Informatization of the Croatian Archival Service.
From the Idea to the Realisation of the ARHiNET Project
PROJECT

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Introduction

Archival service in Croatia consists of state archives, other heritage institutions (libraries, museums, institutes, documentation centres and other institutions) in which the archival material is kept, creators and owners of the archival records and archival service management. Through the state archives' network, consisted of the Croatian State Archives and regional state archives, the archival service takes care of the national archival heritage and ensures its protection and information integrity.

The tasks of the Croatian State Archives (CSA) as the central archival institution include planning of archival activities, coordination of the professional work of the archives and managing the archival records information-documentation service on national level. The basic information resource is the Register of archival fonds and collections of the Republic of Croatia which contains data about every archival material in the state and about its creators and owners. The systematic work on the creation of the Register started in CSA at the end of the last decade, and in 2006 various Access data bases were replaced with web application. After many years of working on collecting, processing and presentation of data concerning archival records and records' creators and owners, the need for standardisation of arranging and description of archival material, archival principles and vocabulary, as well as for unifying of archival work, has emerged.

Subsequently, on the basis of new Register's program solution, CSA started the construction of new archival information system which should cover all archival functions: keeping, preserving, arranging and using archival records. Its goal is to, in the unique data base, make possible standardisation and control of records, and at the same time rationalisation and standardisation of business processes in Croatian archives.

ARHiNET – the Idea

Defining the CSA need for the making of the unique information system of state archives in the Republic of Croatia as well as analysing former attempts in realisation of similar projects, a work group was established, faced with the request for the invention of the optimal solution that would, in long term, ensure the system of collecting, processing and presenting data on archival records in Croatia.

The work group, consisted of experts from CSA and the Avicena company from Split, had set, before defining the project itself, the basic guidelines which the information solution would have to support:

1. the use of available and acceptable technologies,

2. creating the technological prerequisites for including all owners of the archival records into the unique system,

3. modulation, extensivity and simple upgrading,

4. the simplicity of use.

Having in mind that the information-evidence system of the Croatian archival service along with the state archives also includes information about owners of the public and private archival records (over 10 000 institutions and persons) it was obvious, that the selection of the technologies and the ways of building the information system should be approached from the standpoint of accessibility of the information solution to all the interested owners. That is why the information system was upgraded to the level of the national information project of collecting, processing and presenting of the archival records in the Republic of Croatia.

Considering the technologies that were at the work group's disposal and having in mind the guidelines that were defined by the project team, it was decided that the information system had to be defined as a web application. This decision was based on following facts: disposability, simplicity of maintaining and financial aspect.

According to the mentioned guidelines the strategy of making the information system was defined, and afterwards a preparation of the project documentation was carried out as well as the defining of individual segments.

ARHiNET – System development

The preparation of such a significant project demanded a quality organization of the project team responsible for the making of the information-records system. The ARHiNET project team consists of the archivists and IT experts who had to integrate the defined processes into the unique system.

The project time finishing

Considering previous experiences regarding the duration of projects, the project team has decided upon the strategy of small functional steps. In practice, that

meant giving up the comprehensive unique and multi-intensified solution which development could take years and whose content would immediately enclose all the elements needed for the functioning of the system. It was decided to start the system development in small steps, always considering the entirety of the information solution in its own complexity. That, practically, meant that the single solutions were defined in a relatively short period of time, and that they were presented and implemented after the testing phase. This strategy ensured a double benefit:

a. Implementation of new technologies and information systems is quite stressful for the users, especially, concerning the computer literacy and former business logic of work. By releasing single solutions into operative use, the users were faced with the use of the information system on the simple level and they managed to overcome the basic logic of the information system.

b. Regardless the quality of the project team, realisation of a project like this depends on users who will work in a system. Listening to the reactions of the users, the project team was gaining, on a daily basis, useful suggestions and observations that were later on implemented into the system. In this way, an optimal interaction of employers, that is, users and of the project team resulted in significant improvements, simplifications and acceleration of the description of the archival records.

A modular system concept

With the analysis of all the state archives activity area, complex and extremely large and functionally different logical business processes, the project team was faced with the dilemma whether to take a step to the making of a unitary solution, or to define the system as a modular one, always having in mind the whole picture. The unanimous decision was the approach of making the unique information system using the modular system concept. In practice that meant:

a. to define the basic business processes through the separate modules which will, in a specific moment, be able to function as a unique system;

b. to ensure that the particular modules can be realized as independent separate projects;

c. to ensure maximum flexibility of modules in a sense of adding, alterations and supplements of new functionalities;

d. to ensure the possibility of mutual integration of different modules.

