

European projects put workers at the centre of future manufacturing

Wednesday 21st March 2018: Today, industry in Europe provides 50 million direct jobs¹. This accounts for 20% of our workforce, and over half of our exports. Although there are currently high levels of automation in the manufacturing industry, people remain central to operations.

Five projects, funded under the European Union's Horizon 2020 research and innovation programme - A4BLUE, Factory2Fit, HUMAN, INCLUSIVE, and MANUWORK - are developing solutions for manufacturing work environments that adapt to each individual worker. In the past, people were expected to adapt to machine requirements. Now, automation systems are being developed that can recognise the users, remember their capabilities, skills and preferences, and adapt accordingly. Adaptation can also make work organisation more flexible so that individual preferences are taken into account in task distribution. New automation approaches, with workers at the centre, will complement people's capabilities and ensure higher performance, adaptability and quality.

The solutions currently being developed by these five research projects will bring a wide range of benefits for workers, employers, and wider industry in Europe, including:

- » Increased adaptability to provide workers with personalised tasks
- » Improved quality of products and increased productivity
- » Increased worker satisfaction
- » Stronger global position of industry in Europe through higher social acceptance levels

As the five projects entered the second year of their three-year duration in autumn 2017, they teamed up to form a cluster. Based on the common goals they are working towards, the cluster is a forum for sharing projects' knowledge, progress, and results as they emerge. By combining their efforts, A4BLUE, Factory2Fit, HUMAN, INCLUSIVE, and MANUWORK hope to achieve greater impact and wider adoption of these new developments in advanced manufacturing systems. In the coming months, the cluster will be setting up a website to share news and updates. More information about each of the projects in the cluster can be found below.



Figure 1 – Countries covered by the projects' cluster

¹ 'Industry in Europe - Facts & Figures on Competitiveness & Innovation 2017':
<https://publications.europa.eu/en/publication-detail/-/publication/354c1e8b-1db0-11e7-aeb3-01aa75ed71a1>

More information about the projects in the cluster can be found below:



A4BLUE (Adaptive Automation in Assembly for BLUE collar workers satisfaction in Evolvable context) proposes the development and evaluation of a new generation of sustainable and adaptive workplaces dealing with the evolving requirements of manufacturing processes and human variability. For this, A4BLUE is working to introduce adaptive automation mechanisms for an efficient and flexible execution of tasks, ensuring a constant and safe human-machine interaction as well as advanced and personalized worker assistance systems including VR/AR and knowledge management capabilities to support them in the assembly and training related activities. “A4BLUE focuses in three aspects of the future workplaces” says Jon Larreina, the A4BLUE project coordinator. “First, adaptability, which allows effortless integration of heterogeneous hardware and software components to adjust the behaviour of the workplace to face changes within the production site. Second, interaction through intuitive, context-aware and personalized multimodal human-automation interaction mechanisms. And finally, sustainability, by determining the optimal degree of automation of new assembly processes that balance social and economic criteria to maximize long term worker satisfaction and overall performance”.



The solutions developed in Factory2Fit will engage and empower future factory workers and bring increased worker motivation, satisfaction and productivity by giving the worker motivating feedback of his/her wellbeing and work performance, and adapting the work environment according to personal skills and preferences. The solutions also engage workers to share knowledge, participate in designing their work, and take responsibility of their own learning and skills development. “Factory2Fit aims to radically increase the potential for factory workers to influence their work,” said Factory2Fit Project Coordinator Dr Eija Kaasinen from VTT Technical Research Centre of Finland. “Factory2Fit’s solutions will make the factory environment more flexible and adaptable. The solutions will also allow workers to take responsibility for their own wellbeing and skills development, as well as provide tools to share their tacit knowledge. As well as benefitting the workers themselves, the Factory2Fit solutions will bring a range of benefits for employers and the wider European manufacturing industry,” said Dr Kaasinen.



HUMAN aims at developing a platform that is contextually aware of both the factory and the human operator, identifying when an intervention is required in order to support the operator in performing their tasks with the desired quality, whilst ensuring their well-being. The preliminary analysis of needs yielded to four distinct use cases of interest called **services**. The approach taken in HUMAN towards requirements gathering used co-creation methodologies and design thinking principles, engaging with stakeholders from the multidisciplinary HUMAN consortium, including the end-user organizations. “We are now focusing on the development of the first demos of the services”, states Dr. Hans Torvatn, senior researcher at SINTEF research institute in Trondheim, and project coordinator. “Testing will be conducted both in labs and in real life settings, enabling us to get direct feedback from end users as well as experience first hand differences between lab settings and real life. Through this tested combination of services and intervention mechanisms to trigger, HUMAN aims to reach its goal to offer support to the creation of workplaces where automation and human workers operate in harmony to improve the productivity, quality and performance of the factory as well as the worker satisfaction and safety.”

 INCLUSIVE aims at covering the increasing gap between machine complexity and user capabilities by developing a smart and innovative HMI that accommodates to the workers' skills and flexibility needs, by compensating their limitations (due to age, disabilities or inexperience) and by taking full advantage of their experience. To achieve this, the developed HMI system needs to be able to measure the sustainable cognitive load of the human operator, to adapt the automation functions and support and train low skilled operators to accomplish a complex automation task properly, also by integrating a virtual environment and an industrial social network. "We are now working at the definition of the adaptation principles and the design of the training tool," is the comment by Prof. Cesare Fantuzzi, Full Professor at the University of Modena and Reggio Emilia and Project Coordinator. "The INCLUSIVE project will introduce a revolutionary change from the current belief that 'the human learns how the machine works', to the future scenario in which 'the machine adapts to the human capability, accommodating to her/his own time and features'. The final goal is to create an inclusive and flexible working environment for any operator, taking into account multiple cultural background, skills, age and different abilities."



MANUWORK aims to focus on the development of an integrated platform for the management of manufacturing workplaces of the future that will be characterized by the complementarity between humans and automation. MANUWORK develops human-automation load balancing methods that determine the optimal trade-off between automation and human involvement at a shop-floor workplace, taking into account the needed flexibility for the process, the available skills (offered both from human and machines), a safe integration of humans and automation into the process and the overall load of the line. "We want the production system to be able to adapt in order to compensate for human limitations, disabilities for example, thus ensuring a socially sustainable working environment without compromising production targets." says Dr. Kosmas Alexopoulos for Laboratory for Manufacturing Systems & Automation (LMS) coordinating the MANUWORK project.

For more information:

A4BLUE, <http://a4blue.eu/>

FACTORY2FIT, <https://factory2fit.eu/>

HUMAN, <http://www.humanmanufacturing.eu/>

INCLUSIVE, <http://www.inclusive-project.eu/>

MANUWORK, <http://www.manuwork.eu/>