forum for user-groups based on technologies and projects	3
4.- I4.0 competence framework	2

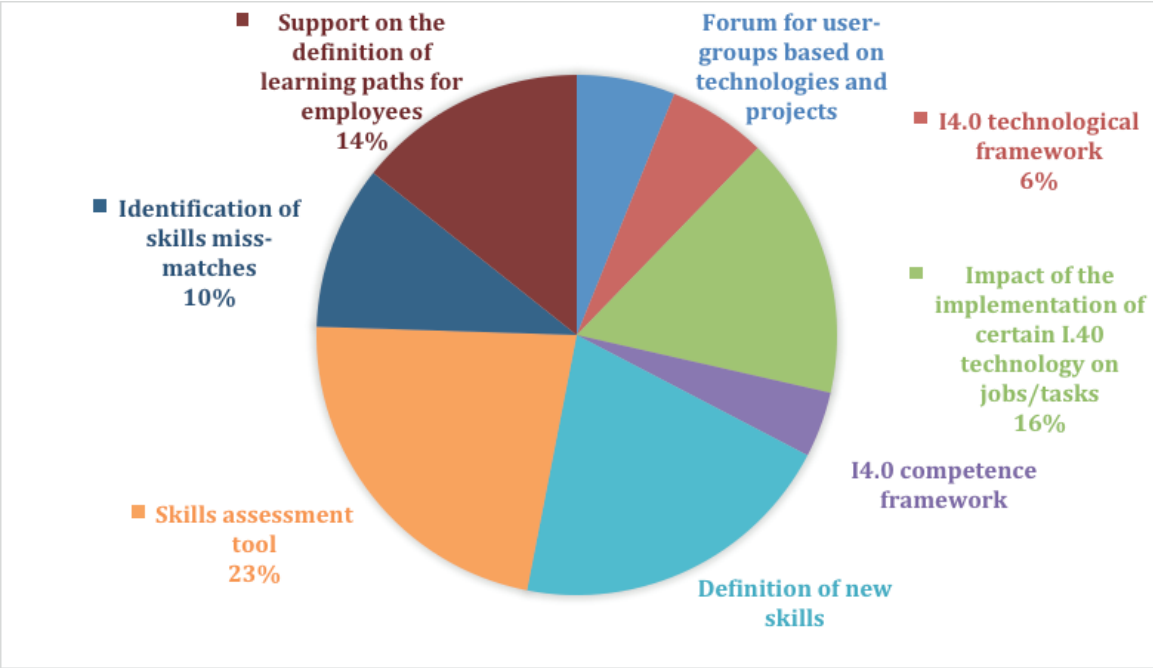


Figure 2: Employees View on services concerning Tools and methodologies on the platform

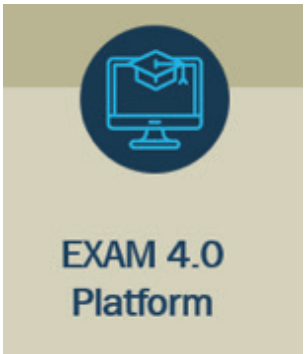
In the section “events and news” the services and offers were almost ranked equally. However, some participants also suggested further events such as online expert talks and a hackathon as a project for learners from different companies and countries.

Events and news - Platform	No. of answers
1.- Focus group meetings organised by peer groups	15
2.- Regular focus group news about education and training of staff (LLL)	14
3.- Online trade fairs	13

1.2. Institutions

20 representatives of institutions participated in the workshops and filled in the questionnaires.

In comparison to the services offered to industry representatives, the services and activities presented in the questionnaires for institutional representatives are slightly different due to the need of adaptation to the target public. The attached table shows the services used to guide participants. Each representative selected the three most relevant items from each block.



INSTITUTIONS VIEW

Technology, knowledge and data services	1.- Joint projects (e.g. research and education – collaborative learning factory) 2.- Qualifications most suitable for working skills 3.- New learning programmes and curricula changes 4.- New forms of education (e.g. game-based learning) 5.- Post- graduate learning opportunities and open education courses (LLL) 6.-Technological update. & trainer's upskilling opportunities 7.- Use cases other VET/HVT organisations describing I4.0 technology implementation in VET Labs 8.- Development of Micro-credentials and online courses
Tools and methodologies	1.- Join projects on novel approaches for AM learning/teaching 2.- Virtual tours through institutions and labs 3.- Augmented learning /virtual learning 4.- Pool of Open Education resources and Micro-Credentials 5.- Contact point for expert support for institutions and employers (expert pool)
Events and news	1.- Annual national AM online conference 2.- International AM online conference 3.- New projects and research 4.- Master classes for experts from industry institutions and policy makers

Results and findings (institutions):

HVET/VET institutions, associations and the Chamber of Industry and Commerce that participated in the workshops valued items related to new contents and adaptation of educational programmes. According to them, the most relevant services on an AM platform are to offer qualifications adapted to the economical demands and new learning programmes and curricula. Furthermore, the institutional representatives acknowledged the need for joint projects.

