

**MANUWORK – Balancing Human and Automation Levels for the Manufacturing Workplaces of the Future**

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**Summary:**

*The second version of the MANUWORK project Dissemination Plan updated until project Month 24 is presented in this document.*

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**EXECUTIVE SUMMARY**

This document contains the outcome of the MANUWORK Task 7.3, known as “Dissemination Plan”. The main aims for preparing this document are as follow:

- Provide knowledge about the dissemination approach within MANUWORK.
- Provide a plan for dissemination activities for the whole project period.
- Report all the performed dissemination activities related to MANUWORK, up to month 24.

Primary conclusions / results include the following:

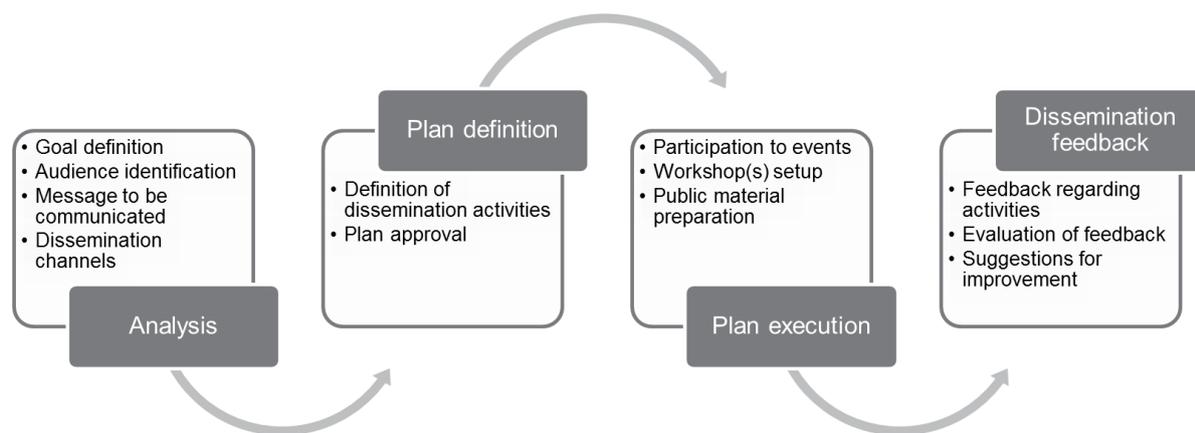
- Having a Dissemination Plan is crucial for increasing the commercial exploitation of the project and maximizing the society awareness of the project results. Dissemination Plan mainly aims at providing a solid ground for effective communication with external potential beneficiaries such as interested stakeholders, industrial practitioners and researchers at an international level as well as internal beneficiaries including all the consortium members and companies.
- The internal coordination of the project is at utmost importance because a well-planned project is the key factor for having an effective external communication as well as aligning the interests of all parties involved in the project.
- To have an effective dissemination, the dissemination plan and activities should be updated and continually revised in parallel with the project development over the time.
- The results of the project should be disseminated to a wide range of audience. This can be achieved by participating in workshops, national and international conferences, publishing in journals, and actively updating the project’s communication channels on the web e.g., Twitter, project’s portal, LinkedIn.
- During the first year of the project the dissemination activities have been planned and dissemination framework has been setup. In the remaining years of the project, the dissemination activities and communication with external audience is expected to be increased as the project neutrally generates more results.

## 1. DISSEMINATION STRATEGY

The main aim of dissemination strategy is to identify and properly plan the dissemination activities as well as effectively promote commercial and other results obtained by the project. The designed strategy helps with maximizing the influence of the project in both the research community and industry.

### 1.1. Dissemination approach

The MANUWORK will follow a dissemination and communication approach which consists of four main steps namely: analysis, planning, execution, and feedback (see Figure 1). A detailed explanation for each step is provided below.



**Figure 1: MANUWORK dissemination steps**

#### Analysis

Analysis is the very first step in the dissemination approach. In this step the key elements of the dissemination activity such as goal, audience, message of the project, and channels of communication/dissemination are analyzed and defined.

- **Goal:** The first important element of the analysis step is the goal(s) definition. To ensure a successful dissemination plan, the mission and objectives of the consortium should be clearly defined in agreement with all the project partners.
- **Audience:** The second element that has influence on having a successful analysis is the audience identification. The targeted audience of the project and dissemination activities should be identified before selecting the means of communication. In this way, MANUWORK project's news can be effectively communicated to the right audience through appropriate channels. Generally, the inserted audience in MANUWORK project can be divided into two main groups namely, external and internal. Internal audience includes academic or industrial people, universities, research centers, and companies that are directly involved in MANUWORK. External audience refers to all researchers and academic members who are not a member of MANUWORK's consortium. The aim is to accurately identify the most relevant stakeholders at each phase of the project, as well as their motivations for their interest in the objectives of the project and namely efficient methods and tools for balancing human and automation levels in manufacturing tasks. Moreover, reaching out to the different audience in the most effective way, the proper communication channels and approaches need to be identified and the message should be continuously updated.
- **Message:** The other important element of the analysis step is the message of the project that should be communicated to audience of MANUWORK. All the messages must be designed to clearly

reflect the goals of the project while, taking into account the phase of the project and the identified audience at the same time.

- **Channels:** The last element of the dissemination analysis is the dissemination channel. The MANUWORK project takes advantage of several different dissemination channels to make sure that the messages of the project are properly communicated to the interested audience and groups of interest. The channels to be used in MANUWORK are: websites, publication of journal papers, leaflets, and face to face discussion at public scientific and industrial meetings, i.e. conferences, exhibitions, and workshops. The consortium is highly committed to advertise the event timely and broadly to ensure the maximum number of audience.

### **Planning**

The second important step in the dissemination approach is the dissemination planning. In this part dissemination activities are defined in agreement with the consortium members. Then, all the details such as activities' dates, target audience for each activity, messages to communicate, and the specific project's objective(s) to be covered by each activity will be planned. The plan will be effective after it has been officially approved by the consortium.

### **Execution**

The third step in the proposed approach is plan execution. All the activities which the Dissemination plan is describing are implemented in the execution step. For each of the dissemination activities there is a key-partner who is allocated to prepare and execute the activity as a main leader. Through the whole phases of the dissemination project all partners are supposed to cooperate in the process of executing the activities regarding to their field of expertise or their interests.

### **Feedback**

Partners who execute the activity are expected to provide feedback after the dissemination activity. The result of dissemination activities must be able to be assessed through tangible objective(s). The provided feedback is profitable in monitoring and updating the goals, audience, messages etc. which are identified as the dissemination components and it also guarantees a significant result of the activity.

## **1.2. Dissemination goals/objectives**

Identifying/defining the needed stages and a set of initial activities are the most important goals of this dissemination plan. While defining the activities and stages the following requirements should be satisfied.

- There must be an awareness built on around the project.
- The findings and results provided by the research are better to be communicated in order to encourage the tendency of MANUWORK.
- Through the development of the MANUWORK each fulfilled Work package (WP) could be passed and its discoveries and products could be used and marketed for further needs.
- Building up a vast network system for the possible customers should also be considered as an important goal.

The project's Description of Work (DoW) document sets the foundation of having the mentioned goals accomplished. It presents: (1) the genuine benefits and goals of the project, (2) an initial step for preparing the interactions of the possible consumers and, (3) a set of dissemination activities which is based on the goals of the project.

In addition to the provided information by the DoW, in the current plan there are some provided elements as follows:

- The identification of the target audience of the MANUWORK which is essential because it shows the most systematic procedures for communications.

- Defining the messages/subjects in order to draw the attention of the target audience.
- Choosing the channels and media of communication that prepares the messages for the target audience.
- Defining the internal collaboration outlook to enhance the efficiency of the dissemination activities.
- Assessment of obtained outcomes by means of regarding the importance of feedback system and creating a method of measuring the objectives.

### 1.3. Target audience

A precise distribution of the dissemination plan has been provided below to facilitate the process of analysing the effect of dissemination on a comparable basis and also organizing the dissemination activities based on the dissemination plan.

- Academic and research community as a type of audience aims at all research communities which are concerned with the improvement, outcomes and innovation of the MANUWORK project. This could be profitable for their own research activities as well. Researchers working in the field of workplace design, ergonomics, production optimization, augmented reality and more are also interested in the scientific aspect of MANUWORK.
- Industrial sector, Professional Associations as a type of target could be addressed by MANUWORK dissemination in order to stimulate the industrial engagement and the communities of the consumers. For organizations with diverse industry verticals the MANUWORK is extremely applicable. Stakeholders from different industrial sectors have been engrossed in MANUWORK. The frame of elaboration and exploitation plan will analyze the capacity of using the outcomes of the MANUWORK. Eventually the analysis of MANUWORK's dissemination effect is planned to be performed by us. On this analysis we specify the industrial segments which are going to be addressed and we differentiate the obtained responses of different segments. This analysis will provide us with valuable knowledge about the exploitations that may occur later in the future through the attempt of the partners' board when the project is finalized.
- Range of the MANUWORK and its objectives must be introduced to the larger public by means of the latest technologies.
- EU technology platforms is another type of audience. European Technology Platform (EPT) production will receive the outcomes created by the MANUWORK and use it in road mapping related jobs. MANUWORK also attempts to take part in the events that will be held by the European Factories of Future Research Association (EFFRA)
- There are other projects working on the similar field that could be considered as another type of audience. The opportunity of making connections among parties and common participants are offered by the cooperation of the partners in other related projects. MANUWORK has joined the cluster of other EU FoF projects in the topic of "FOF-04-2016: Continuous adaptation of work environments with changing levels of automation in evolving production systems". Participating in this cluster brings about several opportunities as follows:
  - Participation in creating the roadmap by using the experience obtained from the execution of the project so that the future research in the mentioned field will be developed.
  - Comparison of results for similar technologies.
  - Circulating provided essays in the news using social media, emails, online posts, etc.
  - Wider dissemination through common communication activities.

- Taking part in the work-related organized gathering events of other projects and receive the most useful effects of joint working groups.
- New ideas and strategies for future research initiatives.
- Considering further collaboration and co-production with other related research projects including Inclusive, Factory2Fit, A4Blue and Human.
- Another type of audience is Internal Audience which should be considered as one of the most effective components of the MANUWORK therefore the internal communication and dissemination among the Consortium partners must be guaranteed.