This kind of approach ensured the design and implementation of single modules in a relatively short period of time. The implementation and the use of the information system based on defining, designing and implementation on the modular principle ensured for the users of the system to accept the work on a program solution with less difficulty, and the training for the work in the system is accelerated because the basic logic of the work for the users was introduced through the first basic modules that were implemented.

Accessibility of the information system

Thinking about the new information system as a unique national project of collecting, processing and presenting of data on the archival records, in front of the project team was put the responsibility of designing the system which is supposed to ensure the inclusion of all the owners (public and private) of archival records under the state archives supervision. Analysing the business processes, the same business processes are defined relating to:

a. Croatian State Archives as a central archival institution;

b. Regional state archives in the Republic of Croatia;

c. Owners of archival records (public and private).

Having in mind all the mentioned specific qualities of single users, the project team has, defining the functionalities, divided them into two segments:

a. Common functionalities;

b. Specific quality functionalities.

Defining the functionalities has ensured the possibility of creating the security system that takes care of the access to single parts of the information system concerning the right and the type of the owner of archival records. In this way, a simple registration and accessing the system from any computer connected to the Internet is ensured.

Security

The project team has dedicated special attention to the security of the information system which is defined into several levels, implicating the multi-functional activity. The system itself is defined through the existence of two parts:

a. Open part of the information system – intended for external users who want to search the registers and catalogues, as well as, to use other the services presented inside the system;

b. Protected part of the information system – intended for the employees of the archives who work in the system, respecting the security protocols of the system. All professional-business processes that define arranging and managing of the archival records are taking place in this part of the system.

While defining the protection of the information system, the project team was taking care of several levels of data protection:

a. Protection of data, that is, the exchange of data through Internet – since a system is designed as a web application, it was clear that the exchange of data among the archival records' owners (user-server-user) is taking place in open way and is accessible on Internet if the usual protocols are used. For that reason, the need for using the HTTP protocol is defined, as well as the insurance of the security certificate that guarantee the safe exchange of data within the protected part of the information system.

b. Protection of the program solution – access to the protected part of the program solution is defined by an adequate level of protection of access, which is defined with the use of user's name and password.

c. Protection of data inside the system – access to the protected part of the information system does not, automatically, mean the possibility of accessing all of the functionalities. The access to functionalities is defined by authorities that are given to individual employees of the archival records' owners concerning the type of the owner (CSA, state archives or owner under the supervision of archives), affiliation of the employees to the particular department regarding organisational structure of institution, affiliation of the employees to the business process or even assignment of single data sets to the employee inside the information system. In this way, four security access levels are defined:

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a. by parts of the information system;

b. by individual modules of the information system;

c. by individual functionalities inside the module;

d. by single data sets.

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Selection of technology

On the occasion of selecting the technology on which the unique information-records system would be based, the project team has selected the MS SQL 2005 data base. As developing language C# was selected and partly JAVA and all on the dot.net technology.

Implementation of the digital contents overview system

As an important segment of the new information system inside the Internet environment, the project team had the task to provide accessibility of the digital contents. The digital contents presentation module was defined through the special module inside the information system. Before defining, a detailed analysis had to be done, as well as adoption of firm rules of managing digital contents. Several business processes were accepted by this concept:

a. Digitalization of archival records;

b. Arranging of digitized records;

c. Saving the master copies in the storage system;

d. Automatically creation of web copies in JPEG format;

e. Linking of archival units and digital records;

f. Presentation of digital content within program solution.

With this defined and adopted concept, the intact quality and protection of the master copy of digitized records is ensured. To the external users an access and review of digitized contents is made possible through web copies, but without the possibility of quality downloading and printing.

New technologies

The project team came across a dilemma of which technology to use in business processes that are connected with physical transfer and supervision of the archival records. Because of the complexity in monitoring the archival records, the guidelines were set, by which the selected technology should be defined:

a. the system must ensure level of security and reliability as high as possible;

b. the system should allow registering of all kinds of physical units of archival records;

c. the system must ensure simple registering of archival units including single items;

d. concerning the amount of archival records the system must be comprehensive;

e. human mistake must be put to the lowest possible level;

f. security and supervision over the archival records must be extremely reliable;

g. the use must be simple.