Technology, knowledge and data services - Platform	No. of answers
2.- Qualifications most suitable for working skills	17
3.- New learning programmes and curricula changes	15
4.- New forms of education (e.g. game-based learning)	11
1.- Joint projects (e.g. research and education – collaborative learning factory)	7
8.- Development of Micro-credentials and online courses	4
6.- Technological update & trainers' upskilling opportunities	4
7.- Use cases other VET/HVT organizations describing I4.0 technology implementation in VET Labs	4
5.- Post- graduate learning opportunities and open education courses (LLL)	1

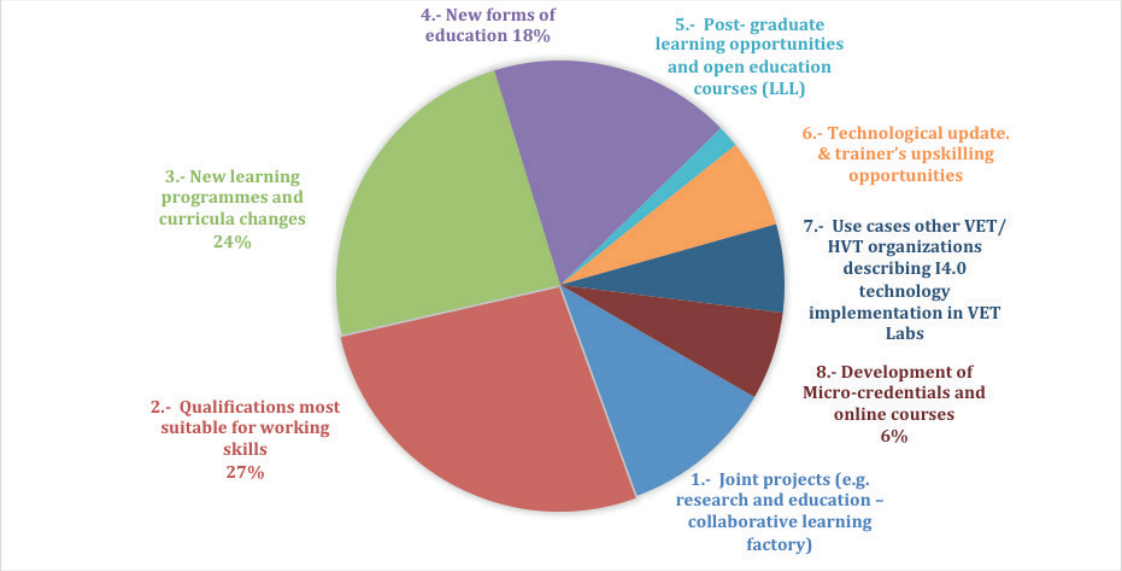


Figure 3: Institutions View on services concerning Technology, knowledge and data services on the plattform

A similar observation can be made regarding services for tools and methodologies for institutions on the platform. New forms of teaching are also estimated by the stakeholders to be very important in this section, for example augmented and virtual learning offers and shared educational resources as well as micro credentials. Moreover, institutional representatives favour the exchange between each other in forms of support for experts. Moreover, joint projects also represent a relevant item in this section.

Tools and methodologies - Platform	No. of answers
4.- Pool of Open Education resources and Micro-Credentials	14
3. - Augmented learning /virtual learning	11
5.- Contact point for expert support for institutions and employers (expert pool)	10
1.- Join projects on novel approaches for AM learning/teaching	8
2.- Virtual tours through institutions and labs	7

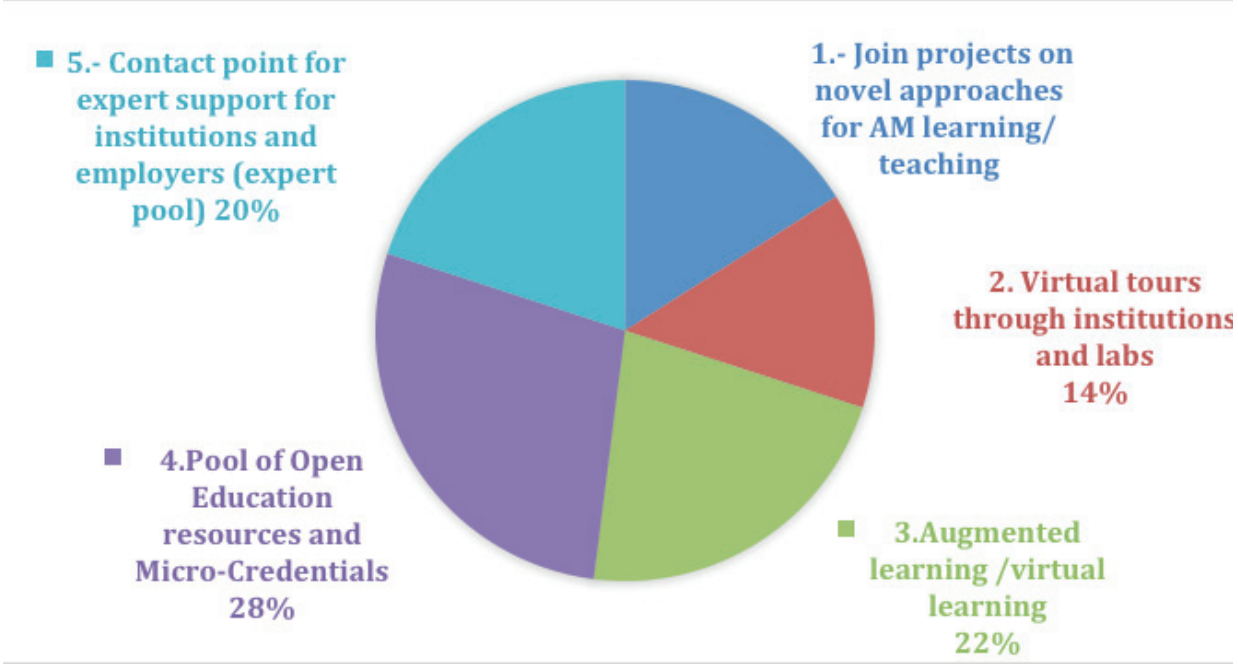


Figure 4: Institutions View on services concerning Tools and methodologies on the Platform

