Boost 4.0
BIG DATA FOR FACTORIES

Big Data Value Spaces for Competitiveness of European Connected Smart Factories 4.0

Title	D1.5 Risk Management Plan V2
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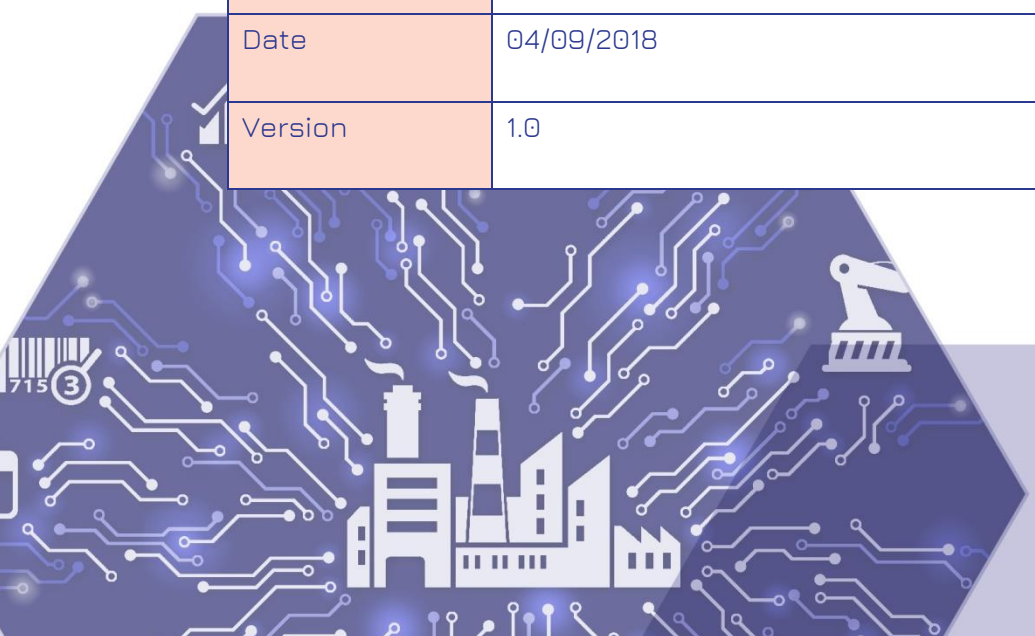

Document history

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0.1	09/08/2018	INNO	Structure of the deliverable (ToC) and second risk collection based on FMEA methodology.
0.2	4/09/2018	INNO	The first complete draft of the document.
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Project Partners

Participant organisation name	Acronym
Asociación de Empresas Tecnológicas Innovalia	INNO
Volkswagen Autoeuropa, Lda *	VWAE
Visual Components	VIS
Automatismos y Sistemas de Transporte Interno S.A.U.	ASTI
Telefónica Investigación y Desarrollo SA	TID
Volkswagen AG. *	VW
UNINOVA	UNINO
FILL GmbH. *	FILL
TTTECH Computertechnik AG	TTT
RISC Software GmbH	RISC
PHILIPS Consumer Lifestyle B.V. *	PCL
PHILIPS Electronics Nederland	PEN
Interuniversitair Micro-Electronicacentrum VZW	IMEC
Centro Ricerche Fiat S.C.p.A. *	CRF
SIEMENS S.p.A.	SIEMENS
Prima Industries S.p.A	PRIMA
Politecnico di Milano	POLIMI
AUTOTECH ENGINEERING, AIE *	GESTAMP
Fundació Privada I2CAT, Internet I Innovació Digital A Catalunyai2cat	I2CAT
TRIMEK S.A.	TRIMEK
CAPVIDIA N.V,	CAPVIDIA
Volvo Lastvagnar AB *	VOLVO
Chalmers Tekniska Hoegskola AB	CHAL
Whirlpool EMEA SpA *	WHIR
SAS Institute Srl	SAS
Benteler Automotive GmbH *	BAT
It.s OWL Clustermanagement	OWL
Fraunhofer Gesellschaft Zur Foerderung Der Angewandten Forschung E.V.	FhG
Atlantis Engineering	AE

Agie Charmilles New Technologies SA *	+GF+
Ecole Polytechnique Federale De Lausanne	EPFL
Institut Für Angewandte Systemtechnik Bremen GmbH	ATB
Rheinische Friedrich-Wilhelms-Universitat Bonn	UBO
Ethniko Kentro Erevnas Kai Technologikis Anaptyxis (CERTH)	CERTH
The University of Edinburgh	UED
Institute Mines Telecom	IMT
Industrial Data Space E.V.	IDSA
FIWARE Foundation EV	FF
GEIE ERCIM EEIG	ERCIM
IBM ISRAEL – Science and Technology LTD	IBM
ESI Group	ESI
Eneo Tecnología, S.L	ENEO
Software Quality Systems S.A.	SQS
Consultores de Automatización y Robótica S.A.	CARSA
INTRASOFT International	INTRA
United Technologies Research Centre Ireland, Ltd *	UTRC-I
Fratelli Piacenza S.p.A. *	PIA
RiaStone - Vista Alegre Atlantis SA *	RIA
Unparallel Innovation, Lda	UNP
Gottfried Wilhelm Leibniz Universität Hannover	LUH

