Deliverable 1.2

Quality Management Plan

DISSEMINATION LEVEL		
PU	Public	**X**
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Project Acronym:	CPSELabs
Project Full Name:	CPS Engineering Labs - expediting and accelerating the realization of cyber-physical systems
Grant Agreement No.:	644400
Programme	ICT-1: Cyber-Physical-Systems
Instrument:	Innovation Action
Start date of project:	01.02.2015
Duration:	36 months
Deliverable No.:	D1.2
Document name:	Quality Management Plan
Work Package	WP1
Associated Task	Task(s) 1.1
Nature [1]	R
Dissemination Level [2]	PU
Version:	1.0
Actual Submission Date:	2015-08-20
Contractual Submission Date	2015-08-01
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The CPSELabs project is co-funded by the European Community's Horizon 2020 Programme under grant agreement n° 644400.

[1] **R**=Report, **DEC**= Websites, patents filling, etc., **O**=Other

[2] **PU**=Public, **CO**=Confidential, only for members of the consortium (including the Commission Services)

Change Control

Document History

Version	Date	Change History	Author(s)	Organization(s)
0.1	2015-07-01	Draft structure	H. Pfeifer	FOR
0.2	2015-07-24	Document drafted	H. Pfeifer	FOR
0.3	2015-08-05	Complete draft	H. Pfeifer	FOR
0.4	2015-08-17	Partner contributions integrated	H. Pfeifer	FOR
1.0	2015-08-20	Document finalised	H. Pfeifer	FOR

Distribution List

Date	Issue	Group
2015-07-24	Revision 1	FOR
2015-08-05	Revision 2	Project consortium
2015-08-17	Finalisation	Project Coordinator
2015-08-20	Submission	EC

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Executive Summary

This document constitutes the Quality Management Plan of the CPSELabs project. It describes the internal management and communication procedures to be followed during the project implementation in order to successfully achieve the project objectives, and formalizes the approach of the project consortium to assure the quality of the project outcome as part of the project management. The document will be updated whenever the project Consortium decides to modify or extend these procedures.

1 Introduction

This document constitutes Deliverable D1.2 of Work Package 1 (Project Management and Coordination) and describes the Quality Management Plan of the CPSE Labs project. It provides information on internal management and communication procedures to be followed during the project implementation, and formalizes the approach of the project consortium to monitor and assure the quality of the project outcomes.

The purpose of the present document is to provide a coherent management and quality planning for the participants in the CPSE Labs project in order for the team to be able to accomplish the project objectives. It aims to ensure

- Smooth implementation of the project
- Completion of the project tasks in time
- High quality of project activities, results, and outcomes, such as deliverables, in line with the contractual obligations that the CPSE Labs consortium has undertaken with the EC.

Quality management typically consists of three types of activities:

- **Quality planning** determines quality objectives, policies and procedures for both project outputs and processes, and defines roles and responsibilities of all parties involved.
- **Quality assurance** focuses on the effective use of the project processes to produce high-quality outputs, by following defined standards, improving project work and correcting potential deficits.
- **Quality control** focuses on the outputs of the project, by monitoring results such as deliverables and verifying that they meet the defined quality objectives and standards.

The scope of CPSE Labs involves a number of activities of different nature and specific (quality) objectives, such as, for instance, fostering an ecosystem around a network of design centres and their respective fields of competencies in CPS engineering; defining and executing small-scale innovation experiments with third parties involved through open, competitive calls; providing services for external stakeholders to interact with the project; disseminating and exploiting the project's results. As these activities are critical for the quality of the project results and thus its success, the work plan of CPSE Labs comprises tasks to develop dedicated plans for each of them, and which are reviewed and updated at regular intervals. For the specific quality planning aspects of these project activities we refer to the following project deliverables:

- Collaboration plan with other Smart Anything Everywhere projects (D1.6), which is updated annually in each project reporting period;
- Communication Plan (D2.2), which is updated twice a year;
- Centre Handbook (D4.1), which provides guidelines for basic processes of the design centres and includes a list of Key Performance Indicators (KPIs), which is regularly assessed and expanded, if deemed necessary;
- Strategic Innovation Agenda (D4.4), developed and updated before each round of Open Calls;
- Dissemination and Exploitation Plan (D5.1), which is updated annually.

