I-MAESTRO: Interactive Multimedia Environment for Technology Enhanced Music Education and Creative Collaborative Composition and Performance

www.i-maestro.org, www.i-maestro.net

DE9.1.1
Assessment and Evaluation Manual

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Abstract:
This report describes the measurable objectives of the I-MAESTRO project which will be used to monitor the progress and impact of the project, and to reorient the project if naccessary.

Keyword List:
Management, measurement, metrics, progress measures, success measures

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1 Executive Summary and Report Scope

The objective of Work Package 9 "Assessment and Evaluation" is to maintain the project quality and keep under control the project evolution. This report describes the measurable objectives and metrics which will be used to monitor progress with the aim to reorient the project, should one of the objectives fail.
To this scope, a data collection excel file has been produced for months 6, 12 and 18 to collect these metrics and values

Also this report contains guidelines for the self-assessment including a form of quality manual used to control the progress of work of the I-MAESTRO partners and for the measurement of the associated metrics.

This report describes:

- the identified, measurable objectives of the I-MAESTRO project
- the key metrics together with their minimum, typical and maximum values
- the baseline data to be used for comparison of the I-MAESTRO results with
- the mechanisms and excel file data collection

Most of the partners have already contributed to the determination of metrics and target values for the tasks they are responsible for and involved in.

This model of assessment is based on models which have been used with success in several other projects (WEDELMUSIC, MOODS, MUSICNETWORK, AXMEDIS and other).

2 Determination of relevant and useful metrics and target values

Metrics should reflect qualities of the software development process, of the software products under development, and most important, qualities of the objectives to be achieved in the project. The definition of the metrics is based on the definition of the specific activities and work tasks supported, and of the tangible benefits created.

The metrics should facilitate the development of a framework that is capable of prediction progress and success of the project, not just describing them. Thus the metrics should be:

- Simple and precisely definable so that it is clear how the metric can be evaluated
- Objective, to the greatest extent possible
- Easily obtainable, i.e., with a reasonable effort
- Valid i.e., the metric should measure what it is intended to measure
- Reliable i.e., the metric should yield the same result if measured repeatedly at the same time by different individuals
- Robust, relatively insensitive to insignificant change in the measurement process

Metrics should have data values that belong to appropriate measurement scales. They need to be defined such that their root rationale, benchmarked comparability and statistical and inferential capability and usefulness can be understood and justified.

To a certain extent the development process will influence the metrics that can be used. The involvement of a large number of partners from different countries, of diverse organisations (large companies and SMEs), research institutes and universities, is typical for EU funded projects like I-MAESTRO. The development processes and quality assurance systems used by the project

partners are often diverse so that at the start of the project a minimum common denominator must be found and agreed.

In I-MAESTRO the development process will be iterative, characterised by step-by-step development with development, test and evaluation, and improvement cycles (presented by an evolutionary spiral development approach to systems engineering, Boehm, 1998). This process permits to track defects, and user problems and deficiencies. Further characteristics of this process are:

- Strong communications between teams and inside teams about features
- Strong communications between developers and users/customers
- Test driven development: writing acceptance and unit tests first, then implement features and provide immediate value to users
- Frequent releases of components/modules/entire system
- Immediate feedback. If a feature is not useful to users then requirements must be amended. This is only achievable if we use "frequent releases"
- Continuous integration of source code: all team share a common code base. An automatic system produces daily builds of the system and if something does not compile the responsible team is immediately notified and invited to back-off his code.

Iterative development will also be applied to the design and development of the assessment and evaluation system. A consensus-driven approach to the identification and evolvement of metrics and target values is applied in I-MAESTRO.

Most of the partners have suggested metrics for the tasks they are responsible for or involved in. Minimum, typical and optimum (sometimes this is also the maximum) target values for months 12, 24 and 36 have been collected from all partners with an excel spreadsheet. In addition the partners have been asked to rate the relevance of each work package, sub-work package and work task for the project and to rate the relevance or importance of each metric together with the ease with which a metric can be measured.

This information will be used to select the most relevant metrics per work package, sub-work package and work task and to assure that the metrics can be measured without unnecessary large effort.

The collection of this data is still in progress and will be completed by the end of this year (2006). This report contains the metrics and average target values for month 18 which have been identified so far.

Nevertheless, the measurement of results achieved in the first four months can start because the metrics determined for these tasks are considerably well understood.

3 Measurable objectives of the I-MAESTRO project

The definition of the metrics are focussed on assessing the project objectives in a quantifiable manner, measuring and quantifying technical, scientific, administrative, content, social, business, market, and other objectives. The measurable objectives of the project were derived from the five key assessment criteria used by the Commission for proposal evaluation and annual project review:

(1) Scientific and technological quality and innovation,
(2) Community added value and contributions to EU policies,
(3) Contribution to community social objectives,
(4) Economic development and scientific and technological prospects,

(5) Management and resources.

The main technical objectives of the projects include:

- To carry out basic research on new solutions and enabling technologies
  - To support (i) traditional pedagogical paradigms for music training with innovative and technical solutions, and (ii) innovative pedagogical paradigms (such as cooperative work, self-learning and class work) to focus mainly on Symbolic Training paradigms, and Practice Training paradigms for string instruments (non-MIDI-based) including interactive (including gesture-based) and creative tools
  - To create an I-MAESTRO framework for technology-enhanced music educational models and tools.
  - To support the creation of e-learning courses with the possibility of producing them in a personalised manner for different students.
  - To improve accessibility to the musical knowledge.
- To explore a unified educational model
  - To utilise different pedagogical methodologies to increase efficiency, motivation and interest in the learning processes
  - To further enhance the growing standard of the ISO MPEG SMR model, and to integrate it with educational aspects model. These possibilities could also be exploited in relationship with the AXMEDIS project on content delivering.
  - To validate the unified pedagogical music model and tools taking into account different methodologies, paradigms and scenarios.
- To reduce the costs for music courseware production and customisation
  - by developing semi-automatic/automatic tools based on the following areas of works: pedagogical aspects of music education, enabling technologies for music education exploiting interactivity and cooperative work, pedagogical tools for music education.

Additional project activities are:

- Demonstration of the functionalities of the solutions implemented, by developing an integrated demonstrator in terms of functionality and providing specific demonstrations in Europe.
- Integration and optimisation of models and tools;
- Disseminating results and at conferences and fairs of relevant sectors;
- Assessment and control will be performed;
- Stimulating the adoption of the produced results at research level, and the more usable level of demonstrator by means of the organisation of conferences and workshops.

4 Reference values

The process of collection and estimation of reference values has been started. Each partner has produced reference values for the whole set of metrics obtaining to produce numbers in the areas in which he-she has not skill. The reference values have been produced for M12, M24 and M36 mainly aligned with the major milestones of the project. For each estimation moment (M12, M24, M36, when applicable) three values have been provided:

Minimum Target Value	Typical Target Value	Optimum Target Value

5 Metrics for monitoring the global objectives of the project

The following global metrics have been selected to assess and evaluate progress of the I-MAESTRO project.

Objective	Unit of Measure	M12	M24	M36
Cost reduction of courseware production	Average cost reduction of production before vs. after piloting		20%	30%
Extent to which I-MAESTRO framework has been realised	Availability of documented and demonstrable I-MAESTRO framework	30%	60%	100%
New knowledge at scientific and technological levels	Number of publications in scientific journals	3	5	8
Project progress according to work plan (management and resources)		100%	100%	100%
Demonstration of the functionalities of the solutions implemented	Number of demonstrators available	1	3	5
Number of projects and initiatives that will use the solution proposed or part of it in the near future, or even during the last phases of the project. The adoption could be carried out for the implementation of new products and services;	Number			1

These general metrics will be further elaborated in the future and where possible work package related metrics described in the following will be allocated to describe the degree of achievement of these general objectives.

6 Metrics for monitoring work package specific objectives

The Metrics are categorised per work package, sub work package and per work task. Each metric is defined and the unit of measure is explained. Where applicable, minimum, typical and optimum target values, to be reached by month 18, have been determined for the metrics.

6.1 Metrics related to WP 1 Management

WP1 activities are, in brief, to co-ordinate the partners' effort in order to reach the project objectives with the minimum time loss, good quality and partners' satisfaction, and to satisfy requests of the European Commission (EC) according to the possibilities of the partners and of the project itself.

Relevant metrics for the overall project are related to the schedule, milestones and the quality of results. Maintaining and managing these measurements provide estimations on whether the project is likely to hit its targetted completion date or not.

The DoW defines a contractual date of delivery for all I-MAESTRO deliverables. Deliverables must be submitted to the EC within 45 days of this contractual date. This task will be continuously monitored during the lifetime of the project. The proportion of deliverables delivered on time will be measured.

All formal I-MAESTRO deliverables will be subject to review by at least 2-3 internal reviewers. These reviewers will include the Project Coordinator, or his delegate, the Technical Director, or his delegate, plus another who is not from the lead partner responsible for the deliverable, nor the relevant work package owner, nor directly involved in the deliverable. At the end of the review process, after the deliverable has been modified as appropriate to take the internal reviewers` comments into account, each of the reviewers will assess the deliverable on a scale ranging from "Very Good", "Good", "Satisfactory", "Poor".

Key I-MAESTRO deliverables will be reviewed by external reviewers. At the end of the review process, after the deliverable has been modified as appropriate to take the external reviewers` comments into account, the reviewer will assess the deliverable on a scale ranging from "Very Good", "Good", "Satisfactory" and "Poor".

It will be monitored if the milestones defined for the project (attached in the appendix) are reached by the agreed dates.