*LHF 4.0 – Lighthouse Factory 4.0 * RF – Replication Factory 4.0

Executive Summary

The document is the updated version of D1.4 Risk Management Plan, identifying new risks emerged while the project evolves. The same qualitative and quantitative methodology established in D1.4 continues being the base of the V2 developed in this document. The V2 focuses on the 28 risks highlighted as the project is marching on and re-assessed the 6 risks identified in the M3 of the project. The following the principals are referenced with the objective to maintain coherence and control new risks:

- Activities related with pilots (WP4-8) captured the risks that threat the scaling up of pilot activities are well captured in your analysis;
- Activities with KPIs (WP9) captured the risks that would ensure KPIs on follow up investment and business impact;
- Activities with platforms (WP2-3) captured the risks to make sure mitigation measures are in place to assure that each pilot implements and aligns with technologies, components and architecture established in WP2 and WP3, which is of paramount importance to the coherency of the whole project; and
- Activities related with management and communication identified risks to make sure all related activities correspond and react agilely with new situations and contingency plans are in place should any major incidents occur.

The quantitative methodology defined in the V1 of the plan still applies here, implying three levels (low, medium and high) of different risks. Having been assessed in terms of probability and impact, they were listed in a prioritised table of threats on basis of their foreseen risk level (risk=probability x impact). Probability and Impact for each threat were defined on a scale between 0 and 1 according to a low medium-high. Moreover, mitigation measures are introduced to reduce original risks, which effect being assessed by the comparison of original risks presented without those measures and the actual risks presented with those measures. In the end, a risk assessment matrix is presented to visualize this assessment.

This deliverable is the second release of the Risk Assessment and Management Action Plan at M9; there will be one last release V3 in M18. Risks are ephemeral. Capturing their changes simultaneously with the development of the project is key to having them well under control and ensuring a smooth and uninterrupted progress of the project. The updated version of risk management plan serves to guarantee the successful rolling out of the Boost 4.0 Industrial Data Space. The plan will be finalised in V3.

Keywords: Risk management, risks in the project, mitigation measures, risk assessment

DISCLAIMER

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Abbreviations and Acronyms

Acronym	Meaning
CA	Consortium Agreement
CPPS	Cyber-Physical Production System
DoA	Description of Action
EC	European Commission
GA	General Assembly
IPR	Intellectual Property Regulations
KPI	Key Performance Indicator
REI	Responsible Exploitation & Innovation Board
RRI	Responsible Research & Innovation
TCC	Technical Coordination Committee
WP	Work Package

1 Introduction

This is the second version developed on the basis of the Risk Management Plan V1, with the shared objectives to track, assess and mitigate potential risks during the project lifetime. The D1.5 is going to be followed by D1.6, the third version, by M18.

As stated in D1.4, the project strategic board continues being responsible to manage risks emerged in the process of the project so as to avert potential risks that would endanger the progress and accomplishment of the project. Based on the initial risks identified in the first period of the project, WP leaders and task leaders have identified 28 new risks and re-assess 6 initial risks while checking how the status quo are reacting with the project activities carried out. Moreover, they are used as elements to link the progress to the capacity to impact significantly in the research and industrial domains.

1.1 Purpose and scope

The D1.5 continues the classification of classes of risks applied in D1.4 and Boost4.0 DoA: Management; Technical & Innovation risks due to the ambition of the scientific and pilot work packages. This encompasses achieving a seamless big data interoperability or models transforming current engineering practices or allowing advanced simulation (simulated reality) or forecasting (harmonized production planning) capabilities. Impact risks due to the market acceptance and/or to complexity of the BOOST 4.0 solutions.

The relationship of different working packages has been demonstrated in the flow chart showed below. (Figure 1)

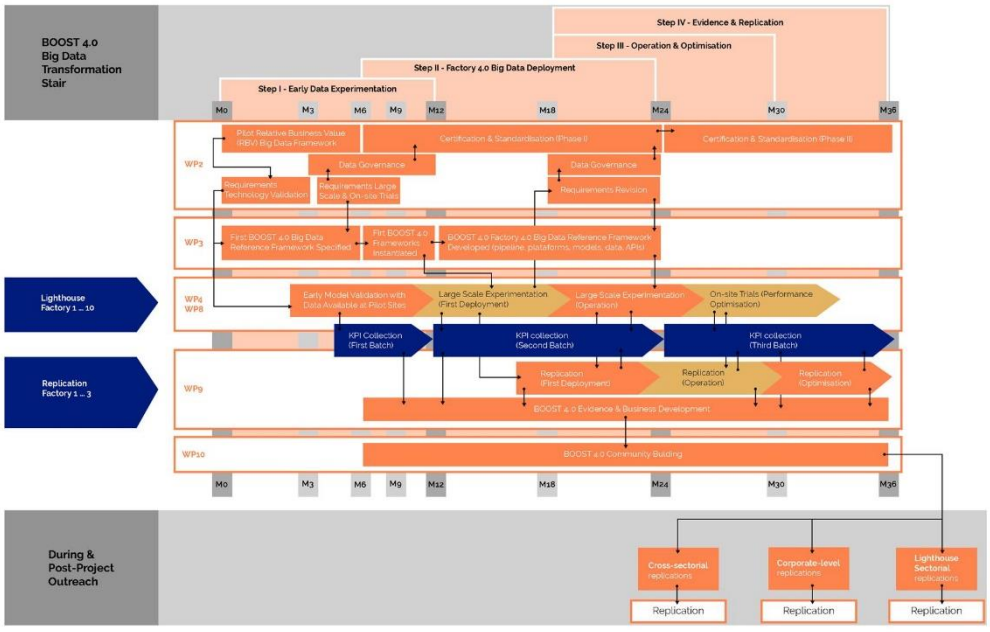


Figure 1 Boost 4.0 Working Packages Flow Chart

2 Risk analysis background and goals

The accomplishment of the series of risk management plan relies on the project strategic board, an efficient and functioning organisation with the mandate of the project strategic board in terms of:

- Project organisation, responsibilities, authority
- Project planning & control
- Results, documentation & data control

The Risk Plan is a support to the Project Management activities.

