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UPWARDS

Deliverable D1.3

Risk Management Plan

WP	1	Consortium Management
Task	1.4	Quality assurance and risk management

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¹ Dissemination level: **PU** = Public, **PP** = Restricted to other programme participants (including the JU), **RE** = Restricted to a group specified by the consortium (including the JU), **CO** = Confidential, only for members of the consortium (including the JU)

² Nature of the deliverable: **R** = Report, **P** = Prototype, **D** = Demonstrator, **O** = Other

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Deliverable abstract

The risk management plan describes the methods used to avoid or mitigate threats that can prevent reaching the goals in UPWARDS. The risk management process applies both management and research activities taking place within the UPWARDS project. It includes risk identification, risk assessment, response planning, and monitoring and control. If a risk incident occurs or a requirement is not fulfilled, the risk management process secures the best possible outcome.

Table of Contents

1. Introduction	3
2. Risk Management Process	4
2.1 Risk identification	4
2.2 Risk assessment	4
2.3 Response planning	4
2.4 Monitoring and controlling	5
2.5 Reporting.....	5
3. Risk Management Register	7

1. Introduction

This Risk Management Plan implement a traditional process for risk management that is suitable for the size and activities in a project such as UPWARDS. It includes risk identification, risk assessment, response planning, and monitoring and control.

In the initial phase of UPWARDS the internal reporting is done on a monthly basis, which makes it possible to response rapidly if needed. With respect to reporting to the European Commission this document must be updated every 6 months.

2. Risk Management Process

The risk management process applies both management and research activities taking place within the UPWARDS project. It includes risk identification, risk assessment, response planning, and monitoring and control. If a risk incident occur or a requirement is not fulfilled, the risk management process secures the best possible outcome.

2.1 Risk identification

During the proposal development phase, several of possible threats and their mitigation measures were identified and updated in Grant Agreement. These are listed in the Risk Management Register, Table 1. During the project execution phase, there is a continued focus on risk where newly identified risks will be reported at the monthly project meeting. Focus will be on:

- Deliverable status
- Milestone fulfillment
- WP schedules and interaction between WPs

2.2 Risk assessment

For every identified risk, the co-ordinator and the EB at the monthly project meetings will try to estimate a probability using the scale (Low/Medium/High) for them to occur.

2.3 Response planning

The risk response includes identifying measures to avoid and mitigate threats with respect to the progress and expected outcomes of the project. It identifies risk owner as well a response strategy for each identified risk in the Risk Management Register, Table 1.

2.3.1 Risk ownership

The risk owner can relates to different levels, such as the co-ordinator, WP leaders and EB. He is responsible for surveying and reporting the risk he is responsible for such that the appropriate response can be taken.

Co-ordinator

The co-ordinator is responsible for meeting the obligations and responsibilities towards the European Commission and for handling the organizational, legal and financial management of the project. He monitors the risk response process throughout the project period.

Work package leaders

The WP Leaders are accountable of the implementation and progress of the work and activities defined in their respective WP. This includes risk assessment for the overall WP and in particular for the associated deliverables and milestones. Before each project meeting, which is initially held once a month, they should identify and report at the meeting new risks and evaluate previously identified risks in the Risk Management Register, such that the co-ordinator can update the Risk Management Register.

If several WPs are involved, the WP leaders will be co-responsible of the risk assessment and mitigation.

Executive Board

The Executive Board (EB) consists of the WP leaders, the co-ordinator and the Innovation manager. The EB will monitor the progress of the project and implement decisions taken by the General Assembly. Concerning the risk management, the EB will advise the co-ordinator and the GA if problems cannot be easily resolved.

External Expert Advisory board

The External Expert Advisory Board (EEAB) includes technical experts as well as potential users. It will give feedback and advice on the different aspects of the project including risk analysis and mitigation.

2.3.2 Response strategy

In UPWARDS one will use the following principles in the risk management in order to reach the goals of the project:

Avoidance

The primary action is to avoid possible threats. The best way to do so is to continued communication within the project. Thus, monthly project meetings at fixed times is implemented in UPWARDS.

Mitigation

If a threat cannot be avoided the mitigation action is listed in the Risk Management Register, table 1. The implementation of the action is the responsibility of the risk owner. Mitigation actions are updated as the project progresses.

2.4 Monitoring and controlling

It is the responsibility of all UPWARDS partners to communicate to the Project Manager the status and effectiveness of each risk and mitigation plan in order to update the risk management register and assess the relevance of the tools. The risk owner will confirm the correct implementation of the risk responses and will check the effectiveness of the response. The risk owner will keep track of the situation and inform the Project Manager. The risk exposure will be continuously re-evaluated and modified accordingly.

