REGNET

Cultural Heritage in REGional NETworks

REGNET - Quality Assurance System

Deliverable D14

March 2003

REGNET

Cultural Heritage in REGional NETworks

Deliverable Report D14

REGNET - Quality Assurance System

Project acronym	REGNET	**Contract nr.**	IST-2000-26336
Type and Number	D14 - REGNET - Quality Assurance System		
Work package	WP 7 – Project Management		
Task	T 7.1 Project Management T 7.2 Quality Assurance		
Date of delivery	2003-03-31		
Code name	RN_D7v01	**Version** 01 draft ☐ final ☑	
Objective	Quality Assurance System		
Distribution Type	Restricted		
Authors (Partner)	MOT		
Abstract	The purpose of Quality Assurance is to develop, establish, support and verify implementation of basic practices that will contribute to the development of the project, insuring quality products and processes. In particular the analysis and development of a framework, in line with Quality international standards, to manage a Quality Process in a multi site, multi-ethnical and multi-partners reality. This deliverable describes the Quality system framework put in place for the development of the REGNET project.		
Keywords List	REGNET Quality System framework, Quality Gates, Quality Goals and Metrics, Change and Configuration Management, Preview and Post Mortem		

Table of Contents

Executive Summary

The REGNET Project will deliver a system, which provides a service infrastructure (technical & legal framework) to service centres supporting cultural institutions and industries. The REGNET system offers a portal to different services like data entry, search and retrieval, and e-business. It can be accessed with mobile devices via de facto standard protocols (such as wireless application protocol, WAP etc). The project is divided in an implementation and demonstration phase. Technical work is related to: content engineering, platform engineering and business engineering and based on emerging technologies like XML, and distributed search mechanisms based on Dublin Core metadata. Business processes involved in the area of publishing will be the basis for the implementation of a publishing system, which enables small and medium organizations the generation of electronic publications.

The development of the product and project shall follow a defined and shared process to grant that proper preventive and corrective actions are taken on time. The basic elements of this process are: development phases and responsibility, quality gates, goals and metrics. For both phases and quality gate entry and exit criteria shall be addressed. For example an entry criteria for a phase may be the readiness of the deliverable of the previous phase. Regarding quality gate, entry criteria may be the completion and baseline of deliverables, while an exit criteria may be the removal of the identified defects.

Disciplined process development requires planning, measurement and control, based on concurrent, sequential, or recursive applications of a standard development pattern. The process shall be essentially method independent, i.e. it may be applied to projects, or tasks, using different development methods with minimal variation. The classic elements of the pattern are: requirements, design, development, and test. These elements have already been defined at a high level; but may be reapplied at a lower level in order to achieve the task goal. At a lower level, the minima elements, required to assure an effective task development, are: Preview and plan, Task activity and Quality Gate (or reviews) of the deliverables.

The purpose of this document is to define a Quality Assurance Plan (QAP) that address a software quality management program to apply to the Regnet project. This Quality Assurance Plan delineates the development approach to be used, standards to be followed, documentation to be developed, reviews to be held and the metrics to be collected.

The objective of the QAP will be to define processes to be observed in monitoring, reporting and providing consulting support for the development of software product. The prime benefit: the assurance that the established process is actually being implemented. More specifically:

- An appropriate development methodology is in place
- Standards and procedures are used
- Documentation is produced (during and not after development)
- Changes are controlled
- Testing and verification are focused on areas of highest risk
- Defects are identified earlier.

In fact it has been proved that is much more expensive to find and repair problems after deployment. For this reason it is important to continuously assess the quality of a system with respect to its functionality, reliability, application performance, and system performance.

This document will also provide basic elements and procedures for Change and Configuration Management, with reference, in particular, to Naming Convention and Baselines Management, a description of the REGNET Repository (Web) and the CVS (Concurrent Versions System) configuration on AIT server.

It is not possible to write software that is always perfectly defect-free. Verification & Validation comprehensively analyses and tests software to determine that it performs its intended functions

correctly, to ensure that it performs no unintended functions and to measure its quality and reliability. Strategies for Integration and Validation & Verification will also be provided.

The REGNET product has to be used within different countries and requires the possibility to be used by different European citizen in their own native language, for this reason it is necessary to develop a product that can be adapted to various languages and regions without engineering changes. Basic principle for Internationalisation and Localisation and a simple process for their implementation are then provided in the document.

A metrics program is a key feature of the Process. It is associated with monitoring all products and processes during development to ensure that quality goals are maintained. By including metrics at every stage of the development process, it assures that projects are monitored against their stated goals and that required quality goals are achieved.

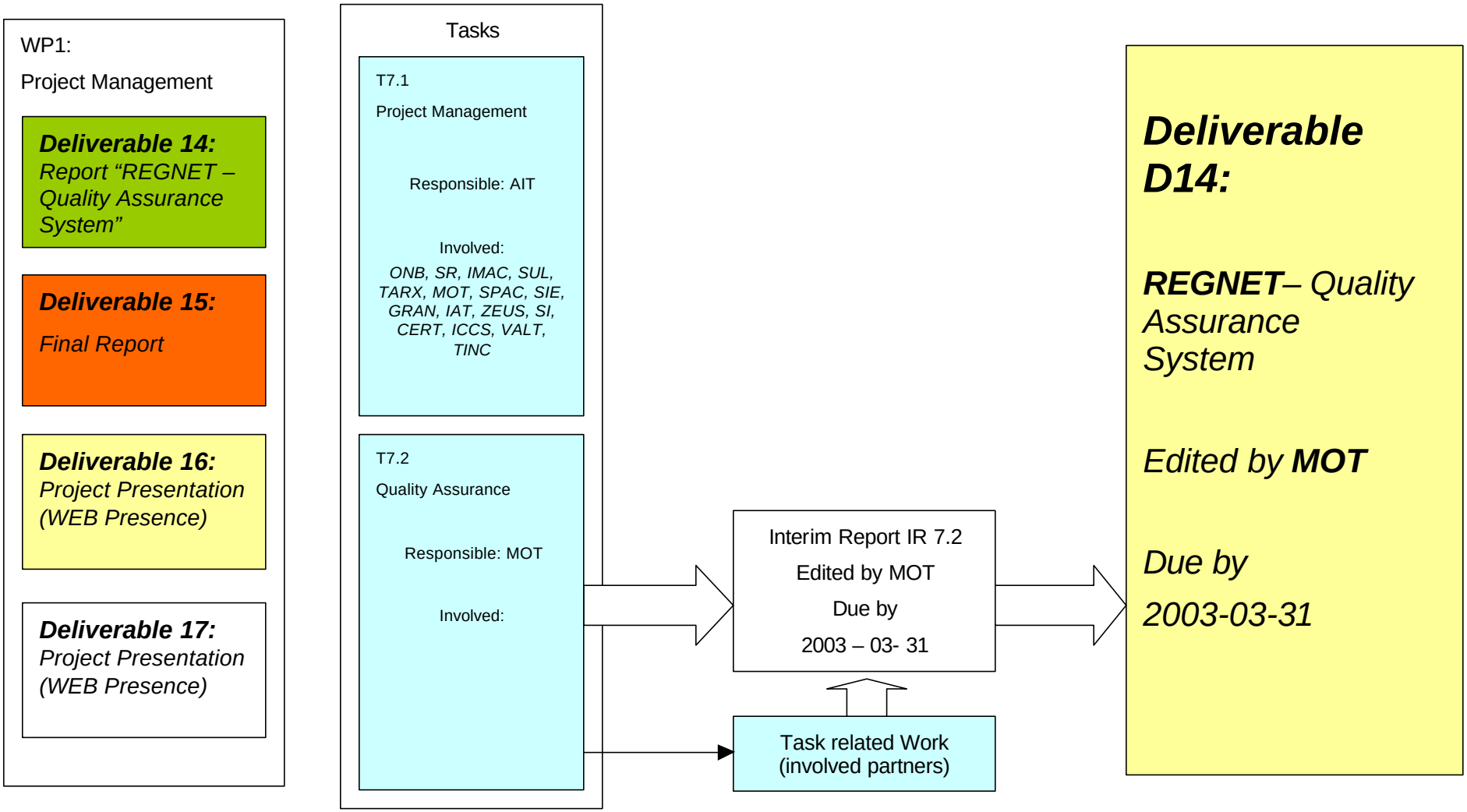
Situation

	Project Management (WP7)			
	Task	**Leader**	**Document**	**MM**
Document Naming Convention	7.2	MOT, AIT	IR 7.2 + QA Guidelines → **D14**	0.25
REGNET Quality Framework	7.2	MOT	IR 7.2 → **D14**	2.50
Task Brief Review (Template and Guidelines)	7.2	MOT	IR 7.2 + QA Guidelines → **D14**	0.25
Review Process Definition (Templates Guidelines)	7.2	MOT	IR 7.2 + QA Guidelines → **D14**	0.50
CVS Architecture definition	7.2	SR	IR 7.2 + CVS System → **D14**	-
Change Management (process Definition and Guidelines)	7.2	MOT	IR 7.2 → **D14**	0.50

In the above table approximately effort is addressed (in Man Month) to provide a rough indication of the impact of the main activities performed in the task.

For details on effort please refer to financial reports.

Project Management



Part 1: Quality Assurance System

1 Introduction

1.1 Purpose

The REGNET Project will deliver a system, which provides a service infrastructure (technical & legal framework) to service centres supporting cultural institutions and industries. The REGNET system offers a portal to different services like data entry, search and retrieval, and e-business. It can be accessed with mobile devices via de facto standard protocols (such as wireless application protocol, WAP etc). The project is divided in an implementation and demonstration phase. Technical work is related to: content engineering, platform engineering and business engineering and based on emerging technologies like XML, and distributed search mechanisms based on Dublin Core metadata. Business processes involved in the area of publishing will be the basis for the implementation of a publishing system, which enables small and medium organizations the generation of electronic publications.

The Regnet Project is structured in two phases; composed by 7 Workpackage divided in tasks. A detailed description can be found in **[1]**.

The purpose of this Quality Assurance Plan (QAP) is to define a software quality management program to apply to the Regnet project. This Quality Assurance Plan delineates the development approach to be used, standards to be followed, documentation to be developed, reviews to be held and the metrics to be collected. The objective of the QAP will be to define processes to be observed in monitoring, reporting and providing consulting support for the development of software product.

In fact it has been proved that is much more expensive to find and repair problems after deployment. For this reason it is important to continuously assess the quality of a system with respect to its functionality, reliability, application performance, and system performance.

The prime benefit: the assurance that the established process is actually being implemented. More specifically:

- An appropriate development methodology is in place
- Standards and procedures are used
- Documentation is produced (during and not after development)
- Changes are controlled
- Testing and verification are focused on areas of highest risk
- Defects are identified earlier

1.2 Overview and document structure of Part 1

The development of the Regnet product and project shall follow a defined and shared process to grant that proper preventive and corrective actions are taken on time.

The basic elements of this process, that will be discussed in the following sessions, are:

- The Quality Framework:
  - Entry and exit criteria
  - Preview and Planning
  - Task activity
  - Quality gates
  - Post Mortem
- Verification and Validation

- Internationalisation & Localization
- Quality Goals and Metrics
- Configuration Management & Naming Convention
- Change Management

2 References

2.1 Acronym

Acronym	Description
AELOC	Assembly Equivalent Lines of Code
CCB	Change Control Board
CI	Configuration Item
CMM	Capability Maturity Model
CR	Change Request
D*i*	Deliverable *i*
CVS	Concurrent
EC	European Commission
KPA	Key Process Area
LOC	Lines of Code
PMG	Project Management Group
Q_GATE	Quality Gate
QAP	Quality Assurance Plan
QMG	Quality Management Group
SCMP	Software Configuration Management Plan
SEI	Software Engineering Institute
SPMP	Software Project Management Plan
V&V	Verification & Validation
WA	Work Area
WP	Work Package

2.2 General References

[1]. REGNET Technical Annex 1, http://www.regnet.org/members/contract.htm.

