

# EFPF: European Connected Factory Platform for Agile Manufacturing



# WP2: Requirements Elicitation and Pilot Scenarios

# D2.1: Project Vision and Roadmap for Realising Integrated EFPF Platform -Vs: 1.0

Deliverable Lead and Editor: Usman Wajid, ICE

Contributing Partners: ICE, ASC, BRM, NXW, FIT, VLC, CERTH, FOR, C2K, CNET, SRFG, AID

Date: 2019-03

Dissemination: Public

Status: < Draft | Consortium Approved | EU Approved>

#### Short Abstract

This vision document acts as a guide during the project and will be used by all partners to stay focused on the main ideas and goals of EFPF. Although the Description of Action gives a clear description of what the project will achieve, and how the achievements will happen, there are still many questions that need to be clarified when the details of the different subtasks are tackled and this vision provides this further guidance.

Grant Agreement: 825075



#### **Document Status**

Deliverable Lead	Usman Wajid, ICE
Internal Reviewer 1	Violeta Damjanovic-Behrendt, SRFG
Internal Reviewer 2	Gash Bhullar, C2K
Туре	Deliverable
Work Package	WP2: Requirements Elicitation and Pilot Scenarios
ID	D2.1: Project Vision and Roadmap for Realising Integrated EFPF Platform
Due Date	2019-03
Delivery Date	2019-03
Status	< Draft   Consortium Approved   EU Approved>

# History

See Annex B.

## Status

This deliverable is subject to final acceptance by the European Commission.

## **Further Information**

www.efpf.org

#### Disclaimer

The views represented in this document only reflect the views of the authors and not the views of the European Union. The European Union is not liable for any use that may be made of the information contained in this document.

Furthermore, the information is provided "as is" and no guarantee or warranty is given that the information is fit for any particular purpose. The user of the information uses it at its sole risk and liability.



# **Executive Summary**

The purpose of D2.1 'Vision Consensus and Roadmap for Realising Integrated EFPF Platform' is to strengthen the common understanding of the project vision and the overall aims and objectives of the project. Throughout the course of the project, this document, together with the Project Handbook (D1.1), will be used as a guide to ensure that the partners' goals are aligned with their vision and help to synchronise ideas for the RTD work.

The EFPF Description of Action (DOA) forms the basis of this document. Additionally, the real-life user scenarios from the pilot/user partners play a crucial role and shape the Vision Consensus. It will help to focus the partners' work, help bring the EFPF project outcomes to market and ensure the project creates its intended impact.

The EFPF Vision and related actions are organised around the following key topics that identify the path for the research, development, and business directions that the project will explore:

- High-level Vision and Challenges: EFPF will establish a federated digital platform that interlinks manufacturing platforms, smart factory toolsets and Industry 4.0 concepts through an interoperable Data Spine. The interconnectivity and interoperability enabled by the Data Spine will help realise an ecosystem of connected smart factory solutions in Europe. EFPF sees itself as a catalyst for an ecosystem of commercially viable, but mainly smaller, platforms that partly compete and partly cooperate to deliver value to their customers. However, the establishment of such an ecosystem bring several challenges that must inevitably be addressed. Addressing of these challenges in the EFPF project provides opportunities for innovation across business and technological areas.
- **Enablers:** The realisation of the EFPF ecosystem is based on the implementation of a 'Data Spine' that interlinks digital platforms, automation and enterprise systems, CPS, IoT objects and cloud services through an interoperable data-exchange mechanism. The Data Spine enables secure system abstraction, data management, business process orchestration, service provisioning, and multi-tier supply chain intelligence. A set of visionary scenarios in this document describe the provider and user perspectives of using the EFPF platform and the Data Spine.
- **Positioning:** Since EFPF proposes a federation and development of a competitive/collaborative ecosystem, future exploitation must be possible along a variety of paths and a governing organisation (e.g. EFPF Foundation) should ensure that partners in the ecosystem adhere to guidelines that ensure a level playing field. In EFPF, various stakeholders of the manufacturing value chain are involved. This set of stakeholders will extend through a funding call that will open the federated EFPF platform for large scale experimentation during the lifetime of the project.