Having in mind above mentioned guidelines, the usual technologies that were on our disposal, such as barcode system of control and monitoring, could not adequately give the answers to highly set requests. It was logical solution to try implementing RFID technology that is, by our estimation, „the future".

In its most simplified form (read only) RFID is used as a replacement for barcode technology. The advantages it offers are:

a. high security level;

b. 100 % reading accuracy;

c. ability to stand different time conditions'

d. excludes the need for the archival records to be in the reader's field of sight.

The reading accuracy is often the decisive factor for choosing RFID. Compared with fixed barcode readers, in first transition the reading accuracy is 95-98 % which is an excellent result, but depending on time conditions RFID can achieve 99,5-100 % in first transition. Furthermore; the important fact is that there are no movable parts, which makes maintenance simpler and the hardware more robust.

The value of RFID technology is additionally proven by the fact that information on the identification stickers do not have to be in the reader's field of sight. The ability to reach into the most of non-metal material makes possible for RFID tags to be implanted into the archival records, and the records can be sealed in packing material without any consequences for reading. The great advantage of RFID technology is ability for one to read more various tags, at the same time, in just one reading, by which the significant time saving is being achieved.

ARHiNET – Realisation

The program solution of the new information-records system is installed to a server of the Croatian State Archives in October, 2006. ARHiNET encloses several modules: Arranging of archival material, Archival documentation, Register books, National archival service' central evidences, Service for archival records outside archives and User service.

The framework of the system's structure represents the Register of archival fonds and collections of the Republic of Croatia, central register of archival material that is based on information from general inventories and other registers of archival records managed in state archives. The Register entry contains information on the signature, classification mark and the title of fond/collection, dates of records' creation, quantity, information on arrangement of fond/collection and sub-archive units, as well as finding aids. It is complemented by information about record creators (names, time of activity and centre) and owners of archival records, acquisitions, data about appraisal of records and the existence of copies. These and other information from the Register, like bibliography of the published archival records and works created by its utilisation, are kept in the Files of archival fonds and collections. The obligation of all archives is to deliver once a year, information for the Register to the CSA, that is current changes and supplements concerning archival material. The information about museums, libraries, institutes and other owners outside the system of state archives are gathered by supervision and contacts of archives with each of these institutions. In ARHiNET all this information are organized in the module Description of archival material and they are defined in several basic, mutually linked data sets:

    a. Fonds and collections;

    b. Creator;

    c. Owners.

The description of archival units is defined according to ISAD(G) and ISAR(CPF) international archival standards, and along with them there are related tables of additional data like finding aids and bibliographies of the archival records which are supplementing the description of archival units, and are available in the form of special lists.

After the training of the CSA employees for the work in a new system, the updating of old and entering the new data started, and after several months of system functioning, all state archives were actively participating in its work. Involvement of all archivists who entered and updating data until now produced entries on 16.000 fonds and collections, 50.000 other archival units (series, files and items). Along with that, about 4.000 finding aids and 2.000 bibliographic units, as well as classification system description and the list of 4.000 places in which the record creators' activities were taking place are also described in the Description module.

Up to the end of 2007. modules Register books, Archival documentation, and National archival service' central evidences were also implemented and the work

begun using them. In Archival documentation module all archives transferred old data and started to record Accession lists, Deposit lists and other documentation defined by law and other regulations in the ARHiNET system. National archival service' central evidences module, beside already mentioned Register, also include the Register of all archives, the Register of owners of private records in the Republic of Croatia, Register of records in foreign archives that are of significance for the Republic of Croatia, Register of the records of Croatian emigrants, the Records of persons working in state archives and other documentation.

Along with stated modules, the extensive work begun in the module Service for archival records outside archives, because gathering information about all owners and creators of archival records in one place is crucial for the creation of national system. This application enables inclusion of all holders of archival records in Croatia into a unique system of registering and managing archival records, which represents a great turning point in the work of state archives and owners of archival records, as well as a long term developing interest of archival service.

In October of 2007 open part of system was presented to the public at the http://arhinet.arhiv.hr. All mentioned data on archives can currently be searched and retrieved by simple search using the word from the name of an archival unit, record creator or record owner, by classification codes and by dates of record creation. Digital images of records, if existed, are also available to public as well as full texts of finding aids, transliterations and translations of particular documents.

