

This project has received funding from the Shift2Rail Joint Undertaking under the European Union's Horizon 2020 research and innovation programme under grant agreement no. 826087 (M2O)

## Deliverable D 1.1

### Integrated Quality and Risk

<b>Project acronym:</b>	M2O
<b>Starting date:</b>	01/12/2018
<b>Duration (in months):</b>	24
<b>Call (part) identifier:</b>	H2020-S2RJU/OC-IP5-01-2018
<b>Grant agreement no:</b>	826087
<b>Due date of deliverable:</b>	Month 6
<b>Actual submission date:</b>	27-05-2019
<b>Responsible/Author:</b>	UNITOV
<b>Dissemination level:</b>	PU
<b>Status:</b>	Draft

Reviewed: (yes/no)

Document history		
<i>Revision</i>	<i>Date</i>	<i>Description</i>
1	12.04.19	First draft
2	01-05.19	Final
3	17.06.20	Reviewed (Quality procedures, added)

Report contributors		
Name	Beneficiary Short Name	Details of contribution
Università degli Studi di Roma "Tor Vergata"	UNITOV	Draft and final release



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## Table of contents

1.	<i>Executive Summary</i> .....	3
2.	<i>Quality Procedures</i> .....	5
3.	<i>Risk assessment</i> .....	7
2.1	Risk identification.....	7
2.2	Risk analysis and evaluation tools.....	8
4.	<i>Risk Management</i> .....	9
3.1	Risk mitigation measures and contingency plan .....	9
3.2	Risk responsibilities.....	9
5.	<i>Risk tracking and reporting</i> .....	9
4.1	Risk register operational .....	10
4.2	Addressing unforeseen and unforeseeable risks.....	11
6.	<i>Conclusions</i> .....	12

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## *1. Executive Summary*

The purpose of this report is to summarize the progress and describe how the **M2O Risk Management Policy** may increase the project success by early detecting potential problematic and challenging tasks and envisaging mitigation and contingency measures to avoid or reduce the probability of negative occurrence. It affirms the M2O commitment to managing risk, assigns relevant responsibilities, and sets out the organisation's priorities.

The M2O Risk Management Plan - which details the processes and activities to be undertaken in order to give effect to the Risk Management Policy - is an ongoing process through the project lifecycle. It includes processes for risk management planning, identification, analysis, monitoring and control.

The identification of M2O risks started before the project initiation (see Table 1), but the number of risks may increase as the project progresses. Following the risk identification, each risk has been first assessed to ascertain the probability of occurrence, the number of project categories impacted, the degree (high, medium, low) of impact on schedule, scope, costs and quality, and then prioritized. All identifiable risks have been then entered into a risk register and documented as a risk statement.

The **Risk Management Register** is a frequently updated database listing all the identified risks, a current assessment of the threat(s) they represent to the success of M2O, the entities responsible for taking appropriate actions, the actions decided, and their current status.

The risk documentation is twofold, as it implies the definition of both mitigation measures – e.g. the steps that can be taken to reduce the probability of the event occurring – and a contingency plan, or a series of activities that should take place either prior to, or when the event occurs.

Identifying and documenting events that may threaten the project outcomes is a first step in the risk management strategy; it is equally important to monitor all risks on a periodic basis, by assigning roles and responsibilities among partners (e.g. identify a 'risk management team') and reporting to project internal boards.

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**Table 1 From Table 1.3.5 “Critical implementation risks and mitigation actions” - Annex I GA**

Risk number	Description of risk	WP Number	Proposed risk-mitigation measures
1	Lack of coordination: Coordination among partners and efficient collaboration with CFM partners are essential for project success.	WP1, WP2, WP3, WP4, WP5	The Technical Coordinator, which has extensive experience in coordinating large projects, ensures the necessary respect for all interdependencies. Effective coordination is ensured by the Project management structure and through the Project Work Plan
2	Partner withdrawal: The Partners have shown a strong commitment to the proposal preparation. It is most unlikely that someone resigns from the project.	WP1, WP2, WP3, WP4, WP5	In the unlikely case of partner withdrawal, the first corrective measure is to redistribute, completely or partially, the not fulfilled activities amongst the other participants who have comprehensive competencies or to seek for an external substitution, utilizing the partners' extensive professional networks. The corrective actions is chosen after an evaluation of their impact and relevance towards the whole project.
3	Under-resourced WP/ Task/Partner: The required resources have been carefully estimated in the project proposal. However, some specific task could be affected by lower or over budgeting. The management structure establishes a close control on costs and budget consumption.	WP1, WP2, WP3, WP4, WP5	The resource expenditure is carefully monitored throughout the project. If needed, resources are redistributed among Tasks/WPs/Partners. All participants are prepared to temporarily commit more resources to the project, if required to secure the work completion. The corrective actions are taken without hesitation whenever necessary to readdress the situation.

