# INTERNATIONAL STANDARD

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# Information technology — Quality for learning, education and training — Fundamentals and reference framework

*Technologies de l'information — Qualité pour l'apprentissage, l'éducation et la formation — Principes fondamentaux et cadre de référence*

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# Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for worldwide standardization. National bodies that are members of ISO or IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

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For an explanation on the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, SC 36, *Information technology for learning, education and training*.

ISO/IEC 40180 cancels and replaces ISO/IEC 19796-1:2005 (initially published under the general title *Information technology — Learning, education and training — Quality management, assurance and metrics*) which has been technically revised.

# Introduction

This document provides the fundamentals and the reference framework for quality assurance, quality management and quality improvement in IT-enhanced learning, education and training (called E-Learning). This document primarily consists of the Quality Reference Framework (QRF) for E-Learning. It is a framework to describe, compare and analyse approaches for quality management and quality assurance. These approaches can be mapped to QRF. Therefore, the framework is not a quality management model or guiding management system – it is a framework for the description of quality approaches. It serves to compare different existing standards and to harmonize these towards a common quality model. For a better understanding of the QRF, several annexes show samples of its usage – the annexes are based on the German DIN PAS 1032-1 (Annex B), the French code of practice in E-Learning (Annex C); and an example of how it can be mapped to other quality systems, such as the Chinese E-Learning Technology Standards(CELTS) (Annex D).

This document provides the fundamentals for the implementation and adaptation of the general quality standards within the fields of E-Learning, education and training. This includes specific vocabulary as well as the Quality Reference Framework (QRF) with its Process Model and Descriptive Model. It provides sector specific information that may be used to support the better integration of mandatory and voluntary quality approaches at the local, regional, national and transnational levels. Through the application of this document, organizations may continue to improve the quality of their processes, products, services and solutions within the fields of learning, education and training.

This document was carefully developed and revised over a period of more than 10 years to ensure compatibility with ISO 9001 and ISO 14001 standards and facilitate their use by organizations that wish to introduce and improve quality assurance, quality management and quality improvement in learning, education and training together with the implementation of both environmental and quality management systems to benefit themselves and their customers and stakeholders.

Overview of ISO/IEC 40180:

— Clause 6 describes the process-oriented Quality Reference Framework (QRF) for the comparison and analysis of quality approaches.

— Annex A (informative) provides an introduction and description of the QRF and illustrates its relation to the PDCA Cycle and the IDEAL Reference Model. It further provides answers on key questions in order to provide a clearer understanding of the QRF concept and its use."

— Annex B (informative) shows the full German process model (DIN PAS 1032-1) as an example of how the basic model can be extended.

— Annex C (informative) describes the use of the model describing the "French Code of Practice in E-Learning" (AFNOR Z 76-001) as a second sample of the use of this document.

— Annex D (informative) describes how other quality approaches can be mapped to QRF. Specifically, the Chinese Model CELTSC is used as an example of the mapping procedure.

— Annex E (informative) describes the use of the model for specific quality objectives such as metadata quality.

# Information technology — Quality for learning, education and training — Fundamentals and reference framework

## 1 Scope

This document provides the fundamentals and the reference framework for quality assurance, quality management and quality improvement in IT-enhanced learning, education and training (called E-Learning). It consists mainly of the Quality Reference Framework (QRF) for E-Learning, which is a common and generic framework to describe, specify and understand critical properties, characteristics and metrics of quality. The QRF combines an elaborated and extensive process model with a descriptive model for the processes. This document harmonizes existing approaches, concepts, specifications, terms and definitions related to quality for E-Learning, education and training.

## 2 Normative references

There are no normative references in this document.

## 3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

— IEC Electropedia: available at http://www.electropedia.org/

— ISO Online browsing platform: available at http://www.iso.org/obp

**3.1**
**organization**
person or group of people that has its own functions with responsibilities, authorities and relationships to achieve its objectives

[SOURCE: ISO 9000:2015, 3.2.1]

**3.2**
**customer**
person or organization who consumes the product (studying and training) directly or indirectly

EXAMPLE    Learner, learner's parents, education institutions and potential employer.

**3.3**
**interested party**
person or organization that can affect, be affected by, or perceive itself to be affected by a decision or activity of ITLET

EXAMPLE    Learner, employee, provider, partner, investor, owner, society.

[SOURCE: ISO 9000:2015, 3.2.3, modified, adapted within ITLET context]

**3.4**
**process**
set of interrelated or interacting activities which transforms inputs into outputs

Note 1 to entry: Inputs to a process are generally outputs of other processes.

Note 2 to entry: Processes in an organization are generally planned and carried out under controlled conditions to add value.

Note 3 to entry: A process where the conformity of the resulting product cannot be readily or economically verified is frequently referred to as a "special process".

**3.5**
**product**
output of an organization that can be produced without any transaction taking place between the organization and the customer

Note 1 to entry: Production of a product is achieved without any transaction necessarily taking place between provider and customer, but can often involve this service (3.6) element upon its delivery to the customer.

Note 2 to entry: The dominant element of a product is that it is generally tangible.

Note 3 to entry: Hardware is tangible and its amount is a countable characteristic (e.g. tyres). Processed materials are tangible and their amount is a continuous characteristic (e.g. fuel and soft drinks). Hardware and processed materials are often referred to as goods. Software consists of information regardless of delivery medium (e.g. computer programme, mobile phone app, instruction manual, dictionary content, musical composition copyright, driver's licence).

[SOURCE: ISO 9000:2015, 3.7.6]

**3.6**
**service**
output of an organization with at least one activity necessarily performed between the organization and the customer

Note 1 to entry: The dominant elements of a service are generally intangible.

Note 2 to entry: Service often involves activities at the interface with the customer to establish customer requirements as well as upon delivery of the service and can involve a continuing relationship such as banks, accountancies or public organizations, e.g. schools or hospitals.

Note 3 to entry: Provision of a service can involve, for example, the following: — an activity performed on a customer-supplied tangible product (e.g. a car to be repaired); — an activity performed on a customer-supplied intangible product (e.g. the income statement needed to prepare a tax return); — the delivery of an intangible product (e.g. the delivery of information in the context of knowledge transmission); — the creation of ambience for the customer (e.g. in hotels and restaurants);

Note 4 to entry: A service is generally experienced by the customer.

[SOURCE: ISO 9001:2015, 3.7.7]

**3.7**
**quality**
degree to which a set of inherent characteristics of an object fulfils requirements

Note 1 to entry: The term "quality" can be used with adjectives such as poor, good or excellent.

Note 2 to entry: "Inherent", as opposed to "assigned", means existing in an object.

[SOURCE: ISO 9001:2015, 3.6.2, modified]

**3.8**
**data quality**
set of features that concern the collection, analysis, persistence, dissemination, and usage of data

EXAMPLE      Relevance, accuracy, timeliness, punctuality, accessibility, clarity, comparability, coherence.

