D8.5 – Stakeholder engagement - mid-term report

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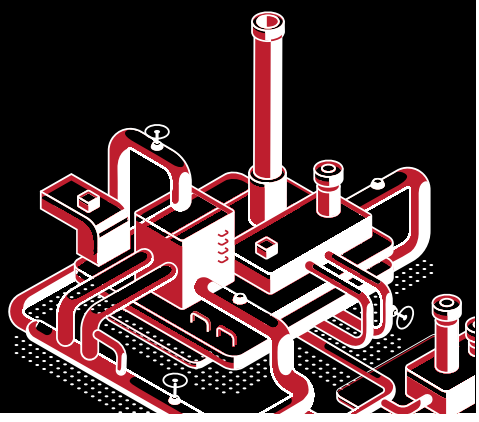

DELIVERABLE FACTSHEET

Deliverable D8.5	
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Dissemination level	
X	PU = Public
	PP = Restricted to other programme participants (including the EC)
	RE = Restricted to a group of the consortium (including the EC)
	CO = Confidential, only members of the consortium (including the EC)

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Terms and abbreviations

AAS	Asset Administration Shell
AI	Artificial Intelligence
AIM-NET	Artificial Intelligence in Manufacturing NETwork
CPSoS	Cyber-Physical System of Systems
DMaaST	Digital Modelling and Assessment through MaaS for Resiliency
DSBC	Data and Services Business Committee (Gaia-X)
EC	European Commission
EFFRA	European Factories of the Future Research Association
Flex4Res	Flexible and Resilient Manufacturing Supply Chains (a Gaia-X lighthouse project)
GDPR	General Data Protection Regulation
IDS	International Data Spaces
IIoT	Industrial Internet of Things
IMC	Intelligent Manufacturing Custodian (NARRATE project)
IoT	Internet of Things
KPI	Key Performance Indicator
Laser4MaaS	Revolutionizing Laser Welding by Dynamic Beam Shaping
M4ESTRO	Manufacturing as a Service Strategies for Resilient Value Networks
MaaS	Manufacturing as a Service
MaaSAI	Agile Manufacturing as a Service through AI Autonomous Agents
MaaSive	Manufacturing as a Service to Increase Resilience in Value Networks
MaaSiveTwin	Manufacturing as a Service and Supply Chain Predictive Twin
MASTT2040	Manufacturing as a Service for the EUs Twin Transition Until 2040
MEDUSA	Manufacturing-as-a-Service Framework Exploiting Decentralized Secure Data Exchange
NARRATE	Regenerative Resilient Smart Manufacturing Networks
Pontus-X	Pontus-X Ecosystem (a Gaia-X lighthouse data space)
RAASCEMAN	Resilient Adaptive Supply Chains for Capability-based MaaS Networks
REED	Responsive and Reconfigurable Value Network for Bulky Parts
SEED	Societal Energy Environmental Industrial and Digital Transitions (IMT Atlantique doctoral program)
SME	Small and Medium-sized Enterprise
SMN	Smart Manufacturing Networks (NARRATE project)
Tec4MaaSEs	Technologies for MaaS Ecosystems
TRL	Technology Readiness Level
UniMaaS	Unified Modeling and Automated Scheduling for Manufacturing as a Service
VDMA	German Mechanical Engineering Industry Association
WP	Work Package

Public Summary

The ACCURATE project, funded under Horizon Europe's TWIN GREEN AND DIGITAL TRANSITION 2023 call, aims to enhance the competitiveness of European manufacturing by developing a federated Manufacturing as a Service (MaaS) framework that boosts resilience, sustainability, and adaptability to disruptions such as pandemics, geopolitical conflicts, or natural disasters. Deliverable 8.5, "Stakeholder Engagement – Mid-Term Report," documents the clustering and networking activities undertaken in the first 18 months (M01–M18, December 2023–May 2025) under Task 8.4. Led by DAO with participation from all partners, these efforts have built a robust stakeholders' network through collaborations with EC-funded projects (e.g., Flex4Res), integration into key ecosystems like Gaia-X and Pontus-X, and participation in high-profile events such as HannoverMesse 2024 and the Gaia-X Summit 2024. Achievements include attaining Gaia-X lighthouse status, fostering synergies with "Made in Europe" initiatives, and engaging academic and industry stakeholders through workshops, webinars, and scientific conferences. This report highlights lessons learned, such as the value of interoperability and the importance of addressing SME concerns about data-driven solutions, and outlines plans to deepen collaborations and expand outreach, including participation in the "Manufacturing Partnership Days 2025". These activities lay a strong foundation for the final stakeholder engagement report in month 36, supporting ACCURATE's mission to create resilient, human-centered MaaS value chains.

1 Introduction

1.1 About this Deliverable

Deliverable 8.5, titled "Stakeholder Engagement – Mid-Term Report," documents the clustering and networking activities undertaken by the ACCURATE project during the first 18 months (M01–M18) addressing the requirements of *Task 8.4- Clustering activities in Horizon, cooperation with Made in Europe and Gaia-X*. Led by DAO with participation from all partners, this task focuses on consolidating collaboration with the European industrial community through clustering with EC-funded projects, "Made in Europe" partnership, Gaia-X, and international initiatives. The objective is to build a network of followers to enhance opportunities for dissemination and exploitation, utilizing instruments such as web presence, social media interactions, conferences, public speaking, webinars, and podcasts.

This mid-term report highlights key achievements, including recognition within key ecosystems (e.g., Gaia-X lighthouse status, joining the Pontus-X ecosystem), collaborations (e.g., with Flex4Res), and participation in high-profile events (e.g., HannoverMesse, Gaia-X Summit 2024). It also reflects lessons learned and outlines future plans for stakeholder engagement. This deliverable serves as a foundation for the final "Stakeholder Engagement" report, due in month 36, which will build on these efforts and incorporate further progress toward the project's dissemination and exploitation goals.

1.2 Document Structure

Deliverable D8.5 is structured to provide a comprehensive overview of the ACCURATE project's clustering and networking activities during the first 18 months, while also reflecting on lessons learned and outlining future steps. The document is organized as follows:

- **Chapter 1: Introduction**

  Provides an overview of the deliverable, its purpose within Task 8.4, and its role in the broader ACCURATE project, along with its structure and relation to other tasks and deliverables.

- **Chapter 2: Stakeholder Engagement and Achievements**

  Details the project's clustering activities and key outcomes, covering integration into key ecosystems (e.g., Gaia-X, Pontus-X), collaborations and partnerships (e.g., Flex4Res, Made in Europe), events and networking activities (e.g., presentations, strategic meetings, booths, webinars), digital outreach efforts, engagement with international initiatives, and depicts a summary of overall engagement impact.

- **Chapter 3: Lessons Learned and Best Practices**

  Reflects on insights gained, challenges encountered, and solutions implemented during the clustering efforts, concluding with recommendations for future collaboration, including key best practices and specific actions for the next phase.

- **Chapter 4: Future Outlook and Long-Term Engagement**

  Outlines the planned activities for the remaining project duration, focusing on sustaining and expanding stakeholder networks to support the project's dissemination and exploitation goals.

- **Chapter 5: Conclusion**

  Summarizes the key findings and achievements of the mid-term stakeholder engagement efforts, emphasizing their role in preparing for the final deliverable in month 36.

1.3 Relation with Other Tasks and Deliverables

Deliverable 8.5, "Stakeholder Engagement – Mid-Term Report," is closely linked to other tasks and deliverables within WP8: Market Uptake & Business Impact, Dissemination and Awareness, led by ES, as well as other WPs in the ACCURATE project. Task 8.4 focuses on clustering activities with EC-funded projects, the "Made in Europe" partnership, Gaia-X, and international initiatives, aiming to build a network of followers for dissemination and exploitation. Its outcomes support and are supported by the following tasks and deliverables:

- Task 8.1: Dissemination, Communication, and Outreach (led by IED, M01–M36)

  Task 8.1 develops the project's communication and dissemination strategy, including activities like creating a project identity, managing a website and social media accounts, issuing press releases, producing multimedia content, and organizing a final Open Day with EIT Manufacturing. The clustering and networking efforts in Task 8.4 directly contribute to these activities by providing content for dissemination (e.g., achievements like Gaia-X lighthouse status) and expanding the stakeholder network for outreach events, feeding into Deliverable 8.1 (Dissemination and Communication Plan).

- Task 8.2: Exploitation Pathway and IPR Management (led by ES, M13–M36)

  Task 8.2 focuses on identifying exploitable results, conducting market analysis, and developing exploitation and business plans using the IPER methodology. The stakeholder network built through Task 8.4 enhances exploitation opportunities by connecting partners with potential collaborators (e.g., Flex4Res, Gaia-X), supporting the market readiness analysis and exploitation pathways outlined in Deliverable 8.2 (Exploitation and Business Plans).

- Task 8.3: Market Analysis and Business Models for MaaS in New/Cross-Pollinated Value Networks (led by SIMAVI, M13–M36)

  Task 8.3 examines market access options and potential alliances, integrating outcomes from Task 8.2. The clustering activities in Task 8.4, such as engagement with Gaia-X and Pontus-X, provide valuable industry connections and insights into market needs, which inform the business strategies and market access plans developed in Task 8.3, contributing to Deliverable 8.2.