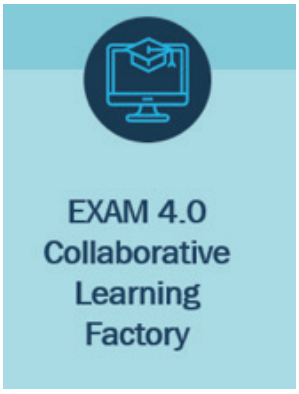
Furthermore, master classes for experts offered on the platform and new projects and research were ranked equally and with high importance. In comparison, a minority of stakeholders ranked an annual national AM conference as a relevant service.

Events and news - Platform	No. of answers
4.- Master classes for experts from industry institutions and policy makers	14
3.- New projects and research	14
2.- International AM online conference	10
1.- Annual national AM online conference	8

2 EXAM4.0 LEARNING FACTORIES AND LABS

The Cooperative Learning Factory or CLF presents another pillar of the questionnaire. The services offered in the CLF refer to Technology, knowledge & data service and tools & methodologies.

2.1. Employees



EMPLOYEES' VIEW

Technology, knowledge and data services	1. Introduction of labs and equipment used 2. Function and training - purpose of labs 3. Technology demonstrators: Projects in labs performed for companies 4. Technology demonstrators: Use of labs for company research and testing 5. Tailored training: Skills trainings in labs
Tools and methodologies	1.Augmented reality space for Life Long Learning 2.Visualisation of career pathways (e.g. with stacked Micro-Credentials

Results and findings (employees):

Starting with the results of participating employees, the participants were mostly interested in the concept of technology demonstrators. There is an interesting comment from an Basque SME concerning this topic: "Being a small company we already have many demonstrators with large companies who are our customers. Direct collaborations with VETs work for us in another direction: it is interesting to work on small projects and applied research services where concrete results are obtained with which we all learn (VET centres and SMEs)".
Furthermore, tailored training was also selected as a relevant service in the CLF. This will make it possible to create a combination of innovation development with lifelong learning of employees.

Technology, knowledge and data services -Collaborative learning factory	No. of answers
4. Technology demonstrators: Use of labs for company research and testing	13
3. Technology demonstrators: Projects in labs performed for companies	13
5. Tailored training: Skills trainings in labs	13
1. Introduction of labs and equipment used	4
2. Function and training - purpose of labs	3

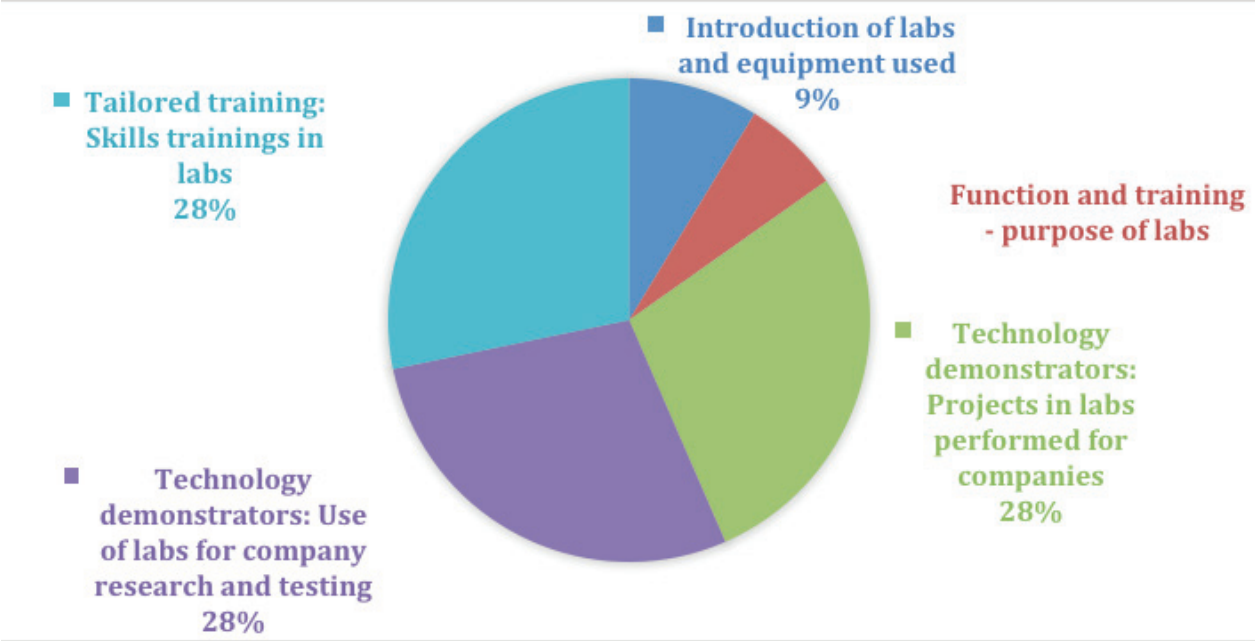


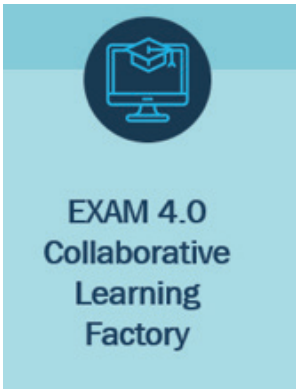
Figure 5: Employees View on services concerning Technology, knowledge and data services in the CLF

