FACTLOG
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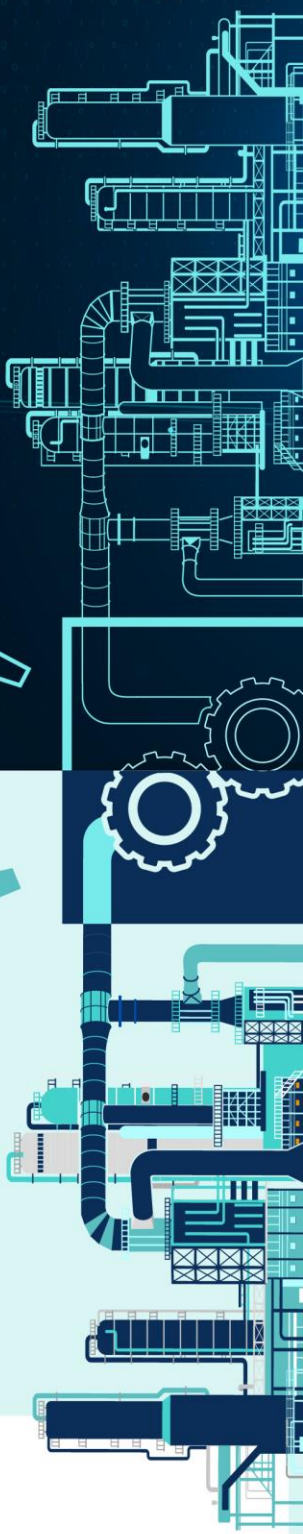
ENERGY-AWARE FACTORY ANALYTICS FOR PROCESS INDUSTRIES

Deliverable D8.6

Dissemination and Communication Activities Report V2



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Date 16/10/2023	**Project Name** FACTLOG – Energy-aware Factory Analytics for Process Industries

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Project Reference 869951	**Start date** November 1st, 2019
Type of Action IA – Innovation Action	**Duration** 42 Months

Dissemination Level

X	**PU**	Public
	CO	Confidential, restricted under conditions set out in the Grant Agreement
	CI	Classified, information as referred in the Commission Decision 2001/844/EC

Disclaimer

Executive Summary

This document summarizes the Dissemination and communication activities carried out by the FACTLOG partners in the second year of the project. This report includes the activities carried out by FACTLOG in its social media channels (such as LinkedIn or Twitter) and also the events targeted by the consortium for dissemination purposes. Due to the COVID19 pandemic, several events were cancelled or moved to online-only, which disrupted the initial plans of the consortium. This document also provides a list of Publications made by FATLOG partners in the second 12 months of the project and also the list of materials made available to support all communication and dissemination activities. Also included is the current status of the KPIs defined in previously released D8.2 – Dissemination and Communication Plan.

Revision History

Revision	Date	Description	Organisation
0.1	15/09/2021	Initial Version	UNP
0.2	29/09/2021	Communication Report	UNP
0.3	05/10/2021	Target events added	HANSE
0.4	13/10/2021	Publications added	AUEB
0.5	28/10/2021	Dissemination Materials	UNP
0.6	16/11/2021	Publications added	EPFL
0.7	30/11/2021	Small changes and Updates	DOMINA
1.0	02/12/2021	Final Version	UNP
1.1	16/10/2023	Addressing the comments from EC	UNP

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1 Introduction

1.1 Purpose and Scope

This document is a report on the dissemination and communication activities from month 13 to month 24 of the project. Considering the pandemic that the whole world is experiencing, it is difficult to carry out events and fairs that were delineated from the beginning. The document also reports on the publications made by partners of the project and all the social media activity in the FACTLOG's social media channels. A complete set of materials available to the consortium is also described. There is also the current status of the defined KPIs, with the current assessment what was accomplished in the second 12 months of the project.

1.2 Relation with other Deliverables

This deliverable is the second of a set of three deliverables that will be provided in M12, M24 and M42, respectively. Each of these deliverables will report on the dissemination and communication activities accomplished by FACTLOG's consortium during a period of 12 months, apart from the last one which will report on the last 18 months of the project (M24-M42).

All these deliverables are meant to provide the information stated before, but also to follow-up on the plan defined in D8.1, especially by monitoring the dissemination and communication KPIs.

1.3 Structure of the Document

This report is divided into 5 different chapters:

- Introduction - This chapter provides an initial view on the context of the document, its objective, and the relationship with other FACTLOG deliverables;
- Communication Report – In this chapter describes the social media pages that were created for the project;
- Dissemination Report – This chapter describes the publications and activities of the project;
- Dissemination and Communication KPIs – to monitor the current status of the dissemination and communication activities of the project;
- Dissemination Materials - this chapter presents the concept of the project and the various dissemination and communication materials.

2 Communication Report

2.1 Official Website

The FACTLOG website is already online, and at the time of the release of this document, it looks like the one depicted in Figure 1, and it's available on the following URL: www.factlog.eu

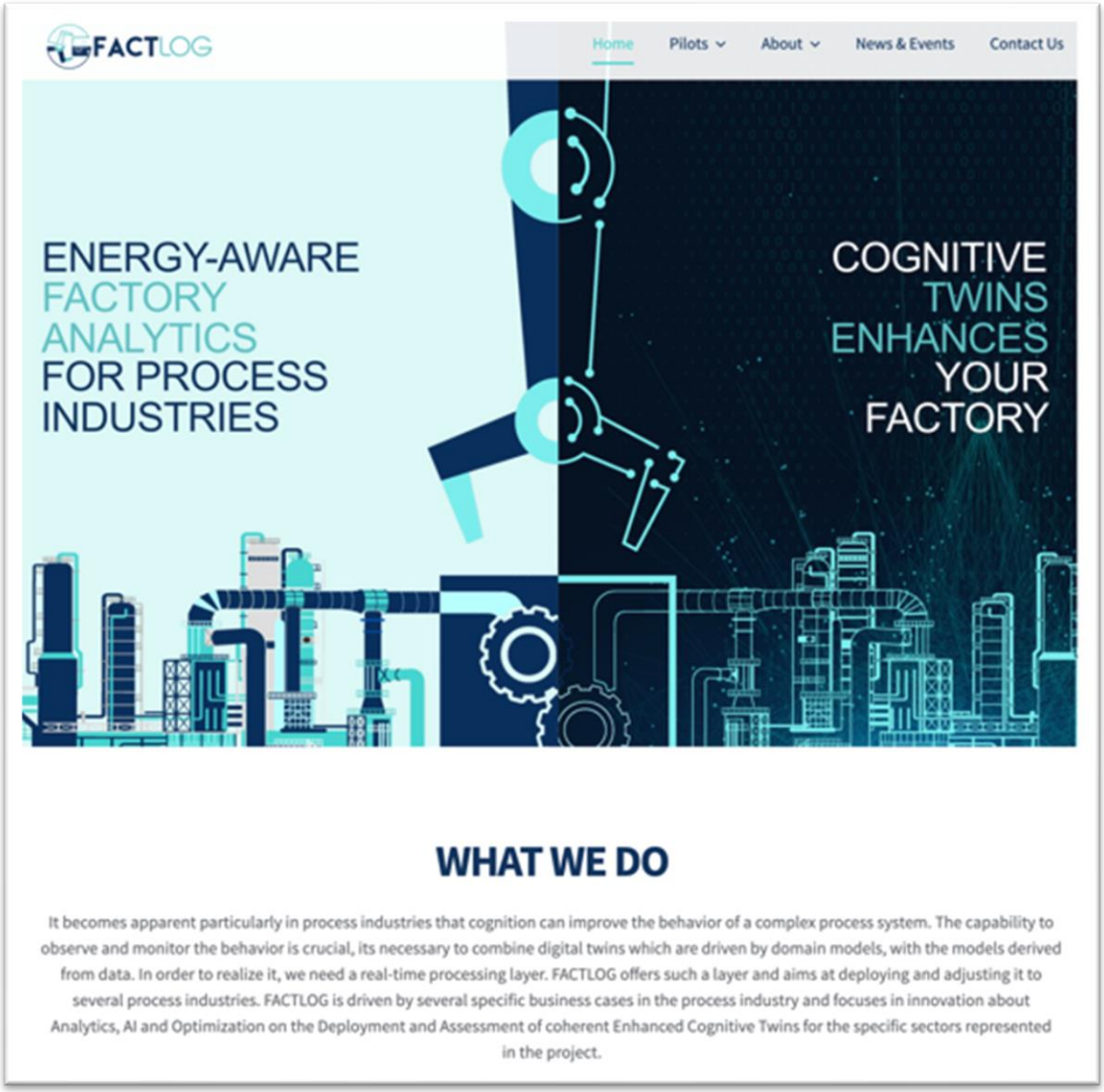

Figure 1 - FACTLOG Website

2.2 Social Media

This section presents all the social media activities, participation on events and publications for which FACTLOG has carried out dissemination activities from September 2020 to October 2021. FACTLOG relies on different social media channels to maximize the dissemination range and impact of the project among the stakeholders' community. All publications that the partners make regarding the project FACTLOG are shared on social networks, namely on Twitter and LinkedIn.