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4	Discrepancies and conflicts: The fluid communication among participants and the work package leaders is ongoing during the development of the project tasks.	WP1, WP2, WP3, WP4, WP5	In case of conflicts arising within the consortium on the project implementation or other matters related to the project itself, the following steps are taken: • The partners try to resolve the conflict issue between themselves in a friendly and informal way; • The next step (escalating procedure) is fulfilled by the Technical Coordinator (TC) and/or the Project Coordinator (PC) to resolve it by consensus. • If these attempts fail, the problem is discussed during the first scheduled meeting of the Steering Committee (SC), or if the issue is urgent an ad hoc SC meeting is convened by the Project Coordinator or the Technical Coordinator at the request of at least two partners; The issue is examined by the SC for final solution according to majority rules. In the SC there is also, by definition, the presence of the JUEU Commission who guarantees the necessary independence of judgment.
5	WPs delays: Tasks are not completed on time, causing delays to other tasks.	WP1, WP2, WP3, WP4, WP5	The prompt project coordination assures the timeliness of deliverables. In case of a Task or WP delay, the Work plan is rearranged and adjusted to correct and amortize the time factor for enabling the project completion on time.
6	WP vital competences disappearance: a partner that has a strong technical competence withdrawing before finalizing the WP.	WP2, WP3, WP4	In case a vital competence disappears, the Partners substitution guidelines are followed as indicated above.
7	Discrepancies on achieved objectives compared to the plan: All project partners have extensive experience in the researched subjects. Despite the declared results are planned to be achieved the possibility of discrepancies cannot be excluded	WP1, WP2, WP3, WP4, WP5	At the project end in case of variations of the declared expected results which can be either positive or negative given the various highly innovative affected fields of operations the consortium partners motivate both the reasons and the corrective actions emerged during the project lifetime if any

## 2. Quality Procedures

The quality procedures aligns with the project goals facilitating the project purposes. At this aim, they are agreed and shared among the Partners, since the beginning of the project. The most relevant project purposes, on which to issue the quality procedures, are connected to:

- Development of the radio solution



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- Simulations of Longitudinal Train Dynamics
- Train Safety and its Assessment.

Above activities, performed within the project, interface with the following:

- CFM Partners: FFL4E and FR8RAIL II
- S2R Steering Committee
- Advisory Board

Exchange of info and project progress relies on recurrent virtual meetings. Periodicity of meetings is typically set as:

- CFM Partners: each two weeks for dedicated activities and each 1.5 months for the project as a whole
- S2R Steering Committee: typically each three months, to report about the project status
- Advisory Board: every six months there is a meeting to inform and share the main project results

Meeting results in general are shared within the Partners via minutes and decisions taken.

Beyond these activities, Partners organize bi/tri-lateral meetings to progress on specific activities; meetings with all M2O Partners are organized to share the status of the project, without a fixed periodicity.

Above activities ensure the communication of information within the project and the alignment of the Partners to its main goals.

Particularly relevant is the exchange on project results with the Advisory Board, ensuring an applicability of project results and methodology at European level.

The homogeneity of information provided and exchanged is ensured by respecting templates for the presentation of the results (via pptx) and the deliverables (via docx).

Furthermore, dedicated xlsx templates support the Partners to report correctly their expenses for the project reporting periods.

Finally, it is very important to mention two ways to rationalize the management of information:

- the centralized management of all information related to safety, for WP2 and WP3
- the list of open points, a live document, used to show the progress of assessment, for WP4.

From the point of view of the quality of the deliverables produced, all the safety analysis, which involves both radio solution and LTD simulations, is overlooked by TUS, which is an independent safety assessor. Anyway, the quality of M2O deliverables relies on a review by different Partners consolidated at the level of the team coordinator and Technical coordinator with the help of UIC

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specialists, when necessary.

### 3. Risk assessment

The aim of risk management is to ensure that all project risks are identified and covered by actions in order to eliminate or reduce them, bringing the residual risk to a level that is acceptable for the JRU S2R and partners. To do so, every effort should be endeavoured to identify potential risks and conflicts as early as possible.