**3.9**
**quality assessment**
measures carried out consistently and systematically in order to insure conformity with the requirements of a defined specification

**3.10**
**quality assurance**
part of quality management focused on providing confidence that quality requirements will be fulfilled

[SOURCE: ISO 9000:2015, 3.3.6]

**3.11**
**quality control**
part of quality management focused on fulfilling quality requirements

[SOURCE: ISO 9000:2015, 3.3.7]

**3.12**
**quality improvement**
part of quality management focused on increasing the ability to fulfil quality requirements

Note 1 to entry: The quality requirements can be related to any aspect such as effectiveness, efficiency or traceability.

[SOURCE: ISO 9000:2015, 3.3.8]

**3.13**
**quality management**
management with regard to quality

Note 1 to entry: Quality management can include establishing quality policies and quality objectives , and processes to achieve these quality objectives through quality planning, quality assurance , quality control , and quality improvement.

Note 2 to entry: [SOURCE ISO 9000:2015, 3.3.4]

**3.14**
**quality objective**
objective related to quality

Note 1 to entry: Quality objectives are generally based on the organization's quality policy.

Note 2 to entry: Quality objectives are generally specified for relevant functions, levels and processes in the organization

Note 3 to entry: [SOURCE ISO 9000:2015, 3.7.2]

**3.15**
**quality planning**
part of quality management focused on setting quality objectives and specifying necessary operational processes and related resources to achieve the quality objectives

Note 1 to entry: Establishing quality plans can be part of quality planning.

[SOURCE: ISO 9000:2015, 3.3.5]

**3.16**
**quality policy**
policy related to quality

Note 1 to entry: Generally the quality policy is consistent with the overall policy of the organization, can be aligned with the organization's vision and mission and provides a framework for the setting of quality objectives.

Note 2 to entry: Quality management principles presented in this International Standard can form a basis for the establishment of a quality policy.

[SOURCE: ISO 9000:2015, 3.5.9]

**3.17**
**total quality management**
management approach of an organization, centred on quality, based on the participation of all its members and aiming at long-term success through customer satisfaction, and benefits to all members of the organization and to society

## 4  Abbreviated terms

QRF                     Quality Reference Framework

RQC                     Reference Quality Criteria

SCORM               Sharable Content Object Reference Model

W3C                     World Wide Web Consortium

IDEAL                  Initiating, Diagnosing, Establishing, Acting and Learning model

PDCA                   Plan-Do-Check-Act cycle

## 5  Conformance

A quality description conforms to this document if each process included in a QRF instance corresponds to the appropriate specification in this document and includes all sub-processes. A conforming description may contain descriptions of processes not included in this document. The description may contain additional data elements.

This document can assist users who are implementing ISO 9000, ISO 9001 and can be used with other ISO quality standards, such as ISO 14001.

This document is informed by the concept and philosophy of Total Quality Management and by ISO 9000 and ISO 9001. However, it is not a Management System Standard and does not provide a model to follow when setting up and operating a quality management system like ISO 9001. Instead, it provides guidance and support for the introduction of quality management and improving learning quality.

This document is informed by the concept and philosophy of Environmental Management and by ISO 14001. However, it is not an Environmental Management System Standard and does not provide a model to follow when setting up and operating an environmental management system like ISO 14001. Instead, it provides guidance and support for introducing and improving quality processes in learning, education and training.

## 6  The Quality Reference Framework (QRF) for E-Learning

### 6.1  General

The QRF provides a process model and a descriptive model for the description, comparison and analysis of process-oriented quality approaches. The QRF can be used as a meta-model for approaches of quality management and quality assurance in learning, education and training. This means that no assumptions and prescriptive requirements of the quality approaches are made.

The use scenarios of the QRF can be described as follows:

**Scenario 1: Description of a quality approach**

— Select a specific quality management or quality assurance approach Q1.

— Identify the processes that are covered within Q1.

— Describe Q1 according to the framework using the description categories.

**Scenario 2: Comparison of quality approaches**

— Select quality management or quality assurance approaches [Q1..Qn].

— Identify the processes that are covered within [Q1..Qn].

— Describe [Q1..Qn] according to the QRF using the description categories.

— Define a metric to compare [Q1..Qn].

— Perform analysis and comparison.

**Scenario 3: Harmonization of quality approaches**

— Select quality management or quality assurance approaches [Q1..Qn].

— Identify the processes that are covered within [Q1..Qn].

— Describe [Q1..Qn] according to the QRF using the description categories.

— Define a metric to compare [Q1..Qn].

— Perform analysis and comparison.

— Combine [Q1..Qn] towards a consensus model.

It is important to mention that the QRF process model and its descriptive model shall be used as a general, descriptive reference framework. In a second step, good practice approaches and profiles can be generated – these profiles could contain specific recommendations, guidelines, procedures, or criteria.

NOTE   In addition, it is important to underline that the QRF process model and its descriptive model are not prescriptive and do not require or determine a specific sequence of the processes: In fact, in practice, many processes are realized in parallel.

Finally, the QRF process model and its descriptive model can be extended and modified to be adapted to the specific situation, organization, target group and requirements.

## 6.2   Descriptive model of the QRF

The QRF descriptive model shows the classification and documentation scheme for quality processes (see Table 1). It is based on CEN CWA 14644. Each process will be described by this scheme.

**Table 1 — QRF descriptive model**

| Attribute | Description | Example |
|---|---|---|
| ID | Unique Identifier | ID1234 |
| Category | Main Process | Course development |
| Process Name | Process name | Method selection |
| Description | Description of the process | Within this process the didactic concept and methods are evaluated and selected |
| Relations | Relation to other processes | Before the method selection a target group analysis must be performed; FA.6 |
| Sub-processes/ sub-aspects | Sub-processes/sub-aspects/tasks | Method identification, method alternatives, method prioritization |
| Objective | Objective of a Process | Adequate selection of one or more didactic concepts |
| Method | Methodology for this process<br><br>Reference to guideline/ documents | Method selection shall be based on the target group<br><br>Methods are selected based on the teachers' experience<br><br>See Method Guidelines Handbook |
| Result | Expected result of a process | Method specification<br><br>Documents |
| Actors | Responsible/participating actors | Team Didactical Design |
| Metrics/Criteria | Evaluation and Metrics for this process | Criteria catalogue 3.2.2–3.2.6 |
| Standards | Standards used | ISO 9241, IEEE 1484.12.1:2003 Learning Object Metadata |
| Annotation/ Example | Further Information, Examples of usage | |

The overview of the descriptive model of the QRF is presented in Figure 1.

