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Flexible Assembly Manufacturing with Human-Robot Collaboration and Digital Twin Models

FELICE

D1.1: Quality assurance plan[†]

Abstract: The quality assurance plan complements the project information as detailed in the grant agreement. The plan defines procedures, guidelines and actions that ensure the quality of the project's outputs. It provides an overview of the organisation and the assignment of project members to the boards and committees as well as listing all work package and task leaders. Afterwards, it details the tools and electronic resources for collaboration and dissemination and presents requirements for the dissemination of results. An important section concerns the quality assurance of project outputs that lists the deliverables and corresponding deadlines and provides a timeline for ensuring the timely completion of each deliverable. Finally, a section devoted to risk management is presented before the deliverable is concluded with some final remarks.

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The FELICE Consortium

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3	FH OÖ Forschungs & Entwicklungs GmbH	*FHOOE*	Austria
4	AEGIS IT RESEARCH GmbH	*AEGIS*	Germany
5	Leibnitz Research Centre for Working Environment and Human Factors	*IFADO*	Germany
6	Foundation for Research and Technology – Hellas	*FORTH*	Greece
7	CAL-TEK S.r.l.	*CALTEK*	Italy
8	Technical University Darmstadt	*TUD*	Germany
9	University of Salerno	*UNISA*	Italy
10	Fraunhofer-Gesellschaft zur Foerderung der Angewandten Forschung e.v.	*Fraunhofer*	Germany
11	ACCREA Engineering	*ACC*	Poland
12	PROFACTOR GmbH	*PRO*	Austria
13	Eunomia Ltd	*EUN*	Ireland

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List of Abbreviations

CA Consortium Agreement

DEM Dissemination Manager

EAB External Advisory Board

EPM Ethics & Privacy Manager

GA General Assembly, also Grant Agreement

IM Innovation Manager

PC Project Coordinator

PCC Project Coordination Committee

PTC Project Technical Committee

QAM Quality Assurance Manager

QAP Quality Assurance Plan

SM Safety Manager

STM Scientific & Technical Manager

SVN Subversion (a document repository)

TL Task Leader

ToC Table of Contents

WP Work Package

WPL Work Package Leader

Executive Summary

The purpose of the quality assurance plan is to provide a single point of reference on the quality assurance processes that will govern the course of *FELICE*. This deliverable defines the project organisation, procedures, roles and responsibilities related to the quality assurance activities. It describes how the project will organise and execute its activities from a quality perspective, and ensures that standards, processes, and procedures are defined and their execution is continuously monitored, corrected when necessary and improved.

The *FELICE* project is a multilateral effort to design, implement, and evaluate next generation assembly processes. The designed and implemented system in form of a newly developed framework is evaluated in two distinct assembly scenarios. The *FELICE framework* comprises two layers that involve sensing, recognizing, and acting involving four technological pillars. *FELICE* pursues sophisticated dissemination and exploitation activities including liaising with existing robotic digital innovation hubs. The project consortium and the duties of each partner are described in the grant agreement (GA), among others. The conflict resolution and communication requirements are further detailed in the consortium agreement (CA), among others.

Collaboration within the consortium is supported through sharing documents, exchanging e-mails, and organizing meetings. The quality assurance plan lists these resources and provides respective guidelines for their use:

- Document repository
- Large multimedia content
- Mailing lists
- Meetings

The outputs of *FELICE* are subject to quality assurance processes that are detailed in this plan. Guidelines and deadlines should ensure the timely delivery of the respective output:

- Deliverables, reports, and scientific publications
- Programs and software libraries
- Demonstrators

Dissemination and exploitation activities ensure the project's visibility and provide information on the progress and certain achievements to the general public. The quality assurance plan defines dissemination-related processes and timelines to ensure the quality of the dissemination for channels such as:

- *FELICE* project website
- Social media accounts
- Conferences and fairs
- Scientific publishing

The present quality assurance plan defines standard procedures for project activities, presents rules and guidelines for achieving high quality research and development output, and defines necessary actions to be carried out. The goal of this plan is to remain concise and to be useful for performing project activities. The document may be subject to further revisions in the course of the project.

1 Introduction

1.1 Purpose of the document

The purpose of this document is to present an overview on the organisation of the project and its procedures and guidelines to ensure the quality of the processes and the produced outputs.

The deliverable provides an overview of the project organisation in Section 2 and which participants are involved in key positions such as project management, work package, or task leadership. This is to ensure that leading actors with their responsibilities are identified. Section 3 lists the collaboration and communication means by which the partners interact and perform the joint activities. A table of electronic resources is given in Table 6 and guidelines are given as to the organisation of these resources as well as for coordination activities such as virtual meetings. In Section 4 this document describes means and ways to ensure high quality outputs and processes. It lists the project's deliverables and describes their acceptance and submission processes, timelines, and requirements in more detail. Furthermore, the document lists the templates that are to be used by consortium members to have a unified and consistent view of the project's documents.

The project risks are discussed and risk management is detailed in terms of mitigation and the communication procedures to ensure that risks are identified, analysed and an appropriate response has been formulated.

Finally, concluding remarks are presented in this deliverable.

1.2 Intended readership

D1.1 is a confidential document (CO) and is intended for the European Commission including the *FELICE* project officer, and members of the FELICE consortium only.

1.3 Relation to other FELICE deliverables

This deliverable covers quality assurance aspects. While this deliverable presents electronic resources for storing files and describes their organisation, data security and privacy aspects on file handling will be described as part of the "D1.2 Data management plan". While this deliverable discusses responsibilities, processes, and timelines for dissemination-related activities "D9.2 Dissemination and exploitation plan" will provide a complete picture on the planned activities.

2 Project Organisation

The *FELICE* project comprises thirteen partner organisations. A formal management structure and respective boards have been defined and individual people have been assigned key management roles in the project. Figure 1 provides an overview of some of the project bodies and actors. A detailed list of workpackage and task leaders is given in Table 4.

