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# Preparing for future skills needs in European manufacturing industry





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## Executive Summary

This publication brings together the major activities conducted within the framework of the EC-funded FIT4FoF project between 2018 and 2022 and presents the FIT4FoF educational approach, the FIT4FoF Scenario depicting the Future of Work in Advanced Manufacturing as well as seven FIT4FoF personas created as part of the FIT4FoF pilot projects.

The human-centric approach, which was at the heart of FIT4FoF, is an important cornerstone within Industry 5.0. This concept in particular highlights the needs of society and that the workforce must be thoroughly considered as part of the industrial and production processes, technology must be applied for the benefit of and tailored to the needs of the worker and finally, that the technologies used must be aligned with the core European values of ethics and privacy. In addition, if applied in the Industry 5.0 concept, technology should heavily contribute to resource optimisation, efficiency, robustness and resilience. The three principles of resilience, sustainability and human-centricity informed the development of the FIT4FoF Scenario and the implementation of the FIT4FoF project as a whole.

The introduction in Chapter 1 is followed by a general outline of the policy-level context of future skills needs in advanced manufacturing in Chapter 2. Chapter 3 depicts the co-creation approach called ICoED, used to develop the FIT4FoF educational programme. ICoED as a tool challenges the current approach of planning and creation of learning courses using pre-defined learning objectives, where the educator plans the course with no external input to the learning principles, learning activities, learning resources and their infrastructure. The ICoED method is a three-phase process facilitated by three workshops, each of them with a focal point: the learning objectives, learning approach and course structure. Throughout the three participatory workshops, a broad range of stakeholders, including the learners/workers, educators and managers use an eight-step approach to collaboratively develop a tailor-made structure for the educational activity.

Chapter 4 starts with briefly outlining the approach applied to develop a scenario for Work in the Factory of the Future, including a participatory scenario workshop and the information collected during this process. This is followed by the FIT4FoF Scenario, which depicts a positive and technology-embracing vision of the future, based on the assumption that the application of future Industry 4.0 technologies will entail opportunities for solving existing and future challenges – if applied and framed accordingly – thus encompassing considerable potential to benefit companies, workers, society and the environment. The scenario consists of two main blocks, which are closely intertwined as well as a set of framework conditions that impact on them. The most important building blocks of the Factory of the Future are the technologies used, which manifest in a large set of machinery and tools operating in the respective company/industry environment, and the workforce that will (still) be of utmost importance for the successful operation of the Factory of the Future. Finally, there are a number of framework conditions that impact on the future manifestation of manufacturing and that companies will need to consider when preparing for future challenges and opportunities. The FIT4FoF Scenario has built the basis for the pilot partners' development of a persona, which they envision will be working in their company in the near future. These seven personas are also discussed in Chapter 4.

Chapter 5 summarises the lessons learned during the implementation of the project. These mainly relate to the novel elements introduced, i. e. the co-design approach to develop upskilling activities, the implementation of the pilot activities and the participatory scenario development and gives recommendations on how to act upon these lessons in the future.

Finally, Chapter 6 presents the conclusions derived from FIT4FoF and the scenario development conducted. The Covid-19 pandemic impacted heavily on the project but actually reinforced the relevance of the project approach as the timely and tailored acquisition of relevant skills for advanced manufacturing is now needed more than ever before. Thus, the FIT4FoF project consortium is happy to share with the widest possible European and global audiences the outcomes of its endeavours to develop a tailor-made, participatory approach to upskilling. This co-design approach applied in FIT4FoF encouraged a broad

discussion on the needs, challenges and opportunities that workers will face in the future factory and how these can be tackled for the benefits of both workers and employers. The future scenarios depicted in this report reflect these discussions and we would like to invite stakeholders to enter into a dialogue on how these future scenarios can become a reality, enabling workers to make the most of their interests, wishes and aspirations in the future.



FIT4FoF consortium during the FIT4FoF final even in Lisbon 11/2021

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## Abbreviations and Acronyms

AI	Artificial Intelligence
AR	Augmented Reality
Arctic	Arctic SA
BSL	Boston Scientific Limited
CEAGA	Fundación Cluster de Empresas de Automoción de Galicia (ES)
CPD	Continuous Professional Development
CNC	Computer numerical control
DL	Deep learning
EC	European Commission
ES	Spain
EQF	European Qualifications Framework
EU	European Union
FIT4FoF	Making our Workforce Fit for the Factory of the Future
GA	Grant Agreement
HEI	Higher education institution
HMI	Human-machine interaction
ICoED	Industrial Collaborative Educational Design
ICT	Information and communication technology
IE	Ireland
IoT	Internet of Things
IPB	Polytechnic Institute of Bragança
KETs	Key enabling technologies
LEA-CFI	Chambre de Commerce et D'Industrie de region Paris Ile-De-France
MESAP	Centro Servizi Industrie S.r.l.

MTS	Meccanica Tonel Sergio S.r.l.
MTU	Munster Technological University
PESTLE	Political, economic, societal, technological, legal and environmental
RTDI	Research, Technological Development and Innovation
S2i	Steinbeis 2i GmbH
SME	Small and medium-sized enterprise
UCN	University College of Northern Denmark
VR	Virtual reality

# 1. Introduction

Over the last two decades, workplaces in Europe and globally have been subject to substantial changes due to increased automation and new and emerging digital technologies. In this context, the challenges associated with changing dynamics in the work environment and increased mobility within and between workplaces raise new questions on how employees and employers can cope with changing skills needs in future labour markets and industrial environments. In particular, employers and employees need to anticipate new skills needs in decreasing time intervals and become more flexible in certification of skills and adaptation of new competencies.



To support the transition to a fully digitalised European industry, the FIT4FoF project aimed at identifying future skills requirements and new job profiles as well as developing and piloting a unique yet transferable education and training framework to answer those needs. This so-called ICoED approach places workers (women and men) at the centre of a co-design and development process that recognises and addresses their skills needs. The development and implementation of this approach reflected the need to provide a pathway by which agile and responsive training and education programmes can be made available to support timely and sustainable continuous professional development for workers in advanced manufacturing. The project centred on close collaboration between training and industry partners and was intended to provide a blueprint for an ongoing process by which needs would be identified or anticipated and solutions co-designed in a tri-partite arrangement involving the worker/learner, the employer and the training provider.

This publication and the information given therein were developed during the implementation of the EU-funded FIT4FoF<sup>1</sup> project between November 2018 and April 2022. FIT4FoF, i. e. Making our Workforce fit for the Factory of the

<sup>1</sup> More information can be found at [www.bit.ly/FIT4FoF](http://www.bit.ly/FIT4FoF)

Over the last two decades the manufacturing sector has been subject to fundamental changes due to new and emerging technologies. This ever-increasing dynamic raised pressing questions on how employees and employers can cope with changing skills needs in future labour markets and increasingly digitalised industrial environments.

The publication at hand presents a new approach to tackle these challenges using participatory tools to co-design upskilling courses tailor-made for both workers and companies.

The FIT4FoF European project developed and tested this approach, called ICoED, in a number of industrial pilot applications. Furthermore, a future scenario for work and skills in Industry 5.0, aligning technology, sustainability, and society, is sketched, including framework conditions that are relevant for its realisation. By presenting recommendations for policy, the FIT4FoF partners would like to invite stakeholders to enter into a dialogue on how to achieve this future scenario using the ICoED approach for the benefit of both the economy and society.

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