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Architecture for Scalable, Self-human-centric, Intelligent, Secure, and Tactile next generation IoT

assist-iot

D2.7 – Risk Management v3

Deliverable No.	D2.7	**Due Date**	31-JAN-2023
Type	Report	**Dissemination Level**	Public (PU)
Version	0.1	**WP**	WP2
Description	The deliverable includes the risk policy, forecasted and detected risks and their mitigation measures, along with ethical and legal risks.		

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History

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Executive Summary

This Risk Management Plan is written within the context of WP2 – Project Coordination and Management of **ASSIST-IoT** project, under Grant Agreement No. 957258. The document is a reference to the work being carried out as a part of task *T2.2 - Technical coordination, quality assurance and risk management*. In particular, it is related to the management and assessment of risks of the ASSIST-IoT project. This document contains the third full report of the risk management related activities that have been performed in ASSIST-IoT. In particular, it summarises the current status of the risk assessment, as it has been performed during the M27 of the action (January 2023).

The Risk Management Plan is based on a well-known 4-steps procedure composed of identification, estimation, mitigation and monitoring. All sub-steps have been considered in this document, while the most relevant part is presented in four tables, with information associated to specific risks that have been identified (separated in "areas" – management, technical, pilots and impact creation).

By M27 of the project (January 2023), 45 risks have been identified (classified in 13 administrative/managerial -+5 since D2.6-, 17 technical -+4 since D2.6-, 12 related to pilots -+5 since D2.6- and 3 about impact creation). They are detailed in four summarising tables, that include the description of the risk itself, its materialisation likelihood, its "advance" from the last iterations and the mitigation and corrective measures defined for each of them.

Risks included in this document cover those usual in RIA projects, as well as some identified along the way related to potential issues that may occur during the next phase of ASSIST-IoT project (full integration, pilot finalisation and impact evaluation) as well as some risks that have materialised and were unforeseen.

Out of those 45, 6 risks are already considered overcome, while the vast majority of the rest (30) are under control. Only 9 risks are now carefully observed as potential highly critical if they get to materialise. In any case, proper and enough mitigation measures are being put in place, as it is documented in this deliverable.

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List of acronyms

Acronym	Explanation
AB	Advisory Board
AI	Artificial Intelligence
ASSIST-IoT	Architecture for Scalable, Self-*, human-centric, Intelligent, Secure, and Tactile next generation IoT
CA	Consortium Agreement
COVID / COVID19	Disease caused by SarsCOV2 virus – refers to the outbreak of 2020 and 2021
CSA	Coordination and Support Action
DevSecOps	Development-Security-Operations, methodology for Secure Continuous Integration and Continuous Delivery.
DX.Y	Deliverable No Y of Work Package No X
GA	Grant Agreement
IEEE	Institute of Electrical and Electronics Engineers
KPI	Key Performance Indicator
ML	Machine Learning
M*X*	Month No *X* of ASSIST-IoT project execution
N/A	Not Applicable
PC	Project Coordinator
PCC	Project Coordination Committee
PIC	Project Implementation Committee
PO	Project Officer
R*X.Y*	Risk No Y of WP No X
SotA	State-of-the-Art
TC	Technical Coordinator
TL	Task Leader
WP	Work Package
WPL	Work Package Leader

1. About this document

The main objective of this document is to provide update of all aspects of risk management. As stated in the action proposal, the aim of ASSIST-IoT management is to systematically monitor risks, and to establish ways of counteracting them before they have adverse effect on the action's results.

1.1. Deliverable context

Table 1. Deliverable context

Keywords	Lead Editor
Objectives	The objective of this document is not related to the technical development of the project. This deliverable establishes and reports over the Risk Management Plan and the main procedures proposed to correctly manage the likelihood of risk materialisation in a continuous and timely manner.
Exploitable results	N/A
Work plan	This document is developed within the WP2 "Project Coordination and Management", being useful for every task of the project and a daily reference of overall project planning and coordination. This document corresponds to the works carried out under the scope of task *T2.2 - Technical coordination, quality assurance and risk management.*
Milestones	N/A
Deliverables	This document is a live asset (living document), subject to be updated. Current version can be seen as an update performed on risk assessment provided in the action proposal (last iteration: D2.6 – M18). Moreover, it is fed directly from the Project Management Handbook (D2.1). Furthermore, this document is semi-independent from D2.3 and D2.4, which cover all aspects of ethical risks. Hence, ethical risks are not considered here. This document does not have a planned new iteration as a deliverable. A final report about risks status on materialisation and mitigation measures put in place will be done via the Final Periodic Report of the project, after the formal finalisation of the action.
Risks	**Planning problems** – This deliverable establishes mechanisms to ensure the quality of the documentation and the processes, facilitating the correct interpretation by the partners so that they know the timing and responsibilities.
	Collaboration issues – This deliverable describes coordination mechanisms, communication tools, and procedures that allow correct decision-making and conflict resolution in the face of any situation that may arise throughout the project.

1.2. The rationale behind the structure

The content of the deliverable is organized in six main sections:

- **Section 2**. Update of risk management strategy.
- **Section 3**. This section reports the current status of risks assessment in the project, separated per risk area (a sub-section each).
- **Section 4** concludes with some reflections and next actions about how the risk management is effectively performed in ASSIST-IoT.

2. Update of Risk Management in ASSIST-IoT

Following the high-quality procedures settled in D2.5 (the guiding document for risks management, tracking and reporting in ASSIST-IoT), the activity of months M9-M18 was reported in D2.6 and the risk-related actions that are documented in D2.7 have redounded in a slight update of the risks tracking procedure.

Year 2022 has witnessed the slow return to normality after the COVID-19 outbreak that stroke the globe in the years 2020 and 2021. After a long period without face-to-face meetings, in the period M18-M27 the project ASSIST-IoT has conducted 3 meetings (2 Plenaries and 1 code-camp) that have helped accelerate some tasks, especially those related to collaborative development and on-site activities in pilot locations. In addition, this period has also been characterised for the resume of dissemination events such as fairs and congresses. In this regard, ASSIST-IoT has been very active, attending to face-to-face conferences, including dedicated workshops and special sessions.

Regarding risks, the previous has relaxed various uncertainties and has helped the application of various mitigation measures. As a counterpart, certain cascading effects have been materialised and some actions such as the inclusion of new third linked partners have required the initialization of new risks that are covered in this document.

From the point of view of planning, the methodology devised in D2.5 remains valid and sound, and has been applied diligently by Project Coordination and the corresponding WP leaders, timely fulfilling any required information to ensure that no risk is left unnoticed and that sufficient mitigation measures are envisioned and applied (if necessary). The application of the steps and plan is expected to be kept till the end of the action.

2.1. Risk classification

As mentioned, risks in ASSIST-IoT are being classified in various “areas”. Depending on which type of action they fall under, risks might be considered as being:

- **Management risks**: Those related with managerial aspects like partners collaboration, delays in reporting, documentation issues, misalignments in communication, Advisory Board, Open Call participants (in terms of funding, participation, impact, etc.). They fall under WP2 but might actually affect the execution of other WPs.
- **Technical risks**: Those related to technical actions, both in software development and in hardware design and availability. These risks also entail any aspects around integration, testing and interaction between enablers and any part of the modular architecture. The WPs are WP3, WP4, WP5 and WP6.
- **Pilot risks**: Those related to the deployment of ASSIST-IoT technology in the actual pilots of the project, including the availability of pilot equipment (scanner, cranes, TOS, car, connectivity, etc.) and the software/hardware of the project to be used. It also covers the actual completion of the objectives of the pilot as well as their validation and measurement through KPIs. Associated to WP7 and WP8.
- **Impact risks**: Those related to the outreach of the project, dissemination capacity, external professionals’ engagement, standardisation, exploitation, etc. Associated with WP9 activities.

3. Current risk assessment tables

The following tables contain the current information of the risk assessment tracking file (live document) managed in ASSIST-IoT. Those risks marked in light purple correspond to the risks identified since the proposal stage, those in green come from the enhancement reported in D2.5, the ones that we identified in the period M9-M18 for D2.6 are highlighted in blue and those that have arisen in the past 9 months of the project (M19-M27), thus new in D2.7 are in orange.

3.1. Management risks

Table 2. Management related risks in ASSIST-IoT

Risk description, comments and potential consequences	Mitigation measures, corrective actions and status/comments per iteration
Name Partners related risks (identified since Proposal stage) ***Description:*** Underperforming, leaving the project, key-personnel temporally not available, reorganization distracting day-to-day activities. ***Potential consequences:*** • As per D2.5 (M9): Delays, extra efforts to be justified. • As per D2.6 (M18): Not reaching on time documentation and software (enablers) delivery, jeopardising further activities. • As per D2.7 (M27) Jeopardizing integration of enablers or deployment of ASSIST-IoT in the pilots. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Medium* • At D2.6 (M18): *Low + Medium* • At D2.7 (M27): *Medium + Medium* ***Notes in D2.5 (M9):*** COVID-19 increases possibility of materialization of these risks. Moreover, partners may be overburdened by the success/failure related to the COVID pandemics (too many/too few activities). Related also to the next risk. ***Notes in D2.6 (M18):*** By the middle of the project, execution is overall smooth and the partners are in a good position to face the pilot deployment and to welcome Open Call winners.	***Mitigation measures:*** Flexible project management structure and project CA allow quick shift of resources to alternate partners, and quick inclusion of new partners in the Consortium, if necessary. All Consortium partners are involved in related areas with more than one staff member, ensuring an immediate substitution. ***Additions in D2.5 (M9):*** COVID-related aspects of these risks, and possible mitigation approaches (including importance of the need of efficient communication) have been discussed during the Kick-off meeting, and have been acknowledged by the partners. So far, no need to elaborate this risk further occurred. ***Additions in D2.6 (M18):*** Managerial measures proposed were discussed again in the February 2022 meeting with partners, with no red flag or issue raised. ***Additions after the latest execution period: M19-M27*** This period has been characterised by several holidays timeframes which might have caused underperforming warnings, however a solid plan for deliverable contributions and early advances in technical tasks, alongside a holiday control spreadsheet, diminished the likelihood of this underperformance. Status:

Notes after the latest execution period: M19-M27: By January 2023, partners are performing well in general, some delays have been noticed but mitigation measures are being put in place. No underperformance that might jeopardise the success of the action.	• At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.* • At D2.7 (M27): *No symptoms detected.*
Name: Planning problems (identified since Proposal stage) ***Description:*** Resources underestimated, project timing not appropriate, deliverables/milestones delayed ***Potential consequences:*** • As per D2.5 (M9): Delays, extra efforts to be justified. • As per D2.6 (M18): Not reaching on time documentation and software (enablers) delivery, jeopardising further activities • As per D2.7 (M27): Not submitting deliverables, diminishing the scope of pilots, not reaching KPIs, WP2 timing disrupted. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Med* • At D2.6 (M18): *Low + Med* • At D2.7 (M27): *Med + High* ***Notes in D2.6 (M18):*** COVID-19 outbreaks have prevented the project to host physical meetings, which has had certain influence in the planning of tasks, etc. This is about to change as the 4th Plenary Meeting of the project is expected to take place in Valencia during M19. ***Notes after the latest execution period: M19-M27:*** The materialization of several risks, alongside the addition of external factors such as global chip shortage, inclusion of third linked parties, among others, have shifted this risk to the focus of the task, being tackled straightforwardly during this period.	***Mitigation measures:*** Potential solutions: involvement of other partners with available resources, rearrangement of resources among partners, change of project plan, as a result of self-assessment activities (in direct communication with the EC / Project Officer), and ensuring timely implementation of corrective actions ***Additions in D2.5 (M9):*** COVID-related aspects of these risks, and possible mitigation approaches (including importance of the need of efficient communication) have been discussed during the Kick-off meeting, and have been acknowledged by the partners. So far, no need to elaborate this risk further occurred. ***Additions after the latest execution period: M19-M27*** In order to mitigate this risk, an amendment has been launched including an extension request of 5 months. Receiving a positive confirmation of the application of such expansion, the project as a whole would end in March 2024 instead of October 2023. This fact would allow planning problems to be relaxed, enabling technical, pilot, and mostly, Open Call and impact activities to finalise smoothly and on time. A contingency plan that included this amendment's extension request was prepared alongside a careful and thorough re-distributions of deadlines. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *Some symptoms detected and under control* • At D2.7 (M27): *Materialised. Mitigation measures are being put.*

Name: Collaboration issues (identified since Proposal stage) ***Description:*** Consortium cannot agree, WP interaction not satisfactory, coordination not efficient. ***Potential consequences:*** • As per D2.5 (M9): Delays, extra efforts to be justified. • As per D2.6 (M18): Not reaching on time documentation and software (enablers) delivery, jeopardising further activities • As per D2.7 (M27): Preventing tasks and WPs to finalise on time and to accomplish their objectives. ***Likelihood + Severity:*** • At D2.5 (M9): *Medium + High* • At D2.6 (M18): *Low + Medium* • At D2.7 (M27): *Low + Low* ***Notes in D2.5 (M9):*** Issues considered in this risk are on "higher level" than the ones discussed in the previous risk. While symptoms of the communication risk have been observed and mitigated, no symptoms covered by this risk have been spotted. ***Notes in D2.6 (M18):*** COVID-19 outbreaks have prevented the project to host physical meetings, which has had certain influence in the planning of tasks, etc. This is about to change as the 4th Plenary Meeting of the project is expected to take place in Valencia during M19. Severity is also considered a bit lower as partners are more gotten to each other at this stage of the project and communication is more fluid. ***Notes after the latest execution period: M19-M27:*** This risk has been diminished, as face-to-face meetings are now being held. Interaction by partners has been benefitted from the previous. A Plenary Meeting was hosted in Valencia on May 2022, and another one took place in Warsaw in October 2022. In addition, specific 1-to-1 meetings between partners, PRO-UPV, TWOT-CERTH-UPV and many others were scheduled and conducted.	***Mitigation measures:*** The project management (as described in Project Handbook; D2.1) provides appropriate decision-making and conflict resolution procedures, which will be applied. As the last instance, management of the affected organisations, including the coordinating organisation, will be involved in problem resolution. ***Additions in D2.5 (M9):*** COVID-related aspects of these risks, and possible mitigation approaches (including importance of the need of efficient communication) have been discussed during the Kick-off meeting, and have been acknowledged by the partners. So far, no need to elaborate this risk further occurred. ***Additions in D2.6 (M18):*** Additional communication/collaboration channels have been put in place like GitLab comments, GitHub account and Slack. ***Additions after the latest execution period: M19-M27*** Meetings were resumed and measures devised in previous periods are being executed as usual. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.* • At D2.7 (M27): *Risk has diminished.*

Finally, a code-camp to boost final development and integration was organised in Bilbao in January 2023.	
Name: External risks (identified since Proposal stage) ***Description:*** Change of project requirements due to evolution of relevant technology and market landscape ***Potential consequences:*** • As per D2.5 (M9): Enablers developed become obsolete before even getting out to the "market". • As per D2.6 (M18): Architecture designed in ASSIST-IoT struggles to become a real reference for NGIoT deployments and the orchestrating/deploying approach is no longer sound. • As per D2.7 (M27): Technology has evolved so quickly that tools and mechanisms used in ASSIST-IoT become outdated and real deployments would require other approaches. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + High* • At D2.6 (M18): *Low + Medium* • At D2.7 (M27): *Low + Low* ***Notes in D2.5 (M9):*** Particularly relevant due to research related to cutting-edge areas. Meeting of ASSIST-IoT with its AB took place in M9 and no indication of risk from this category was raised by its members. ***Notes in D2.6 (M18):*** Severity has been shifted to "Medium" as it has been observed that the underlying technologies upon which ASSIST-IoT approach is based (k8s, Helm charts) are becoming de-facto standards in the edge-cloud deployment commercial and research projects. ***Notes after the latest execution period: M19-M27:*** Consideration of container workloads managed by Kubernetes-oriented deployment technologies and philosophy seem completely aligned with the reality and the trends of the sector. Therefore,	***Mitigation measures:*** The PC/TC/PIC/PCC will immediately analyse concrete impact on the project and propose corrective actions in the work plan. Role of Advisory Board is foreseen. Proposed actions, if necessary, will be consulted with the Project Officer. ***Additions in D2.5 (M9):*** COVID-related aspects of these risks, and possible mitigation approaches (including importance of the need of efficient communication) have been discussed during the Kick-off meeting, and have been acknowledged by the partners. So far, no need to elaborate this risk further occurred. ***Additions in D2.6 (M18):*** No further specific measures have been elaborated during this period. ***Additions after the latest execution period: M19-M27:*** No further specific measures have been elaborated during this period. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.* • At D2.7 (M27): *No symptoms detected*

severity has been shifted to Low. This risk can be considered overcome.	
Name: AB support issues (identified since Proposal stage) ***Description:*** Advisory Board members are not able to conduct satisfactorily the required assessment and/or advisory roles ***Potential consequences:*** • As per D2.6 (M18):Decisions taken based on AB's feedback may guide the project to non-advantage positions. • As per D2.7 (M27): The project might suffer tunnel-vision by not considering external experts' perspective (coming from other research or Industrial areas) ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Low* • At D2.6 (M18): *Low + Low* • At D2.7 (M27): *Low + Low* ***Notes in D2.5 (M9):*** In M9, during the initial meeting of the AB, all its members were present and were very excited about the project and actively (one could even say, enthusiastically) provided advice and offered further help. The AB took place in M9 and no indication of risk from this category was raised by its members. ***Notes in D2.6 (M18):*** Further meetings and interactions have taken place with the AB members and the feedback has been immensely satisfactory. ***Notes after the latest execution period: M19-M27*** Another meeting has taken place with AB members alongside a request for getting formal feedback now that developments in enablers and advances in pilot deployment are occurring.	***Mitigation measures:*** The Consortium will monitor AB activities assuring that they are aligned with the project, implementing the adequate procedures. AB membership can be adjusted in case some AB member underperforms. ***Additions in D2.5 (M9):*** COVID-related aspects of these risks, and possible mitigation approaches (including importance of the need of efficient communication) have been discussed during the Kick-off meeting, and have been acknowledged by the partners. So far, no need to elaborate this risk further occurred. ***Additions in D2.6 (M18:*** The second meeting with the AB was co-located with the February 2022 meeting of ASSIST-IoT, and inputs retrieved from the first contact were endorsed as well as new information was provided. Willingness from all AB members to keep proactiveness going, eager to know more about project advances, was experienced. ***Additions after the latest execution period: M19-M27*** Apart from holding the usual yearly meeting (virtual) with the AB members and several exchanges spread across the period, the project has planned the first face-to-face meeting with AB members that will take place in Thessaloniki on April 2023. This should completely prevent this risk from materialising in the project. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.* • At D2.7 (M27): *No symptoms detected.*
Name: Communication issues (identified during the 1st iteration) ***Description:*** Lack of direct (personal) contact (due to COVID pandemics travel restrictions) leads to problems in in-depth	***Mitigation measures introduced in D2.5 (M9):*** Flexible project management structure and project CA allow quick shift of resources to alternate partners, and quick inclusion of new partners in the Consortium, if

understanding between partners. Particularly "dangerous" when partners are involved in "joint activities". ***Potential consequences:*** • As per D2.5 (M9): Delays, extra efforts to be justified. • As per D2.6 (M18): Not reaching on time documentation and software (enablers) delivery, jeopardising further activities. • As per D2.7 (M27): Same as previous periods. ***Likelihood + Severity:*** • At D2.5 (M9): *High + Medium* • At D2.6 (M18): *Medium + Medium* ***Notes in D2.5 (M9):*** COVID-19 increases possibility of materialization of these risks. Moreover, partners may be overburdened by the success/failure related to the COVID pandemics (too many/too few activities). Related also to the next risk. Potential problems related to/originating from lack of personal communication have been discussed during the Kick-off meeting, and acknowledged by all partners. ***Notes in D2.6 (M18)::*** The situation has substantially improved, mobility restrictions are increasingly being removed and physical meetings are again an option (next one to be taking place in Valencia – May 2022). Likelihood shifted to "Medium". ***Notes after the latest execution period: M19-M27*** ***Meetings have been resumed (see R.Mgmt.3). Three official meetings have been conducted besides 1-to-1 partner sessions.***	necessary. All Consortium partners are involved in related areas with more than one staff member, ensuring an immediate substitution. The PC and the TC pay particular attention to the way partners are communicating, and the common understanding is achieved. As a counter-measure, extra teleconferences (involving "handpicked" groups of partners) have been introduced to mitigate effects of materialization of this risk. Positive effects of these teleconferences have been observed. For instance, there are no delays in project schedule, while the quality of deliverables is adequate. However, the very fact that the risk has started to materialise requires extra attention. This risk will be monitored with high level of involvement by the PC/TC and the PCC/PIC, in upcoming months. ***Additions in D2.6 (M18):*** 4th Plenary Meeting (that will be physical) will be hosted in Valencia on 17th, 18th and 19th May 2022 and will count with hybrid option. ***Additions after the latest execution period: M19-M27*** This risk is now overcome as face-to-face meetings are being now held again with (almost complete) normality. ***Status:*** • At D2.5 (M9): *Some symptoms detected. Initial problems in reaching appropriate level of common understanding between WP/Task leaders, and partners involved in these WPs/Tasks, have been observed* • At D2.6 (M18): *Situation has improved with regards to this risk.* • At D2.7 (M27): *This risk can be considered overcome.*
Name: Technical management correlation (identified during the 1st iteration) ***Description:*** Complexity of interrelations between WP4, WP5 and WP6 leads to managerial problems and negatively influences realization of action outcomes. ***Potential consequences:***	***Mitigation measures introduced in D2.5 (M9):*** TC and PC are aware of the potential problems and will pay extra attention to the progress in interrelated tasks. Potential problems related to the need of on time delivery of results to avoid bottlenecks have been discussed during the Kick-off meeting and acknowledged by all partners.