The new risks are identified by a partner will be analyzed as those on the original risk list and added in the register.

2.5 Reporting

Risk Log

The Risk Management Register will be updated at each project meeting. Any change will be recorded in a Risk Log updated by the project co-ordinator. It will also contain the relevant issues, which has occurred during the project, and possible preventive and avoidance measures or mitigation actions taken.

Risk Status

During the project the probably of an incident will change. The Risk Management register will include risk levels: low, medium and high. If a risk is not relevant anymore, the risk will be enter a status of not relevant.

3. Risk Management Register

The Risk Management Register, Table 1, lists the identified risks. Each risk is assigned a Risk Number. Each entry contains a Description, the related WP(s) and the Proposed risk-mitigation measures for each risk. After every monthly project meeting the Risk management Register will be updated. Every 6 months, the Risk Management Register will be updated and new, identified risks will be added. The registry will be accessible to the partners through the common document storage system.

Table 1 Risk Management Register

Risk Number	Description of risk (indicate level of likelihood: Low/Medium/High)	WP(s)	Proposed risk-mitigation measures
R1	Medium: Failure in implementation of ADM (bad results)	WP2	Use existing ADM in along with new development. This will serve as benchmark of our development
R2	Low: Non-feasible modelling data transfer between partners in T2.4/2.5	WP2	A plan should be designed to minimize the volume of data transferred, by a proper selection and compression and appropriate hardware
R3	Low: Unstable coupling between WRF-LES and Park-LES	WP2	Ensure time scales used in both simulations are consistent. Data transfer between software are consistent
R4	Low: Lack of stability of FSI co-simulation	WP3	Risk description: The coupling between two separate CFD and CSM software implies a risk of lack of stability of the FSI co-simulation procedure. Risk mitigation : Step by step implementation of coupling between SAMCEF Mecano and STAR-CCM+ SAMTECH and UNL are experts in advanced numerical methods and are completely aware of this risk of lack of stability of FSI co-simulation, in particular in full transient, dynamic conditions. However, as both commercial software (SAMCEF Mecano in Computational Solid Mechanics and STAR-CCM+ in CFD) belongs now to Siemens, this will give additional possibilities of coupling that are not possible between external companies.

R5	Medium: Lack of performance of FSI co-simulation	WP3	Mitigation thanks to the HPC infrastructure of ITWM
R6	High: Lack of precision of FSI co-simulation	WP3	Iterative procedure to be put in place between software with measurement of error
R7	Low: Non-operational simulation tool	WP4	Regular VKI-AWST meetings to define software specs and monitor implementation progress
R8	Medium: Non-validated simulation tool	WP4	Progressive complexity of validation tests
R9	Medium: Delays in Task execution	WP4	An immediate face to face (f2f)/online meeting will be organize with the person responsible for delay in task execution. A detailed explanation will be sought from the person responsible for delay. In addition to this Three-monthly f2f/webex meetings between WP4 partners will be done to ensure there is no delay in task execution.
R10	Low: Non-convergence in simulation of damage in blade substructure	WP5	Enhance model resolution in terms of number of elements which will require HPC, implement dedicated implicit sub-plane control solver, or use explicit solver.
R11	Medium: Failure of unified damage model to predict experimental results	WP5	Plan to advance in level of complexity ranging from coupon to sub-structural scale
R12	Medium: Experimental demonstrator of WT blade substructure fail unintended out of zone of interest	WP5	Detailed numerical analysis and parametric will be planned to ensure a robust design of blade substructure.
R13	High: Failure to predict load history effects using model of transition effects together with cycle jump damage models	WP5	A plan should be established in which cycle-by-cycle damage models can be incorporated if needed.
R14	Low: Insufficient computer resources in HPC	WP6	Further complexity reduction of sub-models using MOR techniques
R15	Medium: No access to equations for MOR	WP6	Use equation-free methods (e.g. Dynamic Mode Decomposition)

R16	Low: Model complexity exceeds computational limits of MOR algorithms	WP6	Split models and apply MOR to sub-models
R17	Medium: Insufficient input in participatory process	WP7	Both on and offline participation options with easy and low threshold participation.
R18	Low: Invalid input in participatory process	WP7	Ex ante alignment with data needs from other WPs
R19	Medium: Incommensurability of data to be integrated in other WPs	WP7	Ex ante alignment with data needs from other WPs