[2]. REGNET Technical Annex 1 - Appendix A, http://www.regnet.org/members/contract.htm

[3]. REGNET Review Process - RN_T72vXX_MOT_ReviewProcess

[4]. Quality Software Management, Volumes 1 -4, Gerald Weinberg.

[5]. Handbook of Software Quality Assurance, G.G. Schulmeyer & J. McManus, Van Nostrand, 1992.

[6]. Statistical Methods for Software Quality – Using Metrics for Improvement, Adrian Burr, Mel Owen, 1996.

[7]. Quality Without Tears – The art of hassle-free Management, Philip B Crosby

[8]. Quality is Free – The art of Making Quality Certain, Philip B Crosby

[9]. Watts S. Humphrey, “Managing the software Process”, CMU/SEI, 1989

[10]. M.C. Paulk, C.V.Weber, S.M.GarciaM.B.Chrissis, M.Bush, Key Practices of the Capability Maturity Model”, CMU/SEI, 1993

[11]. Mark C. Paulk “A comparison of ISO9001 and the Capability Maturity Model for Software” , CMU/SEI, 1994

[12]. Watts S. Humphrey, “A discipline for Software Engineering”, Addison-Wesley, 1995

[13]. Roger S. Pressman, “Software Engineering”, McGraw Hill, 1997

[14]. Philippe Kruchten, “The Rational Unified Process”, Addison-Wesley, 1998

3 REGNET Quality Framework

The REGNET Project includes a series of partners of different nature since it covers development and demonstration activities. It may be considered as the starting point of a European wide network of service centres in the field of Cultural Heritage. The partners are coming from more than 10 European countries including non-EU member states.

The following entities are involved (for further information and Acronyms definition please cf. [2]):

- Content Providers (C): 7 Partners provide content of different nature: library material, surrogates of museum objects and photographs, posters, artwork. The content providers are: ONB, LMG, NRM, KVA, ALI, MECH, GRAN.
- Developers (S): the building blocks of the REGNET system are developed by several specialised IT companies. They are experts in the creation of cultural heritage related information systems, distributed search systems, e-business systems, WEB portals, electronic publications, etc. The developers are: SR, SI, CERT, VALT, TINC, MOT.
- Regional Poles (B): to provide access to the REGNET network coordinating organisations (also providing access to the network) are needed as well as technical partners who provide the infrastructure necessary to run a REGNET system. They are called 'business access points' and are: SUL, MUS, CC, IAT.
- Developers/Regional Poles (S, B): there are some partners who have two- or many fold roles. They are acting as developers as well as 'regional poles'. These organisations are: AIT, IMAC, TARX, SPAC, ZEUS, ICCS.

In order to handle the complexity of a multi site, multi-ethnical and multi-partners project like Regnet and to minimize the risk to handle a very large consortium, beside a very detailed management structure it becomes fundamental to introduce a disciplined process development.

Disciplined process development requires planning, measurement and control, based on concurrent, sequential, or recursive applications of a standard development pattern. The process shall be essentially method independent, i.e. it may be applied to the overall project, or work areas, or tasks, using different development methods with minimal variation.

The classic elements of the pattern are: requirements, design, development, and test.

These elements have already been defined at a higher level in Regnet management plan approved by the EC **[1]**; but may be reapplied at a lower level, in order to achieve the project goals identified for each element in the management hierarchical structure (area, work package, task, sub-task…).

At a lower level, the minima elements, required to assure an effective task and /or sub-task development, are:

- Preview and plan.
- Task activity.
- Quality Gate (or reviews) of the deliverables.
- Post Mortem.

Each of these activities (depicted in Figure 1) will be described in the following sections.

Whilst the first three are related to the project development, the third is addressed to the process. In fact the goal of a Post-Mortem is to discover strengths and weakness of the process adopted to increase the productivity and quality level in the following phase.

The task managers should apply this scheme in accordance to their task complexity.

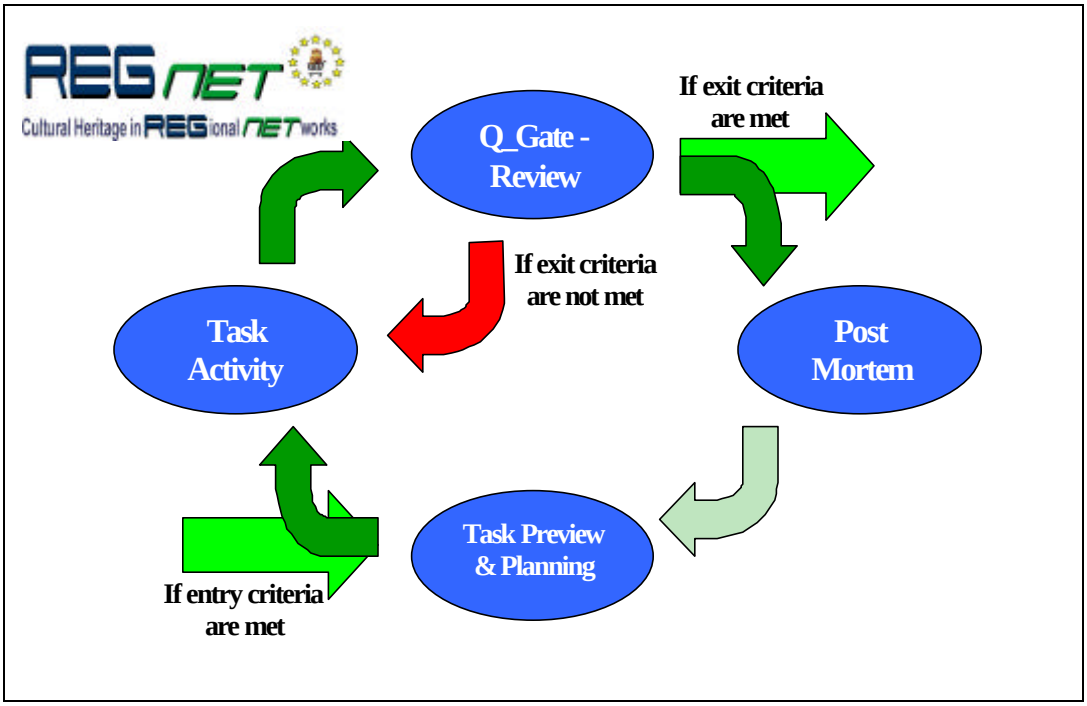


Figure 1: The REGNET Quality Framework

3.1 Entry and Exit criteria

Basic elements of the previous defined process are entry and exit criteria. They give evidence that the end of the phase, task, subtask for which are defined is reached.

In many cases the exit criteria of a task are the entry criteria of the successive task.

For both phases and quality gate, entry and exit criteria shall be addressed. For example, an entry criterion for a phase may be the readiness of the deliverable of the previous phase. Regarding quality gate, entry criteria may be the completion and baseline of deliverables, while exit criteria may be the removal of the identified defects.

At Workpackage level the deliverables identified in **[1]**, and summarized for Workpackages 1 to 5 in Table 3-1, can be considered the exit criteria for the completion of the Workpackages themselves.

WorkPackage(s)	Deliverables
Workpackage 1: Analysis of the State of the Art and Development of Concepts	• D1: Report: "Content Creation and Content Management" • D2: Report: "The REGNET - System: Specifications and State of the Art" • D3: Report: "REGNET - Enterprise Engineering and Market Analysis".
Workpackage 2: Implementation of the System and Preparation of Services and Product Generation	• D4: Status Report: "Available Content and Products" • D5: Prototype: "The REGNET - System: Version 1" • D6: Status Report and Guidelines: "System Services and Business Processes"

Workpackage 3: Validation and Preparation	• D7: Technical Report: "Validation of the REGNET System operation & Preparation of the REGNET - Demonstration Phase " • D8: Prototype: "The REGNET - System: Version 2"
Workpackage 4: Demonstration, Assessment and Evaluation	• D9: Technical Report: "REGNET System operation" • D10: Report: "REGNET - Demonstration (Trial Service)" • D11: Evaluation Report: "REGNET trial service and recommendations"
Workpackage 5: Development of a technological implementation plan	• D12: Report: "Technology Implementation Plan"

Table 3-1: WorkPackeges and Deliverables

In addition each partner responsible (Area Manager, Work Package Manager, Task Manager,…) shall address these elements in his plan, formalizing in particular the proper Quality Gate for his artefacts (Deliverable or part of it).

Moreover entry and exit criteria shall be defined at lower level, according to the subtask complexity, in order to assure correct coordination among all the teams participating to the Task.

The Task-briefs are the appropriate places to specify these criteria.

4 Task Preview & Planning Phase

The Task preview & planning phase is conducted at the beginning of a phase, task or subtask, for the benefit of the project teams, producing a common understanding of the purpose and expected outcome of an activity. All team members shall be aware of the detailed plan of that activity.

The purpose is to focus on the big picture of the current activity. Grey areas and areas of concern shall be highlighted, and risks and dependencies shall be re-assessed, together with the validity of plans. Moreover, the preview is a good place to agree upon standards, conventions, and guidelines.

As already stated, the REGNET project is organized in several hierarchic pieces of work, each one being the object of quality framework application. Depending on the position in such a structure, the preview meeting shall involve a different number of partners. The management structure was also thought to ensure the overall quality of all systems results. Therefore, at a high level, the Project Management Group (PMG), the partners of a same Work Area, or whoever is involved in a certain Work Package, will conduct ad-hoc preview meetings according to the needs of the activity they are entering.

At the bottom of the management work hierarchy, there are the tasks and sub-tasks. Each of them can also involve more than one partner, but the extent of the work is reduced in time. Preview meeting would be (in general) too much expensive, respect to these activities. Therefore, the preview is conducted by means of Task-briefs documents, to be submitted by the Task leader and approved by all the task participants through an iterative process. Each Task-briefs details the objectives of the work, the description of the activities, the expected results, and the methodology related aspects. This also applies to sub-task activities (and sub-sub-task if any).

In any case some coordination and checkpoint meetings during the lifecycle of the project are highly recommended

4.1 Preview & Task Brief Completion Guidelines

This section contains some guiding principles that must be intended as a set of best practices to organize and manage previews in accordance to the specific needs of the REGNET project. In fact, as preview meeting would be too expensive to be held, the goals of the preview will be achieved through the cooperation among partners involved in the same task and work area, which will lead to the production of the Task Brief documents, which shall be considered as the preview reports.

4.1.1 Purpose of a Preview

The purpose of a preview is to prepare the Task team for the activity about to be undertaken. During the preview, partners participating to the activity, or eventually affected by its results will come to agreement on the details of the activity about to be undertaken. A preview gives the project members the possibility to look ahead, to identify major areas of risk in the next phases, and generally to assess the upcoming activities.

4.1.2 When to Conduct a Preview

Previews shall be conducted by a project at least at the commencement of each major project activity. Additional previews may be held at any time benefit may be gained - for long duration activities, periodic previews should be conducted as appropriate. (Note that previews are of most value when they are conducted as close as possible to the commencing of the activities being previewed).

