WhoLoDancE

Whole-Body Interaction Learning for Dance Education

Call identifier: H2020-ICT-2015 - **Grant agreement no**: 688865

Topic: ICT-20-2015 - Technologies for better human learning and teaching

Deliverable 9.4

Quality Assurance Guidelines

Due date of delivery: August 31st, 2016

Actual submission date: September 7th, 2016

Start of the project: 1st January 2016
Ending Date: 31st December 2018

Partner responsible for this deliverable: LYNKEUS

Version: 4.0

Dissemination Level: Public

Document Classification

Title	Quality Assurance Guidelines
Deliverable	D9.4
Reporting Period	M1-M8
Authors	Stefano Di Pietro
Work Package	WP9
Security	Public
Nature	Report
Keyword(s)	Quality Assurance, Testing, Evaluation,

Document History

Name	**Remark**	**Version**	**Date**
Stefano Di Pietro	First Version	1.0.	22Th August
Stefano Di Pietro	Second Version with updated content and tables	2.0	2nd September
Antonella Trezzani	First Review	2.1.	4th September
Mirko De Maldè	Second Review	3.0.	7th September
Edwin Morley-Fletcher	Third Review and Submission	4.0	21st September

List of Contributors

Name	**Affiliation**
Stefano Di Pietro	Lynkeus

List of reviewers

Name	**Affiliation**
Antonella Trezzani	Lynkeus
Mirko De Maldè	Lynkeus
Edwin Morley-Fletcher	Lynkeus

Table of Contents

Table of Figures

1 Purpose of the document

This document is designed to give guidance on assuring quality in planning, achieving, testing, and refining for each area of the WhoLoDancE project.

Although all the areas are closely linked together, the requirements and standard procedures are in many respects different.

From a Quality Assurance point of view it is important to note that the main work of the WhoLoDancE project can be divided into three sections:

- **Work Section 1:** Gathering a Collection of Dance Motion making use of Advanced Motion Capture Technology and building Multimodal Rendering, Holographic / volumetric displays for the learning and teaching of dance.
- **Work Section 2:** Developing a Database with Data Analytics and Advanced Similarity Search Functionalities making use of innovative Semantic and Emotional Representation Models applied to the data acquired
- **Work Section 3:** Managing the Work and collaboration between the partners and effectively communicate and disseminate the project outcomes

The main purposes of these guidelines are:

To define the means of satisfying the objectives for the quality assurance process, and to establish the activities and resources (human organisation, methods and tools) to carry out them;

To provide monitoring of all activities, to assure that the project will meet its specified requirements and will be fit-for-use. This guidelines document defines the activities and resources necessary to ensure that the quality requirements of the project are met. It defines quality assurance guidelines and quality assurance activities. It also defines policies for identifying threats on the project and for implementing corrective actions. These guidelines recognise that, with the diversity of the participating project partners, many different quality assurance and control systems are already in place - the guidelines do not, therefore, seek to override existing procedures.

This document is applicable to the WhoLoDancE project until its end, unless new updates of these QAG are issued in the course of the project.

2 Project Overview

WhoLoDancE aims at developing and applying breakthrough technologies to Dance Learning in order to achieve results that will have relevant impacts on numerous targets including, but not limited to, the dance practitioners ranging from Researchers and Professionals to Dance Students and the Interested Public. For more detailed information on the work of WhoLoDancE please refer to the DoA.

WhoLoDancE focuses on five main Objectives listed and briefly described below:

- **Investigate bodily knowledge** by applying similarity search tools, computational models, emotional content analysis and techniques for the automated analysis of non-verbal expressive movement to dance data that will help investigate movement and learning principles, vocabularies, mental imagery and simulation connected to Dance Practises.

- **Preserve the Cultural Heritage** by creating a proof-of-concept motion capture repository of dance motions built in methods allowing interpolations, extrapolations and synthesis through similarity search among different compositions documenting diverse and specialized dance movement practices, and learning approaches.

- **Innovate the Teaching of Dance** by developing among others a life-size volumetric display that will enable a dance student to literally step inside the Dance master's body that through the use of immersive and responsive motion capture data, will Identify and respond to collisions between the physical and virtual bodies.

- **Revolutionize Choreography** by building and structuring an interactive repository of motion capture dance libraries. Custom dance data blending engine will give choreographers and dance teachers a powerful tool to blend and assemble an infinite number of dance compositions.

- **Widen the access and practice of Dance** by providing access to the created dance database through commercially available consumer grade motion capture devices like the MS Kinect, Intel's real sense and others.

3 Work Section 1

This work section pursues the specific objectives of applying Multimodal Sensing and Capturing Analysis to Dance Data, developing a Volumetric Display and set the requirements test and validate it for the learning and teaching of Dance. This work is being developed in WP1, WP2, WP6 and WP7. Making use of advanced motion capture technologies, EMG and bio-sensors to transfer dance movements into digital data this section of the project will make possible to blend any specific motion element with any other motion element within the database. This will allow WhoLoDancE to deliver any combination of dance moves contained in a teaching syllabus and its Multimodal Rendering, based on the use of either Life-size Holograms of dancers or other immersive visualization techniques, as well as on touch feedback, spatial audio, and abstract visualization that focuses on peripheral vision for the dancer developed in WP 6.

The data acquisition process performed in the motion capture sessions will be respondent to the Learning Principles and Movement Principles set by the Dance experts that will be defined based on an in depth analysis of the state of the art and further developed and tested in WP1 and WP2. The testing and validation of the ICT-based learning platform created will be performed in WP7 starting M7 until the end of the project.

3.1 Organization of Work

In order to achieve the above-mentioned objectives, the work will be carried out through selected procedures and tasks that will ensure the quality of the results taking advantage of the cross-collaboration of different partners with specific expertise to each phase of the process.

- The work in WP1 will be mainly carried out in the first phase of the project (M1-M16) and will be focused on the definition of users' needs, Learning Objectives and Scenarios and Technical Requirement will be defined based on current learning (formal and informal) practices and approaches for dance teaching. A state of the art Survey will start from M1 but taking into account the lack of standardization in Dance Learning in general, as well as the fact that ICT-based Learning for Dance is new, the output of WP1 as a whole with regard to the feedback from various external experts from the dance world will be of great importance in order to ensure the quality of the results for the learning and teaching of dance (T1.2; T1.3; T1.7).