3 Risk management methodology

3.1 Risk Identification and assessment

Risk Management is adopted to manage project issues and conflicts. The challenging mission of BOOST 4.0 is to accomplish the ambition of the scientific work packages, like for instance achieving a seamless big data interoperability or models transforming current engineering practices or allowing advanced simulation (simulated reality) or forecasting (harmonized production planning) capabilities. In this perspective, we identify three main classes of risks:

- Generic management risks exist due to the size and complexity of the project, due to the distribution of competencies in several organizations, due to the ecosystem nature of the consortium where heterogeneous interests co-exist and parties from the industry, the academy and non-profitable organs need to collaborate in the BOOST 4.0 consortium.
- Technical & Innovation risks are due to the ambition of the project to create a seamless industrial data space across Europe integrating machines, processes, platforms, services and workforce along the full product and process life-cycle
- Impact risks are due to the complex dynamics in the market, the communication gap existed from Innovation solutions and the difficulty to gain quick access to the market and/or to the complex portfolio to be presented by the BOOST 4.0 solutions.

During the second phase of the project, BOOST 4.0 has re-assessed the initial 21 risks and identified 34 risks within these categories, which will be expatiated in the table below (Table 2 to Table 4). A list of risks and related action list is reported in the following sections. The risks are divided in different classes. There is a mix between internal risks and external ones.

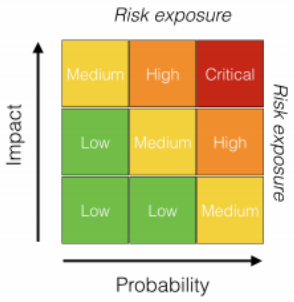
- Internal risks are the ones related to specific project management and consortium ability and efficiency in dealing with its tasks and fulfilling its purposes.
- External risks are more related to the impact vision and are subject to market and environmental factors.

The following tables provide the lists of new risks recognized by the project strategic board, those of which are generated and assessed as the WP leaders march on with project activities and witness new challenges coming on in the process. This issue is the second plan collected in M9 with project updates while comprehensively considering the project dynamics.

The present deliverable on risk management applies a quantitative methodology in defining the three levels of different risks. They were then assessed in terms of probability and impact, resulting in a prioritised list of threats on basis of their foreseen risk level (risk=probability x impact). Probability and Impact for each threat were defined on a scale between 0 and 1 according to a low medium-high. Moreover, mitigation measures are introduced to reduce original risks, which effect being assessed by the comparison of original risks presented without those measures and the actual risks presented with those measures.

Each risk is evaluated through two kinds of marks:

- Probability: This evaluation is related to the likelihood or potential frequency of occurrence of the considered risk (or unexpected event) that may lead to trouble:
  - Low (0-0.4): the risk is unlikely to occur or can occur not more than once during the project;
  - Medium (0.4-0.7): the risk is relatively likely or can occur twice or three times during the project;
  - High (0.7-1): the risk is likely or can occur more than three times during the project
- Impact: the evaluation is related to the effect of the risk occurrence on the project organisation and results. The higher the impact, the higher the lead-time or effort involved to recover back to good conditions in the running project:
  - High (0.7-1): the effect will strongly disturb the project and the effort or lead-time to recover will be significant or too long to reach expected objectives
  - Medium (0.4-0.7): the effect will disturb the project but will not impact the duration of the project or attainment of objectives
  - Low (0.7-1): the effect will slightly disturb the project but good running conditions can be recovered rapidly.



Classification	Numerical Representation
Low	0 to 0.4
Medium	0.4 to 0.7
High	0.7 to 1

Table 1 Classification of probability and impact

Risk is therefore measured in terms of multiplication of probability and impact;

Risk Level *= Probability * Impact* *(1)*

with the levels of severity and color codes as shown above.

WP leaders and other key partners have established risk mitigation plans to reduce the impact and likelihood of the risk occurring, as well as action plans to manage the risk should it arise. This integrated approach to risk management will enable the project office effectively control business, intellectual property, technology, people, management, environment and other implementation risks that may arise.

Such mitigation measures have an impact on the actual probability of the risk in the form

Actual Risk Level *= (Original Risk Probability)*(1-Mitigation Effect)* *(2)*

with an impact on the severity of the risk after mitigation measure application following the risk level formula above. The formula is also illustrated in the figure below (Figure 2).