Complementary to these deliverables, this document is concerned with the general project-wide management and quality assurance and control aspects and covers the following:

- Roles and responsibilities of all parties involved in project activities
- Monitoring and reporting procedures
- Deliverable review and submission procedures
- Definition and execution of experiments with third parties
- Internal and external communication channels and procedures
- Risk assessment and management

2 Project Governance

The management structure and decision procedures are tailored to the specific needs of CPSE Labs and will ensure effective coordination and cooperation amongst the project consortium members and produce high-level deliverables to the EC.

2.1 Project Management Structure

In order to ensure a management structure which provides full transparency and control of the entire project in terms of time, resources and cost monitoring, and which is able to react flexibly to all new insights in the course of a research project, two levels of management are defined:

- A Steering Committee to decide high level management issues with a senior management official from each partner organisation. It is the ultimate decision-making body of the consortium.
- A Centre Board consisting of one representative from each design centre and the innovation manager ensures cross-regional execution of experiments, exchange of best practices, and implementation of strategic innovation objective of the network of design centres.

Activities focus on optimum monitoring and overall management for ensuring an effective and successful operational work flow.

2.1.1 Steering Committee

The Steering Committee (SC) is formed for deciding high level management issues, including technical, exploitation, financial, planning and controlling matters. The Steering Committee comprises a senior management official from each partner organisation.

This committee has been formed at the kick-off meeting. It meets at least once every 6 months (SC meetings). It plays a key role in the management structure as acts as a board for review and assessment of the project implementation, particularly concerning acceptance of project results and milestones. The SC is responsible for strategic decisions and problem solving. The Steering Committee decides on:

(1) All budget-related matters;

(2) The acceptance of new partners as well as the exclusion of partners in common agreement with the Commission services;

(3) Updating the work plan;

(4) The alteration of the consortium agreement;

(5) Premature completion/termination of the project.

(6) Approval of the strategic innovation agenda; and

(7) Acceptance of final experiment.

The CPSE Labs project partners have detailed the specific tasks of the SC and the procedures for decision-making in a Consortium Agreement. In particular, the steering committee has the right to decide to redistribute the open call budget among the centre partners based on the performance of the centre, their third parties, and on added-value results from experiments with respect to the strategic innovation agenda.

2.1.2 Centre Board

The centre board consists of one representative from each centre partner (the centre managers), and it includes the project coordinator and also the innovation manager. It ensures

(1) Cross-regional execution of experiments;

(2) Identification and exchange of best practices from engineering experiments;

(3) Development and maintenance of the strategic innovation objective of the network of design centre.

The main task of the centre board is to provide an effective and successful operational work flow and coordination across centres on work package and task level. In particular, the centre management board is also instrumental in the open call process and it decides on funding of experiment proposals in open calls.

In case of unexpected outcomes or difficulties arising within a work package, the centre managers inform the project coordinator. However, they will try to solve it first with their work package / centre partners. If no solution can be found, the project coordinator will be involved, and if necessary, the steering committee.

2.1.3 Project Coordinator

The project coordinator's tasks are to:

(1) Co-ordinate and monitor the progress of all scientific and technological developments within the CPS Engineering labs project (according to the respective tasks, deliverables and milestones);

(2) Direct all project activities and modifications, plans of use, dissemination and exploitation;

(3) Care about the scientific day-to-day project management

(4) Coordinate preparation and yearly updates to the strategic innovation agenda, and monitor its implementation.

(5) Prepare and organise SC meetings and implement and execute decisions made by SC.