# **Table of Contents**

1       EFPF Context and Vision	0	) Introduction				
2       EFPF Key Activities and Objectives       10         2.1       Inception       10         2.2       Mission       12         2.3       Main Challenges       12         2.3.1       To establish a coherent federation of platforms and tools       12         2.3.2       To link external services where EFPF has limited control.       13         2.3.3       To shape up the value proposition for EFPF that attracts a critical mass of users and contributors       13         2.3.4       To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4       EFPF Sustainability       14         3       Realising the EFPF Vision       15         3.1       Platform Interoperations Challenge       15         3.2.1       Interoperable Data Spine       15         3.2.2       EFPF Platform Tools and Services       16         3.3       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       17         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4<	1	1 EFPF Context and Vision				
2.1       Inception       10         2.2       Mission       12         2.3       Main Challenges       12         2.3.1       To establish a coherent federation of platforms and tools       12         2.3.2       To link external services where EFPF has limited control       13         2.3.3       To shape up the value proposition for EFPF that attracts a critical mass of users and contributors       13         2.3.4       To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4       EFPF Sustainability       14         Realising the EFPF Vision       15         3.1       Platform Interoperations Challenge       15         3.2.2       EFPF Platform Tools and Services       16         3.3.1       Provider Scenario       17         3.2.2       EFPF Platform Tools and Services       16         3.4       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       17         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       22         3.4.5       Data	2	EFPF Key Activities and Objectives				
2.2       Mission       12         2.3       Main Challenges       12         2.3.1       To establish a coherent federation of platforms and tools       12         2.3.2       To link external services where EFPF has limited control       13         2.3.3       To shape up the value proposition for EFPF that attracts a critical mass of users and contributors       13         2.3.4       To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4       EFPF Sustainability       14         3       Realising the EFPF Vision       15         3.1       Platform Interoperations Challenge       15         3.2.2       EFPF Platform Tools and Services       16         3.3       Visionary Usage Scenario       17         3.1       Provider Scenario       17         3.2.1       Interoperatione (T3.2, T3.5)       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21		2.1	Inception	on	10	
2.3 Main Challenges.       12         2.3.1 To establish a coherent federation of platforms and tools       12         2.3.2 To link external services where EFPF has limited control.       13         2.3.3 To shape up the value proposition for EFPF that attracts a critical mass of users and contributors       13         2.3.4 To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4 EFPF Sustainability       14         3 Realising the EFPF Vision       15         3.1 Platform Interoperations Challenge       15         3.2.1 Interoperable Data Spine       15         3.2.2 EFPF Platform Tools and Services       16         3.3 Visionary Usage Scenarios       17         3.3.1 Provider Scenario       18         3.4.1 Data Spine (T3.2, T3.5)       21         3.4.2 Integrated Marketplace (T3.3)       21         3.4.3 Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4 Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5 Data Analytics (T4.2)       21         3.4.6 Data Storage (T4.3)       22         3.4.7 Matchmaking and Agile Network Creation (T4.5)       22         3.4.9 Business and Network Intelligence (T5.1)       22         3.4.10 EFPF Portal (T5.2)       22 <td></td> <td>2.2</td> <td>Missior</td> <td>۱</td> <td>12</td>		2.2	Missior	۱	12	
<ul> <li>2.3.1 To establish a coherent federation of platforms and tools</li></ul>		2.3	Main C	hallenges	12	
2.3.2       To link external services where EFPF has limited control.       13         2.3.3       To shape up the value proposition for EFPF that attracts a critical mass of users and contributors       13         2.3.4       To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4       EFPF Sustainability       14         3       Realising the EFPF Vision       15         3.1       Platform Interoperations Challenge       15         3.2.1       Interoperable Data Spine       15         3.2.2       EFPF Platform Tools and Services       16         3.3       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       18         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.9       Business and Network Intelligence (T5.1)       22<			2.3.1	To establish a coherent federation of platforms and tools	12	
2.3.3       To shape up the value proposition for EFPF that attracts a critical mass of users and contributors       13         2.3.4       To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4       EFPF Sustainability       14         3       Realising the EFPF Vision       15         3.1       Platform Interoperations Challenge       15         3.2.1       Interoperations Challenge       15         3.2.2       EFPF Platform Tools and Services       16         3.3       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       17         3.3.2       User Scenario       18         3.4       Vision Enablers       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.8       Distributed Workflows (T4.6)       22         3.4.9       Business and N			2.3.2	To link external services where EFPF has limited control	13	
users and contributors132.3.4To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities132.4EFPF Sustainability143Realising the EFPF Vision153.1Platform Interoperations Challenge153.2Realising the Federated Platform153.2.1Interoperable Data Spine153.2.2EFPF Platform Tools and Services163.3Visionary Usage Scenarios173.3.1Provider Scenario173.3.2User Scenario183.4Vision Enablers213.4.1Data Spine (T3.2, T3.5)213.4.2Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.10EFPF Portal (T5.2)22			2.3.3	To shape up the value proposition for EFPF that attracts a critical mass	of	
2.3.4       To deliver wider impact of the project through increased cooperation contribution to relevant standardisations activities       13         2.4       EFPF Sustainability       14         3       Realising the EFPF Vision       15         3.1       Platform Interoperations Challenge       15         3.2.1       Interoperations Challenge       15         3.2.2       EFPF Platform Tools and Services       16         3.3       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       17         3.3.2       User Scenario       18         3.4       Vision Enablers       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.8       Distributed Workflows (T4.6)       22         3.4.9       Business and Network Intelligence (T5.1)       22			usei	rs and contributors	13	
contribution to relevant standardisations activities132.4 EFPF Sustainability143 Realising the EFPF Vision153.1 Platform Interoperations Challenge153.2 Realising the Federated Platform153.2.1 Interoperable Data Spine153.2.2 EFPF Platform Tools and Services163.3 Visionary Usage Scenarios173.3.1 Provider Scenario173.3.2 User Scenario183.4 Vision Enablers213.4.1 Data Spine (T3.2, T3.5)213.4.2 Integrated Marketplace (T3.3)213.4.3 Interfaces for Tools, Systems and Platforms (T3.4)213.4.4 Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5 Data Analytics (T4.2)213.4.6 Data Storage (T4.3)223.4.7 Matchmaking and Agile Network Creation (T4.5)223.4.9 Business and Network Intelligence (T5.1)223.4.10 EFPF Portal (T5.2)22			2.3.4	To deliver wider impact of the project through increased cooperation		
2.4EFPF Sustainability143Realising the EFPF Vision153.1Platform Interoperations Challenge153.2Realising the Federated Platform153.2.1Interoperable Data Spine153.2.2EFPF Platform Tools and Services163.3Visionary Usage Scenarios173.3.1Provider Scenario173.3.2User Scenario183.4Vision Enablers213.4.1Data Spine (T3.2, T3.5)213.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			cont	ribution to relevant standardisations activities	13	
3Realising the EFPF Vision153.1Platform Interoperations Challenge153.2Realising the Federated Platform153.2.1Interoperable Data Spine153.2.2EFPF Platform Tools and Services163.3Visionary Usage Scenarios173.3.1Provider Scenario173.3.2User Scenario183.4Vision Enablers213.4.1Data Spine (T3.2, T3.5)213.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22		2.4	EFPF \$	Sustainability	14	
3.1Platform Interoperations Challenge153.2Realising the Federated Platform153.2.1Interoperable Data Spine153.2.2EFPF Platform Tools and Services163.3Visionary Usage Scenarios173.3.1Provider Scenario173.3.2User Scenario173.3.2User Scenario183.4Vision Enablers213.4.1Data Spine (T3.2, T3.5)213.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22	3	Real	ising the	e EFPF Vision	15	
3.2Realising the Federated Platform153.2.1Interoperable Data Spine153.2.2EFPF Platform Tools and Services163.3Visionary Usage Scenarios173.3.1Provider Scenario173.3.2User Scenario183.4Vision Enablers213.4.1Data Spine (T3.2, T3.5)213.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22		3.1	Platform	m Interoperations Challenge	15	
3.2.1       Interoperable Data Spine		3.2	Realisi	ng the Federated Platform	15	
3.2.2       EFPF Platform Tools and Services       16         3.3       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       17         3.3.2       User Scenario       18         3.4       Vision Enablers       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.8       Distributed Workflows (T4.6)       22         3.4.9       Business and Network Intelligence (T5.1)       22         3.4.10       EFPF Portal (T5.2)       22			3.2.1	Interoperable Data Spine	15	
3.3       Visionary Usage Scenarios       17         3.3.1       Provider Scenario       17         3.3.2       User Scenario       18         3.4       Vision Enablers       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.8       Distributed Workflows (T4.6)       22         3.4.9       Business and Network Intelligence (T5.1)       22         3.4.10       EFPF Portal (T5.2)       22			3.2.2	EFPF Platform Tools and Services	16	
3.3.1       Provider Scenario       17         3.3.2       User Scenario       18         3.4       Vision Enablers       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.4       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.8       Distributed Workflows (T4.6)       22         3.4.9       Business and Network Intelligence (T5.1)       22         3.4.10       EFPF Portal (T5.2)       22		3.3	Visiona	ary Usage Scenarios	17	
3.3.2       User Scenario.       18         3.4       Vision Enablers.       21         3.4.1       Data Spine (T3.2, T3.5)       21         3.4.2       Integrated Marketplace (T3.3)       21         3.4.3       Interfaces for Tools, Systems and Platforms (T3.4)       21         3.4.3       Factory Connectors and IoT Gateways (T4.1, T4.4)       21         3.4.5       Data Analytics (T4.2)       21         3.4.6       Data Storage (T4.3)       22         3.4.7       Matchmaking and Agile Network Creation (T4.5)       22         3.4.8       Distributed Workflows (T4.6)       22         3.4.9       Business and Network Intelligence (T5.1)       22         3.4.10       EFPF Portal (T5.2)       22			3.3.1	Provider Scenario	17	
3.4Vision Enablers.213.4.1Data Spine (T3.2, T3.5)213.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.3.2	User Scenario	18	
3.4.1Data Spine (T3.2, T3.5)213.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22		3.4	Vision	Enablers	21	
3.4.2Integrated Marketplace (T3.3)213.4.3Interfaces for Tools, Systems and Platforms (T3.4)213.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)213.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.4.1	Data Spine (T3.2, T3.5)	21	
3.4.3Interfaces for Tools, Systems and Platforms (T3.4)			3.4.2	Integrated Marketplace (T3.3)	21	
3.4.4Factory Connectors and IoT Gateways (T4.1, T4.4)			3.4.3	Interfaces for Tools, Systems and Platforms (T3.4)	21	
3.4.5Data Analytics (T4.2)213.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.4.4	Factory Connectors and IoT Gateways (T4.1, T4.4)	21	
3.4.6Data Storage (T4.3)223.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.4.5	Data Analytics (T4.2)	21	
3.4.7Matchmaking and Agile Network Creation (T4.5)223.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.4.6	Data Storage (T4.3)	22	
3.4.8Distributed Workflows (T4.6)223.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.4.7	Matchmaking and Agile Network Creation (T4.5)	22	
3.4.9Business and Network Intelligence (T5.1)223.4.10EFPF Portal (T5.2)22			3.4.8	Distributed Workflows (T4.6)	22	
3.4.10 EFPF Portal (T5.2)22			3.4.9	Business and Network Intelligence (T5.1)	22	
			3.4.10	EFPF Portal (T5.2)	22	
3.4.11 Governance and Trust Mechanisms (T5.3)			3.4.11	Governance and Trust Mechanisms (T5.3)	23	
3.4.12 Blockchain (T5.4)23			3.4.12	Blockchain (T5.4)	23	
3.4.13 Software Development Kit (T5.5)			3.4.13	Software Development Kit (T5.5)	23	
			3.4.14	Holistic Security (T6.2)	23	
3.4.14 Holistic Security (T6.2)	4	Posi	tioning .		24	
3.4.14 Holistic Security (T6.2)		4.1	Busine	ss Modelling	24	
3.4.14 Holistic Security (T6.2)23 4 Positioning		4.2	Large S	Scale Experimentation	29	
3.4.14Holistic Security (T6.2)234Positioning244.1Business Modelling244.2Large Scale Experimentation29			4.2.1	Experimentation Through Embedded Pilot Cases	29	
3.4.14Holistic Security (T6.2)234Positioning244.1Business Modelling244.2Large Scale Experimentation294.2.1Experimentation Through Embedded Pilot Cases29			4.2.2	Large Scale Experimentation Through Open-Call	30	
3.4.14Holistic Security (T6.2)234Positioning244.1Business Modelling244.2Large Scale Experimentation294.2.1Experimentation Through Embedded Pilot Cases294.2.2Large Scale Experimentation Through Open-Call30	5	Cond	clusion.		32	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       29         4.2.2       Large Scale Experimentation Through Open-Call       30         5       Conclusion       32	Anı	nex A	: History	у	33	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       29         4.2.2       Large Scale Experimentation Through Open-Call       30         5       Conclusion       32         Annex A: History       33	Anı	nex B	: Refere	ences	34	
5.4.12 DIUCKUTAIII (15.4)25			3.4.12	Diuckonalin (15.4)	23	
3.4.13 Software Development Kit (T5.5)			3.4.13	Software Development Kit (T5.5)	23	
			3/1/	Holistic Socurity (T6.2)	20	
3.4.14 Holietic Security (T6.2)	٨	Doci	tioning		20	
3.4.14 Holistic Security (T6.2)	•	/ 1	Rusina	ss Modelling	2/	
3.4.14 Holistic Security (T6.2)		4.2	Large S	Scale Experimentation	29	
3.4.14Holistic Security (T6.2)234Positioning244.1Business Modelling244.2Large Scale Experimentation29			4.2.1	Experimentation Through Embedded Pilot Cases	29	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       20			+.∠.। ∕\ 2 - 2	Large Scale Experimentation Through Open Call	20 20	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       29         4.2.2       Large Scale Experimentation Through Open-Call       30	5	Con			32	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       29         4.2.2       Large Scale Experimentation Through Open-Call       30         5       Conclusion       32	Δn		· Histon	/	33	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       29         4.2.2       Large Scale Experimentation Through Open-Call       30         5       Conclusion       32         Annex A: History       33	Δn	nev R		,	3 <u>∕</u>	
3.4.14       Holistic Security (T6.2)       23         4       Positioning       24         4.1       Business Modelling       24         4.2       Large Scale Experimentation       29         4.2.1       Experimentation Through Embedded Pilot Cases       29         4.2.2       Large Scale Experimentation Through Open-Call       30         5       Conclusion       32         Annex A: History       33         Annex B: References       34	7 11 11			,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	5-	