Please note that the QRF process model and its descriptive model are not prescriptive and are not determining a specific sequence of the processes: In fact and in practice, many processes are realized in parallel. In addition, the QRF process model and its descriptive model can be extended and modified and has to be adapted to the specific situation, organization, target group and requirements.

| ID | Category | | Process | Description | | Relation |
|---|---|---|---|---|---|---|
| | | | | | | |
| | | | | | | |
| Sub-processes/ Sub-aspects | | | | | | |
| Objective | | | | | | |
| Method | | | | | | |
| Result | | | | | | |
| Actors | | | | | | |
| Metrics/Criteria | | | | | | |
| Standards | | | | | | |
| Annotation/Example | | | | | | |

**Figure 1 — Overview of the QRF descriptive model**

## 6.3   Process model of the QRF

The QRF process model includes the relevant processes within the whole life-cycle of learning, education and training (Table 2). The QRF process model is divided into seven parts called process categories. Sub-processes are included with reference to a classification of processes – examples of the use of classifications are shown in Annexes B and C.

**Table 2 — QRF process model**

| ID | Process Category | Sub-Processes |
|---|---|---|
| NA | Needs Analysis | Classification |
| FA | Framework Analysis | Classification |
| CD | Conception/Design | Classification |
| DP | Development/Production | Classification |
| IM | Implementation | Classification |
| LP | Learning Process | Classification |
| EO | Evaluation/Optimization | Classification |

In each part, the essential processes are described. For selected processes, examples how the reference model can be used are included; these examples are written in *italics*.

The use of the process model is shown using the classification of processes from DIN PAS 1032-1, listed fully in Annex B.

### 6.3.1   Overview

The overview of the process model of the QRF is presented in Figure 2.

Please note that the QRF process model and its descriptive model are not prescriptive and are not determining a specific sequence of the processes: In fact and in practice, many processes are realized in parallel. In addition, the QRF process model and its descriptive model can be extended and modified and has to be adapted to the specific situation, organization, target group and requirements.

| Needs Analysis | Framework Analysis | Conception / Design | Development / Production | Implementation | Learning Process / Realization | Evaluation / Optimization |
|---|---|---|---|---|---|---|
| Initiation | Analysis of the external context | Learning objectives | Content realization | Testing of learning resources | Administration | Planning |
| Stakeholder identification | Analysis of staff resources | Concept for contents | Design realization | Adaptation of learning resources | Activities | Realization |
| Definition of objectives | Analysis of target groups | Didactical concept/ methods | Media realization | Activation of learning resources | Review of competencies levels | Analysis |
| Demand analysis | Analysis of the institutional and organizational context | Roles and activities | Technical realization | Organization of use | | Optimization / improvement |
| | Time and budget planning | Organizational concept | Maintenance | Technical infrastructure | | |
| | Environment analysis | Technical concept | | | | |
| | | Concept for media and interaction design | | | | |
| | | Media concept | | | | |
| | | Communication concept | | | | |
| | | Concept for tests and evaluation | | | | |
| | | Concept for maintenance | | | | |

**Figure 2 — Overview of the QRF process model**

### 6.3.2 Description

In this section, the process model of the QRF is described including examples for the use of each category of the description scheme (see Tables 3 to 9).

**6.3.2.1 Needs analysis**

**Table 3 — QRF process model: Needs analysis**

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **NA** | | Needs Analysis | Identification and description of requirements, demands, and constraints of an educational project | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | NA.1 Initiation<br><br>NA.2 Stakeholder identification<br><br>NA.3 Definition of objectives<br><br>NA.4 Demand analysis | | |
| **Objective** | | To describe the needs and demands leading to an educational project | | |
| **Method** | | *Quality Function Deployment* | | |
| **Result** | | Documentation of goals, objectives, needs, and requirements of an educational project | | |
| **Actors** | | *Project manager; specialists, learners, sponsors* | | |
| **Metrics/Criteria** | | *Indicators* | | |
| **Standards** | | ISO 9000 | | |
| **Annotation/Example** | | | | |

**6.3.2.2    Framework analysis**

**Table 4 — QRF process model: Framework analysis**

| ID | Category | Process | Description | Relation |
|----|----------|---------|-------------|----------|
| **FA** | | Framework Analysis | Identification of the framework and the context of an educational process | *NA, CD* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | FA.1 Analysis of the external context<br><br>FA.2 Analysis of staff resources<br><br>FA.3 Analysis of target groups<br><br>FA.4 Analysis of the institutional and organizational context<br><br>FA.5 Time and budget planning<br><br>FA.6 Environment analysis | | |
| **Objective** | | To describe relevant factors for an educational project | | |
| **Method** | | *Methods of empirical social research; methods in legal and economic research and analysis* | | |
| **Result** | | Documentation and validation of relevant parameters | | |
| **Actors** | | *Project manager; specialists* | | |
| **Metrics/Criteria** | | *Check for plausibility; consultation of additional experts* | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

### 6.3.2.3 Conception/Design

**Table 5 — QRF process model: Conception/Design**

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **CD** | | Conception/Design | Conception and Design of an educational process | |
| | | | | |
| **Sub-processes / Sub-aspects** | | CD.1 Learning objectives | | |
| | | CD.2 Concept for contents | | |
| | | CD.3 Didactical concept/methods | | |
| | | CD.4 Roles and activities | | |
| | | CD.5 Organizational concept | | |
| | | CD.6 Technical concept | | |
| | | CD.7 Concept for media and interaction design | | |
| | | CD.8 Media concept | | |
| | | CD.9 Communication concept | | |
| | | CD.10 Concept for tests and evaluation | | |
| | | CD.11 Concept for maintenance | | |
| **Objective** | | To plan and design the concepts for an educational process | | |
| **Method** | | *Use of Design Guidelines* | | |
| **Result** | | To provide a conception and design for educational processes | | |
| **Actors** | | *Consultant, Media Designers* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

### 6.3.2.4 Development/Production

**Table 6 — QRF process model: Development/Production**

| ID | Category | Process | Description | Relation |
|----|----------|---------|-------------|----------|
| **DP** | | Development/ Production | Realization of concepts | *CD* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | DP.1 Content realization<br>DP.2 Design realization<br>DP.3 Media realization<br>DP.4 Technical realization<br>DP.5 Maintenance | | |
| **Objective** | | To realize the conceptions | | |
| **Method** | | *Implementation manual* | | |
| **Result** | | Educational products and services | | |
| **Actor** | | *IT-specialists, authors, developers* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

### 6.3.2.5   Implementation

**Table 7 — QRF process model: Implementation**

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **IM** | | Implementation | Description of the implementation of technological components | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | IM.1 Testing of learning resources<br><br>IM.2 Adaptation of learning resources<br><br>IM.3 Activation of learning resources<br><br>IM.4 Organization of use<br><br>IM.5 Technical infrastructure | | |
| **Objective** | | To implement appropriate technological components being used in the educational process | | |
| **Method** | | *Change/configuration/content management* | | |
| **Result** | | Learning environment including all learning resources | | |
| **Actor** | | *Project manager, IT-manager* | | |
| **Metrics/Criteria** | | *Testing beta versions and system* | | |
| **Standards** | | *Software validation, e.g. following IEEE; ISO 9000* | | |
| **Annotation/Example** | | | | |