The project coordinator is supported by the Steinbeis-Europa-Zentrum (SEZ) of the Steinbeis Innovation GmbH for all administrative and financial issues.

2.1.4 Work Package Leaders

Work package leaders (WPL) plan and coordinate the work package activities and continuously monitor the progress to ensure that milestones and deliverables of the work package tasks are fulfilled. The WPL report to the Centre Board about the work package status. The work package leaders are responsible for the technical and scientific co-ordination of the day to day management of the work. This also include the responsibility of the timely achievements of each WP; deliverable dates are clearly laid out in the work-plan and work-packages descriptions. In addition to following up the development of the tasks in the work package, the WPL are also responsible for collecting inputs from the partners and preparing the regular work package reports, as well as for reviewing and approving any publication and dissemination action related to the technical project content. In consultation with the Centre Board, the leader of the dissemination work package is responsible for establishing and implementing the project dissemination and constituency building strategy.

2.1.5 Innovation Manager

To ensure that the ambitious innovation objectives of the design centre network and its experiments are met the role of a specific innovation manager is implemented. As a member of the Centre Board, the innovation manager is seamlessly integrated in the general project management.

The tasks of the innovation manager include

(1) participation in reviews of experiments, including experiment categorisation, TRL assessments, and mapping and analysis of collaborative innovation activities in development experiments,

(2) identification of business opportunities and improvements in practices for CPS innovation management — interview studies of organisations having central roles in the innovation eco-systems based on CPS in order to identify existing best practices for managing networked and open innovation in this field, and

(3) preparing an action plan for commercialisation/standardisation based on measurable KPIs.

The innovation manager also has an active role in preparing open calls and in the evaluation of proposed and ongoing experiments.

2.2 Meeting procedures

During the course of the project, regular consortium meetings are organised to monitor project progress, to decide on the course of action, to encourage partner interactions, and to exchange important pieces of technical and strategic information. Seven such periodic meetings are planned: the kick off meeting was held in month 1, and further consortium meetings are foreseen shortly after completing the project work for months 6, 12 (1st review meeting), 18, 24 (2nd review meeting), 30, and 36 (final meeting).

In all these meetings milestones reviews will be held to assess the progress of the project as reported by the WP leaders, and the outlook for exploitation of the results will be critically reviewed and compared to the planning described in the work plan (DoW).

Non-periodic meetings are organised whenever the successful achievement of objectives or occurrence of unexpected problems renders them necessary. This is mainly necessary for the good progression and team work in the experiments.

Meetings of the consortium bodies (Centre Board and Steering Committee) can be held either as a physical meeting in a location identified by the Coordinator, or can be organized in form of phone conference calls or as video telepresence meetings. Each member of the Consortium Body should be present or represented at every meeting; members may appoint a substitute to attend and vote at the meeting.

The meetings of the Steering Committee are convened by the Coordinator who shall give notice in writing of a meeting and prepare and send the primary agenda to each member of the SC well advance of the meeting. Any agenda item requiring a decision by the members of the SC must be identified as such on the agenda. Any member of the SC may add an item to the primary agenda by written notification to all of the other members prior to the meeting.

Any expert or qualified person may be invited by the Coordinator to attend the meetings with a role of advisor providing guidance in the general interest of the project or related to specific items in the agenda. The requests of participation of external parties in the SC meeting has to be communicated to each SC member, as soon as possible, prior to the meeting.

After each project meeting or workshop the minutes shall be prepared by the project partner responsible for the organization of the meeting within two weeks after the event. Minutes should be submitted to the Coordinator and subsequently distributed to all consortium partners.

The project partners have defined the specifics about Consortium Body meetings, such as periods for notification of meetings and preparation of minutes, voting rules, etc., in a Consortium Agreement.