Based on the above general goals, the following metrics have been selected. Partners consider the first four metrics very important and the other metrics important for the project. All these metrics are easy to measure.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of deliverables delivered to the EC in time	Percentage No of due deliverables submitted on time / No due deliverables	90%	100%	100%
Percentage of deliverables with average assessment, from internal reviewers, as being of "good" or "very good" quality, prior to submission to the EC	Percentage No of deliverables assessed "good" or "very good" by internal reviewers/ No of deliverables assessed	90%	90%	90%
Percentage of deliverables with average assessment, from external reviewers, as being of "good" or "very good" quality, prior to submission to the EC	Percentage No of deliverables assessed "good" or "very good" by external reviewers/ No of deliverables assessed	80%	90%	90%
Percentage of milestones reached on time	Percentage No of milestones which have been reached / No of milestones	90%	90%	90%
Percentage of the work packages (sub-work packages and tasks) completed in time	Percentage No of WPs (sub-WPs and tasks) completed / No of work packages to be completed	90%	90%	90%
Percentage of resources spent against planned to be spent	Percentage No of resources spent / No resources planned	90%	90%	90%
User Acceptance	Rating	50%	80%	100%

6.2 Metrics related to WP 2 Continuous Requirements Analysis

WP2 general goals are:

- To collect the requirements and perform the requirements analysis of the I-MAESTRO tools and services provided via I-MAESTRO portal;
- To set up and maintain the user group;
- To identify the features of the content to be used for Test Cases and research activities and during the validation;
- To produce the formal description of Use Cases and Test Cases in a first version and updating them during the project lifetime.

The number of requirements will be collected to be able to verify in WP4 whether the requirements have been taken into account, and if this is not the case, we can justify why they have not been accomplished (e.g. due to scarce manpower for the task, due to decreasing importance because the technology applying to it goes in another direction during the project development).

The number of requirements is also needed for the calculation of the percentage of additional requirements collected later in the project. If the requirements are explicitly stated early in the project, the number of additional, new requirements later in the project should be minimal. New and especially changing requirements which are detected late in the project can be costly, affect changes and require the partners to redo work performed in previously completed activities.

We also need the number of Use Cases / Test Cases identified for the calculation of percentage of Use Cases / Test Cases completed. These measures indicate if the activities are taking longer than they should.

Metrics for this WP have been determined at sub-WP level, due to the complexity of the work to be done.

WP 2.1 Early Requirements Analysis (ALBENIZ)

The purpose of this sub-WP will be to collect, in the early stages of the project, all useful inputs from future middle and end users of I-MAESTRO, in order to develop a system tailored to real user needs (sub-WP 2.1a).
The focus will mainly be on: music education, music creation via computer, music educational methods, best practice in computer based music education, cooperative work in the class, self study, distance interaction with the teacher, symbolic and practice training paradigms, authoring tool for pedagogical paradigms, generator of music score, courseware integration and planning, delivery modalities channels and contexts, practice exercises structure, assessment and evaluation execution, access to the archive of coursewares, content and courseware sharing, taking and interacting with the structure and with the teacher, etc.

In addition, a more detailed analysis of the functionalities that could be useful in the above contexts and learning activities will be done in the areas of theory and practice training.

The Use Cases (sub-WP 2.1b) have to be collected by mainly – but not exclusively- considering the points of view of content designers and multimedia producers.

To reach the above mentioned goals, a number of metrics –grouped *per* technological area of pertinence- have been selected:

Metric Definition	Unit of Measure	M5
Number of key scenarios identified per area of work:	Number of key scenarios per area of work	
General	Number	34
I-MAESTRO Music Modelling and Editing	Number	6
I-MAESTRO Music Exercise Authoring Tool	Number	13
I-MAESTRO Lesson Package Authoring Tool	Number	3
I-MAESTRO Exercise Generators	Number	2
I-MAESTRO Student Managing and Tutoring	Number	9
I-MAESTRO School Server and Portal	Number	8
I-MAESTRO Client Tools and additional tools for client	Number	8
I-MAESTRO Sensor, Gesture and Posture Support	Number	7
Practice training paradigm technology support	Number	6
I-MAESTRO P2P and Cooperative Work Support	Number	3
Number of requirements identified per area of work:	Number of requirements identified per area of work	**M5**
General	Number	125
I-MAESTRO Music Modelling and Editing	Number	143
I-MAESTRO Music Exercise Authoring Tool	Number	96
I-MAESTRO Lesson Package Authoring Tool	Number	12
I-MAESTRO Exercise Generators	Number	15
I-MAESTRO Student Managing and Tutoring	Number	36
I-MAESTRO School Server and Portal	Number	81
I-MAESTRO Client Tools and additional tools for client	Number	42
I-MAESTRO Sensor, Gesture and Posture Support	Number	53
Practice training paradigm technology support	Number	38
I-MAESTRO P2P and Cooperative Work Support	Number	27
Quality of the collected user requirements:	Rating of users and developers (1=excellent, 2=good, 3=average, 4=poor)	**M5**
General	Rating	2

I-MAESTRO Music Modelling and Editing	Rating	1
I-MAESTRO Music Exercise Authoring Tool	Rating	3
I-MAESTRO Lesson Package Authoring Tool	Rating	3
I-MAESTRO Exercise Generators	Rating	2
I-MAESTRO Student Managing and Tutoring	Rating	3
I-MAESTRO School Server and Portal	Rating	1
I-MAESTRO Client Tools and additional tools for client	Rating	2
I-MAESTRO Sensor, Gesture and Posture Support	Rating	1
Practice training paradigm technology support	Rating	1
I-MAESTRO P2P and Cooperative Work Support	Rating	1

WP 2.2 Use Cases and Test cases description (ANSC)

This sub-WP is devoted to the organisation of the requirements in terms of Use Cases and the corresponding identification and description of Test Cases. The Test Cases will be used for validating the functionalities identified by research and development WPs and during the activities of integration and optimisation, and in those of demonstration.
To reach the above mentioned goals, a number of metrics have been selected.

Metric Definition	Unit of Measure	M5
Test Cases identified per area of work:	No of Test Cases identified	
General	Number	29
I-MAESTRO music modelling and editing	Number	16
I-MAESTRO Music Exercise Authoring Tool	Number	19
I-MAESTRO Lesson Authoring Tool	Number	11
I-MAESTRO Course definition	Number	3
I-MAESTRO Exercise Generators	Number	8
I-MAESTRO tutoring	Number	7
Student Managing	Number	19
I-MAESTRO Client Tools and additional tools for Clients	Number	21
I-MAESTRO Sensor, Gesture and Posture Support	Number	11
Practice training paradigm technology support	Number	6
I-MAESTRO P2P and Cooperative Work Support	Number	24
I-MAESTRO Portal	Number	19

Percentage of complete Test Case descriptions in UML per area of work:	Complete Test Cases / Test cases identified	**M5**
General	Percentage	80%
I-MAESTRO music modelling and editing	Percentage	80%
I-MAESTRO Music Exercise Authoring Tool	Percentage	80%
I-MAESTRO Lesson Authoring Tool	Percentage	80%
I-MAESTRO Course definition	Percentage	80%
I-MAESTRO Exercise Generators	Percentage	80%
I-MAESTRO tutoring	Percentage	80%
Student Managing	Percentage	80%
I-MAESTRO Client Tools and additional tools for Clients	Percentage	80%
I-MAESTRO Sensor, Gesture and Posture Support	Percentage	80%
Practice training paradigm technology support	Percentage	80%
I-MAESTRO P2P and Cooperative Work Support	Percentage	80%
I-MAESTRO Portal	Percentage	80%
Percentage of the Use Cases which are covered by the Test Cases	No uses covered by Test Cases / total no Use Cases	**M5**
General	Percentage	100%
I-MAESTRO music modelling and editing	Percentage	100%
I-MAESTRO Music Exercise Authoring Tool	Percentage	100%
I-MAESTRO Lesson Authoring Tool	Percentage	100%
I-MAESTRO Course definition	Percentage	100%
I-MAESTRO Exercise Generators	Percentage	100%
I-MAESTRO tutoring	Percentage	100%
Student Managing	Percentage	100%
I-MAESTRO Client Tools and additional tools for Clients	Percentage	100%
I-MAESTRO Sensor, Gesture and Posture Support	Percentage	100%
Practice training paradigm technology support	Percentage	100%
I-MAESTRO P2P and Cooperative Work Support	Percentage	100%
I-MAESTRO Portal	Percentage	100%
Quality of the collected Test Cases:	Rating of users and developers (1=excellent, 2=good, 3=average, 4=poor)	**M5**

General	Rating	2
I-MAESTRO music modelling and editing	Rating	1
I-MAESTRO Music Exercise Authoring Tool	Rating	2
I-MAESTRO Lesson Authoring Tool	Rating	2
I-MAESTRO Course definition	Rating	1
I-MAESTRO Exercise Generators	Rating	2
I-MAESTRO tutoring	Rating	2
Student Managing	Rating	3
I-MAESTRO Client Tools and additional tools for Clients	Rating	1
I-MAESTRO Sensor, Gesture and Posture Support	Rating	1
Practice training paradigm technology support	Rating	2
I-MAESTRO P2P and Cooperative Work Support	Rating	1
I-MAESTRO Portal	Rating	2

WP 2.3 Set up and management of I-MAESTRO User Group (UNIVLEEDS)

In this sub-WP a user group of experts will be set up. The members of the user group will receive updated information about the project evolution and will constitute a source for testing and validating the results produced. The user group has to present experts representing the different users of I-MAESTRO tools at business and consumer levels.

Metrics to assess and evaluate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Number of experts identified for:	No of experts identified per sector			
Education	Number	4	6	8
Research Institution	Number	2	3	5
Information Technology	Number	2	3	5
Expert User Group Profile:	No of experts attracted per sector			
Teachers	Number	4	6	8
Researchers	Number	2	3	5
Students	Number	1	2	3
Number of expert who participated in Expert User Group Meetings:	No of experts per meeting	5	6	7

WP 2.4 Updating and requirements analysis after first period (UNIVLEEDS)

In this sub-WP the updating of the above requirements (determined in the WP 2.1 to WP 2.3) after each validation phase will be performed. This process of updating has to be continuously performed after the early validation and during the final validation.