For the Regnet project at the beginning of each task a Task Brief will be produced starting from the specific template, which will be the reference for the activities belonging to the task. In case of task of high complexity they will be split in sub-tasks, and eventually in sub-sub-tasks, addressing

responsibility, milestones, artefacts to be delivered. Sub-task (and sub-sub-task) responsible will then develop their own specific task briefs.

4.1.3 Inputs to Preview – Task Brief Completion

In order to conduct a complete and successful preview the following inputs must be available:

- Project Repository – Regnet web site (http://www.regnet.org).
- Project plans (i.e. Management Plan, Configuration Plan, Quality Assurance), technical Annexes;
- Estimates & proposed Schedules for the activity being previewed
- Project metrics
- Any standards which are to be followed

4.1.4 Persons involved in Task Brief Completion

The following persons will be involved in the development of the task brief giving their own support and agreement both in the development and the review phases of the Task Brief

- Project Control Group (PCG)
- Task Leader
- Technical expert
- Partners who will participate in or whose work may be affected by the activity being previewed.
- Representative from the Quality Management Group (to provide customer and organisational focus)
- Representative from other Partners if considered appropriate by the Project Task

4.1.5 Preparation

Each team member involved in the preview shall prepare for the preview. In order to prepare read through the following paragraph and make notes.

In addition, the Task Leader and Technical experts shall gather the necessary inputs for the preview.

4.1.6 Preview Phase

The Task Leader shall act as facilitator for the preview. He will prepare the first draft of the Task Brief, which will be submitted to the other participants to the preview, receive their feedback and contributions until consensus is reached. Below are the suggested items to be discussed during the preview phase. The task team should also discuss any other issue pertinent to the success of the activity being previewed.

4.1.6.1 Team Objectives

The Task Leader and technical experts shall summarise the objectives of the activity about to be undertaken.

- Purpose of the activity
- Milestones
- Expected deliveries and other expected outputs

4.1.6.2 Detailed Planning

This paragraph address a set of items to be taken in consideration as that may help the team members in preparing an effective task brief:

- *Estimates*
  Are the estimates for size, effort, cycle time, etc. appropriate? Can the team members commit to the estimates? Do the estimates need to be revised?
- *Detailed Schedule*
  Does the detailed schedule cover all activities that need to be performed? Does the schedule have a relationship with the estimates? Does the schedule need to be revised?
- *Critical Path*
  Are all team members aware of the critical path (if any)? Are the team members on the critical path aware of their responsibilities? Is there a strategy for dealing with delays on the critical path?
- *Configuration Items*
  Are the configuration items for the forthcoming activity defined? Are the defined configuration items appropriate?
- *Peer Reviews*
  Are the artefacts to be peer reviewed determined? Is the level of peer review appropriate? Are reviewers external to the project required? Is there are strategy for conducting the necessary peer reviews? Has a schedule for peer reviews been determined? What special perspectives need to be considered - performance, interfaces etc?
- *Other Issues*
  Are the project requirements expected to be volatile? What strategies are in place to handle requirements change? Are the strategies adequate? Are the acceptance criteria for all customer deliverables clearly defined? Are the acceptance criteria achievable?

4.1.6.3 Methods, Tools and Standards

From your knowledge of the methods, tools and standard proposed and by looking at previous project experiences answer the following questions:

- *Methods*
  What methods are to be used for the upcoming activity? Are the methods appropriate? Are there any known weaknesses in the method? Are the team members sufficiently trained in the method? Is any training required? Have mentors been identified within the project?
- *Standards*
  What standards are to be used for the upcoming activity? Are the standards appropriate? Are there any know weaknesses in the standards? Are the team members sufficiently versed in the standard to use it? What are the notation and naming conventions to be used by the team? Are these conventions appropriate? Is training related to any standards required?
- *Off the Shelf Tools*
  What off the shelf tools are to be used for the upcoming activity? Are the tools appropriate? Are there sufficient licenses to accommodate the project team? Do the tools require special hardware or administrative support? Are there any known weaknesses or defects in the tool? Are there known workarounds for the weaknesses or defects? Are the team members sufficiently trained to use the tool? Is any training required? Have mentors been identified within the project?
- *Project Developed Tools*
  Will the project need to develop any tools to support the upcoming activity? Has sufficient time been allocated for the development? Are the requirements for the tool well defined? Has a quality gate for the tool been determined?

4.1.6.4 Risks

Examine the risks listed in the proposed plan and answer the following questions:

- *Management Risks*
  Are all known management risks listed? Are there any other risks? Are the impacts of the risks determined? Are the risk mitigation strategies adequate and sensible? Is the frequency of tracking of risks adequate?
- *Technical Risks*
  Are all known technical risks listed? Are there any other risks? Are the impacts of the risks

determined? Are the risk mitigation strategies adequate and sensible? Is the frequency of tracking of risks adequate?

- *Dependencies*
  What are the external dependencies of the project? Are any of the dependencies likely to become critical? Are there any strategies to lessen the impact of dependency slippage?

4.1.6.5 Configuration Management

Examine the proposed plans and from your knowledge of configuration management and by looking at previous project experiences answer the following questions:

- *Individual Configuration Management Strategy*
  Is the CM strategy for individuals defined? Is the strategy sufficient to guarantee the integrity of project configuration items? Is the strategy adequate to support the required project activities? Is the strategy easy to understand and implement?
- *Project Configuration Management Strategy*
  Is the CM strategy at the project level defined? Is the strategy sufficient to guarantee the integrity of project configuration items? Is the strategy adequate to support the required project activities? Is the strategy easy to understand and implement? Are the baselines adequate to support the required project activities? Are all baselines defined? Is the change process adequately defined? Is the change process understood by all team members? Are the mechanisms for releasing artefacts to the customer understood by all team members?

4.1.6.6 Project Goals

Examine the proposed project goals in the light of your experience, any metrics for the current project or metrics for projects in similar; answer the following questions:

- *Product Goals*
  Are goals for the product established? What is the basis for the setting of the goals? Are these goals achievable? Are there strategies in place to assist in achieving the goals? Do all team members commit to the goals?
- *Process Goals*
  Are goals for the process established? What is the basis for the setting of the goals? Are these goals achievable? Are there strategies in place to assist in achieving the goals? Do all team members commit to the goals?

4.1.7 Outputs

The output of a preview is the task brief, produced in accordance with the defined template, as specified in the following paragraphs.

Task briefs are stored in the Regnet Repository http://www.regnet.org/members.

4.1.8 Preview Follow-up

The Task Leader shall ensure that the task brief is correctly stored and available for all involved partners.

If from the preview arise the need to review the project plan or to bring some major changes that may affect other Work Areas or Work-packages or tasks, the Project Management Group (PMG) will:

- Update the project plans in accordance with the task needs.
- Communicate to all partners the changes to the project plans.
- Conduct a Project Plan Review if changes have been made which effect the commitments of other groups (Quality, Systems, etc)

4.2 Preview Reports / Task Brief key elements

4.2.1 Team Objectives

Purpose: the purpose of the activity to be undertaken shall be clearly addressed. This shall be described in the specific session of the Task Brief Template called “Objectives”.

Milestones: according to the duration of the task intermediate milestones may be identified in order to have a coordination point with the rest of the team. Milestones shall take in account as a minimum the Quality Gates and the time needed to rework items identified as needing improvement during the Quality Gate itself.

Deliveries & Output shall be clearly addressed in the Task Brief. In the case of tasks, these have already been defined in the project plan and in the *“Annex 1 - Description of work”* **[1]**, while for the subtask they shall be clearly identified, pointing out how the sub-task deliverable or output fit into the final deliverables.

4.2.2 Planning

According to planning the following items shall be defined:

Estimation: At the beginning of the project estimates shall be done to identify resources needed to achieve the goals. These estimates shall be reviewed during the project deployment. For the Regnet project precise estimates have been defined at the beginning of the project and according to them resources have already been assigned to tasks and sub-tasks.

Detailed Schedule: as already said for “milestones”, a detailed schedule is needed to formalize the different steps the deployment goes through. This is particularly true for those tasks in which different partners are involved at different levels and in which the success of the activity is strongly dependent on coordination of sub-activities. A detailed schedule shall also take into account checkpoints, time for quality gate and rework. Progresses shall than be tracked against the schedule in order to promptly intervene when deviations from the plan occur.

Critical Path: the critical path may be defined as the set of task that must be completed on schedule if the project as a whole is to be completed on schedule. It shall be accurately identified and tracked to grant that the schedule will be followed.

Configuration Items: items to be put under configuration shall be identified. Examples from the Regnet project are: Task Brief, Interim Report, and Deliverables...

Quality Gates: each task brief shall address the Quality Gate that deliverables or output will undergo (review or inspection), clearly specifying when and who will participate to. From three to five people should be involved in. We suggest that leaders of other sub-tasks belonging to the same task and the task leader take part to the review so that they are aware and agree to the contents of their task deliverable. For code inspection adequate skill and knowledge is required to people who participate in the inspection.

4.2.3 Methods, Tools & Standards

Methods, tools and standards that will be followed during the development have to be clearly identified and described in the “Methodology” session of the task brief.

4.2.4 Risks

Management and Technical Risks: specific risk factors that may affect the success of the task shall be identified at the beginning of the task such as mechanisms for tracking the various risk factors and implementing contingency plans shall be assessed.

Dependencies: linkages between deliverables and tasks shall be clearly identified in order to assure that all affected parties agree with the specific deployment and the overall structure of the part being developed.

4.2.5 Project Goals

Product & Process Goals: specific goals related to the deliverable should be defined since the beginning in order to give an objective way to assess at the end of the task the conformance of what has been developed to initial requirements and specification.

5 Task Activity Phase

The activity phase is the actual deployment of the work, object of the phase, task or sub-task... Referring to the above stated management structure; it can be either the overall activity of one Work Area, or the collection of jobs of one Work Package, or a single Task.

Depending on the domain of the activity, quality assessment could require a specific process to be followed. This kind of issues are under the responsibility of the Wok Area managers, which are identified in the management structure to deal with domain related aspects, and to contribute in the assessment of the quality of results because of their domain expertise.

A metrics program is a key feature of the Process. It is associated with monitoring all products and processes during development to ensure that quality goals are maintained. By including metrics at every stage of the development process, it assures that projects are monitored against their stated goals and that required quality goals are achieved.

The responsible partners (Area Managers, WP Managers, Task Leaders,…) shall be responsible for ensuring that adequate means exist for collecting and documenting metrics that support Quality Gate assessment.

6 Quality Gate

The Quality Gate is a check to determine whether an activity's output is fit for its intended purpose, where the purpose of the output should be agreed to at the activity preview. The common forms of quality gate are peer review (or the more formal inspection) and testing.

References for Quality Gates are the Quality Goals stated in the preview activity.

All the phase entry criteria and the artefacts of the current phase are the object of the Quality Gate evaluation. The assessment is structured in two levels: one more formal is aimed at verify that all the necessary elements to evaluate the quality of the outcomes have been addressed. These elements regard the configuration management and release consistency, the matching of phase exit criteria and the compliance to all agreed methodological aspects. This level is performed by MOT as responsible of overall quality assurance in REGNET project.

The second level of assessment regards domain competencies and it is managed by the Quality Management Group (QMG), consisting of MOT, AIT, ZEUS, VALT, IMAC, and TARX. Each Work Area is represented in the QMG; therefore, the evaluation is performed on the base of the appropriate expertise.