# 0 Introduction

# 0.1 EFPF Project Overview

EFPF – European Connected Factory Platform for Agile Manufacturing – is a project funded by the H2020 Framework Programme of the European Commission under Grant Agreement 825075 and conducted from January 2019 until December 2022. It engages 30 partners (Users, Technology Providers, Consultants and Research Institutes) from 11 countries with a total budget of circa 16M€. Further information: <u>efpf.org</u>

In order to foster the growth of a pan-European platform ecosystem that enables the transition from "analogue-first" mass production, to "digital twins" and lot-size-one manufacturing, the EFPF project will design, build and operate a federated digital manufacturing platform. The Platform will be bootstrapped by interlinking the four base platforms from FoF-11-2016 cluster funded by the European Commission, early on. This will set the foundation for the development of EFPF Data Spine and the associated toolsets to fully connect the existing platforms, toolsets and user communities of the 4 base platforms. The federated EFPF platform will also be offered to new users through a unified Portal with value-added features such as single sign-on (SSO), user access management functionalities to hide the complexity of dealing with different platform and solution providers.

# 0.2 Deliverable Purpose and Scope

The purpose of this document, D2.1 "Project Vision and Roadmap for Realising Integrated EFPF Platform", is to act as a lighthouse for the project; it will be used by all partners to stay focused on the main ideas and goals of EFPF throughout its life. It describes the general positioning and proceedings of EFPF. It also contains the project business and research/technological objectives, stakeholders, underlying vision enablers, and preliminary usage scenarios.

This deliverable provides high-level information about the project vision. In order to get a deeper, yet still high-level, insight into the project the readers are referred to the deliverables D2.2 (Platform Interoperation Challenge Report), D2.3 (Requirements of Embedded Pilot Scenarios), D2.4 (EFPF Platform Requirements) and D3.1 (EFPF Architecture). The presented generic scenarios are preliminary and will be altered, and better focused, in the pilot specifications to be developed in D2.3.

# 0.3 Target Audience

Whilst primarily aimed at the project partners, this public deliverable should also be used by the wider scientific and industrial communities who may be interested in joining EFPF through its open call. This also includes other publicly funded projects, who may be interested in collaboration activities and companies that see benefits, in using the platforms tools and services and extend their connectivity via the Data Spine.

# 0.4 Deliverable Context

This document is closely related to the following activities and documents dealing with a set of initial platform interoperation challenges, user and technical requirement elicitation:

- Platform Interoperation Challenge (D2.2): A report providing the characterisation of the interoperations between four base platforms in the EFPF ecosystem: DIGICOR, vf-OS, NIMBLE, COMPOSITION.
- **Requirements of Embedded Pilot Scenarios (D2.3):** A report providing an in-depth definition of the user requirements and expectations from the EFPF platform.
- EFPF Platform Requirements (D2.4): A report providing the characterisation of the main technical requirements for the EFPF platform.
- **EFPF Architecture (3.1):** A report providing the architecture of the main components of the EFPF platform and the Data Spine that provides the basis for the EFPF federation.

# 0.5 Document Structure

This deliverable is broken down into the following sections:

- Section 1: EFPF Context and Vision: Provides the base context and the vision with a high value description of the project;
- Section 2: EFPF Key Activities and Objectives: Provides an overview of the EFPF inception, the mission, main challenges, key components and sustainability scenario;
- Section 3: Realising the EFPF Vision: Describes the approach for interlinking diverse solutions in EFPF federation, characterisation of key components required to achieve the EFPF vision, role of Data Spine and a visionary usage scenario;
- Section 4: Positioning: Describes the business modelling and large-scale experimentation ambitions of the project;
- Section 5: Conclusion: Provides the conclusions of the document

#### Annexes:

- Annex A: Document History
- Annex B: References

## 0.6 Document Status

This document is listed in the Description of Action as "public" since it provides general information about the goals and scope of EFPF and can therefore be used by external parties in order to receive insight into the project activities.

## 0.7 Document Dependencies

This document has no preceding documents or further iterations.

# 0.8 Glossary and Abbreviations

A definition of common terms related to EFPF, as well as a list of abbreviations, is available in the supplementary and separate document "EFPF Glossary and Abbreviations".

Further information can be found at https://www.efpf.org/glossary

# 0.9 External Annexes and Supporting Documents

Annexes and Supporting Documents:

#### • None

# 0.10 Reading Notes

• None

# **1 EFPF Context and Vision**

Manufacturing is among the key driving forces of the European economy. It provides about 20% of all jobs in Europe (above 30 million) and generates a turnover of approximately 7,000 billion EUR in 25 industrial sectors and over 2 million companies. Industrial modernisation is of crucial relevance for economic dynamism in Europe and the lasting creation of growth and jobs in the EU. However, European manufacturing is under increasing pressure from the changing market trends that require companies to react more quickly to the demands for highly customised products. Furthermore, manufacturing companies are facing problems to implement new ICT solutions, finding challenges both from IT vendors' expensive monolithic and proprietary integrated digital solutions and from a myriad of disparate highly focused technological solutions for specific functions. The rapid growth of smart manufacturing enterprises and digital manufacturing platforms around Europe raises challenges of interoperability and questions the suitability of existing platforms to support agile collaborations needed for lot-size-one production, particularly in cross-sectorial scenario.

Consequently, the EFPF project aims at realising a future where European companies can create and operate ad-hoc collaborative networks to address the dynamic market needs for mass-customisation, lot-size one manufacturing and smart supply chain management. The project will deliver an open and federated digital manufacturing platform with embedded intelligence and integrated tools and services to significantly reduce the burden of setting up collaborative networks, shorten the time to respond to new business opportunities and simplify the management and control of distributed processes.

The resulting high-level vision of EFPF is the following:

EFPF will establish a digital platform that interlinks digital manufacturing platforms, smart factory tools and Industry 4.0 concepts to realise a federated smart factory ecosystem in Europe.

The EFPF vision is in line with the needs of manufacturing companies, particularly SMEs that build their infrastructure over time and therefore struggle to deal with multiple vendors. By providing unified access to a large set of solutions in an interoperable Data Spine, the EFPF platform will not only support SMEs in adopting the latest technological trends but also help them achieve their growth goals.

# 2 **EFPF Key Activities and Objectives**

# 2.1 Inception

The base idea of EFPF originated from the collaborations between the FoF-11-2016 projects facilitated by European Factories of the Future Association (EFFRA) and in particular the Connected Factories (https://www.effra.eu/connectedfactories) project. One such collaboration activity focused on establishing interoperability across digital manufacturing platforms being developed across multiple Factories of the Future (FoF) projects. In this area, a working group led by EFPF Project Manager carried out a study of ongoing FoF projects (including FoF-11-2016 cluster) and devised an Interoperability Pyramid (as shown in Figure 1) as a conceptual framework for linking multiple platforms and establish interoperability at various levels in digital platforms.