Metrics determined for this task are:

Metric Definition	Unit of Measure	M20
Percentage of additional key scenarios identified per area of work:	Percentage New key scenarios / Key scenarios identified until M5	
General	Percentage	10%
I-MAESTRO music modelling and editing	Percentage	10%
I-MAESTRO Music Exercise Authoring Tool	Percentage	10%
I-MAESTRO Lesson Authoring Tool	Percentage	10%
I-MAESTRO Course definition	Percentage	10%
I-MAESTRO Exercise Generators	Percentage	10%
I-MAESTRO tutoring	Percentage	10%
Student Managing	Percentage	10%
I-MAESTRO Client Tools and additional tools for Clients	Percentage	10%
I-MAESTRO Sensor, Gesture and Posture Support	Percentage	10%
Practice training paradigm technology support	Percentage	10%
I-MAESTRO P2P and Cooperative Work Support	Percentage	10%
I-MAESTRO Portal	Percentage	10%
Percentage of additional requirements identified per area of work:	New requirements / requirements identified until M5	
General	Percentage	15%
I-MAESTRO music modelling and editing	Percentage	15%
I-MAESTRO Music Exercise Authoring Tool	Percentage	15%
I-MAESTRO Lesson Authoring Tool	Percentage	20%
I-MAESTRO Course definition	Percentage	15%
I-MAESTRO Exercise Generators	Percentage	15%
I-MAESTRO tutoring	Percentage	15%
Student Managing	Percentage	15%
I-MAESTRO Client Tools and additional tools for Clients	Percentage	15%
I-MAESTRO Sensor, Gesture and Posture Support	Percentage	20%
Practice training paradigm technology support	Percentage	15%
I-MAESTRO P2P and Cooperative Work	Percentage	10%

Support		
I-MAESTRO Portal	Percentage	10%
Percentage of additional Use Cases identified and described per area of work:	New Use Cases / Use cases identified until M5	
General	Percentage	20%
I-MAESTRO music modelling and editing	Percentage	20%
I-MAESTRO Music Exercise Authoring Tool	Percentage	20%
I-MAESTRO Lesson Authoring Tool	Percentage	20%
I-MAESTRO Course definition	Percentage	20%
I-MAESTRO Exercise Generators	Percentage	20%
I-MAESTRO tutoring	Percentage	20%
Student Managing	Percentage	20%
I-MAESTRO Client Tools and additional tools for Clients	Percentage	20%
I-MAESTRO Sensor, Gesture and Posture Support	Percentage	20%
Practice training paradigm technology support	Percentage	20%
I-MAESTRO P2P and Cooperative Work Support	Percentage	20%
I-MAESTRO Portal	Percentage	20%
Percentage of additional Test Cases identified and described	New Test Cases / Test cases identified until M5	
General	Percentage	20%
I-MAESTRO music modelling and editing	Percentage	20%
I-MAESTRO Music Exercise Authoring Tool	Percentage	20%
I-MAESTRO Lesson Authoring Tool	Percentage	20%
I-MAESTRO Course definition	Percentage	20%
I-MAESTRO Exercise Generators	Percentage	20%
I-MAESTRO tutoring	Percentage	20%
Student Managing	Percentage	20%
I-MAESTRO Client Tools and additional tools for Clients	Percentage	20%
I-MAESTRO Sensor, Gesture and Posture Support	Percentage	20%
Practice training paradigm technology support	Percentage	20%
I-MAESTRO P2P and Cooperative Work Support	Percentage	20%
I-MAESTRO Portal	Percentage	20%

6.3 Metrics related to WP 3 Specification

Global goals of this WP (which will represent the input for many successive WPs) are the following:

- Production of the specification and guidelines to perform research on basic enabling technologies (used by WP4 and WP5);
- Specification of content production for Test Cases and for tool validation and demonstrators (used by WP4);
- Specification of the tools belonging to I-MAESTRO framework and infrastructure (used by WP6);
- Specification of main fruition tools for supporting educational paradigms on the basis of the educational activities defined in the user requirements and Use Cases.

Due to the complexity of the work to be done, the metrics for this WP have been determined at sub-WP level.

WP 3.1 Specification of Supportive Pedagogical Aspects (ALBENIZ)

This subWP mainly produces specification for activities related to WP4.1, WP4.2, and WP4.3:

- modelling and formalizing educational paradigms for music education, unification of Symbolic- and Practice-Training Paradigms/models, integration of gesture and posture analysis, integration of scenarios from self-learning, classroom work, cooperative work for music training and collaboration: Consideration of the following training paradigms: rhythm, score, composition, ear, harmony and counterpoint training, sing/oral, play, play alone, tune, and improvisation training, etc.
- pedagogical aspects and music courseware production, content and exercise production for Test Cases and for validation of I-MAESTRO tools considering educational activities, student profiles, scenarios, different paradigms, context;
- assessment and evaluation models for music tuition, study and definition of assessment models considering both traditional and computer supported assessment, for traditional questionnaires will be used, for computer supported several aspects of pupil behaviour will be considered (creativity, exercise understanding, execution capability, precision in the gesture and posture, repeatability of the gesture and posture, reaction time, rate of progress, deepness of learning, memory of past activities, provoked emotions, motivations, automatism in practice, expressive intentions, etc.) The assessment model has to take into account the student profile, the context, the instrument, the training exercise, etc. On this basis, complete and integrated models will be developed during the project considering information coming from both questionnaires and direct computer based estimations.

Metrics to assess and evaluate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of use cases related to Sensor Support, which are satisfied by the specifications	Percentage No use cases in specs / total no use cases	35%	60%	75%
Percentage of Sensor Support related test cases, described in WP2, which are satisfied by the specifications	Percentage No test cases in specs / total no test cases	35%	60%	75%
Number of scientific publications concerning the Sensor Support related	Total number since the beginning of the WP	1	3	5

technology				
Number of musical projects using the specified technology	Total number since the beginning of the WP	1	3	5

Usability issues for the I-MAESTRO tools

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of usability requirements, described in WP2, which will be taken into account for validation planning	Percentage No usability req. taken into account / total usability requirement	20%	60%	90%
Percentage of usability requirements, described in WP2, which are not covered by the state of the art of usability engineering which will be addressed in this activity area	Percentage No usability req. not covered by state of the art / total usability requirement	20%	60%	90%

WP 3.2 Specification of Interaction and creative interfaces (UNIVLEEDS)

This subWP aims to produce the specification for activities related to WP5:

- Algorithms and solutions to manage sensor and actuators for exploiting and experimenting with the creativity of pupils, develop and integrate, Assessment of the pedagogical impact for music learning, Sonification of objects and gesture via sensors.
- Algorithms and solutions to estimate and manage posture and gesture of human body and hands of the pupils, Assessment of the pedagogical impact for music learning, for simpler and complex Practice Training Paradigms, for regular and impaired pupils. Analysis of learner and learning environment transaction logic and interaction models to facilitate creativity through inspirational feedback, and multimodality including: Sensors & Gesture analysis.

Metrics to assess and evaluate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	25%	50%	80%
Percentage of components developed	Percentage	25%	60%	100%

WP 3.3 Specification of Cooperative support for Music Exercises (DSI)

This subWP aim to produce the specification for activities related to WP5.1 and WP5.6:

- Model and support for cooperative training and playing, study and development of I-MAESTRO cooperative support for music training, cooperative work support based on P2P, discovering, managing symbolic commands, managing additional command lists and undo, managing profiles, configuration and user profile management, managing synchronisation among the different I-MAESTRO tools on local or distributed environment, supporting Symbolic and Practice training paradigms for cooperative work on classes, groups and orchestras, assessment of the cooperative work impact on music education.

- Symbolic Music Representation, analysis and improvement of the MPEG SMR, integration into SMR of educational aspects and features, allow managing specific Selections of Music Events, provide sufficient expressiveness to model all the music representation symbols and extensibility to accept the definition of new symbols belonging to the categories of Symbolic Events, Symbolic SMR Context, Symbolic Qualifiers, defining their semantics for visual and audio rendering, support the representation of music accessible aspects for rendering of Braille Music and for spoken music, integrate synchronisation aspects for integrating the SMR into authoring tools and multimedia tools such as MPEG-4 players, standard authoring players (from the market and not only, for example, SCORM, LOM, IMS compliant, etc.), other tools in which the SMR tools and exercises can be enforced.

Metrics to assess and evaluate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	90%	100%
Percentage of components developed	Percentage	35%	90%	100%
Percentage of defects which have been corrected	Percentage	35%	90%	100%
Number of connected end users during the demonstration via P2P Network	Number	5	15	15

WP 3.4 Specification of enabling technologies for Music Training Paradigms (IRCAM)

This subWP aims to produce the specification for activities related to WP5.3, WP5.4, and WP5.5:

- Symbolic training paradigms: symbolic music representation processing, navigation, comparison, analysis, rendering, reduction, transposition, processing, rhythm analysis, harmony analysis, counterpoint, composition models, music representation and rendering, declination for self learning, class work and cooperative work. Development of the symbolic training processing Tools to support symbolic training exercises. Models and tools for the assessment of symbolic training. Integration with practice training paradigm tools and algorithms.
- Practice training paradigms: audio processing, beat tracking, pitch value recognition, attacks of notes, as rhythm, intonation, timbre, development of the practice training processing tools: score follower, audio processor, audio rendering, to support practice training exercises such as play training, ear training, etc. Models and Tools for the assessment of practice training. Analysis and integration of models of using augmented instruments. Integration with symbolic training paradigm tools and algorithms.
- Annotation: symbolic music representation annotation and description, descriptors of music representation for educational purpose, use of Selections, music representation analysis and processing, contribution to MPEG-7.

Metrics to assess and evaluate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	90%	100%
Percentage of components developed	Percentage	35%	90%	100%
Percentage of defects which have been corrected	Percentage	35%	90%	100%

WP 3.5 Specification of Courseware models and validation material (ANSC)

This subWP aims to produce the specification for activities related to WP4.4, WP4.5, and WP4.6:

- courseware integration and harmonisation, identification of pedagogical relationships among courses and exercises, profiling of exercises, courseware integration will allow producing more efficient courses, reducing the number of exercises in the topics in which more efficient activities are identified and increasing them where they are needed. This activity has to be performed on the basis of the context, profile, software tools, instruments, etc.
- Accessibility and tuning of pedagogical models for impaired, declination of music training paradigms for impaired, Sonification of physical gestures, screen and score readers, magnification of scores, alternative rendering of music representations, interaction with music concepts. Integration of Braille and spoken music with identified paradigms and scenarios.
- Pedagogically driven algorithms for music exercise generation, analysis and processing of music representation for the production of music exercises, decomposition of exercises sequences of activities, models to take into account pupil profile and course objectives.