**6.3.2.6    Learning process**

**Table 8 — QRF process model: Learning process**

| ID | Category | Process | Description | | Relation |
|---|---|---|---|---|---|
| **LP** | | Learning Process | Realization and use of the learning process | | |
| | | | | | |
| **Sub-processes/ Sub-aspects** | | LP.1 Administration | | | |
| | | LP.2 Activities | | | |
| | | LP.3 Review of competence levels | | | |
| **Objective** | | To perform the learning process | | | |
| **Method** | | According to the chosen didactical concepts and methods | | | |
| **Result** | | Completed process of learning, education and training | | | |
| **Actor** | | *Learners, trainers, tutors* | | | |
| **Metrics/Criteria** | | *User performance, user satisfaction* | | | |
| **Standards** | | | | | |
| **Annotation/Example** | | | | | |

### 6.3.2.7   Evaluation/Optimization

**Table 9 — QRF process model: Evaluation/Optimization**

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **EO** | | Evaluation/ Optimization | Description of the evaluation methods, principles, and procedures | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | EO.1 Planning<br><br>EO.2 Realization<br><br>EO.3 Analysis<br><br>EO.4 Optimization/Improvement | | |
| **Objective** | | To describe the evaluation of the educational process | | |
| **Method** | | Evaluation methods *(Questionnaires, User tracking, user feedback report)* | | |
| **Result** | | To perform an evaluation of the educational process; to optimize and improve the educational process | | |
| **Actor** | | *Evaluators, learners, teachers* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | ISO 9000 | | |
| **Annotation/Example** | | | | |

# Annex A
## (informative)

# Introduction and use of the QRF

Annex A explains the QRF and its introduction and use.

First, a mapping of the QRF with the PDCA and the IDEAL models is provided.

Second, some key questions are answered in order to provide a clearer understanding of the QRF concept and its use.

Table A.1 provides a mapping of the QRF with the PDCA Cycle [15] and the IDEAL Model [18].

**Table A.1 — Mapping of the QRF with the PDCA Cycle and the IDEAL Model**

| QRF (ISO/IEC 40180) | PDCA Model | IDEAL Model |
|---|---|---|
| Needs Analysis | Plan | Initiate |
| Framework Analysis | | |
| Conception/Design | | |
| Development/Production | Do | Do |
| Implementation | | |
| Learning Process | | |
| Evaluation/Optimization | Check | Evaluate |
| Evaluation/Optimization | Act | Act |

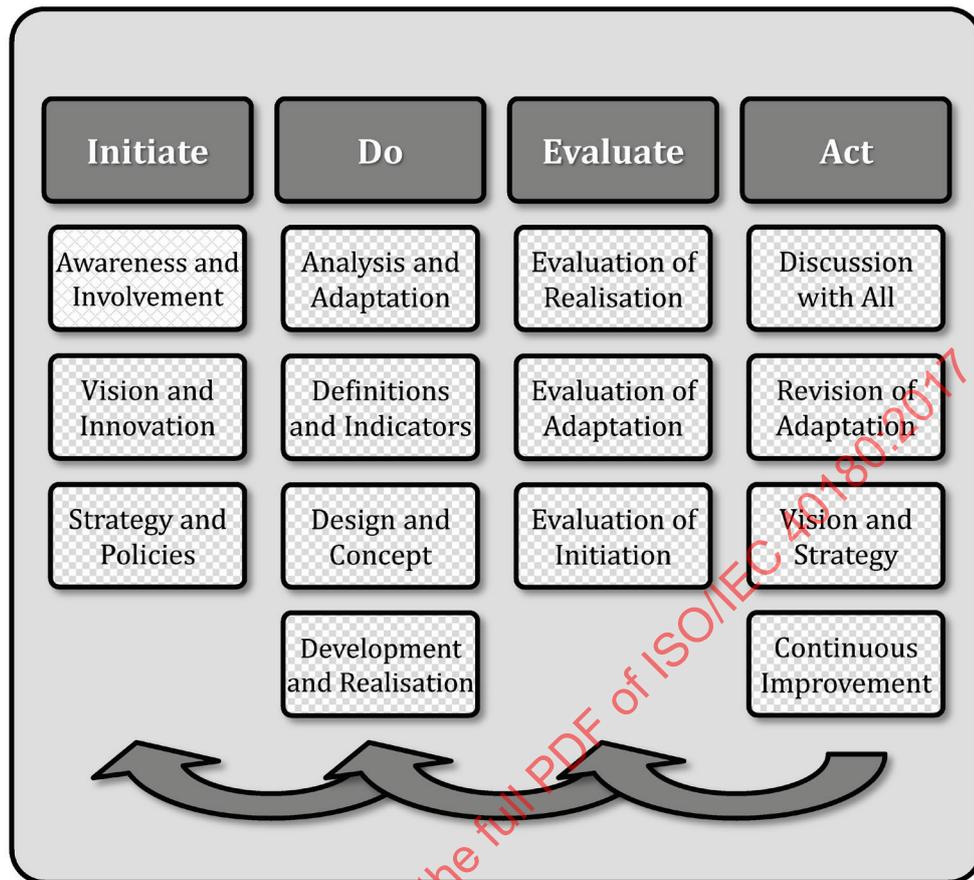Figure A.1 provides an overview of the IDEAL Reference Model.

**Figure A.1 — Phases of the IDEAL Reference Model** [18]

In the following, some key questions are answered (FAQ):

**Is QRF customer oriented / does it take individualization into account?**

In general, QRF is a framework to describe and compare quality approaches. Therefore, it does not take any position of how "good" quality is achieved. However, it is designed so that guidelines, procedures and requirements are included and clearly specified (see Table A.2).

**Table A.2 — Example of quality guidelines and methods for content selection/design**

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **CD.2** | Conception/Design | Concept of the contents | Concept of learning and teaching contents | *NA.4 Demand analysis* |
| | | | | *FA.2 Qualifications* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | Content selection | | |
| | | Content Design | | |
| **Objective** | | 1　　　　Learner Demand: The goal is to provide content adapted to the needs and demand of the learner. 2　　　　Adaptation: Each course shall provide different content presentation formats and entry points based on the user experience. | | |
| **Method** | | A prototype of the content shall be provided to a group of learners' representatives. In a consensus process, the contents shall be prioritized and agreed on. For each course, classify groups of learners according to their learning type. Adapt presentation format and methods according to these learning types. | | |
| **Result** | | 1　　　　Documentation of planned and agreed contents 2　　　　Periodically, evaluate learning performance of different learners (test groups). | | |
| **Actors** | | Curriculum designer, didactic experts, institution accreditation authority, teacher, learners' representatives | | |
| **Metrics/Criteria** | | The content are measured based on their relevance, importance, exemplarity, … | | |
| **Standards** | | Higher Education Standards | | |
| **Annotation/Example** | | | | |

Therefore, negotiations and adaptation should be included when using QRF.