• As per D2.5 (M9): Delays, extra efforts to be justified. • As per D2.6 (M18): Not reaching on time documentation and software (enablers) delivery, jeopardising further activities. • As per D2.7 (M27): Not conducting all planned tests, existing misalignments between enablers, not enough end to end integration evidences. ***Likelihood + Severity:*** • At D2.5 (M9): *High + Medium* • At D2.6 (M18): *Medium + Medium* • At D2.7 (M27): *Low + High* ***Notes in D2.5 (M9):*** COVID-19 increases possibility of materialization of these risks. Moreover, partners may be overburdened by the success/failure related to the COVID pandemics (too many/too few activities). Related also to the next risk. ***Notes in D2.6 (M18):*** This risk has not impacted the project and considering that partners are more used to each other now, likelihood is shifted to Medium. ***Notes after the latest execution period: M19-M27:*** The risk is considered less likely as measurements are being put to ensure alignment. However, the criticality has increased considering that the project has advanced (now, M27) and, in case of materialisation, this risk would imply larger consequences than in the past.	Extra teleconferences (with presence of TC and, possibly, PC) are planned to mitigate effects of materialization of this risk. ***Additions in D2.6 (M18):*** Periodic teleconferences between WP4, WP5, WP6 and WP7 leaders are now taking place. In addition, WP8 has just started and the technical leaders are also keeping constant communication with responsible partners so that WP3 requirements, WP4-5-6 technical deliveries, WP7 testing (in pilot) actions and WP8 measurements via KPIs will be aligned. ***Additions after the latest execution period: M19-M27*** Several measures have been put: • WP4 and WP5 are following mirroring management techniques, so structures are replicated across technical management to ensure partners alignment. • Webinars about how to package and build enablers are being held among packers. • A code-camp was organised and took place on January 2023 for aligning developments, packaging and integration. • All partners have been provided access to a single integration environment (provided by CERTH) so that joint tests are feasible in a proper cloud set up. • There is the firm belief that the extension of the project (if it is accepted) will have a positive effect in terms of testing, integration and overall technical management. ***Status:*** • At D2.5 (M9): *Some symptoms detected.* • At D2.6 (M18): *Less symptoms detected.* • At D2.7 (M27): Less symptoms detected.
Name: Open Call winners reliability (identified during the 2nd iteration) ***Description:*** The Open Call winners end up not being reliable as: (i) to complete their committed works, (ii) to carry out the expenditures of the budget, (iii) to justify their work, (iv) to achieve proper	***Mitigation measures introduced in D2.6 (M18):*** During the evaluation phase, a pre-screening has been performed analysing (among other) the trajectory of the potential winners of the OC as participants of H2020 or similar projects. In addition, a Collaboration Agreement will be drawn (based on DESCA model) and signed (by both parts) between each winner and the Project

successful communication with ASSIST-IoT Coordination or with partners. ***Potential consequences:*** • As per D2.6 (M18): Other (better) participants have been excluded, time from partners would have been lost and further efforts to find other candidates should be put in place. • As per D2.7 (M27): Budget assigned not able to be executed, missed opportunity to increase impact of ASSIST-IoT. ***Likelihood + Severity:*** • At D2.6 (M18): *Low + High* • At D2.7 (M27): *Low + Medium* ***Notes after the latest execution period: M19-M27*** The criticality of this risk has been reduced because Open Call projects are now at the last stages of their execution (M8 out of 9) and two (successfully passed) reviews have already taken place. Thus, their satisfactory completion is closer to be guaranteed.	Coordinator, in which enough articles to ensure responsiveness and reliability will be included. As a corrective action, budget of the OC winners in the 1st call that fall under the prior conditions (if this risk materialises) will be devoted to other participants of the Open Call in the 2nd round. ***Additions after the latest execution period: M19-M27*** Two reviews (initial, for the pre-financing and intermediate, to check real advances) have been performed to all 7 currently running Open Call projects. All of them were passed satisfactorily, having submitted the committed deliverables and showing good progress towards their goals. ***Status:*** • At D2.6 (M18): *This risk is not applicable yet.* • At D2.7 (M27): *No symptoms detected.*
Name: Open Call dependency to ASSIST-IoT assets (identified during the 3rd iteration) ***Description:*** For the Open Call projects to complete their objectives, there might be the compelling need of ASSIST-IoT assets (e.g., enablers, data, pilot premises…) available, that might not be available during their execution timeframe. ***Potential consequences:*** • As per D2.7 (M27): OC projects not being able to be finalised or having to diminished their scope. Incurring in accomplishment of Grant Agreement. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + High* ***Notes after the latest execution period: M19-M27:*** ***It has been materialised in a couple of situations:*** (1) the dire need of enablers put in a globally accessible repository for OC projects to	***Mitigation measures introduced in D2.7 (M27):*** Task T7.2 and task T2.6 are working together to: (i) early identify potential situations in which this can happen and to: (ii) put in place solutions to these cases (***Status:*** At D2.7 (M27): *Some symptoms have been detected.*

use them and (2) projects needed data -labelled images- for training and inference. It was solved thanks to measures put: (1) establishing a GitLab repo for those purposes and (2) pursuing proper persons in the proper entities to gather the data to ensure completion.	
Name: Open Call bureaucracy timing in announcement (identified during the 3rd iteration) ***Description:*** Potential mistakes in announcement of the Open Call 2nd round due to miscommunication in the process. ***Potential consequences:*** • As per D2.7 (M27): Re-opening of the application window of the Open Calls. Winners of OC round 2 not finalising within the active timeframe of ASSIST-IoT. ***Likelihood + Severity:*** • At D2.7 (M27): *High + Medium* ***Notes after the latest execution period: M19-M27*** This risk materialised. The likelihood was, then, high, as it was noticed just after the closing of submission window of Open Calls round 2 due to misalignment on the communication procedure.	***Mitigation measures introduced in D2.7 (M27):*** As this risk was detected, an immediate reaction took place by the Consortium which consisted of augmenting in 2 months the application window opening (till mid January 2023) to comply with bureaucratic procedures. To cope with this consequence of risk materialisation, the mitigation measure put in place was to request a extension of the project (this has been included in the amendment where 5 months of expansion are asked for). This way, OC projects (round 2) would have enough time to complete their actions and contribute to the added value of ASSIST-IoT pilots and to architecture's validation. ***Status:*** At D2.7 (M27): *Risk materialised and mitigation measures are being put.*
Name: Addition of third linked parties (identified during the 3rd iteration) ***Description:*** One of the requests included in the amendment launched in the period is the addition of two linked parties of partner P05 TL. ***Potential consequences:*** • As per D2.7 (M27): This addition implies a series of risks such as: (i) managerial burden of new -even though associated- entities, (ii) proper balance of the workload according to expertise and skills, (iii) financial management of the new period and consolidation • n of figures. ***Likelihood + Severity:***	***Mitigation measures introduced in D2.7 (M27):*** P01 UPV is experienced managing the introduction of third parties from a coordination perspective. A specific task force was created to conduct the whole process of addition of the parties (legal documents to be submitted to validate PIC, LEAR, signatories…) and a special effort is being put under T2.1 to deal with this aspect. Besides, the amendment request included a thoroughly detailed letter with the specific information of the new third linked parties, describing their role, budget, tasks to be devoted to, etc. ***Status:*** At D2.7 (M27): No symptoms detected.

• At D2.7 (M27): *Low + Low*	
Name: Potential risks of a project extension (identified during the 3rd iteration) ***Description:*** The extension of the project may entail risks, considering that it may likely end in March 2024 instead of October 2023. ***Potential consequences:*** • As per D2.7 (M27): The potential consequences of materialisation of this risk are threefold: (i) unbalanced management of budget, settling partners in a position where no further personnel time can be devoted to ASSIST-IoT, (ii) limited resources for attending events after M36 and (iii) potential key members leaving their entities after M36. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Medium* ***Notes after the latest execution period: M19-M27:*** Risk is considered medium in likelihood and severity as it is reasonable that partners may run out of budget if they must devote huge efforts during the reminders of 2023 and beginning of 2024, which may imply leaving relevant finalisation actions unfinished, jeopardising full accomplishment of project goals.	***Mitigation measures introduced in D2.7 (M27):*** First mitigation measure that was put to avoid this risk was to discuss the amendment request (i.e., the extension duration and implementation means) in a face-to-face plenary meeting. In addition, this decision was later ratified by all the consortium following the formal voting procedures and rules as set out in the Consortium Agreement. In addition, once the decision was taken all partners were properly informed so that all partners had been able to devise effort re-distribution plan provided the request would be accepted. Finally, Coordination is continuously updating the Consortium on the status of the amendment approval (every two weeks) so that all partners can prepare with enough time their effort re-distribution. ***Status:*** At D2.7 (M27): No symptoms detected.
Name: Advisory Board plan adjustment (identified during the 3rd iteration) ***Description:*** Initial commitments in the GA included two face-to-face meetings with the AB. As per the COVID-19 applied restrictions, plan was re-structured to only envisage virtual meetings. Now, the plan must be re-scheduled. ***Potential consequences:*** • As per D2.7 (M27): Not keeping GA commitments. ***Likelihood + Severity:*** • At D2.7 (M27): *Low + Low*	***Mitigation measures introduced in D2.7 (M27):*** The plan was re-scheduled and was presented to AB members on the virtual meeting that took place on January 20th, 2023. The new plan will include, at least, one F2F meeting to be conducted in Thessaloniki on April 2023. AB members accepted the plan and committed to keep bringing valuable feedback in the form of recommendations to the Consortium. ***Status:*** At D2.7 (M27): *No symptoms detected.*

Notes after the latest execution period: M19-M27 Risk is considered of low criticality as meetings with the AB are being performed anyway. The only applicable risk is to falling short on face-to-face meetings, now that those can be resumed.	