Regular risk assessment of the project ensures success in terms of fulfilling project objectives within budget, time and resources available.

#### 2.1 Risk identification

Risk identification involves determining which risks or threats are likely to affect the project. It comprises the identification of risks or threats that may lead to project outputs being delayed or reduced, costs being advanced or increased and/or outputs' quality being diminished or compromised.

**Table 2 - Risk identification**

Risk Category	ID risk identification	Description/comment
<b>Interfaces with S2R</b>	1.1: Specifications for safety analysis	In order to perform the safety analysis in task T3.2 and T3.3 and the corresponding safety assessment, data are needed from FR8RAIL II Partners.
	1.2: Specifications for GSM-R radio solutions	There are several technical solutions that can be implemented for an efficient communication between the GSM-R radio placed on the Traction Units (TU): this is relevant when the train has more than 2 TU
	1.3: Wagon/device data for <i>TrainDy</i> simulations	Simulations with <i>TrainDy</i> software require relevant data on wagons and general devices (such as control valves) that have to be provided by FR8RAIL II.
<b>Interfaces outside S2R</b>	2.1: Missing authorization for technical demonstrators	Two demonstrators are foreseen: one with two TU and another with up to 4 TU and up to 1500m length. For the second demonstrators, agreement with National Safety Agency could be critical since because of train length. Anyway, the choice of technical demonstrators is up to FR8RAIL II, based on M2O results.
<b>Project Management</b>	3.1: Lack of cooperation among M2O Partners	Almost all tasks of M2O require a collaboration among partners. Since the number of partners involved is usually two, this risk has a low likelihood.
<b>Results</b>	4.1: Sensitivity	Task 2.2 is devoted to sensitivity analysis. This activity is really

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<b>exploitation</b>	Analysis application	important for future commercial trains. A general method is applied, the risk is that a comprehensive analysis requires a computational effort (in terms of time to solution) not compatible with commercial needs.
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## 2.2 Risk analysis and evaluation tools

Following the identification of risks areas at macro level, an in-depth risk analysis within each Work Package should be carried out to show possible project challenges or threats at operative level, prioritize them and monitor their impact on project goals.

The detailed definition of the existing and possible threats started from the Annex I GA Table 1.3.5 'Critical implementation risks and mitigation actions' (see figure 1) and was extended to other different sources as personal meetings with FR8RAIL II project partners, such as the one of January 2019 in Frankfurt and monthly meetings with FR8RAIL II from starting from early March 2019.

Once analysed, risks are evaluated to determine the **likelihood** of a risk or threat to occur and its seriousness, or **impact**. 'Likelihood' is a qualitative measure of probability to express the strength of belief that the threat will emerge. 'Impact' is a qualitative measure of negative impact to convey the overall loss of value from a project if the threat emerges, based on the extent of the damage. Risk likelihood and impact have been both ranked in a scale of 1 to 5, where value 1 is very low and 5 very high (see Table 2).

**Table 2 - Risk likelihood and impact**

SCALE	LIKELIHOOD OF OCCURRENCE	IMPACT
<b>1-Very Low</b>	Unlikely to occur	Negligible impact
<b>2-Low</b>	May occur occasionally	Minor impact on time, cost or quality
<b>3-Moderate</b>	Is as likely as not to occur	Notable impact on time, cost or quality
<b>4-High</b>	Is likely to occur	Substantial impact on time, cost or quality
<b>5-Very High</b>	It is almost certain to occur	Threatens the success of the project



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## 4. Risk Management

Once risks are identified and properly assessed, a proper risk management plan is put in place. It entails the definition of mitigation measures and a contingency plan, and assigns responsibilities.

### 3.1 Risk mitigation measures and contingency plan

Risk mitigation involves two steps:

- Identifying the various activities, or steps, to reduce the probability and/or impact of an adverse risk;
- Creation of a Contingency Plan to deal with the adverse event generating the risk should it occur.

In most cases the mitigation measure is oriented to avoid the risk at all, applying this approach especially for the risks with a high or extremely high impact (4 or 5 on the scale). In risks with lower impact on scale the mitigation measure could be limited to monitor the risks, although this is not always the case.

### 3.2 Risk responsibilities

The risk management responsibility is shared among project WP Leaders, depending on the risk area, its impact, the mitigation measures and/or contingency plan foreseen.

Each risk has been assigned to a responsible WP Leader and is supervised by the Steering Committee. The responsibility of a risk implies a commitment to monitor its status based on a timescale, to implement mitigation measures to avoid its occurrence, to apply a contingency plan should an adverse event happen. The accomplishment of these tasks is subject to the supervision of a specific governing board, in charge to ensure that the responsible WP Leader properly manages the associated risk.