2.2.1 LinkedIn

Username: FACTLOG Project

Link: https://www.linkedin.com/company/factlog-project

The project's social network page on LinkedIn was created to have an online presence and attract stakeholders to the project. Until today we have **91 Followers.**

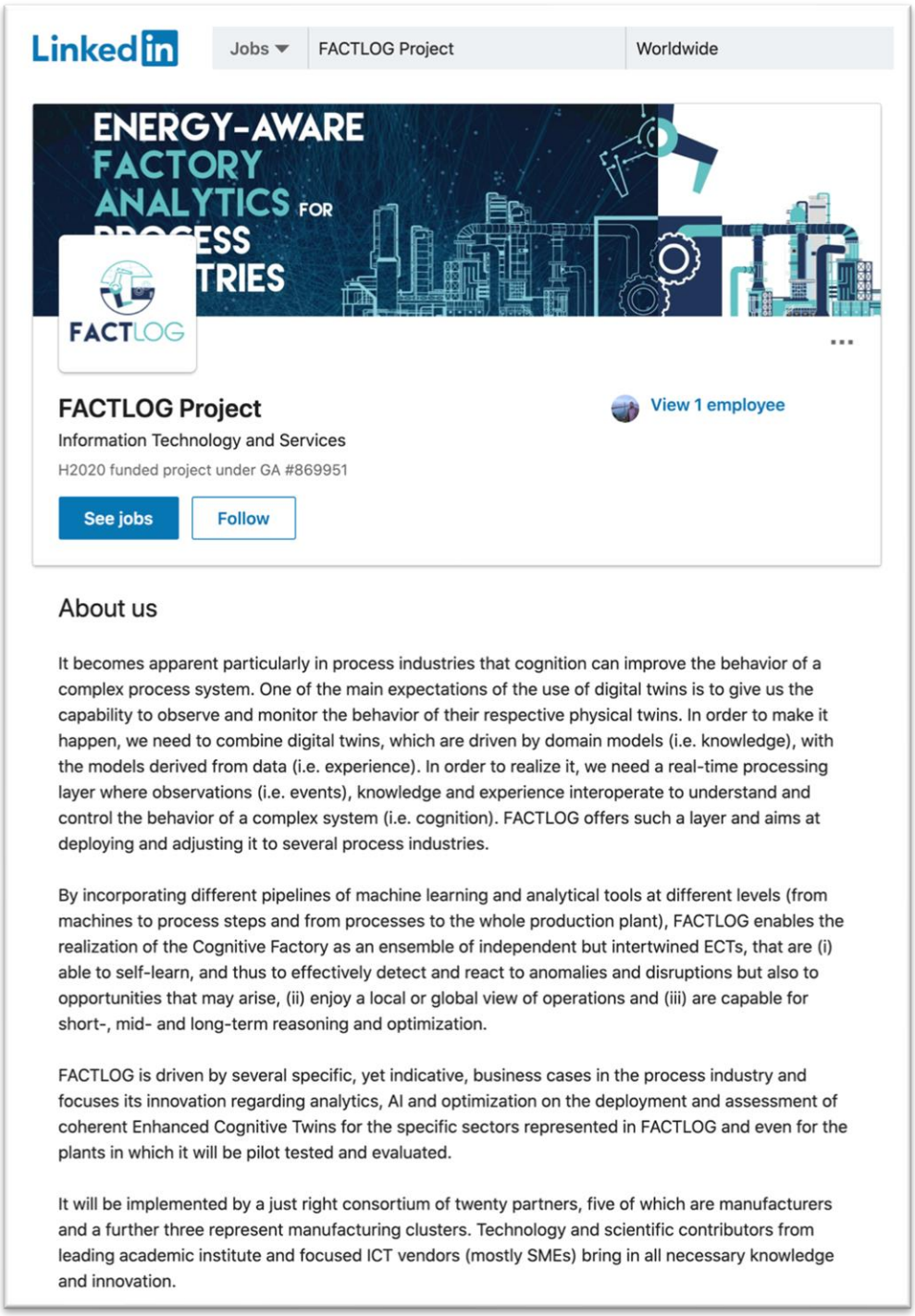

Figure 2 - FACTLOG LinkedIn

From September 2020 until the end of October this year we had a **total of 481 visits.** As we can see in Figure 3 the number of visits for each month.

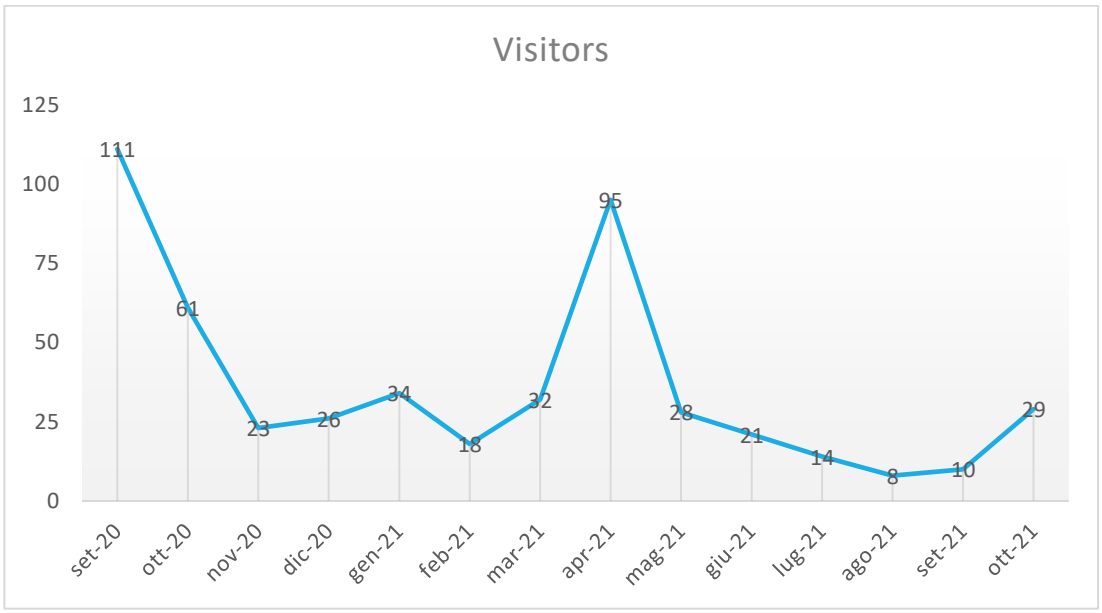

Figure 3 - Visitors Graph

The following figure (Figure 4) shows the different profiles that access the FACTLOG page on LinkedIn.

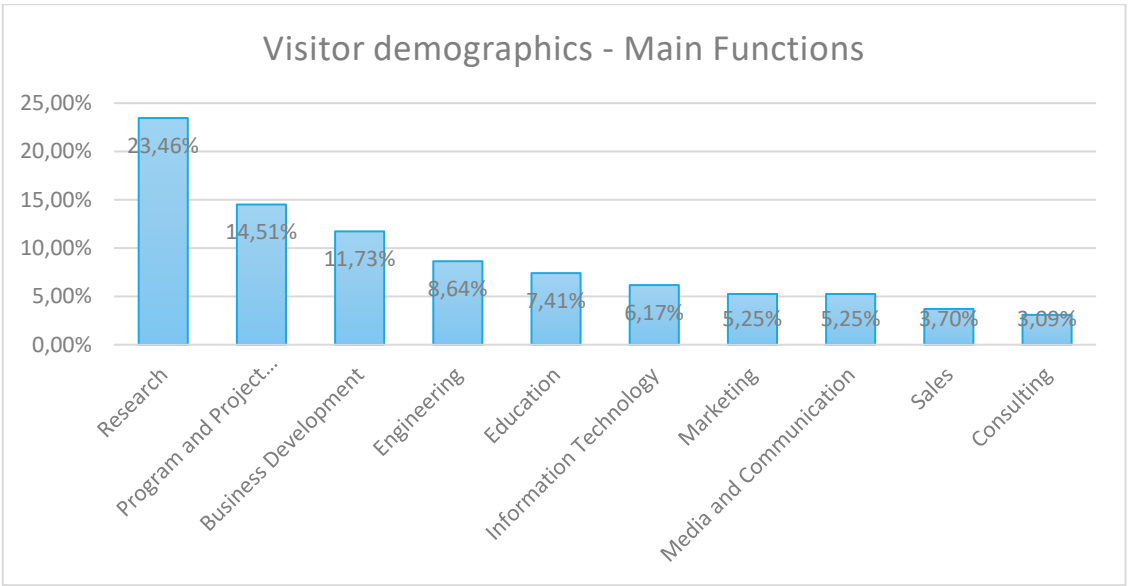

Figure 4 - Visitors Graph - Main Functions

2.2.2 Twitter

Username: FACTLOG

Link: https://twitter.com/Factlog_EU

The project's social network page on Twitter was created to have an online presence and attract stakeholders to the project. Until today we have **55 Followers.**