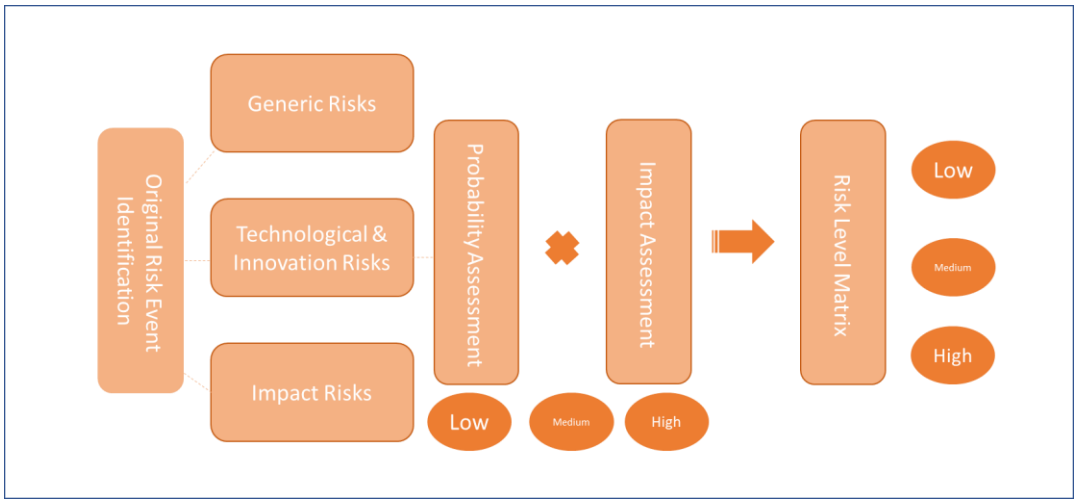


Figure 2 Risk Assessment Procedure

Unresolved issues or conflicts impacting the project plan will be escalated to the appropriate theme board, project coordinator and then if required to the GA.

Should the need arise the necessary partner assembly will be convened to vote on the issue or dispute in question.

Risk Assessment. The Risk Assessment for BOOST 4.0 is based on Failure Mode and Effects Analysis (FMEA). Though this method was first developed for systems engineering, it has proven to be sufficiently powerful for risk analysis is all types of projects to examines potential failures in products or processes. It is used to evaluate risk management priorities for mitigating known threat-vulnerabilities. FMEA helps select remedial actions that reduce cumulative impacts of life-cycle consequences (risks) from a systems or process failure (fault). The basic process was originally to take a description of the parts of a system (a high-level architectural overview), and list the consequences for each part that fails.

3.2 Re-assessment of the initial risks identified

In the spirit of reassessing the initial risks identified in the Risk Management Plan V1, the consortium has assigned the WP leaders to consult task leaders that are on hands of the concrete activities to re-assess the initial risks and come up with new risks based of their evolution, the following updates can be concluded.

- Most of the new risks emerged are technical ones occurred in different pilots, as well as the ones related with KPIs;
- Legal risks and management risks maintain stable as the project is marching on as planned during the first nine months of the project;
- Impact risks are mitigated thanks to the enlightening performance in communications and dissemination.

More detailed analysis and content can be found in the Chapter 3.3, the BOOST 4.0 related risks tables.

3.3 Risk Management and Mitigation Measures

The following is the list of risks table with colour coded for different level of risks. The comparison between original risk and actual risk vividly demonstrate the effectiveness of mitigation measures, which are testified in the % of risk reduced and later in the risk matrix.

The following figure also illustrated the philosophy of how the mitigation measures are reducing the initial risks level of the risks identified. It´s obvious that effect of mitigation measures are shown in the reduction of probability and impacts.

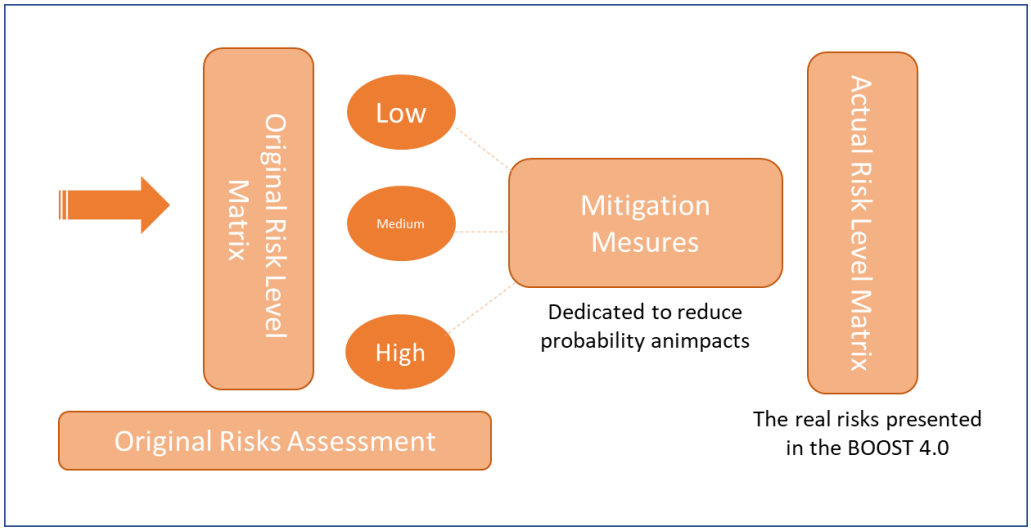


Figure 3 Mitigation measures reducing the original risks

3.3.1 Management Risks (General)

Table 2 BOOST 4.0 related generic risks (management).