Regarding tools and methodologies offered in the CLF, both, visualising career pathways as well as supporting lifelong learning in augmented reality spaces, were ranked equally. There is an interesting comment from a representative, suggesting linking the CLF to existing learning management tools as well as to the competency evaluation system and job profiles. By that, added value can be provided for companies and individuals to find courses and career pathways within their professional fields.

Tools and methodologies - Collaborative learning factory	No. of answers
1 - Augmented reality space for Life Long Learning	13
2 - Visualization of career pathways (e.g. with stacked Micro-Credentials	13

2.2. Institutions

With regard to the survey with representatives referring to institutions, the services include further activities concerning both aspects of the pillar.



INSTITUTIONS VIEW

Technology, knowledge and data services	1.- Collaborative learning factory as education centre for partners 2.- Introduction of new lab technologies 3.- New products jointly produced in labs 4.- Examples of labs incl. specifications and costs 5.- Data generated in learning factory for learners at partner institutions. 6.- Data exploitation/data analytics 8.- New projects and research work in labs 9.- Joint production of new contents for courses 10.- AR/VR applications and procedures 11.- Joint projects among students from different institutions 12.- Guide/support to implement LF for AM in VET
Tools and methodologies	1.- Join projects to develop/improve/extend LF concept for VET Labs 2.- Extent the collaboration options of LFs 3.- Adapt contents to be learned/taught in LFs 4.- Study/compare different LF approaches (following IALFs morphology) 5.- Augmented reality space for Life Long Learning

Results and findings (Institutions):

The findings concerning services as activities provided in the area of technology, knowledge & data services, present a high importance of introducing new lab technologies. According to the results, institutional representatives are also interested in using the CLF as an educational centre and for joint projects. Regarding the German and Dutch survey results, participants highly valued the activity of exploiting and analysing data.

Technology, knowledge and data services – Collaborative learning factory	No. of answers
2.- Introduction of new lab technologies	12
1.- Collaborative learning factory as education centre for partners	10
9.- Joint production of new contents for courses	7
5.- Data generated in learning factory for learners at partner institutions.	6
6.- Data exploitation/data analytics	5
8.- New projects and research work in labs	4
10.- AR/VR applications and procedures	3
3.- New products jointly produced in labs	2
11.- Joint projects among students from different institutions	2
12.- Guide/support to implement LF for AM in VET	2
4.- Examples of labs incl. specifications and costs	2

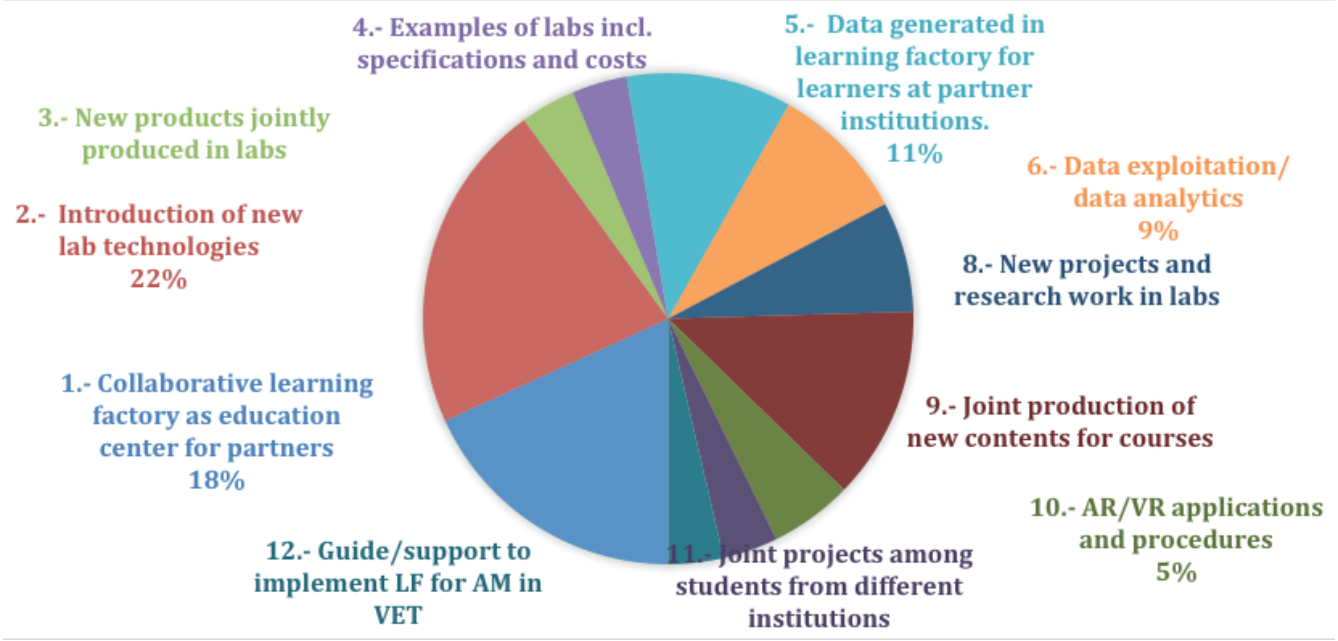


Figure 6: Institutions View on services concerning Technology, knowledge and data services in the CLF

The table below presents the results of relevant tools and methodologies. According to the findings, institutional representatives are mostly interested in activities of the CLF concerning joint projects and collaboration possibilities among learning factories.