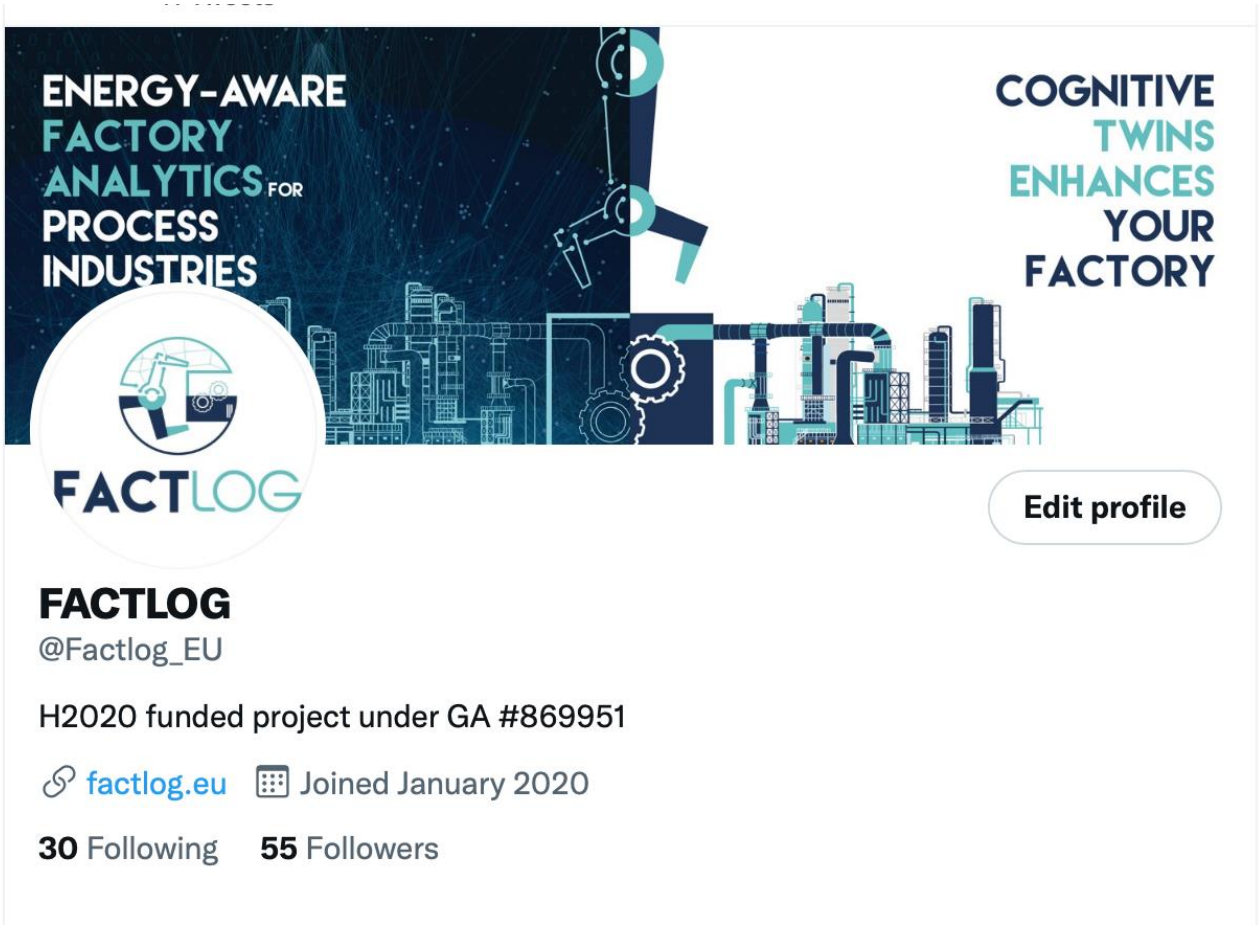

Figure 5 - FACTLOG Twitter

2.2.3 YouTube

Username: H2020 FACTLOG

Link: https://youtube.com/channedXl/UCveKFxka4J5FTTRsSKKZJ_g

The project's social network page on YouTube was created to have an online presence and store the videos used in our newsletters and our training sessions.

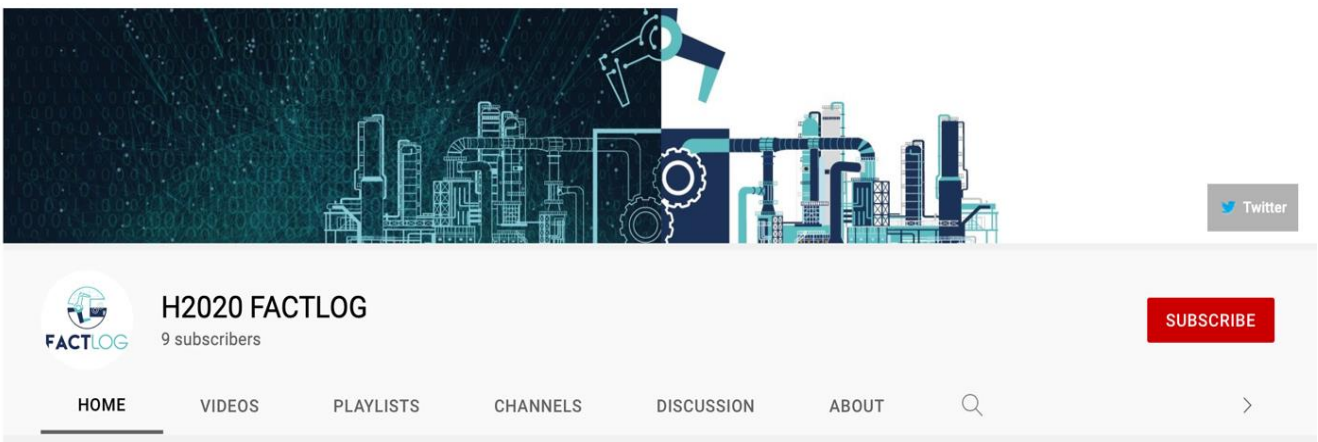

Figure 6 - FACTLOG YouTube

Since the day we created the FACTLOG page on YouTube until today, we have 9 subscribers.

2.3 Newsletters

Our communication plan involves the dissemination of newsletters with some frequency, with the aim of making known our project, its vision and its objectives.

Figure 7 - FACTLOG Newsletters

In the previous report we only had one newsletter published, but now we have 3 more newsletters published. Since the last report, we have continued with the plan to release the newsletters and have released some, like:

- Newsletter #2 Meet our pilots – BCR: BRC limited is a steel manufacturer of reinforcement rebar to the construction industry in the UK, the company is taking part in FACTLOG to find innovation in the way it operates day to day through the concept of digital twinning.

Figure 8 - FACTLOG Newsletter #2

- Newsletter #3 Meet our pilots – Piacenza: The pilot will optimize textile planning under energy-related criteria. The use of cognition to resolve 'unknown unknowns', as proposed by the ECT concept, will be implemented in weaving and finishing

departments to reduce the use of resources and the related environmental impact of textile manufacturing.

Figure 9 - FACTLOG Newsletter #3

- Newsletter #4 FACTLOG @ IoT Week 2020: Three very interesting presentations from Eur3ka on Manufacturing repurposing, Digital Factory Alliance on rapid response and FACTLOG on Green/Cognitive Digital Twins.

Figure 10 - FACTLOG Newsletter #4

3 Dissemination Report

The dissemination activities are expected to ensure that the project's results are widely diffused to the intended targeted audiences with appropriate mechanisms in a timely manner, and that the key stakeholders for the project exploitation and market uptake are early engaged and actively participating to the various implementation phases. The consortium partners aim to implement an intensive, yet clear, strategy and conduct effective dissemination and communication activities from the very early stages of the project. All partners are committed to mobilise the appropriate stakeholders in order to multiply the effects of dissemination and exploitation activities.

The planned events and fairs went online due to the situation in the world and the existing restrictions in the countries to circulate. We still participate in online events, but they are not as effective for networking and engagement.