Risk Management Registry																		
Risk Identification							Risk			Risk Response		Risk Monitoring & Control						
ID	Status	Risk Type	WP	Event/Threat	Cause	Effect	Original Probability	Impact	Original Risk Level	Mitigation Measures	Mitigation Effect	Actual Probability	Actual Impact	Actual Risk Level	% Reduced	Responsible	Date of Review
R8	Active	Management	WP3	Delayed inputs	relevant implementations of IDS components by non-Boost IDS actors are not ready in time/not sufficiently complete	Delayed provision of pilots	0,30	0,70	0,21	continuous contact with respective actors	0,1	0,27	0,63	0,19	0,1	WP3 task leader	Jan 1st, 2019
R9	Active	Management	WP3	pilots not conforming to BOOST4.0 Reference Architecture and vocabulary	incomplete information from the pilots regarding the used/required standards and terminologies	Low generalisation and reusability, limited learnings	0,60	0,80	0,48	periodic workshops of pilot developer and technical partners	0,4	0,36	0,48	0,29	0,4	replication management board	Jan 1st, 2019
R11	Active	Management	WP3	lack of real-world data	productive data is not available/shared in the consortium	technical implementation delayed, applicability of technologies cannot be evaluated	0,80	0,70	0,56	local deployment/evaluation of components, restricted networks, Data Masking; utilizing open data	0,2	0,64	0,56	0,45	0,2	Project Strategic Board	Jan 1st, 2019
R19	Active	Management	WP1	Delayed deliverables	Slower learning curve of collaboration procedures (submission, revision, quality standards) restablished for large lighthouse partnership	Slower project reporting ramp-up	0,80	0,7	0,56	Weekly/Bi-Weekly WP calls, Process tracking and periodic status check. Individual support from Project management office	0,3	0,56	0,49	0,39	0,3	Project Strategic Board	1st October, 2018
R22	Active	Management	WP7	Business objetives achievement for both Business Scenarios	Objetives set not aligned with reality.	Objetives not achieved, expected benefits not drafted correctly.	0,60	0,7	0,42	Objetives establishment based on the pilot plant situation and the business processes solutions and with a close monitoring of selected KPIs.	0,4	0,36	0,42	0,25	0,4	Monitoring & KPI Evaluation manager	1st October, 2018
R28	Active	Management	WP1	Delayed deliverables	Slower learning curve of collaboration procedures (submission, revision, quality standards) restablished for large lighthouse partnership	Slower project reporting ramp-up	0,80	0,7	0,56	Weekly/Bi-Weekly WP calls, Process tracking and periodic status check. Individual support from Project management office	0,3	0,56	0,49	0,39	0,3	Project Strategic Board	1st October, 2018
R29	Active	Management	WP9	Original work plan modification	WP9 activities start earlier than planned in the GA to coordinate activities with other WPs	Unforseen work for partners leading to low involvement and limited results	0,20	0,4	0,08	Increased collaboration between WP leaders through short monthly calls	0,5	0,10	0,20	0,04	0,5	Project Strategic Board	27th August, 2019

3.3.2 Technical Risks

Risk Management Registry																		
Risk Identification							Risk			Risk Response		Risk Monitoring & Control						
ID	Status	Risk Type	WP	Event/Threat	Cause	Effect	Original robability	Impact	Original Risk Level	Mitigation Measures	Mitigation Effect	Actual robability	Actual Impact	Actual Risk Level	% Reduced	Responsible	Date of Review
R1	Active	Technical	WP2	Delayed user/system requirements	WP2 doesn't get prompt and complete input for its deliverables. Early delays in the project (consortium agreement) affect WP2 deliverables which have early due dates.	Delayed WP2 deliverables. Slower progress in defining the Boost4.0 Reference Architecture.	0,50	0,7	0,35	Bi-weekly WP2 calls to coordinate effort and communicate results. Hybrid apporach for the architecture that includes both top down and bottom up.	0,3	0,35	0,49	0,25	0,3	INTRASOFT	1st August?
R2	Active	Technical	WP2	User/system requirements are not adequate or comeplete	End-users don't provide enough details about the platform to be realized in the project.	WP3 implementations are complicated or not feasible.	0,30	0,8	0,24	Technical partners are invovled in the elicitation processs. Several iterations will help refine and clarify requriements.	0,3	0,21	0,56	0,17	0,3	INTRASOFT	1st August?
R3	Active	Technical	WP2	Boost4.0 reference architecture doesn't meet pilot requirements	The Boost4.0 RA disregards or doesn't cover pilot requirements. Also delayed requriements may affect it.	Pilot implementations are complicated or not feasible.	0,50	0,8	0,4	Boost 4.0 RA includes a bottom-up apporach that covers pilot requirements. Furthermore the development of the RA is iterative and includes feedback from all WP2 partners. A Task Force has also been introduced in order to support the RA alignment with existing referece models and architectures and the pilots.	0,3	0,35	0,56	0,28	0,3	INTRASOFT	1st August?
R4	Active	Technical	WP3	Trusted trading of data and services in a common data space is technically compromised	Technical limitations of involved technologies	Limit the potential usage of the BOOST Data space	0,30	0,7	0,21	Close follow up and implementation in phases	0,2	0,24	0,56	0,17	0,2	Technical & Innovation Board	Jan 1st, 2019
R5	Active	Technical	WP3	IDS outcomes from WP3 are not used by the pilots	IDS complexity prohibits pilots to integrate the WP3 outcomes in their production line	Pilots prefer their traditional production process rather than the enhanced with smart factory technologies	0,90	0,8	0,72	Adjustment of technologies and solutions existing in the pilots to the IDS specification, in a way that minor changes will be required in their day-to-day activites.	0,7	0,27	0,24	0,22	0,7	Technical and Innovation Board	1st October
R6	Active	Technical	WP3	Lack of IDS applications in the BOOST4.0 marketplace	The implemented IDS connectors are not generic enough to be used by third parties	BOOST4.0 lacks of useful IDS applications	0,50	0,7	0,35	Generalisation of IDS connectors from the first steps of design and implementation, to take into account different application scenarios, data structures, communication protocols. Furthermore, partners which bring in assets into WP3, have to be enabled to implement their technology as an EIDS app in order to have a marketplace, which brings planty of functionality.	0,8	0,10	0,14	0,07	0,8	Technical and Innovation Board	1st October, 2018