Tools and methodologies Collaborative learning factory	No. of answers
1.- Joint projects to develop/improve/extend LF concept for VET Labs	13
3.- Adapt contents to be learned/taught in LFs	12
2.- Extend the collaboration options of LFs	10
5.- Augmented reality space for Life Long Learning	7
4.- Study/compare different LF approaches (following IALFs morphology)	5

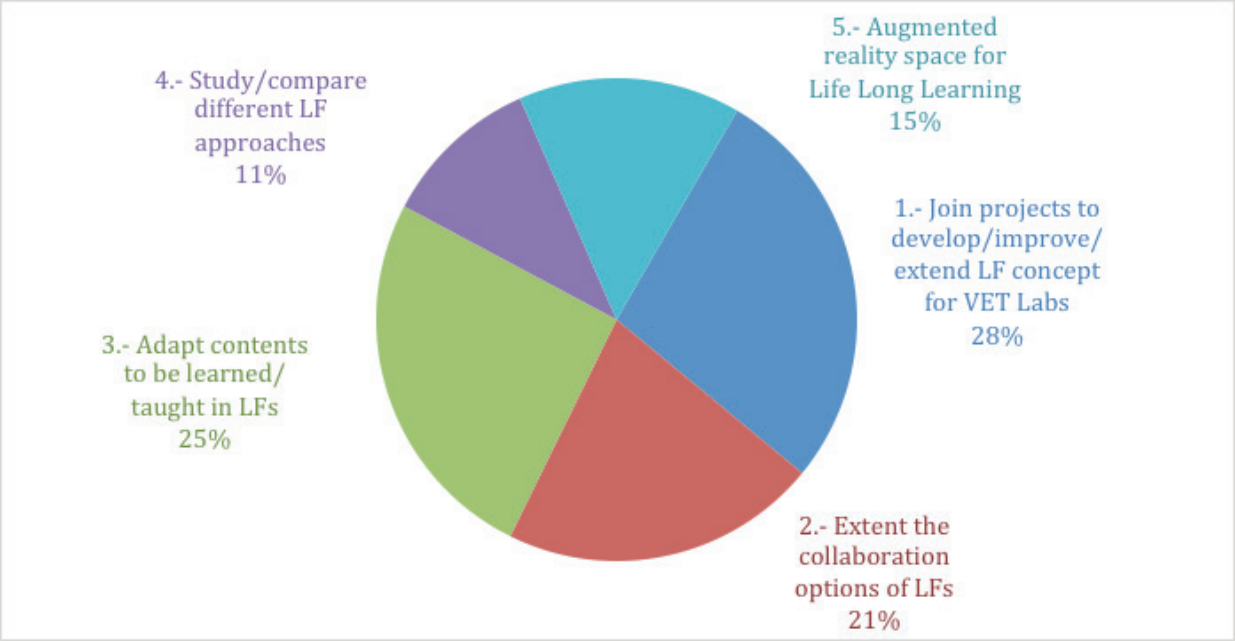
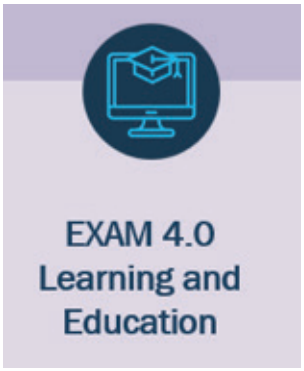


Figure 7: Institutions View on services concerning Tools and methodologies in the CLF

3 FUTURE OF LEARNING AND EDUCATION OF ADVANCED MANUFACTURING

The last pillar of the survey refers to learning and education. The participants were asked to estimate their opinions concerning challenges regarding competencies and skill requirements. Furthermore, topics discussed in this section include distance learning and micro credentials as well as benefits and risks of the platform.

3.1. Employees



EMPLOYEES' VIEW

Challenges concerning competences and skills of the staff	1. Low qualifications or older employees with difficulties to digitally update 2. Difficulties to introduce "culture of digitalisation" among employees 3. Resistance to changes 4. VET/University graduates poorly prepared 5. Few skilled people available on the market 6. Difficulties to find valuable training 7. Difficulties to identify upskilling path for employees
Distance learning and microcredentials provided by institutions in the platform	• Would help to speed up transition offers a wider variety of trainings to our company • Distance learning combined with practical trainings in labs can play an important role
Benefits & risks	• Highest benefits of using the services for education and training on a platform in Advanced Manufacturing (I4.0) in your company • Possible risks of an Advanced Manufacturing (I4.0) platform

Asked about challenges in companies, employees estimated that it would be difficult to find valuable training to acquire relevant competences and skills. Furthermore, the results show the risk of a skills mismatch due to reservations about introducing new technologies and digital skills deficit concerning low qualified and older employees.