- Task 8.5: Enhancement of Standardization (led by DAO, M01–M36)

  Task 8.5, which includes the development of Deliverable 8.7 ("Standardization Methodology – Initial Version"), focuses on identifying standards, addressing gaps, and engaging with standardization bodies like CEN, ISO, and ASTM. Task 8.4 supports this by sharing lessons learned from clustering activities (e.g., Gaia-X and Made in Europe engagements), which help identify potential certifications, standards, and best practices, as noted in Task 8.5's objectives. Conversely, the standardization efforts in Task 8.5 enhance the credibility of Task 8.4's stakeholder engagements by ensuring alignment with industry standards.

- **Broader WP Connections**:

  The stakeholder network established through Task 8.4 supports the dissemination of technical outcomes from WP2 (ontology-based matchmaking), WP3 (digital twins for MaaS), WP4 (supply chain resilience), WP5 (data space design), and WP6 (MaaS framework development). For example, events like the Gaia-X Summit 2024 provide platforms to showcase these results, while collaborations with initiatives like Flex4Res create synergies for exploitation across WPs.

This interconnectedness ensures that Task 8.4's clustering activities amplify the project's visibility, support market uptake, and enhance the impact of other tasks and deliverables, paving the way for the final stakeholder engagement report in month 36.

2 Stakeholder Engagement and Achievements

This chapter provides a detailed overview of the ACCURATE project's stakeholder engagement activities and key achievements during the first 18 months (M01–M18) under Task 8.4. It highlights the project's efforts to build a robust network of followers and collaborators through clustering with EC-funded projects, the "Made in Europe" partnership, Gaia-X, and other initiatives. The following subchapters outline the project's integration into key ecosystems, collaborations with relevant European and international partners, participation in high-profile events, digital outreach efforts, and the overall impact of these activities, demonstrating progress toward enhancing dissemination and exploitation opportunities.

2.1 Integration into Key Ecosystems

This subchapter outlines the ACCURATE project's successful integration into prominent data-sharing and industrial ecosystems during the first 18 months of project implementation, highlighting its recognition as a leader in the European data space landscape. By achieving Gaia-X lighthouse status and joining the Pontus-X ecosystem, ACCURATE has positioned itself at the forefront of interoperable and collaborative frameworks, enhancing its visibility and influence within the European industrial community.

2.1.1 Gaia-X Lighthouse status and its significance

Following a rigorous application process, the ACCURATE project has been recognized as Gaia-X lighthouse project, a prestigious endorsement within the Gaia-X Endorsement Programme, which promotes the adoption of Gaia-X principles and fosters a unified approach to digital transformation. As outlined in the Gaia-X Endorsement Programme criteria (Table 2-1), lighthouse projects must meet stringent requirements, including active Gaia-X membership, commitment to delivering Gaia-X compliant services, ensuring interoperability based on Gaia-X architecture, promoting the creation or expansion of data spaces, and demonstrating scalability potential. ACCURATE's alignment with these criteria underscores its role as a front-runner in implementing the Gaia-X framework, particularly in the manufacturing sector, where it contributes to creating a decentralized data and service exchange data space built on transparency, trust, and openness.

The benefits of this status are significant. ACCURATE gains increased market recognition, access to best practice sharing with other endorsed projects, and the opportunity to shape the Gaia-X framework by contributing to specifications and requirements. Thus, the project is promoted on Gaia-X social media, website, magazines, and podcasts, and is represented at C-level during at least one major Gaia-X event per year. Additionally, ACCURATE benefits from monthly collaboration meetings within the endorsed project community, enabling intense exchange and fostering scalability of its Gaia-X data spaces. This recognition not only enhances the project's credibility but also positions it to influence the future of secure, transparent, and interoperable data economies, aligning with the ACCURATE objectives of enhancing resilience and interoperability in Manufacturing as a Service (MaaS) value chains.

Table 2-1: Gaia-X Endorsement Programme Criteria and Benefits

Criteria	Endorsement Letter	Qualified Projects	Lighthouse Projects	Powered Data Spaces
Active Gaia-X Member	✓	✓	✓	✓
Commitment to deliver Gaia-X compliant services	✓	✓	✓	✓
Project shall ensure interoperability based on Gaia-X architecture		✓	✓	✓
Project shall have a clear set of use cases defined		✓	✓	✓
Project shall have a clear roadmap to deliver Gaia-X compliant services		✓	✓	✓
Project shall promote the creation or expansion of one or more data spaces			✓	✓

Criteria	Endorsement Letter	Qualified Projects	Lighthouse Projects	Powered Data Spaces
Has been a previous Lighthouse project				✓
Creating reusable and Open-Source components			✓	✓
Having a scalability potential			✓	✓
Benefits				
Be part of Gaia-X Ecosystems and contribute to the definition of Gaia-X objectives and priorities	✓	✓	✓	✓
Benefit from best practice sharing with other projects of different maturity	✓	✓	✓	✓
Ensure that your project meets Gaia-X specifications and compliance	✓	✓	✓	✓
Promotion on Gaia-X social media	✓	✓	✓	✓
Be part of the Endorsed project community via monthly call and physical meetings		✓	✓	✓
Shape Gaia-X framework by contributing to the definition of specifications and requirements			✓	✓
Learn about GXDCH services and business opportunities upfront			✓	✓
Represent Gaia-X market voice			✓	✓
Promotion on Gaia-X Website			✓	✓
Promotion on Gaia-X Magazine & podcasts			✓	✓
Representation of Gaia-X C-level at 1 event per year			✓	✓

Criteria	Endorsement Letter	Qualified Projects	Lighthouse Projects	Powered Data Spaces
Use the main stage slot at one of the major Gaia-X Events				✓
Use the powered by logo				✓

2.1.2 Joining and shaping the Pontus-X Ecosystem

The ACCURATE project has joined but also heavily shaped the Pontus-X Ecosystem, a Gaia-X lighthouse data space and the first and largest publicly available European X-Ecosystem, which leverages Gaia-X principles and smart contracts to enable cross-industry data collaboration while ensuring compliance with European regulations such as the Data Act, Data Governance Act, AI Act, and GDPR. As an “ecosystem of ecosystems,” Pontus-X provides an OSS framework for seamless interoperability, connecting several Gaia-X lighthouse projects, including ACCURATE, COOPERANTS, EuProGigant, Flex4Res and Gaia-X4FutureMobility. Together, they represent a network of more than 15 initiatives and 500 onboarded institutions.

Because Pontus-X provides a domain-agnostic solution in sectors such as aerospace, agriculture, manufacturing, Industry 4.0, mobility, AI, smart cities and data-driven businesses, as well as open science, while enabling technical interoperability, it actively promotes a single European digital market that aligns with the EU's data strategy and drives innovation across industries.

Joining and shaping Pontus-X directly contributes to the goals of Task 8.4 by expanding ACCURATE’s stakeholder network and enhancing opportunities for dissemination and exploitation. The ability to directly exchange data and services with a diverse range of initiatives and institutions has facilitated a much broader reach, enabling ACCURATE to connect with new stakeholders and amplify its visibility within the European industrial and data-sharing communities. This integration has also resulted in several direct on-site alignment opportunities with other Pontus-X initiatives, such as COOPERANTS, EuProGigant and Gaia-X4FutureMobility, as detailed in Chapter 2.3 (e.g., the EuProGigant meeting in Nürtingen, moveID meeting in Frankfurt and the COOPERANTS perspective forum in Bremen). Furthermore, as Pontus-X is itself a Gaia-X lighthouse data space, ACCURATE’s participation enhances its relevance, outreach and visibility, reinforcing its position as a leader in the European data space landscape and supporting the project’s objective of creating a federated Manufacturing as a Service (MaaS) framework.

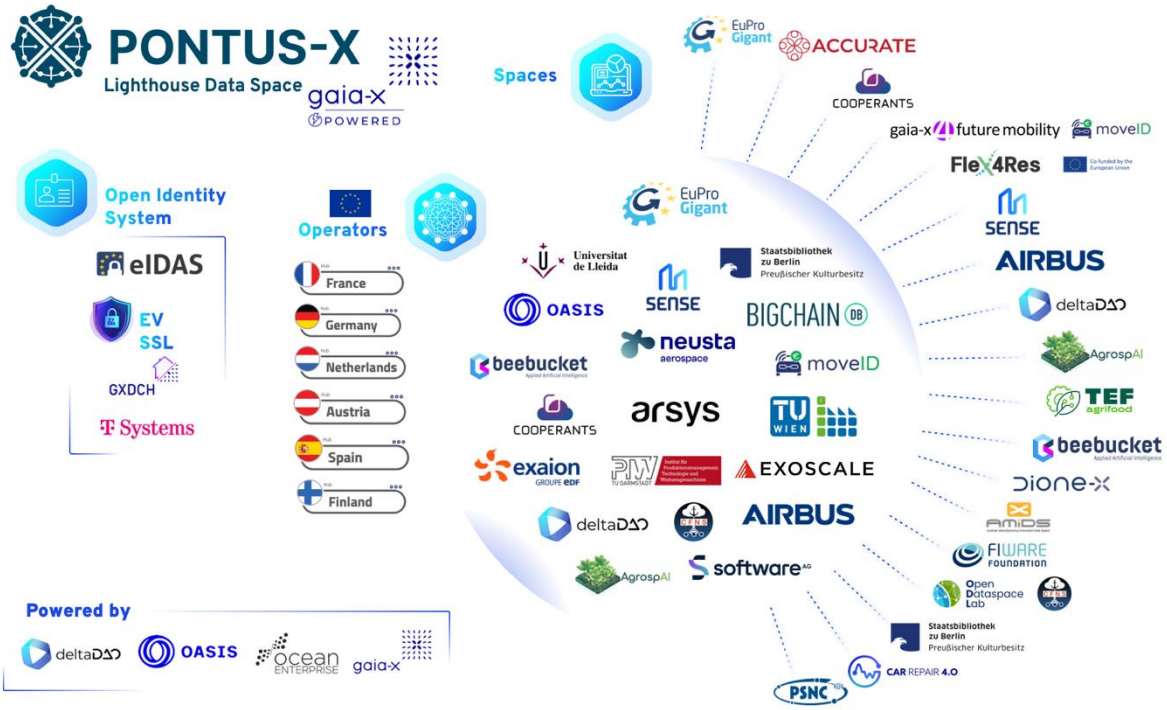

Figure 1: The Pontus-X Ecosystem (Source: deltaDAO AG)

2.2 Collaborations and Partnerships

This subchapter details the ACCURATE project's strategic collaborations and partnerships established during the first 18 months, which have strengthened its position within the European industrial and data-sharing communities. By fostering cooperation with key initiatives like Flex4Res and engaging with European frameworks such as "Made in Europe" and Gaia-X, ACCURATE has created synergies that enhance its objectives of building resilient and sustainable Manufacturing as a Service (MaaS) value chain. These partnerships leverage shared goals, interoperable ecosystems, and mutual recognition to amplify the project's impact.