The Quality Gate can be conducted by means of meetings, when the ending of the phase corresponds to a major project milestone. Otherwise, the evaluation is conducted under the responsibility of one or more members of QMG, involving the appropriate numbers of partners of the affected area. Note that the members of other areas in QMG also take an active role in Quality Gate, introducing for the benefit of the assessment, their own external point of view (cf. [3]).

The Project Management Plan establishes all the deadlines for the activities at each level of detail. In the Quality Framework perspective, at these deadlines the deliverables shall have passed the Quality Gate. Since there is an iterative process between Activity and Quality Gate, the proper rework time must be taken into account when scheduling the assessment.

The Quality Gate activities are reported in formal documentation, available to EC and the entire REGNET consortium. The template to be used depends from the form of Quality Gate conducted, varying form the meeting minute, the memo, or other.

Finally, it must be stated that, whenever some deliverables require specific Quality Gates to be assessed, the involved Area Manager, according to the QMG, is responsible for adopting the opportune process changes.

7 Post Mortem

The Post Mortem is a mechanism for learning from the completed activity, and it is conducted for the benefit of the project team and the consortium. It can be held at the end of the activity before the next activity starts, with the assumption that the activity phase is definitely terminated (this also means that the required quality level was reached).

In the Regnet project Post Mortems should be held at least at the end of main Work-Packages, among the Project Management Group (PMG) members in order to discover strengths and weakness of the process adopted. In this way strengths should be heightened and weakness avoided in the forthcoming activities.

Guidelines in how to conduct a Post Mortem are specified in the following:

7.1 Post Mortem Guidelines

A post-mortem is a learning experience for the project team. For this reason it is strongly suggested that it is performed with focus and discipline.

For example a post-mortem is not a time to lay the blame for failures, it is not the time for self delusion regarding the excellence of the team and techniques, as it is not the time to plan the next stage of the project.

7.1.1 Inputs to Post-mortem

In order to conduct a complete and successful post-mortem all suitable information shall be available and used as inputs for the activity.

Examples are: Regnet web-site, Plans, Technical Annex, Task Briefs & Interim reports, minutes of previous meetings or similar activities, estimates and actuals for the activity being examined, reports and information on problem encountered by the project…

7.1.2 Participants

For the needs of the project post mortems may be conducted at different levels (Project Management Group, Work Area, Work Package, …), participants may then vary according to the scope of the Post Mortems.

Members who are suggested to participate are: Team Leader (for the managerial perspectives); Technical references; members of the project team who participated in the previous activity; Representative from other Groups, whose work may be affected or may have impacted on the activity under consideration.

Although meetings may significantly reduce lead time, Post mortem may also be conducted remotely using e-mails, net-meetings, conference call as appropriate. In these case the different steps of the activity will be precisely defined in advance and adequate resources and time will be allocated.

7.1.3 Preparation

Each team member participating to the post-mortem shall prepare for the post-mortem. In order to prepare in the following a set of items of interest are suggested. According to them each participant will try to identify, regarding the activity being examined:

- Three best practices;
- Three areas you believe could be improved;
- Recommendations for the Regnet Team based on the experience acquired during the activity being examined;
- An action plan for improvement.

The Team Leader and Technical Lead, supported by the Quality Assurance Team shall collect and gather the necessary inputs for the post-mortem.

7.1.4 Post-mortem session

Below a suggested set of items to be taken into account for a post-mortem session are listed. In each case the judgment of effectiveness should be made on the basis of metrics where possible as well as on a subjective basis. The project team should also discuss any other issues pertinent to the success or otherwise of the activity being examined.

7.1.4.1 Team Achievements

The Team Leader and Technical Lead shall summarize the achievements of the team in the activity being examined.

- Milestones achieved
- Deliveries or other outputs generated
- Tools, techniques, methods developed to assist in the activities
- Results of any assessment
- Project goals met or exceeded

7.1.4.2 Project Planning

Each participant examines the Regnet web-site, Plans, Technical Annex, Task Briefs & Interim reports and any other project plans, and answer to the following questions:

- What was the estimation accuracy of any estimates made? What were the reasons for the (in)accuracy of the estimates?
- Was the schedule realistic? Was it of sufficient detail? Did unexpected items become part of the critical path? Why (not)?
- Was the planned level of communication between project members sufficient? Were team communications effective? Why (not)?
- Was adequate leadership (both technical and managerial) provided? Why (not)? Was a mentoring scheme in place on the project? Why (not)? What was the effectiveness of any mentoring?

7.1.4.3 Methods, Tools and Standards

Reflect on the methods, tools and standards used in the activity being examined, answer the following questions:

- What methods were used during the activity being examined? What was the effectiveness of these methods? Were there any difficulties encountered in using the methods, for example, deficiencies or ambiguities in the method? Did team members develop any techniques for using the methods more effectively?
- What standards where followed by the project team? Were the standards clear, concise and unambiguous? Were any standard interpretations developed?
- Were the tools used suitable for the tasks being performed (for example, did the tool correctly support the method the team was attempting to use)? Why (not)? Was the administrative support provided to the team adequate to run the tools? Why (not)? Were there any problems for which the team developed work-arounds?

- Were any tools developed by the team to assist in completion of project tasks? What was the effectiveness of any such tools?

7.1.4.4 Risks

Each participant examines risks addressed in the Regnet Plans, Technical Annex, Task Briefs & Interim reports and any other project plans, and answer to the following questions:

- Did any of the predicted risks become realities? Were the impacts of the risks correctly predicted? Why (not)? Were the risks tracked frequently enough? Why (not)? Were any risks avoided due to the efforts of the team? How? Could these risk mitigation strategies be applied in the future?
- Were there any unforeseen risks which became realities? What were these risks? Why were they not predicted?
- Did any dependencies fail? What was the effect of the failure? Could the effect of the failed dependency have been avoided? How?

7.1.4.5 Configuration Management

Examine the how configuration has been managed, answer the following questions:

- Was the configuration management strategy adopted by single partners appropriate for the activity under examination? Why (not)? Would you recommend the singular partners' individual configuration management strategy for use by other partners or the entire Regnet Project Team?
- Was the configuration management strategy adopted for the whole project appropriate for the activity under examination? Why (not)? Was change processing carried out as planned? Why (not)?

7.1.4.6 Project Goals

Examine the goals established for the activity being examined, answer the following questions:

- Were the product goals reasonable? Were the product goals achieved? Why (not)? Should the goals have been more aggressive? Why (not)?
- Were the process goals reasonable? Were the process goals achieved? Why (not)? Should the goals have been more aggressive? Why (not)?

7.1.5 Outputs

The output of a post-mortem is a post-mortem report. The report shall contain:

1. The minutes of the post-mortem session
2. Project specific action plan. This is a list of action items addressing project specific issues, to be acted upon by members of the project team.
3. Organizational improvement items. Items which are believed to be systemic to the organization.

7.1.6 Distribution of Post-mortem Reports

In order for Regnet Project to learn from project/Work Packages/… post-mortems the report of the post-mortem must be distributed as widely as possible.

8 Verification & Validation

8.1.1 Characteristics of V&V

It is not possible to write software that is always perfectly defect-free. Making errors is a result of human creativity and errors are inevitable.

Verification & Validation comprehensively analyses and tests software to determine that it performs its intended functions correctly, to ensure that it performs no unintended functions and to measure its quality and reliability.

- *Verification* involves evaluating software during each life-cycle phase to ensure that it meets the requirements set forth in the previous phase.
- *Validation* involves testing software or its specification at the end of the development effort to ensure that it meets its requirement.

Verification & Validation yields several benefit:

- it uncovers high risk errors early, providing the development team time to evolve comprehensive solutions, rather than forcing a makeshift fix;
- it evaluates the products against system requirements;
- it gives management continuous and comprehensive information about the quality and progress of the development effort;
- it gives the users an incremental preview of the system performance.

8.1.2 V&V Organization in the REGNET Project

There are several way to organize V&V, that may be summarized as follow:

a. *Independent:* the traditional approach is that the V&V group is independent of the development team. The objective is to develop an independent assessment of the system's quality and to determine whether the software satisfies critical system requirements. The advantages of this approach are detailed analysis and test of software requirements, an independent determination of how well the software perform, and early detection of high risk software and system errors.

b. *Embedded in the System Engineering Group and/or Quality Assurance Group:* When the V&V group is embedded in the system engineering group, its task are to review the group's engineering analysis and testing. Advantages are minimum cost to the project, no system learning to the staff and no additional interfaces.

c. *Embedded in the user group:* in this case the V&V group receive formal software deliverables and provide comments and data to development's project management that distributes the information to its own development team. An advantage of this approach is the strong systems-engineering and users perspectives that can be brought to bear on the software during development.

In order to maximize the effectiveness of Verification and Validation activities within the Regnet project the different approaches are to be put in place in the different phases of the Regnet development life –cycle. In particular (see also figure below):

- During the definition, analysis and implementation part (WP1 & WP2) of the Phase 1 verification activities have been carried out by the System Engineering Group and/or Quality Assurance Group
- A specific Work Package (WP3) has been defined still during Phase 1 to perform Independent Validation
- During Phase 2 (WP4) the Validation group is Embedded in the user group: a broad public is identified and participate in the assessment and evaluation of the System; and on the basis of comments and data received refinement of the Regnet system and services are performed as appropriate.

Moreover there are two forms of testing:

- *white box testing:* conducted on code components to exercise the internal structure of the component
- *black box testing:* conducted on integrated, functional components whose design integrity has been verified to validates that the software meets requirements without regard to the paths of execution

An ideal test environment alternates white box and black box test activities, first stabilizing the design, then demonstrating that it performs the required functionality in a reliable manner consistent with performance, user, and operational constraints.

V&V activities performed in the REGNET Project consist of both:

- During WP1 & WP2 verification activities, carried out by the System Engineering Group and/or Quality Assurance Group, mainly consist of reviews and unit/module/integrate testing (substantially white box type)
- While Independent Validation performed during WP3 & WP4 mainly consist of testing of the system as a whole (and then substantially black box type)

In the following, further details on Verification and Validation are provided.