According to them it is difficult to implement adoption plans. The participants find it rather difficult to identify respective upskilling paths. In addition, the companies acknowledge that there are few skilled graduates and workers on the market, however, skilled labour is a key factor in order to forward the digitization.

However, all alternatives were chosen by the respondents, thus all listed challenges are issues in the industry.

On another note, companies should provide a clear strategy for digital transition and allocate the necessary resources to create an environment of change.

Challenges concerning competences and skills of the staff (employees)	No. of answers
7. Difficulties to identify upskilling path for employees	10
6. Difficulties to find valuable trainings	9
2. Difficulties to introduce "culture of digitalisation" among employees	9
5 Few skilled people available on the market	8
1. Low qualifications or older employees with difficulties to digitally update	7
3. Resistance to changes	5
4. VET/University graduates poorly prepared	3

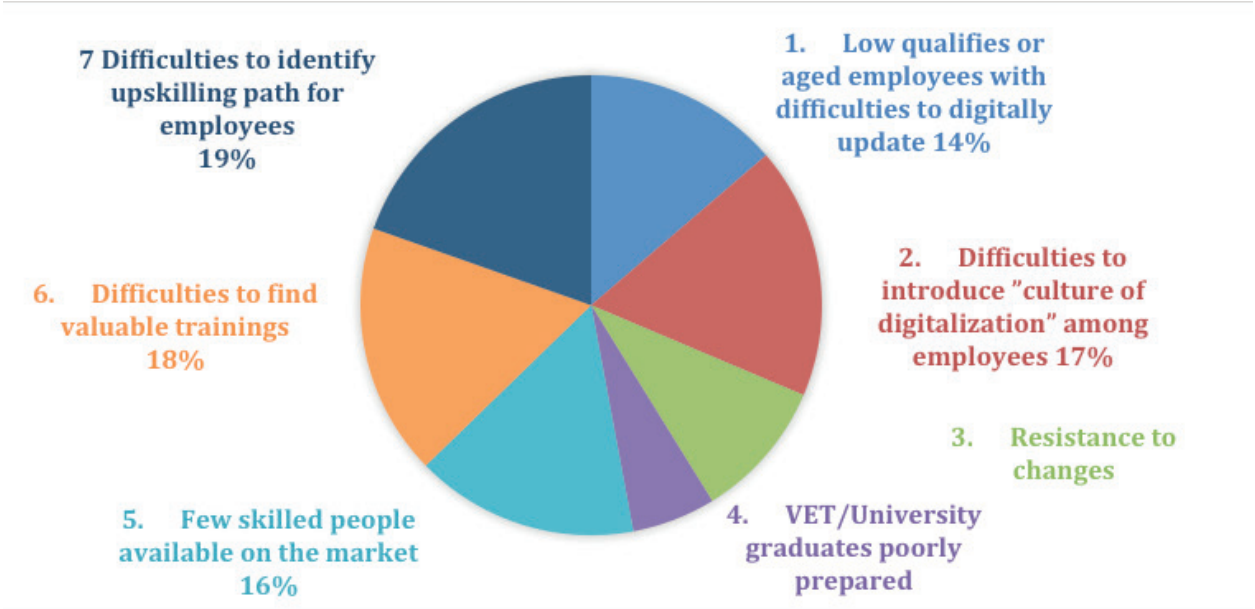


Figure 8: Employees View on challenges concerning competences and skills

Distance learning and micro credentials (employees):

There is unanimity about the relevance of offering distance learning for professionals and for the development of micro credentials. In the cases of employees, it has been shown that the current offer of distance learning and micro credentials is enough. A need to broaden the offer is forecast.

The coupled option of those combined practical trainings in labs is also very well rated.

Taking advantage of expert knowledge of training centres presents a major advantage of the AM platform as well as the combination of training of employees and innovation projects, according to employees. Furthermore, the adaptability as well as training and preparing international employees according to the ongoing developments and changes present another benefit. Participants valued the platform being a central place for different stakeholders to receive information about education and upskilling. In addition, the AM platform can be used to bring together qualified people and companies in demand. The surveyed employees assumed the highest risk of the platform regarding the complexity and user friendliness.

The lack of physical interaction and participation of users on the platform could also present a major risk for the AM platform. One participant also expressed his concern regarding existing training systems in his company for employees to further educate them. According to him, it would be ideal to integrate or adapt the activities for learners offered on the platform and in the CLF with common training systems of large companies in order to prevent duplication.

Benefits and risks of using the services for education and training on a platform

Benefits

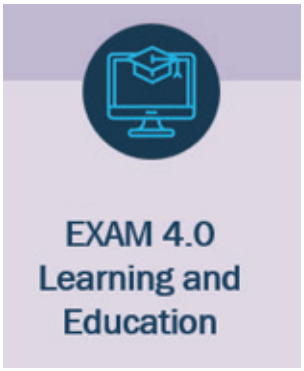
- Basic trainings for technology
- Digitisation trends
- Well trained employees in AM topics
- Flexibility is a key feature for the factory of the future. Not only machines have to be customizable to different conditions. The workforce must also be adjustable to new situations. That means knowledge needs to be available quick & easy
- Taking advantage of the potential of all VET centres on the platform (knowledge, projects, students, network, etc.)
- Possibility of carrying out mixed study plans, taking advantage of the expert knowledge of each training centre
- Validating the professional competencies of employees: Export this knowledge to our clients around the world
- Entering from the beginning in the race towards digitalisation
- Bringing together qualified people with companies in demand
- Having a single location for access to relevant information about education and upskilling
- Is it reachable enough for all the relevant stakeholders
- Digitisation trends
- Bringing together qualified people with companies in demand
- Combination of innovation projects with training of employees
- Well trained employees in AM topics
- Getting a standard level on the education regardless of the country
- To stand prepared for future challenges
- Easier to find odd training