2.3 Decision-making and conflict resolution procedures

As described above, major project decisions will be taken by the Steering Committee. The specifics about representation, voting rules and quorum are defined in a Consortium Agreement. In general, decisions will be taken by a majority of two thirds; however, for certain issues, such as proposal for changes to the Grant Agreement Annexes or changes of the consortium, shall be taken unanimously by all partners.

Work package level decisions will be taken by the work package leader in consultation with the contributing partners. The Centre Board and WP-level decisions are expected to be taken by unanimity. If common consent cannot be reached, decisions will be taken by majority vote.

If necessary, the Project Coordinator will organise a conflict resolution meeting within 21 days following the receipt of a written request transmitted by any of the project partners. Attempts at arbitration will be performed in increasing order of authority:

- within the team of each work package under the management of the WP Leader,
- within the Centre Board under management of the Project Coordinator,
- within the Steering Committee

If necessary, a meeting will be held with all representatives of the respective level of project organisation. Within the meeting, attempts to find satisfactory agreements and understanding will be carried out, based on constructive dialogue, negotiation and concession. In case of failure, a meeting at an upper level will be arranged. Requests for meetings must include suggestions for potential solutions; replies must be given within a fixed and stated time.

2.4 Technical Infrastructure / Collaboration Mechanisms

Document repository

The project employs a Subversion (SVN) document repository. It is hosted by the Coordinator at https://source.fortiss.org/svn/cpse-labs. The repository is the principal location where all relevant project data and documents are stored. All members of the project are eligible to access the repository. Request for access credentials are to be made to the Coordinator.

Monitoring and reporting tool

For project-internal monitoring and reporting purposes the project employs the EMDESK platform, which is specifically designed to support the management European projects. The main functionality of EMDESK that is used in the project is the monitoring and reporting tool, which is based on the EMDESK portal. It gathers information on all tasks to be performed and the roles of each partner. It is also used for planning, reporting and controlling activities as well as financial management. Access to certain information can be granted on a per-partner basis, for example, partners have only access to their own financial information. Partners are requested to provide status reports on work progress and financial information every 6 months for the milestones reviews.

Further features of EMDESK such as an internal collaborative platform may be introduced to the project at a later stage if the project partners desire to use this platform to exchange through forums, groups and emails.

Software packages

The standard document preparation software package used in the project is MS Office, particularly for documents such as the major project deliverables. Standard templates are provided and stored in the document repository. Project presentations usually employ Microsoft Powerpoint; a standard presentation template is provided and stored in the document repository.

Mailing lists

For project-wide communication a mailing list cps-labs@lists.fortiss.org has been set up by the Coordinator. Further mailing lists can be defined for more targeted communication, such as WP-related coordination or discussions.

2.5 Project Communication

The project's communication strategy considers both project-internal communication as well as communication towards external parties.

2.5.1 Project-internal communication

For internal communication, the project makes use of standard communication techniques such as teleconferences, video-conferences and co-operative work through e-mail and web-based platforms to enable the frequent exchange of information and opportunities and provide necessary mechanisms for sharing work.

Monthly management phone conference calls are scheduled for the Centre Board to allow close day-to-day planning and progress monitoring.

The project mailing list cps-lab@lists.fortiss.org is used for project-wide communication, for instance, general announcements of consortium meetings and reviews, distribution of general project management information, such as reports, requests for information, or general discussion. All e-mails between partners that are of any direct relevance to the project shall be made via the project mailing list.

The Coordinator maintains a database of the contact details of all partners, which may be stored in a dedicated file within the project SVN repository. If any change in the contact details or in the project team occurs, partners should notify the project coordinator, who will then inform all partners (and if necessary the EC).

2.5.2 External communication

The Project Coordinator is the principal link between the project and the European Commission and is responsible for the communication with the EC responsible Project Officer with respect to the project. The Project Coordinator also takes care of the diffusion of the communication with EC among the Consortium partners.