**How should specific requirements and needs be included?**

Specific requirements should be included in the process. Specific issues can be added to the model in specific profiles of the model (see Table A.3).

**Table A.3 — Inclusion of French National Body's document concerning negotiation about "Validation of Experiential Learning"** [14]

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| FA.2 | Framework Analysis | Analysis of staff resources | Description of actors, their qualifications and competences | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | Roles/Functions | | |
| | | Competences/formal qualifications of actors | | |
| | | Availability of actors | | |
| **Objective** | | 1     Description of the roles/functions, competences/formal qualifications and availability of actors and users | | |
| | | 2     Evaluate and certify actors' qualifications of prior experimental learning. | | |
| **Method** | | Analyse learner records and certificates. | | |
| | | Analyse learners' qualifications through experimental learning: Presenting a portfolio, or explaining to a jury how professional experience lead to acquire knowledge and skills required by the qualification. | | |
| **Result** | | 1     Description of roles/functions of staff | | |
| | | 2     Description of competences/formal qualifications/qualifications through experimental learning | | |
| | | 3     Description of availability of staff | | |
| **Actors** | | Project manager; experts (-> jury), learners | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | Project management and documentation guidelines; standards for social research; | | |
| | | Law : "Loi sur la Validation des Acquis de l'Expérience" | | |
| **Annotation/Example** | | | | |
| NOTE: In order to include the processes of negotiations and individualization, a separate process has been included in the model. | | | | |

The model can be adapted (e.g. including a more detailed process model) using classifications of sub-processes. Examples for the use of sub-processes are given in Annex B.

# Annex B
## (informative)

# DIN process model (DIN PAS 1032-1)

Annex B contains a sample use of QRF. The German DIN process model (DIN PAS 1032-1) including sub-processes is described using QRF.

**Needs Analysis (NA)**

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **NA** | | Needs Analysis | Identification and description of requirements, demands, and constraints of an educational project | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | NA.1 Initiation<br><br>NA.2 Stakeholder Identification<br><br>NA.3 Definition of objectives<br><br>NA.4 Demand Analysis | | |
| **Objective** | | To describe the needs and demand leading to an educational project | | |
| **Method** | | *Quality Function Deployment* | | |
| **Result** | | Documentation of goals, objectives, needs, and requirements of an educational project | | |
| **Actors** | | *Project manager; specialists, learners, sponsors* | | |
| **Metrics/Criteria** | | *Indicators* | | |
| **Standards** | | ISO 9000 | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **NA.1** | Needs Analysis | Initiation | Initiation of an educational project; description of necessity or demand for learning/education/training | *FA.4* |
| | | | | |

| **Sub-process(es)/ Sub-aspects** | — Identification of demands and requirements<br>— Identification of necessities |
|---|---|
| **Objective** | Description and indication of the processes goals and aims<br>*Needs for teaching* |
| **Method** | *Methods of marketing research and market analysis, trend analysis, need analysis, interviews, balanced scorecard, skill gap analysis; Assessments, work place analysis, Auditing* |
| **Result** | Definition and documentation of the needs, necessities, and demands (for learning/education/training) |
| **Actors** | *End User*<br>*Education and training manager*<br>*Experts in education and training* |
| **Metrics/Criteria** | *Review of description validity* |
| **Standards** | ISO 9000, ANSI/PMI 99–001–2000 5.1 *Initiation* |
| **Annotation/Example** | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **NA.2** | Needs Analysis | Stakeholder Identification | Identification, description and evaluation of the stakeholders groups | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Identification of actors<br>— Identification of interested parties<br>— Identification of users | | |
| **Objective** | | Description of all potential stakeholders. Influence and cooperation within the education and training processes. Importance for and on the development, acceptance and market capabilities of the finished products | | |
| **Method** | | *Literature analysis, Staff sheets, Curricula, Workshops*<br><br>*Examination regulations, business plans*<br><br>*Interviews, Guidelines* | | |
| **Result** | | Description of all interested parties, their focused objectives, documentation of objectives. | | |
| **Actors** | | *Managers*<br><br>*Initiator* | | |
| **Metrics/Criteria** | | *Measurements of acceptance, contracts and applications* | | |
| **Standards** | | ANSI 10.1 and ANSI 10.2 | | |
| **Annotation/Example** | | Who are the respective actors and interested parties? (learners, pupils, students, educators, teachers, trainers, tutors, managers, enterprises, organizations, examination boards, regulative bodies in education, universities, sponsors, cooperating institutions, clients, relevant social groups). | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **NA.3** | Needs Analysis | Definition of Objectives | Description and evaluation of the objectives of relevant stakeholders | *CD.x, IM.5, IM.6, LP.1, LP.2, LP.3, LP.4* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Strategic goals<br>— Tactical goals<br>— Operative goals | | |
| **Objective** | | Identification, description, and evaluation of goals of the stakeholders<br><br>*Transition to a quality system in accordance with* ISO 9000 | | |
| **Method** | | *Questionnaire, Interview, Polls, Workshop.* | | |
| **Result** | | Documentation of goals and objectives<br><br>*operational, consistent goal-systems for quality-measurements in accordance with* DIN/ISO 9000 | | |
| **Actors** | | *project or consortia leadership, user, client* | | |
| **Metrics/Criteria** | | *Achievement of objectives* | | |
| **Standards** | | ISO 9000, ISO 14001 | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| NA.4 | Needs Analysis | Demand Analysis | Specification, description, and evaluation of the demand for qualification | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Description of the qualification demand<br>— Justification of demand<br>— Kind of the qualification demand (formal, informal, prescriptive, taxonomy) | | |
| **Objective** | | Specification, description and validation of demand and objectives in an educational project and their operational description | | |
| **Method** | | *Document analysis, Interview, Workshop, systematic and methodical formulations* | | |
| **Result** | | Requirement specification for project | | |
| **Actors** | | *Project manager, user, supplier, sponsor* | | |
| **Metrics/Criteria** | | *Evaluation by experts, Certification through* DIN/ISO 9000 | | |
| **Standards** | | ISO 9000, ANSI PMI 99–001–2000*a* | | |
| **Annotation/Example** | | | | |

## Framework Analysis (FA)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| FA | | Framework Analysis | Identification of the framework and the context of an educational process | *NA, CD* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | FA.1 Analysis of the external context<br>FA.2 Analysis of staff resources<br>FA.3 Analysis of target groups<br>FA.4 Analysis of the institutional and organizational context<br>FA.5 Time and budget planning<br>FA.6 Environment analysis | | |
| **Objective** | | To describe relevant factors for an educational project | | |
| **Method** | | *Methods of empirical social research; methods in legal and economic research and analysis* | | |
| **Result** | | Documentation and validation of relevant parameters | | |
| **Actors** | | *Project manager; specialists* | | |
| **Metrics/Criteria** | | *Check for plausibility; consultation of additional experts* | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