Risk Management Registry																		
Risk Identification							Risk			Risk Response		Risk Monitoring & Control						
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R7	Active	Technical	WP3	Inefficient handling of resource scalability for big data processing	Manual handling of resource scalability is difficult	Hindering of data processing	0,30	0,5	0,15	Application of automated resource elasticity handling mechanisms to the big data processing	0,5	0,15	0,25	0,08	0,5	Technical and Innovation Board	1st October, 2018
R10	Active	Technical	WP3	state-of-the-art technologies/resources not sufficiently regarded in use cases	provided tools are not user friendly enough to be adapted by use case partner without continuous and intense support	inefficient implementation, no significant results, lack of scientific progress	0,70	0,40	0,28	regular hands-on trainings, one responsible contact for each tool/technology, collection of technology/resource description and documentation in the file share	0,3	0,49	0,28	0,2	0,3	Technical & Innovation Board	Jan 1st, 2019
R12	Active	Technical	WP3	data models incapable for pilot needs	vocabularies inadequately capture information required for applications or are too complex (e.g. in terms of lacking descriptions or intransparent requirements)	lacking usage of shared terms, challenging exchange of data/invocation of APIs	0,60	0,40	0,24	widely used standard vocabularies at the center, extended by domain-specific concepts, iterative contact of technology partners and pilots	0,4	0,36	0,24	0,14	0,4	Technical & Innovation Board	Jan 1st, 2019
R13	Active	Technical	WP3	security concept not in place	IDS Certification too elaborate, secure exchange protocol unreliable, cumbersome implementation of secure connectors	productive data not exchanged	0,90	0,20	0,18	Data Masking, exchange of dummy data to prove exchange functionality	0,3	0,63	0,14	0,13	0,3	Technical & Innovation Board	Jan 1st, 2019
R14	Active	Technical	WP3	component interoperability not achieved	All BOOST 4.0 components come from different sources with different APIs, data formats, and data models;	BOOST4.0 components cannot interact or exchange data	0,40	0,80	0,32	All BOOST 4.0 components need to be adapted to the same communication formats and interfaces. In cases where this is not possible we will contribute with additional modules	0,6	0,16	0,32	0,13	0,6	Technical & Innovation Board	Jan 1st, 2019
R15	Active	Technical	WP3	provision of metadata not feasible	Semantic interoperability requires the description of metadata in RDF. Correct RDF annotations are a challenging task for non-experts.	Structured registration of components not possible at the platform, only unstructured/ambiguous descriptions provided	0,90	0,30	0,27	Automatic generation of descriptions (IDS Information Model), demonstrators with respective descriptions, validation engines	0,2	0,72	0,24	0,22	0,2	Technical & Innovation Board	Jan 1st, 2019
R16	Active	Technical	WP3	unstable data model	unexpected updates and modifications on the data model hamper its usage	data model not continuously used	0,50	0,30	0,15	transparent release strategy and communication, stable accessibility to previous releases	0,3	0,35	0,21	0,11	0,3	Technical & Innovation Board	Jan 1st, 2019

Risk Management Registry																		
Risk Identification							Risk			Risk Response		Risk Monitoring & Control						
ID	Status	Risk Type	WP	Event/Threat	Cause	Effect	Original Probability	Impact	Original Risk Level	Mitigation Measures	Mitigation Effect	Actual Probability	Actual Impact	Actual Risk Level	% Reduced	Responsible	Date of Review
R17	Active	Technical	WP3	specifications of external initiatives not applicable	Guidelines and standards from respective groups do not regard the BOOST4.0 requirements sufficiently	BOOST4.0 implementations and research results are incompatible with major standard proposals	0,20	0,40	0,08	active alerting of the respective initiatives	0,1	0,18	0,36	0,07	0,1	Technical & Innovation Board	Jan 1st, 2019
R20	Active	Technical	WP3	BOOST 4.0 algorithms and services do no support/extend AI and they are innefficient to contribute beyond the State-of-the-Art	Data analytics techniques and algorithms are not based on well known techniques and standards and they are not in compilance with the new trends in machine learning etc.	The project wiil not be able to contribute effectively in the corresponding research fields and it will not offer innovative solution to pilot partners.	0,30	0,7	0,21	Thorough analysis and research in related works, methods and stantards. Testing of different and new analytics approaches in pilot cases.	0,5	0,15	0,35	0,11	0,3	Technical & Innovation Board	1st Oct, 2019
R21	Active	Technical	WP7	Business Processes not possible to be implemented according plan and project definitions.	Pilot plant technical requirements and limitations not properly estimated, mismatch between requirements, limitations and business impact.	Large scale pilot experimentation delayed and further cost, quality and efficiency impacts.	0,60	0,8	0,48	Workshop activities with pilot plant teams and Bi-Weekly partners calls to deeply analysis and clear requirements assesment.	0,3	0,42	0,56	0,34	0,3	Project Strategic Board	1st October, 2018
R23	Active	Technical	WP7	Business Scenarios not flexible and scalable from pilot plant to rest of mafufacturing plants from Gestamp group.	Pilot project outputs not defined on a horizontal deployment basis for current and future projects.	Pilot cannot reach corporative scale.	0,60	0,6	0,36	Horizontal and vertical impact analysis considering both Business Scenarios at an early stage between all parties.	0,5	0,30	0,30	0,18	0,5	Project Strategic Board	1st October, 2018
R24	Active	Technical	WP7	Pilot partners are not able to provide technical solutions	Proposed technical solutions do not cover, reach Business requirements.	Functions from Business Scenarios won't be accomplished due to discrepancies between what is required and what is provided.	0,70	0,8	0,56	All technical solutions will be be developed, and tested on lab conditions and afterwards on a PoC condition to ensure requirements compliance.	0,6	0,28	0,32	0,22	0,6	Project Strategic Board	29th August
R25	Active	Technical	WP08	Unnecessary maintenance actions	False positives from the fault detection mechanism	Boost 4.0 smart maintenance solution not accepted by the end users (frustration).	0,3	0,5	0,15	Thorough evaluation of the proposed solutions	0,6	0,12	0,20	0,06	0,6	Pilot Management Board	1st October, 2018
R26	Active	Technical	WP08	Results of the smart maintenance solution are not reliable	Data from sensors is too noisy and unsynchronised	There is not much trust and acceptance in the proposed solution	0,3	0,5	0,15	Efficient preprocessing of the data and enhancement of the backend data collection system	0,6	0,12	0,20	0,06	0,6	Pilot Management Board	1st October, 2018
R30	Active	Technical	WP9	KPIs divergence	KPIs definition/identification made on the theoretical implementation of pilots	KPIs collection might slightly diverge than foreseen during the actual implementation of pilots	0,50	0,6	0,3	Continuous monitoring and revision of KPIs	0,6	0,20	0,24	0,12	0,6	Monitoring & KPI Evaluation Manager. Pilot Management Board.	27th August, 2019