Metrics to assess and validate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Amount of content and courseware produced	Number	5	10	20
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	90%	100%
Percentage of components developed	Percentage	35%	90%	100%
Percentage of defects which have been corrected	Percentage	35%	90%	100%
Number of content components added	Number		20	

WP 3.6 Specification of Authoring Tools for Music Education (UR)

This subWP aims to produce the specification for activities related to WP6.1, WP6.4, and WP6.5:

- Authoring tool for pedagogical paradigms: study and develop of the integration of the I-MAESTRO models and tools with standard authoring tools for e-learning, consideration

of standards such as SCORM, ADL, IMS, LOM, etc. for the several aspects: synchronisation, data exchange, assessment, logic processing of the exercise and lesson units, etc. Consideration of MPEG21 for the packaging and distribution aspects. Formalisation of relationships between the model and format for lesson packaging and that for the music exercise formalisation of I-MAESTRO. Formalisation of scripting of I-MAESTRO exercises on the basis of fundamental functionalities of symbolic and practice training,

- Music Editor for Authoring and Pupil Work: music editor extension for Symbolic selection, loader and saver of SMR, integration with authoring and playing tools, integration with music training exercise processor, integration with cooperative support for music education. Integration of the visual and audio rendering of the Music Editor with the MPEG-4 players, Integration of the rendering of the results of the assessment and their possible editing, supporting music notation accessibility and understandability, multi-language verbal description of the symbols and of the music context, music notation reader, spoken music, printing in Braille music, hosting the accessibility tools described in a previous section.
- Generation Tools for Music Exercises, Music Exercise Generation, models and algorithms, format for the Formalization of Music Training Paradigms, Music Training paradigm Editor, generation for versioning, generation for decomposition, generation for training paradigms, etc.

Metrics to assess and validate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	90%	100%
Percentage of components developed	Percentage	35%	90%	100%
Percentage of defects which have been corrected	Percentage	35%	90%	100%

WP 3.7 Specification of Client and player tools for Music Education (SIBELIUS)

This subWP mainly produces the specification for activities related to WP6.2 and WP6.3.1, WP6.3.2:

- Client tools for theory- and play/practice-training: detailed from end specification of audio rendering, visual rendering user interface for pupil and teachers, posture and gesture rendering, cooperative support for music training integration and client interface, etc. Integration with other tools: tuner, metronome, beat tracking multimedia rendering, cooperative support, score follower, assessment processors, posture and gesture processing, music editor, symbolic and practice processing tools, etc.
- Tools for music education integrated with MPEG-4: integration and improvement of MPEG SMR with music educational aspects into the MPEG-4 players, synchronisation of SMR rendering with audio MPEG rendering contribution to the improvement of the SMR model, streaming of SMR in the MPEG-4 environment.
- Tools for music education considering accessibility aspects: music score magnification, music score reader, music score editing for impaired, Braille rendering (visual and on paper).

Metrics to assess and validate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	90%	100%
Percentage of components developed	Percentage	35%	90%	100%
Percentage of defects which have been corrected	Percentage	35%	90%	100%

WP 3.8 Specification of Distribution and Management of Coursewares (EXITECH)

This subWP aims to produce the specification for activities related to WP6.6, Distribution and management tools for music lessons, I-MAESTRO lesson distribution Server, I-MAESTRO Portal, P2P School Network of I-MAESTRO: get new lessons or to obtain material to integrate a lesson, get in touch with the teacher or other students, Navigate among available lessons, lesson path , units of a lesson, multimedia content of the lesson, Establish a groupware with other students, interact via internet directly with the teacher or connect to a database for download of music that integrates study of a lesson or for particular technical problems, thus obtaining a personalized study program, Retrieve the historical data of his/her career with I-MAESTRO tools, chatting/communicating among students, supporting lessons exchanging, supporting cooperative work among student start up.

Metrics to assess and validate progress of work for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	90%	100%
Percentage of components developed	Percentage	35%	90%	100%
Percentage of defects which have been corrected	Percentage	35%	90%	100%

6.4 Metrics related to WP 4 Supportive Pedagogical Aspects

Activities of this WP cover the following summarized range of activities:

- the development of basic research and innovations regarding the pedagogical aspects in music education by exploiting the capabilities of the Information Technology mainly for the presence and integration of mechanism for taking into account: human expression, humans gesture, interactivity, cooperative work, etc.
- to formalise the specification of innovative music training paradigm with Integration, sensors, gesture, and cooperative work with a language and model.
- to produce training content for the test and validation with classes and pupils for the music training paradigms in the various scenarios.

- To set up and develop an extended assessment method taking in account about the innovation inserted.
- To incorporate the accessibility aspects in the music training paradigms and models (training specification and assessment).

Metrics for this WP have been determined at sub-WP level, due to the complexity of the work to be done

WP 4.1 Modelling and formalizing educational paradigms for music (UR)

The work of this sub WP is focussed on the analysis of the state of the art: SCORM, IMS, EML, etc.; analysis of the modelling for instructions considering also products such as Macromedia Authorware; assessment of the integration capabilities of standard models into MPEG applications for consumer electronics ; study, formalising and development of I-MAESTRO Training Specification Language, derived or defined; definition of a syntax, constructs and semantics of the I-MAESTRO Training Specification Language; implementing a first prototype of the interpreter for the language processing

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of the Use Cases, described in WP2 and related to this area, which are satisfied by the project specification:	Percentage Use Cases / Specs	80%	90%	90%
Percentage of key problems identified in WP2 that have been solved	Percentage	35%	80%	95%
Number of product analysed	Number	11		

WP4.2 – Pedagogical aspects and Music Courseware production (ALBENIZ)

The work of this sub WP is focussed on the analysis of the state of the art by starting from the analysis already performed and partially reported in this proposal; analysing, classifying and ordering into ideological categories the teachings of the world's leading maestros who teach in the Reina Sofia High School of Music, and Accademia della Musica (Music Academy) (ANSC Partner) in Rome, Italy. In the Escuela Virtual de Música project, and then in the Magister Musicae and HARMOS e-content project, ALBENIZ has had to address this and has made significant inroads into this elusive area, which puts it in a very favourable position to help in the I-MAESTRO effort; defining a pedagogical model considering the music educational paradigms. The resulting pedagogical structure will be accorded with the conclusions of the "Specification of Supportive Pedagogical Aspect" (3.1) and the "Specification of Courseware models and validation material" (3.5); production of the training material following the above mentioned guidelines for the music training paradigms identified; Formalisation of courses in terms of code written in I-MAESTRO Training Specification Language, the resulting code is called: Music Exercise Formalisation. This work will be performed in collaboration with WP4.1. To the set up and creation of the content (related to Test Cases defined in WP3) that will be used for testing and validating the research algorithms and tools capabilities. to the set up and creation of content to be used by the demonstrators produced in WP8 This content will include simple content and file and complete courseware that will be used for validating the innovative paradigms of music teaching.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	80%	90%	90%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	80%	90%	90%
Number of lesson produced	Number	5	10	20

WP4.3 – Assessment and evaluation models for music tuition (ALBENIZ)

The work of this sub WP is focussed on the This evaluation system that will be used in different evaluation waves by content partners, and will involve all the relevant actors of music tuition: teachers, students, pedagogues, and also observers and external reviewers. The partners involved in this activity are mainly: ALBENIZ, ANSC, IRCAM, UR, DSI. To allow the effective assessment of the identified training paradigms in the scenarios a set of technical tools and solutions will have to be developed. Their description is reported in the next sections. Analyse the evaluation and verification models at the state of the art; Define an assessment models integrating the several aspects of practice and symbolic training, with the integration of sensors, gesture and posture analysis; Identification and definition of automatic assessment model for self tuition and semiautomatic for assisted tuition with the teacher. To implement the assessment models and algorithms, technology of Artificial Intelligent such as Neural Network, Genetic Algorithms, etc. will be used. In addition, other solutions based on model identification of Automatic Control will be used to enforce the experience of the teachers to the Assessment models and tools; Study and realising a dynamic assessment engine to use different assessment models in different context, depending on the exercise, pupil, instrument, etc.; Tuning of the student profile models according to the state of the art to cope with music training in the identified scenarios; Integration of constructs, structures, algorithms and models into the I-MAESTRO Training Specification Language to have in the Music Exercise Formalisation also the specification of assessment aspects. Assessment model extension for the cooperative work with pupils, classroom work, orchestra work, group ware, etc.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	95%
Number of assessment parameters identified	Number	10	15	20

WP4.4 – Coursewares integration and harmonisation (ANSC)

The work of this subWP is focussed on harmonizing the different training experiences and assessment models in unified and harmonic coursewares. Analysis of curricula from the major European institutions involved as I-MAESTRO Partners (ANSC, ALBENIZ, IRCAM, etc.) and those that area indirectly reachable, pedagogical aspects and their direct implementation and IT

support, impact, etc.; Analysis of the curricula of major US institutions, pedagogical aspects and their direct implementation and IT support, impact, etc.; Consideration of music curricula defined in the nations involved: Spain, France, Italy, UK and The Netherlands, identification of the overlap and synergies, etc.; Identification with WP3 of the single courses and exercises, organisation of them according to dependencies and balance, etc.; Definition of a core segment valid for a large number of institutions and Nations. It is on these aspects and training courses that constitute the focus of I-MAESTRO including also the integration of verification flow aspects and algorithms into the I-MAESTRO Training Specification Language to have in the Music Exercise Formalisation and the specification mechanisms among different courses and exercises.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	95%
Percentage of assessment models integrated and harmonised	Percentage	35%	80%	95%

WP4.5 – Accessibility and tuning of pedagogical models for impaired (FNB)

This subWP is designed to ensure that all work on pedagogical models undertaken by the consortium is integrated with accessibility models, or that where applicable sufficient future proofing is undertaken to ensure that it remains a possibility for the future. In order to achieve such an objective: Analysis of the accessibility issues and their impact on music education for regular and impaired pupils; Identification of accessible training modalities that can be exploited in both cases, and that could help in detecting specific cases of difficulties in learning music from the pupil; Identification of assessment methodologies to assess needs and impairment and to tune the model and select the mechanism which are more suitable for the music training to impaired on the basis of their profile and their experience with the system.; Integration of Accessible paradigm (Sonification, screen readers, gesture and posture analysis, alternative representation and devices, zooming, spoken music, etc.) into the training paradigms supported and developed WP4.2, WP4.3, and WP4.4; integration of verification flow aspects and algorithms into the **I-MAESTRO Training Specification Language** to have in the **Music Exercise Formalisation** also the specification of accessibility aspects, algorithms, tools, controls and management of human computer interactions, etc..