- The work in WP2 is carried in the first and second phase of the project (M2-M23) and is focused on applying Multimodal Sensing and Capturing Analysis to Dance Data. The WP work has been broken down into selected tasks in which technical and dance partners are involved, in order to ensure the quality of the dance data from a technical standpoint but also to respond to the needs of the end-users:
    - Recruitment protocol and informed consent form
    - R/D – development of the pipeline Capture
    - Data Curation
    - 3D Position reconstruction
    - Skeleton Fitting
    - Post processing
    - Cross range devices and scalability

- In WP6 the exploration and creation of a proof of concept of volumetric display for the data created in WP2 will be performed and the overlay of intersection detection and feedback (visual, auditory and other between real and virtual dancers) will be developed. The data will be indexed on the models of high level descriptors derived from the work in WP3 and Wp4. Since such a volumetric display and detection system is an absolute novelty the accuracy of the procedures, the organization of work as well as the successful integration of feedback from the dance world will be crucial.
  The creation of the system developed in WP6 has been broken into the following tasks:

    - Immersive flow-field display methods and existing devices
    - Alternative spatial displays
    - Cross -sensor intersection detection and response
    - Optimal feedback for the peripheral visual field and auditory sensing spaces

- Finally, in WP7 the quality assurance and validation of the integrated motion capture database, the developed user interface and the validity of the HLF overlay decision assisting algorithms will be performed. The laboratories available at Coventry University and University of Genoa will serve as "testing ground" sites where dance teachers and students will get familiar with the possibilities provided by the tool. Furthermore, the BETA testing work will be performed and operational limitation, feature suggestion and possible bugs will be reported to the partners.

3.2 Reporting, Evaluation and Validation

A number of deliverables in the form of public reports are being produced, circulated and sent to the European Commission throughout the completion of the work section. Reporting of each phase of the process is crucial in order to receive constant feedback from other partners that may share diverse perspectives that can positively contribute to the outcome of each single phase of the project.

Below a brief description of the deliverables that are being produced and circulated in the form of public reports:

- The Deliverables in WP1 that are being produced in the first phase of the project, concern the State of the Art Survey (D1.1), The definition of the learning scenarios (D1.4.), the outcomes of the interviews and workshop organized in order to test these hypothesis (D1.2; D1.3) and technical requirements and definition of the features required for the development and personalization of these scenarios (D1.5; D1.6; D1.7).
- The deliverable in WP2, produced mainly in the first and second phase of the project, concern the report on the recruitment process that should be compliant with specific ethical guidelines (D2.1) and the outcome of single step of the motion capture process from the development of the pipeline until the curation and post-processing of the captured data (D2.2; D2.3; D2.4; D2.5; D2.6; D2.7; D2.8).
- The deliverable in WP6 and WP7, that will be produced in the second and in the last phase of the project, are aimed at reporting in depth the results of the process both from a technical perspective (D6.1; D6.2; D6.3; D6.4; D6.5; D6.6) and from an artistic perspective, making use of feedback for external stakeholders and the general public (D7.1; D7.2; D7.3)

A number of deliverables were already submitted to the European Commission, describing the outcome and progress of selected tasks. In the next paragraphs the outcome of the tasks that are more relevant from a Quality Assurance point of view will be briefly described in order to share the standard procedures among partners and help define quality assurance guidelines and standards for the work sections.

3.2.1 Recruitment Protocol and informed consent

The protocols for recruitment and the consent forms have been included in D2.1., which was submitted on M3.

The recruitment protocol was produced by Coventry University and approved by the Ethical Commission of the University. In order to ensure the full awareness of the details of the process the following issues have been addressed and included in the form that had to be signed by the participants:

- What is the purpose of the study?
- Why have I been approached?
- Do I have to take part?
- What will happen to me if I take part?
- What are the possible disadvantages and risks of taking part?
- What are the possible benefits of taking part?
- What if something goes wrong?
- Will my taking part in this study be kept confidential?
- What will happen to the results of the research study?
- Who is organising and funding the research?
- Who has reviewed the study?

After fully covering these issues in the form, the participants were asked to answer the following questions with a yes or no answer:

1. I confirm that I have read and understood the participant information for the above study and have had the opportunity to ask questions.
2. I understand that my participation is voluntary and that I am free to withdraw any time without giving a reason.
3. Video recording: I understand that my dance movement will be video recorded as part of the process of determining the shot-list for 3D capture.
4. I agree that these video recordings will be used exclusively within the project for research purposes and will not be published online or used for any other publication purposes without my prior agreement.
5. I agree that in addition to use by the project team for research purposes these video recordings may also be released to recognised research groups for related research.
6. I agree that in addition to use by the project team for research purposes and use by recognised research groups for related research, these video recordings may also be released to wider audiences for the purposes of disseminating the outcomes of WhoLoDancE.
7. I agree to being identified by name in relation to my video recordings.
8. I wish to remain anonymous in relation to my video recordings.
9. I understand that my dance movements will be captured in 3D format and will be used to build a data repository that will be anonymously used in this research project.
10. I understand that my personal data will not be stored and any comments I contribute will not be associated with my name under any circumstances.
11. I agree to take part in the research project as described
12. I do not agree to take part in the research project as described.

The participants were involved in testing the teaching principles that will assure a quality of the Motion Capture Dance Data. The project team identified two sets of principles; *Movement Principles* and *Learning Principles* and tested them in order to find out the extent to which these principles are present in different genres and how they manifest in specific teaching strategies. The involvement of external and independent participants is key also to examine the relationship between both sets of Principles in different dance genres throughout all the phases of the project.

Participants could be involved in two ways. The first was to complete a questionnaire divided into two sections; a quick box check section then a section where more in-depth feedback were required. Section one was no longer than 20 minutes and Section two up to 40 minutes. The second way in which participants could get involved was also by agreeing to be interviewed by the researchers at Coventry University to find out more about their experiences and to discuss answers to the questionnaire in more depth in person or via Skype.

3.2.2 Workshop Report

D1.3 reported on the activities of the WhoLoDancE workshop, the first occasion to have a valuable feedback from the dance community, a process that is crucial in order to create an ICT-based learning platform for learning and teaching of dance that will have an impact in the dance community. The workshop took place on the 6th and 7th of July in Thessaloniki, and was titled "Dancing with Technologies: Interact to learn, analyse to create". The workshop was mainly organized by ATHENA RC, with the collaboration and support of all other partners of WhoLoDancE, and it was a Satellite event of the 3rd International Symposium on Movement Computing. The main objectives of the WhoLoDancE workshop were to present the objectives of the project within the wider context of movement computing, cognition, dance and technology, to communicate to and acquire feedback from experts of different relevant background on the initial conceptual framework of the project and to disseminate the project and bring together people with relevant interests (dance practitioners, choreographers, new media artists, ICT researchers and developers).

During the planning of the Workshop it was decided that the most interesting aspects to combine and focus on, both for the participants and the project goals, would be:

a) Learning principles
b) Movement principles,
c) Learning scenarios
d) Available technologies.

The program of the workshop was organized in four different sessions in order to achieve specific goals

Workshop's Session	Goals
Presentation and contributions	Presenting to the dance community the outcomes of research carried on within WholoDance and receive feedback from the audience through a final discussion
Hands-on Session	Gathering suggestions and feedback on crucial aspects of the project by practically engaging on the principles and technologies implemented within WholoDance
Demos	Getting feedback from users that could be directly engaged on the prototypes of the technological tools which are being developed
Evaluation of the workshop	Receiving a feedback from the participants to improve the future workshops that will be organized throughout the project timeline

3.2.3 Outcome of the pipeline development

This deliverable D2.2. Outcome of the pipeline development was produced at M6 and included the detailed shot list documents for motion capture per genre, the design document for the syllabus display, the motion

capture pipeline flowchart document and the raw sequences of captured motion per dancer / motion element.