2.2.1 Flex4Res cooperation and expected synergies

The ACCURATE project has initiated a promising cooperation with Flex4Res, a fellow Gaia-X lighthouse project focused on enhancing the resilience of manufacturing supply chains through an open platform for production network reconfiguration. Flex4Res leverages advanced technologies such as Gaia-X, International Data Spaces (IDS), and the Asset Administration Shell (AAS) to facilitate efficient data sharing and reconfigure manufacturing processes. Central to its approach are digital twin models, which enable resilience assessments and reconfiguration planning, alongside a resilience assessment toolbox and decision-making tools for evaluating "what-if" scenarios. Flex4Res aims to test its integrated solutions across four industrial use cases, covering various manufacturing scales and processes, including logistics reconfiguration.

ACCURATE and Flex4Res share significant alignment in their goals and objectives, particularly in their focus on resilient manufacturing systems and the use of digital twins to adapt to disruptions. Both

projects aim to enhance supply chain resilience—ACCURATE through its federated MaaS framework and decision-support systems, and Flex4Res through enabling flexible reconfiguration of production networks. Their common reliance on Gaia-X principles ensures interoperability, with both projects utilizing digital twins and standardized data models to improve decision-making and adaptability in the face of disruptions, such as those caused by pandemics or geopolitical events. This shared vision fosters a strong foundation for collaboration.
The cooperation is further strengthened through the Pontus-X ecosystem, where both projects are active members. As part of this “ecosystem of ecosystems,” ACCURATE and Flex4Res can directly exchange data and services, facilitating knowledge sharing and technical alignment. This has already led to on-site engagements, such as the EuProGigant meeting in Nürtingen, where both projects aligned on shared challenges (as detailed in Chapter 2.3). Additionally, Flex4Res’s status as a Gaia-X lighthouse project enhances synergy, as both projects benefit from increased visibility, access to Gaia-X working groups, and the opportunity to shape the Gaia-X framework. A notable outcome of this collaboration was a joint panel discussion at the Innovoent Forum in Larisa, Greece, on February 14, titled "EU Supply Chains & Manufacturing in a Global Landscape: Building Resilience Through Data & Technology." The panel explored how businesses can harness data, technology, and analytics to build agile, adaptive, and resilient supply chains, addressing challenges specific to the EU industrial ecosystem, such as regulatory fragmentation and global competitiveness. Representatives from ACCURATE and Flex4Res, alongside other industry and academic experts, shared insights on leveraging digital twins and Gaia-X-compliant data spaces to enhance supply chain resilience, further solidifying their collaborative efforts.

Expected synergies include the potential for joint development of resilience assessment methodologies, shared use of digital twin technologies for supply chain optimization, and coordinated dissemination efforts to amplify their impact within the European manufacturing community. This collaboration positions both projects to drive innovation in resilient manufacturing, supporting ACCURATE’s broader mission of creating sustainable and disruption-robust MaaS value chains.

2.2.2 Engagement with European initiatives (Made in Europe, Gaia-X etc.)

The ACCURATE project has actively engaged with key European initiatives, notably the Made in Europe partnership and Gaia-X, to align its objectives with broader European industrial and digital transformation goals. These engagements have facilitated collaboration, knowledge exchange, and increased visibility, supporting the project’s mission to develop resilient and sustainable Manufacturing as a Service (MaaS) value chain. This section details ACCURATE’s strategic involvement, with a particular emphasis on its role within the Made in Europe framework and its efforts to foster synergies with related projects.

Made in Europe Partnership

The Made in Europe partnership, a co-programmed initiative under Horizon Europe, aims to enhance the competitiveness, sustainability, and resilience of European manufacturing through innovation and digitalization. ACCURATE was funded as part of the **TWIN GREEN AND DIGITAL TRANSITION**

2023 call (HORIZON-CL4-2023-TWIN-TRANSITION-01), under the topic "*Achieving Resiliency in Value Networks through Modelling and Manufacturing as a Service.*" This topic focuses on MaaS as a distributed production system, leveraging resources (e.g., machines, data, software) as services to improve flexibility and resilience amid volatile external conditions. The call's expected outcomes include the development of reliable models, simulators, and digital twins to provide actionable insights into value networks, enabling a better understanding of the impact of unforeseen events on manufacturing. It also anticipates technologies that allow rapid adaptation of logistics and production to varying external conditions, enhancing the resilience and sustainability of industrial systems and value chains. Additionally, the call expects smart manufacturing networks capable of self-adaptation to external threats, ensuring robust and agile operations.

One year later, a new call was launched under the Made in Europe Partnership - **HORIZON-CL4-2024-TWIN-TRANSITION-01-03** (RIA) under the topic" *Manufacturing as a Service: Technologies for customised, flexible, and decentralised production on demand*". This call aims to further develop and integrate the technologies required for the successful deployment of MaaS, particularly through platforms enabling rapid data exchange and seamless, data-driven, standards-based automation of inter-company processes beyond factory boundaries.

Given that all projects funded under these calls, including ACCURATE, were designed to embrace MaaS, there is significant potential for synergy. For instance, projects like DMaaST and M4ESTRO, with their focus on multi-level digital twins and autonomous resilience, can share methodologies with others like UniMaaS and MEDUSA, which emphasize data spaces and secure collaboration, to enhance collective modeling capabilities. Similarly, RAASCEMAN's circular economy integration and MaaSiveTwin's predictive analytics for critical materials can complement efforts in rapid adaptation, fostering cross-project learning on resilience strategies and sustainable practices.

The calls' scope emphasizes actionable value chain models, flexible manufacturing ecosystems, and human-centered solutions that optimize resilience and agility, with consideration for circularity. ACCURATE addresses these through its federated MaaS framework, multi-level digital twins, and decision-support system, demonstrated via three use cases spanning automotive, aerospace, and electronics sectors. The project's business case and exploitation strategy further ensure contributions to industrial competitiveness and sustainability, core pillars of the Made in Europe vision.

Beyond its own development, ACCURATE has engaged with the Made in Europe ecosystem by evaluating and seeking synergies with eleven other projects funded under the calls **HORIZON-CL4-2023-TWIN-TRANSITION-01 and HORIZON-CL4-2024-TWIN-TRANSITION-01-03**:

- **NARRATE (Regenerative Resilient Smart Manufacturing Networks)**: Targets furniture production, multi-sector 3D printing, and semiconductors, using AI and IoT platforms with supply chain digital twins to predict and mitigate disruptions. The project aims to enhance the resilience and efficiency of manufacturing and logistics companies by developing the Intelligent Manufacturing Custodian (IMC), a tool designed to provide end-to-end visibility

and control over supply chain operations. Key activities include integrating AI, Digital Twin, and IoT technologies to enable proactive monitoring and prediction of potential disruptions, thereby transforming traditional supply chains into Smart Manufacturing Networks (SMN). The IMC will serve as a nerve center for coordinating intelligent production processes, while the Digital Twin will model real-time operational data to foster deeper insights and self-adapting capabilities. By leveraging collected data to train machine learning models, the project seeks to improve decision-making, enhance energy efficiency, and promote product circularity across diverse industry sectors. The effectiveness of the IMC will be validated through real-world testing in various production environments.

- **MaaSive (Manufacturing as a Service to Increase Resilience in Value Networks)**: Addresses the rubber and plastics industries, rapid reconfiguration of value networks after disruptions. The project aims to enhance the resilience of the manufacturing sector by developing a novel toolkit that enables rapid reconfiguration of value networks in response to changing demands and unforeseen crises. Key activities include establishing a connected manufacturing network to facilitate the implementation of Manufacturing as a Service (MaaS) and developing innovative methodologies that connect manufacturers with internal and external service providers. The project will address four main aspects: network building, impact assessment, reorchestration of networks, and value network operation. By employing an iterative approach that involves professionals and workers in defining requirements and scenarios, the project will create a human-centered toolkit composed of existing and new technologies. The effectiveness of the toolkit will be demonstrated through two use case scenarios, ultimately empowering manufacturers to respond swiftly to external disruptions and optimize resource utilization within their value networks.