In the dissemination plan, partners’ organizations are significantly important because: firstly they are considered as the potential consumers of the MANUWORK themselves and secondly they have a significant effect on the associated industrial sectors so they are the ‘influencers’ as well.

There are major market players in different segments among MANUWORK consortium partners so there is a natural channel made that facilitates the dissemination of the project and its outcomes for possible customers. In this regard the attempts and the abilities of every partner in grabbing the opportunities for executing the project and its outcomes are directly affecting the dissemination activities. According to this, the communication of the information related to MANUWORK project and the outcomes among all the partners such as managers, consultants and marketers is very essential. In addition encouraging the partner to pass on this information to the customers and business partners is vital.

This communication policy helps the partners to gain the whole information related to planning, ongoing work and also current or possible problems. Apart from requested EC and Internal reporting, active communication with the WP Leaders is required to be done by the partners regarding the technical improvements and issues. On the other hand Project Coordinator (PC) must be kept up to date about the activities by WP Leaders as well. PC could be informed about all the occurring executive and legal issues by the invited partners.

The above mentioned target audiences can be classified into five different groups based on the input they bring into the project and their interest in the project outputs. A list of these five groups is provided in Table 1, together with specific audiences of interest for MANUWORK developments.

**Table 1: The five main groups of AMNUWORK target audience**

Group	Target audience	Why this should be chosen as an audience for MANUWORK?	Why this audience should be interested to MANUWORK?
Industry	Manufacturing and assembly companies	They are the user of the project results and can provide valuable feedback	More smooth and flawless manufacturing and assembly process as well as higher throughput and worker satisfaction
	Robotic manufacturers	They are technology provider and highly affect the applicability of the project’s results	The project’s result will help them to better market their products.
	End-users that are using collaborative robots (Cobot)	They could provide good examples and have valuable experiences	The project’s output will help them to adjust the use of Cobot in their production with the aim of improving the worker satisfaction.
	End-users that are reluctant to use Cobot	They are the potential market for the project outputs	The project results could help them in using Cobots and increasing their productivity
	Industry associations	These associations have high influence in defining the	They may like to take initiative in developing the research roadmap for

		roadmaps and new research areas for industry.	both EU robotics as well as the MANUWORK's roadmap.
	Man-time measurement (MTM) associations	Current standards do not include human-robot collaborative environment.	Human-robot collaboration will probably affect the man-time measurement standards and balancing using MTM.
	Worker Unions	Driver for the implementation in the industry; they may provide valuable feedback	They will benefit from the MANUWORK impact on the workplace
Academic	Production experts at research centers	They provide technical information to the project	The project's finding will provide them a new insight and open an avenue for the future research.
	Human-Automation Collaboration experts	They may provide valuable feedback	MANUWORK highly contributes in this field
Internal audience	Research partners	They are the scientific knowledge provider to the project.	They will get the chance to work in close collaboration with industry and test their developed tools and techniques in real world.
	Industrial partners	They are the potential consumers of the projects results and the developed technology. They also have influence on the associated industrial sectors.	They will benefit from the tools and technology developed within the project prior to their competitors.
Other projects	Similar projects	They share knowledge and provide feedback to the project	They will learn about the new ideas and have also the possibility to use the experience of other experts in the field
	ACE Factories Cluster	They work in similar topics.	Maximize the adoption of the proposed solutions.
Public	Government	The framework for utilizing and deploying the collaborative robots are mainly developed by government.	Getting information and knowledge about the recent developments and usage of collaborative robots in industry, which may help them to develop new policies for the use of collaborative robots.
	European Commission (EC)	The EC provides funding for developing research on human-robot collaboration.	The EC will decide on future calls and findings based on the achievement of the project.

#### 1.4. Messages

The usable outcomes of MANUWORK and the approach through which the entire MANUWORK will be developed are mostly the primary messages that are disseminated along the project and when the project is finalized. To be more specific a list has been provided below.

1. The scope and goals of the MANUWORK
2. The pilot cases description of MANUWORK except the confidential information
3. The entire MANUWORK approach
  - a. Industrial social networking
  - b. Assessment of worker satisfaction
  - c. Continuous Adaptation and Balancing Methods
  - d. Augmented Reality for Operator 4.0
4. MANUWORK as a technology-related project which is connected to INDUSTRY 4.0

## 5. The effect of MANUWORK on the industrial pilot cases

The key messages of the MANUWORK as well as the information related to timing, target audience and partners who are focused to disseminate the key messages are given in Table 2.

**Table2: Key messages**

Message/Subject	Description	Communication period of the message	Target Audience
<b>Project aspects</b>	<b>Project structure, goals, status</b>	<b>During the whole project</b>	<b>All</b>
Project mission	MANUWORK supports the design and operation of human-centered manufacturing that is based on the human-automation symbiosis paradigm. In this paradigm the system adapts in order to compensate for operators' limitations (skills, knowledge, disabilities), thus ensuring a socially sustainable working environment without compromising production targets.	During the whole project	Research and industry community
Pilot cases	The challenges which are set by the pilot cases and the process of addressing the challenges by the MANUWORK. There should be visible effects of MANUWORK technology on the pilot cases	First 2 years of the project	Industrial users around the globe
Human-automation load balancing method and tool	Develop a <b>human-automation load balancing</b> method that determines the optimal trade-off between automation and human involvement at a workplace, taking into account the process flexibility required, available skills, safe integration of human and automation into the process and the overall load of the line.	During the last 2 years of the project	Research and industry community
Measurement of worker satisfaction	Develop method <b>for measuring worker satisfaction</b> , safety and health at work, i.e. "ergonomics climate	During the last 2 years of the project	Research and industry community
Industrial Social Analytics solution	Advanced <b>social networking shop-floor</b> application, which will be used for knowledge capturing, networking, guidance and decision support.	During the last 2 years of the project	Research and industry community

Augmented Reality	<b>AR technologies</b> to create human-centred workplaces	During the last 2 years of the project	Research and industry community
MANUWORK relevance and contribution to Industry 4.0	Technology developed within the MANUWORK project will contribute to the Industry 4.0 paradigm.	During the whole project	Industrial users, policy makers, and EU
Industrial pilot cases being affected by the MANUWORK technology	MANUWORK technology aims to achieve several goals which are related to industry e.g. producing in higher amount with higher quality, consuming the resources more economically, and prevention of the aging staff's effects.	During the last year of the project	Industrial users, policy makers, and EU

### 1.5. Dissemination tools/channels

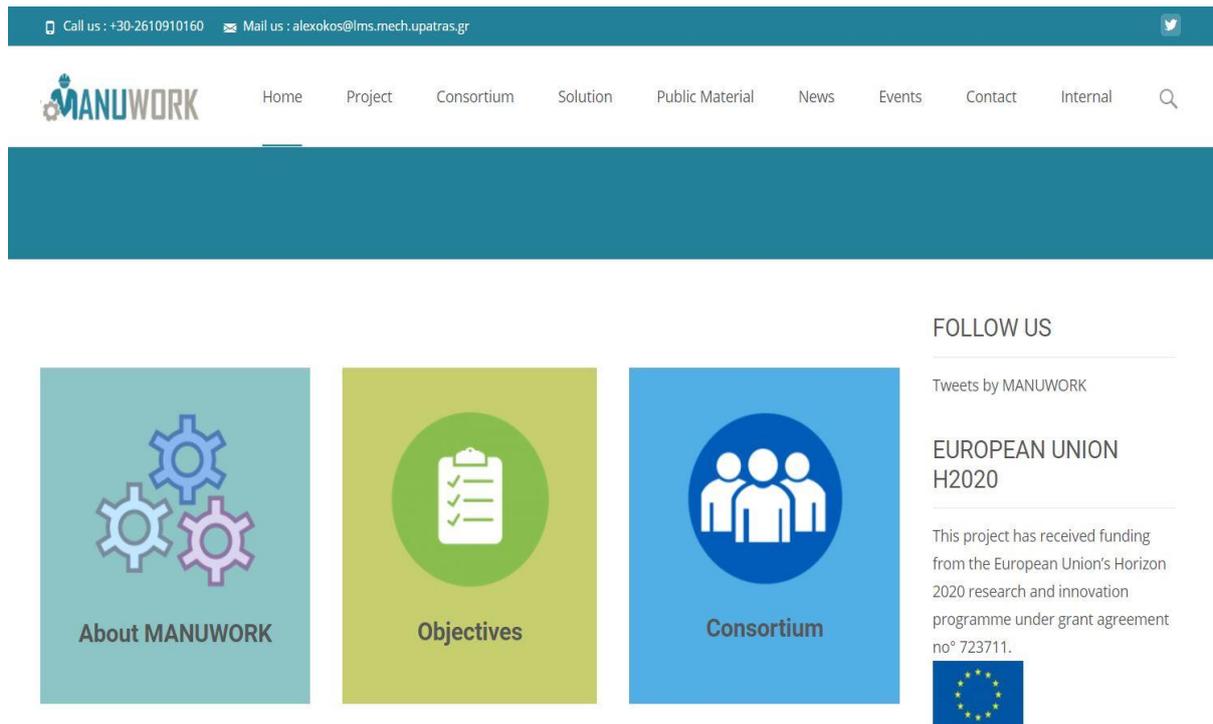
Dissemination channels are mainly used to communicate with both the external audience and people in MANUWORK consortium. Most of the dissemination channels for the project will be public and all the news about the project will be continually published on the web to attract a large number of audience. The most common Dissemination tools/channels for the scientific projects are: newsletters, publication of papers and reports, websites, participating in conferences and exhibitions, and personal contacts through meetings, workshops and other dissemination events.

There are some gadgets that make the process of MANUWORK dissemination easier. To mention some we can refer to websites and intranet which represent the developing process of MANUWORK, Social Media Networking (LinkedIn, Twitter), using emails, newsletters etc. to specialized shareholders, using broadcast channels such as MANUWORK's website and media, holding large public events mainly related to specialized stakeholders, publishing to scientific journals and conferences, setting up public and industrial workshops.

#### Project portal

There has been an MANUWORK public Web Portal developed and aimed to fulfil some of the needs for the project's dissemination, publish news and information related to the project and to make a connection between the project coordinator and those who are interested in the project. This portal is available on the internet for all the people around the world. The project portal can be accessed both by the public and private sectors through this link: <http://www.manuwork.eu/>. The first page of the MANUWORK portal is shown in Figure 2.