To produce a detailed pipeline of the process even from the early stage of the project is key in order to assure the quality of such a highly technological and complex process involving dance experts that may refer to different teaching methods and should formalise and translate into a motion capture segment that can be meaningful not only from a technical but also from an artistic standpoint.

Below the pipeline developed:

- Pre-Production
- Rehearsals
- Dance scripts and shot-list storyboarding
- Character / set BIBLE and Shot pre-production
- Production
- Post processing of data
- Format conversions
- Synchronization for blending

3.2.3.1 Pre-Production

In the pre-production phase it is important to gather from the partners all of relevant materials like scripts, storyboard, production drawings (characters and sets), references on video, scratch audio tracks, etc. It is important to plan for testing and expending more effort on shots that are vaguely specified, in order also to allow for exploring possibilities as part of the creative process carried through during the motion capture. The next step in planning is to examine the information describing the project and "break it down" into potential motion capture shots

For each shot, information relevant to the motion capture work must be extracted. This is then used to plan how to do the work and, more importantly, whether it is possible in the first place. The motion capture pipeline converts the raw information provided by the motion capture equipment into joint rotations on a model of the performer's skeleton and finally onto the target character. The pipeline technician uses the driver software and applications of the motion capture system to derive the "performer skeleton" from the captured rest pose. A low resolution model of the character to be animated is made available to the dancer for real time previews. After setting up the pipeline, the technician can connect this model to the rest pose. This will allow real-time previewing of the motion data during the capture sessions to come.

3.2.3.2 Dance scripts and shot-list storyboarding

The questionnaire that was filled in by the partners as part of WP1 and the video documentation that is created per dance genre and per movement principal, are used to create a comprehensive shot-list story board to be used as a guideline for the motion capture production. The shot-list storyboard is used as a generic template for all capture sequences that build up the repository database.

3.2.3.3 Rehearsals

To assure the quality of movements captured rehearsals with performers and capture technicians are carried out on two different grounds, Creative and Technical. With regard to the Creative aspect, the rehearsal focuses on the best performance of the specific motion. The Technical rehearsal aims at assessing the best way to capture the specific shot (Performer placement, performer calibration and shot specific constraints). Rehearsals are the most important tools for increasing the quality and decreasing the time needed to capture motion data.

3.2.3.4 Character / set BIBLE and Shot pre-production

Some dance movement rely on having props or additional dancers on the set during capture (Specifically for Greek folk dances). These motions are specifically mentioned in the shot-list and need some pre-production on the capture stage to accommodate special shot constraints and assure the quality of the data produced. A separate list of those "special" shots are set in a "Character / Set Bible" that enables proper capture stage setup before data acquisition stage

3.2.3.5 Production

To efficiently carry on the actual production phase, it is necessary to enter the studio on the day of production, calibrate the system, place the equipment on the talent, calibrate the performer and start shooting. There is no need to search for things; they must be laid out beforehand within easy reach. If it isn't possible to get up and go, then the preparation was inadequate. Preparing the Studio Preparation occurs in the days and hours before the performers arrive for the actual shooting.

During the production phase, when the technical crew and the performers are on the capture studio and the session is starting, a real-time preview is enabled for both the Performers, the motion capture director, and the technical team. This Preview, or pre-visualizations, ensure that everyone involved can see the captured movements while they are being captured to identify any possible problems and errors and then the quality of the captured material. Capturing then commences and every shot in the shot-list for the specific capture session is then recorded and saved into the raw data repository. Some of the shots in the list, and the ones based on specific movement principals, need either rhythm or relevant music tracks. Music and rhythm cues are available both during capture or post capture for synchronization purposes. Since for some of the project scope genres, sonification is part of the scope, we will record also sonic data during motion capture sessions, when applicable.

3.2.3.6 Post processing of data

Data is post processed automatically and then examined to discover anomalies. These can be data spikes, bad takes (which are usually discovered during production) and any system jitters. Special attention is given to finger tracking in sequences where those are important for the conveying of specific dance meaning

3.2.3.7 Format conversions

As defined in the WhoLoDancE project document, the master data format that is used throughout the project is FBX. FBX Assets is a framework that allows you to create, edit, and manage asset templates. An asset template defines the interface of an asset. In other words, it specifies the properties an asset must have in order to comply with a specific asset type.

3.2.3.8 Synchronization for blending engine

WhoLoDance involves the creation of a custom blending engine that will relate to the captured FBX data files as a relational database and will enable the blending of any sequence with any other sequence in the database. For this purpose all data needs to undergo different processes of synchronization:

1. **Time domain Synchronization**: deals with having the motion capture data adhering to an overall time unit. The data was captured at speeds of up to 120 Hz, but in the blending engine we intend to down sample this to 30FPS to adhere with most real-time technology.
2. **Frequency domain Synchronization**: Different dance genres are typically dances in different tempos and in many cases, tempo also changes during the same dance. The blending engine is designed to enable the synchronization of the data files on different tempos (rather than the tempo they were recorded in).
3. **Spatial synchronization**: relates to having all sequences aligned to the same XYZ global coordinates at start of sequence.

3.2.4 Outcome of the capture process

The report submitted at M8 contained the results and file list of all the data captured during the motion capture sessions in Amsterdam which took place in May and July 2016 (10 days per each session). The document contained the actual filename, an assessment during capturing indicating if the shots taken were qualitatively sufficient from a movement quality perspective. The assessment was done in real time by Oshri Even-Zohar from Motek and his team, in close collaboration with the dance companies that participated in the capturing in order to fulfill not only the technical aspects but also the "artistic quality" of the data captured together with the choreographer. Also the length of the shot was listed, together with the number of frames captured, in order to provide detailed information also available to the other technical and artistic partners.

3.2.5 Multi-sensor integration report

In view of reporting in detail the outcomes of the capture session and the possible usage of different low-end devices for the scalability of the project, a deliverable (D2.8) was been submitted at M8. The deliverable contained some preliminary results of integration of suggested additional registration devices, all the issues encountered during the task, and a set of recommendations for the optimal usage of multimodal sensors.

The motion capture data-base template was created using Vicon™ optical motion capture systems. Those systems provide high fidelity, high accuracy and high sampling rate, and all other sensor types that have been analysed for future integration within the project have been compared with the Vicon™ base template specification.

The other sensors have been tested, classified and analysed making us of specific parameters (e.g. Date of release, Price, Tracking Method, Range, RGB Image, Depth Image, Connectivity, Physical Dimensions, etc.) in order to ensure the quality of the devices, and evaluate the usability for the development of the project. Comparison between optical, inertial and Elettromagnetic systems have also been performed. (For more details please refer to D2.8.)

4 Work Section 2

This work section pursues the specific objective of Developing a Database with Data Analytics and Advanced Similarity Search Functionalities making use of innovative Semantic and Emotional Representation Models applied to the data acquired. This work is being developed in WP3, WP4 and WP5. The complete development chain from requirements collection to the delivery of the database to the end users has to be controlled and managed from a quality point of view. Therefore, all partners are required to follow their internal procedures to ensure the high quality goals of the WhoLoDance project.