This distribution of responsibilities is well detailed in the Risk Register (see par. 4.1)

## 5. Risk tracking and reporting

As project activities are carried out and completed, risk factors and events are monitored to determine if specific events showing the concrete opportunity for a risk to become real have occurred.

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Based on trigger events that have been documented during the risk analysis and mitigation processes, the responsible WP Leader has the authority to put in place day to day risk mitigation activities and/or contingency plans as deemed appropriate.

#### 4.1 Risk register operational

The result of the qualitative and quantitative risk analysis, as well as the risk response planning, is the creation of a Risk Register (Table 3). The Risk Register list in detail all identified risks, including description, probability of occurring, impact on objectives, proposed responses, timescale, contingency plan, WP Leaders' responsibility.

The **risk register** is developed and maintained by the PMO.

**Table 3 - Risk Register**

Interfaces with S2R						
Risk N.	Risk description	Likelihood 1-5	Impact 1-5	Mitigation measures	Contingency Plan	Responsible WP
R1.1	Specifications for safety analysis	2-3	4-5	Coordination among M2O Coordinator and FR8RAIL II WP5 Coordinator. Bilateral meetings among M2O Partners and FR8RAIL II Partners	Using experience of M2O partners from similar previous projects	WP2, WP3, WP4
R1.2	Specifications for GSM-R radio solutions	2	5	Bilateral exchange with appropriate FR8RAIL II Partners.	Experience of FKW and UIC in the field of GSM-R radio communication	WP2
R1.3	Wagon/device data for <i>TrainDy</i> simulations	1	3	Using of previous experience in <i>TrainDy</i> simulations	Involvement of pertinent Advisory Board Members ( <i>TrainDy</i> Project Manager)	WP2 and WP3
Interfaces outside S2R						
Risk N.	Risk description	Likelihood 1-5	Impact 1-5	Mitigation measures	Contingency Plan	Responsible WP
R2.1	Missing authorization for technical demonstrators	2-3	5	Application of relative approach to demonstrate that even in degraded mode, the demonstrators have in-train forces similar	Limiting the length of second technical demonstrator	WP3 and WP4

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				to in-train forces.		
<b>Project Management</b>						
<b>Risk N.</b>	<b>Risk description</b>	<b>Likelihood 1-5</b>	<b>Impact 1-5</b>	<b>Mitigation measures</b>	<b>Contingency Plan</b>	<b>Responsible WP</b>
<b>R3.1</b>	Lack of cooperation among M2O Partners	1	5	Active involvement of M2O Technical Coordinators (UNITOV and NEWO) in the accomplishment of the tasks.	Ad hoc Steering Committee scheduled to solve the issue	WP2 and WP3
<b>Results exploitation</b>						
<b>Risk N.</b>	<b>Risk description</b>	<b>Likelihood 1-5</b>	<b>Impact 1-5</b>	<b>Mitigation measures</b>	<b>Contingency Plan</b>	<b>Responsible WP</b>
<b>R4.1</b>	Sensitivity Analysis application	3	1-2	Interaction with FR8RAIL II Partners.	Reduction of the variable under investigation based on the experience of Technical Coordinators and relevant Advisory Board Members	WP2

## 4.2 Addressing unforeseen and unforeseeable risks

The so-defined “unforeseen” and “unforeseeable” risks are respectively the types of risk that were not or cannot be accurately forecasted or mitigated before their occurrence.

Unforeseen risks will be limited as much as possible, thanks to a deep analysis of the project challenges and bottlenecks in the different risk areas (see par.1.1). Any risk management plan has however an element of unforeseeable risk, regardless of how capillar and accurate is the planning process.

It is important to define how to properly react to any unforeseen situations that may arise during M2O. Any entity/partner spotting a new risk – regardless to its role in the project – will notify the Project Management Office. The risk will be consequently assessed, evaluated and assigned to a responsible WP Leader, which will help in the identification of a mitigation strategy and/or – depending on the risk maturity - a contingency plan.



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The Risk Register is therefore a “live” document, which is periodically updated via the identification of new unforeseen/unforeseeable risks

## *6. Conclusions*

The Risk Register table will be officially presented during the next SC meeting and made available in excel format to each Responsible WP Leader via the project intranet. The PMO will periodically report to the Steering Committee about the status of the Risk Register, generally after a meeting.