As effective communications are critical to the success of the CPSE Labs project, a dedicated work package *Communication and Outreach* (WP 2) is defined in the project work plan. Consequently, communication with external parties such as international experts and user groups, research and innovation organisations, relevant national and international research projects as well as the general public is managed by the leader of this work package. Specifically, a dedicated Communication Plan is maintained by WP 2, which defines the key communication objectives and corresponding activities. The communication plan is updated every 6 months, in close coordination with the leader of the *Dissemination and Exploitation* work package (WP 5). The latter is responsible for managing the broad dissemination of project outcomes, through publications for both scientific and general audiences, presentations and events and fairs, etc. A regularly updated dissemination and exploitation plan is maintained by the WP 5 leader and defines the key dissemination objectives and corresponding activities for various target audiences. Proper acknowledgement of EC support for all publications and other dissemination shall be included in all project external communications.

Furthermore, a designated Service Centre provides a single point of contact for all interaction with external stakeholders, by maintaining a web portal, presence on social media and fielding incoming queries in all forms. The Service Centre provides a personal contact for each enquiry and undertakes to ensure all queries are closed out in a timely manner.

The project web portal is a major channel for presenting the project and disseminating its results. It is hosted by Newcastle University as the work package leader of the Communication and Outreach work package. The website can be accessed via the URL www.cpse-labs.eu

Besides presenting the overall project objectives and providing access to public deliverables and project results, the primary function of the website is to

- announce relevant project news and events;
- describe the services and offers of the project and its Design Centres;
- publish information about Open Calls for experiment proposals
- provide means for externals to get in contact with the project partners;

All partners can contribute to the contents of the website. In particular, each Design Centre is responsible for presenting its competencies and focus topics. Additions to the website are managed by Newcastle University. If at a later stage of the project the website will be ported to a dedicated Content Management System, all partners can request access to the backend system in order contribute directly to the website. New content will be reviewed by the work package leader of WP 2 and, if applicable, the respective design centre partner adding the content.

3 Quality Management

3.1 Project Progress Monitoring and Supervision

The Centre Board and the Coordinator continuously monitor the progress of the project. Using defined performance indicators (KPIs, see below), deliverables and milestones, the progress is critically reviewed and compared to the planning. Depending on the progress and the results achieved, changes in the work programme may be proposed.

3.1.1 Activity Reporting

Each partner and work package leader formally reports on a regular, six-monthly basis to the Project Coordinator about progress of work. The reports shall cover both the technical and non-technical advancement of active tasks, results generated and obtained, deliverables and compliance with the work programme, difficulties encountered and how they were solved, the next steps to be done, and the expected problems and how they shall be treated. Progress reports are required for each reporting period, i.e., after project months 12, 24 and 36. In addition, the project will execute an internal interim reporting at mid-term of each reporting period (M6, M18, and M30).

The progress status of the task is reported in terms of percentage of completion, estimated time for completion, actual man-months spent and man-months needed to complete the task. The project coordinator summarises the overall project status and planning. The administrative coordination coordinates the preparation of the project reports and organises their distribution (especially the brief 6-monthly progress reports, the 1-year progress and management reports and the different parts of the final report). Every twelve months, the coordinator prepares a consolidated overview of the budgetary situation of the project, on the basis of the cost statements of the partners for submission to the Commission and of the payments that have been made. This allows an early identification of problem areas and to think about possible changes in the approach taken.

The Project Coordinator co-ordinates the preparation of the project reports and take responsibility for their distribution. This is particularly relevant for the intermediate progress reports and the final report. Further regulations concerning official project reporting towards the EC are defined in the Grant Agreement.

3.1.2 Key Performance Indicators

In order to track the progress and performance of the project a set of key performance indicators (KPIs) have been defined to measure the project impact, focusing on tangible successes towards innovation acceleration and product creation. As mentioned in the introduction, the list of KPIs is part of the Centre Handbook (project deliverable D4.1) and is maintained by the Innovation Manager.