In order to disseminate the knowledge of the project and to publish the news and beneficiaries about the project and to make a connection between the project coordinator and those who are willing to participate in the project the public space of the portal has been provided.



**Figure 2: First page of the MANUWORK portal**

## Social media

MANUWORK has been presented in social media specifically in LinkedIn and Twitter which are useful in promotion of MANUWORK activities among the users of those media. The front page of the LinkedIn and Twitter designed for the MANUWORK are shown in Figures 3 and 4, respectively.

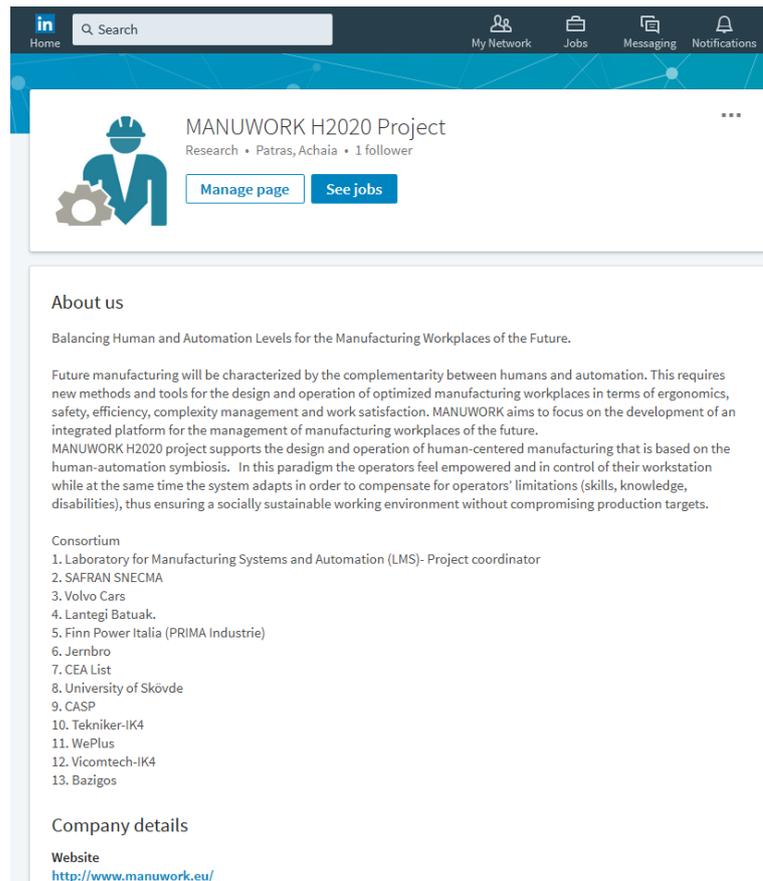


Figure 3: First page of the MANUWORK in LinkedIn

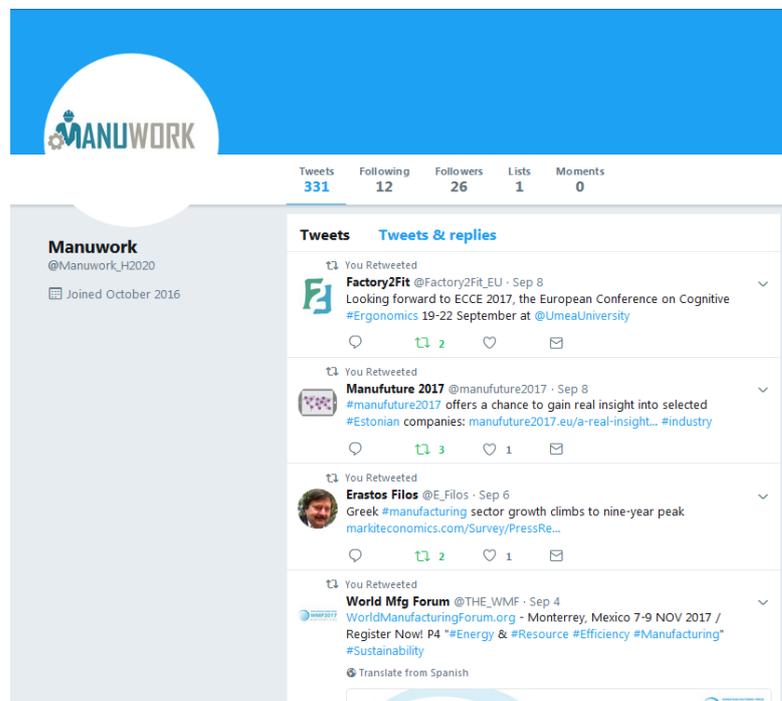


Figure 4: First page of the MANUWORK in Twitter

Newsletters

The new information are sent regularly by emails to those who subscribed on the recently released newsletter and are available on the MANUWORK portal for the public access. The intention of the newsletter is motivate the interest in project activities and also boost their awareness. A new issue of the newsletter is released in key milestone points of the project. The first (published in September 2017) and second (published in July 2018) issues of MANUWORK newsletter, are shown in Figure 5 and 6, respectively.

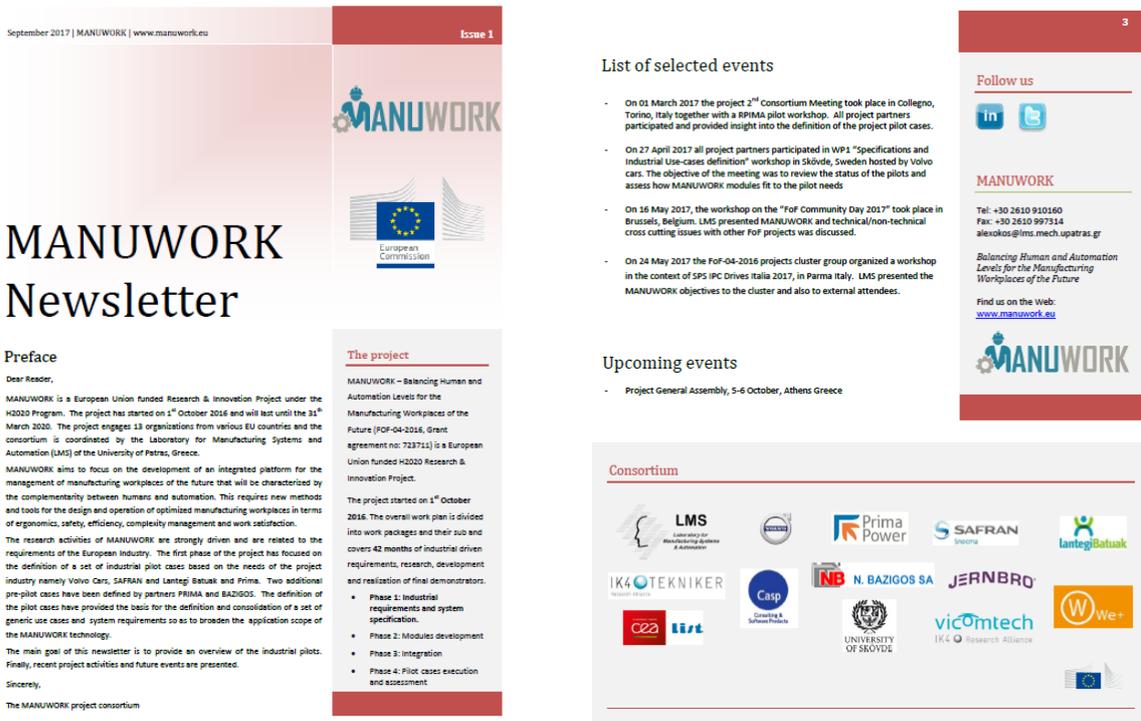


Figure 5: First issue of MANUWORK newsletter (available at: <http://www.manuwork.eu/wp-content/uploads/2017/10/MANUWORK-Newsletter-Sept-2017-v1.pdf>)



Figure 6: Second issue of MANUWORK newsletter ([http://www.manuwork.eu/wp-content/uploads/2018/07/MANUWORK-NewsLetter-2\\_July-2018.pdf](http://www.manuwork.eu/wp-content/uploads/2018/07/MANUWORK-NewsLetter-2_July-2018.pdf))

Brochure

In order to communicate the key-facts for the aim of goals, structure etc. of the project a brochure has been provided which is accessible for the public and is going to be printed out in papers and distributed to interested participants of the MANUWORK events. The MANUWORK brochure can be seen in Figure 7.

## CONSORTIUM



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Balancing Human and Automation  
 Levels for the Manufacturing  
 Workplaces of the Future

[www.manuwork.eu](http://www.manuwork.eu)

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### PROJECT OBJECTIVES

- ✓ Create a framework for **workplace adaptation** based on socio-organizational factors.
  - Workplace attractiveness
  - Well-being and engagement of the worker in the design and adaptation phases based on their experience.
- ✓ Develop a **human-automation load balancing** method that determines the optimal trade-off between automation and human involvement at a workplace, taking into account the process flexibility required, available skills, safe integration of human and automation into the process and the overall load of the line.
- ✓ Develop a method for **measuring worker satisfaction**, safety and health at work, i.e. "ergonomics climate".
- ✓ Develop an advanced **social networking shop-floor** application, facilitating **AR technologies**, which will be used for knowledge capturing, networking, guidance and decision support.

### ABOUT MANUWORK

Future manufacturing will be characterized by the complementarity between humans and automation. This requires new methods and tools for the design and operation of optimized manufacturing workplaces in terms of ergonomics, safety, efficiency, complexity management and work satisfaction. MANUWORK aims to focus on the development of an integrated platform for the management of manufacturing workplaces of the future.

MANUWORK supports the design and operation of **human-centered manufacturing** that is based on the **human-automation symbiosis**. In this paradigm the operators feel empowered and in control of their workstation while at the same time the system adapts in order to compensate for operators' limitations (skills, knowledge, disabilities), thus ensuring a **socially sustainable working environment without compromising production targets**.