3.2. Technical risks

Table 3. Technical related risks in ASSIST-IoT

Risk description, comments and potential consequences	**Mitigation measures, corrective actions and status/comments per iteration**
Name: Dynamic market environment (identified since Proposal stage) ***Description:*** The market environment or the user views change making the results obsolete ***Potential consequences:*** • As per D2.5 (M9): Enablers developed become obsolete before even getting out to the "market". • As per D2.6 (M18): Architecture designed in ASSIST-IoT struggles to become a real reference for NGIoT deployments and the orchestrating/deploying approach is no longer sound. • As per D2.7 (M27): Adoption of ASSIST-IoT by external entities (even by own stakeholders) is diminished as new technologies would cover their needs. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + High* • At D2.6 (M18): *Low + Med* • At D2.7 (M27): *Low + Low* ***Notes in D2.6 (M18)::*** As mentioned before, this severity has been reduced as it has been witnessed that k8s and Helm charts are widely used nowadays and are also expected so in the foreseeable future.	***Mitigation measures:*** Robust effort on market analysis in WP2 and development of an appropriate exploitation plan in WP8, including a business analysis, will assure that users' needs and wishes, as well as market trends, are constantly taken into account. ***Additions in D2.5 (M9):*** Assessment based on monitoring performed continuously by the IM. ***Additions in D2.6 (M18):*** A spin-in customer taskforce has been put in place during this period of the project with the goal of defining personae and potential customers. This exercise has helped to realise whether or not the initial requirements are still sound. ***Additions after the latest execution period: M19-M27*** The survey of T8.4 to understand the barriers of ASSIST-IoT adoption has been oriented to minimise this risk, maximizing the understanding of ASSIST-IoT's tool appropriateness. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.* • At D2.7 (M27): *No symptoms detected.*

Notes after the latest execution period: M19-M27 The criticality level has been reduced in this period after realising that the technological choices made for the architecture and instantiation of ASSIST-IoT are accepted by the stakeholders and are aligned with the current trends in the SotA.	
Name: Insufficient testing (identified since Proposal stage) ***Description:*** Not enough testing of technical components, either from a single, isolated perspective and also as parts of a wider system. ***Potential consequences:*** • As per D2.5 (M9): leading to failures, lack of functionality or dissatisfaction by users. • As per D2.7 (M27): Issues with Open Call modules integration and delay of pilots advances. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + High* • At D2.6 (M18): *Low + High* • At D2.7 (M27): *Low + High* ***Notes in D2.6 (M18):*** Some deliverables have been elaborated establishing clearly: • Unit and integration tests per enabler (D6.2) • Joint integration tests with different enablers (D6.2) • Enough documentation per-enabler basis (D6.5) ***Notes after the latest execution period: M19-M27*** Now, integration has started following the guidelines in D6.2. Progresses are being made and a clear structure of packaging, joint testing and end-to-end testing is being applied over the own-managed GitLab instance of the project.	***Mitigation measures:*** Design of adequate testing plan (WP6) taking into account information gathered during design (WP3) and monitoring of technical tasks (WP4 and WP5) should result in avoiding this risk. ***Additions after the latest execution period: M19-M27*** An integration methodology including packaging, public and internal repositories, utilisation of tools like GitLab and, mostly, a practically specified step-by-step DevSecOps methodology is facilitating the integration of the enablers of ASSIST-IoT. ***Status:*** • At D2.5 (M9)*: This risk is not yet applicable as component development, and their testing (according to project schedule) are still to be initiated.* • At D2.6 (M18): *Tests have been just initiated for PoCs of enablers, it is still early to assess the status of this risk in a proper scale.* • At D2.7 (M27): *Tests advancing as expected.*
Name: Self-* and AI mechanisms match (identified since Proposal stage) ***Description:*** Problems with including/using results of machine learning / artificial intelligence in self-* mechanisms	***Mitigation measures:*** For one side, there will be thorough analysis of mechanisms to be implemented in the architecture and, for the other, within the ASSIST-IoT,

Potential consequences: • As per D2.7 (M27): self-configuration of the nodes or the network not really adjusting to the most beneficial scenario for the architecture as a whole. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Medium* • At D2.6 (M18): *Low + Medium* • *At D2.6 (M27): Low + Low* ***Notes in D2.6 (M18):*** Tasks T5.1 and T5.2 are now much more advance, having developed PoCs of diverse enablers. ***Notes after the latest execution period: M19-M27:*** Criticality has been reduced as the application cases of the self-* enablers have been more clearly specified.	three complex pilots with several scenarios will be implemented and thoroughly analysed to prepare a reproducible catalogue of self-* capabilities. ***Additions in D2.6 (M18):*** Bi-weekly telcos are being held between the responsible partners involved in the FL task and the self-* mechanisms in order to align both deliveries (SRIPAS, PRO, CERTH). Stakeholders also partake under request so that their needs are considered in the technical design of the enablers. ***Additions after the latest execution period: M19-M27:*** Technical advance (software development and integration) has been performed considering the whole functioning of the architecture. In addition, tests (specially for self-healing and self-resource allocation) have been performed, delivering promising results. ***Status:*** • At D2.5 (M9): This risk is not yet applicable as use of ML/AI/self-* mechanisms (according to project schedule) is still to be initiated. • At D2.6 (M18): No symptoms detected. • At D2.7 (M27): No symptoms detected.
Name: Selected approaches for enablers (identified since Proposal stage) ***Description:*** The different technologies selected for the development of enablers might not be the better ones. ***Potential consequences:*** • As per D2.5 (M9): Incompatibilities could exist if this exercise is n not well supervised. • As per D2.6 (M18): Too many encapsulation exceptions could appear. • As per D2.7 (M27): Need of re-visiting enabler designs or existence of overlaps, duplicities between technologies. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + High* • At D2.6 (M18): *Low + Med*	***Mitigation measures:*** Special care must be placed on evaluation of requirements and existing solutions for each plane/enabler. A proof of concept, based on a technology, can be created if its capacity is not fully understood. ***Additions in D2.6 (M18):*** In order to mitigate this potential risk, the technical partners adopted two additional measures: • Design of a "template" per enabler in which the technologies, libraries and API methods selected for that enabler (and its inner components) were to be described. • Explain in several meetings (bi-weekly WP4 and WP5 teleconferences) to the rest of technical partners and also to the whole Consortium (in Plenary meetings) the chosen technologies. That way,

• At D2.7 (M27): *Low + Low* ***Notes in D2.6 (M18)::*** All tasks in WP4 and WP5 are now much more advanced, having developed PoCs of diverse enablers and this risk has not materialised. ***Notes after the latest execution period: M19-M27*** Criticality and likelihood are now reduced to the minimum as the design of the enablers was closed, the development is almost finished and are being currently integrated following DevSecOps and architecture guidelines.	if anyone detected any incompatibility (or would like to suggest a better choice), this could be identified in advance. ***Additions after the latest execution period: M19-M27*** The following actions have been added in this period to prevent this risk from happening: • Mirroring management, design, execution, encapsulation and testing procedures for all enablers, establishing a parallel WP4 and WP5 execution. • Leveraging as maximum as possible existent artifacts (e.g., Helm charts already defined, well consolidated tools and images…) ***Status:*** • At D2.5 (M9): *This risk is not yet applicable as realization of enablers within pilots (according to project schedule) are still to be initiated* • At D2.6 (M18): *No symptoms detected*. • At D2.7 (M27): *No symptoms detected*.
Name: Data standardization and interoperability (identified since Proposal stage) ***Description:*** The project has committed to be active in regards to standardization. In addition, the achievement of data interoperability in the to-be reference architecture for NGIoT is one of the most ambitious challenges. ***Potential consequences:*** • As per D2.6 (M18): Misalignment with current standardization trends and technology, redounding in future (potentially uncomfortable) needed changes to the technical provisions. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Low* • At D2.6 (M18): *Low + Low* • As per D2.7 (M27): *Low + Low* ***Notes in D2.5 (M9):***	***Mitigation measures:*** A specific task devoted to data interoperability has been envisioned to avoid this risk, and to create the most adequate data standardization, in order to homogenize the information provided by each pilot ***Additions in D2.5 (M9):*** A number of activities, involving data interoperability, have been envisioned within the project. Moreover, a number of activities related to various aspects of standardization have been already undertaken. Hence, due to the direct involvement in these and, hence, awareness of existing standards, potential problems related to interoperability and data standardization can be avoided. ***Additions after the latest execution period: M19-M27*** A specific effort has been put to contribute to standards by the side of pilot execution. From Pilot 1 perspective, TIC4.0 is being tackled as the main reference initiative to standardise tools and data models related to maritime

Project actively participates in CSA activities related to standardization. Moreover, one of members of the AB leads IEEE SAB and promised active help in standardization efforts. ***Notes in D2.6 (M18):*** Deliverable D9.3 reports about the standardization-related activity by the partners. ***Notes after the latest execution period: M19-M27*** WP9 is keeping its advance at a healthy pace, including the involvement of partners in task T93.	port terminals. On pilot 2, a specific contribution has been made to a CEN/TC standard. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.* • At D2.7 (M27)*: No symptoms detected.*
Name: Security, privacy inline with the market (identified since Proposal stage) ***Description:*** Security, privacy, and trust design decisions are not aligned with the IoT market and standard trends, potentially causing the need of future improvement of the enablers. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Medium* • At D2.6 (M18): *Low + Medium* • As per D2.7 (M27): *Low + Low* ***Notes in D2.5 (M9):*** Based on analysis performed by pertinent partners (CERTH and 21SEC) and Innovation Manager ***Notes in D2.6 (M18)*** DevSecOps methodology, as well as definition of security and privacy enablers have advanced in the period M9-M18. ***Notes after the latest execution period: M19-M27*** Criticality and likelihood have been diminished after considering the appropriate tool selection that has taken place during this period.	***Mitigation measures:*** DevSecOps has been selected as the development methodology, in order to guarantee that security, privacy and trust are considered and in line with the market. Additionally, link with security agents will be kept as part of the impact. ***Additions in D2.6 (M18):*** DevSecOps methodology has been defined. ***Additions after the latest execution period: M19-M27*** A series of de-facto standards mechanisms and tools have been decided to be used in diverse parts of the projects to align ASSIST-IoT security and privacy with the market: • SAST/DAST tools • Usage of own instance of GitLab • KeyCloak and orbiting tools for identification management and authorization • Usage of OAuth2 • Usage of judiciously selected features and modules of HyperLedger Fabric. Status: • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected.*

