CELL-INTEGRATED SENSING FUNCTIONALITIES FOR SMART BATTERY SYSTEMS WITH IMPROVED PERFORMANCE AND SAFETY

GA 957273

D7.2 - INITIAL QUALITY ASSURANCE AND RISK MANAGEMENT PLAN

LC-BAT-13-2020 - Sensing functionalities for smart battery cell chemistries

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Document history

Table 1 indicates the document history, in order to keep track on the different modifications and improvements included during the project.

Table 1. Versioning of the Data Management Plan document

Version	Date	Beneficiary	Author and modification
0	18/02/2021	IKERLAN	Iñigo Gandiaga
0.1	22/02/2021	IKERLAN	Iñigo Gandiaga. The document has been updated after the reviewing process by UNR.
1	24/02/2021	IKERLAN	Iñigo Gandiaga Final version after last review by ABEE and UNR. Submission to EC portal.

Summary

As detailed in the Annex I of the Grant Agreement, the initial Quality Assurance and Risk Management Plan, on one hand, serves as the basis to ensure high quality in all developments of the SENSIBAT project, from demonstrator to deliverables. On the other hand, it establishes the necessary means to identify the potential risks, estimate the impact and the probability of them and then define the corresponding response. All SENSIBAT consortium members will participate in the peer review of deliverables and risks management.
There are no deviations from the description of this deliverable as given in Annex I of the Grant Agreement

The Risk Management Plan is a living tool which is continuously updated throughout the duration of the project to monitor known risks, identify new risks and, when necessary, respond appropriately to them. As part of the Risk Management Plan, a risk register has been developed based on the identified risks, which will be updated with the risks that are identified during the project. This registry is supervised and discussed by both the Executive Board and the General Assembly.

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Abbreviations

Symbol / Abbreviation	
EB	*Executive Board*
EIS	*Electrochemical Impedance Spectroscopy*
EV	*Electric Vehicle*
DOW	*Description Of Work*
GA	*General Assembly*
IPR	*Intellectual Property Rights*
SOC	*State Of Charge*
SOE	*State Of Energy*
SOH	*State Of Health*
SOP	*State Of Power*
WP	*Work Package*
WPL	*Work Package Leader*

1 Introduction

The deliverable D7.2 is one of the outcomes of task "T7.2 – Technical Coordination" and the initial output of the subtask 7.2.4. At the final phase of the project this deliverable will be updated and reviewed by the Project Coordinator (IKE): with the support of the Technical Project Support Team (ABEE) to create the "D7.4 - Final Quality Assurance and Risk Management Plan" with all the identified risk during the project, their impact, and the given response.

The Project Coordinator (IKE) is responsible for technical coordination, quality assurance and risk management throughout the project. This deliverable defines how to monitor the quality and risk of the various work packages and tasks. When necessary corrective actions will be taken including potential work reallocation which will be coordinated by the Project Coordinator and agreed by the Executive Board consisting of all WP leaders.

The Quality Assurance Plan will establish a procedure to ensure the quality of the deliverables, including the flow of information, timeline to meet the deliverable deadlines and peer review matrix. All SENSIBAT consortium members will participate in the peer review of deliverables. Additionally, it will address the processes in place in SENSIBAT to assure the scientific/technical quality of the work and the quality of the administrative processes.

The Risk Management Plan aims at identifying the risks that may affect the predefined evolution of the project, it will analyse the probability that the risk will become reality and its impact on the project, Finally, it will define a contingency plan for each risk. The Risk Management Plan will be monitored by the Executive Board and General Assembly. During the proposal phase the risk management has already been started by establishing a risk-contingency-plan. To identify and minimise project risks, a continuous process for risk management will be carried out throughout the whole project. In the end of the project, the "D7.4 - Final Quality Assurance and Risk Management Plan" will collect all the identified risks and the details to manage them.