- **MaaSiveTwin (Manufacturing as a Service and Supply Chain Predictive Twin)**: Addresses battery supply chains, tracking lithium and critical materials with a digital twin network and real-time analytics for mine-to-factory optimization. The project aims to enhance digital resilience in the value chain amidst rising demand for critical raw materials. Key activities include tracking and optimizing the mining, processing, and transportation of materials such as lithium and cobalt, thereby improving supply chain efficiency. Real-time data analysis will be employed to monitor various stages of critical raw material handling, while scenario predictions will help prepare for potential disruptions. Collaborations with leading companies will facilitate the practical application of these strategies, supporting the transition to a greener economy and aligning with the EU's sustainability goals.

- **DMaaST (Digital Modelling and Assessment through MaaS for Resiliency)**: Targets aerospace and electronics, developing knowledge graphs, multi-level digital twins, and federated AI for a multi-layer data and model platform. The project aims to enhance the resilience and self-adaptation capabilities of the manufacturing ecosystem in response to frequent disruptions. This is achieved through the development of a Smart Manufacturing Platform that integrates four innovative layers. The first layer establishes a robust data

foundation for real-time information integration across organizations. The second layer features a “two-level cognitive digital twin" that models production processes and value chains, leveraging human expertise and advanced algorithms. The third layer implements a multi-objective distributed decision support system utilizing federated deep learning for optimal decision-making. Finally, the fourth layer focuses on user-friendly interfaces and sustainability assessments, enhancing the scalability and resilience of manufacturing processes. The project will be validated through two key use cases in the aerospace and electronics sectors, promoting the adoption of the Manufacturing as a Service concept and improving sustainability and remanufacturing opportunities.

- **M4ESTRO (Manufacturing as a Service Strategies for Resilient Value Networks)**: Covers aerospace and automotive components and tool manufacturing, using trusted data sharing and AI in an Industrial Metaverse for autonomous resilience. The project aims to develop a trustworthy platform for Manufacturing as a Service (MaaS) that enhances resilience, sustainability, and adaptability in the manufacturing sector, particularly in a volatile and uncertain environment. Key activities will focus on four pillars: creating resilient, transparent, and flexible manufacturing processes; integrating resilient equipment and AI-driven trusted data for adaptive manufacturing; developing resilient simulations for the Industrial Metaverse to enable responsive production; and promoting human-centered manufacturing resilience and sustainability. The project envisions fostering an interactive and collaborative ecosystem where stakeholders can operate securely and effectively. By implementing these components, the project aims to significantly improve key performance indicators such as process ramp-up time, overall equipment effectiveness, and energy consumption, while also creating new jobs and delivering a substantial return on investment for the consortium.

- **Tec4MaaSEs (Technologies for MaaS Ecosystems)**: Focuses on electronic boards, additive manufacturing for injection molding, and hydrogen market facilities, building cognitive twin networks with continuous KPI monitoring. The project aims to address the challenges of inflexibility and distrust in modern manufacturing by developing a network of trustworthy and cognitive digital twins. Key activities include creating a comprehensive framework for collaborative work within value networks, enabling Manufacturing as a Service (MaaS) where production is offered flexibly as a service. The project will enhance resilience and sustainability through continuous evaluation of supply and demand, utilizing a multilevel balanced scorecard system for performance monitoring. By delivering innovative business models and a governance framework that covers business, data, and AI models, the project will facilitate resource sharing, coordination of value creation activities, and improved oversight of industrial operations. The effectiveness of the solution will be validated in three real value networks, demonstrating its potential to improve resilience and sustainability in manufacturing.

- **RAASCEMAN (Resilient Adaptive Supply Chains for Capability-based MaaS Networks)**: Addresses automotive and bicycle supply chains, integrating digital twins, AI for re-planning, and a MaaS marketplace with circular economy principles. The project aims to enhance the

resilience and adaptability of international supply chains in response to unforeseen disruptions. Key activities include developing tools that enable manufacturers to adjust production plans using real-time data, switching suppliers through a Mobility-as-a-Service (MaaS) network and integrating remanufacturing as a procurement alternative. The project will leverage digital twins and open-source software to create a framework for dynamic supply chain generation and self-adaptation. By focusing on actionable propositions for supply chain adjustments, building trust within MaaS networks, and enabling dynamic planning, the project seeks to facilitate swift responses to market changes. The solutions will be demonstrated in the automotive and bike industries, with results made available under open-source licensing to promote further integration and development after the project's conclusion.

- **MEDUSA (Manufacturing-as-a-Service Framework Exploiting Decentralized Secure Data Exchange)**: Targets cross-sector manufacturing (e.g., machinery, electronics), promoting collaborative networks with secure data sharing and AI-driven optimization. The project aims to develop an innovative, secure-by-design framework that leverages the manufacturing-as-a-service (MaaS) paradigm to enhance collaboration and interconnectivity in industrial sectors. Key activities include establishing digital connections for secure data exchange between companies and providing access to advanced tools that promote production efficiency and sustainability. The framework will facilitate improved access to marketplaces, allowing manufacturers to share resources and optimize production efforts. Additionally, the integration of automation and AI-based tools will enhance monitoring and tracking capabilities, enabling real-time production data exchange and lifecycle optimization. By treating resources as part of a distributed Cyber-Physical System of Systems (CPSoS), the project seeks to maximize production efficiency while remaining energy-aware.

- **MaaSAI (Agile Manufacturing as a Service through AI Autonomous Agents)**: Spans metalworking, biotech, food, and electronics with five pilots, using AI agents and a digital marketplace for capacity negotiation. The project aims to develop a comprehensive digital platform that automates interactions between suppliers and manufacturing companies within a Manufacturing as a Service (MaaS) ecosystem. Key activities include creating a System, which leverages explainable AI to facilitate agile and transparent negotiations over manufacturing capacities, thereby enabling on-demand sustainable production. This system will optimize resource utilization, support the transition toward circular manufacturing, and lower entry barriers for SMEs through flexible and decentralized production capabilities. The System will be piloted across various sectors, including metal machining and food processing, demonstrating its potential to revolutionize the European manufacturing landscape and enhance collaboration among value chain participants.

- **REED (Responsive and Reconfigurable Value Network for Bulky Parts)**: Focuses on energy, construction machinery, and railway components, developing MaaS for large-part manufacturing and servitization. The project aims to establish a Manufacturing as a Service

(MaaS) platform to address the challenges of manufacturing large and complex parts in sectors such as energy generation and railway transport. Key activities include developing enabling technologies and providing access to auxiliary equipment and services that enhance production efficiency while minimizing environmental impact. The platform will transform traditional business-to-business relationships into dynamic, networked models, facilitating better collaboration and trust among manufacturers and subcontractors. By focusing on improving precision, efficiency, and flexibility in supply chains, the project seeks to create responsive value networks capable of adapting to market demands and mitigating supply chain disruptions.

- **UniMaaS (Unified Modeling and Automated Scheduling for Manufacturing as a Service)**: Covers aerospace, automotive, construction, and logistics with four pilots, leveraging data spaces and cloud-based digital twins. The project aims to facilitate the adoption of the Manufacturing as a Service paradigm by addressing key challenges such as product customization, sustainability, and cost reduction. Key activities involve the development of a comprehensive platform that integrates three advanced technology suites: the Data Modelling Suite for resource monitoring and data exchange, the Modelling Suite for modular resource modeling and AI estimations, and the Decision-Making Suite for optimizing scheduling and sustainability. The platform will leverage cloud computing, digital twins, and trustworthy AI to support European SMEs and industries in accessing flexible manufacturing resources. The effectiveness of the platform will be demonstrated through four pilot projects, including aircraft maintenance and logistics management, showcasing its capabilities in real-world applications.

- **Laser4Maas (Revolutionizing Laser Welding by Dynamic Beam Shaping)**: Targets laser processing machinery, enhancing servitization with advanced AI and precise laser beam control. The project aims to revolutionize on-demand, smart, sustainable, and decentralized manufacturing through the development of comprehensive methodologies for digital servitization. The project introduces a six-point strategy—reconfigure, connect, control, predict, improve, and comply—to enhance manufacturing processes and ensure compliance with sustainability goals. Key activities include advancing dynamic laser beam shaping technologies and creating an 'all-in-one' laser welding tool, which will be demonstrated across strategic sectors such as automotive, aerospace, food packaging, and renewable energy. The project will also focus on establishing harmonized protocols for data interoperability, implementing IIoT solutions for remote monitoring and predictive maintenance, and developing AI-based decision support systems. A consortium of academic and industrial partners will facilitate the transition from technology readiness levels (TRL) 4 to 6, while promoting standardization initiatives and supporting training and knowledge transfer to meet the objectives of the EU Green Deal.

ACCURATE conducted internal workshops to analyze these projects' goals, use cases, and technologies, assessing their potential synergies with its own focus on multi-sector resilience, digital twins, and secure data collaboration. High-priority candidates for alignment include DMaaST and

M4ESTRO, due to shared aerospace and electronics applications and multi-level digital twin approaches; RAASCEMAN, for its complementary supply chain focus and circularity integration; Tec4MaaSEs, for its ecosystem resilience focus; MEDUSA, for its emphasis on secure data sharing and cross-sector collaboration; and UniMaaS, for its data space and scheduling innovations. Initial alignment meetings with these projects have been initiated, with the first workshops planned with MEDUSA to explore synergies in secure data exchange and collaborative manufacturing networks. These partnerships aim to enable mutual learning, compare methodologies (e.g., ACCURATE's co-simulation vs. UniMaaS's unified modeling), and enhance results, amplifying the collective impact within Made in Europe.

