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ManuLearn II Methodology

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Introduction

Project ManuLearn II aims at increasing the innovation potential of the participating EIT RIS countries by enhancing the educational framework and boosting digitalization under the concept of Industry 4.0. The project also aims for impact across industry and academia through the promotion of gender balance and the enhancement of soft skills.

Project activities offer a practice-based Learning Model where students, researchers and companies can work together to share good practices and experiences by jointly applying solutions to industrial manufacturing challenges. Part of this model is Teaching (TF) and Learning Factories (LF) that focus both on students' and employees' industrial learning needs.

The model through TF will provide industrial-based teaching & training to engineering students and provide examples of novel engineering solutions to enterprises (SMEs, mid-caps and LEs). Solutions can be generated either by academia (applied research results) or by industry (best practices and success stories).

The basis of the methodology has been described in the project ManuLearn 2020, and the summary can be found here: https://manulearn.eu/wp-content/uploads/EIT-M-ManuLearn-Methodology.pdf. Therefore, the ManuLearn II introduces and implements improvements for the methodology of pilot activities, based on the feedback from the previous ManuLearn 2020 project pilots.

Model Development

The ManuLearn II project focuses on addressing three key concepts: digital skills, soft skills, and gender balance in manufacturing.

Soft Skills

Soft skills are non-technological skills related to the way people work. They concern how people interact with colleagues, how people solve problems and how people are able to manage their work. Soft skills include interpersonal (people) skills, communication skills, listening skills, time management, and empathy, among others. Unlike hard skills that are learned, soft skills are similar to emotions or insights that allow people to "read" others. These are much harder to learn, at least in a traditional classroom setting. They are also much harder to measure and evaluate.

Digital Skills

Digital skills are broadly defined as those needed to "use digital devices, communication applications, and networks to access and manage information," in UNESCO's terms. This covers a huge range and variety of skills and can be summarized in the following areas: Digital foundation skills; Communicating; Handling information and content; Transacting; Problem-solving; Being safe and legal online. These are defined as the basic digital skills needed in a day-to-day professional or personal context.

Digital competency is at the core of the modern professional skillset. This need is only likely to increase further as business shifts increasingly to the digital realm, and will be exacerbated by Industry 4.0. A greater drive towards automation and cross-system data exchange will be observed, with two consequences: the loss of roles as they are automated, and a greater demand for those with advanced digital skills.

In 2019, the World Economic Forum estimated that 133 million new roles will be created by 2022 as a result of the new division of labour between humans, machines, and algorithms. The most in-demand skills, according to WEF, will be big data analytics, application and web-enabled markets, and the internet of things.

Coronavirus pandemic has added a further spin on matters. Workers who previously relied on in-person interaction are now compelled to use digital technologies to carry out their day-to-day functions. The pandemic will not last forever, but it is likely that remote working will become a more deeply ingrained part of everyday working life.

Gender equality

Based on European Institute for Gender Equality (EIGE) gender equality is described as “Equal rights, responsibilities and opportunities of women and men and girls and boys”. Equality between women and men is seen both as a human rights issue and as a precondition for, and indicator of, sustainable people-centred development.

Even today when gender discrimination is considered to be at its lowest point ever, some industries are male dominated. Companies still do very little to encourage females to join their circles, especially when it comes to the top positions. Due to inequality and discrimination in the workplace, manufacturing is one of the industries with a large pool of untapped talent. There are highly qualified females with high-level education degrees that are not given their rightful spot in such companies because of inequality that has persisted for centuries.

Industrial Challenges Identification

Industry is facing major challenges in terms of new technologies and digital manufacturing. This makes it necessary to have people trained in all aspects of digitalisation. In order to ensure that the topics covered in the different pilots are related to the problems that companies face in their day-to-day work, in the ManuLearn project a request form was proposed, by means of which companies defined their problems and the different pilots were able to deal with them in an appropriate way by means of TF or LF.

ManuLearn II methodology

ManuLearn II presents a practice-based learning model that will allow participants to carry out an adequate and well-timed learning process, so that they can learn and internalise the different concepts covered in the pilots. The types of pilots, implemented in ManuLearn II, are teaching factories (TF), learning factories (LF), webinars and workshops, organized by project partners.