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| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **FA.1** | Framework Analysis | Analysis of the external context | Identification, description and evaluation of the external context/framework of the educational process | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Legal context/conditions<br>— Economic context/conditions<br>— Educational context/conditions<br>— Social context/conditions<br>— Political context/conditions | | |
| **Objective** | | Identification, description and validation of the external context/framework of the educational process | | |
| **Method** | | *Methods of empirical social/educational research; consultation of specialists; market analysis* | | |
| **Result** | | Identification and documentation of relevant aspects of the external context<br><br>*Legal provisions concerning training intervals in security relevant areas*<br><br>*Development of the E-Learning market*<br><br>*Structures and processes of the organization within which an educational process is located; organizational culture of learning*<br><br>*Structures and constraints due to established curricula etc.*<br><br>Planning for updates of context analysis | | |
| **Actors** | | *Project manager; experts (e.g. market researchers, lawyers)* | | |
| **Metrics/Criteria** | | *Check on plausibility of results; additional expertise* | | |
| **Standards** | | *Project management and documentation guidelines; standards for social research* | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| FA.2 | Framework Analysis | Analysis of staff resources | Identification and description of actors, their qualifications and competences, and availability | |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Roles/functions<br>— Competences/formal qualifications<br>— Availability of actors | | | |
| **Objective** | Identification of the roles/functions, competences/qualifications and availability of actors and users | | | |
| **Method** | *Methods of empirical social/educational research (e.g. document analysis); consultation of specialists; staff profile analysis* | | | |
| **Result** | — Description of roles/functions of staff<br>— Description of competences/formal qualifications of staff<br>— Description of availability of staff | | | |
| **Actors** | *Project manager; Human Resource Expert, learners* | | | |
| **Metrics/Criteria** | *Categories 2, 3, 4 of RQC* | | | |
| **Standards** | *Project management and documentation guidelines; standards for social research;* | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relations |
|---|---|---|---|---|
| FA.3 | Framework Analysis | Analysis of target group | Identification and description of the target group | *NA.x, CD.x, LP.x, EO.x* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Socio-cultural and social factors<br>— Individual attribute (age, gender, preferences, etc.)<br>— Motivation<br>— Skills, qualification, competences<br>— Roles and functions | | | |
| **Objective** | Definition of the target group and learner profiles | | | |
| **Method** | *Quantitative or qualitative methods of empirical research; Analysis of CVs, certificates, etc.* | | | |
| **Result** | Documentation of target group and learner profiles | | | |
| **Actors** | *Project manager, Human Resource Manager, learners, teachers* | | | |
| **Criteria/Metrics** | | | | |
| **Standards** | *IEEE LTSC Public and Private Information (PAPI); IMS Learning Information Package (LIP)* | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|----|----------|---------|-------------|----------|
| FA.4 | Framework Analysis | Analysis of organizational and institutional context | Identification and description of the organizational and institutional context | |
| | | | | |
| Sub-processes/ Sub-aspects | | — Business Model<br>— Organizational structure<br>— Internal context<br>— Learning culture | | |
| Objective | | Description of the organizational and institutional context relevant for the educational process | | |
| Method | | *Document analysis; interviews* | | |
| Result | | Documentation of the organizational and institutional context | | |
| Actors | | *Project manager; educational staff* | | |
| Metrics/Criteria | | | | |
| Standards | | | | |
| Annotation/Example | | | | |

| ID | Category | Process | Description | Relation |
|----|----------|---------|-------------|----------|
| FA.5 | Framework Analysis | Time and budget planning | Identification and description of financial, contractual, and temporal constraints | *NA.4* |
| | | | | |
| Sub-processes/ Sub-aspects | | — Time<br>— Budget/financial resources<br>— Contractual constraints | | |
| Objective | | Description of temporal, budgetary, and contractual constraints | | |
| Method | | *Models for calculating costs; project planning methods* | | |
| Result | | — Detailed financial plan<br>— Detailed project schedule<br>— Documentation of contractual requirements | | |
| Actors | | *Project sponsor; project manager, controller, finance officer* | | |
| Metrics/Criteria | | *Periodical checks and updates, Categories 3 and 4 of RQC* | | |
| Standards | | *Project management and documentation guidelines; principles of budgeting* | | |
| Annotation/Example | | *First Prototype: 31.3.2003; Version 1.0 by 31.12.2003; Usage 2 times per quarter*<br><br>*Design of the website: 20000 Euro; Cost-Benefit-Analysis* | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| FA.6 | Framework Analysis | Environment analysis | Identification and description of the environment of and physical resources for an educational process | |
| | | | | |
| Sub-processes/ Sub-aspects | — Buildings, rooms and furniture<br>— Technical environment (Hardware, Software, Network) | | | |
| Objective | Description of the environment relevant for educational purposes | | | |
| Method | *Document analysis (room plans); inspection;* | | | |
| Result | — Detailed description of physical resources (number and size of rooms)<br>— Detailed description of technical environment (number and specs of PCs; specs of LAN) | | | |
| Actors | *Project manager; educational staff, facility manager* | | | |
| Metrics/Criteria | | | | |
| Standards | *Product information; standards relating to products (e.g. LAN-components)* | | | |
| Annotation/Example | *Training room 10–20 Desktop PCs (Model XYZ), Learning spaces 2–6 people;*<br><br>*Network Ethernet 100MBit,; Netmeeting 100 Licenses; PC Model XYZ: Pentium IV, Hard disk 8BG, CD-ROM; WLAN-; internal Web-Cam*<br><br>*Training budget: 1000 Euro p.a. per employee* | | | |

## Conception/Design (CD)

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| CD | | Conception/Design | Design and conception of an educational process | |
| | | | | |
| Sub-processes/ Sub-aspects | CD.1 Learning objectives<br>CD.2 Concept for contents<br>CD.3 Didactical concept/methods<br>CD.4 Roles and activities<br>CD.5 Organizational concept<br>CD.6 Technical concept<br>CD.7 Concept for media and interaction design<br>CD.8 Media concept<br>CD.9 Communication concept<br>CD.10 Concept for tests and evaluation<br>CD.11 Concept for maintenance | | | |
| Objective | To plan and design the concepts for an educational process | | | |
| Method | *Use of Design Guidelines* | | | |
| Result | To provide a conception and design for educational processes | | | |
| Actors | *Consultant, Media Designers* | | | |
| Metrics/Criteria | | | | |
| Standards | | | | |
| Annotation/Example | | | | |