Additionally, the project is interacting with organizations involved in the initiatives: Catena-X and Factory-X. They are driven by the automotive industry (Catena-X) and the manufacture tooling industry (Factory-X). These projects are subsidized by industry and the federal government of Germany.

- **Catena-X**: Catena-X is an ambitious initiative aimed at creating a collaborative, data-driven network for the automotive industry to enhance transparency, efficiency, and sustainability across the entire value chain. The project's primary objectives include establishing a standardized data exchange framework that facilitates seamless communication among automotive stakeholders, from suppliers to manufacturers and customers. Key activities involve developing digital platforms that enable real-time access to data on production processes, logistics, and supply chain management. Additionally, Catena-X focuses on promoting circular economy principles by integrating sustainability metrics into decision-making processes. Through pilot projects and collaborative partnerships, the initiative aims to demonstrate the potential of connected ecosystems to improve resilience, reduce costs, and foster innovation within the automotive sector.
- **Factory-X**: The Factory-X project aims to create a highly flexible and interconnected manufacturing environment that leverages advanced digital technologies and artificial intelligence. The primary objective is to develop a comprehensive framework for smart factories that enhances productivity, sustainability, and adaptability in response to rapidly changing market demands. Key activities include the integration of IoT devices, digital twins, and AI-driven analytics to enable real-time monitoring and optimization of production processes. The project also focuses on fostering collaboration among industry partners to establish best practices for digital transformation in manufacturing. By conducting pilot implementations and testing innovative solutions in real-world settings, Factory-X aspires to set new standards for the future of manufacturing and contribute to the competitiveness of the German industrial sector.

Moreover, ACCURATE has engaged with the **MASTT2040 project (Manufacturing as a Service for the EU's Twin Transition Until 2040)**, which focuses on road mapping future pathways for MaaS to support Europe's green and digital transition by 2040. MASTT2040, involving a consortium of six partners across five countries, aims to identify challenges, gaps, and priority actions for a sustainable, circular, and resilient MaaS vision. ACCURATE participated in initial exchanges led by

IMT in March 2025 during MASTT2040's first road mapping workshop in Brussels, contributing insights from its use cases to shape the vision. Further workshops are planned to identify synergies, particularly in aligning ACCURATE's practical resilience solutions with MASTT2040's long-term strategic foresight, ensuring that its developments contribute to the broader 2040 goals of the Made in Europe partnership.

EFFRA Innovation Portal

To efficiently connect and engage with other manufacturing projects within the Made in Europe initiative, ACCURATE has actively participated in the **EFFRA Innovation Portal**, managed by the European Factories of the Future Research Association (EFFRA), the private partner of the European Commission in the Made in Europe Partnership. The portal serves as a central hub for describing and promoting project outcomes, supporting the compilation of periodic monitoring progress reports required under the partnership's Memorandum of Understanding. ACCURATE team members have established user accounts with editing permissions linked to the project, following EFFRA's guidance, and have begun introducing project result items for its three planned industrial use cases. These use cases are associated with Made in Europe KPIs, such as resilience, agility, and sustainability, with initial entries structured to reflect the project's progress in developing its federated MaaS framework and digital twins. Illustrative images and detailed descriptions have been uploaded to enhance visibility and contact persons from the consortium are progressively linked to these entries. Additionally, ACCURATE has documented its dissemination and networking activities—such as workshops and events (see Chapter 2.3)—as project result items under the "Resources" KPI section (e.g., knowledge-sharing and cooperation with other initiatives), including links to shared content for transparency and reporting purposes. This participation not only fulfills reporting obligations but also amplifies ACCURATE's visibility and fosters connections with other Made in Europe projects, supporting clustering efforts and future collaboration opportunities.

Gaia-X Engagement

Engagement with Gaia-X remains a cornerstone of ACCURATE's stakeholder strategy, as detailed in section 2.1.1. Beyond achieving lighthouse status, ACCURATE has actively participated in Gaia-X working groups and communities, contributing to the definition of specifications and requirements for secure, interoperable data spaces. This involvement has allowed the project to shape the Gaia-X framework, particularly in manufacturing-relevant areas like data sovereignty and interoperability. Participation in events such as the Gaia-X Summit 2024 in Helsinki (see Chapter 2.3) and monthly meetings within the Gaia-X endorsed project community has amplified its influence and visibility. Early contact with the Data Spaces Support Centre (DSSC) has further enabled collaboration with other data space initiatives, supporting standardization efforts tied to Task 8.5.

Broader Impact

Together, ACCURATE's engagements with Made in Europe and Gaia-X ensure that its technical developments—such as the federated MaaS framework and digital twin models—are aligned with European standards and priorities. The Made in Europe partnership provides a platform to test and validate these solutions within a competitive industrial context, while Gaia-X enhances their interoperability and scalability across data ecosystems. These alignments strengthen ACCURATE's

potential for market uptake and long-term impact, supporting its mission to create sustainable, human-centered, and disruption-robust manufacturing systems. Future plans include deepening these ties through joint workshops with Made in Europe projects and contributing to Gaia-X specification updates, as outlined in Chapter 4. The expected synergies will be disseminated through research multiplier networks, such as AIM-NET, notably in the form of dedicated workshops.

2.3 Events and Networking activities

This section outlines the ACCURATE project's participation in events and networking activities during the first 18 months (M01–M18, December 2023–May 2025) under Task 8.4. These efforts have been crucial in promoting the project's mission to enhance the resilience and sustainability of European manufacturing through a federated Manufacturing as a Service (MaaS) framework. By engaging diverse stakeholders, including researchers and industry leaders from manufacturing, automotive and aerospace. ACCURATE has communicated its objectives, shared progress, and built a robust network to support dissemination and exploitation. Activities are categorized into presentations and panel discussions, strategic on-site meetings, booth presence at fairs, and webinar pitches, reflecting a comprehensive clustering strategy with EC-funded projects, Gaia-X, Made in Europe, and international initiatives.

2.3.1 Presentations and Panel Discussions at Major Industry events

ACCURATE has actively engaged with industry and research communities through presentations and panel discussions, showcasing its vision and ongoing developments to varied audiences, like manufacturing SMEs from various domains like aerospace, process industry and automotive, and academia experts. Key events include:

- VDMA Association Event, Frankfurt (March 2024): Early in the project, ACCURATE presented its goals and initial steps to the German Mechanical Engineering Industry Association (VDMA), reaching 70 industry representatives. The session underscored the project's focus on resilient manufacturing, generating interest among SMEs.
- Market-X Conference, Gaia-X Lighthouse Booth, Darmstadt (March 2024): ACCURATE highlighted its objectives and relevance as a Gaia-X lighthouse project, emphasizing its role in interoperable data spaces for manufacturing. Delivered from the Gaia-X booth, the presentation engaged over 100 attendees, including data ecosystem stakeholders.
- HannoverMesse 2024, Hannover (April 2024): ACCURATE shared its mission and early achievements with approximately 200 manufacturing professionals, focusing on strengthening supply chain stability and sustainability in line with European priorities.
- ACHEMA 2024, Frankfurt (June 2024): Targeting the process industry, ACCURATE outlined its objectives and current state to 150 participants, emphasizing adaptability and sustainability in manufacturing value chains, which resonated with sector interests.
- EuProGigant Open House Day Workshop, Vienna (October 2024): Pontus-X and ACCURATE conducted a workshop for 50 attendees, from various manufacturing SMEs and research institutions, presenting its goals and progress while facilitating discussions on practical applications, reinforcing ties with the EuProGigant project.

- Gaia-X Summit 2024, Helsinki (November 2024): ACCURATE participated in a panel discussion titled "Data Space Orchestrator" in front of over 350 delegates, including EC officials and Gaia-X members. Additionally, as part of the Pontus-X ecosystem and in collaboration with EuProGigant it showcased revenue models and value streams of participating stakeholders within the data space in the Economic Theater. It also showcased its project objectives and progress at the ACCURATE booth (see 2.3.3).
- Innovent Forum Panel Discussion, Larissa (February 14, 2025): ACCURATE joined Flex4Res in a panel attended by 80 participants, from various domains, like manufacturing, agriculture or international research institutions, discussing how its objectives align with EU efforts to build resilient supply chains, strengthening collaboration with Flex4Res.
- Data Spaces Symposium, Gaia-X Lighthouse Booth, Warsaw (Q1 2025): ACCURATE presented its contributions to interoperable data spaces as a Gaia-X lighthouse project, reaching 120 attendees and highlighting its role in European data-sharing frameworks.
- HannoverMesse 2025, Gaia-X Booth, Hannover (April 2025): Near the end of M18, ACCURATE as part of Pontus-X shared its latest progress with 250 visitors at the Gaia-X booth, reinforcing its commitment to a fair and transparent data economy.

These events provided platforms to communicate ACCURATE's overarching goals, gather feedback, and expand its stakeholder network across key sectors.

2.3.2 Participation in On-Site Strategic Meetings

ACCURATE has leveraged strategic on-site meetings to align with other projects and initiatives, fostering collaboration and refining its approach. Key engagements include:

- EuProGigant Meeting, Nürtingen (January 2025): ACCURATE met with EuProGigant and Flex4Res representatives to discuss shared objectives in resilient manufacturing, engaging 25 participants in talks that laid groundwork for future cooperation.
- GaiaX4FutureMobility moveID Meeting, Frankfurt (January 2025): This meeting with 20 mobility stakeholders allowed ACCURATE to explore cross-sector synergies, aligning its goals with Gaia-X4FutureMobility's priorities.
- Gaia-X DSBC Workshop, The Hague (February 2025): Organized by the Data & Services Business Commitee (DSBC), this workshop enabled ACCURATE to share its data space advancements with 50 participants, aligning with other data space initiatives, and international Gaia-X Hubs, contributing to Gaia-X standardization efforts and supporting Task 8.5, as well as expand its stakeholder network across Europe.
- COOPERANTS Perspective Forum, Bremen (March 2025): ACCURATE presented its progress and objectives with 30 aerospace and manufacturing experts, enhancing its integration within the Pontus-X ecosystem.