Risks

- Far away from business needs
- Less micro-training & too much face to face & block training
- Useability
- Integration into existing training systems in companies
- Reliable skills verification
- Ease of use
- Becoming something very generic. It should offer more than what the nearby VET centre offers. If the platform always directs us towards the nearby VET centre, it will no longer make sense
- No risk
- Lack of physical interaction
- Participation
- Missing opportunities concerning activities not included on the platform
- Resistance to change; use cases not immediately clear
- Useability
- Participation
- Collaboration with existing training systems in companies
- Reliable skills verification
- Automation risks decreasing the in-house handy manufacturing skills
- Companies having different levels of „industrialization“ and therefore asking for different levels of education

3.2 Institutions

Representatives of institutions were also asked about challenges concerning competence and skill requirements as well as their opinion on distance learning, micro credentials as well as accompanying benefits and risks of a platform for Advanced Manufacturing.



INSTITUTIONS VIEW

Challenges concerning competences and skills of the staff	1.- Older teachers/trainers with difficulties to digitally update 2.- Difficulties to introduce a ”culture of digitalisation” among teachers/trainers 3.- Resistance to changes 4.- Difficulties to find valuable trainings for trainers 5.- Difficulties to identify upskilling path for trainers 6.- Lack of knowledge on new methodologies 7.- Lack of information of industrial needs on digitalisation 8.- Lack of infrastructure/equipment
Distance learning and microcredentials provided by institutions on the platform	• Would help to speed up transition • Offers a wider variety of trainings to our company • Distance learning combined with practical trainings in labs can play an important role
Benefits & risks	• Highest benefits of using the services for education and training on a platform in Advanced Manufacturing (I4.0) in your company • Possible risks of an Advanced Manufacturing (I4.0) platform

Regarding the results presented in the table below, the participants estimate difficulties concerning teachers open-mindset towards implementing new technologies and systems. Moreover, similar to the findings in the employee’s survey, older teachers tend to present a lack of digital competences and representatives estimate difficulties to find valuable trainings for teaching staff.

Challenges concerning competences and skills of the staff (institutions)	No. of answers
2.- Difficulties to introduce ”culture of digitalisation” among teachers/trainers	14
1.- Older teachers/trainers with difficulties to digitally update	13
3.- Resistance to changes	9
4.- Difficulties to find valuable trainings for trainers	8
6.- Lack of knowledge on new methodologies	6
7.- Lack of information of industrial needs on digitalisation	5
5.- Difficulties to identify upskilling path for trainers	3
8.- Lack of infrastructure/equipment	1

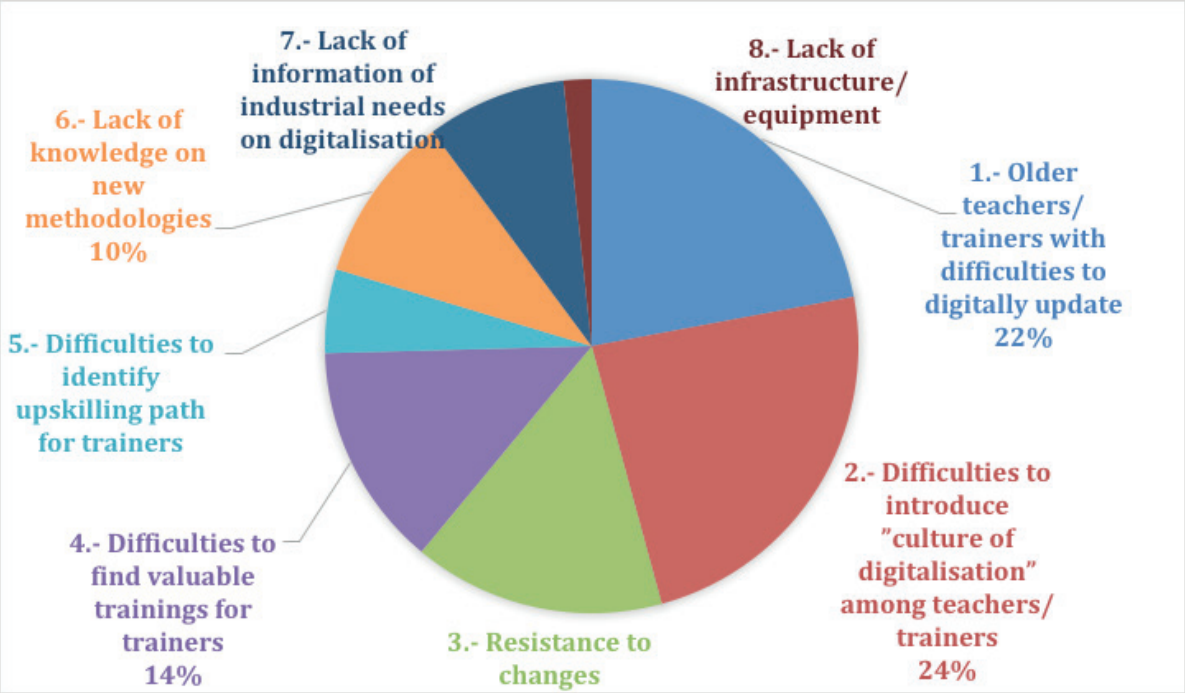


Figure 9: Institutions View on challenges concerning competences and skills

Distance learning and micro credentials (institutions):

There is unanimity about the relevance of offering distance learning for employees and for the development of micro credentials. However, according to the Swedish results, institutional representatives favour the development of micro-credentials. The coupled option of those combined practical training in labs is also highly valued by institutional representatives.