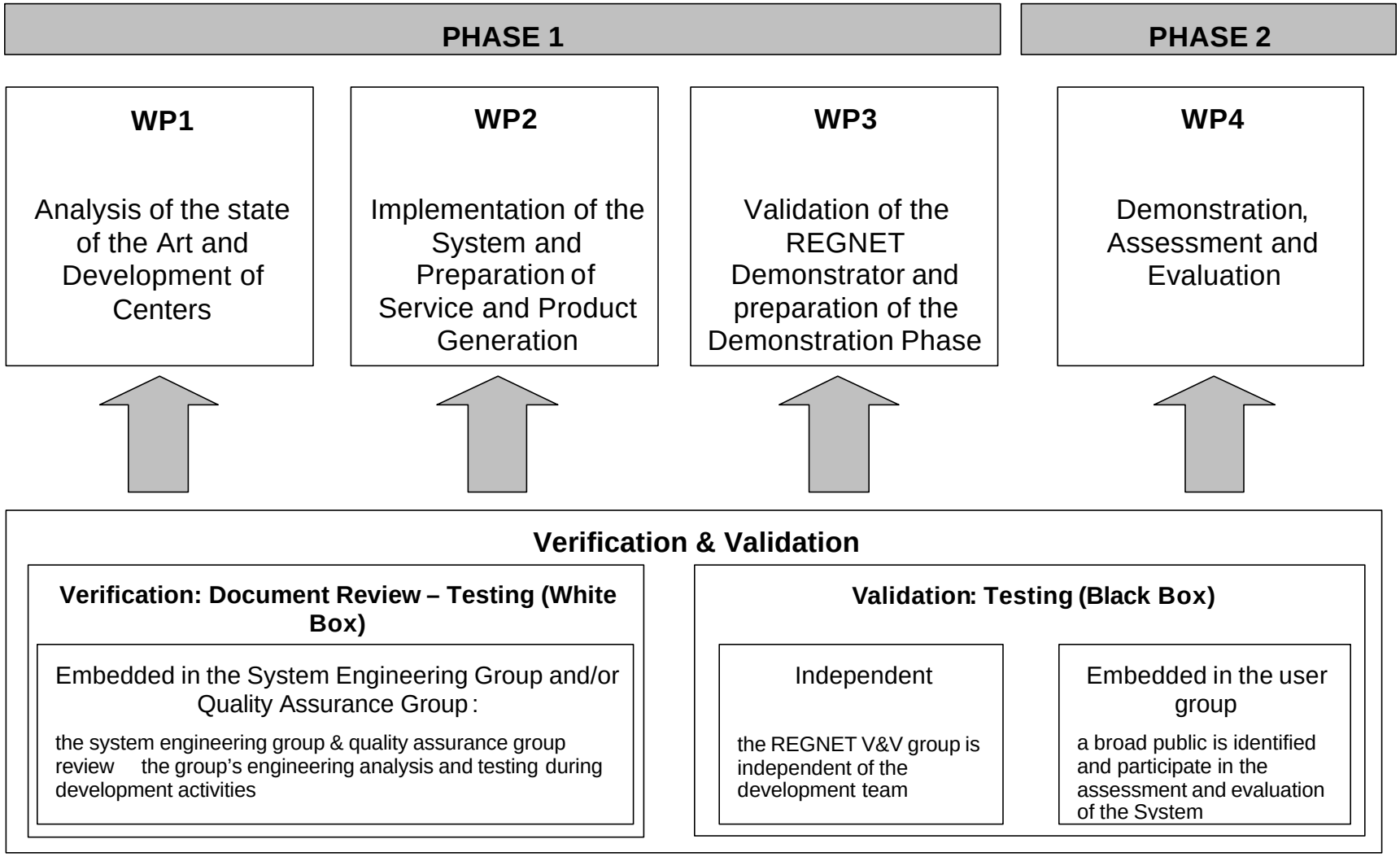


Figure 2: Verification and Validation in REGNET project

8.2 Verification: Reviews and White Box testing

Verification involves evaluating software during each life cycle phase to ensure that it meets the requirements set forth in the previous phases/task.

Typical Verification activities are:

- *Document Review:* these reviews verify completeness, accuracy and consistency of development documents.
- *Code reviews:* code is reviewed with respect to the design documents and the coding standard.
- *Software Unit Test:* is through testing of each unit of software, either by the developer or another independent team member.
- *Software Verification Testing:* verifies correctness with respect to the design; function input/output, path coverage and error guessing.
- *Integration Testing:* The emphasis is on interfaces and functions working together.

As far as it concerns document and code reviews, these may be organized through face-to-face meeting or in alternate way via e-mail.

In particular, in the area of "Platform engineering and nodes development" (Work Area B) of the REGNET project, the required starting point has been the Identification of standards to be used (Task 1.3). On this basis the System Specification are to be developed (Task 1.4).

Verification of the report "The REGNET System Specification and State of the Art" (D.2), performed by the System Engineering Group aims at verify that the requirements coming from all Work Areas during the task activities have been taken into account and adequately implemented in the document. For this reason also Partners representatives of other Work Areas should participate to this deliverable review, in order to provide a different point of view and to assure that requirements related to their specific Areas (such as specific content and their management – WA A - and/or specific requirement or constraints coming from market analysis and legal framework – WA C -).

On the other hand, in the following stage (WP2), design and software modules of the System (Prototype: "The REGNET System: Version 1" – D.5) has to be verified by the System Engineering Group to ascertain that they meet previously identified requirements and specification, as per D.2. In this case the participation of Partners involved in subsequent (WP3 - Validation) activities is highly recommended to provide Tester perspective.

As far as it concerns testing, as mentioned above, white box testing is conducted on code components, which may be software units, computer software components, or computer software configuration items. These tests exercise the internal structure of a code component, and include:

- Execution of each statement in a code component at least once
- Execution of each conditional branch in the code component
- Execution of paths with boundary and out-of-bounds input values
- Verification of the integrity of internal interfaces
- Verification of architecture integrity across a range of conditions
- Verification of database design and structure

White box tests verify that the software design is valid and that it was built according to the specified design.

These are performed by Partners during the REGNET Demonstrator development (WA B Task 2.2: "System implementation"), during which Partners are responsible not only for system development,

but also for system tests and verification of system function and test of production and service processes.

This is done according to a bottom up approach.

8.3 Validation: Black Box testing

Validation involves testing software or its specification at the end of the development effort to ensure that it meets its requirement. Testing is the only way to assess the quality of software in its actual environment. Other quality techniques also help to assess quality, but it is still essential that software actually functions correctly where it is intended to work.

Testing is the process of finding defects in relation to a set of predetermined criteria or specifications. The purpose of testing is to prove a system, software, or software configuration doesn't work, not that it does.

Within the Regnet Project independent Validation is performed during Work Packages 3 & 4 (respectively Phases 1 & 2) and mainly consist of testing the system as a whole (substantially Black Box type).

In fact Black box testing is conducted on integrated, functional components whose design integrity has been verified through completion of traceable white box tests (WP 1 & 2). Black box testing traces to requirements focusing on system externals. It validates that the software meets requirements without regard to the paths of execution

In particular, during the Task 3.1 ("Validation of the REGNET Demonstrator ") of the Work Package 3 a group of Partners independent from those directly involved in the development of the REGNET System perform a set of Black Box tests with the following purpose:

- exercising and simulating REGNET-System operation.
- establishing confidence that the REGNET-System does what it is supposed to, and doesn't do what it isn't supposed to, according to the requirements developed during WP1 and prior to allow a broad public to participate.
- analysing the REGNET-System with the intent of finding problems, errors or incorrect behaviours.
- measuring REGNET-System functionality and quality.
- evaluating the attributes and capabilities of the project work products, and assessing whether they achieve required or at least the minimum criteria of usable systems.

During the second phase of the project (WP4 - "Demonstration, Assessment and Evaluation") a broad public is identified and participate in the assessment and evaluation of the System; and on the basis of comments and data received refinement of the Regnet system and services are performed as appropriate.

9 Internationalisation (i18n) & Localisation (i10n)

The Regnet product has to be used within different countries and requires the possibility to be used by different European citizen in their own native language.

Internationalisation is the process of designing an application so that it can be adapted to various languages and regions without engineering changes. Sometimes the term internationalisation is abbreviated as i18n, because there are 18 letters between the first "i" and the last "n."

An internationalized program has the following characteristics:

- With the addition of localized data, the same executable can run worldwide.
- Textual elements, such as status messages and the GUI component labels, are not hardcoded in the program. Instead they are stored outside the source code and retrieved dynamically.
- Support for new languages does not require recompilation.
- Culturally-dependent data, such as dates and currencies, appear in formats that conform to the end user's region and language.
- It can be localized quickly.

Some of the elements to be taken into account for internationalisation are:

- Types of data that may vary with region or language (such as text messages, Icons labels, helps, Times & date…) have to be identified;
- Use of *Resource Bundles* for isolating Translatable Text (including status messages, error messages, log file entries, and GUI component labels).
- Whenever possible avoid constructing compound messages, as they are difficult to translate. Nevertheless if the application requires compound messages, they have to be handled with particular care.
- If the application displays numbers and currencies, they must be formatted in a locale-independent manner.
- Date and time formats differ with region and language, so they have to be managed with particular care.
- Use the Unicode Character Properties to identify character properties.

"*Localization* is the process of adapting a product to meet the language, cultural and other requirements of a specific target environment or market (a "locale")." The term localization is often abbreviated as l10n, because there are 10 letters between the "l" and the "n." Usually, the most time-consuming portion of the localization phase is the translation of text.

The user determines which localized resource will be used by the application by clicking a flag, the application sets the "locale" and automatically displays pages in a chosen language. But for every language bundle we need know each translated word or phrase.

9.1.1 Resource bundles

Resource bundles contain language-dependent text strings. Resource bundles provide the means for utilizing locale-specific information without having to maintain multiple versions of code for those various locales.

Resource bundles contain locale-specific objects. When a program needs a locale-specific resource, a String for example, the program can load it from the resource bundle that is appropriate for the current user's locale. In this way, it is possible to write program code that is largely independent of the user's locale isolating most, if not all, of the locale-specific information in resource bundles.

This allows to write programs that can:

- be easily localized, or translated, into different languages
- handle multiple locales at once
- be easily modified later to support even more locales

Internationalization is foreseen for the following languages:

- English (en)
- Dutch (nl)
- German (de)
- Swedish (sv)
- Cyrillic (sr)
- Spanish (es)
- Italian (it)

Each module responsible will then identify the appropriate Resource Bundles and will submit it to the native speaking partner. For each language, translation effort will be done by native speaking partners.

9.1.2 Localization Process

In order to perform localization in the most effective way the following process shall be used:

Step 1. For each language a responsible partner has to be identified. He or she can refer to other people or partners, but he/she will be responsible for the final choice for each specific translation.

Language	Responsible/interface Partner
English (en)	N.A.
Dutch (nl)	MECH, MUS, TARX
German (de)	IMAC, ONB, SR, AIT
Swedish (sv)	NRM, KVA, LMG, SUL
Cyrillic (sr)	SUSU, ICCS
Spanish (es)	GRAN, IAT
Italian (it)	CC, ALI, MOT, SPACE
Greek	ZEUS, (SI, CERT)
Bulgarian	ICCS

Table 9-1: Language Responsible/Interface Table

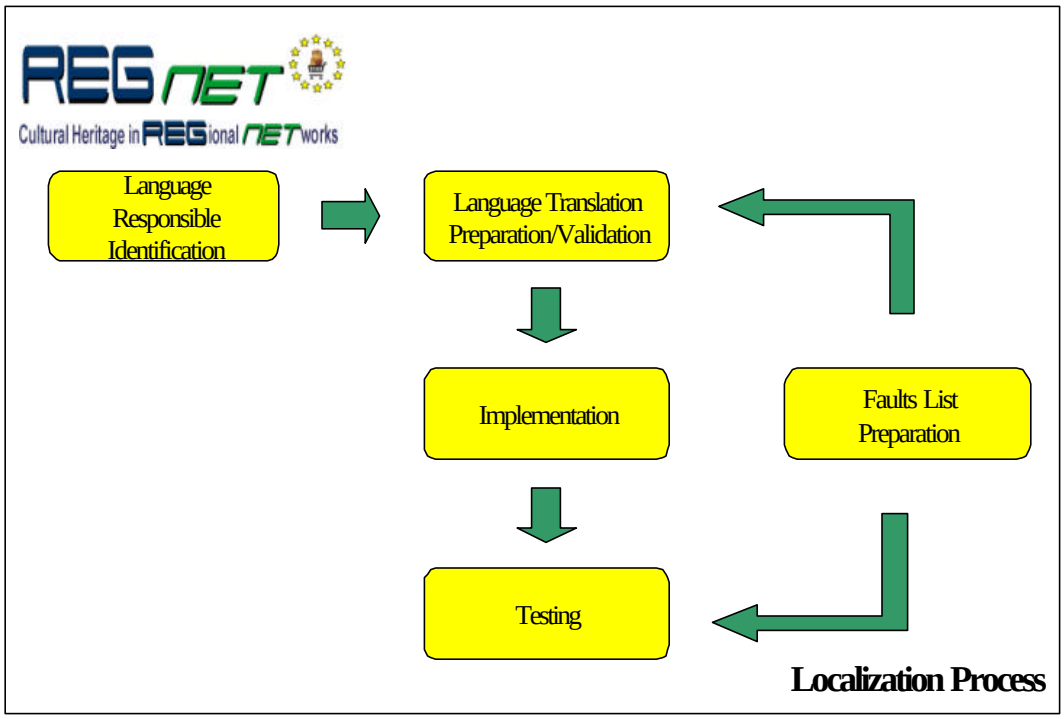
Step 2. For each tool and language, a detailed table will be prepared and validated by each Language Responsible Partner using the specific template (RN_T3v01_MOT_i18n).

