DELIVERABLE REPORT

Project acronym: INPUT
Project number: 687795

Deliverable:	**D1.1, Quality Report**
Dissemination type:	R (Report)
Dissemination level:	Confidential
Planned delivery date:	2016-05-01
Actual delivery date:	2016-04-27
Reporting Period:	1

WP1, Task 1.4: Quality Assessment
Lead: OBHP

This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No. 687795

1 DESCRIPTION OF THE TASK

This activity regards quality assurance and assessment on the fulfilment of the objectives of the project, including: risk management, comprising of risk identification, evaluation, follow-up and contingency plans and also includes progress measurement against the estimated baseline as regards fulfilment of the proposed objectives according to the quantitative and qualitative indicators of the project.

2 DESCRIPTION OF DELIVERABLE

The quality plan discloses all planned measures that will ensure high quality output of the action, following standard procedures implemented at OBHP.

3 IMPLEMENTATION OF WORK

The Quality Plan defines the organisation and the methodology that all the partners shall apply throughout the project. It forms a common standard for the entire project lifecycle. The aim is to describe the mechanisms that will be used throughout the project in order to ensure the quality level of the project deliverables and the project outcomes.

It defines INPUT Project Management structures identifying roles and responsibilities to ensure a successful project completion; it approaches project deliveries towards the European Commission and internally; it provides indications to manage produced documentation, their archiving and delivery procedures and guidelines to follow for high quality level standards.

It contains also a description of the organization of the internal project reporting, budget and time tracking as well as internal repository that will be used by all partners to upload / download the documents related to the project.

This document should be used as a reference by the Project Coordinator and all project partners.

4 PURPOSE OF THE QUALITY PLAN

This Quality Plan defines the organisation and the methodology that all the partners shall apply throughout the project. It forms a common standard for the entire project lifecycle. It is complementary to the Consortium Agreement and the DoA (Annex I to the Grant Agreement) of the project and defines procedures if not yet defined in these documents. For assuring high quality standards in the project, all relevant documents are relevant in conjunction.

The purpose of this document is to define a consistent set of working procedures, processes and best practice or guidelines in order to ensure quality standards of the Project outcomes. Its main aims can be summarised as follows:

- To manage the interaction between the beneficiaries during the work execution
- To check the progress of the work on a regular basis
- To detail how and when the documentation has to be exchanged by the beneficiaries and with the European Commission
- To set editorial standards for Project document contents
- To complete existing documents for diffusion to public and other European projects.

The Quality Plan shall be applied:

- by all partners,
- for all deliverables to the European Commission,
- for deliverables between partners.

Consortium Partners supervise and check the work performed by their own staff in accordance with the INPUT Quality Plan.

This Quality Plan should be interpreted with reference to:

- the INPUT Grant Agreement.
- the INPUT proposal: Description of Action (DoA), Annex I to the Grant Agreement.
- EC General Conditions for Horizon 2020 Grant Agreements: Annex II to Grant Agreement.

Different events may contribute to modify this QP contents. For instance:

- project characteristics evolution
- techniques or tools changes.

Any project partner may request amendments but each amendment must be analysed by the General Assembly.

5 PROJECT MANAGEMENT STRUCTURE

Due to the relatively small number of project partners of INPUT, the project management structure is kept minimal in order to be as efficient as possible for reassuring well-structured work coordination. The management structures implemented are described below. Personal appointment to management structures was accomplished with all partners present at the projects Kick-Off Meeting held on February 23rd/24th 2016, Vienna, Austria.