The following paragraphs provide the users with a minimal set of tasks to be followed during all work-package activities related to this work section, with a particular focus on the creation of the database.

From the Data quality assurance point of view the following general principles must be applied:

- Data must be collected according to the agreed protocols and forms.
- Instrument data must be computer readable and the servers holding that data must be accessible by the WhoLoDance platform.
- Selected data must be concurrent, according to protocols.
- Automatic Data Pre-processing (for noisy, outliers, and missing data) must be implemented.
- Incomplete data can be collected for specific and previously agreed purposes.
- Reusable knowledge discovery techniques will be used for the analysis of vertically integrated data.

Participants entitled to develop the database of the project recognise the importance of requirements analysis and documentation in successful platform development and end-user satisfaction. The complete development chain from requirements collection to the delivery of the database to the end users has to be controlled and managed from a quality point of view.

Following the general principles for the database creation a number of issues have been addressed extensively in the DoW and briefly summarised in the table below:

Issue	Guidelines and policies to be applied
Data Management	• The work carried out by the consortium will be reported at M12 via the production of D5.1. “Data modelling, data integration and data management plan”, that will contain specific aspects of representation standards for primary content and data, as well as their metadata, data sharing, metadata-based documentation of services and workflows, data provenance, attribution and citation, archiving and preservation will be dealt with, in order to ensure discoverability, accessibility, assessability, intelligibility, standardization and interoperability. • WhoLoDancE export services (WP5) will support multiple standard access APIs and export such content in several formats, e.g. XML, RDF and JSON, and metadata schemas • The relative JSON, RDF, and XML schemas will be published (DocBook format) to maximize re-use and intelligibility • WhoLoDancE will make the metadata collection available for access and re-use to the outside world. Such WhoLoDancE data will be accessible via standard APIs, including OAI-PMH, HTTP REST search APIs, OpenSearch, while a SPARQL Linked Open Data entry point will also be investigated. Specific APIs will be provided on request to serve interoperability with systems or infrastructures that are particularly relevant to WhoLoDancE.

Data Protection and Privacy	• The procedures that will be implemented for data collection, storage, protection, retention, destruction and confirmation have been checked in order to comply with the national and EU legislation. These procedures have been reported via the production of the deliverable "D1.5 Data Acquisition Plan" (data collection), and will be subsequently reported in "D5.1 Data modelling, data integration and data management plan" (storage, protection) at M12. • The main objectives of WhoLoDancE do not include the processing or sharing with third parties any kind of personal sensitive data. The data storage and collection will be based on technologies and approaches to protect the participant's privacy considering the anonymization of any sensitive personal data (health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction). As described also in T5.4, that will start at M13, well established security related protocols, guidelines and policies for authentication, authorization and encryption (e.g., HTTPS, OAuth2.0, HIPAA) will be implemented to ensure the security of data transactions through the platform and the various components. The aforementioned processes have taken into account the need to make fully or partly public names, images or extracts of work belonging to participants artists and contributors, following their written agreement, in order to a) acknowledge them and their work, b) promote and disseminate the outcomes of the project, c) introduce WhoLoDancE platform as a media for networking and bringing together artists and experts
Ethics and Security	• The collected data will make it possible to create an anonymous 3D database that will be used to drive virtual avatars. In particular, the motion capture components of the database will not be revealing any personal parameters of the performing dancers and will not imply Ethical risks, or privacy risks. • A specific Informed Consent Form will be prepared (as per T2.1, and see at p.87 the section containing the Basic Elements of the Informed Consent Form), to be submitted for signature to all the participants prior to their inclusion, as a mandatory precondition for their involvement in the study. All involved subjects will be free to withdraw their consent to participate in the experiment at any time, whatever the reason. They will be informed about this possibility before entering the study. • No sensitive data (such as health, sexual lifestyle, ethnicity, political opinion, religious or philosophical conviction) will be collected. Furthermore, WhoLoDancE is not engaged in research in biotechnologies, nor in the development or experimentation of medicine, nor in any research involving the storage and processing of biological data. • Whenever an ethical issue shall arise, given the fact that in any case such recordings will of course refer to individual performers, who could be recognised (or possibly even wish to be recognised), WhoLoDancE will act in accordance with Directive 95/46/EC of the European Parliament and of the Council of 24 October 1995 concerning the processing of personal data and on the free movement of such data. On principle, every effort will be made to preserve the privacy of the subjects (as per T9.9). This means that, generally, the dancers' identity will be kept confidential by default, unless they themselves indicate that they would like their involvement to be published. In any case, to effectively deal with this issue, in the Informed Consent Form, which the participants shall sign before any recording is made, a specific section regarding video recordings will be included, to allow the participants to explicitly agree to the level at which recordings involving them may be released. It will specify the level of release that is agreed (within the project, to recognised research groups, or to a wider audience), and will assure the right to withdraw their personal data from any level at any time.

4.1 Organization of Work

In order to achieve the above-mentioned objectives this section of work has been organized into selected broken down tasks responding not only to the internal procedures of all the partners to ensure the quality of the results, but also making use of the cross-collaboration between different partners within the consortium that will contribute with different perspectives and expertise to each phase of the process.

- The work that is being carried out in WP5 will ensure the creation of the overall data management infrastructure (T5.1) that will be built and deployed to collect, store, pre-process and manage the multimodal data acquired in WP3, to deliver that data as input to various similarity search algorithms developed in WP4, and to support data exchange between different components and modalities of interaction (T5.3; T5.4; T5.5; T5.6). WP5 is responsible for integrating the "ground-truth" data selected in WP2, indexing and annotating based on the models and high-level descriptors prepared in WP3, and creating a Learning content repository of movement data following the requirements and theoretical guidelines defined in WP1 and modelling in WP3 (T5.2). The platform testing and validation will be performed during the all duration of the project (T5.7)
- The work in WP3 will be carried out within the whole project timeline (M1-M36) and will be focused on the creation of models and representations(T3.1), multimodal analysis methodologies (T3.3), signal modelling (T3.2) and the development of the platform and software libraries (T3.4). For the quality assurance for the whole project it is key to develop learning tools in accordance to the user's needs and the technical requirements identified in WP1.
- The objective of WP4 is to facilitate the development of application scenarios based on similarity search techniques, consolidating the efforts concerned with model building (developed in WP3) and output/interface modalities into subsystems that make the development of novel applications for dance education feasible (T4.1). The second goal is to supply core components of the application logic formulated as data-mining problems which include similarity search, clustering and indexing of high-level feature data and databases (T4.2).