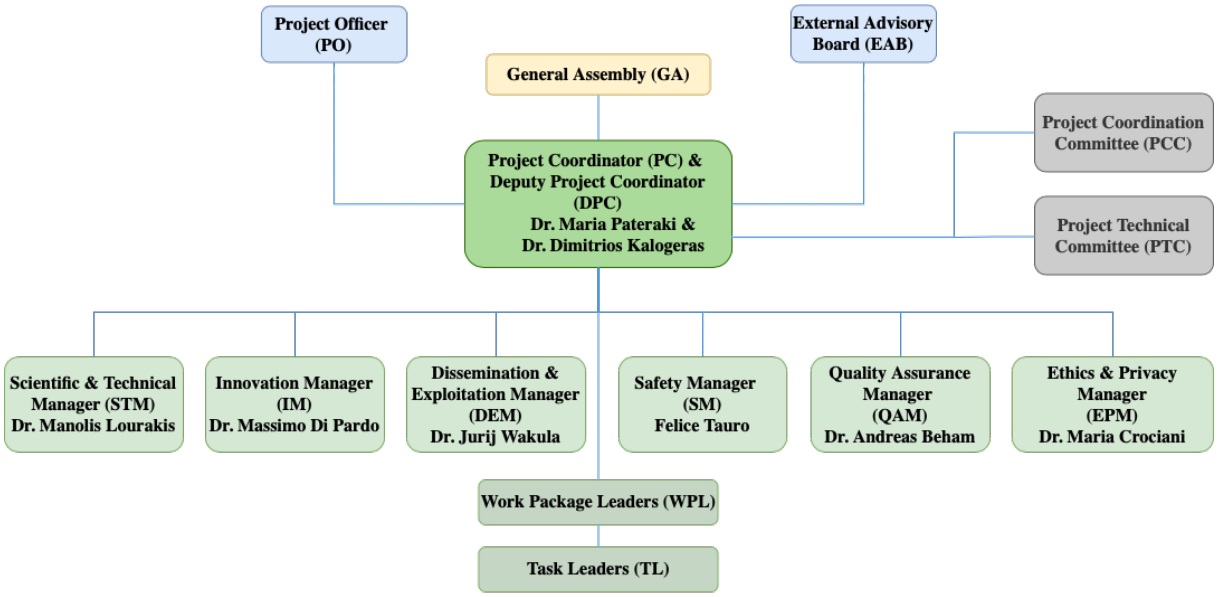

Figure 1: Overview of the management structure, roles and responsibilities.

2.1 Roles and Responsibilities of Project Bodies and Actors

Project management and decision making has the general assembly (GA) as its highest decision board. Execution of the technical and non-technical aspects of the project is governed by the project technical committee (PTC) and the project coordination committee (PCC) respectively.

2.1.1 General Assembly (GA)

The GA consists of one representative from each organisation. It is responsible for all technical, financial, legal, administrative, ethical, IP management, and dissemination issues within *FELICE*. The GA approves deliverables and reviews the project. Chair of the GA is the project coordinator (PC). Representatives of the GA are given in Table 1. Deputies may be appointed in case representatives are prevented for any reason.

2.1.2 Project Coordination Committee (PCC)

The PCC constitutes the decision-making body for non-technical aspects of the project. It consists of one delegate from each organisation. The PCC is chaired by the project co-

Table 1: Representatives of the GA.

Name	Partner	Role
Maria Pateraki	*ICCS*	Chairwoman
Massimo di Pardo	*CRF*	Representative
Roman Froschauer	*FHOOE*	Representative
Spyros Vantolas	*AEGIS*	Representative
Gerhard Rinkenauer	*IFADO*	Representative
Manolis Lourakis	*FORTH*	Representative
Francesco Longo	*CALTEK*	Representative
Jurij Wakula	*TUD*	Representative
Mario Vento	*UNISA*	Representative
Thomas Kirks	*Fraunhofer*	Representative
Bartlomiej Stanczyk	*ACC*	Representative
Sharath Chandra Akkaladevi	*PRO*	Representative
Maria Crociani	*EUN*	Representative

ordinator. Representatives of the PCC are given in Table 2. Deputies may be announced in case representatives are prevented for any reason.

Table 2: Representatives of the PCC.

Name	Partner	Role
Maria Pateraki	*ICCS*	Chairwoman
Massimo Di Pardo	*CRF*	Representative
Roman Froschauer	*FHOOE*	Representative
Spyros Vantolas	*AEGIS*	Representative
Gerhard Rinkenauer	*IFADO*	Representative
Manolis Lourakis	*FORTH*	Representative
Francesco Longo	*CALTEK*	Representative
Jurij Wakula	*TUD*	Representative
Pierluigi Ritrovato	*UNISA*	Representative
Thomas Kirks	*Fraunhofer*	Representative
Bartlomiej Stanczyk	*ACC*	Representative
Sharath Chandra Akkaladevi	*PRO*	Representative
Maria Crociani	*EUN*	Representative

2.1.3 Project Technical Committee (PTC)

The PTC constitutes the decision-making body for technical aspects of the project. It consists of one delegate from each organisation. The PTC is chaired by the scientific

& technical project manager (STM). Representatives of the PTC are given in Table 3. Deputies may be announced in case representatives are prevented for any reason.

Table 3: Representatives and deputies of the PTC.

Name	Partner	Role
Manolis Lourakis	*FORTH*	Chairman
Maria Pateraki	*ICCS*	Representative
Felice Tauro	*CRF*	Representative
Roman Froschauer	*FHOOE*	Representative
Spyros Vantolas	*AEGIS*	Representative
Gerhard Rinkenauer	*IFADO*	Representative
Francesco Longo	*CALTEK*	Representative
Jurij Wakula	*TUD*	Representative
Pierluigi Ritrovato	*UNISA*	Representative
Sebastian Hoose	*Fraunhofer*	Representative
Bartlomiej Stanczyk	*ACC*	Representative
Sharath Chandra Akkaladevi	*PRO*	Representative
Maria Crociani	*EUN*	Representative

2.1.4 Project Coordinator (PC)

ICCS has the responsibility to carry out overall project management activities, communication between the Commission and the project. The PC is Dr. Maria Pateraki (*ICCS*), assisted in all aspects of general and administrative management of the project by the Deputy Project Coordinator (DPC), Dr. Dimitris Kalogeras (*ICCS*). They are responsible for overseeing the entire project, including its administrative, technical, and scientific coordination. The PC will monitor the planning and progress of the project with respect to the objectives and targets and, if necessary, initiate corrective actions for any deviations. The PC will manage all the communications to/from the EU Commission, the periodic reporting and will organize the review meetings with the appointed Project Officer. The PC will also be responsible for collecting financial statements and audit certificates, as required by the contract and for reporting the periodic financial summaries and resource efforts spent by each partner. The PC will manage the granted EU contribution and the distribution of the funds to each partner according to the actual allocated efforts. The PC will convene and chair the GA and the PCC.

2.1.5 Project Managers

In addition to the PC and deputy PC, a number of individuals have been assigned specific project management roles as is shown in Figure 1. These roles are as follows:

Scientific & Technical Manager (STM) chairs the PTC and oversees all technical aspects of the project. Dr. Manolis Lourakis (*FORTH*) will act as the STM.