Step 3. For each tool Responsible Partners will develop different versions to implement the different languages according to the previously identified table.

Step 4. Tools will be tested to verify correctness of the Localization during a specific agreed time-slot.

Step 5. Misspelling and other faults will be addressed creating a new version of the respective RN_T3v01_MOT_i18n in which they are highlighted and listing them in the specific Table. This two document will be submitted to respective Language Responsible Partner for validation.

Step 6. If validated, Change Requests will be submitted to the Tool Responsible Partners for fixing. Tool Responsible Partner will deploy changes requested and release a new updated version. A new test run will be performed (Step 4).



10 Quality Goals and Metrics

10.1 Quality Goals

Product Quality Attributes, or Goals, are related to the intrinsic quality of the product and map to the SEI Level 4 Software Quality Management (SQM) KPA **[10]** with the purpose of developing a quantitative understanding of the quality of the project's software products and achieve specific quality goals.

It involves defining quality goals for the software products, establishing plans to achieve these goals, and monitoring and adjusting the software plans, software work products, activities, and quality goals to satisfy the needs and desires of the customer and end user for high quality products.

Quantitative goals are established for the software products based on the needs of the organization, the customer, and the end users. So that these goals may be achieved, the organization establishes strategies and plans, and the project specifically adjusts its defined software process, to accomplish the quality goals.

Important major attributes include:

- Performance
- Usability
- Availability
- Security
- Reusability
- Debuggability
- Maintainability
- Capability to evolve

The attributes listed above focus on quality from the point of view of the product. On the other hand, quality is addressed also by ensuring the compliance of all the project activities to the development process. Other attributes reflect this need:

- Planning accuracy
- Rework occurrence
- Conformity to methodologies
- Duplication effort
- …

Responsible partners are in charge of establishing Quality Goals at Work Area, Work Package, Task, or sub-Task levels. In this activity they can involve other partners indicated in the correspondent Task-briefs.

10.2 Quality Metrics

A software metric is defined as a unit that enables one to quantitatively determine the extent to which software process, product, or project possess a certain attribute. Metrics should be:

- Simple to understand and precisely defined
- Inexpensive to use
- Robust
- Consistent and used over time

- Unobtrusive

Metrics help us in monitoring the state of the project by providing better visibility, by enabling better communication, and by helping in better resource management. The Goal Question Metric approach (GQM) simplifies the identification of metrics based on Quality Goals. It consists of the following steps:

- Identify improvement goals for the process, product or project
- Identify operational definitions (question) that characterize, evaluate, predict and motivate the goals
- Identify the metrics for determining the answers to the questions
- Develop mechanisms for data collection and analysis
- Collect, verify, and validate the data
- Provide feedback

In the Appendix some example of metrics are reported, together with some instances of application of the GQM approach.

Following the GQM approach, each responsible partner, supported by MOT and QMG, will address specific goal and related metrics for his task, with particular reference to Schedule & Effort, Defect tracking, and Test Coverage.

10.3 REGNET Quality Goals and related Metrics

10.3.1 Work Area A

10.3.1.1 Work Package 1

High level goals:

- Definition of content to be provided.
- Development of a documentation and digitisation plan for content creation and management.

10.3.1.2 Work Package 2

High level goal:

- Preparation of content and products

10.3.1.3 Work Package 3

High level goals:

- Validation of the REGNET-Demonstrator
- Preparation of the Demonstration Phase
- Implementation of the version 2 of the REGNET system.

10.3.2 Work Area B

10.3.2.1 Work Package 1

High level goals:

- Identification of standards to be used
- Development of the System Specifications

10.3.2.2 Work Package 2

High level goal:

- System Implementation (1.Version).

10.3.2.3 Work Package 3

High level goals:

- Validation of the REGNET-Demonstrator
- Preparation of the Demonstration Phase
- Implementation of the version 2 of the REGNET system.

10.3.3 Work Area C

10.3.3.1 Work Package 1

High level goals:

- Set-up of the Legal Framework and Partnership Model.
- Definition of supported Business Functions.
- Identification of Market (Segments) and User Groups.

10.3.3.2 Work Package 2

High level goals:

- Set-up of the legal framework.
- Business process (re-) engineering.
- Market preparation.

10.3.3.3 Work Package 3

High level goals:

- Validation of the REGNET-Demonstrator
- Preparation of the Demonstration Phase
- Implementation of the version 2 of the REGNET system.

10.3.4 Work Area D

10.3.4.1 Work Package 4

High level goals:

- Execution of the demonstration phase (trial service)
- Refinement of system and services where appropriate and necessary.

- Analysis of the trial service, assessment and evaluation of the system.

10.3.5 Work Area E

10.3.5.1 Work Package 5

High level goal:

- Development of a technological implementation plan

11 Configuration Management

The main goal of Configuration Management is to track and maintain the integrity of project assets as they evolve in the presence of changes.

In particular Configuration Management (CM) deals with:

- Artefacts identification
- Version Control
- Baselines Management

11.1 Artifacts Identification

Unique identifiers shall be assigned to each Configuration Item (CI) to be placed under Configuration Management.

A Configuration Item is any part of the development and/or deliverable system which needs to be independently identified, stored, tested, reviewed, used, changed, delivered and/or maintained.

The identification scheme applied to each document addressed as a CI is defined in RN_T72vxx_AIT_docnaming.doc "Document Naming Convention".

11.2 Version Control

Version control is the process by which multiple versions of configuration items are identified, stored, and retrieved upon demand. Each CI shall be placed under version control. Each version of a CI shall be uniquely identified. REGNET project shall be able to recreate any version of any CI.

The REGNET Version Control it will be based on use of CVS (Concurrent Version System); an open source tool for configuration management and version control.

11.3 Baseline Management

A baseline is used to mark a point in the developmental history of the REGNET project, e.g. a milestone or end of an activity.

A baseline is a CI or collection of CIs, formally reviewed and agreed upon and thereafter identified as a baseline. After a baseline has been established, any change to artifacts comprising the baseline must be approved and communicated to all parties involved. A baseline is also described as a set of CIs and their version numbers at the time the baseline is created.

Each version of a baseline shall be uniquely identified.

REGNET project shall be able to recreate any version of any baseline.

A baseline shall be defined at the end of each significant activity as the basis for moving forward to the next.

11.4 Regnet Repository

The first step performed by the Project Team, according to Configuration Management, has been the creation of a Common Repository in which all identified Configuration Items can be stored.

As the REGNET Project includes a series of partners coming from more than 10 European countries including non-EU member states, the REGNET-Project Repository is supported by a WEB-Server, which is located at AIT (Angewandte Informationstechnik Forschungsgesellschaft mbH, Graz).

The “MEMBER AREA” can be accessed by the project members via: http://www.regnet.org and is protected by User Id and Password.

Figure 3 shows the layout of the homepage, while Figure 4 shows the “MEMBER AREA” layout.