International joint projects as well as fostering collaboration and exchange between institutions and students present the highest benefits of the platform, according to institutional representatives. Moreover, participants emphasized the platform being a one-stop shop for innovation and contributes to advance the process of digitization as well as to visualize technical processes.

In comparison to the concerns of surveyed employees, participants of HVET/VETs also assume user friendliness & complexity of the platform as its highest risks. Furthermore, they were apprehensive of cyber security and participation of users. The platform addresses different stakeholder groups which could evoke a loss of intended focus, according to representatives.

Benefits and risks of using the services for education and training on a platform

Benefits

- International cooperation & student exchange
- Joint projects & cooperation between different institutions
- It will be easier to improve the digital transition of our institution if we have support from a platform such as EXAM4.0
- Collaboration is key
- I think it would help to improve our digital transformation
- Advance in the process of digitalisation 4.0
- Support in the change process (mainly with people), and tools for technical implementation and training
- See the school as a whole, not just manufacturing departments
- Provide a plus to students
- It would help boost it. Improve training
- Visualise the technological advance that can reach all companies
- Updating of skills, knowledge of new technology, new forms of organisation and possibly new services or new ways of offering services
- On stop shop for innovation in the region
- International collaboration with students and teachers
- Joint projects & cooperation between different institutions
- Visualise the technological advance that can reach all companies
- It is always beneficial to get better understandings and knowledge of this field
- To get an insight into advanced and innovative learning environments for education

Risks

- User-friendliness of services & tools
- Too complex
- Ease of use
- The platform must be properly updated and fed, communication among users must be facilitated
- It has to be a very active place
- Like all advances and new implantations, not reaching the initial objectives.
- That it stays in a club of friends that is not very operational, that interesting results are not produced and / or that said results are not disseminated effectively, meaning that they are not known or the use of said results is not encouraged
- Not becoming a reference for the institutions due to the difficulty of change, and that the resources and the work carried out in the reality of the centres are not taken advantage of
- Faculty Involvement. Lack of resources
- Cultural change
- Cyber security
- There is no risk, that it can stay in theory
- No common language
- Loss of focus with a lot of stakeholders involved
- User-fiendliness
- That it will be too far away from the real production. It is important to be able to relate to the ongoing production system
- That time is limited, and this time will be spent in the wrong way if the interface and collaboration opportunities are difficult to understand and use, which they are

4 CONCLUSIONS

In the course of workshops carried out among 18 industry representatives and 23 institution representatives in Spain, Germany, Sweden and the Netherlands, the users' perspectives on 3 main aspects for advanced manufacturing education have been discussed including i) Exam platform ii) Exam Learning Factory iii) Future of learning and education. The results of the survey give an insight into opportunities for collaboration and the most relevant services and activities that should be provided on an AM platform.

From an employee's perspective the most relevant aspects of the EXAM4.0 platform are **future competences, skills** and their **assessment**. Therefore, offering services pertaining to future skill requirements that meet industry demands will be necessary. Employees showed a major interest in **industrial use cases** as references for their activities.

Regarding the Collaborative Learning Factory, they estimated the importance of **technology** demonstrations and **tailored training offers** to obtain relevant skills for labs.

Furthermore, according to the results of the survey, resistance towards **introducing a culture** of digitization and **identifying upskilling paths** for employees present the greatest challenges for companies. The surveyed employees see high potential in the AM platform for training and upskilling of employees with courses and innovation projects. Connecting qualified people with companies in demand presents another benefit of the platform for the different stakeholder groups. However, they pointed out some concerns pertaining to the usability of the platform and active participation of users.

Regarding the **institution's perspective** the most valued items of the EXAM4.0 platform referred to **new contents** and **learning methods.**

Furthermore, the representatives were highly interested in **joint** projects and **extended collaboration opportunities** as well as **new lab technologies concerning** the CLF.

Regarding challenges companies face concerning the transformation process, a similar observation applies to institutional challenges. **Introducing a culture of digitization** and **resistance to changes** also present major problems in HVET/VETs. In addition, **upskilling** and **updating digital skills** of older teachers and trainers will be crucial. Finally, the participating institutions see high potential in the AM platform as a one-stop shop for innovation and collaboration which contributes to improving digitization. Although they also noted some concerns pertaining usability of the platform, involvement of users as well as the difficulty to consider different stakeholder groups to address on the platform.

Considering the findings of this report, we conclude that the Collaborative Learning Factory" approach offers to the consortium an adequate scenario to pilot Advanced Manufacturing LAB's activities. In the course of the different pilot topics covered in WP5, we will respond to the challenges aroused including their inclusion on the EXAM4.0 Platform.

5 REFERENCE

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EXAM 4.0

THE EXCELLENT ADVANCED MANUFACTURING 4.0