| ID | Category | Process Name | Description | Relations |
|----|----------|--------------|-------------|-----------|
| CD.1 | Conception/ Design | Learning objectives | Definition and commitment of learning objectives | *NA.1, NA.2, FA.x, LP.x* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Objectives<br>— Competence model | | | |
| **Objective** | Description of learning objectives in relation to target groups resp. sub groups embedded in a model of competences | | | |
| **Method** | *Use of the context analysis; discussion and formalization of competence model and objectives* | | | |
| **Result** | Documentation and validation of learning objectives and competence model | | | |
| **Actors** | *Curricula designer, subject experts, teacher* | | | |
| **Metrics/Criteria** | *Analysis of experiences, comparison with needs in real practice* | | | |
| **Standards** | *Reference taxonomies, ontologies* | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|----|----------|--------------|-------------|-----------|
| CD.2 | Conception/ Design | Concept for contents | Concept of learning and teaching contents | *NA.3, NA.4, FA.3-FA.6, CD.1, CD.3, LP.x* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Topics/subjects<br>— Volume | | | |
| **Objective** | Representation of the learning and instructional contents | | | |
| **Method** | *Describing subjects using semantic networks* | | | |
| **Result** | Documentation of planned contents | | | |
| **Actors** | *Curricula designer, Subject experts, teacher* | | | |
| **Metrics/Criteria** | *Expert interviews, Categories 5–8 of RQC* | | | |
| **Standards** | *National Curriculum Standards* | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **CD.3** | Conception/ Design | Didactical concept/ methods | Conception of didactic models, concepts, principles of using methods | *NA.3, NA.4, NA.5, NA.6* |
| | | | | *FA, CD.1* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Learning and pedagogical theories<br>— Didactic models<br>— Curriculum<br>— Learning Scenarios<br>— Methodical concepts<br>— Activities | | |
| **Objective** | | Development of didactic models based on learning and pedagogical theories; selection of adequate methods, activities, settings of work and technologies; designation of objectives and contents relevant for test creation | | |
| **Method** | | *Use of instructional design guidelines* | | |
| **Result** | | — Documentation of the overall concept of didactics<br>— Selection procedure for didactic models<br>— Description of the selection procedure for methodical concepts<br>— Description of the controlling<br>— Activity schemes | | |
| **Actors** | | *Didactic experts, teacher* | | |
| **Metrics/Criteria** | | *Formatively by permanent experience feedback by teacher and learner*<br><br>*Summatively by success control at the end of learning process (Which increase of competences has been achieved?)* | | |
| **Standards** | | *IMS Learning Design, DIN PAS 1032–2* | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **CD.4** | Conception/ Design | Roles and activities | Description of roles and their functions in the educational process | *NA.2; FA.2; FA.3, FA.4; FA.6; CD.2* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | Relevant roles in learning scenarios | | |
| | | *Curricula responsible, Experts for media didactics, Didactic experts, Content writer, Screenplay writer, Teacher, Learner, Tutor/learning advisor/moderator, Support, Test expert* | | |
| **Objective** | | Definition of roles, tasks, responsibilities and rights between the actors | | |
| **Method** | | *Actor and workflow modelling* | | |
| **Result** | | Documentation and justification of roles and functions | | |
| **Actors** | | *Project manager* | | |
| **Metrics/Criteria** | | *Analysis of experiences* | | |
| **Standards** | | *IMS Learning Design* | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **CD.5** | Conception/ Design | Organizational Concept | Concept of general conditions of the organizational concept | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Location | | |
| | | — Duration, Learning time | | |
| | | — Segmentation of learning time | | |
| **Objective** | | *Representation of general conditions relevant for the learning process* | | |
| **Method** | | Description and justification of the general conditions | | |
| | | *Data of requirements of areas and technical equipment, data of planned average time, data of planned fixed or freely selectable times, Expert interviews* | | |
| **Result** | | Documentation of general conditions | | |
| **Actors** | | *Curricula responsible, experts media didactics, Didactic experts* | | |
| **Metrics/Criteria** | | *Category 2 of RQC* | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| CD.6 | Conception/ Design | Technical Concept | Concept of the technological realization | |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Mandatory technical requirements<br>— Optional technical requirements | | | |
| **Objective** | Representation of the technical concept | | | |
| **Method** | *Data of software requirements, definition of interfaces, integration into existing structures* | | | |
| **Result** | Documentation of the technical base<br>*Functional specifications* | | | |
| **Actors** | *Technical group, network experts, teacher, support staff* | | | |
| **Metrics/Criteria** | *Failure Mode and Effects Analysis FMEA* | | | |
| **Standards** | *Category 1 of RQC,* ISO 9241 | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| CD.7 | Conception/ Design | Concept of media and interaction design | Definition of media and interaction design | *NA.3; NA.4; FA;, CD.1; CD.2; CD.4; CD.6* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Media design<br>— Interaction design | | | |
| **Objective** | Representation of the design concept concerning all relevant fields in consideration of existing templates/guide lines | | | |
| **Method** | *Development of screen design and interaction design based on specifications of software ergonomics, Human-Computer Interaction Design/usability and if so of the corporate design of the organization* | | | |
| **Result** | Documentation of design principles (*design concept, style guide*)<br>*Design prototype* | | | |
| **Actors** | *Design experts, Experts media didactics* | | | |
| **Metrics/Criteria** | *Usability test on the basis of the design prototype*<br>*Heuristic evaluation*<br>*Conformity examination respecting existing specifications,* ISO 9241 | | | |
| **Standards** | ISO 9241, ISO 13407, ISO 14915, *W3C-Accessibility-Guidelines, US Section 508* | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **CD.8** | Conception/ Design | Media concept | Selection of media usage | *NA.3; NA.4; NA.5; NA.6; FA.4; FA.5; CD.1; CD.2, CD.5; CD.6* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | Selection and use (by media functions)<br>— *Presentation and distribution of information*<br>— *Collecting and filtering of information*<br>— *Information editing, interaction*<br>— *Constructive representation of own learning results*<br>— *Performance support tools, Communication* | | |
| **Objective** | | — *Specification of required media functions*<br>— *Selection and design of media usage adequate* to target group, learning objectives, learning contents and general conditions | | |
| **Method** | | | | |
| **Result** | | Documentation media selection procedure and media usage | | |
| **Actors** | | *Expert media didactics, media designer* | | |
| **Metrics/Criteria** | | *Examination for didactics and methods adequacy and for technical feasibility of selected media usage before implementation process* | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **CD.9** | Conception/ Design | Communication concept | Selection and description of planned communication media | *NA.3; NA.4; NA.5, NA.6; FA.5; FA.6; CD.1; CD.2* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Aspects of communication media: <br>— *Actors* <br>— *Medium* <br>— *Communication objectives* <br>— *Tools* <br>— Tutor/moderator/trainer instruction | | | |
| **Objective** | Integration and description of relevant communication and interaction media | | | |
| **Method** | | | | |
| **Result** | Documentation of communication and interaction media according to the relevant aspects <br>*Documentation/guideline for tutor/trainer/moderator* | | | |
| **Actors** | *Curricula responsible, expert media didactics, teacher* | | | |
| **Metrics/Criteria** | Examination for didactics and methods adequacy and for technical feasibility of selected communication media before implementation process, *Categories 2 and 5 of RQC* | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **CD.10** | Conception/ Design | Concepts for tests/ evaluation | Specification of evaluation concept and test procedures | *EO.x* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Test development <br>— Test validation <br>— Test scoring | | | |
| **Objective** | Identification of test procedures for competence/skill levels | | | |
| **Method** | *Proving with suitable comparison groups* <br>*Statistical validation* | | | |
| **Result** | Documentation and justification of test procedures for classification, diagnostics, learning success and proficiency/competence level | | | |
| **Actors** | *Didactical experts, test expert, teacher* | | | |
| **Metrics/Criteria** | *Correlation of different test procedures* <br>*Expert discourse* <br>*Categories 2, 6, 8 of RQC* | | | |
| **Standards** | — *National and international professional associations' standards* <br>— *State/ school performance standard* | | | |
| **Annotation/Example** | | | | |