Innovation Manager (IM) will support the innovation driven research and amplify the project's impact. This role will be assumed by Dr. Massimo Di Pardo (*CRF*).

Dissemination & Exploitation Manager (DEM) will coordinate the dissemination, communication and exploitation activities during the project lifecycle. This role will be assumed by Dr. Jurij Wakula (*TUD*).

Safety Manager (SM) will ensure that any elements in the project developments which may cause harm to human actors are adequately dealt with. Felice Tauro (*CRF*) will serve as SM.

Quality Assurance Manager (QAM) will be liable for (i) developing, implementing, communicating and maintaining the quality plan throughout the lifecycle of the project task; (ii) overall monitoring of the different KPIs; (iii) the identification of the problems during internal audits and initiating corrective actions to eliminate the problem; (iv) ensuring that goals set by the PTC and GA are fully implemented on a daily basis. This role will be assumed by Dr. Andreas Beham (*FHOOE*).

Ethics & Privacy Manager (EPM) will oversee the *FELICE* data protection strategy and will advise *FELICE* partners on data collection and processing procedures, to ensure compliance with GDPR requirements. Dr. Maria Crociani (*EUN*) will serve as the EPM.

2.1.6 Workpackage and Task Leaders

Workpackage leaders (WPL) and task leaders (TL) are appointed by the partner organisations and are responsible to organise, communicate, and carry out the work described in the respective workpackage or task. Note that the WP leadership of WP4 was reassigned from *ICCS* (as described in Annex 1 of the Grant Agreement) to *FORTH*. WPLs are responsible for maintaining an up-to-date plan of the WP activities, monitoring its progress and ensuring that deliverables are completed within deadlines. In addition, WPLs have to coordinate the interaction and collaboration with other WPs and facilitate the communication within and among WPs. TLs are coordinated by the respective WPLs for their work package. The full list of workpackage and task leaders is given in Table 4 below.

Table 4: Workpackage and Task Leaders

WP	Name	Partner	Leader
WP1	**Project Coordination and Management**	*ICCS*	**Maria Pateraki**
T1.1	Scientific and administrative management	*ICCS*	Maria Pateraki
T1.2	Quality assurance and risk management	*FHOOE*	Andreas Beham
T1.3	Ethical and privacy issues	*EUN*	Maria Crociani
T1.4	Innovation management	*CRF*	Massimo Di Pardo
WP2	**FELICE framework formalization**	*IFADO*	**Gerhard Rinkenauer**
T2.1	Robotic and safety system specification	*ACC*	Adam Kurnicki
T2.2	Interaction requirements for the Human-Robot dyad	*IFADO*	Georgios Athanassiou

Continued on next page

Table 4: (Continued)

WP	Name	Partner	Leader
T2.3	Interaction requirements for the global supervisory unit	*IFADO*	Bianca Zickerick
T2.4	Productivity aspects identification	*CRF*	Massimo Di Pardo
T2.5	System architecture and IoT ecosystem specifications	*AEGIS*	Spyros Vantolas
WP3	**System baseline technologies and enablers**	*AEGIS*	**Spyros Vantolas**
T3.1	Baseline technologies & tools	*UNISA*	Alessia Saggese
T3.2	Security & Privacy enabling mechanisms	*FORTH*	Manos Papoutsakis
T3.3	Knowledge Base	*AEGIS*	Spyros Vantolas
T3.4	User-driven interfaces and visualizations	*AEGIS*	Spyros Vantolas
WP4	**Perception mechanisms**	*FORTH*	**Manolis Lourakis**
T4.1	Object detection & localization	*ICCS*	Alexandra Papadaki
T4.2	Scene perception	*FORTH*	Manolis Lourakis
T4.3	Human parameters and actions monitoring	*ICCS*	Maria Pateraki
T4.4	Speech and gesture analysis	*UNISA*	Antonio Greco
WP5	**Cognitive robotics and adaptive workstations**	*PRO*	**Sharath Chandra Akkaladevi**
T5.1	Robotic hardware and safety system setup	*ACC*	Marcin Jawor
T5.2	Adaptive workstation for manual assembly	*TUD*	Verena Klaer
T5.3	Task Execution and verification	*PRO*	Sharath Chandra Akkaladevi
T5.4	Cognition for Human-robot collaboration fluency	*FORTH*	Michail Maniadakis
WP6	**Data driven digital twin of production process**	*CALTEK*	**Francesco Longo**
T6.1	Modelling and Digital Twin of production process	*CALTEK*	Francesco Longo
T6.2	Quality assurance in Digital Twin modeling	*FHOOE*	Georg Hackenberg
T6.3	Feedback strategy management	*CALTEK*	Francesco Longo
WP7	**AI for predictive models of human behavior and production evolution**	*FHOOE*	**Andreas Beham**
T7.1	Ergonomics and productivity data analytics	*FHOOE*	Andreas Beham
T7.2	Resilient assembly line	*Fraunhofer*	Julian Eßer
T7.3	Intelligent manufacturing execution system	*FHOOE*	Stefan Wagner
WP8	**Integration, pilot implementation and evaluation**	*CRF*	**Felice Tauro**
T8.1	Use cases and pilot evaluation strategy	*IFADO*	Gerhard Rinkenauer
T8.2	Integration strategy	*AEGIS*	Spyros Vantolas
T8.3	System integration and deployment	*CALTEK*	Francesco Longo
T8.4	Pilots execution and evaluation	*CRF*	Felice Tauro
WP9	**Dissemination, exploitation and long-term sustainability**	*TUD*	**Jurij Wakula**
T9.1	Dissemination and communication activities	*TUD*	Jurij Wakula
T9.2	Exploitation and long term sustainability	*CRF*	Rossella Monferino

Continued on next page

Table 4: (Continued)

WP	Name	Partner	Leader
T9.3	Standardization activities	*TUD*	Jurij Wakula
T9.4	Liasing with DIHs	*Fraunhofer*	Thomas Kirks
WP10	**Ethics requirements**	*ICCS*	**Dimitrios Kalogeras**

2.1.7 External Advisory Board (EAB)

The EAB is involved in the strategic steering of the project's research and innovation endeavors contributing to its challenges and opportunities from emerging research. The EAB will additionally support *FELICE* to connect with other projects and research initiatives and ensure maximum project impact. Members of the EAB are given in Table 5.

Table 5: Members of the EAB, their affiliation and areas of expertise.