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	95%
Percentage of accessibility models integrated with pedagogical models		35%	80%	95%
Number of assessment methodologies for impaired identified			1	3

WP4.6 – Pedagogically driven algorithms for music exercises generation (LCU)

The work of this sub WP is focussed on the analysis of the state of the art for music training specification generation, generation of exercises, etc.; Definition of language and methods for music exercises generation, modelling of profiles for generations, modelling of styles for music exercise generations; Music Exercise generation declined on symbolic and practice training paradigms; Music analysis and processing algorithms and tools for music exercises generation; Algorithms for Automatic and semiautomatic generation of music exercises, the generation has to include both formalisation of the exercise and the production of the corresponding Symbolic Music Representation; Generation of I-MAESTRO Training Specification Language code that is Music Exercise Formalisation, including structure, flow of actions and Symbolic Music Representation, etc.; Development and test of assessment model and tools

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	95%

6.5 Metrics related to WP 5 Enabling technologies for Music education

WP 5 is one of the central workpackages of I-MAESTRO. Aims of this WP are:

- scenarios identified in the proposal and better focused in WP2 and WP4.
- Study and realisation of the Cooperative Support for Music Tuition, supporting training paradigms and scenarios
- Development of software tools for exploiting sensors in music education and to allow the gesture and posture of humans to assess for educational purpose and for music teaching in particular.
- Implementation of a technical framework supporting symbolic and practice training with tools
- Implementation and integration of annotation capabilities for music education.
- Contribution to improve MPEG Symbolic Music representation for music tuition

WP activities have been broken down into six sub-WPs; for each sub-WP all relevant subtasks have been identified and metrics are provided, in order to accurately track and evaluate WP5 activities.

WP5.1 – Models and supports for cooperative training and playing (DSI)

The work of this sub WP is focussed on the computerized music lecterns which can be used by musicians to avoid transporting heavy paper music scores, to save their work, to manage versions, analysis of the state of the art regarding cooperative work for tuitions, for example cooperative support based on SCORM, etc.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	95%
Number of users during the cooperative playing session	Number		3	5

WP5.2 – Interaction models and creative interfaces, Sensors and Gesture analysis (UNIVLEEDS)

The work of this sub WP is focussed on the sensors to develop a sensor interface for music capture – provide the tool to sense and track musical performance using physical sensors including flex sensor, vibration, etc; develop interfaces to communicate with a list of sensor acquisition systems for data acquisition and analysis; to develop creative data visualisation module for augmented instrument performance; integration of these system aspects and algorithms into the I-MAESTRO Training Specification Language to have in the Music Exercise Formalisation also the specification of algorithms, tools, controls and management of human computer interactions via sensors, etc.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	95%
Percentage of interaction models satisfied	Percentage No of models available / No of models identified		50%	90%

WP5.3 – Symbolic training paradigm technology support (DSI)

The work of this sub WP is focussed on the Analysis of the symbolic training paradigms and related variations; Identification of the all the micro functionalities and procedure: transposition, compare, navigation, reduction, processing, etc.; Implementation of the micro functionalities and their rendering on the screen for the pupil and teacher; Integration of symbolic training processing tool with the assessment model developed in WP4.6; integration of these aspects and algorithms into the I-MAESTRO Training Specification Language to have in the Music Exercise Formalisation also the specification of symbolic training aspects, etc.; Integration of symbolic training processing tools with the Music Training Exercise Processor.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	40%	90%	100%
Percentage of training paradigms satisfied	Percentage No training paradigms satisfied / total training paradigms identified	35%	90%	100%

WP5.4 – Practice training paradigm technology support (IRCAM)

The work of this sub WP is focussed on the Analysis of the practice training/exercise paradigms and related variations; Identification of the all the micro functionalities and procedure for audio processing as described above; Implementation of the micro functionalities and their rendering on audio and for the pupil and teacher; Integration of practice training processing tool with the assessment model developed in WP4.6; integration of these aspects and algorithms into the I-MAESTRO Training Specification Language to have in the Music Exercise Formalisation also the specification of practice training aspects, etc.; Integration of practice training processing tools with the Music Training Exercise Processor; Integration of the IRCAM score follower into the I-MAESTRO environment considering Practice Training Processing Tool, Assessment Models and Tools and the rendering in terms of Symbolic Music representation in collaboration with WP5.3.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of use cases related to Practice training paradigm technology support, which are satisfied by the specifications	Percentage No use cases in specs / total no use cases	50%	80%	95%
Percentage of Practice training paradigm technology support related test cases, described in WP2, which are satisfied by the specifications	Percentage No test cases in specs / total no test cases	50%	80%	95%
Number of scientific publications concerning the Sensor Support related technology	Total number since the beginning of the WP	1	3	5
Number of musical projects using the specified technology	Total number since the beginning of the WP	1	3	5

WP5.5 – Annotation and description models (IRCAM)

The work of this sub WP is focussed on the renovation of the annotation models defined in the past with the Symbolic Music Representation, their porting and integration into the new environment and models; Identification of the user-tool paradigms for music annotation and fruition of the annotation; Impact of the annotation model when it is used in the cooperative environment of I-MAESTRO; participation with the elaboration of proposals issued from research fundamentals, such as descriptors specifically elaborated in the MPEG-7 Description Scheme; Development and formalisation of Ontologies for annotation and description early version; Development and formalisation of Ontologies for annotation and description final version; Automatic annotation of symbolic music presentation and derive exercises; Interactions between

automatic extraction and manual annotation will be studied in order to improve models and algorithms in a continuous feedback; Augmentation of the formal description of the Music Exercises in I-MAESTRO adding annotation at different level of abstraction; Implementation of tools for manual and automatic annotation and rendering to the pupil and teachers; integration of these aspects and algorithms into the I-MAESTRO Training Specification Language to have in the Music Exercise Formalisation and in the Music Training Exercise Processor also the possibility of the specification of algorithms, and structures to manage and take into account annotations, etc.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	50%	80%	95%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	50%	80%	95%
Percentage of annotation models available	Percentage No of models available / No of models identified	50%	80%	95%

WP5.6 – Contribution and improvement of Symbolic Music Representation (EXITECH)

The work of this sub WP is focussed on the improvement of the MPEG SMR standard on Symbolic Music Representation for its incorporation into the educational aspects identified above and derived from the training paradigms and scenarios; implementation of a loader and saver for MPEG SMR in both XML and Binary forms; integration of MPEG SMR with authoring tools for classroom work, cooperative work, distance learning, and MPEG-4 distribution; contribution to the production of the standard incorporating it in all functionalities that are needed for the music education; integration of the MPEG SMR model into the I-MAESTRO Music Training Exercise Processor and related Training Specification Language, load and save and data access.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%
Percentage of Scores produced in SMR format	Percentage No of Scores in SMR format / No of total Scores available	60%	90%	100%

6.6 Metrics related to WP 6 Pedagogical tools for music education

General goals of this WP are the following:

- Develop of I-MAESTRO Music Exercise Authoring Tool
- Design and Develop of I-MAESTRO Client Tools/players
- Design and integration of I-MAESTRO Client Tool integrated in the MPEG-4 player
- Incorporate of accessibility features in at least one I-MAESTRO Client Tool/player
- integration of I-MAESTRO SIBELIUS Music editor exploiting the capability of the huge and powerful SIBELIUS Music editor
- Design and develop of I-MAESTRO Music Exercise Generation Tool
- Design and develop of the I-MAESTRO Server for deploying lessons, supporting cooperative work, maintaining historical data, and pupils' profiles.
- Design and development of the P2P support for group ware among students

The WP is divided into six sub-WPs.

WP6.1 – Authoring tool for pedagogical paradigms (UR)

The work of this sub WP is focussed on the Analysis, design and implementation of I-MAESTRO Music Exercise Authoring Tool, including user interface, help, support for exploiting the functionalities of all the algorithms and tools developed in other project tasks; Integration in the I-MAESTRO Music Exercise Authoring Tool of the formalisation model and editor for Music Training Paradigms defined in WP4.1, WP4.2 and WP4.3 as code generation in terms of I-MAESTRO Training Specification Language; Integration of I-MAESTRO Music Exercise Authoring Tool with other Commercial and not commercial (Open Source Authoring Tools) for packaging of lessons. In this case both SCORM and MPEG21 will be considered; early test of I-MAESTRO Music Exercise Authoring Tool including interaction and integration with lesson packaging tool.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%

WP6.2 – Client Tools for theory and play/practice training (EXITECH)

The work of this sub WP is focussed on the Design of the I-MAESTRO Client Tool/player architecture to be used as both; I-MAESTRO SIBELIUS: an independent I-MAESTRO Client Tool player based on SIBELIUS tools; ActX-MAESTRO: an ACTIVE X renderer in other applications; I-MAESTRO SMR decoder: an additional decoder in MPEG-4 players based on WEDEMUSIC core plus MPEG4 player; I-MAESTRO specific client tools for: pupils, teachers, conductors, directors, etc.; Integration of Music Training Exercise Processor with the SMR decoders and renderers for music notation; Integration of Symbolic and Practice Training Tools developed in other WPs; Integration of the Score Follower and Audio Processing Tools developed in other WPs; Integration of Sensor, gesture and posture processing tools; Integration of the

Assessment model and tools developed in WP4; Integration and management of the Cooperative Support for Music Training; Early test and validation of the I-MAESTRO Client Tool; etc.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%

WP6.3 – Client Tools for Multimedia music and for Impaired (DSI)

The work of this sub WP is focussed on the detail analysis of the MPEG4 architecture for SMR decoder integration on the basis of the above reported description; design of the integration of the core parts of the I-MAESTRO Client Tool into an I-MAESTRO SMR decoder to be enforced into a MPEG4 player, called I-MAESTRO Decoder.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%

WP6.4 – Music Editor for Authoring and Pupil Work (SIBELIUS)