4.2 Reporting, Evaluation and Validation

Database development requires that the ideas behind developed datasets are well documented. This facilitates maintainability, testing, requirements validation and most importantly integration of the different learning platform components. WhoLoDancE's IT partners shall adhere to the practice that the design of the platform components will be documented. Again, the assurance for a successful integration of different learning practices and technologies for education is partly built in our Description of Work via the initial requirements analysis document and will be updated and described in depth at M15 and will continue until M36 via public reports (D7.1; D7.2; D7.3). We do not require – and the diversity of the project's research and development domains hardly allows for – that all teams follow a uniform design paradigm, but design practices should be documented and shall be guaranteed and supervised by Work Package Leaders

A number of deliverables in the form of public reports are being produced, circulated and sent to the Commission:

- The Deliverables in WP3, that will be produced in the second and third phase of the project, concern the report on the representation models of all the aspects of the data gathered (D3.1; D3.2; D3.3) multimodal signal modelling (D3.4), the analysis methodologies (D3.5) and finally the report on the software platform and libraries (D3.6; D3.7), that will be produced first at M15 and then updated at M30
- The deliverables in WP4, to be produced mainly in the second and third phase of the project, will be public reports produced regularly starting at M18 on the development of System Analysis algorithm

(D4.1), components (D4.2) and tools (D4.3; D4.4) to be applied to the database that will be developed within the project work.

- The deliverables in WP5, that will be produced in the second and in the last phase of the project, are aimed at reporting the progression of the process (M12; M18; M24), the requirements, the design, development, and testing, of the database created (D5.1; D5.2; D5.3) and the results of the testing of the final release of the data management platform (D5.4)

No preliminary report has been set to be produced at M8. For more details on the ongoing testing and evaluation of the database development please refer to the Dow. More details will be included in the first intermediate report that will be produced at M12.

5 Work Section 3

This work section pursues the specific objective of successfully managing the work and ensuring collaboration between the partners, while properly communicating and disseminating the results to a variety of research communities, artists and Technological companies, ranging from Dance Companies and Dance Institutions to Researchers and Scholars, as well as industry. This work will be carried out in WP8 and WP9.

5.1 Organization of the work

In order to achieve the above-mentioned objectives, the work in WP8 will be carried out throughout the duration of the whole project (M1-M36), and will be focused on designing and developing a management structure and management procedures in order to ensure a smooth cooperation between partners, and to maximise the knowledge exchange within the consortium.

In WP9, an effective dissemination concept and structure has been put into place, starting at M1, and will be developed, improved and assessed continuously during the whole project (M1-M36).

Furthermore, an effective ongoing monitoring and self-evaluation process is enabled, making it possible for the Consortium to identify the most effective and promising moves toward the achievement of the project objectives, as well as to forecast the major threats to the achievement of these objectives, thus allowing to promptly put in place appropriate mitigation strategy.

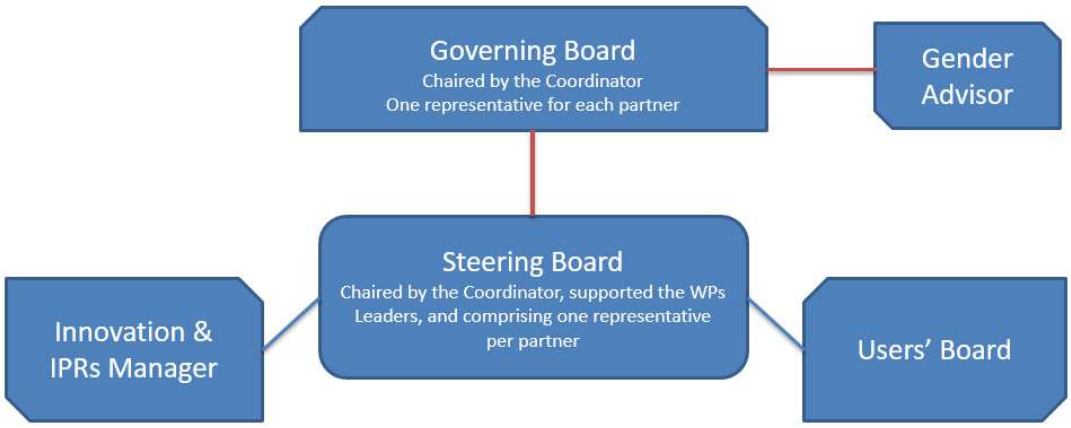
In view of defining the quality assurance guidelines for this section of activity, a description of the management, the review process description, including the specific pairing between partners that have been agreed upon during the general meeting in Thessaloniki (M6), and the related communication strategies, will be briefly described in the next paragraphs (for a detailed description please refer to the DoA).

5.1.1 Management structure and procedures

WhoLoDancE project structure is organised according to the structure illustrated in the following Figure (Figure 1), and focuses on four primary managerial tasks:

- Decision making, implemented by the Governing Board,
- Scientific and technical coordination, performed by the Steering Committee,
- Operational management, performed by the Steering Committee,
- Advisory, carried out through:
    - The Users' Board
    - The Innovation manager

Figure 1: WhoLoDancE Governance Structure

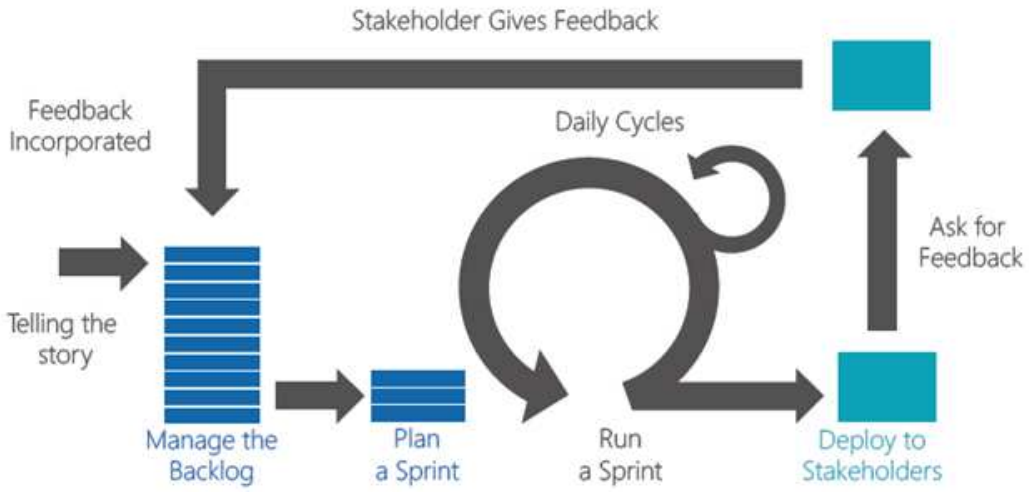


The Governing Board is the highest level of management in the project. It is the Consortium's main decision-making and arbitration body, and it is composed by one representative per partner. The Governing Board is engaged in addressing only very high-level/strategic issues of the project.

The Steering Committee ensures both the project management and the technical and scientific coordination of the project, and represents the executive body of the consortium. It is chaired by the Project Coordinator, who is supported by all WP leaders, and comprises one representative for each partner.

The management procedures of the project recognise that each implementation phase of the project should be considered as a learning process that leads to subsequent phases of adjustment and improvement. This approach adheres to the classic project cycle management, which makes it possible to comply also with the reporting obligations to the EC. With regard to the implementation phase, though, a different model will be adopted: the agile project management. This approach has the following values: continuous cooperation with the end-users, frequent delivery of products, the adaptation to new requirements, and working prototypes as a primary measure of success. It has proven to be really effective in delivering high-level products, compliant with the users' needs, requirements and expectations.