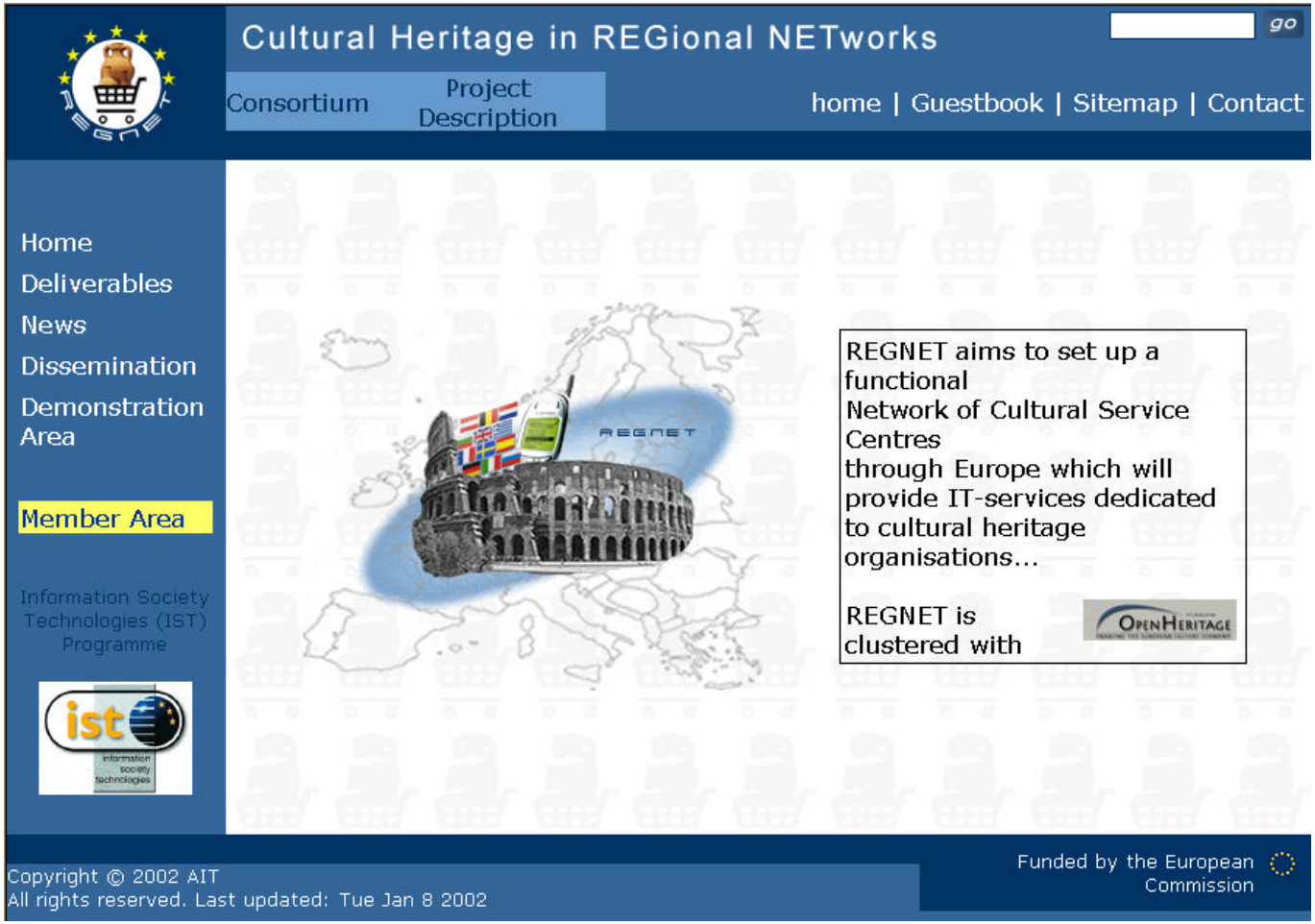


Figure 3: REGNET website Homepage

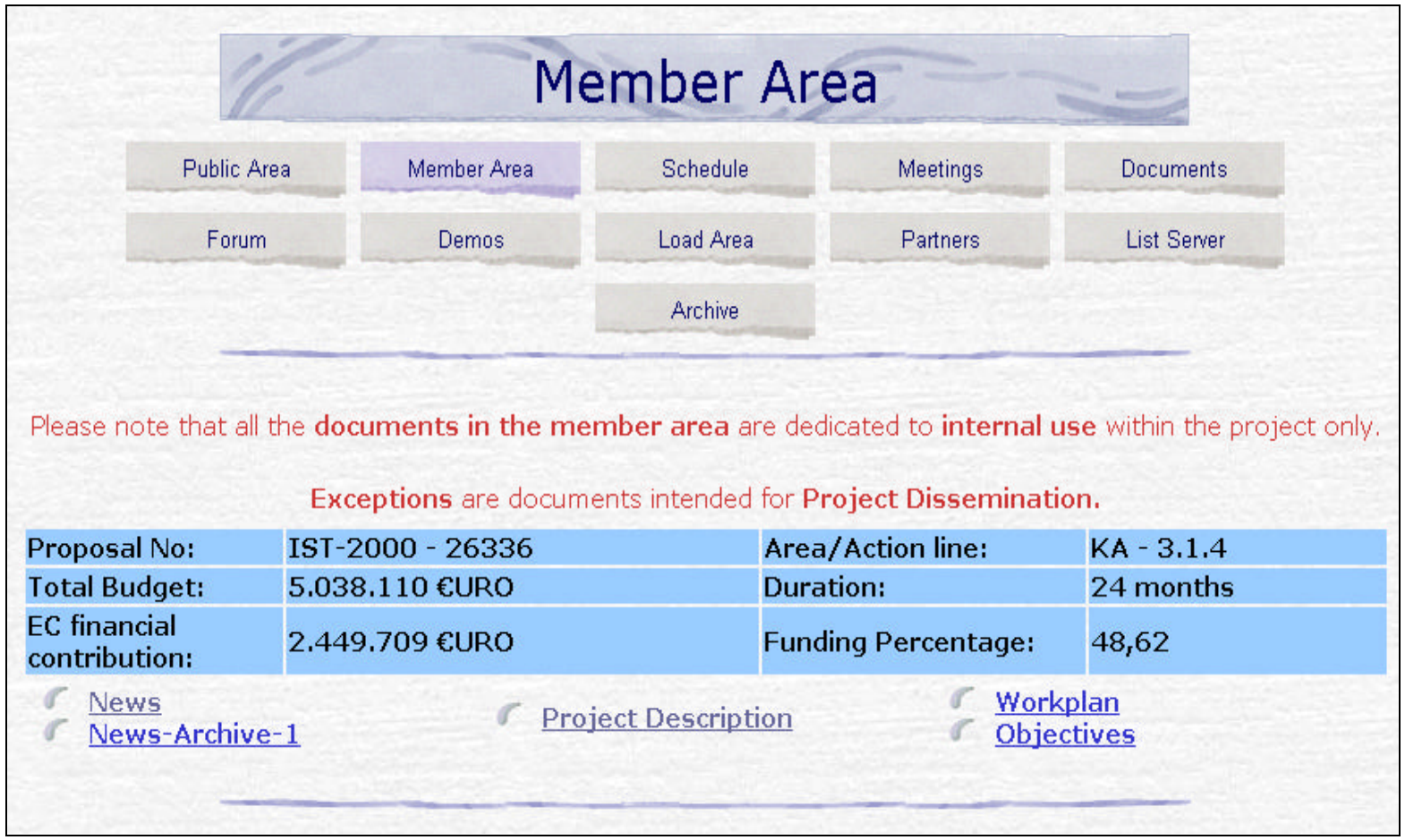


Figure 4: REGNET website "Member Area"

The Repository is partitioned as follow:

- Public Area: readdress to the Homepage (Figure 3).
- Member Area: the selected Area (Figure 4).
- Schedule: contains important events, deadlines for WorkPackages and Deliverables, Project Plan and Project Team.
- Meetings: contains the meeting plan.
- Documents: contains relevant contractual and work package/task related information as well as supplementary information (publications, standards, etc).
- Forum: is a room for Work-Packages related forums.
- Demos: where REGNET Functional Architecture is described with particular reference to nodes (building blocks) and components (subsystem).
- Load Area:
- Partners: gives partner related information (organisational details, key persons)
- List Server: provides details of discussion lists available for the REGNET-Partners.
- Archive.

The objects to be put in the repository (in the following referred as Configuration Items – CI) are documents (Deliverables) and Software. The responsible for CI integrity is the manager who submitted the CI, with the supervision of the relative Area Manager. All the CI shall be available at the QMG for quality assessment purposes.

11.5 CVS (Concurrent Versions System)

CVS is a version control system. Using it, it is possible to record the history of your source files.

For example, bugs sometimes creep in when software is modified, and the bug might not be detect until a long time after the modification have been made. With version control systems, it is possible to easily retrieve old versions to see exactly which change caused the bug.

CVS stores all the versions of a file in a single file in a clever way that only stores the differences between versions.

CVS also supports group of people working on the same project avoiding to overwrite each others' changes by insulating the different developers from each other.

Every developer works in his own directory, and CVS merges the work when each developer is done.

The tool stores all files in a centralized repository. The CVS *repository* stores a complete copy of all the files and directories which are under version control.

11.5.1 CVS configuration on AIT server

To allow Partners to work safely, a common repository has been defined and it is managed by AIT.

In this section it is described the CVS structure for the system development (see also m_72v02_sr_cvsstructure.doc).

The proposed structure should support:

- easy developing and testing of the system at the developer site
- easy generation of software packages for installation at a client site (CSC)

easy development of administrative tools for configuration of the REGNET system

The table below is structured as follows:

- path contains the CVS path of the resource described
- file specifies the CVS file described
- description holds the remarks on the resource

The following table describes the structure:

Path	File	Description
<root>/global/conf	to be defined by each partner	Contains information needed by all REGNET nodes.
	regnet_conf.xml	Contains information about the set-up of the REGNET system, e.g. installed components, environment variables used, etc.
<root>/global/lib	to be defined by each partner	Contains libraries necessary for running global services like a registry or lookup mechanism.
<root>/global/scripts	to be defined by each partner	Contains necessary start / stop / etc. scripts for running global services.
<root>/global/doc	to be defined by each partner	Documentation of the REGNET system, e.g. overview, installation instructions, etc.
<root>/<node>/	to be defined by each task leader	Main directory for a particular node. May contain additional structures for tools needed e.g. J2EE container, web-server, database, tools, etc.
<root>/<node>/<package>	to be defined by each partner	Examples for <package> are org.regnet.portal or org.regnet.portal.datageneration
<root>/<node>/conf	to be defined by each partner	Configuration files for each node.
<root>/<node>/lib	to be defined by each partner	Libraries necessary for a particular node.
<root>/<node>/scripts	to be defined by each partner	Contains necessary start / stop / etc. scripts for a particular node.
<root>/<node>/doc/operation/	to be defined by each partner	Node related documentation containing configuration, installation, etc.
<root>/<node>/doc/development/	to be defined by each partner	Node related documentation regarding system development containing API documentation, UML diagrams, etc.

Table 11-1: Regnet CVS - General Structure

Where:

<root> specifies the main directory of the REGNET system on a certain host

<node>specifies the directory for a REGNET node implementation

12 Change Management

Change Management is the process by which a change to a released configuration item is proposed, evaluated, approved or rejected, scheduled, and tracked.

A process for changes deployment shall be defined to assure that all affected partners are informed about changes, agree to them, and consequently integrate changes to their artefacts. Change processing shall be used at least once an artefact has been released. Prior to this, changes may be made without resorting to a formal change processing. Change Management deals with:

- Capture and management of requested changes.
- Analysis of potential impact and tracking of changes.

After a Configuration Item has been released, if the need to introduce any change rises, the REGNET Change Process shall be followed. (Figure 5) shows the basic process for Change Management in Regnet Project). It starts with the submission of a Change Request (CR).

A Change Request is the fundamental unit of change being requested for a product or Configuration Item under configuration management; may represent a symptom of a problem, a description of a defect in the software product or any configuration item, a request for a minor enhancement, a request for new functionality in the product, or a request to create a new configuration item.

It is submitted by the partner who identified the above stated need. Every CR must be submitted with the appropriate form to the Work Area Change Control Board.

A Change Control Board is a group or team with the responsibility to:

- Review and evaluate new change requests, and either accept or reject them
- Review and evaluate the work done in response to change requests, and either approve for release or reject them

In particular in each CR the following information should be addressed: description of the change, reason why it is requested, list of the other CI that may be affected by the change, a preliminary impact analysis – if available, importance (severity), urgency (priority)…

The Change Control Board (CCB) analyses the opportunity and feasibility of the submitted CRs deciding whether to accept or reject them. Moreover the impact of the requested changes is verified in order to assure that all affected partners are informed and agree with it.

In REGNET, the Change Control Board will have two layers, involved according to the impact of the requested Change:

1. General CCB.
2. Work Areas CCB (one for each Work Area).

Project Management Group (PMG) and the partner in charge of Quality Assurance (MOT) form the General CCB while each Work Area CCB is formed by its WA Manager and the related Task Leaders.

General CCB will manage only those CIs whose impact are not limited to a specific Work Area and require agreement and coordination across different Work Areas.

For this reason, two kind of CRs can be distinguish: “internal” or “external”, depending on whether the modifications affect only the Work Area of the request for change CIs, or other WAs are affected by the change. The process in Figure 7 takes care of criteria for addressing “external” CRs.