Both the Quality Assurance and Risk Management Plan should be complimentary with respect to the other Deliverable reports, in particular to Deliverables "D7.1 - Project Handbook", "D7.3 – Initial Data Management Plan" and "D6.3 – The Dissemination and Exploitation Plan". Furthermore, all the partners have signed a Consortium Agreement, in which all relevant issues necessary for the proper execution of the project are described in detail including the rights and obligations amongst themselves.

2 Risk Management

As described in the deliverable D7.1 (Project Handbook), the probability of a situation that may suppose a risk to the SENSIBAT project is high as it is a high content of innovation and research project. Therefore, it is essential to have an effective Risk Management Plan that allows Project Coordinator and all participants to identify any potential risks to the project, estimate the impact of them and the probability of them happening, and then define responses.

It should be noted that the potential outcome of a risk, a moment of uncertainty for the project, can be either positive or negative. Thus, the objective of a risk management plan is to identify those uncertainties and manage them aiming at both minimizing the negative effect and maximizing the positive impact to the project.

As in any other project, the consortium that forms SENSIBAT assumes some element of risk, but even though it is a project with a high content of innovation, the main objective of the Risk Management Plan is to carry out the most accurate management and monitoring of risks that have the potential to impact the outcome of the project.

2.1 Methodology

The Risk Management Plan of the SENSIBAT project follows five steps (risk identification, analysis or evaluation, plan definition, continuous monitoring and respond) which together form the "circle" of risk management. The designed Risk Management is not a linear path, as it is needed to deal with unknowns, the Risk Management Plan will be a living document and conceived as a circle.

Figure 2-1 SENSIBAT Risk Management Circle

This Risk Management Plan deals with four types of uncertainties:

• Technological risks: As it is a novel project, the first risks that arise in the minds of researchers are risks related to the technology being used, its performance and quality.

• Partnership risks: the risks associated with tasks dependencies or collaborative objectives are categorized as partnership risks.

• Management risks: all risks related to the non-technical coordination of the project (planning, budget, resources, or communication) are classified as management risks.

• External risks: risks that come from other projects, market, or any other risk that may impact on the expected evolution of the project.

2.1.1 Identify potential risks

At the beginning of the project and periodically, the potential risks that SENSIBAT project is facing will be identified.

The risk identification process will be composed of three types of information sources. First, in order to identify as many potential risks as possible, the Project Coordinator, with the support of the Technical Project Support Team (ABEE) will establish interviews with key project partners, WP leaders and Advisory Board members. Additionally, the Project Coordinator will follow a checklist created in previous projects to identify mainly partnership, management, and external risks. Finally, risks will also be identified via the internal reporting and deliverables, and (continuously) by Task leaders and WPLs.

Once the risks are identified, a The Risk Management Register table will be filled (each identified risk will have a Risk Number) which will serve as base to document, categorize and group them to find common responses. ABEE, with the help of the Project Coordinator, will ensure that all identified risks and input regarding these risks (see following sections) are documented in the Risk Management Register table. More details on The Risk Management Register table can be found in Section 2.2.3.

2.1.2 Risk evaluation

Once the risk is included in the Risk Management Register table, each risk will be further evaluated, analysing the probability of happening and the effects or potential consequences if that hypothetical situation takes place, together with the resulting impact on the project. Risk evaluation will be done by the person responsible for the risk (see Section 2.1.3.1), supported and monitored by ABEE and the Project Coordinator. The result of this evaluation will be documented in the Risk Management Register table.

The risk probability is the chance that a risk will occur in the lifetime of the project. Three risk likelihood categories are defined.

Table 2. Probability of risk occurrence

Probability of risk occurrence	Description
High – 1	*Risk event more likely than not to occur*
Medium – 2	*Risk event may or may not occur*
Low - 3	*Risk event not expected to occur*

The effect of risk is the impact of the risk in the project's progress. It is classified in three levels.