Contributions to the KPIs are continuously monitored, and measurements are taken every six months during the (internal) project reporting. At each project status meeting, KPI performance is assessed by the Centre Board, which may define specific corrective measures in case of insufficient project progress.

3.1.3 Risk management

The project employs dedicated project management procedures to control risks and limit risk impact. In the periodic meetings of the project bodies potential project risks are identified, evaluated and tracked. In case major deviations to the project's work plan, targets or objectives become visible, the Centre Board may apply corrective actions. In case of non-conformities the Steering Committee may activate contingency plans. The Centre Board will elaborate contingency plans for the major risks and uncertainties of the project. Each WP leader will communicate early to the Centre Board any identified

problems and risks arising for each task, as this will contribute to identifying potential risks at an early stage and to adopting adequate measures.

The following table show an initial list of risks that have been detected and which risk mitigation measures the project management will provide. The list will regularly be re-assessed at period project meetings, and modified or expanded if deemed necessary.

Risk ID	Description of risk	Risk-mitigation measures
R1	Failure to sign third party agreements by experiment third party.	Partners discussed subject of the grant and consortium agreement during proposal preparation and major problems are solved. Instalment of IPR board to resolve conflicts. If no agreement can be found, and adequate replacement for experiment third party. If this fails, SC might decide to cancel the experiment and redistribute budget for cascading funding to third parties.
R2	Failure to achieve innovation objectives with experiment results	Increased involvement of innovation manager, mentoring of experiment third parties, involvement of business development managers from existing innovation ecosystems
R3	Failure to attract attractive proposals for open call experiments	Increase efforts in actively approaching potential experiment third parties
R4	Failure to agree on strategic innovation agenda, open call issue, and ranking and selection of proposed experiments	Conflict resolution procedures are explicitly addressed in the management structure. Seek consultation with the reference commission and/ or other external experts to resolve disagreement.
R5	Quality of work produced is not of the best standard.	Quality management is explicitly addressed in the project plan. Members will build on their experience in working under defined quality management systems.
R6	Communication problems between partners or work packages.	Kick-off meeting will be held to establish personal contacts. Project manual for the day-today management of the project will be set up.
R7	Lack of resources and/or personnel changes forced upon the project by one or more partners.	Raise the issue urgently with management in partner organisations. In consultation with the Commission, consider whether a replacement partner can be sought.
R8	Partner fails to agree on the consortium agreement.	Partners discussed subject of the consortium agreement during proposal preparation and major problems are solved. Details are further discussed to achieve signature during the beginning of the project.
R9	Problems within the consortium or between the consortium and the EC due to a non-adapted management structure that fails to take into account the complexity of the project work.	The consortium prepared a detailed work plan defining tasks and responsibilities. Project management structure and plan are refined based on the experience and lessons learnt from previous large R&D and innovation projects.

R10	Centre partner leaves the project	Depending on competences of leaving partner, explore the possibility of effort redistribution within remaining partners. Reduce goals retaining high-level objectives.
R11	Failure to achieve the project objectives	Periodic internal reporting enables proactive management of the project risks. Perform periodic internal reviews of the project including deviation analysis and allocation of corrective actions
R12	Insufficient progress of experiments	Quality management plan includes at least a half-time review for each experiment. Adequate actions are defined by the Centre Board. Experiment is stopped if performance is inadequate.

3.2 Innovation Management

One of the keys to achieve impact for CPSE Labs is the development of a portfolio of focused experiments with clear innovation objectives. To this end, specific innovation management activities are defined, covering the definition of a strategic innovation agenda and the solicitation, selection, initiation, and monitoring of experiments. The innovation manager ensures that the ambitious innovation objectives of the project and its experiments are met.

3.2.1 Strategic Innovation Agenda

The Strategic Innovation Agenda (SIA) serves as an important instrument to maximize the impact of CPSELabs by providing, amongst others, the basis for developing and evolving the portfolio of experiments. As mentioned in the introduction, the SIA will be documented in a separate deliverable (D4.4), and its development plan is specified as part of the Centre Handbook in deliverable D4.1.