3.1 Publications

Table 1 - FACTLOG Publications

Author(s)	Partner(s)	Title of the Publication	Type of Publication	Journal / Conference
Jinzhi Lu; Dejiu Chen; Guoxin Wang; Dimitris Kiritsis; Martin Törngren	EPFL	Model-Based Systems Engineering Tool-Chain for Automated Parameter Value Selection	Journal	IEEE Transactions on Systems, Man, and Cybernetics: Systems
Pengfei Yang, Jinzhi Lu, Lei Feng, Shouxuan Wu, Guoxin Wang , Dimitris Kiritsis	EPFL	A Knowledge Management Approach Supporting Model-Based Systems Engineering	Conference Paper	WorldCIST 2021: Trends and Applications in Information Systems and Technologies pp 581-590
Jinzhi Lu, Xiaochen Zheng, Lukas Schweiger, Dimitris Kiritsis	EPFL	A Cognitive Approach to Manage the Complexity of Digital Twin Systems	Conference Paper	Smart Services Summit pp 105-115
Mourtos I., Vatikiotis S., Zois G.	AUEB	Scheduling Jobs on Unrelated Machines with Job Splitting and Setup Resource Constraints for Weaving in Textile Manufacturing.	Conference Publication	Dolgui A., Bernard A., Lemoine D., von Cieminski G., Romero D. (eds) Advances in Production Management Systems. Artificial Intelligence for Sustainable and Resilient Production Systems. APMS 2021. IFIP Advances in Information and Communication Technology

Stavros Lounis, Georgios Doukidis, Yiannis Mourtos	AUEB	The role of Digital Twins and Optimisation in facilitating Digital Transformation in manufacturing	Conference Presentation	Euro2021 | 31st European Conference on Operational Research
Yiannis Mourtos, Grigoris Kasapidis, Panagiotis Repoussis, Pavlos Eirinakis	AUEB, UNIPI	Combined Production Scheduling and Predictive Maintenance for PCB Manufacturing	Conference Presentation	Euro2021 | 31st European Conference on Operational Research
Konstantinos Kaparis, Kyriakos Bitsis, Stavros Lounis	AUEB, UNIPI	Production scheduling for the steel reinforcement industry	Conference Presentation	Euro2021 | 31st European Conference on Operational Research
Nikolaos Sarantinoudis, George Tsinarakis, Kostas Kalaboukas, Pavlos Eirinakis, George Arampatzis	TUC, MAG, UNIPI	Cognitive Manufacturing: The role of process modelling	Conference Presentation	Euro2021 | 31st European Conference on Operational Research
Pavlos Eirinakis, George Arampatzis, Aljaž Košmerlj, Jože Rožanec, Nikolaos Sarantinoudis	UNIPI, TUC, QLECTOR, JSI	Utilizing an enhanced digital twin to optimize on-specs LPG recovery	Conference Presentation	Euro2021 | 31st European Conference on Operational Research
Georgios Zois, Yiannis Mourtos, Stavros Vatikiotis	AUEB	Scheduling jobs on unrelated machines with job splitting and setup resource constraints	Conference Presentation	Euro2021 | 31st European Conference on Operational Research

3.1.1 Model-Based Systems Engineering Tool-Chain for Automated Parameter Value Selection

Abstract: Cyber-physical systems (CPSs) integrate heterogeneous systems and process sensor data using digital services. As the complexity of CPS increases, it becomes more challenging to efficiently formalize the integrated multidomain views with flexible automated verification across the entire lifecycle. This article illustrates a model-based systems engineering tool-chain to support CPS development with an emphasis on automated parameter value selection for co-simulation. First, a domain-specific modeling approach is introduced to support the formalizations of CPS artifacts, development processes, and simulation configurations. The domain-specific models are used as the basis to generate a Web-based process management system for automated parameter value selections, which coordinates Open Services for Lifecycle Collaboration services of development information and technical resources (models, data, and tools) in order to support automated co-

simulation. The services are deployed by a service orchestrator based on a decision-making algorithm for parameter value selection. Finally, developers make use of the WPMS to implement simulations and to select system parameter values for co-simulation automatically. The approach is illustrated by a case study on auto-braking system development and we evaluate the efficiency of this tool-chain by both qualitative and quantitative methods. The results show that parameter values are selected more efficiently and effectively when implementing co-simulations using our tool-chain.

3.1.2 A Knowledge Management Approach Supporting Model-Based Systems Engineering

Abstract: Model-based Systems Engineering (MBSE) is a noval approach to support complex system development by formalizing system artifacts and development using models. Though MBSE models provide a completely structural formalisms about system development for system developers, such large of domain specific knowledge represented by models cannot be captured as what the developers expect. This leads to a big challenge when MBSE can be widely used for complex system development. In this paper, a knowledge management approach is proposed to support an intelligent question answering scenario when implementing MBSE in system lifecycle. We make use of the GOPPRR approach to support MBSE formalisms which are transformed to knowledge graph models. Then such models provide cues for intelligent question answers through reasoning. In the case study, we make use of an auto-braking system scenario to develop MBSE models and to implement the intelligent question answering. Finally, we find the availability of our approach is evaluated which the domain engineers enable to capture their domain knowledge more efficiently.

3.1.3 A Cognitive Approach to Manage the Complexity of Digital Twin Systems

Abstract: During the entire lifecycle of system development, various digital twins could be developed to support different systems engineering activities, such as verification and validation. The increasing complexity of digital twins leads to a challenge to manage the consistency, changes and traceability across the entire lifecycle. In this paper, a semantics modeling approach is provided to formalize the digital twins using systems thinking. The semantic models represent the information of each digital twin and the interrelationships among them. Using the semantic models, system developers are enabled to promote the cognitive capabilities of digital twins, which in return will provide more potentials for decision-makings based on digital twins. Finally, the feasibility of the proposed approach is evaluated through a case study in the Swiss Innovation Project IMPURSE.

3.1.4 Scheduling Jobs on Unrelated Machines with Job Splitting and Setup Resource Constraints for Weaving in Textile Manufacturing.

Abstract: This work considers the production scheduling of the weaving process in a real-life textile industry, where a set of jobs - linked to the production of a fabric type and accompanied by a quantity - arrive over time and have to be processed (woven) by a set of parallel unrelated machines (looms) with respect to their strict deadlines (delivery dates), under the goal of makespan minimization. A number of critical job and machine properties demonstrate the challenging nature of weaving scheduling, i.e., a) job splitting: each order's quantity is allowed to be split and processed on multiple machines simultaneously, b) sequence-dependent setup times: the setup time between any two orders j and k is different than setup time between jobs k and j on the same machine and c) setup resource constraints: the number of setups that can be performed simultaneously on different

machines is restricted due to a limited number of setup workers. We propose a MILP formulation that captures the entire weaving process. To handle large real instances, while also speeding up an exact solver on smaller ones, we propose two heuristics that perform job-splitting and assignment of jobs to machines either greedily or by using a relaxed version of our MILP model, respectively. We evaluate the impact of our approach on real datasets under user-imposed time limits and resources (machines, workers) availability.

3.1.5 The role of Digital Twins and Optimisation in facilitating Digital Transformation in manufacturing

Abstract: The Industry 4.0 era is already evolving at a fast pace, however not all industries, let alone factories within those industries, have caught up, putting them at a disadvantageous position. In order to rapidly catch up and progress, Digital Transformation (DX) can provide the frame- work where (a) the Customer experience will be at the forefront, (b) the Business Processes will be redesigned and digitalized, (c) the Business Model will expand and (d) the overall organization will align with a new I4.0 strategy. In this work, we focus on the benefits of introducing Optimization enabled Digital Twins (DT) towards facilitating DX. The goal is to examine the design approach(es) and subsequently the impact of DTs' introduction in the four pillars of DX and their benefits and limitations, as well as the challenges brought forth during implementa- tion in different cases in process industries and discrete manufacturing. In particular our examination includes the DX of a Steel and a Textile manufacturing factory, both utilizing DTs for production scheduling, an Oil Refinery utilizing DTs for on-specs LPG production and an Au- tomotive parts factory utilizing DTs for preventive maintenance during production, all whilst taking under consideration the DTs' enhanced capabilities brought forth by Optimization.

3.1.6 Combined Production Scheduling and Predictive Maintenance for PCB Manufacturing

Abstract: One significant challenge in flexible manufacturing environments is the halt or deterioration of production due to unexpected machine failures. In the era of Industry 4.0, modern production facilities are equipped with a wide range of sensors that capture the performance as well as the health of the equipment. Therefore, production engineers can mon- itor the condition of the equipment and act early to prevent failures. In this work, we focus on an assembly flow-shop environment with two production stages. The goal is to re-schedule a given production sched- ule by incorporating preventive maintenance activities for specific ma- chines. Resource constraints are also considered. More specifically, when a job is processed from the first machine of a production stage, the required resources (e.g., semi-finished products, raw materials etc.) for all processing steps should be available. In this work, a constrained programming (CP) approach is proposed for modelling and solving the problem. Computational results using real data from a PCB production line are presented. Results showcase the efficiency of the method as well as the importance of preventive compared to corrective mainte- nance.

3.1.7 Production scheduling for the steel reinforcement industry

Abstract: Optimal scheduling is among the most vital aspects of any efficient and effective production line. The so-called Digital Twin (DT) paradigm has been proposed as a tool for real-time optimization of production decision making, including scheduling. Enhancing the DT's with state of the art scheduling algorithms that act in synergy with machine learn- ing and simulation algorithms lies at the core of smart factories. Within this framework we consider the production of a steel reinforcement manufacturer and we develop a Mixed

Integer Programming (MIP) for- mulation for a multistage flexible flow shop scheduling problem with parallel unrelated machines. The model takes into account machine dependent setup times and processing speeds in each stage as well lag times between the processes of two consecutive stages. The objective function is a convex combination of makespan and tardiness. Anomaly detection plays a vital role in the overall scheme and re-optimization strategies are implemented to respond to such requests.