### INDUSTRIAL PILOT CASES

The developments of the MANUWORK will be demonstrated in three industrial pilots and one pre-pilot setting:

- **Automotive (VOLVO):** The automotive use case focuses on the assembly of car engines targeting at optimal manual/automation load balancing with consideration of the real-time status and knowledge extracted from shop-floor.
- **Aerospace (SAFRAN):** The aerospace use-focuses on the final assembly of civil aircraft engines and the focus will be on feedback/information sharing, workers' training and satisfaction
- **Disabilities (LANTEGI):** This pilot case will use the human-machine symbiosis paradigm for supporting people with different disabilities to perform complex assembly tasks.
- **Machine tool (PRIMA, BAZIGOS):** The machine tool use-case will form the basis for a pre-pilot validation activity planned prior to the industrial demonstrators of MANUWORK.

[www.manuwork.eu](http://www.manuwork.eu)

Figure 7: MANUWORK brochure

### Joint activity with other similar EU projects

There are other ongoing EU projects that share some similarities with MANUWORK, specifically the projects that are aimed at improving the human working condition at manufacturing industry. Identifying and creating a cluster of these projects could be a good opportunity to find synergies, bring together results that can be disseminated together, build on each other's ideas, increase and facilitate the project awareness around the world, and etc. This way, all the projects can take advantage of already established academic and industrial networks by each individual project. This strategy can significantly facilitate to communicate the latest results and news of each project to the right audience, i.e. research centers, academia, and industry, who are having interest in improving the human working condition.

Considering the advantages of clustering and joint activities with other projects, MANUWORK has formed a dissemination cluster with four other EU projects. The name of the cluster is chosen to be **HumAn CEntred Factories (ACE Factories)**.

Several joint dissemination activities such as producing press release and newsletter will be performed during the project life to increase the awareness around all the projects. Moreover, some joint workshops, where both industry and academia are invited, will be organized to directly communicate the results and progress of all the projects as well as to get feedback from experts. Additionally, the cluster is planning to apply for the European Commission's Common Dissemination Booster (CDB) service, on the first open call. Additionally, the projects in the cluster will support the dissemination of each other's activities through their social media.

The following activities have been already taken by the dissemination Cluster.

- An online portal is created for ACE Factories Dissemination Cluster which can be accessed at: <http://ace-factories.eu/projects/>.
- A joint press release is produced and have been shared among all the projects network. It is also posted on each project's websites and social channels. Moreover, the release has been syndicated to all of the following media outlets. The first page of joint press release is shown in Figure8.
  - CORDIS
  - EFFRA
  - Science|Business
  - Horizon Magazine
  - Politico Europe
  - EurActiv
  - Horizon Magazine
  - Parliament Magazine
  - Research Europe
  - EuroNews

Press release

## European projects put workers at the centre of future manufacturing

Wednesday 21<sup>st</sup> March 2018: Today, industry in Europe provides 50 million direct jobs<sup>1</sup>. 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

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

**Figure 8. The first page of the first joint press release (available at: <http://ace-factories.eu/wp-content/uploads/Joint-Press-Release.pdf>)**

- A joint newsletter is produced and posted on each project's webpage as well as their other communication networks (e.g. LinkedIn, Facebook). The first page of joint newsletter is shown in Figure 9.

ACE Factories Cluster Newsletter | Issue n°1 | JULY 2018



ACE Factories: humAn CEntred Factories Cluster - Enjoy reading our first newsletter!

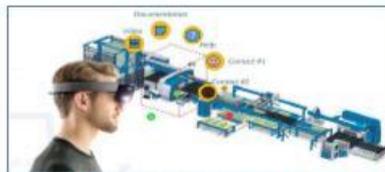
### *ACE Factories: humAn CEntred Factories Cluster*

ACE Factories: humAn CEntred Factories Cluster is a networking Cluster of five FoF-4 projects funded under the European Union's Horizon 2020 research and innovation programme - [A4BLUE](#), [Factory2Fit](#), [HUMAN, INCLUSIVE](#), and [MANUWORK](#). Based on the common goals they are working towards, the cluster is a forum for sharing projects' knowledge, progress, and results. Those projects are developing solutions for manufacturing work environments that adapt to each individual worker. By combining their efforts, the projects hope to achieve greater impact and wider adoption of these new developments in advanced manufacturing systems.



Countries covered by the projects' cluster

#### Our vision and mission



Smart and connected technologies are not only transforming how parts and products are designed, produced, used, and maintained, but also workplaces and workers, transforming organisations themselves in human-centred factories. Consequently, now, by introducing new technologies, industrial work is increasingly mediated; i.e. the work is not related to the physical objects but to their counterparts in the virtual world. But people remain central to operations. 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. Humans and automation are therefore taking advantage of each other's strengths, having a symbiotic relationship for enhancing capabilities, skills and quality of their work. Workers get encouraging feedback of their wellbeing and competence development, taking responsibility of their own competence development with adaptive on-the-job learning tools. Adaptation can also make work organisation more flexible so that individual preferences are taken into account in task distribution. In short, new automation approaches, with workers at the centre, will complement people's capabilities and ensure higher performance, adaptability and quality. The result is more flexible, inclusive and safe workplaces, as well as better work conditions and increased productivity and improved quality. But, above all, this means increased worker satisfaction and work well-being, more empowered and engaged workers and increased interest towards factory work as a career, attracting young talented people.

**Figure 9. The first joint newsletter (available at: [http://ace-factories.eu/wp-content/uploads/ACEFactories-Newsletter\\_1\\_final.pdf](http://ace-factories.eu/wp-content/uploads/ACEFactories-Newsletter_1_final.pdf))**

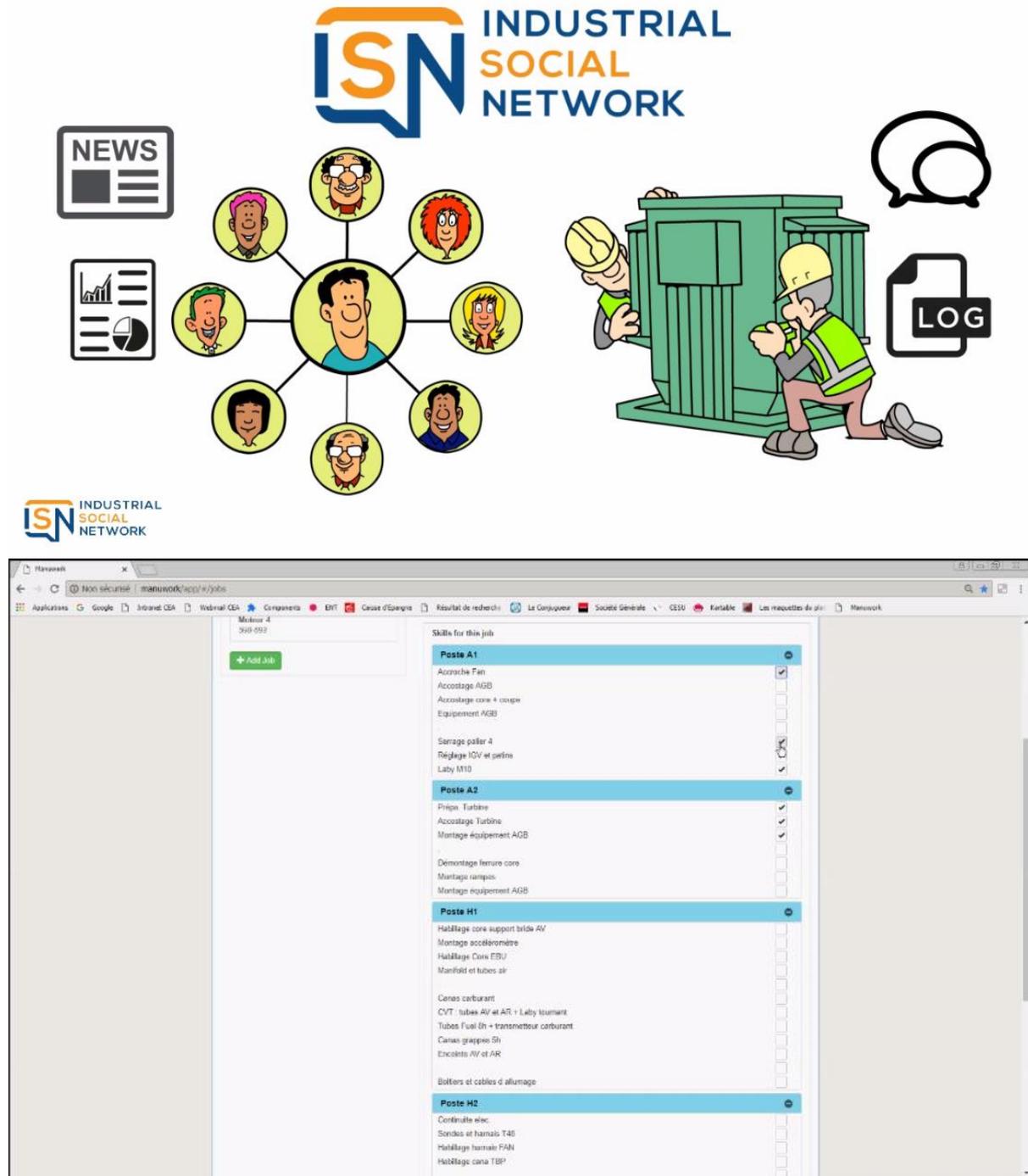
- The ACE Factories cluster was presented in the Factories of the Future Community Day on the 27th of June 2018, in Brussels. The presentation included a summary of the common vision shared by the EU-funded projects participating in the cluster, the use cases and the foreseen impacts in the Human-centered factories of the future. The presentation can be found at: <http://ace-factories.eu/wp-content/uploads/Human-centred-factories-FoF-Community-Day-Kaasinen-et-al-5.pdf>

**Video teaser**

Videos are important and powerful tools for promoting or/and making awareness around a product or technology in the world. Videos can be considered as one of the best tools in going viral to a large number of audience as it is easy to consume and it can be fitted into audience schedule more conveniently.

In order to bring more attention as well as to provide a glimpse into project progress and results some teaser videos will be produced and made available online to public through different channels (e.g. project portal, LinkedIn, YouTube).

The first set of video teasers are already produced in order to show the current project's results and provide knowledge about the future expected technology that will be delivered at the end of the project. A screenshot of the produced video teasers is shown in Figure 10. All the videos are currently available on the internal portal and will be published before the second Review meeting. More video teasers are planned to be produced, i.e. one teaser for each developed technology, at the last phase of the project and when the physical demonstrators are installed. In the end of the project, dedicated videos will be created, also including data from the validation of the developed solutions in the use case pilots.