Table 1: Project management bodies and appointments

Body	Responsibilities	Decision approval	Appointed person(s)		Planned meetings
Project Coordinator	The project coordinator will take charge of all the executive responsibilities in this project. The coordinator is authorized to execute the project management and shall guarantee that all partners, including itself as an organization, fulfil the obligations, which are taken with the European Commission through the Grant Agreement.	General Assembly	OBHP	Dr. Sebastian Amsüss	N/A
General Assembly	It is the decision making body of the consortium and responsible of its governance. It consists of one representative per partner. The General Assembly is chaired by the Project Coordinator or representative, who will initiate a meeting every six months, or on the initiative of one of the partners according to the provisions in the Consortium Agreement. The General Assembly will be responsible of decisions regarding overall strategy and development, changes in the implementation plan, project scope and/or resource allocation and evolution of the partnership composition. It will also oversee the administrative and financial aspects of the project, communication and exploitation activities, as well as technical decisions that may impact the objectives of the project or when the Project Board cannot reach a consensus. For decision purposes, each member of the General Assembly will be allocated one vote. The General Assembly decisions are binding to all partners in all project-related matters.	Self-decision making body	OBHP OBG UMG-GOE OSS UMCG IDSIA	Dr. Sebastian Amsüss Heiko Glindemann, MSc. Prof. Dario Farina Dr. Andreas Kranzl Ass. Prof. Raoul Bongers Dr. Michael Wand	Once every 6 months
Project Board	It is the executive board to take strategic decisions at scientific and technical level and reports to the General Assembly. The Project Board is constituted by all Work Package Leaders, the Scientific Coordinator and the Project Coordinator who chairs it and who will initiate a meeting (even remotely) at least bi-monthly or on the initiative of one of its members under special circumstances. The fact that Work Package Leaders are members of the Project Board ensures that the objectives of the project will match the goals of the work plan. Key responsibilities of the Project Board are to oversee the adequate and	General Assembly	Project Coordinator, Scientific Coordinator, Work Package Leaders		Once every 2 months

	coherent progress of the project as a whole by taking appropriate measures in a regular and adaptive manner. The Project Board will be allowed to require specific actions regarding the implementation of agreed work and quality plan and deadlines.				
Scientific Coordinator	The scientific coordinator of INPUT is represented by Prof. Dario Farina, who was the coordinator of several past EU and ERC projects, has a wide expertise in muscle physiology research, and directs a Department devoted to the translation of neurotechnologies to the clinics.	N/A	UMG-GOE	Prof. Dario Farina	N/A
Work Package Leaders	The Work Package Leaders will be responsible for the technical and scientific aspects as well as for the day-to-day management of specific work related to their individual work package. Work Package Leaders will coordinate the implementation of the work package activities as defined in the Implementation Plan. Each Work Package Leader will have the responsibility to achieve all the planned deliverables within the scheduled deadline and with the contractually allocated financial and human resources. Each Work Package Leader will work in close collaboration with all work package participants, as well as with other Work Package Leaders whose work results could be interrelated. They will be expected to identify risks as early as possible, find solutions and follow-up to ensure effective remedies. The Work Package Leaders will report work progress and achievements to the Project Coordinator through submitting a Work Package progress report on a quarterly basis and, informally, through teleconferences and/or e-mails.	Project Coordinator	OBHP OBG UMG-GOE OSS UMCG IDSIA	Dr. Sebastian Amsüss Heiko Glindemann, MSc. Prof. Dario Farina Dr. Andreas Kranzl Prof. Corry van der Sluis Dr. Michael Wand	When needed and as part of Project Board

6 QUALITY CONTROL

Quality control is a fundamental aspect of project management both for the administrative aspects and for the scientific ones. For this reason emphasis is put on checking whether project outcomes comply with relevant standards and of identifying ways to eliminate causes of unsatisfactory performance.

In order to assure compliance with the expected quality levels, each document related to the project both public and internal is checked by Project Coordinator. Several aspects will be considered such as:

- Content and the adherence to the project objectives. All outcomes are related to some objectives or task which are clearly described in the Annex I DoA, which is the main document for content related aspects;
- Clarity and completeness are also elements to be addressed in any deliverable, report, study, position paper, communication.

Some possible clarifications and integrations on documents can be needed and these tasks will be the responsibility of the partner in charge of producing the document.

7 RUNNING PROJECT MANAGEMENT

An online EU project management tool based on the SUCCEEDIT platform has been set up for the INPUT project. This platform will be used for the running project management and internal project status supervision by the Project Coordinator, including the following tasks:

- Work package and Tasks monitoring
- Financial monitoring
- Person month monitoring
- Common document repository

From each partner, the work package leaders were designated as responsible persons for keeping all information up to date on the SUCCEEDIT platform. These persons have access to the data in the platform and may keep them up to date continuously or every 6 months at the latest. For this purpose, internal project reporting periods have been defined, which are shorter than those officially set by the European Commission. The internal reports are due in the following months: (bold months coincide with the official reporting periods as set out in the Grant Agreement).