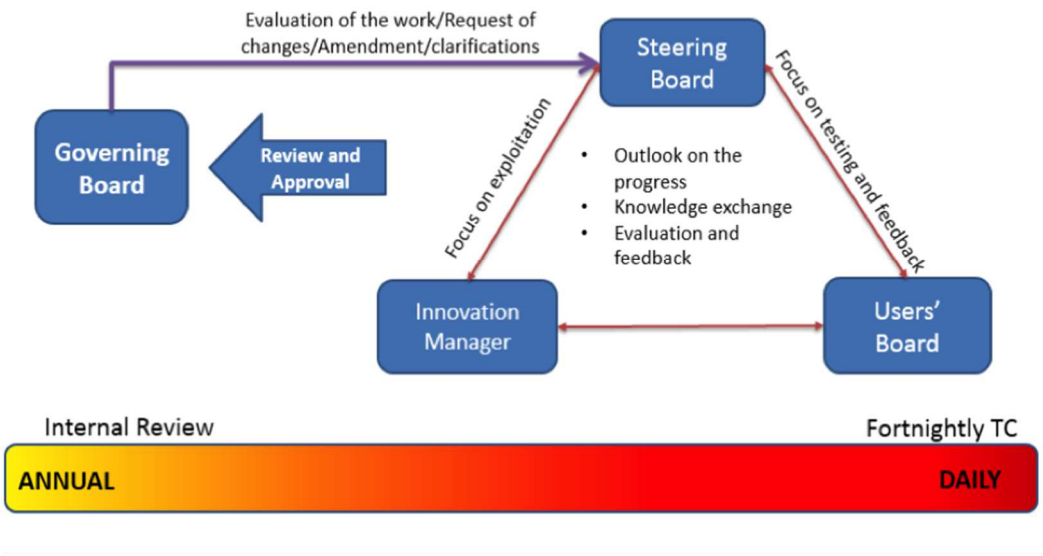
Figure 2 - Scheme of agile development approach



It was deemed appropriate to use this model for the implementation of the technical component of the project, in order to maximise the interaction between technical partners and dancers/end-users, enabling – through subsequent interactions – a continuous feedback on the intermediate/partial outcomes of the implementation. Thus, we have two interwoven procedures, described in the following figures.

- The first one represents the classic Agile/scrum development approach (figure 2), which will be adopted for the implementation of the most technical part of the project. The Users' Board will play a role in defining the project backlog, while also providing the feedback to inform the consequent interactions.
- The second one represents a more general interaction procedure among the project bodies (figure 3). This procedure is designed to optimize resources, involving the relevant bodies and partners when necessary and useful.

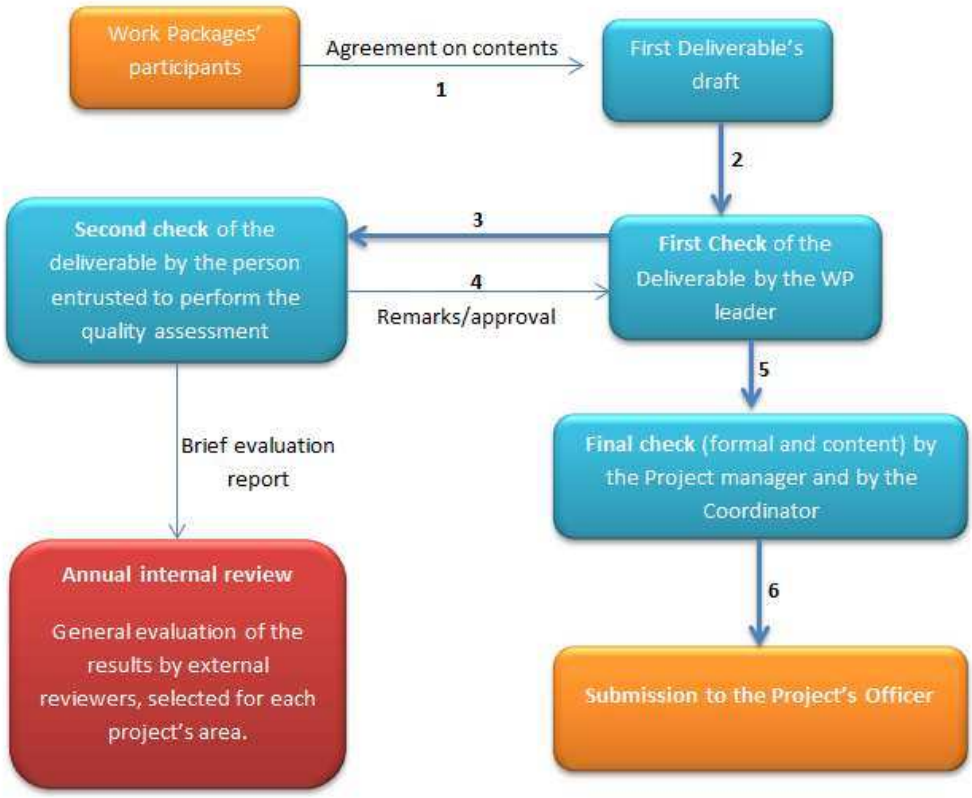
Figure 3 – WhoLoDancE Governance scheme



5.1.2 Deliverables Review Process

This internal review process is structured as follows:

Figure 4 – Deliverable Review Process Scheme



5.1.3 Project Planning

Within WhoLoDancE, Quality Assurance is focused on achieving an ongoing implementation activity aimed at facilitating a common understanding and agreement of key project issues such as the formulation of user requirements, the definition of project objectives, roles and responsibilities, critical success factors, risks, constraints and organisational impact, etc.

In particular, the following list includes the main quality assurance components taken into account in the project planning processes:

- Defined roles and responsibilities: identification of the roles having responsibility, accountability, and authority within the scope of the process.
- Common standards and processes for use in development of the project are being identified and benchmarked.
- Attention to QA aspects has been important in preparing and reviewing the project's development plan, standards, and procedures.
- Measures for tracking project progress and project quality have been indicated through the reporting mechanisms available within the Self-Assessment Plan.
- Functional configuration audit, to ensure deliverables match requirements and are consistent and ready for delivery at the end of the project.
- Timing and content of planned management reviews have been identified and are being addressed.
- Provision of necessary documentation for post-project review of the project is being ensured by the use of the PM and Communication platforms.

- All the partners of the project are aware of the roles, responsibility, authority, and value of the project.
- Deviations from the project's plan are being communicated to the project management team and effectively addressed.
- Management is notified when deviations and/or delays are not being addressed.
- Periodic reports of all ongoing activities are being provided to the project management team and highlighted relevant quality aspects are being gathered and reported. WP leaders will review the QA activities on a regular basis.