**Figure 10. Example (Screenshots) of the created videos**

As MANUWORK consortium is called to participate in Conferences and presentations, which include an exhibition stand and/or a poster presentation, a poster (Figure 11) and a banner (Figure 12) were designed. The poster includes all the details of the objective and the project use cases, highly useful in exhibitions where industry stakeholders are a majority of the visitors. Additionally, the eye-catching banner is created to further support promoting the project in dissemination events.

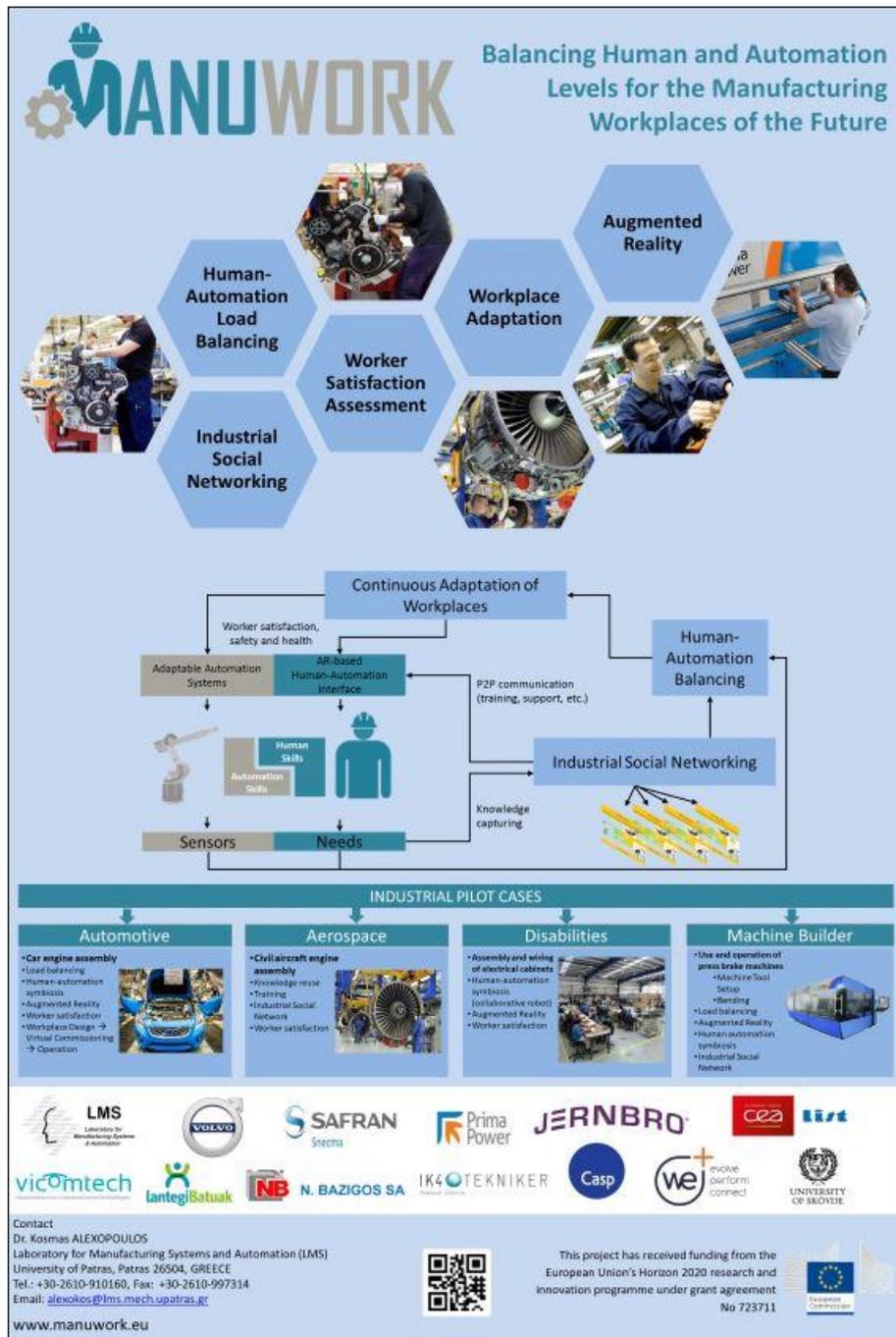


Figure11. MANUWOK's poster

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723711



Human-Automation Load Balancing

Worker Satisfaction Assessment

Workplace Adaptation

Augmented Reality

Industrial Social Networking



# MANUWORK

Balancing Human and Automation Levels for the Manufacturing Workplaces of the Future



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Figure 12. MANUWOK’s banner

## Dissemination channels

A list of media partners which is presented below can be helpful in the dissemination activities of MANUWORK.

- **CORDIS News:** CORDIS is the official portal of the European Commission's research results and can be reached at [http://cordis.europa.eu/news/home\\_en.html](http://cordis.europa.eu/news/home_en.html). CORDIS News is contained and interested to publish the most recent scientific developments in Europe. The very main focus of the CORDIS News is on political matters, important interviews and events, research and innovation in Europe. In principal, the targeted grope of audience of this portal are European research community. There are several advantages for the MANUWORK to use this channel for instances it could be helpful to advertise activities/events and inform the European community to the project development as well as to increase the project awareness around the world.
- **CORDIS Wire:** CORDIS Wire acts like a press agency by issuing news released and also announcements of events that are organized by projects funded by EU. The CORDIS Wire can be easily reached at <http://cordis.europa.eu/wire/> and also targeted at European research community. This channel can also be important to advertise activities/events and inform the European community to the project development. It can also be useful to increase the project awareness.
- **Research EU results magazine:** This magazine mainly publishes highlights of projects and research funded by EU. The magazine has 10 issues per year which are all published in English language. The audience of the EU results magazine is not limited and can be worldwide. This channel can be useful mainly to disseminate results of the MANUWORK project.
- **Events on the Commission's Research & Innovation website:** This website provides information about the related conferences and events to each specific research topic. The targeted audience of the website is mainly European countries and can be accessed at <http://www.ec.europa.eu/research/index.cfm?pg=conferences&filter=all>. This dissemination channel can be used by the MANUWORK project to advertise planned events and activities which are organized by the consortium.
- **EU researcher:** EU researcher is a magazine that specialize in dissemination of research conducted in EU. The focus of the magazine is to disseminate the finding of the pioneering frontier research. The magazine page can be found at <http://www.euresearcher.com/> and it can be beneficial to the MANUWORK project by helping to disseminate the project results. The magazine has a wide range of audience, about 33 countries and 50000 readers.

## Events

The dissemination task will be mainly performed by two groups: 1) MANUWOK's academic partners and, 2) MANUWOK's industrial partners.

Academic partners will be mainly responsible for transferring the finding and knowledge to the scientific community. The primary dissemination channel for communicating the research performed by academic partners to the interested people and organizations will be through publication in scientific journals and scientific conferences.

The MNAUWORK's industrial partners will organize and attended some events such as workshops and popular science seminars to inform both the industrial community and the general public about the

project and its main goals. They will also take advantage of these opportunities to communicate and discuss the achievement of the projects with industrial and scientific experts and getting feedback on the work done.

- The list of international scientific conferences and journals that have been specified through former attempts and which MANUWORK is going to take part in or/and publish in to satisfy the dissemination objectives in terms of reaching the academia audience is presented below.
- Selected conferences

Manufacturing technology and robotics: are the core elements of MANUWOK project. Therefore, a big part of scientific contribution is targeted technical manufacturing and robotics. Some of the most prestigious peer-reviewed conferences that are identified as potential place in meeting experts, exchanging ideas, presenting and publishing the findings, and getting the feedback are as follows.

- CIRP Conference on Manufacturing Systems (CMS)
- CIRP Conference on Intelligent Computation in Manufacturing Engineering (ICME)
- IFAC Symposium on Information Control in Manufacturing
- IEEE/RSJ International Conference on Intelligent Robots and Systems (IROS)
- IEEE International Conference on Robotics and Automation (ICRA)
- ACM/IEEE International Conference on Human Robot Interaction (HRI)
- International Conference on Changeable, Agile, Reconfigurable and Virtual Production (CARV)

Simulation and optimization: are the important techniques that need to be used in developing and testing the new tools and technology within MANUWORK. These techniques will be used in several work packages and by different partners. Therefore, it is crucial to identify some simulation and optimization scientific events to communicate the project's finding with the right audience and getting feedback from experts.

- Winter simulation conference
- The International Conference on Computer Modeling and Simulation
- The European Simulation and Modelling Conference

Human factors and ergonomics: are studied in some of the work tasks in MNAUWORK and the following conferences are identified as the most relevant event for meeting up with researchers and industrial practitioners as well as spreading the project's finding within human factors and ergonomics.

- Applied Human Factors and Ergonomics
- ACM Computer Human Interaction (CHI)
- The ACM Conference on Human Factors in Computing Systems (ACM CHI).

Virtual and Augmented Reality: are among the technologies that are going to be used and developed within MANUWOWRK. They will be used to provide a framework for adaptive shop floor. So, the results of this part of the project will be communicated to interested industrial and academic researchers through attending and presenting in some prestigious conferences such as:

- IEEE Virtual Reality Conference
- AR VR Innovate Conference
- Virtual Reality Developers Conference (VRDC)
- VRTO—Virtual & Augmented Reality World Conference & Expo

Additionally, some other conferences that focus on technologies of interest to MANUWRK developments have been identified:

- ACM International Conference on Multimodal Interfaces (ICMI)
- CIRP Conference on Assembly Technologies and Systems (CATS)
- CIRP Global Web Conference
- International Conference on Computer Supported Education
- ICCPS: ACM/IEEE International Conference on Cyber-Physical Systems
- IEEE Conference on Emerging Technology and Factory Automation

Scientific journals: although attending the scientific conferences can be very beneficial to the advancement of the project but, to have a deeper contribution in scientific community publishing the project's finding and the knowledge developed within the project can be at utmost importance. Therefore, some of the top specialized journals identified by the members of the consortium for disseminating the MANUWORK outputs are as follows. Publishing in scientific journals will also help to widen the project audience. The identified journals can be categorized into the three following groups.