As mentioned, the methodology to be implemented is the same as the one presented in the ManuLearn 2020 project, but with some variations and improvements.

Learning Factories (LF)

Nowadays, there are plenty of studies that seek to determine which are the skills that should be met by an engineer. Communication and teamwork are some of the most requested skills associated in addition to in-depth engineering knowledge. However, their application is not straight forward, due to the lack of educational approaches that contributes to develop experience-based knowledge. LFs have shown to be effective for developing theoretical and practical knowledge in a real production environment. The proposed transformations were based on the definition of three pillars (didactic, integrating and engineering) for the development of a LF. A proper transformation process may contribute to ease the path towards new manufacturing trends such as industry 4.0 into an academic context that strengths the engineering training process.

Teaching Factories (TF)

The TF paradigm aims to align manufacturing teaching and training to the needs of modern industrial practice. Future engineers need to be educated with a new curriculum in order to cope with the increasing industrial requirements of the factories of the future. The TF paradigm comprises of the relevant educational approach and the necessary ICT configuration for the facilitation of interaction between industry and academia. The TF aims at a two-way knowledge communication between academia and industry. Knowledge channels of the paradigm are presented, in the context of this work, within real-life industrial applications. The TF paradigm provides a real-life environment for students and research engineers to develop their skills and comprehend the challenges involved in everyday industrial practice.

Workshop

Workshops are intensive courses, which are attended to develop a talent or skill as quickly as possible, that is, always with an eye on the benefits that the organization will have by providing its team with these training tools. The workshops are usually in the hands of a specialist or professional in the area to be developed, usually contracted under the figure of outsourcing. Although they often have a theoretical or lecture part, workshops tend to be dynamic and get straight to the point, encouraging participation and an active attitude from the part of the attendees. In this way, they differ from conferences or courses.

Workshops tend to be short (4 hours' maximum) and sporadic, and they involve intensive work, which is as little disruptive to the company's operations as possible. They are usually shorter than a seminar or a course, and much more versatile: teamwork, specific talents, customer service, training, accident prevention, etc.

Webinar

A webinar is a conference, workshop, course, or seminar in video format that is delivered via the Internet. What characterizes a webinar and gives value is the interaction that takes place between the speaker and the users attending the webinar. Webinars are livestreamed, on a specific date and time. Normally, the person giving the conference interacts with the users, who in their turn, can comment on or ask any question that occurs to them in relation to the speaker's speech.

Competency assessment method

The implementation of all activities within the ManuLearn II project are aimed at developing both technical / digital and soft skills. In order to be able to identify the correct acquisition of these skills by the people participating in the different learning proposals developed during the project, it is necessary to carry out an evaluation. It includes self-assessment (form of reflection that helps the person to identify their skill level and opportunities for development, collecting evidence of their capability level) and expert assessment (implemented by experts or assessors, highly experienced in an area of technical competency).

ICT Tools used in ManuLearn II

It is apparent that the ideal software to cover the demands of ManuLearn and ManuLearn II projects is the MS Teams platform. MS Teams allows the integration of various and heterogeneous materials required by the TF setup, such as live and recorded sessions, audio interactions, lectures and so on. MS Teams is designed with applications and resources to enhance the communication between the different stakeholders of the TF Network and maximise the effectiveness of the ManuLearn II program.

Conclusions

The consortium gathered all the feedback comments from participants and EIT reviewers for the ManuLearn pilot activities and re-addressed the methodology, content, organization, delivery mechanisms, ICT tools and outcomes of the pilot activities for ManuLearn II. The feedback was mostly positive; however, some limitations were the number of participants and the need for a better time management. The same platform for organizing the events will be used (MS Teams) since it was well-received with few technical issues but will a variety of functionalities.

Nine activity pilots will be organized, including TFs, LFs, webinars and workshops, to address manufacturing challenges and interesting topics for the industrial partners. Digital nuggets will also be organized, to support the learning activities. All pilot activities will highlight and address digital skills, soft skills and gender balance in the manufacturing sector.