2.3.3 Booth Presence at Fairs and Conferences

ACCURATE enhanced its visibility through both presence at significant fairs, offering interactive opportunities for stakeholder engagement:

- Gaia-X Summit 2024, Helsinki (November 2024): Alongside its presentation, ACCURATE hosted a booth showcasing its current state and objectives through demonstrations. Over

300 visitors, including industry leaders and policymakers, engaged with the team, yielding 60+ follow-up contacts. Promotional materials distributed at the booth were later repurposed for digital outreach (see 2.4).

2.3.4 Participation in scientific conferences

Furthermore, the project entities are focusing heavily on outreach to the scientific community. The objective is to spread the idea and enable interaction within the scientific community. As of today, the highlighted event creates a basis for these interactions (see Table 2-2).

Table 2-2: Overview of scientific conference with interactions based on ACCURATE project

No.	Name	Date	Location	Attendee(s)	Type
1	**OR 2024**	3 – 6 September, 2024	Munich, Germany	IMT Atlantique, HWR Berlin	Conference
2	**AHFE Hawaii Edition 2024**	8 - 10 December, 2024	Honululu, USA	Fraunhofer IAO	Conference
3	**Nord Design 2024**	12-14 August 2024	Reykjavík, Iceland	Aarhus University	Conference
4	**ROADEF 2025**	26-28 February 2025	Paris, France	IMT Atlantique,	Conference
5	**CIRP CMS 2025**	13 - 16 April 2025	Enschede, Netherlands	Fraunhofer IAO	Conference
6	**ICIEA 2025**	April 24-27, 2025	Seoul, South Korea	Aarhus University	Conference
7	**ASMC 2024**	May 13- May 26, 2024	Albany, USA	IMT Atlantique	Conference
8	**IFAC INCOM 2024**	28-30 August, 2024	Vienna, Austria	IMT Atlantique, HWR Berlin	Conference

2.3.5 Webinars and Digital Outreach Efforts

ACCURATE extended its reach through webinar pitches, targeting specialized audiences, including aerospace, information technology experts and research leaders, to share its mission and progress:

- German Gaia-X Aerospace Domain Meeting (April 2024): ACCURATE pitched its objectives to 100 aerospace professionals, highlighting its relevance to high-stakes manufacturing and fostering interest in potential applications.
- Gaia-X Hub Germany HubDate (Q1 2025): This session with 80 participants from the German Gaia-X Hub network showcased ACCURATE's goals and lighthouse status, enhancing its visibility within Germany's industrial community.

These webinars complemented physical engagements, broadening ACCURATE's audience and supporting Task 8.1's dissemination efforts.

2.3.6 Social engagement

Several initiatives targeting the younger generation have been carried out by the academic and industrial partners of the ACCURATE project:

- **AIRBUS Atlantic** is hosting a PhD student from IMT and actively contributing to making engineering and manufacturing more attractive to young people. The initiative also aims to empower young graduates by fostering a dual academic and industrial culture.
- **Tronico** has expressed interest in delivering seminars to IMT students, strengthening the link between industry and education.
- **IMT Atlantique** is continuously updating its portfolio of training nuggets and educational materials, drawing inspiration from ACCURATE use cases. In addition, an internship topic focused on supply chain resilience has been proposed within the project framework, and a student intern has been hosted at IMT to work on this topic.

2.4 Digital Outreach and Engagement Metrics

2.4.1 LinkedIn Engagement Performance

As part of the ACCURATE project's digital outreach strategy, LinkedIn has served as a primary channel for professional stakeholder engagement.

ACCURATE Project

Achieving Resilience Through Manufacturing as a Service, Digital Twins, and Ecosystems.

Non-profit Organizations · 456 followers · 2-10 employees

The follower base grew steadily to 456 followers (May 2025). Over the reporting period from May 27, 2024, to May 26, 2025, the LinkedIn page generated consistent growth in visibility and interaction, reflecting increasing interest from the target audience.

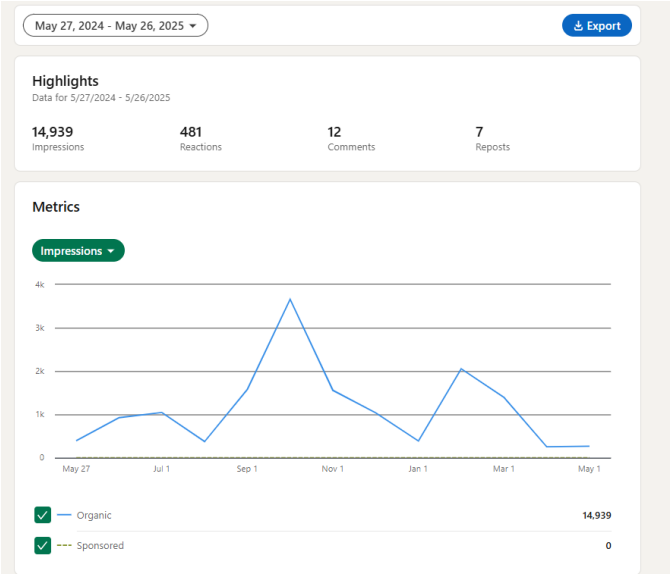

Figure 2: Linkedin Metrics

Engagement peaked between September and October 2024, coinciding with the dissemination of key project milestones and event promotions. The content strategy prioritized updates on project developments, insights from consortium members, and participation in relevant European forums, which contributed to the observed engagement spikes.

The steady baseline of impressions throughout the year indicates sustained visibility, even outside peak posting periods. All interactions were achieved organically, demonstrating the relevance of the content to the community without paid promotion.

The LinkedIn strategy will continue to evolve, with an increased focus on multimedia content (e.g., videos, infographics) and strategic alignment with stakeholders' needs to maintain and improve performance.

2.4.2 Website Engagement

The ACCURATE project website serves as the central hub for public communication, stakeholder engagement, and access to project outputs. It provides timely updates on project milestones, news, events, and publications, while also hosting downloadable resources such as deliverables and policy briefs.

Throughout the first half of the project, the website has played a key role in increasing visibility and transparency. Relevant stakeholders, including researchers, policy makers, and industry actors, are regularly directed to the site through social media, newsletters, and event promotions.

User engagement has been supported by a clear navigation structure, a responsive design optimized for both desktop and mobile devices, and regular content updates. The website also includes links to the project's social media profiles, enabling cross-channel engagement.

As the project progresses, additional features—such as interactive visualizations, embedded media, and stakeholder feedback forms—may be introduced to enhance user experience and support more dynamic interaction with content.

	Page path and screen class	Views	Active users
	Total	8,082 100% of total	1,652 100% of total
1	/	3,467 (42.9%)	1,375 (83.23%)
2	/project/	958 (11.85%)	303 (18.34%)
3	/partners/	921 (11.4%)	391 (23.67%)
4	/activities/	596 (7.37%)	232 (14.04%)
5	/news/	427 (5.28%)	133 (8.05%)
6	/contact-us/	363 (4.49%)	100 (6.05%)
7	/publications/	236 (2.92%)	93 (5.63%)
8	/press/	217 (2.68%)	64 (3.87%)
9	/knowledge-hub/	145 (1.79%)	76 (4.6%)
10	/ecosystems/	136 (1.68%)	59 (3.57%)

Figure 3: Most frequently visited pages of the ACCURATE website

The most frequently visited pages include the Homepage, which offers a concise overview of the project; and About the project, which showcases real-world applications of the project's work. Additionally, the partners page receives consistent visits from users interested in the consortium's composition and expertise.

Between the project launch and mid-term, the website attracted a total of 1,652 unique users. Analysis of traffic sources shows that most visitors arrive via direct access (61.4%), indicating that stakeholders are actively returning to the site or are accessing it via bookmarked links or direct referrals. Additionally, organic search accounted for 18.6% of traffic, suggesting that the site is being successfully indexed by search engines and discovered through relevant queries. A further 14.3% of users came via referral traffic, likely from partner websites or project-related platforms, while organic social (5.7%) reflects visits stemming from posts shared on platforms such as LinkedIn.

	First user prim...Channel Group)	Total users
	Total	1,652 100% of total
1	Direct	1,014 (61.38%)
2	Organic Search	308 (18.64%)
3	Referral	236 (14.29%)
4	Organic Social	94 (5.69%)

Figure 4:Traffic Sources of the ACCURATE website

Website visitors came from a diverse international audience. The top five countries by user volume were:

1. Germany
2. United States
3. Ireland
4. France
5. Greece

This international reach illustrates the project's relevance to both European and global stakeholders, and reflects successful outreach efforts across academic, industry, and policy communities.