3.3.3 Impact Risks

Risk Management Registry																				
Risk Identification							Risk			Risk Response		Risk Monitoring & Control								
ID	Status	Risk Type	WP	Event/Threat	Cause	Effect	Original Probability	Impact	Original Risk Level	Mitigation Measures	Mitigation Effect	Actual Probability	Actual Impact	Actual Risk Level	% Reduced	Responsible	Date of Review			
R31	Active	Legal	WP3-8	GDPR compliance issues in carrying out pilots	Pilots identify the need of using personal data for the implementation of pilots	The use of personal data needs to comply with EU directives and CA agreements	0,05	0,8	0,05	CA definies the liabilities of all parties, the extreme low probability of using personal data. Data Governance data will supervise agreed governance procedures are followed	0,9	0,01	0,08	0	0,99	Pilot Management Board	1st July, 2019			
R32	Active	Legal	WP3-8	Business-critical data released consortium-wide or made public by inadvertence	Misuse of confidencial data without the suitable written agreements between the parties	Breach of confidentiality	0,10	0,7	0,08	CA definies the liabilities of all parties and the strict procedures to be followed by parties. Increased control procedures to be in place	0,8	0,02	0,14	0	1	Pilot Management Board	1st July, 2019			
R33	Active	Legal	WP1, 9, 10	IPR conflicts resulting in stop of partnership or results are not delivered by partners	Joint ownership of results is not clear	Stop exploitation of results	0,80	0,9	0,72	Arbitration mechanims set in CA and GA are trigerred.	0,3	0,56	0,63	0,5	0,3	Project Strategic Board	1st July, 2019			

3.3.4 Legal Risks

Risk Management Registry																				
Risk Identification							Risk			Risk Response		Risk Monitoring & Control								
ID	Status	Risk Type	WP	Event/Threat	Cause	Effect	Original Probability	Impact	Original Risk Level	Mitigation Measures	Mitigation Effect	Actual Probability	Actual Impact	Actual Risk Level	% Reduced	Responsible	Date of Review			
R31	Active	Legal	WP3-8	GDPR compliance issues in carrying out pilots	Pilots identify the need of using personal data for the implementation of pilots	The use of personal data needs to comply with EU directives and CA agreements	0,05	0,8	0,05	CA definies the liabilities of all parties, the extreme low probability of using personal data. Data Governance data will supervise agreed governance procedures are followed	0,9	0,01	0,08	0	0,99	Pilot Management Board	1st July, 2019			
R32	Active	Legal	WP3-8	Business-critical data released consortium-wide or made public by inadvertence	Misuse of confidencial data without the suitable written agreements between the parties	Breach of confidentiality	0,10	0,7	0,08	CA definies the liabilities of all parties and the strict procedures to be followed by parties. Increased control procedures to be in place	0,8	0,02	0,14	0	1	Pilot Management Board	1st July, 2019			
R33	Active	Legal	WP1, 9, 10	IPR conflicts resulting in stop of partnership or results are not delivered by partners	Joint ownership of results is not clear	Stop exploitation of results	0,80	0,9	0,72	Arbitration mechanims set in CA and GA are trigerred.	0,3	0,56	0,63	0,5	0,3	Project Strategic Board	1st July, 2019			

3.4 Mitigation and Risk Management Effect

Having designed corresponding mitigation measures, the monitoring procedure and all the tools necessary to the mitigate original risks, it's obvious to see the change of status quo from the two charts for comparison demonstrated below.