The work of this sub WP is focussed on the Extension of the Music Editor to cope with SMR structures and in particular Symbolic Selections to manage educational aspects and high level navigation in music structure; Realisation of a loader and saver to support MPEG SMR; Integration of the Music Editor with the Cooperative Support for Music Training, when the Music Editor is used as a front end for the pupil for editing music in the cooperative environment, and to interact from the Music Editor with the Standard Authoring Tool Player, and Music Training Exercise Processor; Integration of the visual and audio rendering of the Music Editor with the MPEG-4 players; Integration of the rendering of the results of the assessment and their possible editing; supporting music notation accessibility and understandability, multi-language verbal description of the symbols and of the music context, music notation reader, spoken music, printing in Braille music, hosting the accessibility tools described in a previous section; To be able to support accessible formats (at least Braille and Talking Music), and to be able to support learning frameworks for both Talking Music and Braille Music.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%

WP6.5 – Generation Tools for Music Exercises (LCU)

The work of this sub WP is focussed on the Generation of I-MAESTRO exercises means the generation of the I-MAESTRO Training Specification Language code that is the Music Exercise Formalisation, including structure, flow of actions and Symbolic Music Representation, etc.; implementation of editor and interpreter for music exercises generation, modelling of profiles for generations, modelling of styles for music exercise generations; Music Exercise generation declined on symbolic and practice training paradigms; Music analysis and processing algorithms and tools for music exercises generation; Algorithms for Automatic and semiautomatic generation of music exercises, the generation has to include both formalisation of the exercise and the production of the corresponding Symbolic Music Representation; Detailed design and development Music Exercise Generation Tool; Early test and validation of the Music Exercise Generation Tool against Test Cases identified in WP2.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%

WP6.6 – Distribution and management tools for music lessons (EXITECH)

The work of this sub WP is focussed on the detailed design and implementation of the I-MAESTRO School Server for music lessons distribution, profile maintenance, cooperative work support; integration and customisation of some standard (preferably Open Source) LMS (Learning Management System with the aspects and needs of I-MAESTRO.

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of Use Cases related to this area, which are satisfied by the specifications	Percentage No Use Cases in specs / total no Use Cases	35%	80%	100%
Percentage of Test Cases, described in WP2 and related to this area, which are satisfied by the specifications	Percentage No Test Cases in specs / total no Test Cases	35%	80%	100%

6.7 Metrics related to WP 7 Integration and optimisation

The goals of this WP are the following:

- To perform the early and final validation of the I-MAESTRO solution and Architecture;
- Integration and optimisation of the pedagogical tools and paradigms, Integration and optimisation of the integration aspects among tools, Integration and optimisation of the usability aspects, Integration and optimisation of the pedagogical impact of developed tools implementing innovative paradigms.

The WP is divided into two sub-WPs.

WP7.1 First and continuous Integration and Optimisation (EXITECH)

This subWP regards the integration and testing of the pedagogical tools components and cooperative support, optimisation of the communication support, integration and optimisation of theory and practice training paradigms tools, integration and optimisation of interactive tools for gesture and posture assessment, integration and optimisation of tools for generating music education exercises, validating the usability of prototypes in controlled environment, validating the architecture for managing lessons and distributing them to the final user devices in single and cooperative scenarios, exploiting music features via visualisers and Interfaces, verifying the satisfactory of the needs of Music Schools, conservatoires, teachers, etc., all the actors that are the target end users of the identified tools.

Metric Definition	Unit of Measure	M20
Percentage of defects which have been corrected	Percentage Defects corrected / Total no of defects	60%
Percentage of deficiencies reported by users which have been removed	Percentage Deficiencies removed / Total no of deficiencies	60%
Percentage of components optimized with respect to the total number described in the general architecture and specification	Percentage components / specs	60%
Percentage of components included in the I-MAESTRO Framework compared to those described in the general architecture and specification	Percentage components / specs	60%

WP7.2 Final Integration and Optimisation (EXITECH)

This subWP regards the refined integration and test among the pedagogical tools components and cooperative support. The final integration among different tools will be verified and the identified Use Cases and scenarios replicated by using real tools and actors. The aspects considered will: theory and practice training paradigms tools, interactive tools for gesture and posture assessment, tool for generation of music education exercises, usability of prototypes, managing lessons and distributing them to the final user devices in single and cooperative scenarios, visualisers and users interfaces, the satisfactory of the needs of all the actors that are the target end users of the identified tools

Metric Definition	Unit of Measure	M34
Percentage of defects which have been corrected	Percentage Defects corrected / Total no of defects	95%
Percentage of deficiencies reported by users which have been removed	Percentage Deficiencies removed / Total no of deficiencies	95%
Percentage of components optimized with respect to the total number described in the general architecture and specification	Percentage components / specs	95%
Percentage of components included in the I-MAESTRO Framework compared to those described in the general architecture and specification	Percentage components / specs	95%

6.8 Metrics related to WP8 Validation via demonstrator development and usage

The goals of this WP are:

- validate the effectiveness of the technical solutions derived and implemented in training music pupils.
- measure the real impact and improvement obtained in teaching music with the new technologies with respect to the traditional approach exploited by the involved partners and other associated institutions.
- validate the effectiveness and measuring real impact in music training efficiency and pupil improvements of cooperative work, interactive models including sensor technology, gesture and posture analysis of the pupil, signification of gesture, etc.
- diffuse and demonstrating the I-MAESTRO experience to a large number of music schools that will be invited at the demonstrative sections

Activities can be broken down into four sub-WPs, and metrics are thus given for each sub task in the following tables.

WP8.1 Validation for self and distance learning (ALBENIZ)

Metric Definition	Unit of Measure	M12	M24	M36
Number of lessons produced for distance learning validation	Number	2	5	10
End user satisfaction rating for use of service	Survey result - % very or completely satisfied		50%	80%
Number of connected end users during the demonstration via School server	Number		3	5
Number of connected end users during the demonstration via P2P Network	Number		3	5
Number of users during the demonstration via traditional 'live' I-MAESTRO supported lesson	Number		3	5

These metrics will be updated in the following period when more details bout the demonstrators will be available.

WP8.2 Validation for Practice training of strings (IRCAM)

Metric Definition	Unit of Measure	M12	M24	M36
Number of lessons produced for practice training validation	Number	2	4	8
End user satisfaction rating for use of service	Survey result - % very or completely satisfied		60%	90%
Number of connected end users during the demonstration via School server	Number		3	5
Number of connected end users during the demonstration via P2P Network	Number		3	5
Number of users during the demonstration via traditional 'live' I-MAESTRO supported lesson	Number		3	5

These metrics will be updated in the following period when more details bout the demonstrators will be available.

WP8.3 Validation for Class learning (ANSC)

Metric Definition	Unit of Measure	M12	M24	M36
Number of lessons produced for class learning validation	Number	2	5	10
End user satisfaction rating for use of service	Survey result - % very or completely satisfied		60%	90%
Number of connected end users during the demonstration via School server	Number		3	5
Number of connected end users during the demonstration via P2P Network	Number		3	5
Number of users during the demonstration via traditional 'live' I-MAESTRO supported lesson	Number		3	5

These metrics will be updated in the following period when more details bout the demonstrators will be available.

WP8.4 Validation for Cooperative learning Scenarios (ANSC)

Metric Definition	Unit of Measure	M12	M24	M36
Number of lessons produced for cooperative learning validation	Number	2	4	8
End user satisfaction rating for use of service	Survey result - % very or completely satisfied		60%	90%
Number of connected end users during the demonstration via School server	Number		3	5
Number of connected end users during the demonstration via P2P Network	Number		3	5
Number of users during the	Number		3	5

demonstration via traditional 'live' I-MAESTRO supported lesson				

These metrics will be updated in the following period when more details about the demonstrators will be available.

6.9 Metrics related to WP9 Assessment and Evaluation

Objectives of this WP will be to monitor and control the project evolution and quality according to the following terms:

- scientific and technological quality and innovation,
- community added value and contribution to the EU policies,
- contribution to community social objectives,
- pedagogical quality and didactical innovation,
- economic development and scientific and technological prospects,
- management and resources.

Two main sub-WPs have been identified; metrics are given below for each of the identified tasks.

WP9.1 Continuous self assessment of the project (DSI)

Metric Definition	Unit of Measure	M12	M24	M36
Number of metrics reported	Number	300	300	300
Percentage of metrics reported	Percentage	100%	100%	100%

WP9.2 General quality assessment, assessment with peer experts (DSI)

WP9.2.1 General Quality Assessment

Metric Definition	Unit of Measure	M12	M24	M36
Number of accesses to the Internal web pages per partner	Number	100	200	300
Number of total access to the internal web pages	Number	1000	2000	3000
Number of documents posted per partner	Number	25	35	70
Number of documents downloaded per partner	Number	70	100	150

WP9.2.2 Activity of Quality Assurance of the documents and deliverables

Metric Definition	Unit of Measure	M12	M24	M36
Percentage of deliverable compliant with defined models	Percentage	100%	100%	100%
Percentage of produced dissemination material compliant with defined models-rules	Percentage	100%	100%	100%

WP9.2.3 External assessment by using the External Expert Board

Metric Definition	Unit of Measure	M12	M24	M36
Number of external experts identified	Number	2	3	3
Number of interactions with external experts per year	Number	10	20	30
Number of key deliverables evaluated by external experts per year	Number	2	3	4

6.10 Metrics related to WP10 Dissemination, Distribution and Exploitation

Objectives of this WP will be:

- To disseminate the ideas and related results of the project considering technical, educational, cultural and commercial levels;
- The participation and the presentation of articles to scientific conferences for publishing the project results.
- To produce the early exploitation plan;
- To perform the market and business analysis and watch to verify if the project has still interesting objectives to be reached in the next period of work;
- To support and organise external events;
- To provide service for the project and dissemination via WWW pages.

Activities are grouped into five sub-WPs.

I-MAESTRO will evaluate the extent to which its dissemination programme is effective through a variety of metrics, given in the tables below for each sub-WP.

WP10.1 Dissemination and Valorisation (UNIVLEEDS)

The main goals of this sub-WP will be to disseminate and promote benefits for technology and end-users obtained by using the identified I-MAESTRO system, models and solutions, by preparing and maintaining different dissemination materials.

Metrics for assessing and evaluating progress of work are given below.