	Country	Active users
	Total	1,652 100% of total
1	Germany	267 (16.16%)
2	United States	258 (15.62%)
3	Ireland	165 (9.99%)
4	France	129 (7.81%)
5	Greece	102 (6.17%)
6	Netherlands	93 (5.63%)
7	Italy	65 (3.93%)
8	Denmark	52 (3.15%)
9	Japan	50 (3.03%)
10	Finland	42 (2.54%)

Figure 5: Country of origin of ACCURATE website visitors

The ACCURATE project's digital outreach activities have established a solid foundation for stakeholder engagement and public visibility. The LinkedIn page has shown strong organic growth, while the website has attracted a diverse international audience through multiple traffic channels. Together, these platforms demonstrate the project's ability to reach key target groups and maintain ongoing interest. Continued efforts in content development, targeted dissemination, and user experience enhancement will support an even greater impact in the next phases of the project.

2.5 Engagement with International (outside of Europe) Initiatives

The research activities initiated at IMT Atlantique in the context of Manufacturing-as-a-Service (MaaS) and related operations management have fostered several research directions beyond the scope of the ACCURATE project. Notably, a proposal entitled *"Solving New Manufacturing-as-a-*

Service Scheduling Problems: Multi-Objective, Bi-level, and Dynamic Pricing Extensions" has been submitted to the **National Agency for Research and Development of Chile** ("Concurso ANID de Proyectos Fondecyt de Iniciación en Investigación 2026"). This proposal is led and submitted by Cristian Durán, ITM postdoctoral fellow until July 2025, who will continue this line of research as Associate Professor at the University of Santiago de Chile. The research project will last 3 years, allowing to finance the training of Master and PhD students in Industrial Engineering and Operations Research. The results of the call for proposals will be known in January 2026.

Another synergy has been established between the ACCURATE project and the University of Adelaide (more specifically with the Centre for Sustainable Operations and Resilient Supply Chains). This synergy emerged from the work conducted within the PhD programme SEED at IMT Atlantique. SEED (standing for Societal, Energy, Environmental, Industrial and Digital transitions) is a 60-month interdisciplinary, international, and intersectoral doctoral training programme, co-funded by the European Union (https://www.imt-atlantique.fr/en/research-innovation/phd/seed).
Inspired by one of the industrial use cases from Continental, one of the PhD research directions focuses on the issue of excess inventory of raw materials, components, and parts in manufacturing systems. The study explores modelling and solution approaches to enable the recovery and reuse of these surplus materials, either via better informed inventory management decision support or through alternative recovery pathways supported by Manufacturing-as-a-Service (MaaS). The objective is to reduce waste and enhance resource efficiency, while preserving the resilience of manufacturing systems.

2.6 Key Performance Indicator Achievements

This subchapter evaluates the ACCURATE project's progress toward achieving specific Key Performance Indicators (KPIs) related to scientific impact, outreach, and ecosystem adoption during the first 18 months (M01–M18, December 2023–May 2025) under Task 8.4. By tracking metrics for KPI6.1 (Scientific Impact), KPI6.3 (Outreach), and KPI6.4 (Ecosystem Adoption), this section highlights the project's success in advancing its federated Manufacturing as a Service (MaaS) framework and building a robust stakeholder network, setting a strong foundation for meeting or exceeding these targets by the project's end in month 36.

KPI6.1: Scientific Impact

KPI6.1 targets ≥15 journal publications in well-esteemed publishers with official Impact Factor metrics and ≥15 conference publications with highly esteemed organizers. By M18, ACCURATE has made significant progress toward the conference's publication goal, with consortium members attending and presenting at eight scientific conferences, representing over 50% of the target. These include OR 2024 (Paris, September 2024), AHFE Hawaii Edition 2024 (Honolulu, December 2024), Nord Design 2024 (Reykjavik, August 2024), ROADEF 2025 (Munich, February 2025), CIRP CMS 2025 (Enschede, April 2025), and ICIEA 2025 (Seoul, April 2025), among others, as detailed in Section 2.3.4. These presentations, led by partners such as IMT Atlantique, Fraunhofer IAO, Aarhus University, and HWR Berlin, focused on technical advancements in MaaS, digital twins, and supply chain resilience, contributing to the project's scientific dissemination.

KPI6.3: Outreach

KPI6.3 aims for presentations and dissemination to ≥20 technological conferences, workshops, symposia, roundtables, trade fairs, social media platforms, websites, and blogs, measured through tracked metrics over time. By M18, ACCURATE has achieved dissemination across 18 non-scientific events and outreach channels, demonstrating strong progress toward this target. Key activities include presentations and panels at major trade fairs such as HannoverMesse 2024 (1000+ attendees), ACHEMA 2024 (250+ attendees), and the Gaia-X Summit 2024 (300+ delegates), as well as strategic workshops like the EuProGigant Open House Day (Vienna, October 2024) and the Innovent Forum panel (Larisa, February 2025). Webinars, such as the German Gaia-X Aerospace Domain Meeting (30 attendees) and Gaia-X Hub Germany HubDate (80 attendees), extended digital outreach, complemented by regular social media campaigns on LinkedIn and X, and content updates on the project's website (see chapter 2.4). These efforts, detailed in Sections 2.3.1, 2.3.3, and 2.3.5, have been tracked via engagement metrics, including e.g., 300+ booth visitors at Gaia-X Summit 2024 and webinar registrations. With planned participation in events like Manufacturing Partnership Days 2025 and intensified digital campaigns (Section 4.1), ACCURATE is well-positioned to exceed the ≥20 target by M36, amplifying its visibility within the European manufacturing community.

KPI6.4: Ecosystem Adoption

KPI6.4 targets ≥15 actors interested in evaluating the ACCURATE toolset. By M18, over 10 actors from various initiatives, including "Made in Europe", EuProGigant, and Flex4Res, have already expressed interest in exploring the toolset, reflecting substantial progress toward this goal. Engagement with Made in Europe projects like DMaaST, M4ESTRO, and MEDUSA during workshops and alignment meetings (Section 2.2.2) has highlighted the toolset's potential for interoperable digital twin models and resilience assessment, attracting interest from five SMEs. Similarly, collaborations within the Pontus-X ecosystem, including with EuProGigant and Flex4Res (Section 2.1.2 and 2.2.1), have generated interest from at least five additional industrial and academic stakeholders, evidenced by follow-up contacts from events like the EuProGigant meeting in Nürtingen (25 participants) and the joint Innovent Forum panel (80 attendees). These 60+ follow-up contacts indicate strong early adoption potential. Planned activities, such as demonstrations at Manufacturing Partnership Days 2025, aim to engage at least five additional actors by M36, ensuring the ≥15 target is met or exceeded, supporting the project's exploitation goals.

3 Learned and Best Practices

This chapter reflects on the insights gained, challenges encountered, and solutions implemented during the ACCURATE project's clustering and networking activities under Task 8.4 during the first 18 months (M01–M18, December 2023–May 2025). It consolidates lessons learned from engagements with ecosystems like Gaia-X and Pontus-X, collaborations with projects such as Flex4Res, and participation in high-profile events. The chapter concludes with general best practices and specific actions to guide future collaboration efforts, ensuring alignment with the project's goals of enhancing resilience, sustainability, and interoperability in Manufacturing as a Service (MaaS) value chains.

3.1 Key Insights Gained from Clustering Efforts

The clustering Lessons activities have provided valuable insights into effective stakeholder engagement and the operational dynamics of collaborative ecosystems:

- **Ecosystem Integration Enhances Visibility and Credibility:** Achieving Gaia-X lighthouse status and joining the Pontus-X ecosystem significantly amplified ACCURATE's visibility within the European industrial and data-sharing communities. These affiliations provided access to high-level platforms (e.g., Gaia-X Summit 2024) and fostered trust among stakeholders, reinforcing the project's role as a leader in interoperable MaaS frameworks.
- **Cross-Project Synergies Drive Innovation:** Collaborations with projects like Flex4Res, DMaaST, and M4ESTRO revealed the value of shared objectives, particularly in leveraging digital twins and data spaces for supply chain resilience. For instance, the joint panel at the Innovent Forum in Larisa highlighted how complementary technologies (e.g., ACCURATE's federated MaaS framework and Flex4Res's reconfiguration tools) can address common challenges, such as adapting to geopolitical disruptions.
- **Event Participation Builds Diverse Networks:** High-profile events like HannoverMesse 2024 and the Gaia-X Summit 2024 enabled engagement with diverse stakeholders, from SMEs to policymakers. Tailoring presentations to specific audiences (e.g., sustainability at ACHEMA 2024) maximized impact, while both presence generated significant follow-up contacts.
- **Digital Outreach Complements Physical Engagement:** Webinars, such as the German Gaia-X Aerospace Domain Meeting, extended ACCURATE's reach to specialized audiences, reinforcing the value of hybrid engagement strategies. Repurposing event materials (e.g., both content for social media) increased dissemination efficiency, supporting the objectives of Task 8.1.
- **Academic-Industry Collaboration Fosters Innovation:** Initiatives like IMT Atlantique's internship program and AIRBUS's PhD hosting bridged academic research with industrial applications, attracting young talent and aligning with the project's human-centered vision.

3.2 Challenges Faced and Solutions Implemented

Several challenges arose during the clustering efforts; each met with targeted solutions to ensure progress:

- **Challenge**: *Coordinating Diverse Stakeholders:* Engaging with a wide range of stakeholders (e.g., SMEs, large enterprises, academic institutions, and policymakers) across ecosystems like Gaia-X and "Made in Europe" required aligning diverse priorities and technical capabilities.

  Solution: ACCURATE adopted a structured approach to stakeholder mapping, prioritizing high-synergy partners (e.g., Flex4Res, DMaaST) and tailoring communication to their needs. Regular alignment meetings, such as the EuProGigant workshop in Nürtingen, facilitated mutual understanding and technical interoperability.