3.1.8 Cognitive Manufacturing: The role of process modelling

Abstract: The novel concept of the cognitive factory has been introduced in re- cent years, in the drive towards the full digitalisation of production lines for the transformation of industry and the realisation of the smart factories of the future. Cyber-Physical Systems, Digital Twins and re- lated digital technologies that build upon the virtualisation of the phys- ical system they support, are at the forefront of research and devel- opment. However, applications are yet mostly non-standardised and untested, with uncertain results. The issue of modelling the physical system is crucial in any effort towards this direction. If the cyber sys- tem is to display digital cognition capacities, then the physical system's model must support them. However, the meaning and attributes of cog- nition in this context remain unspecified in most cases. In this paper, a framework for the definition, development and standardisation of cog- nitive models is described. Cognition is semantically defined as a vec- tor of specific attributes enabled and/or supported by a model. Process modelling is selected as the standard for cognitive models represent- ing production chains. An essential set of model extensions needed for supporting the defined cognitive vector are described at length. The context for practical applications and the operational environment within which the model will interact with other components of a cyber system are also described.

3.1.9 Utilizing an enhanced digital twin to optimize on-specs LPG recovery

Abstract: Liquefied Petroleum Gas (LPG) purification is a complex process in- volving different types of interconnected process units, encountered in all oil-refinery industries. LPG needs to adhere to certain quality specifications concerning some impurities (e.g., Sulphur, Naphtha and Ethane). However, anomalies that may arise in any given process unit may lead to an off-specs situation, i.e., the LPG in the collection tank may not meet the desired specifications. In such case, actions need to be taken to ensure the final mixture complies with the regulations. We propose a Digital Twin (DT) approach that utilizes Mixed Integer Programming (MIP) to facilitate recovery from such an off-specs sit- uation. DTs offer a virtual environment that may be used to replicate physical processes and allow for the simulation of operations. We im- plement a DT for LPG production that utilizes machine learning tools to model and simulate the different process units' operations. This DT is enhanced with optimization capabilities triggered to support re- covery decisions by indicating which process units need to be utilized and under which operational scenario. The underlying MIP approach drives recovery to on-specs LPG production within a given time hori- zon while also minimizing the energy consumption.

3.1.10 Scheduling jobs on unrelated machines with job splitting and setup resource constraints

Abstract: This work considers the production scheduling of the weaving process in a real- life textile industry, where jobs - each linked to the production of a fabric type and accompanied by a quantity and a priority value - arrive over time and have to be processed (woven) by a set of paral- lel unrelated machines (looms) with respect to their strict deadlines (delivery dates), under the goal to minimize standard criteria, such as the makespan or the

sum of completion times. A number of crit- ical job and machine properties demonstrate the challenging nature of weaving scheduling, i.e., (a) job splitting: each orders' quantity is allowed to be split and processed on multiple machines simultaneously, (b) sequence-dependent setup times: the setup time between any two orders j and k is different than the setup time between jobs k and j on the same machine and (c) setup resource constraints: the number of setups that can be performed simultaneously on different machines is restricted due to a limited number of setup workers. We propose a MILP formulation that captures the entire weaving process. To handle large real instances, while also speeding up an exact solver on smaller ones, we propose two heuristics that perform job-splitting and assign- ment of jobs to machines either greedily or by using a relaxed version of our MILP model, respectively. We evaluate the impact of our ap- proach on real datasets under user-imposed time limits and resources' (machines, workers) availability.

3.2 Dissemination Activities

3.2.1 Target Events

Table 2 shows all events targeted by FACTLOG from November 2020 to July 2022. These events are detailed in the following subsections with their respective place, date and description. Due to the Covid19 pandemic, some of the events were disrupted by being cancelled or changing to an online event.

Table 2 - FACTLOG Dissemination Events/Conferences

Conference / Event	Date	Location	Status
I-ESA 10th International Conference on Interoperability for Enterprise Systems and Applications	17/11/2020 - 20/11/2020	Tarbes (France)	Online
ICT Conference	01/12/2020 - 03/12/2020	Cologne (Germany)	Cancelled
Hannover Messe (Hanover Fair)	12/04/2021 - 16/04/2021	Hamburg (Germany)	Online
Paris Airshow	21/06/2021 - 27/06/2021	Le Bourget [Paris] (France)	Cancelled
Webinar: Asset Administration	25/06/2021	Online	Online
Aircraft Interiors Expo	31/08/2021 - 02/09/2021	Hamburg (Germany)	Online
Aircraft Interiors Expo Hamburg (Virtual)	14/09/2021 - 16/09/2021	Online	Online
Airtec Munich	26/10/2021 - 28/10/2021	MTC Munich	Attended

Aviation Forum Hamburg	07/12/2021 - 08/12/2021	Congress Center Hamburg	Planned
Hannover Messe	25/04/2022 - 29/04/2022	Hannover Messe	Planned
ILA Berlin	May 2022	Messe Berlin	Planned
Aircraft Interiors Expo Hamburg	14/06/2022 - 16/06/2022	Hamburg Messe	Planned
Farnborough Airshow	18/07/2022 - 22/07/2022	Farnborough Airfield	Planned

3.2.1.1 I-ESA 10th International Conference on Interoperability for Enterprise Systems and Applications

- **Data:** 17/11/2020 – 20/11/2020
- **Location:** Tarbes (France)
- **Status:** Online
- **Description:** The I-ESA conference connects the world's leading researchers and practitioners of enterprise interoperability and related domains, including interoperability aspects of enterprise systems and application. It joins new business models, smart services, IoT and Cloud technologies. All these current and future technologies cannot work smoothly without interoperability. I-ESA will be an outstanding opportunity to exchange experiences and business ideas between researchers, service providers, entrepreneurs and industrial stakeholders throw research papers. The Conference welcomes submissions of full papers in the scope of the conference. The maximum paper length is 10 pages. Accepted papers will be published in "Enterprise Interoperability IX (2020)". It will be indexed in Web of Science (WoS) in the "Conference Proceedings Citation Index- Science" which is inside the "Web of Science Core Collection", and in SCOPUS. Industry 4.0, smart cities, Internet of Things, big data, digital transformation are the main paradigms and technologies of the ARTIFICIAL INTELLIGENCE ERA. This ERA requires a foundation for seamless and secure communication called "interoperability". Moreover, the cooperation between different

3.2.1.2 ICT Conference

- **Data:** 01/12/2020 – 03/12/2020
- **Location:** Cologne (Germany)
- **Status:** Cancelled
- **Description:** The next edition of the largest ICT event in Europe will take place this year in the Koelnmesse in Cologne between 1st and 3rd December 2020. The event, co-organised by the European Commission and the German Presidency of the Council of the European Union, will have the following elements:
    - a high-level conference on digital policies,
    - an exhibition of EU-funded research and innovation projects in the field of ICT;

- a series of networking activities and many more.

3.2.1.3 Hannover Messe (Hanover Fair)

- **Data:** 12/04/2021 – 16/04/2021
- **Location:** Hannover (Germany)
- **Status:** Online
- **Description:** The Hannover Messe (HM) is one of the world's largest trade fairs dedicated to industry development. It is organised by Deutsche Messe AG and held at the Hanover Fairground. Typically, there are about 6,500 exhibitors and 250,000 visitors. The largest B2B platform of its kind, Digital Ecosystems, maps the entire digital value chain. The spotlight is on IT solutions and applications that drive forward digital transformation in manufacturing enterprises. Hanse-Aerospace was in 2021 present with a virtual booth and could answer questions regarding the current development activities in the FACTLOG project. In April 2022, Hanse-Aerospace will be present physically again, showing the first results of the FACTLOG-Project.

3.2.1.4 Paris Airshow

- **Data:** 21/06/2021 – 27/06/2021
- **Location:** Le Bourget – Paris (France)
- **Status:** Cancelled
- **Description:** The 54th edition of the show will take place at the Le Bourget Parc des Expositions from 21st to 27th June 2021, and once again will bring together all the players in this global industry around the latest technological innovations. The first four days of the Show will be reserved for trade visitors, followed by three days open to the general public.