Name	Organisation	Expertise
Prof. Kostas Daniilidis	University of Pennsylvania, PA, USA	Computer vision and robotics
Prof. Alois Zoitl	Johannes Kepler University Linz, AT	Industrial automation systems
Prof. Agostino Bruzzone	University of Genoa, IT	Simulator-based defense and industrial applications
Prof. Emma Hart	Edinburgh Napier University, UK	Artificial intelligence, optimisation and learning
Prof. Peter Hancock	University of Central Florida, FL, USA	Human factors and ergonomics

3 Project Collaboration and Communication

Several communication media will be employed within the project. Communication for day-to-day activities will take place via e-mail, telephone, or video conferences. Mailing lists have been created to facilitate communication with the consortium as a whole or individual work package members. A versioned file repository has been set up to facilitate document and file exchange.

3.1 Collaboration Tools

3.1.1 SVN Repository

The *FELICE* subversion (SVN) repository is maintained by the project coordinator and is hosted at the facilities of *ICCS*in Athens, Greece. It is used for facilitating file sharing among partners regarding deliverables, progress reports, management reports, and other documents and files.

The SVN repository contains folders for each workpackage (WP) which may be further structured to contain the working documents of the tasks and deliverables. For instance, `WP1\D1.1` contains the working documents for the current deliverable. A folder named `templates` contains templates for deliverables, presentations, and meeting minutes. The folder `meetings` contains the presentations, agenda and documents related to both plenary and WP meetings. The folder `deliverables` contains circulated draft versions of the deliverables as well as the submitted version.

Generally, the SVN repository is to be used for collaborating and sharing text documents, PDFs, presentations, graphics, and reports. Larger files, such as datasets, videos, photos, and multimedia files are to be shared via a cloud service. This service will be organised such that each partner is responsible for managing their files. As such, the basic directory layout is set up to have one folder per partner.

The addresses of the repository, cloud service, and other electronic resources are given in Table 6.

3.1.2 Mailing lists

To facilitate communication within many members of the consortium simultaneously, a number of mailing lists have been created. Communication on the mailing list is confidential and only used for internal purposes. Only content that is explicitly flagged as public information may be disclosed to people outside the project. An enumeration of all active mailing lists is given in Table 6, among others. Additional ones may be created if such a need arises during the course of the project.

Subscription to a mailing list is not automatic and has to be requested. The manager of the mailing lists is Dimitris Kalogeras (*ICCS*).

3.1.3 Video Conferencing

An increasing use of video conferencing solutions is both an environmentally friendly and effective medium to facilitate communication. Video conferences may be planned

Table 6: *FELICE* electronic resources

Resource	Maintainer	Description
Public		
https://www.felice-project.eu	*UNISA*	Project website
https://twitter.com/FeliceH2020	*TUD*	Project twitter account
https://www.linkedin.com/company/h2020feliceproject	*TUD*	Project linkedin account
info@felice-project.eu	*ICCS*	E-mail address for external inquires
Confidential		
all@lists.felice-project.eu	*ICCS*	Mailing list for project-wide communication. Every individual working on the project may request to register to receive these e-mails.
legal@lists.felice-project.eu	*ICCS*	Mailing list for legal aspects of the project. One representative from each partner must receive these e-mails.
ga@lists.felice-project.eu	*ICCS*	Mailing list for the general assembly
pcc@lists.felice-project.eu	*ICCS*	Mailing list for the project coordination comittee
ptc@lists.felice-project.eu	*ICCS*	Mailing list for the project technical comittee
wpX@lists.felice-project.eu	*ICCS*	Mailing list dedicated to work package X only (X $\in \{1, 2, ..., 10\}$). Every individual working on the project may register to receive these e-mails.
dissemination@felice-project.eu	*ICCS*	All internal dissemination relevant discussions and actions *must* also be sent to this e-mail address
https://svn.felice-project.eu/svn/docs	*ICCS*	SVN repository for document and file exchange
https://storage.felice-project.eu	*UNISA*	Large Seafile file store, for videos, images, and generally large files

and include sending out a link to all participants in advance or unplanned by calling the respective contact directly. The partners may use whatever tool is available to them as long as it does not have system requirements that other partners cannot meet. Generally, an option should exist to avoid installation and participate via a web browser. Furthermore a call-in option should also exist in case of technical problems with computer audio connections. For internal meeting and discussions participants should have the possibility to share their screen. Larger conferences including external audience or a large number of participants should be organized as webinars where participant interaction is limited.

The guidelines and recommendations for organising and conducting meetings with video conferences:

- Allow up to 5 minutes for people to join
- At the start of the meeting indicate who is moderating the discussion, announce the purpose and intent of the meeting, disclose whether it will be recorded, who will keep the notes and where these will be available
- If a meeting requires significantly more than 2 hours, announce the time of a short break at the start of the meeting
- Activate the video camera when speaking, mute the microphone while not speaking
- Use a headset instead of built-in microphones if possible to avoid echo
- Use features of the conferencing tool such as raise hand to indicate your desire to speak, interrupt if necessary
- Stick to the alotted time, note open questions or points for discussion and create follow-ups

3.2 Internal Communication

Internal communication will be within meetings of the GA and the executive boards (PCC and PTC). The frequency of meetings, requirements on announcements, changes to the agenda, and follow up are stated in the consortium agreement (CA) in Section 6. Apart from GA, PCC, and PTC meetings, workpackage leaders and task leaders will organise meetings for the day to day work at a regular basis and due prior coordination with the involved people.

3.2.1 Project monitoring and reporting

Partners will formally report at quarterly intervals to the project coordinator on the progress of the work packages with respect to the project timetables (as defined in Annex 1 of Grant Agreement), including the timing of all tasks, milestones and deliverables. The actual progress of each period will be compared to the scheduled progress as listed in the project timetable, and the project technical committee will make a formal evaluation of the progress of the project (as a whole and at the work package level).

Monitoring in the first phase will be particularly rigorous to ensure on-time completion of the milestone MS3 and MS4 (first version of the system). Deliverables and milestones are defined for each WP to be used as control and decision points in the

progress monitoring of the project. The completion of deliverables and milestones will be discussed regularly in PTC meetings.

3.3 External Communication

The project's activities and results are communicated via its website and social media accounts. The *FELICE* website is accessible online from January 2021 (M1) at https://www.felice-project.eu, and will be used for public dissemination and communication activities, as well as for knowledge and information transfer. Moreover, it will include information on the progress of the project and operational activities. Deliverable D9.1 provides more information on the webpage. Social media is used to disseminate project progress and results. The established channels are listed in Table 6 among others.