- **Challenge:** *Fear of Digital Data-Driven Solutions in SMEs:* Manufacturing SMEs expressed reluctance to adopt data-driven solutions due to fears of losing intellectual property (IP), complicating engagement with this key target group.

  Solution: ACCURATE clearly communicated the advantages of its decentralized, data-sovereign approach, emphasizing features like Compute-to-Data, which ensures data remains under owner control while enabling secure collaboration. Targeted workshops and demonstrations at events like HannoverMesse 2024 highlighted these benefits, building trust among SMEs.

- **Challenge**: *Balancing Standardization and Innovation:* Ensuring compliance with data space, value chain and further standards while developing innovative MaaS solutions posed a risk of over-constraint.

  Solution: The project leveraged the standardization efforts from Task 8.5 to align its digital twin and data space designs with existing frameworks (e.g., Gaia-X architecture). Participation in Gaia-X working groups allowed ACCURATE to influence standards while maintaining innovation.

3.3 Recommendations for Improving Future Collaboration

Based on the insights and challenges, the following recommendations outline the best practices and specific actions to enhance collaboration in the next phase of the project.

3.3.1 General Best Practices

- **Foster Interoperability Through Standards**: Continue aligning with established standards to ensure seamless data exchange and functionality within the manufacturing ecosystem. Regular participation in standardization bodies (e.g., CEN, ISO) will enhance credibility and interoperability.
- **Leverage Hybrid Engagement Models**: Combine physical events with digital outreach (e.g., webinars, social media) to maximize reach and cost-efficiency. Repurposing content across platforms ensures consistent messaging and broader dissemination.
- **Prioritize High-Synergy Partnerships**: Focus on collaborations with projects sharing technical and sectoral goals (e.g., DMaaST, M4ESTRO) to co-develop tools like digital twins and resilience methodologies, amplifying collective impact.
- **Engage Diverse Stakeholders Early**: Involve SMEs, policymakers, and academic institutions from the outset to align expectations and gather diverse feedback, as demonstrated by successful engagements at HannoverMesse and academic conferences.
- **Track and Report Impact Systematically**: Maintain a robust tracking system for engagement metrics (e.g., contacts, downloads, citations) to evaluate success and inform future strategies.

3.3.2 Specific Actions for the Next Phase

- **Deepen Flex4Res Collaboration**: Organize joint workshops with Flex4Res by M24 to align resilience assessment tools, leveraging shared digital twin technologies.
- **Expand Made in Europe Synergies**: Initiate workshops with DMaaST, M4ESTRO, and MEDUSA by M26 to compare digital twin and data space methodologies.
- **Strengthen Gaia-X Engagement**: Join Gaia-X Summit 2025 and join the Gaia-X lighthouse webinars within the Gaia-X community to share ACCURATE's progress and gather feedback.
- **Enhance Academic-Industry Integration**: Expand internship and PhD programs with partners like AIRBUS and Tronico, targeting at least two additional students by M24. Develop educational materials based on ACCURATE's use cases for IMT Atlantique's curriculum.
- **Pursue International Expansion**: Follow up on the Chilean research proposal outcome in January 2026 and explore additional partnerships in Asia-Pacific (e.g., with the University of Adelaide) to align MaaS solutions with global supply chain challenges.

4 Future Outlook and Long-Term Engagement

This chapter outlines planned activities for the remaining project duration (M19–M36, June 2025–November 2026) to sustain and expand stakeholder networks, supporting ACCURATE's dissemination and exploitation goals.

Building on the first 18 months' achievements and lessons, the project will deepen collaborations, enhance outreach, and align with European and international initiatives to maximize the impact of its federated MaaS framework and digital twin ecosystem, paving the way for the final stakeholder engagement report in month 36.

4.1 Planned Clustering and Networking Activities

ACCURATE will focus on the following activities to strengthen its stakeholder network:

- **Deepening Ecosystem Integration:** Continue leveraging Gaia-X lighthouse status and Pontus-X membership to influence data space standards and expand the project's reach. By M24, ACCURATE aims to contribute to at least two Gaia-X working group sessions to refine specifications for manufacturing data spaces. The project will also explore integration with additional Gaia-X ecosystems (e.g., Prometheus-X) to progress interoperability efforts.
- **Expanding Project Collaborations:** Build on initial alignments with Flex4Res, DMaaST, M4ESTRO, and MEDUSA by organizing joint workshops and technical exchanges by M28.
- **High-Profile Event Participation:** Maintain presence at HannoverMesse 2026, and Gaia-X Summit 2025, to showcase use case results (e.g., automotive, aerospace, electronics). Participate in the Manufacturing Partnership Days on October 20–22, 2025, in Brussels, with a dedicated ACCURATE booth and speaker opportunity to present achievements and network with the Made in Europe community.
- **Enhanced Digital Outreach:** Launch a series of webinars by M22, targeting specific sectors (e.g., aerospace, electronics) to present the progress of use cases and gather stakeholder feedback. Social media campaigns will be intensified, with monthly posts on platforms like LinkedIn, repurposing event content, and highlighting partnerships. A dedicated ACCURATE podcast series is planned for Q4 2025 to discuss MaaS resilience with industry leaders.

- **Academic and Industry Engagement:** Expand academic-industry initiatives, such as internships and PhD programs, with partners like AIRBUS and Tronico. By M28, ACCURATE aims to host at least two additional interns and develop a training module based on its use cases for IMT Atlantique's curriculum. Participation in scientific conferences (e.g., CIRP CMS 2025, ICIEA 2025) will continue, with at least three papers submitted to share technical outcomes.
- **International Expansion:** Follow up on the Chilean research proposal (January 2026 outcome) and initiate at least one new international collaboration in the Asia-Pacific region by M24, leveraging the University of Adelaide partnership. These efforts will focus on aligning MaaS solutions with global supply chain resilience challenges, such as critical material shortages.

4.2 Supporting Dissemination and Exploitation Goals

The planned activities are designed to align with Task 8.1 (Dissemination, Communication, and Outreach) and Task 8.2 (Exploitation Pathway and IPR Management):

- **Dissemination**: Events' participation, including Manufacturing Partnership Days, and digital outreach will provide content for Task 8.1's communication strategy, including press releases, multimedia, and the final Open Day in M36. Regular EFFRA portal updates will ensure transparency.
- **Exploitation**: Collaborations with projects like Flex4Res and Made in Europe initiatives will inform the market analysis and business plans from Task 8.2. By M24, ACCURATE will organize a stakeholder workshop to identify exploitable results (e.g., digital twin tools, MaaS platform components) and map them to market needs, leveraging connections from Pontus-X and Gaia-X.
- **Standardization**: Continued engagement with Gaia-X and Task 8.5 will ensure that ACCURATE's solutions align with emerging standards, enhancing their market readiness. Contributions to at least two standardization bodies (e.g., CEN, ISO) by M30 will support the project's long-term impact.

4.3 Long-Term Engagement Strategy

To ensure sustained impact beyond the project's duration, ACCURATE will:

- **Build a Sustainable Stakeholder Network**: Establish a formal network of MaaS stakeholders by M36, including SMEs, large enterprises, and academic partners, to continue collaboration post-project. This network will be anchored in the Pontus-X ecosystem and supported by EFFRA and Gaia-X communities.
- **Develop a Scalable MaaS Ecosystem**: Use the project's use case results to demonstrate the scalability of its federated MaaS framework, targeting adoption by at least five new industrial partners by M36. This will be supported by open-source components shared through Pontus-X.
- **Influence Policy and Standards**: Contribute to EU policy discussions through Gaia-X and "Made in Europe", advocating for MaaS-friendly regulations by M36. A dedicated MaaS workshop is already planned after the Manufacturing Partnership Days on October 24, in Brussels.

- **Foster Talent Development:** Expand academic-industry programs to train the next generation of MaaS experts, with a goal of integrating ACCURATE's methodologies into IMT European university curricula of IMT by M36.

5 Conclusion

The ACCURATE project's stakeholder engagement efforts under Task 8.4 during the first 18 months (M01–M18) have laid a robust foundation for advancing its vision of resilient, sustainable, and interoperable Manufacturing as a Service (MaaS) value chains. Achieving Gaia-X lighthouse status and integrating into the Pontus-X ecosystem have positioned ACCURATE as a leader in European data-sharing and industrial communities. Strategic collaborations with projects like Flex4Res, DMaaST, and M4ESTRO have fostered synergies in digital twin technologies and resilience methodologies, while events like HannoverMesse 2024 and the Gaia-X Summit 2024 have engaged diverse stakeholders, from industry leaders and academia.

Academic initiatives, such as IMT Atlantique's internships and AIRBUS's PhD hosting, have bridged research and industry, aligning with the project's human-centered approach.

Chapter 3 highlights lessons learned, including the importance of addressing SME fears about data-driven solutions through clear communication of ACCURATE's decentralized, data-sovereign approach and features like Compute-to-Data. Solutions like stakeholder mapping and content repurposing have overcome challenges such as resource constraints and diverse priorities. Chapter 4 outlines a forward-looking strategy, with plans to deepen partnerships, participate in the Manufacturing Partnership Days 2025, and intensify digital outreach to ensure market readiness. These efforts position ACCURATE to achieve its dissemination and exploitation goals, delivering a scalable MaaS framework that enhances European manufacturing's resilience. This mid-term report sets the stage for the final stakeholder engagement report in month 36, which will build on these achievements to maximize long-term impact.