Table 3. Effect of risk

Effect of risk	Description
High – 1	*The project's continuity would be affected, or the project main outcomes may be altered. Usually, there would be a need of changing the project contract.*

Effect of risk	Description
Medium – 2	*The risk has a significant impact on the project evolution, but it is perceived that the objectives will be still achieved. Possibly a delay would be needed.*
Low - 3	*The effect on the project is negligible, e.g. shift of budget or tasks between partners.*

The priority of each risk can be well-defined like the product of probability and effect. A preliminary analysis of SENSIBAT project risks will be done using a risk assessment matrix with the objective of prioritizing them. The risk assessment matrix shows how dangerous for the project certain risks are and how critical a response is needed.

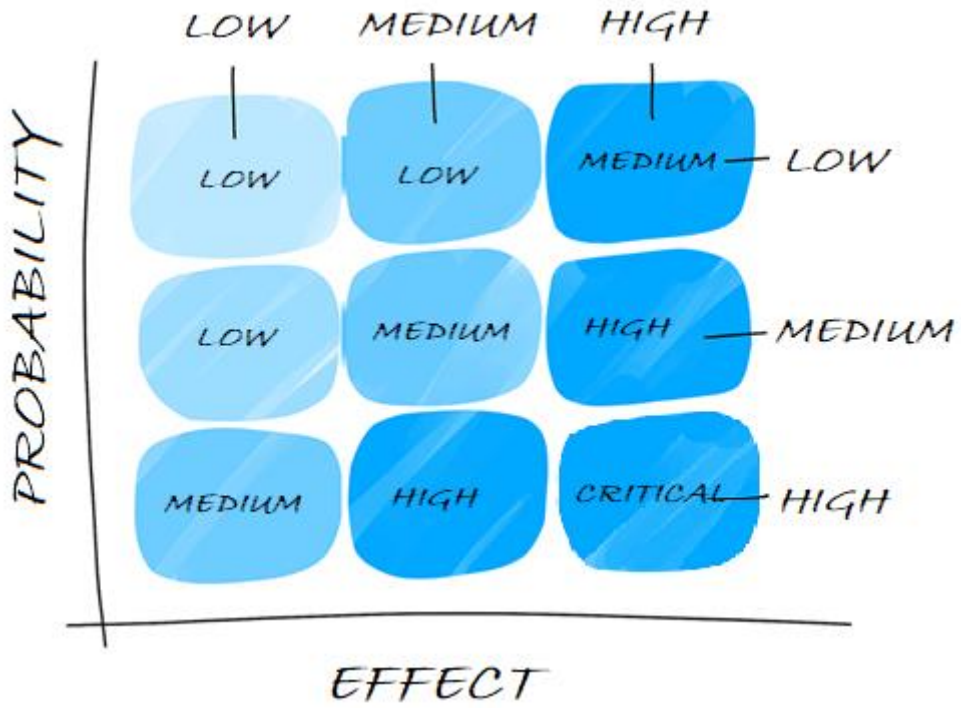

Figure 2-2 SENSIBAT Risk Assessment Matrix

2.1.3 Plan

In this step, plans are developed for management of the specific risk, as well as contingency plans.

2.1.3.1 Responsible

Once the risk is identified a responsible person will be assigned and the risk will be documented in the Risk Management Register table. Assigning the responsible partner will be done by the involved partners, WPL, ABEE and the Project Coordinator. The designated responsible will oversee the evolution of the risk and decide how to handle with it, and report to the Project Coordinator.

Although each risk is assigned to a single person or project partner, it must be visible to all consortium partners, which is done through the Risk Management Register table (see Section 2.2.3). In this way, the entire project is aware of the risks to be monitored and in case of detecting any indication that could cause any change in an identified risk, know who to contact.

2.1.3.2 Prevention plan

The objective of having a prevention plan is not only to avoid the risk, but to prepare the project minimize its impact.

Within the prevention plan, three strategies have been defined to manage a risk before it happens: (i) try to avoid it, (ii) define a strategy to reduce the effect of the risk in the project, and (iii) accept the possibility that the risk situation arises and assume its impact on the project.

Work Package Leaders and the person responsible for each risk must jointly define in advance which preventive strategy to follow. This will be documented in the Risk Management Register table.