Figure 1: Interoperability Pyramid

The work on the interoperability pyramid was complemented by the Pathway definition activity carried out by EFFRA and the ConnectedFactories (CSA) project. 'The Pathways to Digitalisation of Manufacturing' (as shown in Figure 2) reflect how digitalisation and eventually the deployment of digital platforms can bring value within different manufacturing perspectives, such as factory automation, value networks or product-service development.





The definitions of pathways enhanced the awareness among different stakeholders about the actual and future use of digital technologies in manufacturing. In particular, the pathway

on 'Hyperconnected Factories' [D4.1-ConnectedFactories] highlighted the needs of networked enterprises in complex, dynamic supply chains and more specifically the need for addressing different kinds of manufacturing processes through different digitalisation approaches that can co-exist or even compete in a concrete business environment.

Description of Persona			Platform Chara	acteristics	
International supply chains	producing of complex produ	icts	Fully automated and integrated design process of new products		
Trusted interdependent eco	systems, including supply pa	artners	Collection,	sharing and transparent ma	nagement of real-time data
Digitalised, connected and automatically exchanged information		Advance m	odelling and analytics of sup	oply chain data	
Intensive use and sharing of	supply and value chain data	а	Match mak	ing and new business mode	ls for supply chain
• 1-to-many relationship betw	veen horizontal and vertical	platform	Continuous	interactions and distributed	d control and decisions
Pathway to Hyperconnecte General purpose software Spreadsheet, mails, textfiles, paper files	d Factories: Dedicated software in silos ERP implemented	Basic inter	connected	Dedicated IT connection to some supply chain partners Administrative transactions digitalised High level planning using dedicated digital connections Forecasting of required capabilities	Dynamic IT connections to new supply chain partners Dynamic detailed scheduling and rescheduling Visibility of work in progress Common digital platform used for tenders and bidding

Figure 3: Platform characteristics addressing the needs of Hyperconnected Factories

The definition of the Hyperconnected Factories pathway and further discussions/work on relevant platform characteristics (as shown in

Figure 3) highlighted that none of the platform projects selected for funding in FoF-11-2016 (and beyond) had an all-encompassing vision for a future manufacturing ecosystem in Europe, but instead, each covered a well-argued subset of functionalities and each was able to legitimize its objectives through industrial partners who were willing to participate in view of the promised functionality.



Figure 4: Alignment and Complementarity of 4 FoF-11-2016 in EFPF

Collaborations between the 4 FoF-11-2016 projects highlighted the complementary business functions of these platforms that address the 'platform' needs of Hyperconnected

Factories. These 4 projects (as shown in Figure 4) offered a good mix of solutions and brought together diverse user communities but lacked an all-encompassing vision for Hyperconnected Factories.

Further discussions were then focused on the model that can bring complementary services from diverse providers into a common 'platform' offering.

The convergence of these discussions led towards the federation model that allows greater flexibility to integrate diverse solutions in a unified offering.

# 2.2 Mission

EFPF combines existing digital manufacturing platforms and open-source smart factory tools in a federated ecosystem where seamless access to disparately available solutions is offered to the users through unified user interfaces, Open APIs and permissive open source models.

The innovation focus of EFPF starts with the combination of 4 digital platforms from the EU funded FoF-11-2016 cluster, "making them work" through the "federation" model. The base platforms, COMPOSITION<sup>1</sup>, DIGICOR<sup>2</sup>, NIMBLE<sup>3</sup> and vf-OS<sup>4</sup>, complement each other and have a high degree of technological match, as well as a common philosophy towards governance and IPR. In addition to the base platforms, the federated EFPF platform provides seamless access to multiple industrial platforms and open-source tools brought in by the project partners to address specific needs in lot-size-one manufacturing.

# 2.3 Main Challenges

As an innovation project, EFPF faces the following challenges:

- Establish a coherent federation of platforms and tools currently under development
- Enable integration of external platforms, tools and services over which EFPF has limited control
- Develop a value proposition for EFPF, that leads to Europe-wide uptake
- Foster dialogue amongst stakeholders and standardisation of digital services
- Establish a sustainable platform and Data Spine that remains operational after the project

We are now addressing each of these challenges in terms of mission statements.

#### 2.3.1 To establish a coherent federation of platforms and tools

The essence of the EFPF project is in interlinking 4 EU (FoF-11-2016) platforms and in extending the federated EFPF ecosystem through the inclusion of other open-source tools and external platforms. At the start of EFPF, each of these 4 base platforms is still under development.

In order to address this challenge, the project includes key partners from the 4 EU projects with the ownership or control over the innovative features (components, tools) of the respective platforms. If variations within base platforms are foreseen after the official project lifetime of the respective projects, then the coordinators of the 4 EU platforms (FIT, A-D, SRFG and ICE) will synthesize the core features of the platform infrastructure to support experimentation in EFPF. A Memorandum of Understanding (MOU) is signed between the

<sup>&</sup>lt;sup>1</sup> https://www.composition-project.eu/

<sup>&</sup>lt;sup>2</sup> https://www.digicor-project.eu/

<sup>&</sup>lt;sup>3</sup> https://www.nimble-project.org/

<sup>&</sup>lt;sup>4</sup> https://www.vf-os.eu/

coordinators of the 4 EU projects and the coordinator of the EFPF project. Based on this MOU, the coordinators of the 4 EU projects will cooperate with each other to ensure successful transition of knowledge and technology between the projects. The MOU includes that the coordinators regularly (3 monthly basis) inform each other on the technical progress.

#### 2.3.2 To link external services where EFPF has limited control

Other/external platforms and facilities that want to join the EFPF federation need to show firm commitments and vested interests in the success of EFPF. The linking and interoperation of external platforms with the EFPF ecosystem is under investigation in e.g. T2.2 (Initial Platform Interoperation Challenge) where specific challenges are designed around the interoperation of external platforms. During the project, the interlinking and interoperation of external platforms is realised based on the availability of industrial tools and platforms by some of the EFPF partners e.g. NextWorks Symphony IoT platform, C2K's Industreweb 4.0 platform and ValueChain's iQluster platform are external platform candidates to be interoperating with the EFPF platform federation.

The design and development of the Data Spine (with relevant interfaces and APIs) is also informed by the need to support the interlinking and interoperation of external platforms.

# 2.3.3 To shape up the value proposition for EFPF that attracts a critical mass of users and contributors

Commercial Internet platforms have, so far, only followed the principle of market domination also known as "winner-takes-all". Whereas, EFPF sees itself as a catalyst for an ecosystem of commercially viable, but mainly smaller, platforms that partly compete and partly cooperate in order to deliver value to their customers. In this respect, the technology partners that come together in EFPF are motivated by the EU's policy of establishing level playing fields that foster healthy competition while enjoying the benefits of digital automation. The EFPF project establishes such an ecosystem and open-market infrastructure with adequate governance mechanisms that ensure stable growth and avoid the development of gross imbalances.

The value-proposition of the EFPF platform is shaped-up around the following offerings:

- Access to interoperable tools and services from multiple platforms
- Opportunity to leverage and build-upon opensource solutions
- Opportunity for developers to not only develop but also test and validate new solutions
- New business opportunities through visibility and participation in the ecosystem
- Be part of a community that is interested in collaborations.

The value-proposition is delivered through solid developments (WP3 – WP6), industrial validations (WP8 - WP9) and effective dissemination (WP11).

# 2.3.4 To deliver wider impact of the project through increased cooperation

#### contribution to relevant standardisations activities

The wider impact of the project is delivered through bringing together the use communities of the 4 EU, as well as those of other/external platforms in the EFPF ecosystem. The project has setup quantifiable indicators, for organisation of events, integration of technologies and contribution towards standardisations, in order to track the impact of activities.

## 2.4 EFPF Sustainability

The EFPF project sees itself as an enabler and facilitator of digital manufacturing ecosystem in Europe. For such an ecosystem to flourish and deliver any real-world impact, the EFPF platform needs to be offered and managed as a sustainable infrastructure. The sustainability strategy in the EFPF project is to setup a joint-venture spin-off entity called **EFPF Foundation** (EFF), which will manage the sustainability and Return-On-Investment (ROI) aspect of the EFPF platform along and beyond the project. The EFPF Foundation is established at month 9 of the EFPF project through partner consultations – on roles, responsibilities and commitments. Once established, EFF joins as a partner in the project by month 12 of the EFPF project. This ensures that the interests of EFF are formally represented in the project. This also addresses the concerns about platform ownership and sustainability. In this respect, EFF has a say on all matters influencing the creation, utilisation and exploitation of the platform.