The information system of state archives is a dynamic structure which is in a phase of a continued growth and development. The defining of new functionalities and making meaningful the additional modules make this project interesting, dynamic and challenging. The realization of this developing project of archival service, predicted for the year 2008, will enable the establishment of the unitary national integrated system of exchanging information among institutions that keep archival records and standardization and improvement of the quality of service in archives.

ARHiNET –Project Overview

Diagram 1: Initiation phase

technical	project control	quality assurance
P0: Project kick-off		

Pre-conditions	Impulse	Preliminary requirements	

Activities	Analysis of preliminary requirements for ARHiNET	Conducting of risk analysis Conducting of preliminary project planning Decision on the project enterprise	Analysis of QA requirements
Results	Specification of proposed solution	Preliminary project plan Project decision report	Preliminary QA plan

P1: Project enterprise decided		

Diagram 2: Definition phase

technical	project control	quality assurance

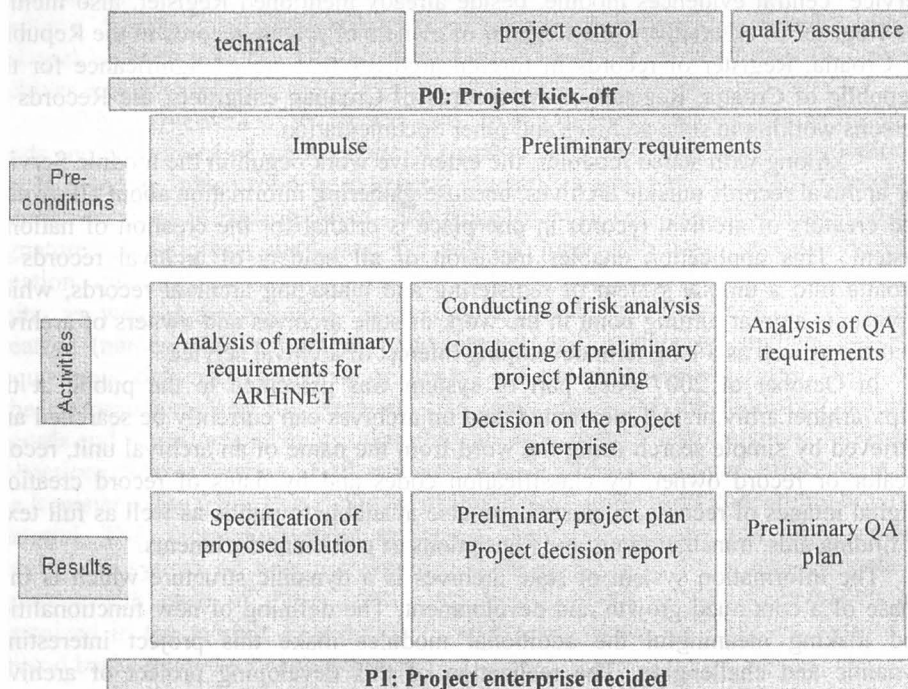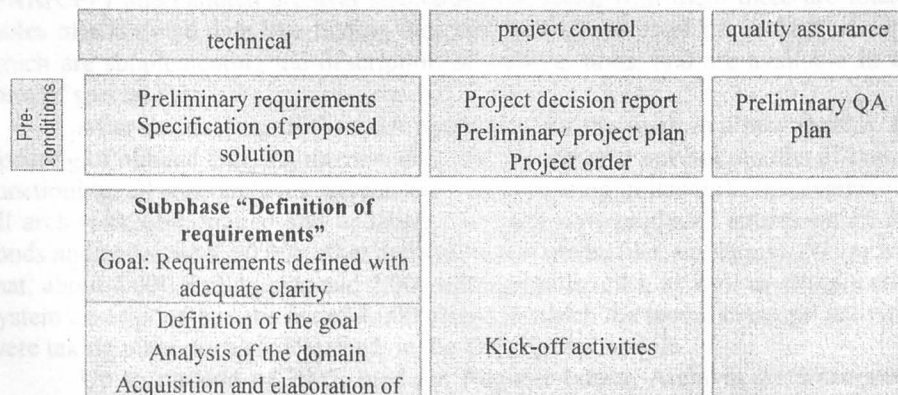| Pre-conditions	Preliminary requirements Specification of proposed solution	Project decision report Preliminary project plan Project order	Preliminary QA plan
	Subphase "Definition of requirements" Goal: Requirements defined with adequate clarity Definition of the goal Analysis of the domain Acquisition and elaboration of	Kick-off activities	