2.1.3.3 Contingency plan

Once the prevention plan is carried out, a contingency plan must be defined in the cases in which it has been decided to accept the option that the identified risk may affect the project. So, this will be done mainly with risks that have a high priority and a high effect in the project, but without an obvious solution.

The contingency plan defined by and risk responsible and Work Package Leaders will be defined in four steps: (i) Identify resources that can be used, (ii) define which people or organization contact in the event of a risk situation, (iii) propose a work plan to minimize the possible impact and (iv) establish a plan to oversee the factors that may activate the identified risk. The contingency plan for each risk will be documented in the Risk Management Register table.

2.1.4 Monitor

The person or partner assigned to each identified risk will oversee tracking it together with the Work Package Leader. On one hand, the current risk situation must be continuously updated in the developed Risk Management Register table. On the other hand, the Project Coordinator will manage to ensure that the project members are aware of the updated status by ensuring updating of the Risk Management Register. Furthermore, as mentioned above, this Risk Management Register table will be a living document that must be updated each time new risks arise, or current ones evolve and change.

2.1.5 Respond

The specific risk management plan is put into action when the monitoring step has shown the need for this. The person assigned to each identified risk together with the Work Package Leader will take actions to prevent the risk from happening full force or to avoid undesired consequences of the risk.

2.2 SENSIBAT Risk Management Plan

In this section the specific aspects of how the defined Risk Management will be implemented in the SENSIBAT project is explained.

2.2.1 Roles and responsibilities

All project partners are required to participate in the identification of the project risks especially Task and WP leaders, and to give input to the reports concerning those risks. The risks must be defined, reported, and monitored through The Risk Management Register table, indicating its risk probability, effect, type of risk, prevention plan, contingency plan and responsible partner and in what period of the project the risk is valid and should be monitored.

The Project Coordinator (IKE) with the support of the Technical Project Support Team (ABEE) will supervise the identified risks and will advise the assigned responsible partner and/or Work Package Leader (WPL) if necessary.

If the risk exposure is excessive or critical, the Project Coordinator is responsible for raising the issue during the Executive Board and Consortium meetings (i.e. General Assembly). In that case, the contingency plan must be established through a consensus decision process, and it may require the involvement of the Project Officer and all the partners.

Summarizing, the roles and responsibilities in risk management are:

-Project partners: with the objective to identify as many risks as possible, it is essential that all project partners participate in the identification of the project risks and give input to The Risk Management Register table reporting potential risks to their WPL or Project Coordinator.

-Task Leaders: will identify and report risks to their Work Package Leader (WPL).

-Work Package Leaders: will identify, as every partner, and collect risks for their WP. In addition, WPL will consolidate risks and assign a responsible for each of them (with the support of Project Coordinator and the Technical Project Support Team). WPL and risk responsible will develop prevention strategies and contingency plans for their risks on WP (Work Package) level. Work Package Leaders will report potential risk factors to the Project Coordinator and to other WPLs via the Executive Board. WPLs will be responsible to monitor risks for their WP and take actions if needed.

-Risk responsible: will develop prevention strategies and contingency plans for each risk with the help of WPLs. Risk responsible will also monitor assigned risks and take actions if needed.

-Project Coordinator (IKE): with the support of the Technical Project Support Team (ABEE) is responsible for the risk management of the whole project. Identifies risks, develops prevention plans, monitors risks and reports risk status in the periodic progress reports to the European Commission (EC), including planned prevention measures.

-EB and GA: the status of risks will be evaluated every Executive Board and General Assembly meeting, and each half year as part of the internal project reporting. As can be concluded from the above, the role of the EB in risk management has been changed compared to the DoW.

2.2.2 The Risk Management Register

Each risk is listed in The Risk Management Register that is presented below and is available on METT, the online management platform used in the SENSIBAT project. Work Package Leaders are expected to collect feedback from the partners involved in their tasks, revise and if necessary, update The Risk Management Register before each Executive Board and General Assembly meetings or when requested by Project Coordinator.