In operational terms, EFF acts as the "shop-front" of the EFPF platform i.e. EFF will manage the EFPF platform portal. This clarifies the ownership of the platform beyond the project. Moreover, the EFF is responsible for setting up the procedures and agreements in place for management, maintenance, evolution and extension of the platform in longer term future.

# 3 Realising the EFPF Vision

The realisation of the EFPF platform is carried out through a set of tasks prescribed in the EFPF project work program.

# 3.1 Platform Initial Interoperations Challenge

The work on establishing an interconnected ecosystem in the EFPF project starts through a small set of business interoperation challenges that involve different usage scenarios across the participating tools and platforms that come together in the EFPF federation. The challenges are defined as simple scenarios targeting:

- **Business function level**: Specifies the user perspective of accessing/utilising diverse functionalities
- **Platform and service level**: Represent the business functions with specific tools and services of platforms participating in the EFPF federation. It also addresses technologies, standards and the implementation details that the technical teams are requested to specify.

The definition and implementation of the interoperation challenges early on in the project provides much needed requirements, confidence and also risk assurance for establishing the envisioned federation during the EFPF project. More details on platform interoperation challenges are described in D2.2.

The implementation of the Interoperation Challenges also informs the design of the key infrastructure underlying the EFPF platform such as the interoperable Data Spine.

## 3.2 Realising the Federated Platform

The realisation of the EFPF platform is based on the successful implementation of the interoperable Data Spine and the platform tools and services.

#### 3.2.1 Interoperable Data Spine

Data Spine is envisioned to be the interoperability backbone of the EFPF platform that initially interlinks and establishes interoperability between the four base platforms: COMPOSITION, DIGICOR, NIMBLE and vf-OS. The Data Spine will adhere to common industry standards and follow the micro-services pattern to enable the creation of a modular platform that can be extended beyond the base platforms. The Data Spine will enable the integration of different tools and services through a modular plugin system.

Figure 5 depicts the envisioned architecture of the Data Spine together with the EFPF platform, showing a high-level conceptual view of the components that provide the core functionality. It makes clear that, as far as interactions with the Data Spine are concerned, there is no distinction between the EFPF platform and the base EU platforms or any other platforms (additional and third party) from an architectural perspective. Thus, the Data Spine will be independent from the rest of the EFPF platform. This means that even if the EFPF platform was 'switched-off' in the future, the Data Spine will not have to be 'switched-off' with it and therefore will continue to support an interconnected ecosystem.

#### European Connected Factory Platform for Agile Manufacturing – <u>www.efpf.org</u>



Figure 5: Data Spine as a Facilitator of an Open and Interoperable Ecosystem

#### 3.2.2 EFPF Platform Tools and Services

The technology stack that supports the EFPF federation includes:

- **Key Services:** A collaboration infrastructure that streamlines communication across digital platforms, automation systems and applications through the interoperable Data Spine. This enables European companies to be part of a smart manufacturing ecosystem, to setup cross-organisational collaborations, optimise their processes and increase network competitiveness. Key services include security, user management, Single Sign-On, privacy, governance, marketplace and also an SDK will be provided to enable third parties to develop and validate custom prototypes on the EFPF platform a synopsis of the these is provided in Section 3.4.
- **Key Tools:** The EFPF platform integrates market ready or reference implementations of the smart factory and Industry 4.0 tools from project partners. Available tools and services cover the complete lifecycle of production and logistic processes, validated by the three cross-domain pilot scenarios brought forward by the project partners. Examples for the

tools include: e.g. data gateways, distributed process design, monitoring, decision support, process optimisation, risk management and blockchain based trust and message exchange – a synopsis of the these is provided in Section 3.4.

• **Marketplace Framework:** Part of the federated platform services is a multi-sided marketplace framework that interlinks and complements the existing marketplaces of the 4 base platforms. The framework supports cross-platform utilisation of tools and services to enable the uptake of the latest solutions and link solution providers and users across multiple platforms and sectors. The marketplace framework includes mechanisms for service discovery, automated match-making and recommendation mechanisms. Moreover, an accounting service tracks the user activities, platform use, and utilisation of different tools and services.

# 3.3 Visionary Usage Scenarios

This section proposes a set of visionary usage scenarios that highlights the innovative aspects of the platform. These scenarios elaborate both the platform/service provider perspective and platform/service user perspective.

#### 3.3.1 Provider Scenario

The entry point to the EFPF platform is the EFPF portal. The portal provides unified access to diverse tools and services brought together in the EFPF federation.



# Welcome to the EFPF Portal

Portal Hosted and Managed by: The European Factory Foundation

Figure 6: Visionary snapshot of the EFPF Portal

The snapshot of the portal in Figure 6 shows that the portal not only provides entry point to the tools and services that are hosted by the EFPF platform but also to others that are part of EFPF federation.



Figure 7: Data Spine as enabler of Federation Platform that has Multiple Entry Points

As shown in Figure 7, although EFPF Platform remains the main entry point to the EFPF federation, there can be many other entry points to it. This is realised by keeping the Data Spine as a platform independent interoperation and interoperability mechanism that can be used by multiple users (platforms, tools and services).

#### 3.3.2 User Scenario (Kleemann Group)

The EFPF platform supports manufacturing and logistic companies by providing the business opportunities, facilitating trustworthy and transparent collaborations, optimization of processes, contract negotiations and extracting value from the available datasets.

A collaborative production, supply chain and lot-size-one manufacturing scenario may involve multiple stakeholders with several roles and systems. According to the User Role, the scenario in the next part is from the View of Kleemann, an EFPF project partner and one of the biggest producers for elevator and escalators. In summary the roles, scenario organisations are the following:

Role	Description	Company, Role and Persona
Large Manufacturer	The manufacturing operations of large manufacturing companies relay a lot on extended multi-tier supply chain companies that provide parts and services	KLE – a large manufacturing company with an established network of SMEs suppliers
SME	SMEs provide products/parts and services, often to large manufacturers. The agility of SMEs allows them to be part of multiple supply networks at the same time	ELD – an SME operating in the industrial waste management domain Mil – an SME operating in the recycling domain
EFPF Platform	A digital connection between platforms providing access to integrated tools and services where each tool or service provides some value to most of the users	EFPF – a platform that interlinks multiple tools and services. See Vision Enablers (Section 3.4)
Other Platform	A digital platform that provides access to data, integrated tools and services	Any other platform in the EFPF Federation

The following table describes a set of EFPF scenarios, composed of several steps, in which the company, role and personas are highlighted.

Step	Description	Roles
Need for Business Network Creation	KLE would like to engage with their supply chain to manage the industrial waste in an efficient manner.	• KLE
Analysis of EFPF Platform	KLE analyses the EFPF platform and identifies the Matchmaking and Agile Network Creation tools as an easy to use approach to identify suitable partners and engage in collaborations	<ul> <li>KLE</li> <li>EFPF - Matchmaking and Agile Network Creation</li> </ul>
Finding relevant tools/service in the EFPF federation	Through EFPF Marketplace Search service, KLE finds out that several suitable candidates (SMEs) are listed in the Marketplace of the COMPOSITION platform	<ul> <li>KLE</li> <li>EFPF – Portal, Data Spine, Marketplace Search</li> <li>Other Platform</li> </ul>
Advertisement of Business Opportunity	Through EFPF Portal, KLE is diverted to the COMPOSITION Marketplace where KLE advertises a business opportunity to collect and manage waste material (e.g. wood or scrap metal) from its manufacturing facility. The EFPF Accountancy Service records this user journey	<ul> <li>KLE</li> <li>EFPF – Portal, Data Spine, Accountancy Service</li> <li>Other Platform</li> </ul>
Step	Description	Roles