Name: Transversal enablers concept (identified during the 2nd iteration) ***Description:*** Lack of understanding of the concept of transversal enablers by stakeholders. The role of transversality (crossing planes) and functionalities that should be provided may be confusing to the potential end user. ***Potential consequences:*** • As per D2.6 (M18): Lack of application and/or problems in applying transversal enablers by users of ASSIST-IoT solution, as well as identifying which transversal enablers are needed for each pilot. • As per D2.7 (M27): Lack of accuracy on the integration of Open Call external modules or delays in the pilots execution. ***Likelihood + Severity:*** • At D2.6 (M18): *Low + Moderate* • *At D2.7 (M27): Low + Low* ***Notes in D2.6 (M18):*** Whereas the concept of horizonal enablers is quite intuitive, the idea and justification of transversal (or, better, vertical, as used in ASSIST-IoT) enablers is harder to understand. ***Notes after the latest execution period: M19-M27*** The likelihood and overall criticality has been relaxed as the concept has been more naturally accepted when the vertical enablers have started being applied to specific use cases (e.g., manageability).	***Mitigation measures introduced in D2.6 (M18):*** Providing a comprehensive documentation and usage examples e.g., in the context of pilot applications. A complete Wiki page per each enabler (Readthedocs of the project) has been created that is continuously updated. Conducting integration between enablers and application of transversal enablers in pilots to verify and justified functionalities provided by them. ***Additions after the latest execution period: M19-M27*** Internal webinars for explaining the evolution of transversal enablers (i) development status and (ii) application. In addition, specific sessions in the meetings have been created to discuss the status of the enablers. A code-camp was organised in Bilbao in January 2023 where the technical members (mostly, software developers) by ASSIST-IoT partners clarified the potential misalignments and boosted the joint testing of both horizontal and transversal enablers. ***Status:*** At D2.6 (M18): *Some symptoms detected but mitigation measures as well as communication with all stakeholders seem to be working.* At D2.6 (M18): *Symptoms have ceased.*
Name: Delays in enabler (software) development (identified during the 2nd iteration) ***Description:*** Delay in releasing PoCs and next versions of enablers may negatively impact integration activities and pilots implementation. ***Potential consequences:*** • As per D2.6 (M18): Delays in project execution, jeopardising the integration activities and unit and joint tests. • As per D2.7 (M27): Lack of accuracy on the integration of Open Call external modules or delays in the pilots execution. ***Likelihood + Severity:***	***Mitigation measures introduced in D2.6 (M18):*** Monitoring on task and WP level. Reporting on any problems and risks as soon as they are identified. Keeping Enablers status spreadsheet up-to-date. Organizing periodic telco on tasks and WP level. Having tasks registry with current statuses. Defining a series of “essential” enablers, first ballot artifacts that are considered top priority and that will be present in any ASSIST-IoT deployment. These enablers are prioritised whenever delays or blockages are a threat. Also, a global prioritisation structure has been created. This way, the most prioritised enablers will be given preference and their integration-deployment will be more protected.

• At D2.6 (M18): *Moderate + High* • *At D2.7 (M27): Low + Moderate* ***Notes in D2.6 (M18):*** This risk has appeared in the 2nd iteration as the enablers are advancing at different speeds and this period has been intensive in the development tasks. MVPs are being defined. ***Notes after the latest execution period: M19-M27*** Criticality and likelihood are still a factor but mitigation measures must be carefully observed. The project is now facing a critical stage where the proper delivery of functioning enablers is paramount for the evolution of pilot execution and Open Call projects integration.	***Additions after the latest execution period: M19-M27*** Organisation of a code-camp in Bilbao in January 2023 to foster the advance speed of the enablers. Topics discussed (and clearly moved forward) were: ○ GWEN training with K8s + features discussion. ○ Improvement of Helm charts + tests with Smart Orchestrator. ○ LTSE security. ○ Integration of authentication and authorisation code in clients ○ PUD representation in Tactile dashboard ○ DLT + FL integration. ○ Data pipelines realisation + features of the *Composite services manager (manageability).* ○ Enablers' Tests and integration with GitLab pipelines. Before that, a series of special sessions were organised in the meetings of Valencia and Warsaw to let specialists partners to focus on technical advances on deliverables. This was done through the conduction of parallel work streams in separate rooms during those meetings. ***Status:*** At D2.6 (M18): *Some symptoms detected but mitigation measures proposed above promise to work. A relevant milestone will need to be carefully observed: Pilot deployment with integrated ASSIST-IoT enablers.* At D2.7 (M27): *Some symptoms detected but mitigation measures proposed above have demonstrated their utility to help catch up with schedule.*
Name: Integration issues (identified during the 2nd iteration) ***Description:*** Inconsistencies or incompatibilities while integrating enablers (incompatible technologies, versions, dependencies…) ***Potential consequences:*** • As per D2.6 (M18): Delays in project execution and/or reduced performance. ***Likelihood + Severity:*** • At D2.6 (M18): *Moderate + High* • *At D2.7 (M27): Low + High*	***Mitigation measures introduced in D2.6 (M18):*** Monitoring on WP level. Regular technical meetings to report progress and discuss issues Dedicated testing and integration infrastructure to allow testing in real environment. This has already been put in place, although not completely exploited. ***Additions after the latest execution period: M19-M27*** GitLab system set up and being used with proper folder structure, repository policies, merging mechanisms, packaging guidelines and instructions for all partners. Integration played a major role in the conducted code-camp at M27.

Notes in D2.6 (M18): Although not explicitly mentioned above, it is also possible that "developing and/or testing environments" affect also to this risk. ***Notes after the latest execution period: M19-M27*** Criticality is still high as, in case of materialisation, the consequences could directly impact the work plan. However, alleviation and mitigation measures are being put in place.	***Status:*** At D2.6 (M18): *No symptoms detected. The actual "integration" has not started yet. At this moment, only PoCs of communicating enablers are in places, whereas most enablers have delivered at least a working version. It is expected that this risk might materialise to a larger scale during the next period (M18-M27).* At D2.7 (M27)*: Still some misalignments exist but the risk seems to be under control.*
Name: UC-enablers compatibility (identified during the 2nd iteration) ***Description:*** Use cases may not be developed as already described due to the enablers are not totally developed yet ***Potential consequences:*** • As per D2.6 (M18): Leads to issues in the limited evaluation of the ASSIST-IoT architecture or delays on the pilot deployment. • As per D2.7 (M27): Delays in execution, workplan jeopardised, impossible integration of Open Call projects, lower impact achieved. ***Likelihood + Severity:*** • At D2.6 (M18): *Moderate + Moderate* • *At D2.7 (M27): Low + Moderate* ***Notes after the latest execution period: M19-M27*** The likelihood of occurring of the risk has been reduced, as several measures have been put in place to prevent it from happening. In addition, both pilots and enablers are more mature in their development at this point of the project, and no major issues or incompatibilities have been found.	***Mitigation measures introduced in D2.6 (M18):*** Formalisation and fine-tuning of the use case in accordance with requirements traceability matrix. Multi-round testing and integrations based on RTM. ***Additions after the latest execution period: M19-M27*** All pilots assigned a technical partner associated that has taken over the exercise of mapping ASSIST-IoT enablers to the specific scenarios of the pilots. This has been done in order to ensure a proper translation of the technical knowledge into actual use case needs through the features provided by the enablers. In addition, the fact of launching the amendment that includes a request for 5 months extension of the project has been partially motivated by the possibility of this risk materialising. Provided that this extension will be accepted, the materialisation likelihood is diminished. ***Status:*** At D2.6 (M18): *No symptoms detected.* *At D2.7 (M27): No symptoms detected.*
Name: Isolated enablers (identified during the 2nd iteration) ***Description:*** All the enablers may not be interlinked and worked together under the ASSIST-IoT architecture. ***Potential consequences:*** • As per D2.6 (M18): This may introduce computing delays and dependencies that may negatively affect in ASSIST-IoT architecture.	***Mitigation measures introduced in D2.6 (M18):*** Developing enablers based on the needs of the ASSIST-IoT architecture and interaction with the collaborative enablers Multi-round testing in the phase of enablers integration and mapping of the required enabler per use case ***Additions after the latest execution period: M19-M27***

• As per D2.7 (M27): Some enablers may imply duplicities in technologies (e.g., monitoring utilities, databases, UIs) that might interfere with other enablers scope. ***Likelihood + Severity:*** • At D2.6 (M18): *Moderate + Moderate* • *At D2.7 (M27): Low + Moderate* ***Notes in D2.6 (M18):*** Compatibility issues may occur during the integration phase of the enablers. ***Notes after the latest execution period: M19-M27*** Likelihood has been reduced as the Consortium has been able to organise three specific 2/3 day-long face-to-face technical meetings where the various overlaps have been tackled and corrected.	Apart from the three dedicated face-to-face sessions in which the technical staff of ASSIST-IoT technological partners have shared the technologies used, the code (and/or artifacts) obtained and the tools leveraged, specific integration exercises (pre-and-during pilots) have been conducted in order to identify and correct major overlaps. ***Status:*** At D2.6 (M18): *No symptoms detected.* At D2.7 (M27): *Some symptoms detected but measures have been applied and the risk is under control.*
Name: Encapsulation exceptions (identified during the 2nd iteration) ***Description:*** Some enablers (due to the underlying technologies/libraries that they use) cannot follow the encapsulation rules set out for ASSIST-IoT enablers (k8s, Helm charts...). ***Potential consequences:*** • As per D2.6 (M18): They are not able to be deployed via the smart orchestrator nor can be controlled the same way as the others from the manageability interface. • As per D2.7 (M27): Encapsulation exception make the architecture unfeasible and irrelevant. ***Likelihood + Severity:*** • At D2.6 (M18): *High + Low* • *At D2.7 (M2): Low + Low* ***Notes in D2.6 (M18):*** Examples: MR enabler (HoloLens), and the actual manageability interface (the PUI9-based software is installed as-is in the host that will act as k8s master in the deployment). ***Notes after the latest execution period: M19-M27*** The measures put in place have demonstrated to be effective, and the likelihood and the criticality of this risk have been reduced drastically.	***Mitigation measures introduced in D2.6 (M18):*** As long as they will be reachable from the network and interactable via APIs (this is the real important matter for those enablers), they will be able to be integrated. The first mitigation strategy is to select as much as possible open technologies that had already been tested / used in similar deployment environments as those of ASSIST-IoT (K8s, Helm charts, DevSecOps, etc.). If this is not possible, as a second mitigation strategy, an external service (automated) interacting with such enabler (e.g., MR device) and exposing an API to be reached, is planned. ***Additions after the latest execution period: M19-M27*** During this period, some actions to mitigate the occurrence of this risk have been put in place: • A Helm chart generator has been developed by UPV and made available to all the partners. Thus, encapsulation is easier for al ASSIST-IoT enablers. In addition, the usage of this generator has helped make evidence some misalignments that have been corrected, smoothing the encapsulation process. • Code-camp and meetings have allowed partners to realise the necessities and to generate better alignments between enablers.