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Activities		
requirements Ordering of the requirements Checking of the requirements Building a domain model Producing a user requirements specification	Risk evaluation Coordinating of user requirements specification with client	Review of user requirements specification
T21: Requirements defined and checked		
Subphase "Definition of the product" Goal: Product defined with adequate clarity		
Checking of the requirements Elaboration of product features Building an OOA model Planning of RR Definition of external interfaces Definition of all project processing conditions Making feasibility studies Creating prototype(s) Producing a software requirements specification	Drawing up the project agreement Planning the project Planning the CM Setting up the basis CM system Setting up the project infrastructure Coordinating the software requirements specification with the client	Review of the OOA model Review of the software requirements specification Review of project plan Planning the QA measures Review of the QA plan Review of the feasibility studies
T22: Product defined and checked		
Subphase "Drawing up a tender" Goal: Tender submitted		
Checking of the requirements Selecting and defining the contractual framework Defining the services Estimating the effort Coordinating price/performance Producing the tender document	Submitting the tender Project checks and control	Review of the tender
T23: Tender defined, checked and submitted	**P2: Project plan drawn up and checked**	**Q2: QA plan drawn up and checked**
User req. spec. Domain model SW req. spec. Feasibility studies Tender Prototype(s) RR plan OOA model	Project agreement Project plan CM plan Basis CM system Estimation report	QA plan Review reports

Results		Open Source SW decision report	

Diagram 3: Prototyping phase

	technical	project control	quality assurance
Pre-conditions	SW req. spec. Feasibility studies Tender Prototype(s) RR plan OOA model Domain model Open Source SW decision report	Project order Project plan CM plan Basis CM system	QA plan
Activities	Subphase "Design" Designing the architecture Selecting/defining a prototyping development environment Elaborating/defining design principles and style guides Deciding on reuse of patterns/sample solutions/component ware Evaluation of Open Source • components Phased adoption of patterns/component ware Phased creation of an OOD model	Project checks and control Setting up the complete CM system	Revision of the QA plan Drawing up the test plan
Activities	Subphase "Implementation" Phased implementation of a user interface Phased implementation of functions and sequences Phased adoption of design patterns/sample solutions/componentware Producing documentation of	Saving checked states of the product in the CM system Defining the preparatory measures for deployment Setting up the test infrastructure Providing for acceptance	Design of test cases Review of the test plan Review of solution documentation Ongoing validation of development

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solution Producing product documentation Performing the system test		states Producing the test reports
T43: System test completed	P4: Product ready for acceptance	
Subphase "Preparation of operations" Goal: System ready for use		
Finalizing the product documentation Drawing up the introduction plan Elaborating and conducting user training courses Performing process integration	Performing the acceptance procedure	Review of product documentation Producing the acceptance report
T44: Preparation of operations completed	P5: Product accepted	Q4: Product checked
Approved product of ARHiNET Documentation of solution for ARHiNET Product documentation for ARHiNET Introduction plan for ARHiNET GUI Styleguide Evaluation report	Project plan CM plan Complete CM system Release note	QA plan Test plan Review reports Test reports Acceptance report

(Left margin labels: **Activities**, **Results**)

Diagram 4: Design phase

	technical	project control	quality assurance
Pre-conditions	SW req.spec Feasibility studies Tender Prototype(s) RR plan OOA model Domain model Open Source SW decision report	Project order Project plan CM plan Basis CM system	QA plan
	Subphase "Architectural design" Goal: Architecture defined		

Activities		
Checking (and complementing) the external interfaces	Project checks and control	Definition of design rules and processes
Designing the architecture	Planning and commissioning external services	Planning and organizing the test procedure
Defining the architecture and product components	Augmenting the CM planning	
Building the preliminary OOD model	Setting up the complete CM system	Review of the architectural design specification
Building the data model	Defining the HW/SW development tools and programming languages	
Creating prototype(s)		
Producing the architectural design specification		

T31: Architecture specified and checked		

Subphase "Detailed design" Goal: Components defined		

Activities		
Defining global methods and components	Planning the product integration	Design of test cases
Refining the OOD model	Defining the preparatory measures for use	Review of the OOD model
Designing the individual components		Review of the detailed design specification(s)
Producing the detailed design specification(s)		Review of the test plan