Table 2: Internal reporting periods

Official Reporting Period	Internal Reports due in months		
1	M6	M12	**M18**
2	M25	**M30**	
3	M37	M42	**M48**

With these internal reports, the project coordinator will have the possibility to tightly monitor and track the project progress, especially in budgetary regards. This will allow INPUT to stay on track and discover financial imbalances before the official periodic reports are due to the European Commission.

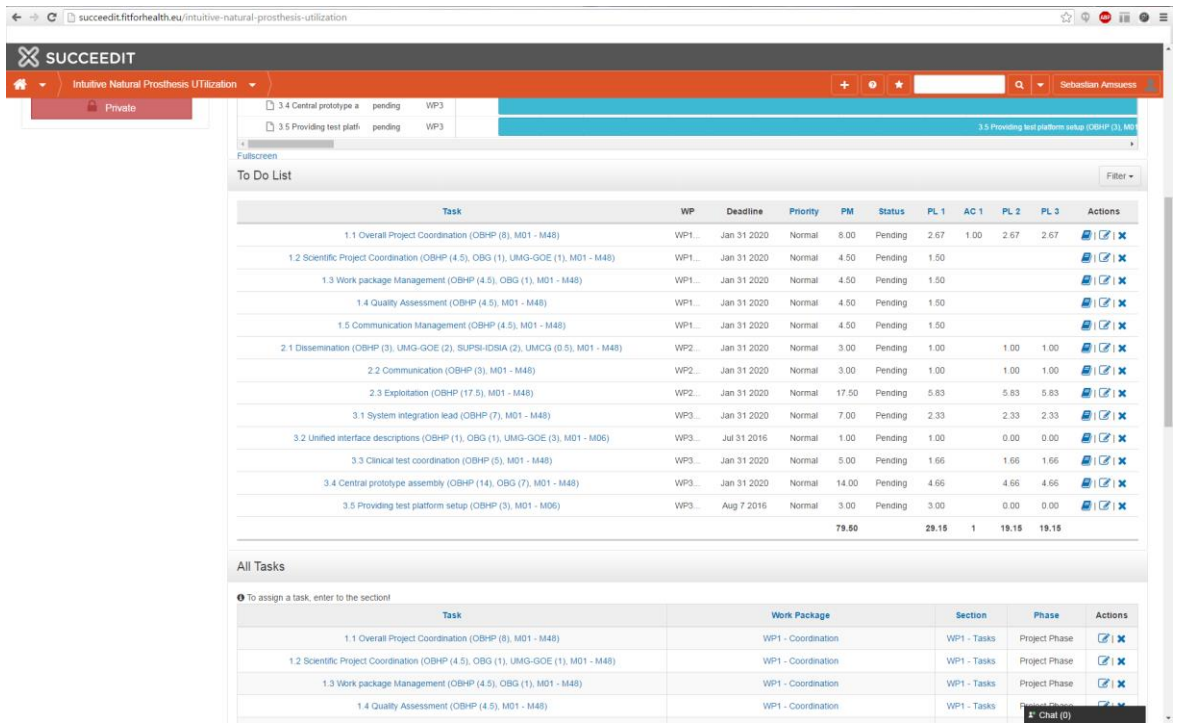


Figure 1: Screen shot of the SUCCEEDIT platform readily set up for INPUT

A detailed time plan giving an overview to all partners of due tasks, schedules and reports along with all deliverables and project risks was handed out to all participants of the Kick-Off meeting. The time plan can be found in the Annex of this deliverable report.

8 INPUT CONSORTIUM MEETINGS

Table 3: Consortium meeting schedules

When	Type	Scope
February 23rd/24th 2016	Kick-Off Meeting	Start-up of the project; Detailed work planning; Setting project and H2020 specific ground rules; project body appointments
Every 2 months	Bi-Monthly Web Meeting	Virtual meeting of all partners for project updates and status reports
Every 6 months	General Assembly Meetings	General steering and scope direction of the project. Can be combined with the bi-monthly meetings
5 times (app. once a year)	Face to Face meeting	Meetings at premises of project partners in the following order: OBHP (Kick-Off), OBG, UMG, IDSIA, UMCG. Topics: Progress reports, discussion of project related topics; activities planning
Upon request	Personal meetings of partners in tight collaboration	Partners who have strongly interlacing work packages will meet upon request for coordinative actions. These partners are especially UMCG and OSS, UMG-GOE and OBG, UMG-GOE and IDSIA and OBHP with all partners.