Metric Definition	Unit of Measure	M12	M24	M36
Number of accesses to the public part of the web site	Number	500	1500	3000
Number of downloaded documents from the public site of the web	Number	50	100	200
Number of flyers distributed	Number	500	1000	1800
Number of brochures distributed	Number		100	200
Number of demos distributed	Number			50
Number of CDs distributed	Number		100	200
Number of major organisations contacted to raise awareness of the I-MAESTRO project	Number	3	6	10
Number of major music schools contacted to raise awareness of the I-MAESTRO project		8	15	25
Number of conferences attended by I-	Number	5	9	18

MAESTRO partners				
Number of fairs attended by I-MAESTRO partners	Number	1	2	3
Number of tutorials/courses on technology enhanced music education related aspects produced	Number		1	2
Number of workshops organised	Number	1	2	3
Number of research projects which adopted I-MAESTRO solutions and guidelines (with tutorials, courses, and demonstrations in collaboration with the demonstrations and training WP)	Number			1
Number of papers presented in international conferences	Number	3	5	8
Number of contributions to the relevant international standardisation groups	Number	1	2	3
Number of meetings, conferences, fairs, IST events, etc. attended by members of the I-MAESTRO consortium		5	8	10
Number of articles and publications published (at least submitted) at national and international conferences by project partners on the results produced by the project	Number	3	5	8
Number of links and references to the I-MAESTRO project externally such as other networks and actions (e.g. MUSICNETWORK, etc)	Number	3	5	8
Number of articles published at national and international journals and magazines in the field of both music and computer science by project partners on the results produced by the project	Number		1	3
Number of public relations and press agency activities	Number	2	3	6
Effectiveness of public relations and press releases	rated by I-MAESTRO partners	50%	60%	70%
Quality of tutorials/course rated by participants	Rating score		60%	75%
Quality of workshops rated by participants	Rating score	60%	70%	75%
Number of videos (5 minutes) distributed	Number			160
Number of videos (20 minutes) distributed	Number			80

WP10.2 Exploitation plan (SIBELIUS, ALBENIZ)

The goal of this sub-WP is to plan successive exploitation strategies, in order to transform the project into a stable service, by defining institutional agreements and collaborations.

The produced plans will be updated and amended by taking into account results from the successive sub-WP 10.3.

Metrics for this task are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Number of companies interested in becoming I-MAESTRO compliant	Number			2

These metrics will be updated in the following periods.

WP10.3 Business and market analysis (SIBELIUS, EXITECH)

This sub-WP will be devoted to analyse, the potential market for the I-MAESTRO model.

Metrics are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Number of active companies, magazines, industrial workshops and conferences, www sites, international and national fairs, etc monitored	Number **SWOT** analysis	10	20	30
Number of conferences, journals, WWW site of active research group, network news, deliverables of other projects monitored	Number **SWOT** analysis	10	20	30

WP10.4 External events: organisation and harmonisation (UNIVLEEDS)

This sub-WP will be devoted to dissemination, participations at fairs, meetings and external conferences.

Metrics to assess and evaluate the progress and effectiveness of work are given in the table below.

Metric Definition	Unit of Measure	M12	M24	M36
Number of fairs where I-MASTRO results were promoted (e.g., MUSICNEWORK, ICMC, RESONANCE, etc.);	Number	1	2	3
Number of participants at I-MAESTRO workshop(s)	Number	6	12	18
Quality of the I-MAESTRO workshop(s)	rated by the workshop participants	60%	70%	75%

WP10.5 WEB Portal Set up and Maintenance, Distribution (EXITECH)

The goal of this sub-WP will be to maintain and update a www portal which will be used as the main "entrance gate" for I-MAESTRO. The number of visitors to the I-MAESTRO portal (http://www.i-maestro.org/, http://www.i-maestro.net/) will be recorded. The average number of visitors per-day will be calculated and reported to the Commission on a six-monthly basis.

Metrics are the following:

Metric Definition	Unit of Measure	M12	M24	M36
Number of visitors (potential customers / users) attracted through the I-MAESTRO portal	Number	300	600	1000
Number of page accesses to the I-MAESTRO portal	Number	1000	2000	3000
Number of registrations to the I-MAESTRO portal	Number		100	200
Number of subscriptions to the I-MAESTRO framework	Number			1
Number of downloaded I-MAESTRO demonstrator versions	Number			10
Number of downloaded I-MAESTRO test versions	Number			10
Number of emails exchanges on the I-MAESTRO framework	Number			80
Number of documents downloaded	Number		50	100
Number of subscription to the newsletter	Number	5	10	15
Number of posted documents	Number	3	6	10

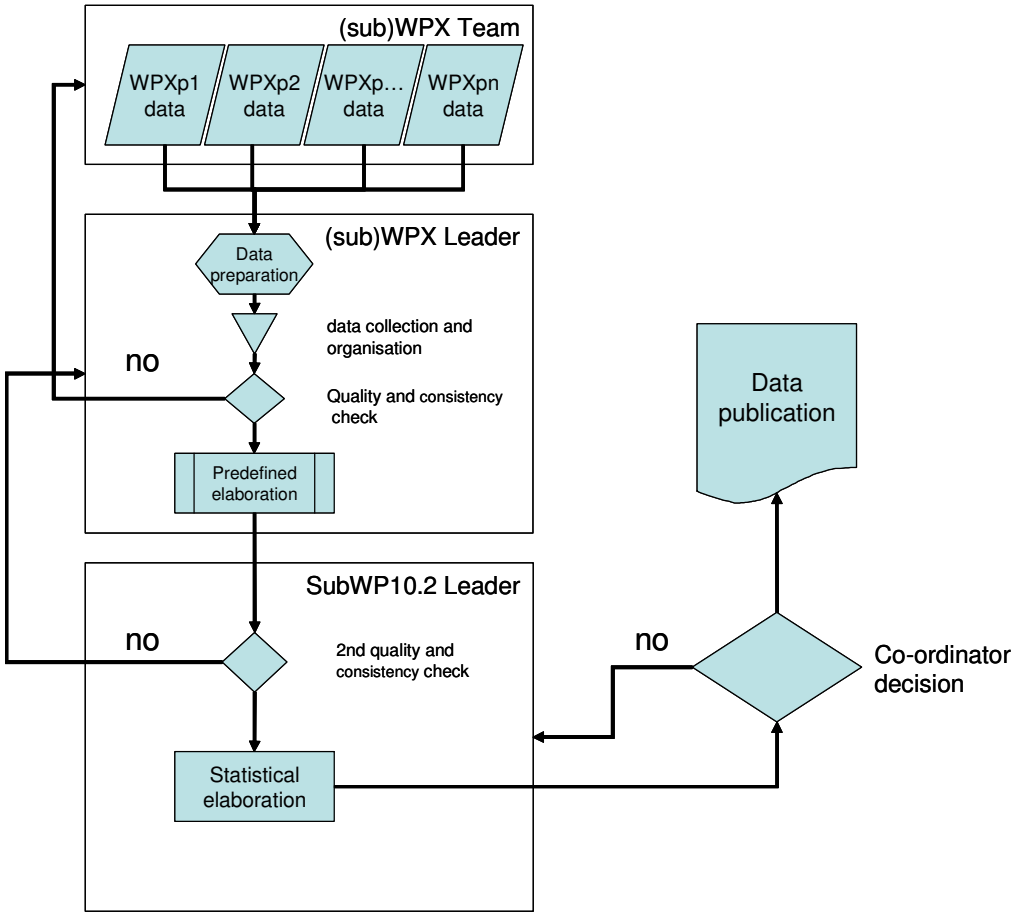
Plus a general traffic analysis performed every 4 months.

7 Procedure and instruments for measurement

Measurements will take place at different intervals (monthly, bi-monthly, six-monthly, annually and so on) as stated for each metric. Some data will be collected per event (for instance, attendance at conferences or meetings). To simplify this process data collection will take place on a bi-monthly basis. Some drafts of checklists needed for the assessment of several of the metrics are already available (see appendix 1). This will be further elaborated in the coming months.

The scheme presented below shows the information flow for data collection. Summary results of this activity will be reported to the project management board (internally) every two months and to the Commission every six months. Data collection for a specific subject will be the responsibility of WP, sub-WP or sub task leader, identified in brackets after the headlines of the tables.

The aggregation and analysis of data will be carried out by DSI. The target values will serve as reference values. The collected values will be compared with these target values to assess and evaluate the progress of the project. The aggregated results will be delivered to the project coordinator and the project management board to facilitate decision making.



As soon as the metrics and target values have been agreed by all partners, the approach to assessment and evaluation will be finalised.

Metrics are collected with a specific purpose in mind, to assess the progress / success of the project. To use the metrics in an assessment model will involve using the data in calculations or subjecting them to statistical analyses. For this reason it is important to consider the type of data collected. Four basic types of measure data are recognised by staticians: nominal, ordinal, interval and ration. We have collected metrics for the latter three types of data.

Ordinal data allow us to rank the various data values although the differences or ratios between the values are not meaningful. E.g. quality of guidelines may be measured “excellent”, “good”, “average”, “and poor”. In order for this to be an objective metric, we must assure that the criteria for selecting one of the categories are well defined, so that different observers always assign the same value to a given guideline.

Interval scale data can be ranked and also exhibit meaningful differences between values. Differences appear meaningful, but there is no absolute zero, and ratios of values are not necessarily meaningful. Most of the data, we are collecting possess an absolute zero and therefore allow meaningful ratios to be calculated.

It is important to be aware of what measurement scale is associated with a given metric. If metric values are to be used in mathematical equations designed for the assessment model, metrics associated with a ratio scale may be preferred, since ratio scale data allow most mathematical operations to be meaningful applied. This will be further elaborated as soon as the selection of metrics has been agreed by the partners.

The foreseen assessment model for aggregating the metrics will distinguish several key levels of assessment of the I-MAESTRO deliverables and lifecycle consequences.

- I-MAESTRO Sub-system Testing & Debugging
- I-MAESTRO Integrated Platform Conformance Testing
- I-MAESTRO User Interfaces Evaluation (user-group and expert-based heuristic evaluation)
- I-MAESTRO Dissemination

The above assessment levels will need to be applied to the following main application sectors:

1. Music Education
2. Music pedagogic, computer music, IT, multimedia, and other relevant research
3. Multimedia Music related services, e.g. music exercise/Lesson/content distribution

8 Bibliography

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9 Glossary

Measure A measure provides a quantitative indication of the extent, amount, dimension, capacity, or size of some attribute of a product or process.

Measurements can be classified in several ways: objective/subjective, absolute/relative, explicit/derived, dynamic/static, predictive/explanatory.