T32: Internal structure specified and checked		

Subphase "Design when using existing software" Goal: Adaptations specified	Setting up the test infrastructure	Revision of the QA plan
Evaluation/testing of existing SW		Drawing up the evaluation plan
Evaluation of Open Source SW components	Decision on the use of existing software	Review of the adaptations specification(s)
Determining the need for adaptations		
Producing the adaptations specification(s)		

T33: Use of existing software specified	**P3: Complete CM system set up and checked**	**Q3: Test plan drawn up and checked**

Architectural design specification Detailed design specification(s) OOD model	Project plan	QA plan Test plan

Results	RR plan Prototype(s) Evaluation report Adaptations specification(s)	CM plan Complete CM system	Review reports Evaluation plan

Diagram 5: Implementation phase

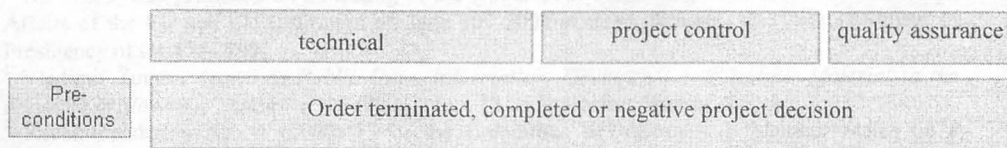|	technical	project control	quality assurance
Pre-conditions	Software requirements specification Architectural design specification Detailed design specification(s) Adaptations specification(s) RR plan Feasibility study (studies) Prototype(s) OOD model Open Source SW decision report	Project order Project plan CM plan Complete CM system	QA plan Test plan
Activities	**Subphase "Producing the code"** Goal: Developed components implemented Coding the software Performing stand-alone tests Producing the product documentation **T41: Code produced and checked** **Subphase "Adapting existing SW"** Goal: Purchased/RR components adapted	Project checks and control Detailed planning and organization of integration	Revising the QA plan Conducting code reviews Finalizing test planning
Activities	Adaptation of SW and interfaces Stand-alone test of adaptations Adaptation of product documentation **T42: Code adapted and checked** **Subphase "Integration and test"** Goal: System tested	Management of components in the CM system	

Activities	Creating tools for integration, testing and installation Phased integration and testing of the system Performing the system test	Providing for acceptance	Producing the test reports
	T43: System test completed	**P4: Product ready for acceptance**	
Activities	**Subphase "Preparation of operations"** Goal: System ready for operations Completing the product documentation Drawing up the introduction plan Elaborating and conducting user training courses Performing process integration	Performing the acceptance procedure	Review of product documentation Producing the acceptance report
	T44: Preparation of operations completed	**P5: Product accepted**	**Q4: Product checked**
Results	Approved product Product documentation Introduction plan	Project plan CM plan Release note RfA note	QA plan Test plan Review reports Test reports Acceptance report

Diagram 6: Operations phase

technical		project control	quality assurance
Software requirements specification Released product Preparation for performing the operations		Project order Project plan Deployed CM system	QA plan Test plan
Subphase "Pilot operation" Goal: Ready for productive operations			

Activities	Preparation of pilot operation Installation of the product	Project checks and control Performing the acceptance procedure	Planning of phase-specific QA measures Recording of metrics data Producing the acceptance report
	T51: Start of pilot operations		
	Support of pilot users		
	Subphase "Productive operations" Goal: Stable productive operation		
Activities	Installing and commissioning the product	Releasing maintenance releases	Revising the test plan/ complementing the test data
	T52: Start of productive operations		
Activities	Support of product deployment Analyzing problem reports and change requests Eliminating errors Making approved changes	Deciding on problem reports and change requests **P5: Product accepted**	Performing of regression tests
Results	Deployed product	Release note Project plan	QA plan Quality-related evaluations, metrics data Acceptance report Test plan & Test reports

Diagram 7: Termination phase

	technical	project control	quality assurance
Pre-conditions	Order terminated, completed or negative project decision		

Activities	Archiving of relevant documents and data	Producing a final report	Holding a review of the project Collecting reusable project results Consideration of deviations
Results	Archived documents and data Reusable project results	Project file Final report	Project experience report

P6: Project terminated

List of abbreviations: CM = Configuration management, HW = Hardware; GUI = General User Interface; SW = Software; OOA = Object-oriented Analysis; OOD = Object-oriented Design; QA = Quality Assurance; Rfa = Ready for acceptance; RR = Round Robin (back up procedure)