9 DOCUMENTATION MANAGEMENT

The aim is to define standard rules and procedures related to documentation production that all the partners have to follow for the project duration.

The documentation management procedure is applicable:

- by all partners,
- for all deliverables to the European Commission,
- for documents exchanged between partners.

9.1 FILE NAMING

For easy attribution and locating, all file names will adhere to the following standard:

Standard: *PartnerAcronym_Title_yyyymmdd_Version.extension*

Examples: OBHP_CommunicationPlan_20160101_v1.pdf
OBHP_CommunicationPlan_20160122_v2.pdf
UMCG_DeliverableReportD9.1_20180101_v1.docx

When a new version of a file is created, the date of the current version and the version number are to be updated in the file name. Filenames should not contain whitespace characters.

9.2 DOCUMENT TEMPLATES

During the Kick-Off meeting, the above rules were explained to all participants and document templates were handed out to all partners. The bundle comprises templates for:

- Deliverable reports
- Meeting minutes
- Workpackage Leader Reports

These templates are also made available for download on the common file repository of the SUCCEEDIT platform.

9.3 DOCUMENT REVIEW

Deliverables to European Commission are reviewed by the Project Coordinator while internal deliverables are reviewed during internal reviews organised by the Work Package Leaders.

The final version of a document is checked by the Work Package Leaders for technical aspects and conformity to requirements while quality aspects (coherence) will be checked by the Coordinator:

- the format of the document is correct, the presentation, the identification, the title pages, the summary, the glossary, the annexes, the plan, production rules are respected;
- the content of the document is coherent itself and contains all the information necessary for its comprehension;
- the content of the document is coherent and compliant with other documents;
- should the document have to be incorporated into another document, the resulting document's coherence is also checked.

The table below summarizes the quality indicators to consider when assessing project deliverables/reports:

Table 4: Quality criteria for documents produced in IINPUT

Quality Indicator	Reference
The deliverable/report is in accordance with the objectives stated in the Description of Action	INPUT DoA
The deliverable/report offers complete documentation on the work done in the corresponding WP/Task	INPUT DoA Project meetings
The deliverable/report is compliant with the templates and editing guidelines as outlined within the Quality Plan	INPUT D1.1 Quality Plan
The deliverable/report is clear and legible	Editing to cover: » Language and syntax errors » Structure » Use of pictures, tables and diagrams » Clear distinction between body and annexes
The deliverable/report is complete	Content check covering: » Missing Parts » Non-existent references » Topics not covered » Unclear arguments
The deliverable/report is useful for the target reader/audience	INPUT DoA Project Dissemination Plan
Version history is clear and well documented	INPUT D1.1 Quality Plan

10 CONCLUSION

The above report shows how the structure of the project has been deeply studied to be implemented in the most complete manner giving relevance to the quality of results.

This report, which has to be followed by the coordinator and the project partners, guarantees that the quality level required by the European Commission and by the scientific audience is respected both under the graphical and the technical point of view.