Manufacturing, production and industrial engineering:

- The international journal of advanced manufacturing technology
- The international journal of production research
- International Journal of Computer Integrated Manufacturing
- CIRP Annals - Manufacturing Technology
- Advances in Manufacturing
- European Journal of Industrial Engineering
- International Journal of Industrial Engineering Computations
- International Journal of Industrial and Systems Engineering
- International Journal of Advanced Robotic Systems
- Robotics and Computer Integrated Manufacturing
- International Journal on Interactive Design and Manufacturing
- Journal of Modelling in Management

Human factors and ergonomics:

- IEEE Transactions on Human-Machine Systems
- Cognition, Technology & Work
- Applied Ergonomics
- Human-Computer Interaction
- International Journal of Human-Computer Studies
- Personal and Ubiquitous Computing

Virtual reality and augmented reality:

- International Journal of Human-Computer Studies
- Virtual Reality
- Virtual and Physical Prototyping
- International Journal of Virtual Technology and Multimedia
- ACM Transactions on Graphics
- IEEE Internet of Things Journal
- INFORMS Journal on Computing

**Industrial workshop:** In order to share the gained knowledge throughout the project and to receive the industrial feedback on the process of improving the project a series of workshops will be held. External experts and production specialists will be engaged in these workshops.

Industrial partners of MANUWORK will mainly disseminate their findings and new developed technology through workshops. There are three pilot cases in the MANUWORK project each associated with a manufacturing company. Therefore, it is planned to organize three workshops, one per pilot, where both experts and interested people from academia and industry will be invited. The primer responsible for organizing each workshop is the Pilot case leader but, all the other partners will also cooperate as they are the technology developer. These workshops will be held when physical demonstrators are installed and tested at each pilot company's site. The MANUWORK's industrial partners will also attend some events and workshops to get knowledge about the latest development in as well as disseminate the project progress and news. Some of the identified events are as follows.

- EHLABE, Basque Association of Sheltered Workshops.
- Innobasque, the Basque Innovation Agency
- Euskalit, the Basque Foundation for Excellence.
- Workability-Europe, the largest body representing providers of paid work and
- Employment services to people with disabilities in Europe

## 1.6. Dissemination activities execution and industrial coordination

University of Skövde is considered as the dissemination leader which is in charge of internal coordination of the dissemination activities and attempts to guarantee that when the dissemination activities are done, the main principles are fully met.

- The other beneficiaries should be noticed about the dissemination activities at least 45 days in advance. Adequate information regarding the programmed dissemination activities and the information predicted to be disseminated are supposed to be contained in the notice.
- In order to specify that the foreground has been created through the help of financial support from EU all issuing and dissemination which are relevant to the mentioned foreground should contain the following ensuing statement: *“This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 723711”*
- All dissemination items always contain the logo of the project and H2020 in order to acknowledge the funding.

To provide and to evaluation the dissemination activity an analysis is prepared by those consortium members who are the most important partner in pursuing the activities. The ensuing features are needed to be pondered through the analysis:

- To specify the goal of the MANUWORK
- To set the time during which the project is going to come about
- To identify the target audience
- To clarify whatever is going to be shared with the target audience.
- To point out what material is needed for message communications e.g. video demonstrator
- To calculate the required expenses for the project

To fulfil this need the consortium member has been demanded to fill in a particular template document in advance titled “Dissemination Event Template, MANUWORK Intent to publish Template” and also after the activity is executed titled “Dissemination Activity Report Template”. To clarify the internal process we can refer to the following list:

**Project beneficiary:** It is included in MANUWORK Dissemination Event Template or MANUWORK Intent to prepare the Template for scientific publications and share it with the Consortium through mailing. This information should be provided to the entire consortium member.

**All:** Two weeks are considered for the likely objections through email. The publication is considered approved unless there's an objection made. The applicants are supposed to be informed and observed by the dissemination manager.

**Dissemination manager:** University of Skövde as the dissemination manager is in charge of updating the Dissemination Plan.

**Beneficiary:** It is responsibility of the beneficiary to do the activities and fill in Dissemination Activity Report Template. Dissemination manager should also be informed by the beneficiary about any kind of publication. Moreover, the identification number and publication link should also be provided after official publication.

**Dissemination manager:** Dissemination manager, in this case University of Skövde, is supposed to update Dissemination Log portal if it is needed.

### 1.7. Feedback and assessment

In order to assess the success of dissemination and provide continues improvement in the efficiency of the activities there is going to be a system provided in MANUWORK. The three main strategy to grantee the effectiveness of the dissemination in this projects are listed below.

- In order to observe the outcomes of various dissemination activities a list of assessable objectives and relevant metric systems will be designed and used all throughout the project.
- The efficiency and feedback that is received from the targeted audience will be reported in details after each dissemination activity.
- To communicate the point of views regarding the dissemination activity the consortium holds regular assessment meetings.

A series of assessable objectives and the related metrics is listed in Table 3 to make the dissemination activities successful.

**Table 3. The list of measurable objectives and metrics**

Activity	Measurable Objective
Publications	The number of publications by the MANUWORK partners
Events	The number of audience who were interested in the project that can be assessed by the number of visit cards that has been collected after the event. The number of audience that attended the events spoke by the MANUWORK. Feedback provided by the audience which can be assessed by the received emails or ensuing activities. The number of project leaflets distributed during the event.
Social Media	Number of followers and twits on Twitter Number of followers in MANUWORK page which has been made on LinkedIn and the number of discussions took place
Portal	- Number of visitors, number of page views to the portal and demographics of portal visitors which show the viewers' countries.

Cooperation with other projects	- Number of participations and involvements in the related research forums where other national and international projects are also involved. - Instances of participation in EU and cluster meetings
Newsletter	- Number of times the newsletter is downloaded from portal - Number of emails sent with the newsletter.

### Portal Activity

To observe and check the quality of the activity in MANUWORK public portal Google Analytics has been used and the recorded numbers for period 1.10.2016 to 29.09.2017 are listed Table 4. It should be noted that the activity reported involves only the MANUWORK public portal and it also includes the activity of MANUWORK partners.

**Table 4. MANUWORK portal activity (from 1.04.2016 to 30.09.2018)**

Performance measure	Value
Sessions	2220
Users	901
Page views	5000
Average Session Duration	00:01:34
Bounce Rate	67,75

### Social Media

Another important channels for the project dissemination is the utilization of social media accounts. Through the social media the Consortium may quickly target interested audience, posting updates regarding the organized activities, such as conferences and workshops, while also posting interesting updates from the ongoing research. Posts are uploaded in a regular basis, in an effort to expand the project's audience and increase the participation of interested stakeholders in the organized events. Twitter has been selected as the key social media to get in touch with MANUWORK's audience. A summary of the MANUWORK Twitter page activities are reported in Table 5.

**Table 5. MANUWORK Twitter page activity (from 1.04.2016 to 30.09.2018)**

Performance measure	Value
Impressions	More than 3.000 per month (reached 11.000 in May 2018, when the ACE Factories Cluster was announced)
Followers	89
Posts	471

## 2. DETAILED DISSEMINATION PLAN

The non-exhaustive list of planned dissemination activities and scientific publications for the MANUWORK project is presented in Tables 6 and 7.

**Table 6. Planned dissemination activities**

Type of activity	Leader	Title	Planned date	Location	Target audience	Countries addressed	Dissemination Objective	Channel
Presentation, flyers	Vicomtech	Mixed Reality Framework for Assembly Tasks In Manufacturing	2018	Portugal	Scientific community	Europe	To communicate advances in AR to support cognition in assembly work	Presentation
Recorded video	Vicomtech	Videos of current results	October 18	Spain	Industry	Worldwide	To demonstrate the use of AR in assembly assistance	YouTube, LinkedIn, other online channels
Workshop	UniSkövde, Volvo, Jernbro	Load balancing at assembly lines considering the human-robot collaboration	2019	Skövde	Industry and Academia	Europe	To communicate the results and findings of the projects to industrial and academic experts as well as getting feedback	Presentation, brochure, leaflet
Recorded video	UniSkövde, Volvo, Jernbro	Optimal load balancing between human and robot	2019	Skövde	Industry and Academia	Worldwide	To create awareness about the project's results and finding	YouTube, LinkedIn, other online channels
Presentation	CEA	Present the current progress of MANUWORK at bilateral	2018	Paris	Industry	France	To create awareness about the project's results and finding	Presentation, brochure, leaflet

		meetings with industrial partners (e.g. Airbus, Nexter, etc.)						
Presentation	CEA	Present the current progress of MANUWORK at bilateral meetings with industrial partners (e.g. Airbus, Nexter, etc.)	2019	Paris	Industry	France	To create awareness about the project's results and finding	Presentation, brochure, leaflet
Recorded video	CEA	Job satisfaction evaluation	2018	Online	Industry and Academia	Worldwide	To create awareness about the project's results and finding	YouTube, LinkedIn, other online channels
Presentation at conference	TEKNIKER	Empowering workers with intellectual disabilities to carry out assembly work in collaboration with cobots	2018	Bilbao, Spain	Industry and Academia	International conference on Health and Safety at Work	Explain the approach to empowering persons with disabilities through HRC	Presentation, flyer
Recorded video	LMS and PRIMA	Press Break Augmented Reality App	2018	Online	Industry and Academia	Worldwide	To increase awareness about how AR can be used to support the shopfloor operators- to be used in other	YouTube, LinkedIn, other online channels

							dissemination events	
Article in press	LMS	MANUWORK project	December 2018	Online	Industry, Academia	World wide	To increase awareness about the project's approaches and current results as a whole	Presentation
Exhibition	LMS	Patras IQ 2019	May 2019	Patras, Greece	Scientific community & Industry	Greece	Contact researchers and industrial stakeholders that are interested in HR collaboration	Poster, Flyers, Videos
Newsletter	LMS	MANUWORK newsletter volume 3	March 2019	Online	Industry, Academia	Worldwide	Update Stakeholders that follow MANUWORK portal for its news	Website, Social media
Newsletter	LMS	MANUWORK newsletter volume 4	September 2019	Online	Industry, Academia	Worldwide	Update Stakeholders that follow MANUWORK portal for its news	Website, Social media
Newsletter	LMS	ACE Factories newsletter volume 2	December 2018	Online	Industry, Academia	Worldwide	Joint newsletter release with other projects that target similar audience	Website, Social media
Newsletter	LMS	ACE Factories newsletter volume 3	August 2019	Online	Industry, Academia	Worldwide	Joint newsletter release with other projects that target similar audience	Website, Social media
Recorded video	LANTEGI and Vicomtech	Electrical Panel Augmented Reality App	2018	Online	Industry and Academia	Worldwide	Present the current achievement of the project related	YouTube, LinkedIn, other online channels

							to the use of AR for assembly of Electrical Panel	
Recorded video	LANTEGI and Tekniker	Electrical Panel Robotic Demonstrator	2018	Online	Industry and Academia	Worldwide	Present the current achievement of the project related to the use of robots/cobots for assembly of Electrical Panel	YouTube, LinkedIn, other online channels
Presentation	LANTEGI and Tekniker	International Congress of OSALAN	November 2018	Bilbao, Spain	Security and health at work	Worldwide	There are 2 topics with the aim to introduce: The current challenges of ergonomics in the inclusion of people with disabilities. Empowerment of people with intellectual disabilities for the realization of complex electrical assemblies, through strategies of sharing tasks with collaborative robots in industry 4.0 contexts	Presentation
Recorded video	We Plus	Industrial Social Network software	2018	Online	Industry and Academia	Worldwide	Sharing current results obtained within the	YouTube, LinkedIn, other online channels