To publish or disseminate through the website or social media channels, partners must prepare their announcements. The prepared announcement is sent to the dissemination manager (DEM) who checks the quality and suggests changes or adaptions. The DEM forwards the final announcement to the maintainer of the respective channel. For all internal e-mails on dissemination related matters the address dissemination@felice-project.eu must be included in the communication.

3.3.1 Project-wide representation and info days

To represent the *FELICE* project, the dissemination manager (DEM) is to be informed 30 days prior to the event about the material that is to be presented and in which form. The DEM is responsible to ensure the quality of the representation.

3.3.2 Requirements for Dissemination of Results

Any dissemination of results (in any form, including electronic) must:

1. Display the EU emblem
2. Include the text: "This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101017151."

In addition to the EU emblem, it is recommended to also display the *FELICE* logo and provide a link to the *FELICE* website.

4 Quality Assurance of Project Outputs

This section describes guidelines on ensuring a high-quality collaboration and achieving high-quality outputs within *FELICE*. Participating members should be aware of these guidelines and follow them during project activities. More specifically, this section describes

- The project's deliverables
- The deliverable acceptance process
- Document templates

4.1 Project Deliverables and Deadlines

The list of deliverables is defined in the grant agreement. It is reproduced in Table 7 for convenience and the deliverables appear in the chronological order they should be completed in the project.

Table 7: List of deliverables sorted by delivery date in project months

No.	Description	Lead	Type[1]	Dissem. level[2]	Mon.
D9.1	Project website and visual identity	*UNISA*	REP	PU	2
D1.1	Quality assurance plan	*FHOOE*	REP	CO	3
D1.2	Data management plan	*ICCS*	ORDP	PU	6
D1.3	Ethics and privacy manual	*EUN*	REP	CO	6
D1.4	Innovation management plan	*CRF*	REP	PU	6
D2.1	Robot, architecture and system specification I	*ACC*	REP	CO	6
D3.1	State of the art report	*UNISA*	REP	PU	6
D9.2	Dissemination and exploitation plan	*TUD*	REP	PU	6
D10.1	GEN - Requirement No. 1	*EUN*	Ethics	CO	6
D8.1	Use cases and pilot evaluation strategy	*IFADO*	REP	CO	8
D2.2	System interaction requirements I	*IFADO*	REP	CO	9
D2.3	Productivity specifications I	*CRF*	REP	CO	9
D5.1	Robotic hardware and adaptive workstation I	*ACC*	DEM	CO	11
D8.2	Integration strategy	*AEGIS*	REP	CO	11
D3.2	System enablers I	*AEGIS*	Other	CO	16
D4.1	Perception mechanisms I	*ICCS*	Other	CO	16

Continued on next page

Table 7: (Continued)

No.	Description	Lead	Type[1]	Dissem. level[2]	Mon.
D5.2	Robot task execution and human-robot fluency I	PRO	Other	CO	16
D6.1	Digital Twin models and executable Implementation I	*CALTEK*	Other	CO	16
D6.2	VV&A activities and feedback strategy management I	*FHOOE*	REP	CO	16
D6.4	VV&A activities and feedback strategy management II	*FHOOE*	REP	CO	16
D7.1	Intelligent manufacturing execution system I	*Fraunhofer*	Other	CO	16
D8.3	*FELICE* integrated prototype I	*CALTEK*	DEM	CO	18
D8.4	Pilot execution and evaluation I	*CRF*	REP	CO	22
D9.3	Dissemination, exploitation, standardisation activities report and impact assessment I	*CRF*	REP	PU	22
D2.4	Robot, architecture and system specifications II	*AEGIS*	REP	CO	26
D2.5	System interaction requirements II	*Fraunhofer*	REP	CO	26
D2.6	Productivity specifications II	*CRF*	REP	CO	26
D5.3	Robotic hardware and adaptive workstation II	*TUD*	DEM	CO	26
D3.3	System enablers II	*FORTH*	Other	CO	30
D4.2	Perception mechanisms II	*FORTH*	Other	CO	30
D5.4	Robot task execution and human-robot fluency II	*FORTH*	Other	CO	30
D6.3	Digital Twin models and executable Implementation II	*CALTEK*	Other	CO	30
D6.5	*FELICE* production process digital twin	*CALTEK*	Other	CO	30
D7.2	Intelligent manufacturing execution system II	*Fraunhofer*	Other	CO	30
D8.5	*FELICE* integrated prototype II	*CALTEK*	DEM	CO	32
D8.6	Pilot execution and evaluation II	*CRF*	REP	PU	36
D9.4	Dissemination, exploitation, standardisation activities report and impact assessment II	*Fraunhofer*	REP	PU	36

Continued on next page

Table 7: (Continued)

No.	Description	Lead	Type[1]	Dissem. level[2]	Mon.
D2.7	*FELICE* framework specifications	*IFADO*	REP	PU	40
D4.3	*FELICE* Perception mechanisms	*ICCS*	Other	PU	40
D5.5	*FELICE* cognitive robot and adaptive workstation	*PRO*	DEM	CO	40
D3.4	*FELICE* system enablers	*AEGIS*	Other	PU	42
D7.3	*FELICE* Intelligent manufacturing execution system	*FHOOE*	Other	PU	42
D9.5	*FELICE* exploitation plan and long-term sustainability	*TUD*	REP	PU	42

4.2 Deliverable Acceptance and Submission Process

Each deliverable has an associated lead beneficiary as shown in Table 7. This partner is mainly responsible in progressing with the deliverable and coordinating the involvement of project members (contributors), typically from the lead partner, but may also involve other partners. Each deliverable has also assigned two reviewing partners that are responsible to assure quality of the deliverable and provide feedback during the acceptance and submission phase. They will revise the final draft and fill the reviewer's checklist. The timeline for preparing deliverables is given in Table 8. It should be noted that this is a generic timeline that applies to most deliverables of their category, but sometimes it may be meaningful to agree on a slightly different timeline for a specific deliverable. The table reflects that 60 days ahead of the deadline a deviation from the generic timeline should be agreed upon. The assigned partners carrying out the reviews for each deliverable are listed in Table 9. Specific reviewers for the deliverables have to be appointed according to the timeline as stated above.

Deliverables of types *Other* and *Demonstrator* are accompanied with a report to provide an executive summary in textual form which is submitted to the European Comission. The overall procedure for deliverables is as follows:

1. The responsible authors of a deliverable send an annotated outline to the PC. This outline consists of the table of contents (ToC) as well as a brief description for each subsection. The PC then requests from partners assigned as reviewers to appoint the respective person responsible for the review. In addition, the PC forwards the annotated outline to the GA for approval.