3.2.1.5 Webinar: Asset Administration

- **Data:** 25/06/2021
- **Location:** Online
- **Status:** Online
- **Description:** The Asset Administration Shell (AAS) is a core element of Industry4.0 by enabling a standardised digital representation of an asset (aka digital twin) giving uniform access to information and behaviour of the asset, and thereby facilitating interoperability among applications within one organisation and across enterprise boundaries. Recently, AAS started to get more attention due to its endorsement and adoption by several key industrial stakeholders and also the availability of supporting technologies to facilitate its use/integration. The AAS specification was developed in the German Plattform Industrie 4.0 initiative and is now becoming a standard - IEC 63278 developed inside IEC TC 65 / WG 24. This webinar aims to present the fundamentals and new developments of the AAS concept while demonstrating how to use AAS, showcasing enabling technologies to deploy AAS and presenting projects/initiatives taking advantage of AAS for smart manufacturing use cases. **10h30-11h30:** Next Generation IIoT for Resilient and Sustainable Manufacturing session - Three very interesting presentations from Eur3ka on Manufacturing repurposing, Digital Factory Alliance on rapid response and **FACTLOG on Green/Cognitive Digital Twins**, followed by a debate. Agenda:
  - Eur3ka Use Case on Repurposing, INTELLIMECH // Sergio Gusmeroli POLIMI (OpenDEI) (15 mins)

- Manufacturing Global Response (DFA) - Expand Rapid Respond // Angelo Marguglio || Oscar Lazaro (15 mins)
- Cognitive Digital Twins & Sustainable Manufacturing - Kostas Kalaboukas (15 mins)
- Debate on Next Generation IIoT for Resilient and Sustainable Manufacturing (15 mins)

3.2.1.6 Aircraft Interiors Expo

- **Data:** 31/08/2021 – 02/09/2021
- **Location:** Hamburg (Germany)
- **Status:** Online
- **Description:** AIX announces new dates for the 2021 show. AIX will return to the Hamburg Messe from 31st August to 2nd September 2021, moving from the original April dates. We recognise the industry needs more time to allow for the reopening of borders, lifting of travel restrictions and resuming of services. Our priority is to deliver an engaging and COVID-secure face-to-face event for you, and by moving to September, we are giving all our valued exhibitors and visitors the additional time to adapt and continue on the path to recovery. We once again want to thank all of our exhibitors, visitors, and partners for their support. We believe this extra time ahead of the 2021 events will offer exhibitors reassurance and more opportunity to prepare their fantastic showcases, and for our visitors to be ready to restart planning for the cabins of the future. We continue to focus on keeping the industry connected during this time, fostering collaboration, promoting new innovative solutions and helping to nurture critical business contacts. We look forward to facilitating this through a further series of virtual events, set to take place in April, details of which will be announced soon.

3.2.1.7 Aircraft Interiors Expo Hamburg (Virtual)

- **Data:** 14/09/2021 – 16/09/2021
- **Location:** Online
- **Status:** Online
- **Description:** Aircraft Interiors Expo (AIX) is the world's leading event for airlines and the supply chain to source the latest innovations, technologies and products for the cabin interiors, inflight entertainment (IFE) and passenger comfort industries. The event unites the world's airlines with aviation interior suppliers over three days of face-to-face business, discovering, networking and buying at the Hamburg Messe. Typically, there are about 600 exhibitors and 14,000 visitors. The AIX 2021 was organised as a virtual event. Hanse-Aerospace was present with a virtual booth and could answer questions regarding the current development activities in the FACTLOG project. In June 2022, Hanse-Aerospace will be present physically again, showing the first results of the FACTLOG-Project.
- **Participating as exhibitor:** In addition to your digital company presence, you will receive access to the matchmaking tool and the extensive conference program. There are three different packages to choose from, **starting at EUR 2,500**.

3.2.1.8 Airtec Munich

- **Data:** 26/10/2021 – 28/10/2021
- **Location:** MTC Munich

- **Status:** Attended
- **Description:** Airtec is one of the largest trade fairs for the aerospace supply industry. The fair offers an extensive supporting programme with various special shows, theme parks and specialist conferences. Special shows on innovative and future-oriented technologies will be held at the fair. In addition, prominent expert speakers will lecture on and discuss issues critical to the industry. Hanse-Aerospace was in 2021 present with a physical booth and could answer questions regarding the current development activities in the FACTLOG project. In October 2022, Hanse-Aerospace will be present physically again, showing the results of the FACTLOG-Project.
- **Participating as exhibitor:** 15% discount for our partners - 6 sqm for EUR 3,145 and 9 sqm for EUR 4,760.
- **Images:**

Figure 11 - Airtec Munich Picture 1

Figure 12 - Airtec Munich Picture 2

3.2.1.9 Aviation Forum Hamburg

- **Data:** 07/12/2021 – 08/12/2021
- **Location:** Congress Center Hamburg
- **Status:** Planned
- **Description:** At the **Aviation Forum** Hamburg, more than 750 decision-makers and experts from the aviation industry meet to shape the new age of the aviation industry. Under the motto **Aviation Reloaded**, new strategies, technologies and partnerships will be discussed to meet the new demands on aviation.
- **Participating as exhibitor:** Special conditions for our partners - 4 sqm - until 30 June EUR 2,000; from 01 July EUR 2,500.

3.2.1.10 Hannover Messe

- **Data:** 25/04/2022 – 29/05/202
- **Location:** Hannover Messe
- **Status:** Planned
- **Description:** The **Hannover Messe** is one of the world's largest trade fairs and has established itself as the leading trade fair for industrial transformation. Our joint stand is located in Hall 17, which is part of the '**Digital Ecosystems**' exhibition area. This area is entirely dedicated to the technical basis for the digital transformation in industry.
- **Participating as exhibitor:** Prices not yet published, estimated to cost around EUR 1,100 per sqm

3.2.1.11 ILA Berlin

- **Data:** May 2022
- **Location:** Messe Berlin
- **Status:** Planned
- **Description: ILA Berlin** is the hub for the international aerospace industry and showcases the industry's very best in terms of high-tech products as well as research and development projects. The Hanse-Aerospace booth is located in the **International Supplier Center** ISC - a dedicated hall where over 300 exhibitors from around the globe can present their latest innovations.
- **Participating as exhibitor:** Prices not yet published, estimated to cost around EUR 1,100 per sqm.

3.2.1.12 Aircraft Interiors Expo Hamburg

- **Data:** 14/06/2022 – 16/06/2022
- **Location:** Hamburg Messe
- **Status:** Planned
- **Description: Aircraft Interiors Expo** plays host to the latest innovations, technologies and products for the cabin interiors, inflight entertainment and passenger comfort industries. With an area of 1,700 sqm and 90 companies exhibiting, the Hanse-Aerospace pavilion is the largest stand at the fair and is ideally located in the highly frequented Hall B6.
- **Participating as exhibitor:** starting at EUR 1,050 per sqm

3.2.1.13 Farnborough Airshow

- **Data:** 18/07/2022 – 22/07/2022
- **Location:** Farnborough Airfield
- **Status:** Planned
- **Description: Farnborough Airshow** is the biggest trade airshow in the United Kingdom. For five days in July biennially, Farnborough becomes an exciting hub for the most innovative technology within our industry, attracting market-leading companies from across all sectors and providing an unrivalled opportunity to meet and forge new relationships with key decision makers.
- **Participating as exhibitor:** to be defined, estimated to cost around EUR 1,300 per sqm.

3.3 Clustering Activities

3.3.1 DMP Cluster Event

FACTLOG was at a meeting on March 12, 2020, in partnership with the eFactory, QU4LITY and ZDMP projects.

Figure 13 - First draft of our booth from booth builder

3.3.2 SPIRE-06 Cluster

FACTLOG in undergoing discussions with the SPIRE-06 sister projects to setup a clustering activity. The SPIRE-06 projects involved in the discussion are HyperCOG, COGNIPLANT, CAPRI, INEVITABLE, COGNITWIN and FACTLOG. From the FACTLOG side, the activity is led by UNPARALLEL (as leader of task 8.4) in cooperation with MAGGIOLI (FACTLOG project coordination).

The intention of the clustering activity is to have an instrument for collaboration and sharing knowledge amongst the SPIRE-06 projects. Some of the foreseen objectives are: (1) sharing information - especially pilots & use case, KPIs, technologies - amongst sister SPIRE-06 projects and outreaching; (2) having interest/working groups on joint relevant topics for the projects; and (3) organising joint activities, workshop, seminars, etc. More information in the Deliverable 8.9.

3.4 Pilot Workshops

Workshops were organised involving the main stakeholders of the pilots to gather their impressions and guide the development of the technologies in the next steps. The partners actively involved in the pilot (i.e., the modules developers, the platform developers and technical support of the pilot, in charge of handling the data extraction and the data ingestion processes) have participated to the workshop. In deliverable D8.9 the workshops will be more detailed and with more information. The workshops of the four pilots[1] are:

- Pilot TUPRAS: Oil Refineries
  - Date: 25th of September, 2021
  - Venue: Izmit, Turkey
  - No. of participants: 10
- Pilot PIA: Textile Industry
  - Date: 28th of September, 2021
  - Venue: Biella, Italy
  - No. of participants: 6
- Pilot CONT: Automotive Manufacturing
  - Date: 12th of September, 2021
  - Venue: Timisoara, Romania
  - No. of participants: 10
- Pilot BRC: Steel Manufacturing
  - Date: 30th of September, 2021
  - Venue: Cardiff, Galles, UK
  - No. of participants: 10

[1] JEMS pilot did not meet its objectives, especially with regards to the integration of the FACTLOG system to its plant since there is not yet an operative plant in Slovenia.