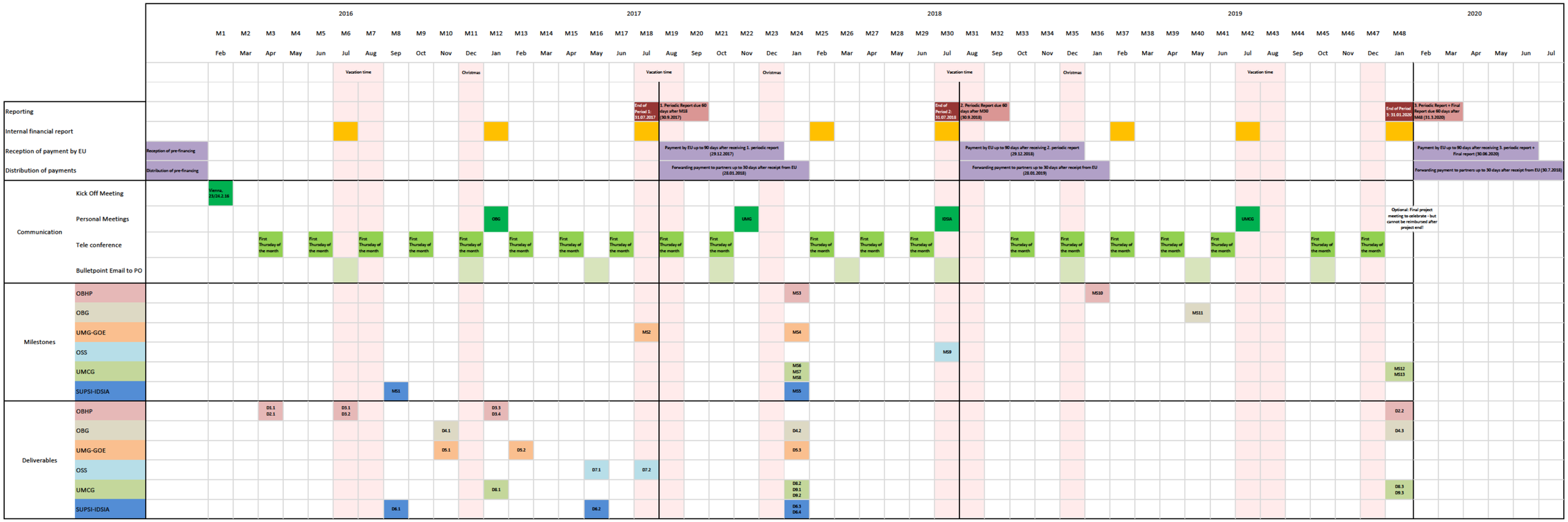
As shown, accurate monitoring is implemented to check quality performance and detect and avoid time or budget problems early on. A clear identification of “who does what” (General Assembly, Project Board, Scientific Coordinator, Work Package Leaders, etc.) clarifies roles and responsibilities.

Finally, the use of an online repository will be of great support to all partners to be always updated with the latest document versions, templates and project implementation activities.

INPUT - HORIZON 2020

Grant Agreement number: 687795

www.input-h2020.eu



WORKPACKAGES

Work package No.	Work package title	Type of activity	Lead Participant Short name	Lead Participant no.	Person- months	Start month	End month
WP 1	Coordination	IA	OBHP	P1	29	M01	M48
WP 2	Dissemination, Communication and Exploitation	IA	OBHP	P1	28	M01	M48
WP 3	System Integration	IA	OBHP	P1	41	M01	M48
WP 4	Signal Acquisition Hardware	IA	OBG	P2	82	M01	M48
WP 5	EMG Models	IA	UMG-GOE	P3	43	M01	M24
WP 6	Machine Learning	IA	SUPSI-IDSIA	P5	91	M01	M48
WP 7	Evaluation Paradigm	IA	OSS	P4	58	M01	M48
WP 8	Patient Training	IA	UMCG	P6	55.5	M01	M48
WP 9	Clinical Testing	IA	UMCG	P6	66.5	M01	M48

DELIVERABLES

Del. No.	Deliverable name	WP no.	Lead Participant	Type	Dissemination	Delivery date
D 1.1	Quality Plan	WP 1	OBHP	R	PP	M03
D 2.1	Project Homepage	WP 2	OBHP	DEC	PU	M03
D 3.1	Template for interface definitions	WP 3	OBHP	R	PP	M06
D 3.2	Decision on terminal prototyping test device	WP 3	OBHP	R	PU	M06
D 6.1	Integrated Machine Learning Software Suite	WP 6	SUPSI-IDSIA	DEM	PP	M08
D 4.1	First prototype of electrode Liner	WP 4	OBG	DEM	PP	M10
D 5.1	Optimal electrode configuration for myocontrol	WP 5	UMG-GOE	R	PP	M10
D 3.3	Templates for clinical test advice and feedback	WP 3	OBHP	R	PP	M12
D 3.4	Terminal prototyping test device	WP 3	OBHP	DEM	PP	M12
D 8.1	Computer-based rehabilitation game	WP 8	UMCG	R	PU	M12
D 5.2	Linearity of degrees of freedom in muscle space	WP 5	UMG-GOE	R	PP	M13
D 6.2	Report on Optimal Machine Learning Methods for Prosthesis Control	WP 6	SUPSI-IDSIA	R	PP	M16
D 7.1	Protocol for testing non-stationarities	WP 7	OSS	R	PP	M16
D 7.2	Set of functional ADL movements	WP 7	OSS	R	PP	M18
D 4.2	Optimized prototype of electrode liner	WP 4	OBG	DEM	PP	M24
D 6.3	Report on first Machine Learning System implemented on Microcontroller	WP 6	SUPSI-IDSIA	R	PP	M24
D 6.4	First Machine Learning System implemented on Microcontroller	WP 6	SUPSI-IDSIA	DEM	PP	M24
D 8.2	Feedback in game	WP 8	UMCG	R	PU	M24
D 9.1	Test for evaluating the ability of simultaneous proportional control	WP 9	UMCG	R	PU	M24
D 9.2	Activity monitoring system	WP 9	UMCG	DEM	PU	M24
D 5.3	Factors of influence on EMG features for myocontrol	WP 5	UMG-GOE	R	PP	M24
D 2.2	Exploitation plan of results	WP 2	OBHP	R	PP	M48
D 4.3	End-user validation report	WP 4	OBG	R	PP	M48
D 8.3	Preferred training method	WP 8	UMCG	R	PU	M48
D 9.3	Advantages of simultaneous proportional over conventional control	WP 9	UMCG	R	PU	M48