							MANUWORK project	
Dissemination event	We Plus	Presentation of results for local industry	November 2018	Torino, Italy	Industry, Academia and local authorities	Italy	Share MANUWORK activities and obtained results	Conference presentation
Public video	We Plus	Introduciton movie	December 2018	Online, Europalace building @ Orbassano (about 200 companies present as for today)	Italian companies / market	Italy	To create awareness about the project's results and involvement of WEP	Website, FB, and LinkedIn channels
Presentation	Bazigos	Manuwork: Towards the Industrial Workplaces of the Future	September 2019	Greece	Industry – Established Client (Thin walled packaging international producer)	Europe / Global	To create awareness about the project's results and finding – Possible interest in the Manuwork platform	In person meeting
Presentation	Bazigos	Manuwork: Towards the Industrial Workplaces of the Future	September 2019	Greece	Industry – Established Client (Consumer products/ Shavers)	Europe / Global	To create awareness about the project's results and finding – Possible interest in the Manuwork platform	In person meeting
Presentation	Bazigos	Manuwork: Towards the Industrial Workplaces of the Future	March 2019	Greece	Industry – Mold Manufacturer in Netherlands established partner – Market leader	Europe	To create awareness about the project's results and finding – Possible interest in the Manuwork platform	In person meeting

					in european thin walled packaging			
Article in industrial magazine	Bazigos	To be decided	June 2019	Greece	Industry	Greece	To create awareness about the project	<a href="https://moulding.gr/">https://moulding.gr/</a> digital and in-print publication (Greek & English)
Workshop	VCC, Jernbro, UniSkövde, Tekniker	Automotive Demonstrator	June 19	Skövde	Industry and Academia	Europe	To communicate the results and findings of the projects to industrial and academic experts as well as getting feedback	Presentation, flyer, brochure, in person meeting

**Table 7. Planned scientific publications**

Type of publication <sup>1</sup>	Title	Responsible partner	Title of the journal/conference	Year/date	Publisher	Place of publication	Peer-review	Is open access provided to this publication <sup>2</sup>	Dissemination Objective
Article in journal	Enhancing Human Cognition In Manufacturing	Vicomtech	To be selected	2019	Springer	Online	Yes	Not decided	Definition/Presentation of a new mathematical interaction model for a silk-based worker-machine interaction

1 Article in journal or Publication in conference proceeding/workshop.

2 Open Access (OA) is defined as free of charge access for anyone via Internet.

	With Mixed Reality								
Article in journal	Using Spaces Between Devices For Mixed-Reality	Vicomtech	To be selected	2019	Springer	Online	Yes	Not decided	Evaluation of the MANUWORK system. Focus on assembly tasks
Article in journal	Towards a Design Space for Mixed-Reality Data Analysis	Vicomtech	To be selected	2019	Springer	Online	Yes	Not decided	Evaluation of the MANUWORK system. Focus on training and ergonomics
Article in journal	Visual Computing Technologies to support the Operator 4.0	Vicomtech	Computers & industrial engineering	2018	Elsevier	Online	Yes	No	To illustrate the potential of visual computing to assist manufacturing workers including Manuwork as a use case
Article in journal	Graphics and Media Technologies for Operations in Industry 4.0	Vicomtech	IEEE Computer Graphics and Applications	2018	IEEE	Online	Yes	No	To highlight the importance of keeping human workers in the production chain, and disseminate Vicomtech's work on how to deal with human-machine interactions in terms of adaptive skills
Article in journal	X-Reality System Architecture for Industry 4.0 Processes	Vicomtech	Multimodal Technologies and Interaction	2019	MDPI	Online	Yes	Yes	Expose to the scientific community the importance of an IIoT architecture to seamlessly integrate different devices and machines, and to adapt configurations to particular worker skills. Emphasis is put on network

									and communication processes
Article in journal	Mixed-Reality in Industrial Manufacturing Processes	Vicomtech	International Journal of Advanced Manufacturing Technology	of 2019	Springer	Online	Yes	No	To describe the process of adapting MR human-machine interactions to a particular set of skills. It provides an overview of the worker cognitive augmentation process
Article in journal	Workers' satisfaction: a review of theories and evaluation methods	CEA	International Journal of Industrial Ergonomics	of June 2019	Elsevier	Online	Yes	Yes	Present the state of the art on workers' satisfaction in the different MANUWORK pilot cases
Article in journal	Workers' satisfaction: theories, methods and a case study	CEA	Human Factors and Ergonomics in Manufacturing & Service Industries	October 2019	Wiley	Online	Yes	Yes	Present the results of the field studies on workers' satisfaction in the different MANUWORK pilot cases
Conference proceeding	To be defined	CEA	International Conference on Industrial Engineering and Operations Management - ICIEOM 2019	July 2019		Prague	Yes	Not decided	Present the development of the SKIMATIC tool

Article in journal	A mathematical programming model for straight and U-type stochastic assembly line balancing problems with zoning constraints	UniSkövde	To be selected	2019		Online	Yes	Not decided	To share the developed load balancing models and concepts with the scientific community
Article in journal	A genetic algorithm with variable neighborhood search for bi-objective assembly line balancing problem	UniSkövde	To be selected	2019		Online	Yes	Not decided	To share the developed load balancing solution algorithm with the scientific community
Article in journal	“Well designed workspaces and work practices in manufacturing resist classical interruptions: How an assembly line assembles engines “	UniSkövde	Cognition, Technology and Work	2018		Print and Online	Yes	Not decided	Sharing the results of an analysis of work at VCC, a focus on interruption management in this article
Conference proceeding	Towards Including Workers with Cognitive Disabilities in the	Tekniker, Lantegi	The 20th International ACM SIGACCESS Conference on Computers and Accessibility	October 2018	ACM	Online	Yes	Not decided	Dissemination of MANUWORK use case “persons with disabilities” among the community of researchers and

	Factory of the Future								practitionars of technology and accessibility
Article in journal	Not decided	Tekniker	Tentative: Journal of Advanced Robotic Systems	2019	Elsevier	Online	Yes	Not decided	Dissemination among robotics research community, specifically on collaborative robotics
Conference Proceeding	Early evaluation of assembly cobot by prospective users with intellectual disabilities	Tekniker, Lantegi	CIRP CMS	2019	Springer	Online	Yes	decided	Production experts at research centers and academia
Conference proceeding	An Adaptive Framework for Augmented Reality Instructions Considering Workforce Skill	LMS	CIRP CMS	2018	Springer		Yes	Yes	This publication aims to present to the academia how the AR content in a manufacturing- targeted application may consider the operator's skills to create customized visualizations
Conference proceeding	Social Network Analytics to Capture Worker Satisfaction in Industrial Environments	LMS	CIRP CMS	2018	Springer		Yes	Yes	To share how social analytics may transform the knowledge capturing in the industrial environment and increase the channels for knowledge distribution

Conference proceeding	Cycle Time Estimation in Human-Robot Collaboration Tasks	LMS	To be identified	2018	-	-	Yes	Yes	To present the new findings within the projects about estimation of cycle time in HRC that could be interesting for production experts and end-users that are using collaborative robots (Cobot)
Article in journal	Modelling of Human Skills to Support AR Applications in Manufacturing	LMS	To be identified	2018	-	-	Yes	Yes	The publication aims to present to the academia how an adaptive AR application can consider the current skills of the shop floor operator, adjusting the visualized content and improving their skills.
Article in journal	Preliminary: "A Virtual Manufacturing Application Framework for human-automation balancing of automotive high volume production"	Volvo & UniSkövde	To be selected	2019		Online	Yes	Not decided	Sharing the developed framework for human-automation balancing with the scientific community
Article in journal	Preliminary: "Exploring methods for the balancing of automotive assembly lines production in a human-robot"	Volvo & UniSkövde	To be selected	2020		Online	Yes	Not decided	Make the developed methods for dividing the workload in a human-robot collaboration environment available to research and industrial community

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	collaboration environment”								
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### 3. DISSEMINATION ACTIVITIES UNDERTAKEN

A list of all the undertaken tasks, from the onset of the project, related to dissemination activities has been provided in Tables 8 and 9.