5.1.4 Timeline for the review process

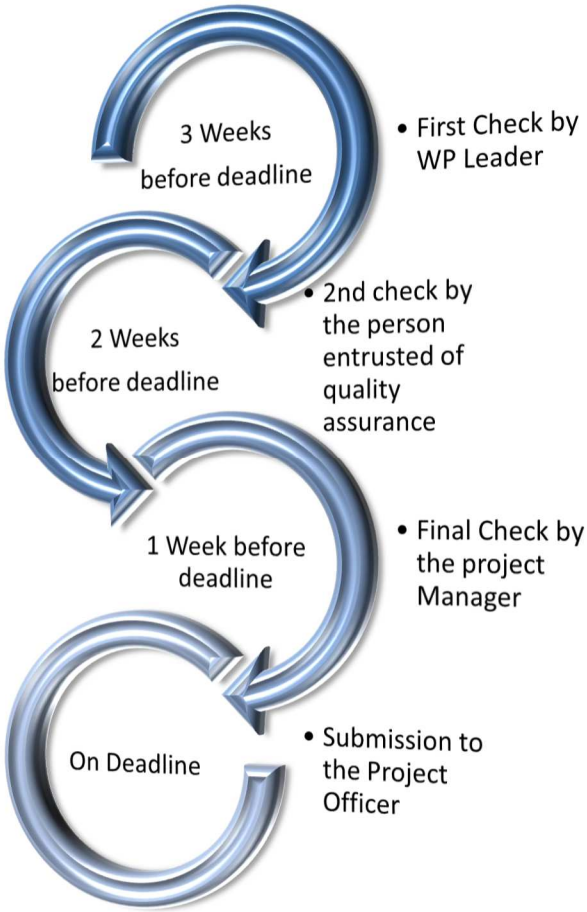


Figure 5 – Review Process' Timeline

5.1.5 Partners' pairing for the Review Process

Partner	Assigned Reviewer
Athena	PoliMi
PoliMi	Peachnote
UniGe	MOTEK
COVUNI	UniGe
Peachnote	Athena
MOTEK	COVUNI

Lynkeus	MOTEK

5.1.6 Deliverables Responsibility Table

The following table reports, for each deliverable, the responsible and the person entrusted of the quality assurance assessment:

Del. No.	Deliverable Title	Responsible of the Deliverable	WP Leader	Quality Assurance entrusted to
D1.1.	State of the Art Survey	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D1.2.	Interviews Report	Sarah Whatley	Yannis Ioannidis	Antonio Camurri
D1.3.	Workshop Report	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D1.4	Definition of Learning Scenario - Needs Analysis	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D1.5.	Data Acquisition Plan	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D1.6.	HLF Definition for the Learning Scenarios	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D1.7.	User Profiling	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D2.1.	Recruitment protocol and informed consent form	Sarah Whatley	Oshri Even-Zohar	Antonio Camurri
D2.2.	Outcome of the pipeline development	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D2.3.	Outcome of the capture process	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D2.4.	Trimmed linear database of curated data sequences	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D2.5.	3D avatar scenes	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D2.6.	Motion capture sequences and skeleton avatar	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D2.7.	Post Processing data sets	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D2.8.	Multi-sensor integration report	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D3.1.	Report on semantic representation models	Yannis Ioannidis	Augusto Sarti	Augusto Sarti

D3.2.	Report on emotional representation models	Yannis Ioannidis	Augusto Sarti	Augusto Sarti
D3.3.	Report on music-dance representation models	Augusto Sarti	Augusto Sarti	Vladimir Viro
D3.4.	Report on multimodal signal modelling	Antonio Camurri	Augusto Sarti	Oshri Even-Zohar
D3.5.	Report on data-driven and model-driven analysis methodologies	Antonio Camurri	Augusto Sarti	Oshri Even-Zohar
D3.6.	First report on software platform and libraries	Augusto Sarti	Augusto Sarti	Vladimir Viro
D3.7.	Second report on software platform and libraries	Antonio Camurri	Augusto Sarti	Oshri Even-Zohar
D4.1.	Data Integration, Algorithm and System Analysis, and Framework Description	Vladimir Viro	Vladimir Viro	Yannis Ioannidis
D4.2.	Similarity Search Framework and Components	Vladimir Viro	Vladimir Viro	Yannis Ioannidis
D4.3.	Analysis and Integration of Generic Application Framework	Augusto Sarti	Vladimir Viro	Vladimir Viro
D4.4.	Generic Application Framework and Required Components	Augusto Sarti	Vladimir Viro	Vladimir Viro
D5.1.	Data Modelling, data integration and data management plan report	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D5.2.	Beta Prototype, testing and validation Data Management Platform Report	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D5.3.	Integration and interoperability with external services, systems and applications report	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D5.4.	Final Release, testing and validation of the Data Management Platform Report	Yannis Ioannidis	Yannis Ioannidis	Augusto Sarti
D6.1.	Report on the device adaptation	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D6.2.	Report on the intersection detection and feedback software layer development	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley

D.6.3.	First Report on the resulting extension and integration of the ASTE engine in WhoLoDancE	Yannis Ioannidis	Oshri Even-Zohar	Augusto Sarti
D6.4.	Final Report on the resulting extension and integration of the ASTE engine in WhoLoDancE	Yannis Ioannidis	Oshri Even-Zohar	Augusto Sarti
D6.5.	Report on validation process	Oshri Even-Zohar	Oshri Even-Zohar	Sarah Whatley
D7.1.	Usability and Learning Experience Evaluation Report	Yannis Ioannidis	Sarah Whatley	Augusto Sarti
D7.2.	Evaluation of Learning Personalized Experience (Preliminary)	Sarah Whatley	Sarah Whatley	Antonio Camurri
D7.3.	Evaluation of Learning Personalized Experience Final public report	Sarah Whatley	Sarah Whatley	Antonio Camurri
D8.1.	Dissemination and exploitation strategy plan and preliminary material	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D8.2.	Updated dissemination materials	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D.8.3.	Updated dissemination materials (2)	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D8.4.	First dissemination event	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D8.5.	Outcomes of the strategic exploitation seminar and First Exploitation Plan	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D8.6.	First Dissemination even	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D.8.7.	Final Exploitation Plan	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D.8.8.	WhoLoDancE Dance-athon	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.1.	Kick-off meeting Report	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.2.	Project Presentation	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.3	Self-Assessment Plan	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.4.	Quality Assurance Guidelines	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.5.	First Intermediate Report	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.6.	Second Intermediate Report	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.7.	First Periodic Report	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar

D9.8.	Second/Final Periodic Report	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar
D9.9.	Final Report	Edwin Morley-Fletcher	Edwin Morley-Fletcher	Oshri Even-Zohar

5.1.7 Risk Assessment

Any research project with challenging objectives has to cope with the risk of a failure. To reduce this possibility an early recognition of potential risks and the selection of appropriate countermeasures is essential. The WhoLoDancE consortium has prepared a plan listing possible risks and related proposed risk-mitigation measures. This plan will be continuously enhanced, following the risk management methodology below described that has been successfully tested in previous projects.