One of the purposes of the SIA is to set out the overall direction for experiments and to guide the process of selecting experiments proposed by third parties in response to the open calls. Consequently, there will be two iterations of the Strategic Innovation Agenda at project months 8 and 14, aligned with the second and third round of open calls.

3.2.2 Open Call Experiments

The processes for the development of the Open Calls and the evaluation and selection of experiments is defined in work package 3 and the work package leader ensures that the processes are followed. The following quality assurance measures are implemented:

- The definition of Open Call topics is based on the SIA. The topics proposed by the Design Centres are reviewed and approved by the Centre Board.
- The evaluation of received proposals for experiments is carried out by independent external experts to ensure maximum transparency and fairness. The experts are proposed by the project partners and approved by the Centre Board.
- The Centre Board assesses the evaluation reports and proposes a shortlist of experiments to be funded to the Steering Committee. The Steering Committee takes the final decisions on the selection of experiments to be funded.

The initiation, execution and monitoring of experiments is overseen be the leader of work package 6. To ensure a high quality of experiment results, the following measures are defined:

- For each experiment an implementation plan is developed by respective third parties and the designated design centre in which the experiment will be executed. The implementation plans include milestones, deliverables, and work-split among partners. The implementation plans are evaluated by the Centre Board.
- The progress of each experiment is monitored by the designated host design centre on the basis of the implementation plan. The experiment third parties report on the progress to their host design centre on a quarterly basis progress.
- For each experiment a mid-term and a final review will be conducted by a review board, which includes the Project Coordinator, a representative of one additional designated CPSE Labs Centre, and the Innovation Manager. The review board evaluates the progress of the experiment and reviews the results.
- The design centres and review boards provide monitoring and review reports, respectively, to the Centre Board, together with recommendation for actions, if applicable. The Centre Board may request corrective measures in case of insufficient progress or quality.

3.3 Deliverable Management

Deliverables are at the core of the contractual obligations of the project consortium towards the European Commission. As a consequence, quality assurance of deliverables is an important task within the project management activity.

3.3.1 Review Process

All partners are responsible for submitting their project deliverables in time to the Project Coordinator, according to the required specifications and format. All deliverables are subject of an internal review, which is carried out by all project partners. After successful completion of the review process, deliverables are internally approved by the Centre Board and submitted to the EC by the Project Coordinator.

Each deliverable is examined with respect to quality of the content, scope of the content compared to the specification in the Description of Work, and formal aspects such as structure, format and appearance. In order to allow for sufficient time for the quality control of each deliverable dedicated deadlines are set for the preparation and review process. Draft versions of deliverables shall be available for internal review by the project partners at least 4 weeks before the contractual deadline for submitting the deliverable to the EC. Reviews shall be available to the authoring team within 2 weeks. A final draft version shall be prepared incorporating all review comments and requests for modification; the final draft shall be distributed to the Centre Board at least one week before the submission deadline for final approval.

As most of the project documents will be produced in a collaborative effort, reviews will already be carried out informally during the document preparation process. In order to enable faster consensus on the structure and contents of major project deliverables, the production process shall be facilitated by employing agile preparation processes, such as producing document outlines and collections of content keywords for various document parts within the project SVN.

3.3.2 Format of Deliverables

A MS Word template to be used for deliverables is available in the CPSELabs SVN repository. The layout and structure of the reports shall conform to the instructions and guidance notes established by the Commission.

Source files of documents shall be stored in the project SVN to ensure effective version control. Documents that are distributed within the consortium and to the EC shall be in PDF format. To allow

for easy reference, file names should be used that uniquely identify deliverables. For draft versions, the format `<deliverable identifier>_<revision>_<partner>.pdf` shall be used; final versions that are going to be submitted to the Commission shall be named `CPSELabs_644400_<deliverable identifier>.pdf`.