2. The final draft is created by the authors of the deliverable.

[1]REP = Report, DEM = Demonstrator, ORDP = Open Research Data Pilot, Ethics = Ethics requirement
[2]PU= Public, CO = Confidential – only for members of the consortium (including the Commission Services)

3. The deliverable is verified according to the reviewer's checklist and comments are communicated to the authors.

4. Meanwhile, the project coordinator and quality assurance manager reviews the deliverable to assess the degree to which the objectives are met and whether the deliverable meets in general the standards to be expected. They also provide feedback to the authors.

5. The responsible authors revise the deliverable and provide an update to the PC, QAM, and the reviewers for a second round.

6. If no further comments need to be addressed, the deliverable can be submitted to the European Commission. Otherwise, the authors have to provide a further update and initiate a new round of reviewing.

Table 8: Deliverable preparation and review timeline

Type	**Deadline**	**Action**
All	60 days ahead	The actual reviewers for the deliverable are appointed and the table of contents as well as a brief description of the sections are agreed upon. A more specific timeplan for the deliverable than the generic one presented in this table may also be agreed upon. The annotated outline is circulated among the GA.
All	50 days ahead	The annotated outline is approved by the GA.
Report	30 days ahead	The final draft is sent to to the PC and the reviewers. The PC, QAM, and the reviewers engage in reviewing rounds.
Report	0 days	The deliverable is submitted by the PC.
Other	30 days ahead	The implementation and the documentation is uploaded to a private repository. The link to the repository is sent to the PTC for evaluation.
Other	7 days ahead	The PTC has defined the steps for the integration of the implementation and describes necessary changes.
Other	0 days ahead	Final changes are made and a tag is to be created and uploaded to the respository, for public deliverables the repository is made public or the code is moved to a new public repository.
Demonstrator	30 days ahead	The services, data, and executables, together with instructions on running the demonstrator, including a video of the demonstration is sent to the PC and the reviewers.

Continued on next page

Table 8: (Continued)

Type	Deadline	Action
Demonstrator	15 days ahead	The PC, QAM and the reviewers submit their comments.
Demonstrator	0 days ahead	The deliverable is submitted by the PC.

Table 9: Deliverable reviewers

No	Deliverable name	Reviewer #1	Reviewer #2
D9.1	Project website and visual identity	*TUD*	*ICCS*
D1.1	Quality assurance plan	*FORTH*	*ICCS*
D1.2	Data management plan	*FORTH*	*EUN*
D1.3	Ethics and privacy manual	*ICCS*	*IFADO*
D1.4	Innovation management plan	*CALTEK*	*ACC*
D2.1	Robot, architecture and system specifications I	*TUD*	*AEGIS*
D3.1	State of the art report	*Fraunhofer*	*FORTH*
D9.2	Dissemination and exploitation plan	*UNISA*	*CRF*
D10.1	GEN - Requirement No. 1	*IFADO*	*ICCS*
D8.1	Use cases and pilot evaluation strategy	*FHOOE*	*CRF*
D2.2	System interaction requirements I	*ACC*	*Fraunhofer*
D2.3	Productivity specifications I	*TUD*	*IFADO*
D5.1	Robotic hardware and adaptive workstation I	*PRO*	*AEGIS*
D8.2	Integration strategy	*CALTEK*	*FHOOE*
D3.2	System enablers I	*FORTH*	*PRO*
D4.1	Perception mechanisms I	*PRO*	*FORTH*
D5.2	Robot task execution and human-robot fluency I	*FORTH*	*UNISA*
D6.1	Digital Twin models and executable Implementation I	*FHOOE*	*Fraunhofer*
D6.2	VV&A activities and feedback strategy management I	*Fraunhofer*	*CALTEK*
D6.4	VV&A activities and feedback strategy management II	*CALTEK*	*CRF*
D7.1	Intelligent manufacturing execution system I	*CRF*	*FHOOE*
D8.3	FELICE integrated prototype I	*AEGIS*	*Fraunhofer*
D8.4	Pilot execution and evaluation I	*IFADO*	*EUN*
D9.3	Dissemination, exploitation, standardisation activities report and impact assessment I	*TUD*	*ICCS*
D2.4	Robot, architecture and system specifications II	*ACC*	*UNISA*
D2.5	System interaction requirements II	*ACC*	*IFADO*
D2.6	Productivity specifications II	*TUD*	*IFADO*

Continued on next page

Table 9: (Continued)

No	Deliverable name	Reviewer #1	Reviewer #2
D5.3	Robotic hardware and adaptive workstation II	*ACC*	*CRF*
D3.3	System enablers II	*UNISA*	*AEGIS*
D4.2	Perception mechanisms II	*ICCS*	*PRO*
D5.4	Robot task execution and human-robot fluency II	*Fraunhofer*	*PRO*
D6.3	Digital Twin models and executable Implementation II	*CRF*	*FHOOE*
D6.5	FELICE production process digital twin	*FHOOE*	*CRF*
D7.2	Intelligent manufacturing execution system II	*ACC*	*AEGIS*
D8.5	FELICE integrated prototype II	*PRO*	*AEGIS*
D8.6	Pilot execution and evaluation II	*IFADO*	*EUN*
D9.4	Dissemination, exploitation, standardisation activities report and impact assessment II	*TUD*	*ICCS*
D2.7	FELICE framework specifications	*FHOOE*	*EUN*
D4.3	FELICE Perception mechanisms	*FORTH*	*UNISA*
D5.5	FELICE cognitive robot and adaptive workstation	*UNISA*	*TUD*
D3.4	FELICE system enablers	*ACC*	*UNISA*
D7.3	FELICE Intelligent manufacturing execution system	*CALTEK*	*Fraunhofer*
D9.5	FELICE exploitation plan and long-term sustainability	*CALTEK*	*PRO*

4.2.1 Scientific Publications

Scientific publications detail the methods, and evaluate and compare them in a scientific study. The described method and the study setup may pose risk of violating IP rights of partners. The legal grounds and timelines set forth by the partners regarding publications, among others, are detailed in Section 8.4 of the Consortium Agreement.

4.3 Templates

Templates are maintained in the *FELICE* SVN repository. They will be updated to fix errors or add new features during the course of the project. The most recent version resides in folder **templates** at the root of the SVN repository.

FELICE_Presentation.pptx This template is used for creating presentations. It contains several slide types and an acknowledgement slide with the logos of all partners.