Encapsulation is now clearly guided and the exceptions are well covered by the installation script and instructions attached to the architecture.	• An installation script (that includes, whenever necessary, the exceptions) has been developed and tested in multiple environments. ***Status:*** At D2.6 (M18): *Some enablers have already been detected as "encapsulation exceptions". See D3.6. No actual issue has derived from this risk yet.* At D2.7 (M27): *Although two more enablers have been declared as exceptions, the measures put are keeping this risk under control in a very advanced stage of the project.*
Name: Open Call integration (identified during the 2nd iteration) ***Description:*** Open Call winners integration require too much adaptation effort, having to re-design some enablers or to deliver ad-hoc technology, APIs... ***Potential consequences:*** • As per D2.6 (M18): Inner tasks of the project, including development of enablers might be delayed and/or even jeopardised. • As per D2.7 (M27): Jeopardised timing, not achieving final outcomes of OC projects and of ASSIST-IoT. ***Likelihood + Severity:*** • At D2.6 (M18): *Medium + Medium* • At D2.7 (M27): *High + Medium* ***Notes after the latest execution period: M19-M27*** Now, this risk is being materialised as the integration phase of OC projects with ASSIST-IoT is at its peak (for 1st round projects). This risk is now critic.	***Mitigation measures introduced in D2.6 (M18):*** In the Open Call evaluation process, two steps within the whole flow consider the "intervention" of ASSIST-IoT technical partners to ensure that the proposed projects fit the plan and technological approach of ASSIST-IoT. In addition, a specific task in WP7 (T7.4) has been established to work together with Open Call participants. Specially at the beginning of their actions, it will be paramount to align their technical scope (communication protocols, technologies to be using, databases, integration approach, etc.) to minimise the materialisation likelihood of this risk. ***Additions after the latest execution period: M19-M27*** For the 2nd round of Open Call submissions, the descriptions of the architecture, the technologies, inner components of enablers, etc. have been enhanced (this is a preventive measure for this risk not to happen in the 2nd round of OC projects). For the current execution, a special task force (including the technical leader partners of every involved pilot) has been created and put in contact with the OC project entities to smoothen the collaboration. In addition, several actions have been performed to allow software contributions and better cooperation: (i) creating accounts in the GitLab instance of ASSIST-IoT to OC members (including access control per repository), and (ii) creating a public GitLab repository with ASSIST-IoT's enabler artifacts so that OC projects can directly access the necessary outcomes of ASSIST-IoT. ***Status:*** At D2.6 (M18): *This risk is not applicable yet.*

	At D2.7 (M27): *Several symptoms have been detected.*
Name: Natively inclusion of ASSIST-IoT in the GWEN (identified during the 3rd iteration) ***Description:*** There is the risk that the GWEN (prominent hardware outcome of ASSIST-IoT) has problems to natively equip the basic components (essential enablers or required pre-installed deployment frameworks). ***Potential consequences:*** • As per D2.7 (M27): Requires additional effort by partners to adjust the installation of ASSIST-IoT in the GWEN. Eventual technical misalignments and execution delays across the workplan. ***Likelihood + Severity:*** • At D2.7 (M27): *Low + Medium* ***Notes after the latest execution period: M19-M27*** ***T***he first version of the GWEN was able to run Kubernetes framework, but considering the constrained computing resources and its high modularity it was required to ember a lightweight version of the deployment framework and still be accepted as ASSIST-IoT native. There are currently works being done to cope with this risk.	***Mitigation measures introduced in D2.7 (M27):*** Three measures have been put in place during this period in order to alleviate the occurrence of the risk: • Specific incorporation of k3s built-in in the booting SD card of the GWEN was designed and is being put in place. • The first and foremost session of the Code-camp in Bilbao in January 2023 was devoted to analyse this aspect and have all technical partners agree in an approach. • The extension request included in the amendment should favour relax the pressure on the time constraints for achieving such integration. ***Status:*** At D2.7 (M27): *Early symptoms detected at the beginning of the period that are being solved with the proposed mitigation strategy*.
Name: Disparate speeds of advance in enablers (identified during the 3rd iteration) ***Description:*** The enablers are advancing at different speeds, either due to their varying complexity or to the temporal efforts devoted to ones in detriment of the others. ***Potential consequences:*** • As per D2.7 (M27): This might create misalignments in the intercommunication of enablers are might impose a delay in the integrations, thus in the pilots execution. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Low* ***Notes after the latest execution period: M19-M27***	***Mitigation measures introduced in D2.7 (M27):*** Several measures were put in place: - All enablers must comply with the same API for metrics, health, interaction with underlying components, etc. This way, even though those are completed in different moments, intercommunication is guaranteed by design. - Establishment of a detailed roadmap, aligned with pilot necessities, to ensure that the disparate speeds do not affect the pilots execution. - Creation of specific per-enabler GitLab repositories where it is easy to check and control which enablers are being left behind at a quick glance. - Code-camp meeting in M27 to boost the development of enablers, that has helped harmonise the advance status and to identify potential problems or interdependencies.

In early stages of the period (~M19), in several control teleconferences, it was noted that the different speeds may occasion troublesome interdependencies. However, at the end of the period, thanks to the mitigiation measures designed, the risk seems under control	***Status:*** At D2.7 (M27): *Some symptoms detected. Risk under control.*
Name: Questioning of integration success (identified during the 3rd iteration) ***Description:*** Integration efforts (including end-to-end data pipelines) require enablers to be finalised., ***Potential consequences:*** • As per D2.7 (M27): Sterile efforts in integration as there was not enough material to ensure a proper outcome out of the integration. Cascading delays in pilots and impact achievement. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Medium* ***Notes after the latest execution period: M19-M27*** The fact of tackling the previous risk (in the table) by default minimises the likelihood of this risk to take place. This is a very important risk that might be critical for the pilots and the project as a whole, therefore it will be carefully observed during the next execution period.	***Mitigation measures introduced in D2.7 (M27):*** Apart from the previously mentioned measures (code-camp, GitLab, enablers spreadsheet control…), the extension request has been accompanied by a carefully elaborated plan for WP6 deliverables, keeping the need of reporting by M30 and extending the integration time and possibilities till M36. ***Status:*** At D2.7 (M27): *Early symptoms detected. Risk under control.*
Name: Poor performance in end-to-end and/or stress testing (identified during the 3rd iteration) ***Description:*** During the integrated system's testing (i.e., testing the pilots pipelines) the performance of the system is poor/inadequate for the pilot tests to succeed. ***Potential consequences:*** • As per D2.7 (M27): Poor pilot results. ***Likelihood + Severity:*** • At D2.7 (M27): *Low + Medium* ***Notes after the latest execution period: M19-M27*** End-to-end and stress testings are starting to be performed by the time of preparing this deliverable.	***Mitigation measures introduced in D2.7 (M27):*** During the development phase special attention has been given to the performance of the individual modules. In addition, the development teams are actively monitoring the integration activities and will provide solutions and optimizations in any problems that arise. Development teams will provide fixes and/or updates to the individual components to ensure acceptable performance. ***Status:*** At D2.7 (M27): *No symptoms detected.*

Name: Not sufficient data for technical validation (identified during the 3rd iteration) ***Description:*** Several enablers (such as Federated learning enablers) require data from pilots to be validated (i.e., training, proper models, models aggregation…). A slow advance in pilots or the lack of data might damage their validation. ***Potential consequences:*** • As per D2.7 (M27): Incomplete enablers, cascading delays in the workplan execution across the board, less reliable outcomes, thus less potential adoption by internal and external stakeholders. ***Likelihood + Severity:*** • At D2.7 (M27): *Low + Low* ***Notes after the latest execution period: M19-M27*** ***Risk is considered of low likelihood and low criticality as the measures being put in place should cope with the event of not having enough data.***	***Mitigation measures introduced in D2.7 (M27):*** The measures put in place are two-fold: - Enablers that require real data from pilots for a true validation have been clearly identified and priority has been given in pilots' workplan to procure equipment/data sources to ensure proper validation. - A set of emulated (synthetic) data is being generated (aligned with the expected format by the enablers) so that training/validation can start taking place even though real data was not available yet. ***Status:*** At D2.7 (M27): *Some symptoms detected.*

3.3. Pilot risks

Table 4.Pilot related risks in ASSIST-IoT

Risk description, comments and potential consequences	Mitigation measures, corrective actions and status/comments per iteration
Name: KPI computation (identified since Proposal stage) ***Description:*** Unable to measure or compute the KPIs as planned ***Potential consequences:*** • As per D2.5 (M9): Ability to extract information and measures for pilots can be altered. • As per D2.6 (M18): In case the defined KPIs for the pilots cannot be measured, the validation will be incomplete, and the project will not be able to verify the benefits of their developments.	***Mitigation measures:*** Due to unexpected factors, ability to extract information and measures for pilots and the project in general, in order to compute the KPIs, can be altered, thus leading to change and adapting the planning of KPIs calculation. ***Additions in D2.6 (M18):*** D8.1 has included a specific exercise of defining the specific measurement procedure that will be carried out for each KPI (surveys, benchmarking, analysis of results, acceptance methodologies, etc.). Drawing from this, D8.2 should be ready

• As per D2.7 (M27): KPIs not able to be measured, therefore no way to validate the impact of ASSIST-IoT technology. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + High* • At D2.6 (M18): *Low + Medium* • *At D,7 (M27): Medium + Medium* ***Notes in D2.6 (M18):*** It is considered Medium (the severity) as D8.1 has served the good purpose of fine-tuning the KPIs and address the measurement strategies. ***Notes after the latest execution period: M19-M27*** Likelihood and criticality have increased due to the proximity of the project and after the realization of what can actually be done and the final scope of the developed technologies.	to start reporting about those KPIs, while the partners still expect some minor changes in other to accommodate for this risk to not materialising. ***Additions after the latest execution period: M19-M27*** Deliverable D8.2 has been planned and executed in a way that: (1) it already reports the early state of some KPIs (those that are able to be measured, mostly technical), (2) enhance the descriptions of the KPIs and ensure that they are still valid and applicable – and judiciously modify if needed), (3) provide details on the specific plan to be followed to measure the KPIs. The previous should contribute to reduce the likelihood of risk materialisation. In addition, the project extension request can be considered part of the strategy to reduce this likelihood. ***Status:*** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *Some symptoms detected. Actions put in place through D8.1 are expected to overcome the potential materialisation of this risk.* • At D2.7 (M27): *Some symptoms detected and tackled through D8.2.*
Name: Pilot description detail level (identified during the 1st iteration) ***Description:*** Detailed specification of pilots (performed in WP3) leads to realization that some goals / KPI's may be very difficult to reach. ***Potential consequences:*** • As per D2.5 (M9): Potential issues to complete the pilot goals (either too ambitious or too vague to work upon). • As per D2.6 (M18): Insufficient quality for finalising key tasks in the project – T3.2 and T3.3. • As per D2.7 (M27): Erratic execution of pilots in WP7, with major changes compared to the original description. ***Likelihood + Severity:*** • At D2.5 (M9): *High + Medium* • At D2.6 (M18): *Medium + High*	***Mitigation measures introduced in D2.5 (M9):*** Analysis reaching beyond SotA (T3.1), seeking alternative solutions to be able to reach goals / KPI's. Establishing hierarchy of goals to be able to focus on realizing the most important ones (engineering 80:20 rule). Engaging Advisory Board and/or Project Officer and/or Project Reviewers to adjust the goals and KPIs in a way that will be satisfactory to all parties. ***Additions in D2.6 (M18):*** D3.2 has enriched the information that was contained in D3.2, making it more actionable and directly engaging current actions of the pilot owners to finalise the use-cases definition. ***Additions after the latest execution period: M19-M27*** In this period several activities have been performed in order to minimise this risk and for the sake of proper pilot execution:

• *At D2.7 (M27): Low + Low* ***Notes in D2.5 (M9):*** Based on self-assessment performed in M8, jointly by the PC and the TC. ***Notes after the latest execution period: M19-M27*** This period has been characterised by the advance in the pilots. For doing so, specific detailed plans divided in clearly described and reported activities is taking place. This risk is now very well tackled and should not occur nor have consequences in the foreseeable future.	- Thorough description of the activities to be performed in the pilots, based on the business cases and scenarios described in WP3. Here, - Drill down of activities to be performed in the pilots in: procurement, development, integration and validation, listing all the activities to be done with enough detail in D7.2. - Detailed reporting on the advances performed in the period M19-M27 in those sub-activities through deliverable D7.3. ***Status:*** • At D2.5 (M9): *Some symptoms detected.* • At D2.6 (M18): *Less symptoms detected.* • At D2.7 (M27): *Risk should now be overcom*e.
Name: Global chip shortage (identified during the 2nd iteration) ***Description:*** The Global Chip Shortage will probably affect the delivery of procured equipment needed to: (i) produce the GWEN, (ii) carry out on-premise pilots. ***Potential consequences:*** • As per D2.6 (M18): Delays and in the worst case failures on pilots deployment validation. • As per D2.7 (M27): Same consequences as above. ***Likelihood + Severity:*** • At D2.6 (M18): *Medium + Serious* • At D2.7 (M27): *Low + High* ***Notes in D2.6 (M18):*** Project partners are finalising the list of procured equipment that will be used in the pilots' trials. ***Notes after the latest execution period: M19-M27*** Criticality has been reduced as the Consortium has been able to find ways to obtain the necessary semiconductors and equipment in general to produce the necessary GWENs and to carry out procurement activities in the pilots.	***Mitigation measures introduced in D2.6 (M18):*** Flexible pilot procurement strategy, aiming at considering more than a single solution for carrying out pilots' trials At least two alternatives will be considered in order to have the HW on place on time. ***Additions after the latest execution period: M19-M27*** Datasheet was properly modified (CPU, components, capacitors, global layout, etc.) was adjusted in order to ensure more flexibility if the risk occurred. Status: • At D2.6 (M18): *Some symptoms detected.* • At D2.7 (M27): Partners (especially NEWAYS) experienced this risk during several months in the period but were able to gather the material. Thus, the critical phase of this risk has long passed. However, pilots might still be affected if there is the need of modification of any components.

Name: Pilot's KPIs realization (identified during the 2nd iteration) ***Description:*** Detailed specification of pilots KPIs and requirements in WP3 may be very difficult to reach in real deployments in pilots ***Potential consequences:*** • As per D2.6 (M18): Leads to problems in pilot assessment and validation, risking the fulfilment of the expectations of the pilots. • As per D2.7 (M27): Difficults the execution of tasks T8.2, T8.3 and T8.4 during the last stage of the project. ***Likelihood + Severity:*** • At D2.6 (M18): *Low + Moderate* • *At D2.7 (M27): Low + Low* ***Notes in D2.6 (M18):*** Project partners are finalising the list of procured equipment that will be used in the pilots' trials. ***Notes after the latest execution period: M19-M27*** The risk likelihood and criticality has been reduced after the delivery of D8.2.	***Mitigation measures introduced in D2.6 (M18):*** Engaging Advisory Board and/or Project Officer and/or Project Reviewers to adjust the goals and KPIs in a way that will be satisfactory to all parties. Reviewing all KPIs in D8.1, proposing the shift of some of them that seem unfeasible towards other (equally relevant) valid alternatives. The scope of the pilots is not being changed, but rather enhanced with the selection of more fine-tuned validation metrics to check/report. Establishing hierarchy of goals to be able to focus on realizing the most important ones (engineering 80:20 rule) ***Additions after the latest execution period: M19-M27*** Revision of all KPIs in D8.2 including the following information: (i) whether or not the KPI is still valid, (ii) indicating if the target value is still acceptable and (iii) specifying how each KPI is going to be measured (clearing the potential uncertainty depicted in D8.1). ***Status:*** • At D2.6 (M18): *Some symptoms detected.* • At D2.7 (M27): *Less symptoms detected.*
Name: Port cartography (identified during the 2nd iteration) ***Description:*** BS-P1-1 requires the use of port terminal detailed cartography, which was initially assumed it was available but it has been realised that it is not. ***Potential consequences:*** • As per D2.6 (M18): The demonstration of BS-P1-1 would not be as accurate as possible due to not having an accurate provisioning of terminal layout. ***Likelihood + Severity:*** • At D2.6 (M18): *Low + Moderate* • At D2.7 (M27): *Low + Low* ***Notes in D2.6 (M18):*** Project partners are finalising the list of procured equipment that will be used in the pilots' trials.	***Mitigation measures introduced in D2.6 (M18):*** Make use of open-source libraries available online. In case the pilot 1 partners are not able to obtain a very detailed terminal layout GIS map, they will make use of open source ortophotos provider such as OpenStreetMap or Mapbox ***Status:*** • At D2.6 (M18): *The risk that was not identified was realised due to its actual materialisation. With the proposed measures, the impact should be mitigated.* • At D2.7 (M27): This risk is now overcome.

Notes after the latest execution period: M19-M27 The mitigation measures were put in place, and now that the pilot has advanced the risk is considered no longer applicable.	
Name: Port database access (identified during the 2nd iteration) ***Description:*** The port HW infrastructure is currently facing severe overloaded resource conditions ***Potential consequences:*** • As per D2.6 (M18): Until these very demanding conditions are relaxed, ASSIST-IoT development will not be able to be deployed in Pilot 1, or at least at the expected pace. ***Likelihood + Severity:*** • At D2.6 (M18): *Low + High* • At D2.7 (M27): *Low + Low* ***Notes in D2.6 (M18):*** Project partners are finalising the list of procured equipment that will be used in the pilots' trials. ***Notes after the latest execution period: M19-M27*** The mitigation measures were put in place, and now that the pilot has advanced the risk is considered no longer applicable.	***Mitigation measures introduced in D2.6 (M18):*** Act and plan with flexibility on Terminal Infrastructure, designing use cases PoCs and tests with relaxed needs of usage of the actual terminal equipment. Instead of accessing to the Production environment of the port terminal, Pilot 1 partners will set up a pre-production, controlled environment specific for the trials of the project. ***Status:*** • At D2.6 (M18): *Some symptoms detected.* • At D2.7 (M27): This risk is now overcome.
Name: Open Call deployment and pilots (identified during the 2nd iteration) ***Description:*** The proposals from Open Call winners differ too much from the goal of pilots' use-cases, preventing actual added value to be provided. ***Potential consequences:*** • As per D2.6 (M18): (i) Too many roundabouts must be taken, or (ii) ad-hoc infrastructure equipment must be provided for them, or (iii) too much effort is needed to be devoted from ASSIST-IoT stakeholders, deviating their focus from succeeding in the pilot.	***Mitigation measures introduced in D2.6 (M18):*** In the Open Call evaluation process, one step within the whole flow considers the "intervention" of ASSIST-IoT stakeholders partners to ensure that the proposed projects fit the pilots' approach. In addition, the expert evaluators of the Open Call proposals have been specifically instructed to consider the "stickiness to pilot spirit and goals" as a paramount evaluation criterion. ***Additions after the latest execution period: M19-M27*** A specific mitigation strategy has been put in place to ensure that the execution of OC projects is aligned with ASSIST-IoT technology and pilot goals. The strategy consists of:

• As per D2.7 (M27): Same consequences as above, added to potential administrative inconvenient related to payments to external parties (OC projects). ***Likelihood + Severity:*** • At D2.6 (M18): *Low + Medium* • At 2.7 (M27)*: Low + Low* ***Notes after the latest execution period: M19-M27*** This period has been characterised of covering the major part of the OC projects (round 1) execution. During this period, two controls (in the form of reviews of checks) to the OC projects have been applied. This, together with other mentioned measures has helped minimise the likelihood and criticality of this risk.	• Periodic check in the advances of the OC projects ("reviews") in which the execution is evaluated, including stickiness to plan and to ASSIST-IoT views. • Establishment of communication channels and software exchange through GitLab public repositories and GitLab participation by OC projects. ***Status:*** At D2.6 (M18): *This risk is not applicable yet.* At D2.7 (M27): *No symptoms detected.*
Name: Pilot 2 construction site timing (identified during the 3rd iteration) ***Description:*** Due to the contract signed by the construction company (MOW – partner of ASSIST-IoT) with the promoter of the building, the construction works must be finalised by September 2023, which limits the practical time to perform on-field ASSIST-IoT demo site validation activities till July-August 2023. ***Potential consequences:*** • As per D2.7 (M27): Validation activities not ending on time, diminished impact of the pilot, enablers not fully validated on field. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Medium* ***Notes after the latest execution period: M19-M27*** This risk, although controlled till now, it may affect the final validation activities if some enablers are not developed on time.	***Mitigation measures introduced in D2.7 (M27):*** The mitigation strategy is consisting on speeding up those activities in pilot 2 that require the performance of on-site tests in the Warsaw construction works. This is being dealt with properly, as documented in D7.3. In addition, those Open Calls projects to be funded in round #2 will be properly informed that the integration works will not be able to take place in the real pilot site environment due to this constraint. ***Status:*** At D2.7 (M27): The risk has materialised. Partners in pilot 2 are shifting their focus on the practical, validation activities so that to ensure that the pilot is not jeopardised by this fact. For now, the risk seems under control but will need to be followed carefully throughout the M28-M36 period.
Name: Open Call technological dependency and assets provisioning (identified during the 3rd iteration)	***Mitigation measures introduced in D2.7 (M27):*** Specific attention is being put to this risk by partners involved in T7.4. A specific taskforce including project coordination (UPV) and Innovation Managers (PRO) has

Description: Some Open Call projects might require specific assets from ASSIST-IoT partners (e.g., images, data, spaces, connection to software or hardware…). ***Potential consequences:*** • As per D2.7 (M27): This might damage the execution goals and/or rhythm of Open Call projects and potentially disrupt the actions of pilot partners as the retrieval of required assets might consume unexpected resources and efforts. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Low* ***Notes after the latest execution period: M19-M27*** This risk might be repeated along the next periods, as several incidences about required assets could happen at the end of OC projects (round 1 and all the period of round 2).	been set up to deal with these special cases, always supported by the technical lead partner associated to each pilot. ***Status:*** At D2.7 (M27): Some symptoms detected: labelled images of people and machinery in the yard of the port of Malta and construction site personnel and works in SMART SONIA. Both aspects have been dealt with successfully during the period. Therefore, the risk is under control.
Name: Measurement means for KPIs (identified during the 3rd iteration) ***Description:*** The description on how KPIs will be measured is, for some KPIs, not very clear and it might become a problem in later stages. ***Potential consequences:*** • As per D2.7 (M27): Not possible to measure validates nor to compare against targets set. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Medium* ***Notes after the latest execution period: M19-M27*** KPIs is a relevant part of the evaluation of project success (including solution, technologies, pilot approach, adoption, etc.), and not being able to measure them would be critical for the project. However, it is considered medium at this stage as some mitigation measures have been put in place and the WP8 will have enough time to carry out proper technical, pilot and process evaluation strategies.	***Mitigation measures introduced in D2.7 (M27):*** The Deliverable D8.2 aims to provide an update of deliverable D8.1 (Evaluation plan) focused on initial results over technical KPIs as well as updating the evaluation plan and status of all the defined KPIs of the project. ***Status:*** At D2.7 (M27): Some symptoms detected at the beginning of the period. Applied measures to correct them via D8.2.