		1	
Addressing new business opportunities	ELDIA and MIL frequently check the EFPF Marketplace Search Service to look for new business opportunities that may be may be advertised in any of the marketplaces, linked with the EFPF platform through Data Spine. Upon identifying the opportunity from KLE, ELD and MIL register their interests and submit bids in the COMPOSITION Marketplace	•	ELD KLE EFPF – Portal, Marketplace Search Other Platform
Agile Network Formation	KLE engages in negotiation with both ELD and MIL to formalise the details of the collaboration. COMPOSITION Marketplace provides support for automated negotiation.	•	Other Platform
Smart Contracting	Upon evaluating the bids and based on the negotiation, KLE selects both ELD and MIL to manage its industrial waste. KLE initiates the creation of a smart contract between the three companies using the EFPF Smart Contracting service	•	KLE EFPF – Portal, Data Spine, Smart Contracting ELD MIL
Distributed Workflow	KLE uses EFPF portal to navigate to the distributed workflow tool. This tool is used to design a workflow that describes the sequence/dependencies and interrelations of activities that will take place in the KLE, ELD and MIL collaboration.	•	KLE EFPF – Portal, Data Spine, Distributed Workflow Tool
Step	Description		Roles
Need for Shop- floor Connectivity	During the execution of the (above) distributed process, ELD identifies the need for a real-time monitoring solution that can help the company collect waste from KLE facility in more efficient way. ELD finds several Factory Connectivity services on the EFPF portal	•	ELD EFPF – Portal, Data Spine, Factory Connector Service
Establishing Shop-floor Connectivity	From EFPF Portal, ELD configures a factory connectivity service to gather data from the sensors installed in its waste collection containers at the KLE facility.	•	ELD EFPF – Data Spine, Factory Connectivity Service
Getting Value out of Shop-floor Data	The graphical interface of the factory connectivity services provides real-time monitoring and alerting functionality to ELD, allowing it to collect waste as soon as the container becomes full	•	ELD EFPF – Data Spine, Factory Connectivity Service

## 3.4 Vision Enablers

In the following sub-sections, each major piece of the EFPF platform is briefly described in terms of its motivation and purpose. This will then be used as a stem for further (high-level) detailing in D3.1 Architecture.

#### 3.4.1 Data Spine (T3.2, T3.5)

**Motivation:** A gluing mechanism that connects multiple tools, services and platforms to realise an integrated platform.

**Purpose:** Based on the identification of common standards and abstractions, this task defines and implements the APIs, connectors and interfaces that enables tools, systems and platforms to be interlinked through the Data Spine.

#### 3.4.2 Integrated Marketplace (T3.3)

**Motivation:** Smart factory platform users want to access marketplaces from other platforms and utilize offered functionalities and tools.

**Purpose:** This task will provide a marketplace framework interlinking existing external platform marketplaces, providing access to functionalities and tools and enable to track, trace and credit their utilisation by implementing an accountancy service.

#### 3.4.3 Interfaces for Tools, Systems and Platforms (T3.4)

**Motivation:** The individual tools, systems and platforms, provided by different partners (and external entities) to EFPF, must be able to communicate through the Data Spine. In order to facilitate that, relevant interfaces and APIs need to be defined.

**Purpose:** This task focuses on the development of these necessary interfaces and APIs for the tools, systems and platforms – the basic building blocks that are integrated within the EFPF platform.

#### 3.4.4 Factory Connectors and IoT Gateways (T4.1, T4.4)

**Motivation:** A framework providing guidance, methodologies and connectivity methods to enable a vendor neutral interface to systems and platforms within the manufacturing domain with extensibility to support other domains.

**Purpose:** This task will provide a framework to support an extensive range of connectors with links to industrial control and automation systems (ICS) and IoT devices through to Manufacturing Execution System (MES), Enterprise Resource Planning (ERP) and other factory and enterprise ICT as well as future Cyber-Physical Systems in general. It will enable support for any relevant protocols and data formats, allowing data to be made available through the Data Spine to support the functionality of platform tools and services.

#### 3.4.5 Data Analytics (T4.2)

**Motivation:** Successful manufacturing depends on business constantly finding new ways to streamline their operations. The analysis of data from shop floors and manufacturing systems can give manufacturers more focused and actionable insight to streamline and optimise their manufacturing operations.

**Purpose:** This task provides enhanced data analytic services to capture in-factory implicit data knowledge and providing the analytics that can help optimise the manufacturing

processes. The data analytic services will provide means to analyse heterogeneous datasets and will be made accessible to wider user-base through the EFPF platform.

#### 3.4.6 Data Storage (T4.3)

**Motivation**: In addition to capturing and storing data, platform users need normalized privacy controls for safely sharing data access across platforms.

**Purpose:** This task will provide a deployable data storage solution, allowing for the creation of local data stores within the control of manufacturers or other platform environments. Furthermore, fine grained privacy controls for authorizing platform users will provide trustworthy mechanisms to allow data access outside of the controlled environment.

#### 3.4.7 Matchmaking and Agile Network Creation (T4.5)

**Motivation:** To support agile network creation and value creation in the EFPF platform through interactions between participants. In multi-sided platforms, finding relevant partners and interactions with partners are crucial for value creation.

**Purpose:** This task will provide matchmaking and network creation mechanisms that lead to positive network effects. In a multi-sided ecosystem as envisaged by EFPF, a number of matchmaking mechanisms must be present to enable the development of dynamic positive network effects.

#### 3.4.8 Distributed Workflows (T4.6)

**Motivation:** To support the orchestration of services and tools from distributed partners in collaborative networks. The support for designing, executing and managing distributed processes is crucial when a potential myriad of services and tools is available through a federated platform.

**Purpose:** This task provides a process design, execution and monitoring environment where users can define distributed processes or workflows that integrate services from multiple providers. The support for execution and monitoring enable users to plan and keep track of distributed activities.

#### 3.4.9 Business and Network Intelligence (T5.1)

**Motivation:** To understand how manufacturing businesses collect and analyse their data to reflect key business performance measures. Further, to understand how these businesses behaves in the network of their suppliers and customers and what that behaviour conveys about their capabilities, capacity, interests and quality of work.

**Purpose:** This task provides tools for digital KPI measurements and analysis of data that is important for decision making. This will help propagate digital best practices to smaller businesses who are far behind in their journey. Also, the data analysis tools will help identify cross sector capabilities in supply chains and collaboration opportunities between SMEs.

#### 3.4.10 EFPF Portal (T5.2)

**Motivation:** To access the EFPF platform, an entry point is required, providing a unified access to EFPF resources.

**Purpose:** This task will create a portal website, which enables the secure access to EFPF resources. It will provide registration and management of users, integration of new

tools and the utilisation/instantiation of integrated tools and services by EFPF users. Additionally, it will provide administrative tools to monitor the EFPF platform.

#### 3.4.11 Governance and Trust Mechanisms (T5.3)

**Motivation:** To establish necessary governance in virtual market places based on economic theory where suppliers and customers exchange selling/buying signals with necessary trust. Platforms require governance rules in order to protect participants from market failures that may arise from imbalances in the information flow between buyers, sellers and platform.

**Purpose:** This task will establish adequate governance rules and trust-enhancing mechanisms that make the EFPF ecosystem dynamically stable and sustainable. The rules and trust mechanisms must be algorithmically enforceable and must also be transparent so that they can be understood and subjected to ethical and legal scrutiny.

#### **3.4.12** Blockchain and Smart Contracting (T5.4)

**Motivation:** The ad-hoc collaborations and agile value networks created by diverse users in a federated platform environment will need mechanisms for smart contracting and collaborative trust.

**Purpose:** This task will apply proven blockchain technology to enable smart contracting in agile networks. Build on the blockchain implementations of the core platforms, this task will establish collaborative trust by providing audit trails for manufacturing and supply chain data, transfer of rights and values, verification of the authenticity of data as well as business.

#### 3.4.13 Software Development Kit (T5.5)

**Motivation:** The dynamic nature of supply and value networks require manufacturing companies to adopt custom smart factory solutions in order to remain competitive in their respective domains. The market for smart factory solutions is estimated to grow at a CAGR of 9.3% to \$205.42B by 2022. Third party developers require tools for application development (such as the APIs, SDKs etc) to capture a share of this evolving market sector.

**Purpose:** This task delivers an application development environment with open APIs and SDKs that enables third party developers to develop complementary applications for manufacturing and supply companies.

#### 3.4.14 Holistic Security (T6.2)

**Motivation:** Manufacturing is traditionally strongly governed by patent law and licensing. This means that trade secrets, innovative procedures etc. are worthy of protection, which is at odds with the free flow of information that has been the central tenet of the Internet. Hence, holistic security needs to ensure protection and integrity of information and flow of information at the same time, and under full control of the information owners.

**Purpose:** This task will implement holistic security mechanisms to avoid damages to businesses from any form of unwanted or illegal behaviour of participants on the platform. The security mechanisms will have a holistic view of the threats at the platform level and will ensure safety, privacy and integrity of interactions that the users of the platform engage in.

# 4 **Positioning**

This section describes how the project positions in terms of business strategy, research and technological objectives.