FELICE-WP#-confcall-minutes-yyyy-mm-dd.docx This template is used for summarizing the main points of a meeting.

deliverables/word/FELICE-DX.X-DeliverableTemplate.docx The deliverable template in MS Word format.

deliverables/latex The folder that contains the LaTeX deliverable template.

deliverables/FELICE-DX.X-Reviewer-checklist_name.docx This template is used for reviewing deliverables. Reviewers should replace “DX.X” with the actual deliverable number and “name” with their short handle.

FELICE-quarterly-partner-YYYY-QY.docx This template is used to provide the quarterly report (see Section 3.2.1). In the filename “partner” is to be replaced with the short name of the institution, “YYYY” with the year and “QY” with the quarter.

5 Risk Management

Several risks have been identified already in Annex 1 of the Grant Agreement. These and emerging risks will be monitored closely during project management. In general, risks are categorized according to two criteria: probability (P) and impact (I). The probability describes the likelihood of having to cope with a certain risk during the project while the impact describes the degree to which it affects the project's progress and output. Highly probable and high impact risks represent the most dangerous category and must be given high priority in discussing and implementing mitigating actions.

There are several sources for risks that are considered including managerial risks, technical risks, scientific risks, cooperation risks, and implementation risks. Partners are responsible to report any change in risks or newly emerging risks immediately to the affected WP leader and to the project coordinator.

Risk management will be performed under the supervision of the project coordinator and the quality assurance manager who will be responsible for the following tasks:

- Maintaining an up to date list of all risks including analysis and response plan
- Suggest measures and actions for risk monitoring

The Project Coordination Committee (PCC) (cf. Section 2.1.2) is responsible for:

- Allocating the required resources and time to execute the project activities within the scope of the project budget and schedule
- Reviewing the risk analysis and response plans of risks
- Making the final decision on risk response actions, in coordination with the WP Leaders
- Reviewing the measures and actions for risk monitoring
- Monitoring the effectiveness of risk management

Work package leaders are responsible for:

- Identifying and describing risks
- Monitoring existing risks and reporting changes to the PCC
- Analysing risks and developing risk response plans
- Performing or delegating risk response actions and reporting their progress to the PCC
- Reviewing the effectiveness of risk response actions

5.1 Project Risks

A joint risk analysis that was conducted during proposal preparation, is included in section 1.3.5 of Annex 1 of the Grant Agreement. It is also reported here in Table 10.

Table 10: *FELICE* risks and mitigation actions

No.	Risk description	WP(s)	Mitigation measures
1	Underperforming partner (P:low/I:med)	WP1-9	Many consortium partners have already successfully collaborated with each other in previous research projects, which already provides a solid foundation for a fruitful collaboration in *FELICE*. All consortium partners are highly committed to the project and this situation is unlikely. If it occurs, the flexible project management structure and Consortium Agreement allow a quick shift of resources to alternative project partners.
2	Partner leaving the project (P:low/I:high)	WP1-9	If possible, the affected tasks can be allocated to other partner(s). Otherwise, the flexible management structure will allow quick inclusion of new partners in the consortium if necessary.
3	Key-person leaving or being unavailable (P:med/I:low)	WP1-9	Multiple staff members from each partner are involved in all disciplines, ensuring an immediate substitution. Additional substitution possibilities are provided by partners working in closely related areas.
4	Necessary partner resources are underestimated (P:low/I:med)	WP1-9	The project management bodies will analyse the following options to ensure that planned work can be completed: (i) rearranging resources among the partners as needed; (ii) committing further internal resources of organisations in project activities (if possible); and (iii) re-planning work on the activities in accordance with previous measures.
5	Project schedule is partly not appropriate (P:low/I:med)	WP1-9	The project management structure and measures continuously monitor performed work vs. project plan and are entitled to perform corrective actions by changing the project plan as necessary; this also applies for this case (see also below). In crucial cases, the PM will work on the plan adaptation in close cooperation with EC officials.
6	Project milestones or deliverables are delayed (P:low/I:med)	WP1-9	In the scope of project management monitoring activities, detailed analysis will be done on both global project and lower (WP/Task) project implementation levels. Thus, it will be ensured that such cases are recognised in early stages, ensuring timely and effective implementation of necessary corrections in the work plan.

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No.	Risk description	WP(s)	Mitigation measures
7	Agreement among partners is difficult to achieve (P:low/I:med)	WP1-9	The collaboration spirit in the consortium targets to achieve consensus among all partners on the open issues and the project management bodies will work in this direction. However, to avoid prolonged consensus making processes, which might affect the project plan, the related management procedures for decision making and conflict resolution will be timely applied.
8	Not satisfactory interaction among WPs and tasks (P:low/I:med)	WP1-9	The regular synchronisation of work among WPs (as well as among tasks within WPs) is accomplished with focused project management activities, so that these cases be prevented or be timely recognised allowing implementation of corrective actions without impact on the project plan. If the problems continue, the PC together with STM and WPLs will propose specific procedures for improvement (e.g. monthly reports).
9	Necessary coordination level is not achieved (P:low/I:med)	WP1-9	Similar to monitoring the technical project activities, including analysis of work done and implementation of the corrective actions, the project coordination and management will be observed as well. Thus, if necessary, the responsible management bodies will propose the corrective actions improving overall project coordination. If needed, management of the Coordinator organisation will be involved to solve the problems.
10	Solutions do not meet requirements (P:low/I:high)	WP2	*FELICE* puts a strong emphasis on specifications in WP2, aiming to ensure that all development will be in line with the requirements of the application and end users.
11	Certain components underperform in terms of accuracy, running time, etc (P:med/I:high)	WP3-8	*FELICE* developments relate to a number of R&D challenges, for which the workplan foresees Task 3.1 which is dedicated to the reassessment of the state-of-the-art. Additionally, the consortium has adopted a spiral development approach whose iterative evaluations of use case pilots ensure early detection and rectification of deficiencies. If necessary, additional resources will be allocated to reinforce development and testing.
12	Problems in component integration (P:med/I:med)	WP8	All *FELICE* technical partners have significant expertise in platform integration. Furthermore, the agile approach proposed for the *FELICE* implementation lifecycle will also ensure effective integration.
13	Low technical quality of deliverables (P:low/I:high)	WP1-9	Addressed through regular quality reviews and assignment of peer reviews for each deliverable prior to submission.