Table 4. Probability of risk occurrence

Risk No.	***WP***	***Descrip-tion***	***Type of Risk***	***Probabilit y***	***Effect***	***Priority***	***Preventi on plan***	***Contingency plan***	***Respons ible***	***Pe-riod***
XX	***WPx***	*Describe the risk here and, when relevant, refer to the section with related text in the deliverable*	*Indicate type: Tech = Technologica l, Part = Partnership, Mana = Management , Ext = External*	*Indicate the level 1 = High 2 = Medium 3 = Low*	*Indicate the level 1 = High 2 = Medium 3 = Low*	*Indicate the level Critical High Medium Low*	*Give a descriptio n how to avoid the risk and reduce the effect*	*Identify resources, propose a work plan to minimize impact and to oversee the factors that may activate the risk*		

2.2.3 Preliminary Foreseen Risks

The Risk Management Plan has already been implemented in the first six months of the project, as a result in addition to the first 11 risks which were included in the proposal of the SENSIBAT project, several risks have been identified in the first 6 months of the project. As mentioned above, the Risk Management Register is a living document which will be continuously under review.

The contingency plan will be defined in the cases in which it has been decided to accept the option that the identified risk may affect the project.

Risk No.	WP	Description	Type of Risk[1]	Probability [2]	Effect[3]	Priority[4]	Prevention plan	Responsible	Period
1	**WP2 WP3**	Sensors cannot withstand adverse environment in battery cell (e.g. may react with electrolyte to produce by-products) and lose sensitivity	Tech	3	1	Medium	A part of task 3.1 is focussed on the encapsulation of the level 1 sensors for chemical resistance against electrolyte. The level 1 sensors will be integrated within a polymer substrate giving them an intrinsic (backside) encapsulation that will protect against (electro-)chemical interference using the appropriate material or additional organic/ inorganic coating. The situation is more delicate on the surface of the sheet, especially for the temperature sensors that have to be equipped with a thermal interface to the environment. The consortium will use appropriate and chemically stable thermal interface materials (e.g. aluminium oxide/nitride) to build the interface, ideally exposing them only partially to the electrolyte by opening "windows" in an additional encapsulation layer. Pressure sensors are less critical to shield because the transduction of the forces can be realised through any sub- or superstrate given appropriate stiffness and thickness. For the level 2 sensors, subtask 2.1.1 is focussed on the selection of	FHG	M1-18

[1] Tech = Technological, Part = Partnership, Mana = Management, Ext = External
[2] Probability risk will occur: 1 = High, 2 = Medium, 3 = Low
[3] Effect of risk: 1 = High, 2 = Medium, 3 = Low
[4] Priority of risk: Critical, High, Medium, Low

							electrode-materials that withstand the operation condition of the battery cell		
2	**WP2 WP3**	Feedthrough of measurement contacts from the inside to the outside of the cell without leakage is not possible	Tech	3	1	Medium	A new pouch cell design will be developed by introducing a barrier layer near the seal areas to prevent the leakage. In case this is not sufficient, an additional tough polymer (typically polyester) exterior barrier will be introduced to the pouch cell.	AIT/ VAR	M1-36
3	**WP2 WP3**	Incompatibility of the sensors with the pouch cell assembly process	Tech	2	3	Low	The level 1 sensors are chosen and designed to be as thin as possible to be compatible during the pouch cell assembly. The level 2 sensors will be printed on the cell separator and therefore it is expected that they will not influence the assembling process.	AIT/ VAR	M1-36
4	**WP2 WP3**	Integration of sensors without changing the electrochemical behaviour of the battery cell (e.g the transport or transfer of lithium ions between anode and cathode electrodes) is not possible	Tech	2	1	High	The level 1 sensors will be attached to one side of the stacked battery electrode inside the cell where there is minimum flow of lithium ions. In case of conflict with the battery chemistry and/or functional elements several measures can be taken, e.g. a) relocation of sensing layer into different level/to different interface b) Perforation of the sensor sheet to yield a chemically open grid. The level 2 sensors will be printed onto the separator and therefore it is not expected that this will have a negative impact on the electrochemical behaviour of the battery cell. Optimisation of the geometry/shape and/or the position of the electrodes onto the separator will be investigated.	AIT/ VAR	M1-36
5	**WP2 WP3**	The EIS with internal auxiliary electrodes (level 2) is too complex and expensive (both in extra hardware required and modelling) to be implemented	Tech	2	1	High	The level 2 Electrochemical Impedance Spectroscopy (EIS) may turn out to be too expensive for commercial use in Electric Vehicle (EV) battery systems. However, the developed EIS electrodes printed on the separator, will very likely be useful in development and application laboratories to gain insights about degradation mechanisms, improve battery cells and battery control (state functions)	BDM	M1-30