# 4.1 Business Model Innovation

Starting from the EFPF value network schematically shown in the figure below, the positions and roles of the various players in the EFPF ecosystem and their relations are designed. On a high-level perspective, stakeholders comprise the demand for smart factory solutions and Industry 4.0 tools (manufacturing enterprises), their potential suppliers (base platforms and new platforms) as well as EFPF as an intermediary offering interoperability (Data Spine), reach and accompanying management functionalities (EFPF Platform and Marketplace). To allow for the validation of this basic setting as early as possible, the project will run and assess related initiatives, including an interoperability challenge, pilots and cross-domain experiments as well as an open call and additional dissemination activities to foster the population of the EFPF ecosystem.



Figure 8: Overview of the federated EFPF platform

#### 4.1.1 Business Model Canvas

Taking this overall context into account, the Business Model Canvas (BMC) is used to describe the rationale of how the EFPF project creates, delivers, and captures value, in economic, social, cultural or other contexts – towards the successful exploitation of project outcomes. Preliminary inputs related to the guiding questions of the Business Canvas are

summarised below, starting with EFPF value proposition as a vital element of the EFPF business strategy.

Business Canvas element and guiding questions	Basic EFPF rationale to create, deliver and capture value
Value Proposition	EFPF establishes an ecosystem of smart-factory platforms, tools and services, making them easily accessible by various stakeholders of the manufacturing and supply domain. The federated EFPF platform is offered to European companies, allowing them to create and operate ad-hoc collaborative networks that meet the dynamic market needs for mass-customisation and lot-size one manufacturing. Through the utilisation of the platform (and its digital offerings), the burden of setting up collaborative networks is reduced, the time to respond to new challenges and opportunities is shortened and the management and control of distributed processes is simplified. Both, users and providers of smart factory tools and services benefit from an increased level of transparency related to players in the ecosystem. Companies in the manufacturing and supply domain also benefit from unified access to existing implementation of Industry 4.0 concepts as well as advance smart factory, collaborative manufacturing, loT, data analytic and application development solutions that can be exploited in new industrial domains and geographic regions.
Key Activities	<ul> <li>EFPF combines existing and emerging digital manufacturing platforms and open-source smart factory tools / services in a federated ecosystem where seamless access to disparately available solutions is offered to the users through unified user interfaces, open APIs and permissive open source models. Key activities for the realisation of the EFPF value propositions outlined above are shaped-up around the following high-level offerings:</li> <li>Set-up of the EFPF ecosystem, building up a community interested in strengthening smart factories and Industry 4.0 as well as related collaboration to create and sustainably maintain business opportunities.</li> <li>Realise a stable, scalable and intuitive-to-use platform to:</li> <li>Increase visibility of and significantly ease access to smart factory tools and services as well as provide capabilities for their efficient co-development, collaboration and/or integration;</li> <li>Offer opportunities for leveraging horizontal open source solutions components, and test and validate</li> </ul>

	<ul> <li>new (joint) offerings across various domains and sizes;</li> <li>Establish a collaboration framework with clear technical, legal, business and financial parameters.</li> <li>Generate critical mass of stakeholders involved in the ecosystem and use the power for successfully advertising smart factory tools / services and Industry 4.0 concepts connected via the EFPF ecosystem.</li> </ul>
Key Resources	Resources needed to fulfil the activities of EFPF are far- reaching and of interdisciplinary nature. They range from technical expertise required for the development and continuous operation of the ICT platform, to platform provisioning, training, consulting, support services and maintenance of the EFPF platform. These resources are well represented in the project consortium. Other resources of interest for EFPF operations and sustainability include technical, legal, networking, business and financial frameworks and management expertise.
Key Partners	<ul> <li>Besides the main actors of the EFPF ecosystem, i.e. smart factory tool / service users and providers, the following key partners are required to establish the EFPF federation and sustainable platform offerings based on the Data Spine and the Marketplace features:</li> <li>Software architects and developers for designing, setting-up, maintaining, further developing, operating and monitoring the EFPF platform components and open source tool / service elements;</li> <li>Hardware / server infrastructure providers for hosting the EFPF platform (set-up, maintenance and operation of the EFPF platform environment, including operating system, hosting and monitoring);</li> <li>Experts in the domains of relevant technologies, data security and privacy, data management and analytics, regulations and standards, dissemination, awareness building, marketing, business development and sales for starting, tuning, communicating and exploiting the EFPF platform successfully.</li> <li>Marketing experts, to make EFPF more popular, to reach the critical mass.</li> <li>Considering the EFPF project team, members include the entire value chain spanning from tool/service providers, technology providers, industry partners to tool/service users and industrial associations. This allows the rapid realisation of the EFPF Minimum Viable Product (MVP) version, its operation, testing and validation in real-life contexts.</li> </ul>

Customer Groups	<ul> <li>Main target customer groups of the EFPF platform are:</li> <li>SME and large industry manufacturers, suppliers, system integrators and supply chain service providers (e.g. in the domain of production, logistics, human resources, maintenance, engineering and storage), acting as (potential) users of smart factory tools and services</li> <li>Providers of smart factory tools and services / Industry 4.0 concepts</li> <li>Sectoral associations and clusters, being valuable multipliers within the EFPF ecosystem.</li> <li>Researchers and R&amp;D ventures allowing for an exchange of knowledge and the realisation of co-developments.</li> </ul>
Customer Relationships	<ul> <li>Relationships with partners are tuned for the respective customer type and include amongst others:</li> <li>Technical and economic consulting, support and training for the integration, customisation and tuning of EFPF platform offerings as well as connected smart factory tools / services.</li> <li>Consultancy and co-development of APIs to interface with smart factory tools / services in the EFPF ecosystem and EFPF platform service features.</li> <li>Support the usage of EFPF SDKs for the development of new applications and the set-up of EFPF Marketplace with integrated accountancy and capabilities.</li> <li>After-sales services like helpdesk, dedicated assistance, periodic software updates and user conferences.</li> </ul>
Channels	<ul> <li>Communication means used to introduce, promote, exploit and disseminate EFPF are manifold:</li> <li>Existing business networks and supply chains</li> <li>Industry and trade associations and clusters</li> <li>EFPF experiments and open call programmes</li> <li>Participation in fairs, exhibitions and conferences.</li> <li>Online ads, blogs, newsletters, enterprise social media, etc.</li> <li>Interaction amongst the actors in the EFPF ecosystem is primarily based on the EFPF platform and managed but the EFPF form.</li> </ul>
	Costs triggered by the key resources required to successfully set-up and operate the EFPF platform offerings and the related ecosystem include: • the R&D efforts of the EFPF project and their continuous operation, maintenance and further-

	Cost Structure	development, commercial platform hosting, management activities related to standards, the legal framework, IPRs, communications, exploitation and partner coordination, administration and controlling as well as technical and non-technical customer training and support beyond the project lifetime.
٥	Revenue Streams	<ul> <li>Comparable to other state-of-the-art platform offerings, dedicated revenue streams are established for different customer types within the EFPF ecosystem; Potential candidates for EFPF relevant revenue streams are:</li> <li>Tool / service users:</li> <li>Fee for platform subscription;</li> <li>Freemium / Add-on (free or low-cost basic offering &amp; charging for premium services</li> <li>Flat-rate (usage based on fixed rate fee)</li> <li>On-demand (charging based on metering usage of the platform of specific services)</li> <li>Revenues from advertisings and sponsoring</li> <li>Earnings for on-demand support and training services related to platform usage and customisation;</li> <li>Fee for platform subscription;</li> <li>Revenues from advertisings and sponsoring;</li> <li>Lead generation or Sales commissions;</li> <li>Incomes for providing EFPF service capabilities like cloud storage and/or billing.</li> <li>Earnings for on-demand consulting, training and technical support.</li> <li>Fee for 24/7 helpdesk.</li> </ul>

#### 4.1.2 Platform Ownership and Planning

As the platform owner, the EFPF Foundation (EFF) acts as a legally independent non-profit organisation with the ultimate goal to establish and provide a sustainable ecosystem of federated smart factory solutions and their sustainable usage. The organisational structure of the EFF is designed to ensure that the technical and economic interests of EFPF platform are represented at all levels and the vested interests of its members are specifically preserved. When it comes to the business or exploitation model of the EFF, the BMC described in Section 4.1.1 will be elaborated to refine the rationale of how the EFPF platform creates, delivers, and captures value.