MILESTONES

Milestone number	Milestone name	Related work package(s)	Expected Date
MS1	Integrated machine learning software suite developed and tested	WP 6	M08
MS2	Guidelines for optimized signal acquisition available	WP 4	M18
MS3	First test prosthesis setup with machine learning system available for end user tests	WP 3, WP6	M24
MS4	Theoretical foundations of EMG signals established	WP 5	M24
MS5	Machine learning system available for testing with patients	WP 6	M24
MS6	Rehabilitation Game developed and tested with different types of users	WP 8	M24
MS7	Develop a test for measuring performance with simultaneous proportional prosthetic device	WP 9	M24
MS8	Developed a system to monitor prosthesis activities in daily life situations	WP 9	M24
MS9	End of verifying test setup with amputees	WP 7	M30
MS10	Final test prosthesis setup with mobile machine learning system available for end user tests	WP 3	M36
MS11	Decision on signal acquisition hardware for clinical tests	WP 4	M40
MS12	Determine relative contribution of computer-based training to conventionally based training	WP 8	M48
MS13	Evaluated advancements of simultaneous proportional prosthetic device compared to current state of the art	WP 9	M48

RISKS

Consortium risks	Impact/ Probability	WP involved	Contingency plan (Preventive and Remedial Actions)
Coordination and Management problems	Med/Low	WP1	The consortium has been selected to have a broad basis of complementary skills, so that competence overlapping and unclear work load distribution risks are minimized from the beginning. Regular General Assembly (GA), Project Board (PB) and Workpackage Leader (WPLs) meetings will mitigate any arising Management problems early on.
Lowdecreasing partner commitment and contribution	High/Low	WP1, WP2	All partners affirmed strong commitment to the project. In case of decrease or low partner contributions, corrective actions will be taken by the CO, GA, PB and WPLs. If all kinds of interventions fail, previously developed hardware and software might partially mitigate low partner contributions.
Corrective actions fail or cannot be taken	Med/Med	WP1	Quality plans and risk management will be structured to allow flexibility in corrective actions. Alternative counteractions will be sought and applied.
Disagreement on project coordination and goals	Low/Low	WP1	In case of divergence on how to run and orient the project, resolving of conflicting interests will be sought. In case of failure, a two-thirds majority vote (4 out of 6 partners) will be considered decisive.

Management Risks	Impact/ Probability	WP involved	Contingency plan (Preventive and Remedial Actions)
Budget inadequate or unbalanced	High/Low	WP1	The calculated budget is adequate and in accordance with the planned activities. Continuous financial monitoring by the persons in charge for each institution and the CO is required for avoiding problems
Delays in deliverables and reports	High/Low	WP1, WP2	Regular reports and documentation of costs and activities will be submitted to the CO in order to comply with EC rules but also to ensure the proper progress of the project. Assistance will be given by more experienced project partners to the less experienced where needed and appropriate.
Consensus on exploitation of results cannot be reached among partners	Med/Low	WP2	Publication and IP management will be regulated according to the Consortium Agreement. In case of irresolvable issues, the results will not be published or made accessible to externals until consensus is reached by all involved parties.