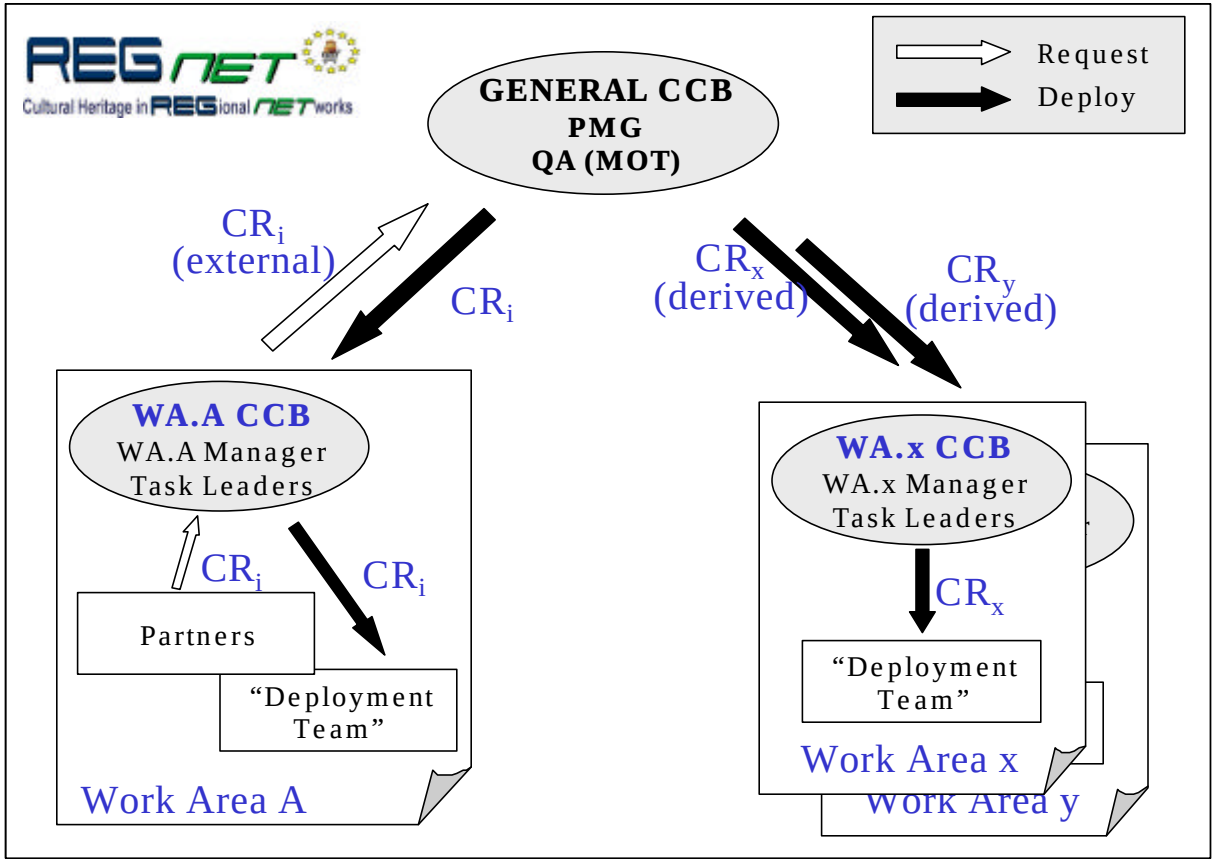


Figure 5: Change Request iter

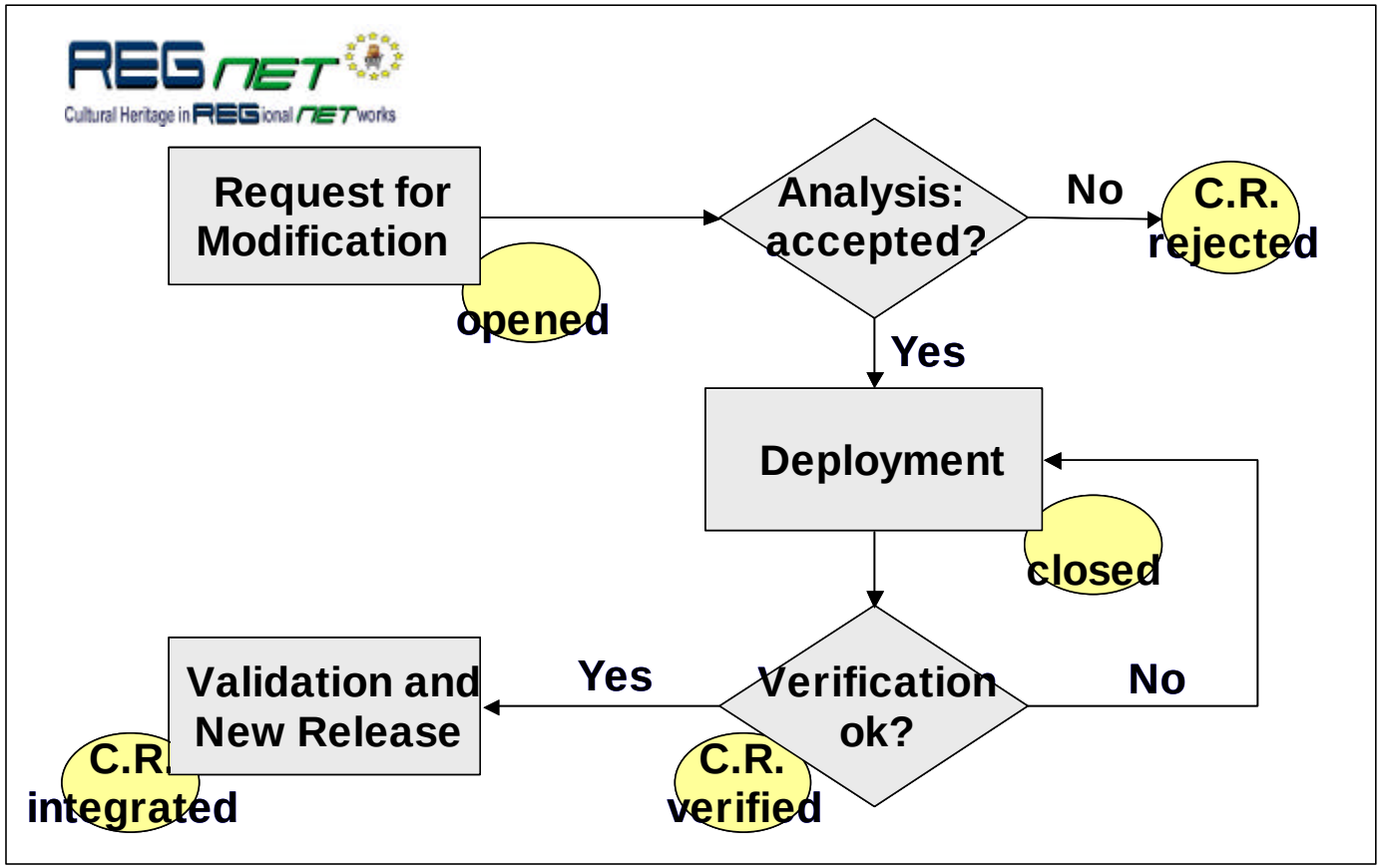


Figure 6: REGNET Change Process (internal CI)

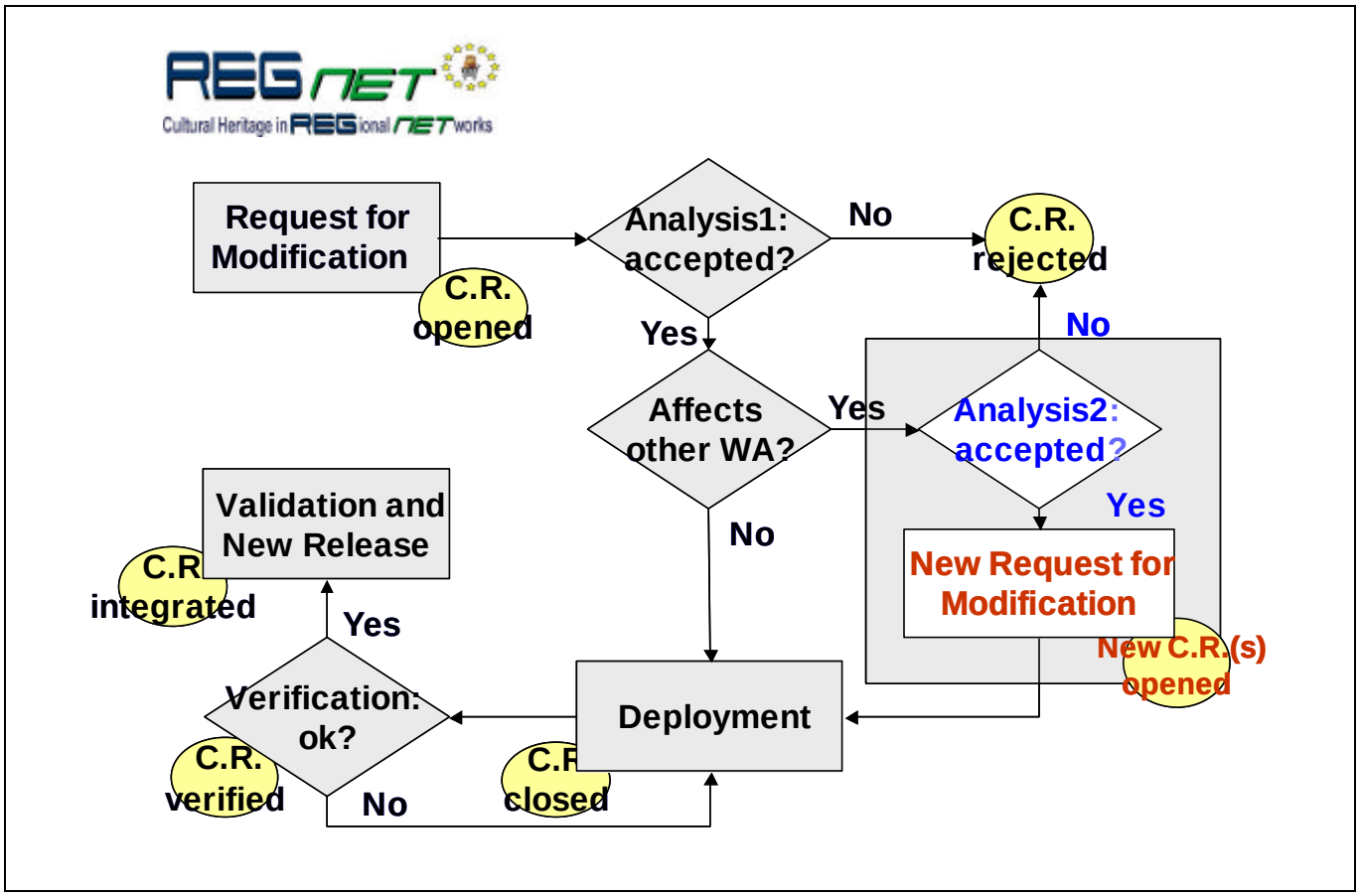


Figure 7: REGNET Change Process (external CI)

As stated before the change Process starts with the submission of a Change Request. Each Change Request shall be submit to the respective Work Area Change Control Board that verifies the CR, approves or rejects it and, if approved, categorizes it as internal or external.

In case of complex modifications, CCB may require to some Technical expert to support it in the decision providing a feasibility study with an estimate, in terms of effort and time, of the impact of the above-mentioned change.

If the approved CR is "internal" its deployment is assigned by the WA CCB to the partner(s) who has (have) adequate resources and skills to deploy all the related modification (including documentation). At the end of the deployment the partner will communicate to their CCB about the completion of the work. The latter will verify the adequacy and completeness of the solution and integrate it in a new release of the Configuration Item.

In case of an "external" CRs, it is readdressed by the WA CCB to the General Change Control Board, who approves it, and investigates on the impact on affected artefacts of the other WAs. One or more Technical experts may support the General CCB in its decision.

If the General CCB recognizes the need for the requested modification, generates the new CRs (derived) needed for each Work Area. Every WA CCB will be then in charge to verify, approve and integrate the new solution. The General CCB will only verify that all the WA CCBs involved reach the end of the process.

Since many partners located in different sites compose the CCBs, it is expected it performs its functions with some form of remote coordination, leaving more independence to single Work Area managers for the processing of "internal" CRs, and leveraging the inter-working for cross-area CRs.

12.1 Change Request Acceptance Criteria

In this session there are some criteria that may support the CCB deciding whether to accept or reject a Request for modification. They are divided in: Intrinsic merits of the proposal, feasibility,

12.1.1 Intrinsic merits of the proposal:

- Does it meet a customer need?
- Does it improve the product/configuration item?
- Does it make business sense?

12.1.2 Feasibility

- Size, complexity, cost of change
- Urgency
- Availability of resources
- Timeliness (current point in life cycle)
- Test requirements

12.1.3 Potential impact

- On previous, current and subsequent work
- On system/product performance
- On customers

13 List of Figures

14 List of Tables

Table of Appendices