4 Dissemination and Communication KPIs

In order to achieve the objectives proposed by the FACTLOG project, dissemination and communication play an extremely important role. Hence, a set KPIs are defined in DoA that need to be achieved in order for the work being done in FACTLOG has the expected impact, not only within the consortium members but also with external stakeholders that could provide valuable feedback to all the work to be carried out within the project's lifespan Table 3 - Dissemination and Communication KPIs provides the set of KPIs identified, along with the current status at M24.pq

Table 3 - Dissemination and Communication KPIs

FACTLOG Dissemination and Communication Activities	Planned (M42)	Status (12)	Status (24)
Demos and talks in relevant SPIRE/ H2020 cluster meetings and workshops	5	1	2
Hackathons to experiment with FACTLOG tools	4	0	0
Local workshop co-organized with the national authorities (per countries 1 0 represented by FACTLOG consortium)	1	0	0
Newsletters	8	1	4
Papers / Poster sessions in International conferences and stands	20	4	13
Papers in Scientific Journals	10	0	1
Training material & Specific demos (per FACTLOG result)	2	0	0
Workshops for each domain pilot case with selected supply chain actors	2	0	1
Workshops in relevant initiatives	5	0	0
Workshops organized per Software vendor (inside their existing networks of collaborative partners)	2	0	0
Workshops per large ICT industrial player (MAG, SIVECO) utilizing their existing customer base and commercial marketing channels	2	0	0
Workshops/Stands in ICT-related events focusing on Industrial automation and supply chain and in Industry 4.0 events	20	2	3

5 Dissemination Materials

This section presents the set of dissemination materials created for the use of the consortium in all FACTLOG disseminations and communication activities.

5.1 New Materials

As new materials, we have created Posters, Flyer, Rollup, Background images for Conference call software and Videos.

5.1.1 Posters

5.1.1.1 Supply Chain

Figure 14 – FACTLOG Poster - Supply Chain

5.1.1.2 Cognitive Twins Enablers

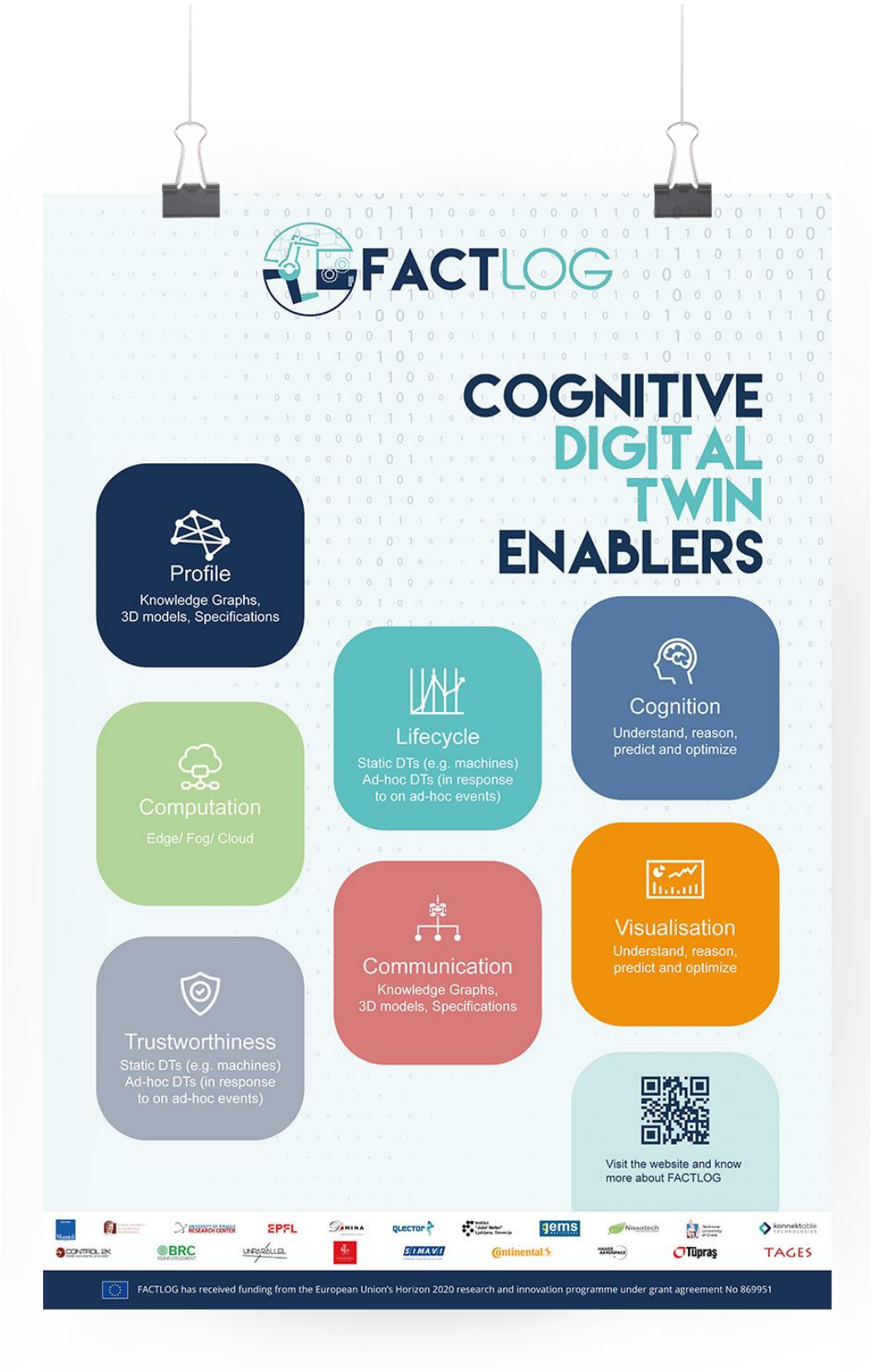

Figure 15 - FACTLOG Poster - Cognitive Twins Enablers

5.1.1.3 Cognitive Supply Chain

Figure 16 - FACTLOG Poster - Cognitive Supply Chain

5.1.1.4 Poster for Hanse-Aerospace booth at the coming trade fair AIRTEC in Munich

Figure 17 - Poster for Hanse-Aerospace both

5.1.2 Flyer

Figure 18 - FACTLOG Flyer

5.1.3 Roll Up

Figure 19 - FACTLOG Roll Up

5.2 Background images for Conference call software

Due to the pandemic and all or nearly all of the meetings being held virtually, four different backgrounds were created for the virtual meetings, which are listed below.

Figure 20 - FACTLOG Background image 1

Figure 21 - FACTLOG Background image 2

Figure 22 - FACTLOG Background image 3

Figure 23 - FACTLOG Background image 4

5.3 Videos

5.3.1 FACTLOG – Cognitive & Dynamic Supply Chains Enable

Figure 24 - FACTLOG Video - Cognitive & Dynamic Supply Chains Enable

5.3.2 FACTLOG – Operational Model

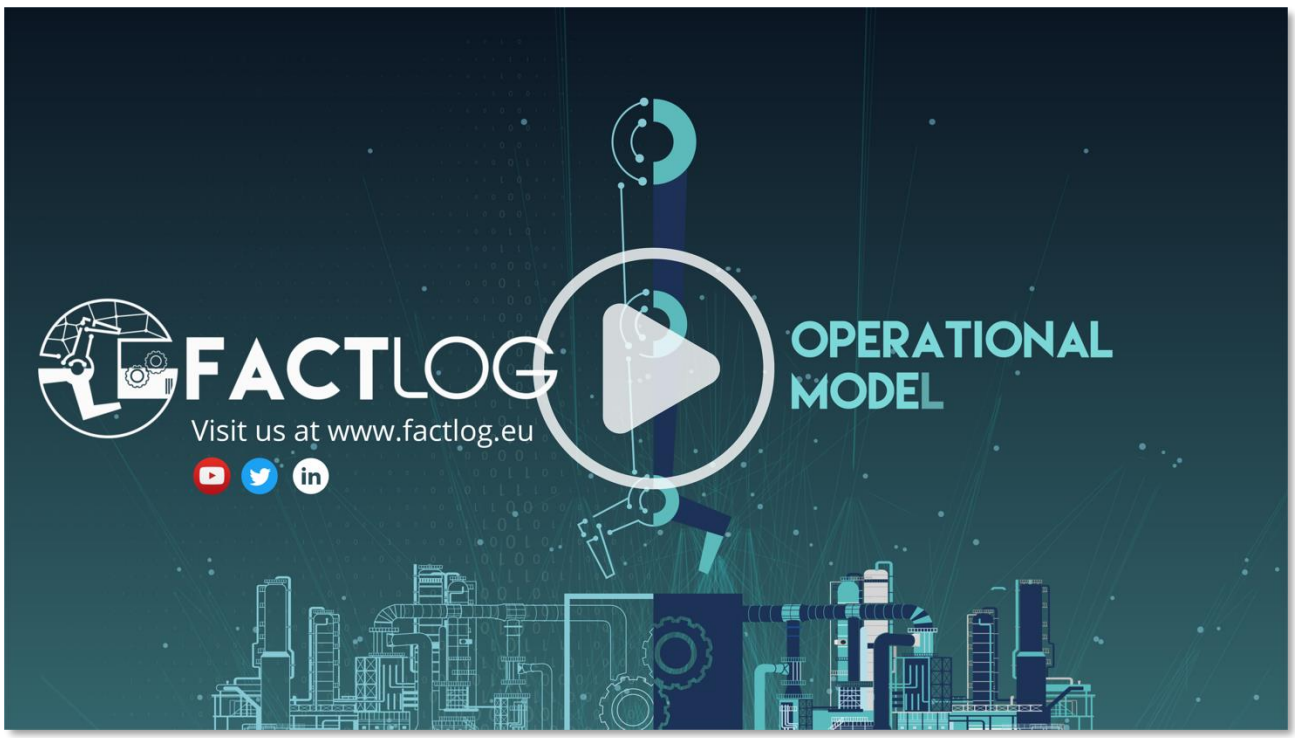

Figure 25 - FACTLOG Video - Operational Modelai é?