The proposed methodology is based on a three-stage approach:

Stage	**Description**
Risk Identification.	When a risk is detected, it is reported to the WP leader concerned, who assesses the risk.
Risk Assessment.	The risks are assessed using a numeric scale from 1 to 3, where 3 represents a risk that is almost certain on the likelihood scale, or a risk that is very serious, affecting the critical path of the project, on the risk impact scale.
Risk Mitigation and Follow-up.	Each identified risk shall have an owner who is responsible for its mitigation, monitoring and reporting. In addition, the risk owner proposes a preventive and corrective treatment, consisting of suitable actions to reduce the severity and the probability of occurrence of the risk.

The adoption of an agile methodology represents, in general, a risk-mitigation factor, particularly with regard to the risk of final non-acceptability or non-usability of the implemented solutions by the intended end-users. Still, also the agile method involves some risks.

5.1.8 Management of Intellectual Property Rights (IPR)

The WhoLoDancE Consortium is aware of the importance of addressing IPR management issues already at a very early stage, as an established best practice capable facilitating the effectiveness and robustness of the exploitation of results, which often require further substantial investments to take them to market, and this can be appealing only if the results are well protected through intellectual property.

For this reason, the definition of a clear IPRs' management policy has been specifically addressed to make it possible to safely disclose the generated knowledge, clarifying its ownership and facilitating the commercialization of the results. In particular, given the expected exploitation initiatives that will be individually undertaken by the more commercially-geared partners, IPRs' management of individual results will be appropriately tracked during the project lifetime, including a defined approach within the foreseen Exploitation Plan. In doing so, the expertise in dealing with IPRs brought in by these commercial partners will be put at the service of the Consortium to help outline its intellectual property policy.

5.1.9 Innovation Management

In order to appropriately manage the innovative solutions stemming from the project, understanding the market potential and opportunity and the required steps needed for an effective market outreach (e.g. testing, prototyping, business planning, partnership with external industrial or commercial subjects, etc.),

the WhoLoDancE Consortium has deemed it useful to appoint a specific Innovation and IPR Manager, who will act as advisory with the aim of maximizing the effectiveness of the expected exploitation initiatives.

The Innovation & IPR Manager, Dr Ludovica Durst (P1-Lynkeus), as part of the leading partner for the Exploitation tasks, will rely on a broad understanding of both market, technical, and legal issues, taking care of all the related activities (For detailed description please refer to the Dow section 2.3)

5.1.10 Knowledge management and protection strategy

An important goal of WhoLoDancE is to carry on innovative research that will contribute to, but will not be limited to, the learning and teaching of dance. For the quality assurance of the research procedures and sharing of the results an appropriate knowledge management strategy is essential. In this matter the consortium commits to the Horizon2020 Open Access mandates and intends to embrace all possible Open Access roads known today. These include Gold Open Access, Green Open Access and self-archiving. With this objective, the Consortium partners will privilege Open Access journals or non-Open Access journals that support Green and Gold roads. They will rely on dedicated funding from their research projects and/or institutions and store originals or pre-prints of their publications into their organization's repository or, in absence of such repositories, into OpenAIRE's Zenodo for publications. Similar strategies will be adopted for research data, whenever this may arise: thematic data repositories will be preferred and alternatively OpenAIRE's Zenodo for datasets arising from the use cases of WhoLoDancE.

5.2 Reporting, Evaluation and Validation

A number of deliverables in the form of public reports have been produced, circulated and sent to the Commission throughout the completion of this section of work.

Below a brief description of the deliverables that have been produced and circulated in the form of public reports:

- The Deliverables in WP8 concern public reports produced throughout the whole project regarding all the events that are being organized (D8.4; D8.6; D8.7), the dissemination materials produced (D8.1; D8.2; D8.3) and the outcomes of the exploitation process (D8.5).
- The deliverables in WP9 will include regular reporting on the project coordination and management of the project (D9.1; D9.2; D9.5; D9.6; D9.7; D9.8; D9.9) and description of the self-assessment plan (D9.3) and quality assurance guidelines (D9.4).

A number of deliverables has been already submitted to the Commission describing the outcomes of the work section. In the next paragraphs the outcomes of the selected reports already produced that are deemed more relevant from a Quality Assurance point of view will be briefly described in order to share the standard procedures to each partner and help better define the quality assurance guidelines for each work section and ensure coherence within the project work.

5.2.1 Self-assessment plan

The Self-Assessment Plan (D9.3), is considered as the first step towards deliverables quality. All the Work Package Leaders (WPLs) have been involved in defining modes and characteristics for the self-assessment of WhoLoDancE. It is the WPLs' common belief that the Self-Assessment Plan must be considered as a dynamic process, undergoing appropriate regular updating in order to validate/modify the chosen indicators. The re-definition of the Self-Assessment indicators therefore represents a deliverable at the end of each Reporting period. As the first input, each WPL was requested to clarify the main objectives each WP aims to achieve. They then provided a description of the measurement processes/methodologies which have been adopted. Finally, and on the basis of the previous inputs, a series of correlated indicators for measuring the outcomes of the various WP activities has been defined, associating them, as much as possible, to task-level details with

an approximate numerical indication of the allowed threshold limits related to each WP objective. Besides the Self-Assessment Plan, the quality of the documents will be ensured also through an internal review system which will lead to the annual internal review in preparation of the annual project's review with the EC reviewers.

This approach gives the Consortium a clear tool for understanding the actual implementation level, making it possible to acknowledge the existence of delays and thus ultimately allowing the timely implementation of appropriate mitigation strategy. Finally, the Self-Assessment plan constitutes an objective tool of evaluation and understanding of the project status for the external reviewers.

5.2.2 Dissemination Material

WhoLoDancE's dissemination and communication activities have been following principles and best practices, already proved to be effective within a number of currently ongoing EC-funded projects (e.g. MD-Paedigree, Cardioproof, Health-e-Child, Sim-e-Child in particular) that have been refined and tailored to the specific characteristics and needs of the project:

- **A bi-directional and knowledge sharing approach will be adopted,** to capitalise the interaction with the intended end-users, and to ensure the final usability of the technological solutions. To this end, a process of feedback and interactions has been conceived, based on the workshops and other communication and dissemination events that will be organised by the Consortium.
- **Given the diversity of the potential stakeholders interested in the outcomes of the project, specific messages will be conceived and tailored to each audience,** organising communication and dissemination activities, materials and channels for each target audience;
- To maximise the effectiveness of the communication activities, in particular oriented to the general public and non-expert stakeholders, the team in charge of dissemination and exploitation will pay particular attention in **making use of everyday language** rather than in an academic or industrial language.
- **In order to expand the network of reference and widen the community of stakeholders, the Consortium will aim to both facilitate the involvement of further institutions and centres** in the initiative, also to expand the base of data and knowledge in the consortium, and to **establish close collaboration with other relevant projects.**
- **The dance companies will be involved in the** dissemination and communication activities.
- **In order to leverage on the media-attractiveness and** entertainment potential of the project, the key dissemination events will include **dance performance and live demonstration of the implemented technical solutions.**
- **Make extensive use of multimedia content** to explain in the most effective way the approach and outcomes of the Project