Name: Target goal of KPIs is too ambitious (identified during the 3rd iteration) ***Description:*** It might happen that the initial KPI target values, as per defied in the proposal, were no longer valid, having been too reaching or falling short to true potential of the project. ***Potential consequences:*** • As per D2.7 (M27): Unfeasible to be achieved (those target numbers) during the lifetime of the project, resulting in poor metrics. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + High* ***Notes after the latest execution period: M19-M27*** The risk is considered medium (and not high) as a first run of checking the target numbers (and adjusting them, if needed) took place in D8.1 before this period. The likelihood of this risk is still medium as, even though D8.2 is completed with another review round, this stage of the project is very relevant for KPIs and some valid KPIs target numbers could turn into difficult figures to reach**.**	***Mitigation measures introduced in D2.7 (M27):*** Deliverable D8.2 has included a review of the validity and soundness of KPI target goals. D8.2 presented a thorough update of all the (five-dimensions structured) KPIs of the project. In this deliverable, technical KPIs have been mainly enhanced in terms of detail, procedures and early evaluation results. Although some measurements have been able to be tackled, the work in WP4, WP5 and WP6 is still on-going and only partial results have been obtained. The results are looking good so far, and now that integration in a common "lab" infrastructure is close to be finalised, data about performance, technical connection between elements and other aspects are closer to be settled. ***Status:*** At D2.7 (M27): No symptoms detected.
Name: Low responses in the adoption measures survey (identified during the 3rd iteration) ***Description:*** T8.4 is carrying out a series of surveys to identify potential barriers of adoption of ASSIST-IoT technologies. ***Potential consequences:*** • As per D2.7 (M27): Reduced impact outreach. ***Likelihood + Severity:*** • At D2.7 (M27): *Medium + Low* ***Notes after the latest execution period: M19-M27*** This risk might materialise as ASSIST-IoT partners do not have total control of the potential answers received to the forms, however, lessons learned make this risk considered of low criticality.	***Mitigation measures introduced in D2.7 (M27):*** The following mitigation measures have been put in place: • Thoroughly analysed plan of surveys in order to minimise overburdening requests to potential responders. • Enhanced communication campaigns to ensure proper outreach. • Extension of the timeline of the project so that the answering windows are larger. ***Status:*** At D2.7 (M27): No symptoms detected.

3.4. Impact risks

Table 5.Pilot related risks in ASSIST-IoT

Risk description, comments and potential consequences	Mitigation measures, corrective actions and status/comments per iteration
Name: Lack of interest (identified since Proposal stage) ***Description:*** Lack of interest in the project results by external stakeholders. ***Potential consequences:*** • As per D2.5 (M9): Lead to problems in applying successfully the impact plans and meeting the set KPIs • As per D2.7 (M27): Not meeting the KPIs expected related to impact and process evaluation. ***Likelihood + Severity:*** • At D2.5 (M9): *Low + Low* • At D2.6 (M18): *Low + Low* • *At D2.7 (M27): Medium + Low* ***Notes in D2.5 (M9):*** Based on responses to the result dissemination as performed within the scope of WP9. ***Notes in D2.6 (M18):*** All events organised by the project (Webinars, surveys with stakeholders, Open Call landing acceptance, etc.) have been reasonably followed by the community and all KPIs are under control. ***Notes after the latest execution period: M19-M27*** Likelihood has been augmented due to the proximity of the end of the project. A series of KPIs are expected that require formal/informal involvement by potential adopters, that might need time and additional explanations.	***Mitigation measures:*** Targeted dissemination and communication plans focused mainly on industry and academia will be provided, elaborating further the core ASSIST-IoT impact plans (D9.2), for raising external stakeholders' awareness and increasing interest in results ***Additions in D2.5 (M9):*** They will be systematically evaluated and adapted (through upcoming WP9 deliverables), to assure successful results sharing and impact. ***Additions in D2.6 (M18):*** Closely following, executing and adapting the impact plans described in D9.2. New, updated content is being continuously generated and communicated through all ASSIST-IoT channels on a daily basis. Quarterly issued ASSIST-IoT Newsletter is communicated through website and ASSIST-IoT social media channels addressing 1000+ website visitors and social media followers. Interaction with other projects is continuous through events, associations and impact task forces. ***Additions after the latest execution period: M19-M27*** Taking advantage of the amendment request to adapt the plan to ensure proper coverage of external adopters actions. In addition, an enhanced description was requested to all partners and has been included in D8.2, clearly detailing the plans for accomplishing the KPIs and increasing the impact and potential interest of adopters. **Status:** • At D2.5 (M9): *No symptoms detected.* • At D2.6 (M18): *No symptoms detected. KPIs are meeting expectations in global lines.* • At D2.7 (M27): *No symptoms detected.*

Name: Underperformance in scientific dissemination (identified during the 1st iteration) ***Description:*** There is the risk that the project will fall short in achieving KPIs of scientific dissemination (e.g., 38 total publications by M36). ***Potential consequences:*** • As per D2.6 (M18): Less dissemination capacity, reduced impact outreach, weaker scientific baseline for further research. ***Likelihood + Severity:*** • At D2.5 (M9): *High* + *Low* • At D2.6 (M18): *High* + *Low* • At D2.7 (M27): Low + Low ***Notes in D2.5 (M9):*** Based on self-assessment performed in M8, jointly by the PC and the TC. ***Notes in D2.6 (M18):*** This risk is the second one that has started to materialise. It has been spotted and is being monitored by the PC/TC and T9.2 leader. ***Notes after the latest execution period: M19-M27*** Likelihood has been drastically reduced as several conference and journal papers have been published or have been produced and are under publication review.	***Mitigation measures introduced in D2.5 (M9):*** Due to the COVID-19 a number of potential target conferences did not materialise (e.g. they were postponed or did not happen). Moreover, participation in online conferences has considerably lover impact in comparison with on-site conferences. Moreover, due to the, above mentioned, communication issues, resources have been devoted to delivery of core results, rather than dissemination-related activities. This problem has been spotted during M6 project review. In M9, the situation in this area is much better and it is still possible to "catch-up" with scientific dissemination; e.g. because travel resources have been preserved due to COVID-imposed travel restrictions. ***Additions in D2.6 (M18):*** The creation of "Technical Reports" has been enhanced, uploading to project's website any scientific article created even though it has not yet been accepted or published (pre-print). Attending conferences/workshops and making ASSIST-IoT presentations remain a top activity even in virtual format. In M18, the situation in this area is much better and from now on it is expected that scientific dissemination events will be resumed, where ASSIST-IoT presence is foreseen (e.g., IoTWeek2022, EU-IoT Hackathon, TRA2022). ***Additions after the latest execution period: M19-M27*** T9.2 created a specific workforce group to organise the preparation of scientific articles. This was agreed on 5th Plenary Meeting and a control has been conducted every month on periodic telcos and also in F2F plenaries (e.g., Warsaw in M24). ***Status:*** • At D2.5 (M9): *Some symptoms have been spotted in M5-M8 and counter-measures applied.* • At D2.6 (M18): *Situation is much better and more events and special issues are being tackled.* • At D2.7 (M27): *Situation has improved enormously. This risk is almost overcome.*

Name: COVID-19 impact for dissemination (identified during the 2nd iteration) ***Description:*** COVID-19 restrictions related to travelling and organisation of physical events ***Potential consequences:*** • As per D2.6 (M10-M11): COVID-19 may continue to restrict travelling and organisation of physical events, affecting in this way the impact activities of the projects (mainly the ones related to scientific dissemination and f2f communication through physical attendance of scientific events, workshops, exhibitions etc.). ***Likelihood + Severity:*** • At D2.6 (M10-M11): *Moderate + Moderate* • At D2.6 (M18): *Low + Moderate* • *At D2.7 (M27): Low + Low* ***Notes after the latest execution period: M19-M27*** Face-to-face meetings have been resumed in ASgSIST-IoT. Two plenary meetings (Valencia, Warsaw) plus a code-camp meeting (Bilbao) have been organised alongside partner-to-partner specific meetings.	***Mitigation measures introduced in D2.6 (around M10-M11):*** Alternative types of communication and dissemination activities will continue to apply (as already done during the first period of the project) i.e participation in virtual events, use of digital content for enhancing communication. Impact activities will continue through participation in activities and events organised virtually. Most type of events offered a virtual type of organisation during the last two years. If physical events are not resumed, all partners will continue creating impact through digital channels and means ***Additions after the latest execution period: M19-M27*** Meetings have been organised and conducted ***Status:*** • At D2.6 (M10-M11): *Not possible to perform on-site dissemination. The risk is materialising.* • At D2.6 (M18): By the time of closing this deliverable (D2.6 – M18), the situation with travelling and physical events is little by little resuming the pre-pandemic scenario, therefore the likelihood of this risk has been reduced to Low • At D2.7 (M27): *This risk is considered overcome.*

4. Conclusions

After M27 of the projects, a reasonable amount of risks has been identified (in already-conducted three iterations) and tackled appropriately. Following the 4-steps strategy outlined since the beginning of the project, those that have materialised have been mitigated applying proper measures.

In general, several risks have shown symptoms and others have directly occurred, affecting to disparate extents the whole list of risks and potential cascading delays. However, the measures indicated have demonstrated to be efficient as no major disruption has been registered.

The most remarkable aspect of the risk management in the period M19-M7 has been the launch of a request for an amendment to the Grant Agreement that includes an extension of 5 months to the project duration. This has been motivated by the detection of several risks (under the scope of task T2.2), therefore it can be considered the main mitigation strategy (in advance) for both administrative, technical, pilot and impact risks.

This document will have a continuation in M36 (D2.13) if the amendment request is accepted.