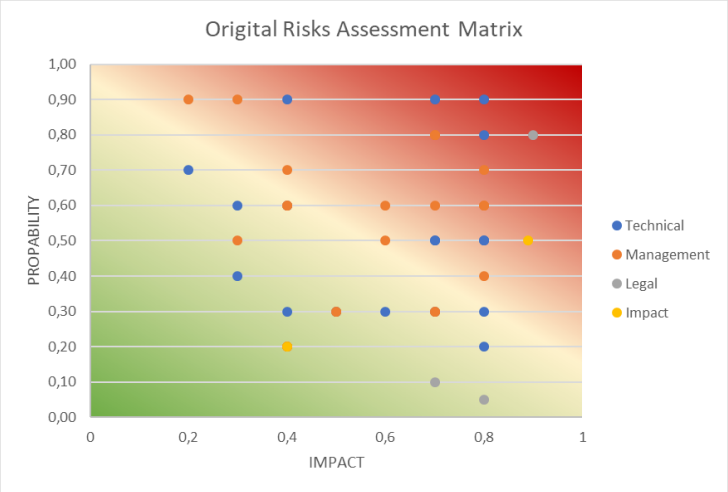

Figure 4 Original Risks distribution

If no mitigation measures are put in place, the project represent relative high risks, with about 30% of risk factors resting in the red zone, most of them management and technical risks. The riskiest ones are related to the huge amount of data to gather from the Pilots Data Systems, scalability problems, which are more concrete technical risks derived from the initial risks concerning scalability problems. Initial legal risks, for example IPR conflicts and GDPR concerns are reassessed and considered less risky than in the first period. IPR present remains high risks mainly because the high negative impacts it will have should such incident happened, which entails scandals and other further legal disputes.

However, like original risks, no new risks are left aside. They are taken good care of by different highly targeted mitigation issues, which have certain effects to bring down the level of probability and impacts, resulting in lower risk levels in actual situation. As a result, the general situation in actual risks chart is that, most of the risks factors now reside in green zone.

What remains to be concerning is risks is about pilot infrastructure facilities being not enough to accomplish the project ambition. As pilots are key players in the project and carry huge weight in the success demonstration of algorithm viability, hence should be carefully handled as the project marches on into further stages.

It can be also observed that, among many risks, technical risks are generally more concerning than management risks, legal risks and impact risks, due to the technology and innovation ambition of the project. Thanks to the sound and solid management structure and a committed consortium, the management risks are drastically reduced after mitigation measures. On the other hand, the Consortium Agreement that has been negotiated among all the partners to the grain of every single details have ensured that the risks on the legal side are considerably low. For example, R9 and R8 are both on the edge of zero probability.

Overall, the top five risks the project present are:

- IPR conflicts resulting in stop of partnership or results are not delivered by partners
- Considering the huge amount of data to gather from the Pilots Data Systems, scalability problems.
- Delayed Deliverables
- Pilot partners are not able to provide the necessary data sets - quantity, timeliness, QA

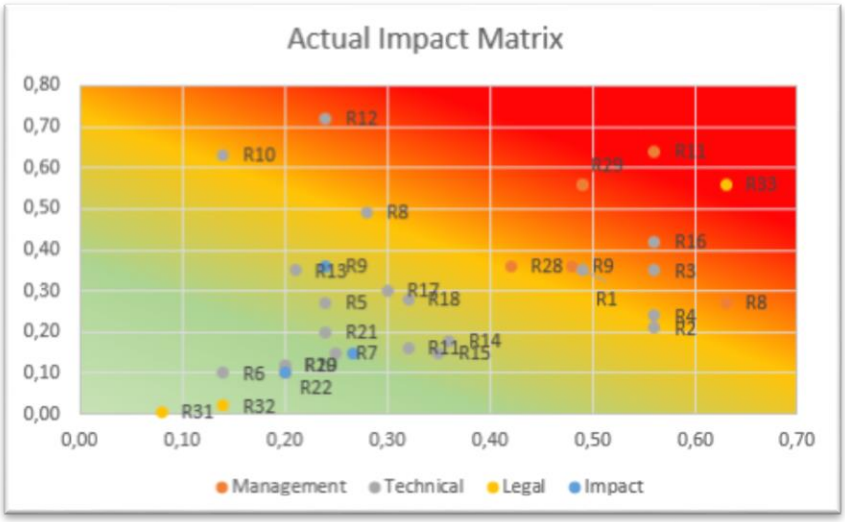

Figure 5 BOOST 4.0 Actual Risks Chart

4 Conclusion

Deliverable D1.5 Risk Management Action Plan V2 is the second issue of the three risk management deliverables planned in the project, which represent the planning and implementation of the BOOST 4.0 risk management strategies and their continuous assessment.

The document has reassessed the various risks identified early in the project (M7) and come up with 28 new and concrete risks (M8) in the middle of the project. This represent an active process to control and monitor project advancement, in alignment of the whole strategy. It also reassures the effectiveness of FMEA methodology while dealing with an objective assessment of risk severity at all levels of project implementation.

Next activities regarding risk management and control are comprised of continuous monitoring of the new incidents occurred, reassess them with the planned timetable indicated in the table and allow possible deviations when changes in the working environment or any unexpected factor occurred in the whole duration of the project. The process will be registered in the upcoming version of this plan. The document is going to be extended in D1.6 (M18) with risks related to the first result of pilot activities at laboratory level. Moreover, it will also

provide an updated view of risk levels of the project and extend if necessary risks after large scale extension of the pilots and looking towards pilot replication and fully operational assessment.