**Table 8. Dissemination activities undertaken**

Type of activity <sup>3</sup>	Leader	Title	Date	Location	Audience addressed	Number of audience	Countries addressed	Dissemination Objective	Dissemination Channel
Article in Newspaper	Tekniker	El proyecto Manuwork creará una plataforma para gestionar los futuros entornos de trabajo	15 October 16	Article in Empresa XXI	Basque industry	Not available	Spain	Raise awareness of the project among the Basque industrial sector, at the beginning of the project	Newspaper
Article in Newspaper	Tekniker	El proyecto Manuwork creará una plataforma para gestionar los futuros entornos de trabajo	18 October 16	ADEGI website	Business Association of Gipuzkoa	Not available	Spain	Raise awareness of the project among the Basque industrial sector, at the beginning of the project	Newspaper
Workshop	Tekniker	Collaborative robots for empowering workers with	March 2018	Tampere, Finland	Industry and Academia attending the ERF (European Robotics Forum),	40	Europe	Disseminate LAN use case among European	Presentation at workshop

<sup>3</sup> Article in journal; Publication in conference proceeding/workshop; Books/Monographs; Chapters in books; Thesis/dissertation.

		intellectual disabilities			workshop on industrial robotics			robotics community	
Workshop	Tekniker	Collaborative robots and their applications	March 2017	Eibar, Spain	Industrial companies	Not available	Spain	Dissemination of the approach on collaborative robotics within the project	Presentation at workshop
Workshop	Tekniker	Lean community day - Collaborative robotics	March 2017	Eibar, Spain	Industrial companies	Not available	Spain	Dissemination of the approach on collaborative robotics within the project	Presentation at workshop
Workshop	Tekniker	New trends in robotics	May 2017	Eibar, Spain	Vocational training students	Not available	Spain	Dissemination of the approach on collaborative robotics within the project	Presentation at workshop
Workshop	Tekniker	LAIT 4.0 (Linking VET teachers and SMEs to move towards factories of the future)	May 2017	Eibar, Spain	VET teachers and SMEs	Not available	Spain	Dissemination of the approach on factory of the future technologies within the project	Presentation at workshop
Presentation	Tekniker	Collaborative robots for empowering workers with	13 March 2018	5th Workshop on Hybrid	Industry, academia, European policy makers	40	Finland	Cross-feeding with key European robotics	Presentation

		intellectual disabilities (including an update on the status of the Manuwork case scenario “persons with disabilities”)		Production Systems (in ERF2018)				advancement players	
Presentation	Tekniker	A project summary is regularly presented to relevant visiting professionals and companies	Project lifetime	Eibar, Spain	Professionals from industry and academia	Not available	Spain	Dissemination of the approach on factory of the future technologies within the project	Project slide in customised presentations
Flyers	Tekniker	BIEMH-2918 International Exhibition fair on machine tool	May 2018	Bilbao, Spain	Industry		Worldwide	Dissemination of the approach on factory of the future technologies within the project	Distribution of flyers among attendees
Flyers	Tekniker	Automatica 2018 (Trade Fair for Smart Automation and Robotics)	June 2018	Munich, Germany	Industry		Worldwide	Dissemination of the approach on factory of the future technologies within the project	Distribution of flyers among attendees

Workshop	LMS	MANUWORK project presentation (consortium, timeline, objectives, pilots)	May 2017	Brussels	FoF and EFFRA community members	20	Europe	Clustering and collaboration with other FOF-04-2016 projects. Discuss common challenges and how to address them.	Presentation and brochures
Presentation, brochures	LMS	SPS IPC Drives Italia 2017	May 2017	Italy	Industry academia and	36	Europe	Clustering and collaboration with other FOF-04-2016 projects. Discuss common challenges and how to address them.	Presentation, brochures
Flyers/leaflet	LMS	Impact Workshop 2017	May 2017	Brussels	H2020 community members (FoF,E2B and SPIRE)	30	Europe	Create awareness of the MANUWORK project in the H2020 community members (FoF,E2B and SPIRE)	Flyers/leaflet
Presentation	LMS	FoF Community Day 2017	16 May 2017	Brussels, Belgium	FoF and EFFRA community members	20	Europe	Create awareness of the	Presentation, leaflets,

								MANUWORK project in the FoF and EFFRA community members. Establish links with other FoF project in the topic of Human-Automation interaction	Through EFFRA portal
Joint workshop	LMS	FoF Community Day 2018	27 June 2018	Brussels	Research, Industry	20	Europe	Dissemination of MANUWORK within EFFRA, FoF community. Getting feedback to MANUWORK developments . ACE Factories Cluster initiative	Presentation. The public version of the presentation will be available through the EFFRA portal.
Newsletter	LMS	MANUWORK newsletter volume 1	July 2017	Online	Industry, Academia	Not available	World wide	Update Stakeholders that follow MANUWORK portal for its news	Website, Social media

Newsletter	LMS	MANUWORK newsletter volume 2	April 2018	Online	Industry, Academia		World wide	Update Stakeholders that follow MANUWORK portal for its news	Website, Social media
Joint Newsletter	LMS	ACE Factories newsletter volume 1	July 2018	Online	Industry, Academia		World wide	Joint newsletter release with other projects that target similar audience	Website, Social media
Joint Press Release	LMS	European projects put workers at the centre of future manufacturing	March 2018	Online	Society, Industry		Europe	Joint press release with other EU projects (ACE cluster) focused in similar topics	Presentation
Presentation	LMS	Satisfactory H2020 project final workshop	15 December 2017	Torino	Academia and Industry	30	Europe	Present the results to participants in other EU projects, discuss on common grounds and interests	Presentation
Joint workshop	LMS	EFFRA Connected Factories workshop	06 February 2018	Brussels	Academia and Industry	20	Europe	Present the project aims and current achievements to get	Presentation

								feedback from experts	
Exhibition	LMS	Patras IQ 2018	27-29 April 2018	Patras, Greece	Scientific community & Industry	500	Greece	Contact researchers and industrial stakeholders that are interested in HR collaboration	Poster
Presentation	LMS	9th International Conference on Intelligent Systems 2018	25-27 September 18	Madeira, Portugal	Academia	30	Europe	Inform academia about the ongoing research in the workforce empowerment	Presentation
Other	Vicomtech	GraphicsMedia.net consortium workshop	September 2017	San Sebastián, Spain	Scientific community	20	Europe	Networking and exchange of experiences	Oral communication
Demonstration	Vicomtech	Manuwork technology results	December 2017	San Sebastián, Spain	Industry/Manufacturing	10	Spain	Demonstration of technology to industrial partners	Demo prototype
Demonstration	Vicomtech	Manuwork technology results	January 2018	San Sebastián, Spain	Industry/Manufacturing	10	Spain	Demonstration of technology to industrial partners	Demo prototype
Workshop	Vicomtech	Basque Industry 4.0	November 2017	San Sebastián, Spain	Industry/Manufacturing	100	Spain	Networking and presenting	Oral communication

								MANUWORK project to Industry	
Workshop	Vicomtech	Annual GraphicsMedia.net workshop	September 2018	Berlin	Academia and Industry	20	Europe	Presentation and discussion with domain experts of technical details of the AR platform of Manuwork	Presentation
Conference presentation	Vicomtech	SOCO 2018 conference	June 2016	San Sebastian	Academia and Industry	20	Spain	To present technical aspects (mainly tracking) of the AR system of Manuwork aimed at the Lantegi pilot	Presentation
Presentation	CEA	Industrial members of the Factory Lab National Alliance	June 2018	Paris	Industry/Manufacturing	10	France	General presentation of the objectives of the project and its current developments	Oral presentation
Presentation	CEA	Present the current progress of MANUWORK at bilateral meetings with	Throughout 2018	Paris	Industry/manufacturing	4 to 6	France	General presentation of the objectives of the project	Meetings

		industrial partners (e.g. Airbus, Nexter, etc.)							and its current developments	
Recorded video	CEA	Skematik App	June 2018	Online	Industry Academia and	Worldwide	France	To create awareness about the project's results and finding	YouTube, LinkedIn, other online channels	
Presentation	CEA	Human Factors in Future Factories: the EU project Manuwork	April 2017	Paris	Academia Industry and	60	France	To create awareness about the project's results and finding	Oral presentation	
Conference Presentation	CEA	EFFRA Conference Factories of the Future Conference 2016: Materialising Factories 4.0	September 2016	Brussels	Academia Industry and	40	Europe	To create awareness about the project's results and finding	Oral presentation	
Conference Presentation	UniSkövde	16th International Conference on Manufacturing Research ICMR 2018	September 2018	Skövde, Sweden	Academia Industry and	30	Europe	Sharing current Manuwork results and achievements related to load balancing tool and human envelope with industrial and academic	Presentation, flyer, newsletter	

									expert as well as to get feedback on the work performed.	
Conference Presentation	UniSkövde	2017 Winter Simulation Conference (WSC)	December 2017	Las Vegas, NV, USA	Academia and Industry	20	US		Presenting the ideas and achievements related virtual and augmented reality and getting feedback from experts.	Presentation

**Table 9. Published scientific work**

Type of publication	Title	Responsible partner	Title of the journal/conference	Year/date	Publisher	Place of publication	Peer-review	Is open access provided to this publication	Dissemination Objective
Article in journal	Augmented Reality for Virtual User Manual	Vicomtech	International Journal on Interactive Design and Manufacturing (IJIDeM)	2017	Springer	Online	Yes	No	To propose a new approach for interactive assembly manuals based on AR
Conference proceeding	Unlocking Augmented Interactions in Short-lived Assembly Tasks	Vicomtech	The 13th International Conference on Soft Computing Models in Industrial and Environmental Applications	2018	Springer	Online	Yes	No	To present the ideas for AR-based assembly assistance and the technologies developed so far in Manuwork.

Article in journal	Assembly line balancing problem: a comparative evaluation of heuristics and a computational assessment of objectives	UniSkövde	Journal of Modelling in Management	2018	Emerald	Online	Yes	No	Reviewing the existing line balancing literature in order to identify the related works to the project.
Conference proceeding	Combining augmented reality and simulation-based optimization for decision support in manufacturing	UniSkövde	Winter simulation conference	2017	IEEE	Online	Yes	No	Communication the progress of the project for augmented reality and simulation-based optimization with the experts and getting feedback for extending the work.
Conference proceeding	Assembly Line Balancing Type-E with Technological Requirement: A Mathematical Model	UniSkövde	16th International Conference on Manufacturing Research ICMR 2018	September 2018	IOS Press	Online	Yes	No	Presenting the preliminary results to both academic and industrial experts in order to get constructive feedback.
Conference proceeding	Classification of collaboration levels for human-robot cooperation in manufacturing	UniSkövde	16th International Conference on Manufacturing Research ICMR 2018	September 2018	IOS Press	Online	Yes	No	Show the first steps towards a system for specifying the collaboration level of an assembly station using Human-Robot Collaboration

## 4. CONCLUSIONS

The initial step in the definition structure of the dissemination and circulation of MANUWORK chief attainments and outcomes have been composed in this document. It builds the foundation for the joint attempts in dissemination of the MANUWORK consortium. To gain a vast range of audience and circulate the concept of MANUWORK the listed items below are required:

- Publishing the outcomes of the project
- Dissemination the outcomes on the MANUWORK portal and other proper scientific media channels
- Organizing one workshop per pilot case to present the developed technologies and achieved results within MANUWORK
- Organizing four MANUWORK workshop events with the cluster projects