RISKS

Specific Implementation Risks	Impact/ Probability	WP involved	Contingency plan (Preventive and Remedial Actions)
Templates for interface definitions not ready	Med/Low	WP3	Including all partners from the beginning on and organizing a workshop to reach agreements on interfaces will mitigate this risk. In case of failure of resolving this issue, the sending partner will define the interface for the receiving partner for each subsystem.
Templates for clinical tests and development cooperation not ready	Low/Low	WP3	The CO will mediate the exchange between clinical and technical partners.
Decision on which prototype test device not ready	Med/Low	WP3	In case of uncertainty, the software emulation will be chosen due to its simplicity and cost effectiveness
Prototype test device not ready	Med/Med	WP3	Products already available from Otto Bock will be circulated among the partners
Successful integration of multichannel amplifiers in socket lab	Low/Low	WP4	In this unlikely case, an already existing table top amplifier could be used
Artifacts in EMG recording due to conductive polymers cannot be	Med/Med	WP4	Development of robust signal processing algorithm which are not influenced by those artefacts. If that approach does not work traditional metal electrodes can be used
Linear summation of degrees of freedom in the muscle space does not hold	Med/Med	WP5/6	Preliminary work within the project AMYO indicates that this assumption is valid, within approximations, for two degrees of freedom. If it will turn out that the validity of the assumption does not hold for several degrees of freedom, appropriate non-linear mappings will be investigated, with the main aim of maintaining the training minimal
Limited matching between the modelling predictions and experimental evidence on factors of influence	Med/Low	WP6	The models used for EMG generation have been developed and extensively validated in the past 2 decades, thus it is unlikely that they cannot predict appropriately the factors of influence in myocontrol applications. Mismatches with the experimental evidence will be solved by a better tuning of the model parameters
Indications for optimal electrode number, placement and locations incompatible with the liner technology	Med/Low	WP4/5	The modelling will allow to provide general indications that can be adapted to the specific practical constraints. If some of these indications are difficult or not possible to meet, an iterative procedure will be used so that new simulations will be run with the added constraints.
Machine Learning software suite not finished and tested in time	Med/Low	WP6	SUPSI-IDSIA has ample experience with implementing machine learning solutions on a variety of platforms and with a variety of constraints, so this event is very unlikely to occur. Also, sample EMG data from previous projects (AMYO, MYOGENS) exist and can be used for testing. In case single components might not be ready in time, previously existing isolated solutions may be used and later integrated into the software suite, with no substantial loss of time and efficiency.
Robust prosthesis control with 4 DOF cannot be achieved	Med/Med	WP 6	In this case a focus will be laid on robustness, possibly reducing the final number of DOF. Preliminary work within the project AMYO indicates that at the very least for two degrees of freedom, a comparatively simple scheme of extracting control muscle signals is feasible.
Implementation of machine learning algorithms on integrated hardware solution not feasible	Med/Med	WP6	If newly developed algorithms based on neural networks require more computing power than the microcontroller can provide, the algorithm can be simplified (e.g. by using smaller networks) with only a gradual loss of accuracy. Furthermore, since the hardware implementation task will commence early in the project (shortly after the completion of the integrated software suite), problems will be discovered early and can also be mitigated by choosing different microcontroller hardware.
Not enough amputees to validate developed ADL tests in given time	Med/Low	WP 7	In that case additional amputees will be recruited from other institutes to furfil the necessary number of subjects.
Test protocol not finished in time	Med/Low	WP 7	In case of not finding conclusive advanced test protocols, a set of tests proposed previously in literature will be used.
Game not finished in time	Med/Low	WP8	In that case UMCG will use a slightly adapted version of a game that is currently being developed to train the switching between modes of a multi-DOF hand prosthesis
Patients not available	Med/Low	WP8/9	In the case that also our national network is not able to provide for enough patients, we will ask rehabilitation centres in Belgium and Germany, not that far from us, to collaborate and use their patients. In worst case scenario we will do the measurements at one of our international collaborators.
Able-bodied participants not available	Low/Low	WP8/9	In this exceptional case we will do the measurements at one of two institutes with which we closely collaborate and that have comparable equipment to our lab.
Activity monitoring system not finished in time	Med/Low	WP9	In that case the measurements of the lab-based daily life tasks will be done with camera based, opto-electrical measurement systems. UMCG has several of these setups. UMCG has experience measuring upper limb prosthetic behavior in daily life tasks with these systems.