6	**ALL**	Breach of IPR conditions as per Consortium Agreement	Part	3	1	Medium	The General Assembly, as it will be stated in the Consortium Agreement, will be the main body in charge of monitoring the intellectual property rights (IPR) aspects, the Exploitation Manager will prepare the IPR state of play during the project execution.	IKE/ POL	M1-36
7	**ALL**	Infringe on existing patents	Mana	3	2	Low	The Exploitation Manager will scan the IP environment worldwide and update the consortium in a timely manner. Risk of infringement could be avoided by adapting project development trajectory.	POL	M1-36
8	**WP1-5**	Relevant data are not being supplied in time by the partners.	Part	3	1	Medium	The Consortium will specify relevant backup data to work with	IKE/ ABEE	M1-36
9	**WP2 WP3**	Integration effort of the sensors higher than expected	Mana	2	1	High	Within WP2-WP3 the partners are committed to have sufficient PM for the dedicated task, or will make available additional efforts	VAR	
10	**ALL**	Low level of quality in technical studies. Delays in milestones or deliverables.	Mana	2	2	Medium	The Executive Board will monitor continuously progress and quality of work in accordance to defined work plans	IKE/ ABEE	M1-36
11	**WP7**	Partners leave or partners become insolvent	Mana	3	1	Medium	Back-up partners list or inside Consortium solution	IKE/ UNR	M1-36
12	**WP7**	Delay in work plan due to COVID-19	Ext	1	3	Medium	Partners will review the schedule and determine if there are areas that can be compressed or consolidated or if there is work that can be done concurrently rather than sequentially. Develop a priority scale for the project and work on deliverables.	IKE	M1-…
13	**WP1-5**	Delays in providing the components in time for following WPs activities	Part	2	2	Medium	Track development progress and focus efforts especially in the most sensible components.	IKE/ ABEE	M4-30
14	**WP5**	Testing plan not suited to detect differences between baseline and sensor cells.	Tech	3	2	Medium	Testing plan planned and reviewed by experienced engineers/scientists. Random post-mortem samples of test items to identify.	AIT	M6-30
15	**WP4**	Equivalent-circuit type battery models do not allow to adequately describe the link	Tech	2	2	Medium	Task 4.4 will assess the level of model complexity required to leverage level 1 sensor information to improve the state estimates. If equivalent-circuit type	IKE	M9-M36

		between the battery state (2D heterogeneous SOC and SOH, SOE and SOP) and the 2D temperature and pressure measurements of the level 1 sensors.					models prove inadequate, electrochemical battery models will be considered. In this case, part of the work of task 4.5 will move to task 4.4.		
16	**WP4**	The data coming from the different sensors are not consistent, which hinders their usefulness in improving the state estimation functions.	Tech	2	2	Medium	Tasks 4.4 and 4.5 will investigate the consistency between the various sensor readings using a commercially available EIS measurement device. This will allow the detection of potentially unreliable readings and the ranking of the different sensors according to their usefulness in improving the state estimation functions. If inconsistencies or inaccuracies are observed in the level 1 or 2 sensor measurements, this will be fed back to the relevant sensor development work package(s) for further investigation.	FM/ IKE	M9-M36
17	**WP3**	Pouchbag cells are typically operated between two plates (braced together) – attached sensor may result in additional mechanical stress	Tech	2	2	Medium	Special design of the plates may become necessary, providing additional space for the attached sensor	VAR	M1-36
18	**WP7**	Not detect a risk	Mana	2	3	Low	Monitor risks and try to identify new ones in the corresponding meetings	IKE/ ABEE	M1-36

3 Quality Assurance

In SENSIBAT, we distinguish three types of quality: i) the scientific/technical quality of the work, ii) the quality of the deliverables and milestones, and iii) the quality of the administrative processes. This document addresses the processes in place in SENSIBAT to assure all three.