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No.	Risk description	WP(s)	Mitigation measures
14	Insufficient data for training AI models (P:med/I:med)	WP4-8	Partners already have certain relevant data, public datasets can also be used, and more data will be collected.
15	The consortium fails to capture a relevant breakthrough (P:med/I:low)	WP1-9	*FELICE* will mitigate those issues by partners closely observing developments in their fields and maintaining bidirectional communications with the EAB and DIHs. A separate task for liaising with DIHs has been foreseen (Task 9.4).
16	Dissemination or exploitation strategy is inadequate (P:low/I:high)	WP9	Relevant activities will be closely monitored and corresponding strategies will be redesigned if the envisioned results are not satisfactory.
17	*FELICE* has insufficient impact and uptake (P:med/I:med)	WP9	All partners will utilise their existing communication channels to increase the project's impact. On top of that, the following measures have been foreseen: a) provision of a consolidation phase in the workplan to refine and wrap-up R&D activities, b) close interaction with DIHs and their networks, and c) participation of a major industrial partner (CRF), who will also transfer developments to actual production environments.
18	Rapid changes in market landscape result in *FELICE* losing relevance (P:low/I:med)	WP9	Market will be continuously analysed throughout the project and any necessary adaptations will be made to the *FELICE* business plan to ensure that the project remains relevant. Furthermore, co-operation among industrial partners, monitoring of co-existing research projects and published high quality research will allow key developments to be identified and adopted early.

5.2 Risk Processing

Risk identification, analysis and response planning are the main steps in risk processing. These steps are initiated and controlled by the risk monitoring process which in turn is governed by risk management. The risk management process involves the review of the identified risks and the implementation of further actions. The process is shown in Figure 2.

Risks will be identified and analysed by all affected WP leaders and mitigations measures will be proposed. The body that is responsible for determining actions arising out of risk management in *FELICE* is the project coordination comittee (PCC).

5.2.1 Risk Identification

In the risk identification step, the actual risk has to be discovered and accurately described. The emphasis will be placed on identifying risks as early as possible in order to

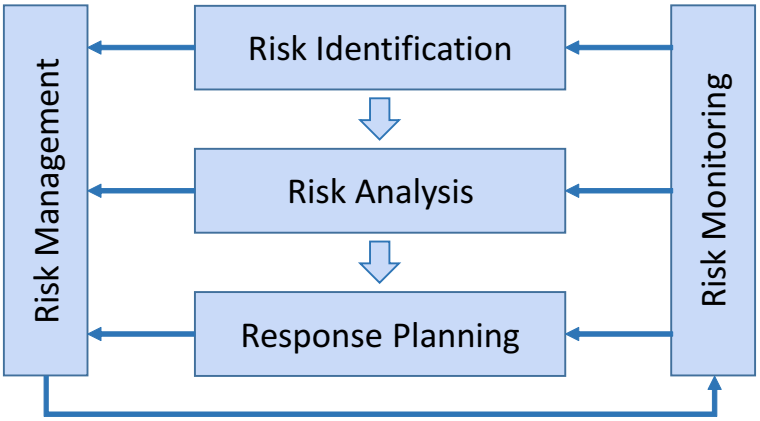

Figure 2: Risk processing plan

formulate an effective response. In *FELICE*, risks emerging as part of particular work packages will be identified by WP leaders.

5.2.2 Risk Analysis

After a risk has been identified and described, risk analysis will be conducted. Each risk is categorised according to the probability of the risk becoming an actual issue and determining the impact of that issue on the project's goals and progress. Both dimensions will be measured on a three point scale of low, medium, and high. Figure 3 shows the prioritisation that is given to certain combinations of probability and impact. Concerning each risk, the WP leaders will provide a preliminary analysis which will then be reviewed by the PCC.

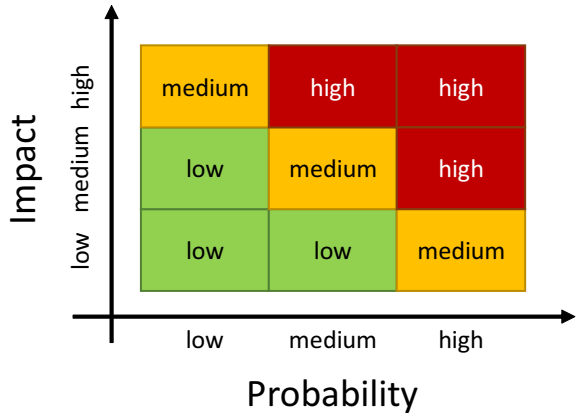

Figure 3: Risk analysis and prioritisation

5.2.3 Response Planning

During risk response planning, strategies and plans are developed to minimise the effects of risks to a point where they can be controlled and managed. The prioritisation

of risks according to the preceding analysis should be taken into account when determining the extent and immediacy of response planning. Every risk that poses a threat should be assigned to a responsible party during response planning:

High prioritisation: Mitigation Risk mitigation should focus on reducing the probability and the impact of a certain risk so that its priority can be lowered. A proactive approach to risk handling may be more effective than a reaction to the damage caused by a risk that becomes an actual issue.

Medium prioritisation: Close Monitoring Close risk monitoring should focus on periodically updating and reassessing the risks, their probability and impact with higher frequency.

Low prioritisation: Acceptance It is the nature of a high impact research project such as *FELICE* that certain risks remain and cannot be completely eliminated. Low priority risks will be monitored at a lower frequency.

5.2.4 Risk Monitoring

There are two aspects of risk monitoring. One concerns the monitoring of risks, their analysis and related response plans, whereas the other is monitoring of risk response actions, their effectiveness and progress in mitigating risks.

In general, risk monitoring is the responsibility of WP leaders who may delegate ownership of a certain risk to a certain partner. Risk owners are responsible in performing the monitoring in close collaboration with WP leaders.

6 Conclusions

This plan must be viewed as a base for achieving quality outputs and processes within *FELICE*. However, quality assurance poses challenges that do not end with the compilation of such a plan. A further basis for achieving high quality is the project's carefully crafted work plan and schedule, the depicted interrelation between work packages and the interdepencies between project outputs that have been taken into consideration when formulating the proposal and subsequently described in Annex I of the grant agreement.

Finally, it has to be mentioned that "quality" is not uni-dimensional and some aspects of quality may have a higher priority than others. It has always to be taken into account, that first and foremost, the project pursues very ambitious and challenging goals. The project has come into existence as a large part to achieve those goals under the requirements and constraints presented in the grant agreement, consortium agreement and in some of the deliverables that are yet to follow. Progress towards these goals is realized in small steps, described in the form of deliverables of the project and it is important to warrant the quality of each step. At the same time, to perform each step to the highest quality possible, is not any more of a guarantee to achieve the goals. Instead of maximising the quality, the overall aim is to maximise the project's impact by pursuing a sufficient level of quality. What exactly "sufficient" represents, is something that will have to be continuously discussed during the whole project.