Metric A metric is a quantitative measure of the degree to which a system, component or process possesses a given attribute.

Indicator An indicator is a metric or combination of metrics that provide insight into a process, a project, or the product itself.

Testing is the act of creating and executing manual or automated sequences of conditions that are structured, methodical, and repeatable, which examine a product or system in order to assess its quality. Within a development project testing might apply to different types of product: requirements specifications, design documents, guidelines, prototypes, modules, components, non-executable and executable portions of a software.

User Testing is defined as "attempts to find any human-factor problems" [2]. It is testing a product from the viewpoint of users taking into account the viewpoint of customers.

Validation is "the process of evaluating a system or component during or at the end of the development process to determine whether it satisfies specified requirements." (IEEE/ANSI)

Verification is "the process of evaluating a system or component to determine whether the products of a given development phase satisfy the conditions imposed at the start of that phase." (IEEE/ANSI)
Verification is the checking or testing of products (including software) for conformance and consistency by evaluating the results against pre-specified requirements. Are we building the system right?

10 Appendix 1: Draft checklists and questionnaires

10.1.1 Draft checklist to assess the quality of guidelines and other documents

Ideally several I-MAESTRO partners who have not been involved in the development of the guidelines should read them and apply the following heuristics to evaluate the quality (high, medium, low):

- Compliance with the specification guidelines
- Degree of relevance for the I-MAESTRO partners
- Completeness of the content. Is some relevant / necessary information to accomplish a task missing?)
- Wording and Style. Is it appropriate for the I-MAESTRO partners?
- Consistency. Is the wording and style consistent across the guidelines.
- Effectiveness of the guidelines. Do the guidelines contain diagrams, tables, etc to facilitate understanding?
- Level of accuracy of the content. Were errors detected in text and diagrams? Diagrams should be consistent with the text and in themselves. The text should be consistent, both syntax and semantic.
- Evidence of Coverage. Are the boundaries of the topics dealt with in the guidelines clear and easy to perceive.
- Degree of Currency. Is the information sufficient to know the time scope of the validity of the content?
- Evidence of Objectivity. Is the commitment of the authors with respect to the conveyed content clear?

Which project / organisation do you represent? (optional)

How did you hear about the I-MAESTRO event?

- brochures disseminated at meetings
- invitation by e-mail from I-MAESTRO
- I-MAESTRO portal
- other …….....

What were your aims and expectations for this I-MAESTRO event?

To what extent were your aims and expectations met?

- completely
- well
- not very well
- not at all

What changes would you like to see to help improve future events?

How do you rate the overall structure of the I-MAESTRO event?

- excellent
- good
- average
- poor

Further comments .....

How do you rate the <element> of the event (presentation, demonstration, exhibition, plenary session, workgroup session, etc?
<Element>
Relevance:

- excellent
- good
- average
- poor

Content:

- excellent
- good
- average
- poor

Clarity:

- excellent
- good
- average
- poor

Further comments .....

Thank you very much

10.1.2 Draft Participant Feedback Form (to be used for dissemination, training and demonstration events)

To help us ensure that future I-MAESTRO events meet your needs, we would be grateful if you complete this questionnaire.

10.1.3 Reflections about the measurement of user satisfaction

At least 2 user surveys are foreseen to test the user-oriented outcomes of I-MAESTRO for:

- B2B users – i.e. the producers, integrators and distributors, both internal to the consortium, and in the wider I-MAESTRO User Group. These users can be surveyed to assess their reaction to the **usability**, and the **utility** of the I-MAESTRO tools themselves and the wider I-MAESTRO framework.
- End consumers of the content – a broader survey can be conducted via the project's distributors during year 4 with the actual consumers, to measure their level of satisfaction with the content provided, and its value-for-money. This will enable us to truly validate the success of I-MAESTRO in terms our mission to reduce the cost of content creation thereby increasing the value-for-money to the end-consumer,

For efficiency, both of these categories of survey can be automated as far as possible, using online survey forms to facilitate ease of data collection and ease of database analysis. If possible, we should set these survey tools up to allow a regular survey to be conducted, so that temporal measures can be made of improvements in satisfaction.

Questionnaires in scientific research are not just a list of questions, but measurement instruments which are developed according to scientific standards. This may range from ad-hoc questionnaires (if nothing else is available and possible) to tested and validated questionnaires (and of course the latter are by far preferable, and in fact the only fully defensible instruments). There is a wealth of methodology available for all steps of the process. This is no simple matter, and requires

considerable background knowledge, but also experience and skills appropriate to the application domain and purpose of the investigation. In view of the fact that there are standardised and validated questionnaires for user satisfaction (e.g. SUMI, described below) it will be investigated and agreed by the partner whether one of the standardised questionnaires should be used and more specific questions related to the I-MAESTRO framework be added.

SUMI is a validated instrument for measuring user satisfaction. It is designed to be used with end users of a software product being evaluated. SUMI enables experts concerned with the usability of a product to obtain objective and trustworthy data about the subjective assessment of the product by users.

SUMI was designed to be used primarily to evaluate those systems which are generally known as 'office software' but in practice it has been used to measure a wide variety of software (from space station control systems to games). Computer users are likely to implicitly compare their level of satisfaction with any kind of software to the standard office software suites of which they have routine experience. When using SUMI to assess the usability of a prototype during development, a SUMI 'profile' can indicate the weak aspects of the prototype.

Users normally require about ten minutes to complete the inventory after having used the software for at least an hour.

User Satisfaction is one of the three key aspects of usability as defined by the ISO 9241 standard, part 11 (Efficiency, Effectiveness, Satisfaction). Satisfaction is an important variable. Low satisfaction scores inevitably mean that usage of the product either is or will be accompanied by feelings of stress with the end users. The most obvious signs of stress are lack of concentration, a tendency to make elementary mistakes, leading to increased use of help, and eventually the user's refusal to use the software.

User Satisfaction can be subdivided into five aspects (measured with SUMI):

- Efficiency refers to the user's feeling that the software enables them to perform the task(s) in a quick, effective and economical manner.
- Affect is a psychological term for emotions. It refers to the positive user feeling of the user being mentally stimulated and pleased as a result of interacting with the software.
- Helpfulness refers to the user's perceptions that the software communicates in a helpful way and assists in the resolution of operational problems.
- Control refers to the feeling that the software is responding in an expected and consistent way to input and commands.
- Learnability refers to the feeling that the user has that it is relatively straightforward to become familiar with the software.

Sample Size: SUMI yields reliable information when used with appropriate sample sizes. A sample of ten or more users per system being evaluated is required to obtain statistically reliable results. Although SUMI has been used on samples as small as 3 or 4, its use in these circumstances was primarily for diagnostic purposes. On the other hand, sometimes it may only be possible to get a small handful of users. A small amount of information is better than no information at all, but results from small samples must be interpreted cautiously and critically with common sense.

The statistical analysis is carried out with the scoring program SUMISCO. The output of SUMISCO can be divided into three components: Scale scores, User scores, and Item Consensual Analysis.

The questionnaire could be available in several European languages.

In addition it can be useful to ask users what they consider the three best and the three worst features of the product and to let them explain why.

11 Appendix 2: Milestones

WP		Month
1	**Management**	**1**
1.1	Technical Management	
1.2	Preparation of Review Meeting	
1.3	Administrative Management	
1.4	Pedagogical Management	
1.5	External Relationship	
2	**Continuous Requirements Analysis**	**1**
2.1	Early requirement Analysis	
2.2	Use cases and Test Cases description	
2.3	Set up and management of I-MAESTRO User Group	
2.4	Up dating requirement analysis after first period (a part)	
2.1	Early requirement Analysis	
2.2	Use cases and Test Cases description	
2.3	Set up and management of I-MAESTRO User Group	
2.4	Up dating requirement analysis after first period (a part)	
3	**Specification**	**2**
3.1	Spec. of Supportive Pedagogical Aspects	
3.2	Spec. of Interaction and creative interfaces	
3.3	Spec. of Cooperative support for Music Experience	
3.4	Spec. of Enabling technologies for Music Training Paradigms	
3.5	Spec. of Courseware models and validation material	
3.6	Spec. of Authoring Tools for Music Education	
3.7	Spec. of Client and player tools for Music education	
3.8	Spec. of Distribution and Management of Coursewares	
3.1	Spec. of Supportive Pedagogical Aspects	
3.2	Spec. of Interaction and creative interfaces	
4	**Supportive Pedagogical Aspects**	**6**
4.1	Modelling and formalizing educational paradigms for music	
4.2	Pedagogical aspects and Music Courseware production	
4.3	Assessment and evaluation models for music tuition	
4.4	Coursewares integration and harmonisation	
4.5	Accessibility and tuning of pedagogical models for impaired	
4.6	Pedagogically driven algorithms for music exercises generation	
5	**Enabling Technologies for Music Education**	**6**
5.1	Models and supports for cooperative training and playing	
5.2	Interaction models and creative interfaces, Sensors and Gesture analysis	
5.3	Symbolic Training paradigm technology support	
5.4	Practice Training paradigm technology support	
5,5	Annotation and description models	
5,6	Contribution and improvement of Symbolic Music Representations	
6	**Pedagogical Tools for Music Education**	**8**
6.1	Authoring tool for pedagogical paradigms	
6.2	Client Tools for theory and play/practice training	

6.3	Client Tools for Multimedia music and for Impaired	
6.4	Music Editor for Authoring and Pupil Work	
6,5	Generation Tools for Music Exercises	
6,6	Distribution and management tools for music lessons	
7	**Integration and Optimisation**	**13**
7.1	First and continuous Integration and Optimisation	
7.2	Final Integration and Optimisation	
8	**Validation via demonstrator development and usage**	**29**
8.1	Test and Validation for self and distance learning	
8.2	Test and validation for play training of strings	
8.3	Test and Validation for Class learning	
8.4	Test and Validation for Cooperative learning Scenarios	
9	**Assessment and Evaluation**	**1**
9.1	Continuous Self assessment of the project	
9.2	General Quality Assessment, assessment with peer experts	
10	**Dissemination, Distribution and Exploitation**	**1**
10.1	Dissemination and Valorisation	
10.2	Exploitation plan, early version	
10.3	Business and market analysis	
10.4	External events: organization and harmonization	