3.1 Scientific and technical quality of the work

The quality of the overall outcome of the project is primarily dependent upon the quality of the execution of the performed activities. The quality of the work is monitored throughout the project by the General Assembly, the Executive Board, the Project Management Team and the WP leaders. Additionally, each and every project team member – including the Coordinator – has the responsibility to critically consider the quality of the work and strive for the best work possible. Potential deviations from the project plan must be anticipated and identified in a timely manner. The procedure for reporting changes in technical content and timing can be found in Section 2.5.3 of the Project Handbook. Quality will subsequently be maintained by taking suitable corrective actions.

3.1.1 External Advisory Board

Within SENSIBAT an external Advisory Board is set up consisting of relevant external experts which have the following responsibilities:

- to support SENSIBAT and its activities actively, inter alia by giving feedback on questions asked by SENSIBAT team members, and
- to participate in General Assembly, Advisory Board meetings or workshops when needed, and
- to provide feedback, advice, and support to SENSIBAT on the exploitation, and dissemination and communication channels relevant to SENSIBAT.

3.2 Quality of deliverables and milestones

The deliverables are the output of the performed work and, as such, should be high-quality representations of the activities undertaken. The quality assurance procedures for deliverables can be found in Section 4.1 of the Project Handbook. Additionally, the procedure for milestones can be found in Section 4.2 of the Project Handbook.

3.3 Administrative quality

Another important aspect of quality management is in the administrative processes of a project. The Project Management Team has extensive experience in the administration of large international research projects funded by the European Commission. The responsibilities of the members of the Project Management Team can be found in Section 1.2.2 of the Project Handbook. General management and progress management procedures can be found in Chapter 2 of the Project Handbook.

4 Conclusion

This document contains the Quality Assurance and Risk Management Plan of SENSIBAT project. Both plans serve as basis for a high quality of the project and an effective and updated risk management including a complete risk analysis.

Finally, it should be considered that this is an initial document and that the Risk Management Register will be updated each time a new risk is identified. An updated and final version of the Quality Assurance and Risk Management Plan will be developed in the end of the SENSIBAT project.

5 Risks

Risk No.	What is the risk	Probability of risk occurrence[5]	Effect of risk[6]	Solutions to overcome the risk
18	*Not detect a risk*	*Medium*	*Low*	*Monitor risks and try to identify new ones in the corresponding meetings*

[5] Probability risk will occur: 1 = high, 2 = medium, 3 = Low

[6] Effect when risk occurs: 1 = high, 2 = medium, 3 = Low

6 Acknowledgement

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Project partners

#	PARTICIPANT SHORT NAME	PARTNER ORGANISATION NAME	COUNTRY
1	IKE	IKERLAN S. COOP.	Spain
2	BDM	BEDIMENSIONAL SPA	Italy
3	POL	POLITECNICO DI TORINO	Italy
4	FHG	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.	Germany
5	FM	FLANDERS MAKE VZW	Belgium
6	TUE	TECHNISCHE UNIVERSITEIT EINDHOVEN	The Netherlands
7	NXP NL	NXP SEMICONDUCTORS NETHERLANDS BV	The Netherlands
8	NXP FR	NXP SEMICONDUCTORS FRANCE SAS	France
9	ABEE	AVESTA BATTERY & ENERGY ENGINEERING	Belgium
10	VAR	VARTA MICRO INNOVATION GMBH	Germany
11	AIT	AIT AUSTRIAN INSTITUTE OF TECHNOLOGY GMBH	Austria
12	UNR	UNIRESEARCH BV	The Netherlands

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