The parameters of the EFPF ecosystem as well as the EFF and its business orientation will be continuously elaborated and tuned using a SWOT analysis. The following SWOT analysis initially identifies main factors influencing the expected impact of EFPF.

weaknesses
<ul> <li>The experimentation focused approach can hinder the efforts for the integration of industrial/commercial solutions in EFPF</li> </ul>
<ul> <li>Cross-border collaborations only represent a fraction of activities performed by manufacturing SMEs, hence too much focus on this aspect can disinterest of SMEs</li> </ul>
<ul> <li>The development of smart factory tools and data analytic services have a big footprint yet slower adoption than desired</li> </ul>
<ul> <li>Section specific issues divert attention away from achievements</li> </ul>
Threats
<ul> <li>Lack of reference implementations of federated platforms in the area of digital manufacturing or smart factories can deter interest</li> <li>Lack of clarity on standards and regulations can counter technological support for cross-border collaborations</li> <li>Insufficient business case for interoperability and federated functionality can wade off interest of platform providers</li> </ul>

Figure 9: Initial EFPF SWOT analysis

# 4.2 Large Scale Experimentation

Innovative usage scenarios of EFPF platform will be realised through both project's pilot cases and platform's experimentation in the cases of cascade funding or open-call. The embedded pilots would demonstrate connected smart factories and lot-size-one manufacturing scenarios and would provide feedback on the maturity level of the platform, tools and services. Furthermore, the federated EFPF platform will be made available for large-scale prototyping and experimentation by European companies that would participate in competitive open-call process.

#### 4.2.1 Experimentation Through Embedded Pilot Cases

The EFPF project includes three embedded pilots focusing on lot-size-one manufacturing through agile network creation. Upon validation of project outcomes through embedded cross-domain pilots, a well-defined plan for large scale experimentation will elaborate the key offerings and the support features available for open experimentation.

The vision of embedded pilot cases and their innovation potential is to demonstrate the three cross-domain pilots through the utilisation of the integrated EFPF platform and the integrated tools. Both platform and tools should be made accessible to users through a unified interface (i.e. EFPF Portal). Moreover, the EFPF envisions to offer the three pilots results as lighthouses examples for large scale experimentation. Therefore, the experimentation plan for pilot cases should contain APIs for utilising the core platform, tools (e.g. data analytics, business intelligence etc.) and an SDK for prototyping in both reduced, controlled environments and in real-life scenarios. Both APIs and SDK should be promoted for large-scale experimentation by third parties participate in Open Calls processes.

In particular, for the three different pilots, the case specific outcomes of the EFPF platform are:

- 1. Ad-hoc Supplier Network in the Aviation Domain. In this pilot, the EFPF platform will provide (a) API capabilities for connecting multiple suppliers in a supply chain, (b) Platform Governance procedures and rules for interoperation with the aviation supply domain and (c) setup and demonstration of a connected factory scenario where multiple suppliers collaborate, using EFPF platform, to take advantage of ad-hoc business opportunities. These scenarios will serve as a basis to support the network's later enhancement through external open call companies.
- 2. Lot-Size-1 Furniture Manufacturing in B2B Scenarios. In this pilot, the EFPF platform will provide (a) setup of a complete ad-hoc supply network and its sub-processes, (b) API to interoperate with SME IT systems from all the involved stakeholders related to furnishing and decoration, and (c) demonstration of the scenario based on different supply networks, which are coordinated with batch furniture manufacturing systems.
- Agile Supply Networks in Circular Economy. In this pilot, the EFPF platform will provide (a) participation mechanisms to SMEs in closed-loop supply chain activities of collecting, processing and selling industrial recyclable materials through a marketplace, (b) integration of IT systems (KLE, ELD, MIL and other companies), (c) automated partners matchmaking and (d) improvement of resource- efficiency through the design and monitoring of distributed processes.

The results of three embedded pilots will be published as success stories and best practices of using the EFPF platform. They will be released along with a well-defined plan for large-scale experimentation to elaborate the tools, techniques, services and other platform features available to SMEs.

#### 4.2.2 Large Scale Experimentation Through Open-Call

The EFPF large-scale experimentation will be based on Open Calls process and the selection of funded experiments. The selection process will be based on both the quality of applications and the relevance of the proposed experiments with the EFPF objectives and visions.

In particular, the quality of the submitted applications in the Open Calls process will be evaluated against Excellence, Impact and Management criteria similar to that of the H2020 project proposals. Furthermore, in order to attract more participants and boost the competition, the open call and its available funding would be advertised through relevant websites such as EFPF project website, EFFRA website and on the websites of EFPF partners etc.

EFPF will support two types of experiments through the planned open-call.

**Experiments for the development of innovation solutions.** This category will support open-innovation, proliferation and uptake of innovative solutions across the manufacturing sector in Europe.

- Experiments focusing on the development of well-scoped apps or components typically with a narrow purpose that can be used on their own or integrated with the EFPF platform via open APIs
- Experiments that develop new tool or solution, either by using the EFPF tools or combining the functionalities of existing EFPF applications. The newly developed solution must be usable in the EFPF platform

**Experiments for the enhancement of the EFPF ecosystem.** When larger eco-systems or platforms need to collaborate, more complex adaptations will be needed to add value to the EFPF platform or federation. We call such larger-scale adaptations "enhancements" as they significantly extend the platform ecosystem. For example, if two platforms support business process definitions but are based on different standards then the integration or interoperation will require more redesign than adding a narrow-focus tool using the standard API or a pre-defined marketplace. This second category of experiment will focus on the extension of EFPF platform through:

- Experiments that integrate a 3rd application in the EFPF ecosystem. Experiment must provide validation scenario to demonstrate the seamless access and utilisation of the 3rd party system/application by EFPF services and users
- Experiments that focus on the integration of 3rd party platforms with EFPF through agreements on security framework (e.g. single-sign-on, user authorisation, rights management etc). The emphasis here is to provide EFPF users with wider access to Industry4.0 and digital manufacturing solutions.

In line with the work programme and the grant agreement, legal entities trading as mid-caps, SMEs, entrepreneurs and sole traders only, will be eligible for financial support through the open call in the EFPF project.

# 5 Conclusion

The EFPF Project Vision and Roadmap defines the integrated EFPF platform that establishes an ecosystem of manufacturing platforms, tools and service via the interoperable Data Spine. The document strengthens a common understanding of the project's overall aims and objectives and provides a coherent understanding of the project outcomes. The key areas of innovation and impact are based around synchronising of ideas from the project partners. As the project progresses, this document will be used as a reference to ensure that the partners activities are aligned and synchronous with the agreed vision. It also serves the purpose of conveying a coherent vision for the external audience. The public nature of this deliverable means that the EFPF vision is open to scrutiny by project partners as well as interested parties outside the EFPF project.

This document will be used as an input to the more specific definition approaches in the future deliverables of the EFPF project. The document highlights the technology and business innovation areas that need to be supported to allow interoperable data flow between multiple platforms and hence improve the knowledge required to fully utilise Industry 4.0 principles. EFPF will allow diverse technology providers and user communities to connect and communicate through the Data Spine. SME's will be able to test and enhance the EFPF offerings through the funded open call in the project.

# **Annex A: History**

Document Hist	tory
	<ul> <li>V1.0:</li> <li>Final integration and updates based on internal review</li> <li>V0.6:</li> </ul>
	<ul> <li>Updates in Section 4 to integrate BMC from BRM V0.5;</li> </ul>
	<ul> <li>Updates in section 3 and 4, aggregating input from, VLC, CERTH and FIT</li> </ul>
Versions	<ul> <li>V0.4:</li> <li>Restructuring of the document and updates in various sections</li> </ul>
	<ul> <li>Consolidation of partner input from, C2K, CNET, FIT, FOR, SRFG and BRM</li> </ul>
	<ul> <li>V0.2</li> <li>Further contributions in Section 2 and Section 4.</li> </ul>
	<ul> <li>Incorporation of partner contributions from ASC, NXW V0.1</li> </ul>
	Structure of the document and base content added by ICE
	ICE: • Usman Wajid ASC:
	Norman Wessel     SREC:
	Wernher Behrendt
	Violeta Damjanovic-Behrendt
	NXW:
	Matteo Pardi
	Rohit Deshmukh
	BRM:
Contributions	Dieter Meinhard
	Happy Dudde     CERTH
	Alexandros Nizamis
	C2K:
	Simon Osborne
	Georg Neugschwandtner
	CNET:
	Mathias Axiing     AID:
	<ul> <li>Núñez Ariño, María José</li> </ul>

# **Annex B: References**

[D4.1-ConnectedFactories] D4.1: First Draft Edition of Future Visions and Pathways. ConnectedFactories. June2017



European Factory Platform

www.efpf.org