5.3.3 FACTLOG – Supply Chain as Network of Cognitive Twins

Figure 26 - FACTLOG Video - Supply Chain as Network of Cognitive Twins

5.3.4 FACTLOG – A Vision for Cognitive Supply Chains

Figure 27 - FACTLOG Video - A Vision for Cognitive Supply Chain

Appendix I – FACTLOG Publications

DOI	Type of Publication	Repository Link	Link to the Publication	Title	Authors	Title of the Journal / Prodeedings / Books…	Publisher	Year of Publication	Is it available in Open Access, or wil be made available? (Yes/No)	Is it a peer-reviewed publication? (Yes/No)	Is it a joint public / private publication? (yes/no)	Partner (s)
10.1109/TSMC.2020.3048821	Journal	https://ieeexplore.ieee.org/document/9328223		Model-Based Systems Engineering Tool-Chain for Automated Parameter Value Selection	Jinzhi Lu; Dejiu Chen; Guoxin Wang; Dimitris Kiritsis; Martin Törngren	IEEE Transactions on Systems, Man, and Cybernetics: Systems	IEEE	2021	Yes	Yes	Yes	EPFL
10.1007/978-3-030-72651-5_55	Conference Paper	https://link.springer.com/chapter/10.1007/978-3-030-72651-5_55		A Knowledge Management Approach Supporting Model-Based Systems Engineering	Pengfei Yang, Jinzhi Lu, Lei Feng, Shouxuan Wu, Guoxin Wang, Dimitris Kiritsis	WorldCIST 2021: Trends and Applications in Information Systems and Technologies pp 581-590	Springer	2021	Yes	Yes	Yes	EPFL
10.1007/978-3-030-72090-2_10	Conference Paper	https://link.springer.com/chapter/10.1007/978-3-030-72090-2_10		A Cognitive Approach to Manage the Complexity of Digital Twin Systems	Jinzhi Lu, Xiaochen Zheng, Lukas Schweiger , Dimitris Kiritsis	Smart Services Summit pp 105-115	Springer	2021	Yes	Yes	Yes	EPFL

DOI	Type of Publication	Repository Link	Link to the Publication	Title	Authors	Title of the Journal / Prodeedings / Books…	Publisher	Year of Public ation	Is it available in Open Access, or wil be made available? (Yes/No)	Is it a peer-reviewed publication? (Yes/No)	Is it a joint public / private publication? (yes/no)	Partner (s)
10.1007/978-3-030-85874-2_45	Conference Publication	https://link.springer.com/chapter/10.1007%2F978-3-030-85874-2_45		Scheduling Jobs on Unrelated Machines with Job Splitting and Setup Resource Constraints for Weaving in Textile Manufacturing.	Mourtos I., Vatikiotis S., Zois G.	Dolgui A., Bernard A., Lemoine D., von Cieminski G., Romero D. (eds) Advances in Production Management Systems. Artificial Intelligence for Sustainable and Resilient Production Systems. APMS 2021. IFIP Advances in Information and Communication Technology	EURO2021	2021	Yes	Yes	Yes	AUEB
	Conference Presentation		https://www.euro-online.org/conf/admin/tmp/program-euro31.pdf	The role of Digital Twins and Optimisation in facilitating Digital Transformation in manufacturing	Stavros Lounis, Georgios Doukidis, Yiannis Mourtos	Euro2021 | 31st European Conference on Operational Research	EURO2021	2021	Yes	Yes	Yes	AUEB

DOI	Type of Publication	Repository Link	Link to the Publication	Title	Authors	Title of the Journal / Prodeedings / Books…	Publisher	Year of Public ation	Is it available in Open Access, or wil be made available? (Yes/No)	Is it a peer-reviewed publication? (Yes/No)	Is it a joint public / private publication? (yes/no)	Partner (s)
	Conference Presentation		https://www.euro-online.org/conf/admin/tmp/program-euro31.pdf	Combined Production Scheduling and Predictive Maintenance for PCB Manufacturing	Yiannis Mourtos, Grigoris Kasapidis, Panagiotis Repoussis, Pavlos Eirinakis	Euro2021 | 31st European Conference on Operational Research	EURO2021	2021	Yes	Yes	Yes	AUEB, UNIPI
	Conference Presentation		https://www.euro-online.org/conf/admin/tmp/program-euro31.pdf	Production scheduling for the steel reinforcement industry	Konstantinos Kaparis, Kyriakos Bitsis, Stavros Lounis	Euro2021 | 31st European Conference on Operational Research	EURO2021	2021	Yes	Yes	Yes	AUEB, UNIPI
	Conference Presentation		https://www.euro-online.org/conf/admin/tmp/program-euro31.pdf	Cognitive Manufacturing: The role of process modelling	Nikolaos Sarantinoudis, George Tsinarakis, Kostas Kalaboukas, Pavlos Eirinakis, George Arampatzis	Euro2021 | 31st European Conference on Operational Research	EURO2021	2021	Yes	Yes	Yes	AUEB, TUC
	Conference Presentation		https://www.euro-online.org/conf/adm	Utilizing an enhanced digital twin to optimize on-	Pavlos Eirinakis, George Arampatzis,	Euro2021 | 31st European Conference on	EURO2021	2021	Yes	Yes	Yes	AUEB, TUC, QLEC

DOI	Type of Publication	Repository Link	Link to the Publication	Title	Authors	Title of the Journal / Prodeedings / Books…	Publisher	Year of Public ation	Is it available in Open Access, or wil be made available? (Yes/No)	Is it a peer-reviewed publication? (Yes/No)	Is it a joint public / private publication? (yes/no)	Partner (s)
			in/tmp/program-euro31.pdf	specs LPG recovery	Aljaž Košmerlj, Jože Rožanec, Nikolaos Sarantinoudis	Operational Research						TOR, JSI
	Conference Presentation		https://www.euro-online.org/conf/admin/tmp/program-euro31.pdf	Scheduling jobs on unrelated machines with job splitting and setup resource constraints	Georgios Zois, Yiannis Mourtos, Stavros Vatikiotis	Euro2021 | 31st European Conference on Operational Research	EURO2021	2021	Yes	Yes	Yes	AUEB

Appendix II – FACTLOG Dissemination Events/Conferences

Conference / Event	Date	Location	Status	Tickets	Website	Deadline / Info	Key Stakeholders	Comments	Partners Involved
I-ESA 10th International Conference on Interoperability for Enterprise Systems and Applications	17/11/2020 – 20/11/2020	Tarbes (France)	Online	Personal registration required	Link				
ICT Conference	01/12/2020 – 03/12/2020	Cologne (Germany)	Cancelled	Personal registration required	Link				
Hannover Messe (Hanover Fair)	12/04/2021 - 16/04/2021	Hannover (Germany)	Online		Link			Joint booth organised	HAW
Paris Airshow	21/06/2021 - 27/06/2021	Le Bourget [Paris] (France)	Cancelled		Link			Joint booth organised	HAW
Aircraft Interiors Expo	31/08/2021 - 02/09/2021	Hamburg (Germany)	Online		Link			Joint booth organised	HAW
Aircraft Interiors Expo Hamburg (Virtual)	14/09/2021 - 16/09/2021	Online	Online	From EUR 2,500			Cabin Interiors, Passenger Experience		
Airtec Munich	26/10/2021 - 28/10/2021	MTC Munich	Attended	From EUR 3,145	Link		Future Mobility		HAW
Aviation Forum Hamburg	07/12/2021 - 08/12/2021	Congress Center Hamburg	Planned	From EUR 2,000	Link		Aerospace Conference		HAW
Hannover Messe	25/04/2022 - 29/04/2022	Hannover Messe	Planned	Approx.. EUR 1,1000/sqm	Link		Industrial Transformation		HAW

Conference / Event	Date	Location	Status	Tickets	Website	Deadline / Info	Key Stakeholders	Comments	Partners Involved
ILA Berlin	May 2022	Messe Berlin	Planned	Approx.. EUR 1,100/sqm	Link		International Ais Show		HAW
Aircraft Interiors Expo Hamburg	14/06/2022 - 16/06/2022	Hamburg Messe	Planned	From EUR 1,050/sqm	Link		Cabin Interiors, Passenger Experience		HAW
Farnborough Airshow	18/07/2022 - 22/07/2022	Farnborough Airfield	Planned	Approx.. EUR 1,300/sqm	Link		International Ais Show		HAW