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| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| CD.11 | Conception/ Design | Concepts for maintenance | Conception for maintenance and updates of learning scenarios | *LP.5* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Didactical / methodological updates *(adaptation of learning methods)*<br>— Content updates<br>— Technical maintenance | | | |
| **Objective** | To ensure the appropriateness of the concepts | | | |
| **Method** | *Maintenance plans, interviews, trend analysis* | | | |
| **Result** | Documentation and justification of maintenance and update concepts | | | |
| **Actors** | *Didactical experts, test expert, teacher* | | | |
| **Metrics/Criteria** | *Correlation of different test procedures*<br>*Expert discourse*<br>*Categories 2, 6, 8 of RQC* | | | |
| **Standards** | ISO 9001 | | | |
| **Annotation/Example** | | | | |

## Development/Production (DP)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **DP** | | Development/ production | Realization of concepts | *CD* |
| | | | | |
| **Sub-processes/ Sub-aspects** | DP.1 Content realization<br>DP.2 Design realization<br>DP.3 Media realization<br>DP.4 Technical realization<br>DP.5 Maintenance | | | |
| **Objective** | To realize the conceptions | | | |
| **Method** | *Implementation manual* | | | |
| **Result** | Educational products and services | | | |
| **Actor** | *IT-specialists, authors, developers* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **DP.1** | Development/ Production | Content realization | Realization of teaching/learning contents | *CD.2* |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | Topics/Subjects |
| **Objective** | Representation of teaching/learning contents |
| **Method** | *Expert/learner interview, desktop research* |
| **Result** | Representation of planned contents<br><br>*Process plan, Curriculum*<br><br>*Production of script/realization* |
| **Actor** | *Teacher, expert, scriptwriter, programmer* |
| **Metrics/Criteria** | *Prototype evaluation, peer-review* |
| **Standards** | *Guideline for scriptwriters*<br><br>*General education theories/taxonomies* |
| **Annotation/Example** | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **DP.2** | Development/ Production | Design realization | Realization of screen and interaction design | *CD.7* |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | — Media design<br>— Interaction design |
| **Objective** | Realization of design concept for all relevant fields in consideration of existing patterns/guidelines |
| **Method** | |
| **Result** | Templates for media/interaction design |
| **Actor** | *Designer, illustrator* |
| **Metrics/Criteria** | *Verification of conformity with regards to existing patters, acceptance of screen design by client*<br><br>*Category 7 of RQC* |
| **Standards** | *Principles of interface design and usability, standards for software ergonomics (ISO 9241)* |
| **Annotation/Example** | The realization of the interaction design implies design of control interaction, e.g. functions, navigation, menus, buttons, but also of didactical interactions, e.g. exercises, talks, opportunities of exploration<br><br>Existing conditions could be, for example, a style guide or corporate identity or corporate design conditions and have to be taken into consideration accordingly. |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| DP.3 | Development/ Production | Media realization | Production of the relevant and chosen media / media resources | *CD.8* |
| | | | | |

| Sub-processes/ Sub-aspects | *Audio, video, graphics, animations, photos* |
|---|---|
| Objective | Production of required media |
| Method | Production of media on the basis of defined criteria *Guidelines for appropriate/available formats and available software* *Data security* |
| Result | Completed media products |
| Actor | *Designers, illustrators, film-maker, photographers, speakers* |
| Metrics/Criteria | *Screenplay conformity test, correctness test* |
| Standards | |
| Annotation/Example | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| DP.4 | Development/ Production | Technical realization | Realization of technical concept | *CD.6* |
| | | | | |

| Sub-processes/ Sub-aspects | |
|---|---|
| Objective | Realization of technical concept |
| Method | *Java / Flash programming using programming/documentation guidelines* |
| Result | — *Documented development of application/coding* <br> — *Code review* |
| Actor | *Designer, Programmer* |
| Metrics/Criteria | |
| Standards | *General software-engineering standards, SCORM, XML* |
| Annotation/Example | |

| ID | Category | Process | Description | Relations |
|---|---|---|---|---|
| **DP.5** | Development/ Production | Maintenance | Maintenance of learning scenarios | *EO.x* |
| | | | | |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | — Content maintenance<br>— Technical maintenance |
| **Objective** | Provision of recent solutions, realization of maintenance concepts |
| **Method** | *Interviews, trend analysis* |
| **Result** | *Up-to-date learning scenarios* |
| **Actors** | *Programmer, content experts, evaluators* |
| **Metrics/Criteria** | |
| **Standards** | |
| **Annotation/Example** | |

## Implementation (IM)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **IM** | | Implementation | Description of the implementation of technological components | |
| | | | | |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | IM.1 Testing of learning resources<br>IM.2 Adaptation of learning resources<br>IM.3 Activation of learning resources<br>IM.4 Organization of use<br>IM.5 Technical infrastructure |
| **Objective** | To implement appropriate technological components being used in the educational process |
| **Method** | *Change/configuration/content management* |
| **Result** | |
| **Actor** | *Project manager, IT-manager* |
| **Metrics/Criteria** | |
| **Standards** | |
| **Annotation/Example** | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IM.1** | Implementation | Testing of learning resources | Testing and validation of technical components of the educational process | *DP.2, DP.3* |
| | | | | |

| | | | |
|---|---|
| **Sub-processes/ Sub-aspects** | — Testing in development environment<br><br>— Delivery<br><br>— Testing in productive environment |
| **Objective** | Achievement of a system status, which is qualified for final release by correct function and high usability. |
| **Method** | *Module Design Test, Functional Test, Challenge Test, Module Integration Test (alpha test), Installation Test, User Acceptance Test (beta test), Test Implementation, pre-production environment, Performance Test (Pilot phase)* |
| **Result** | Documented test results and change requests<br><br>A qualified software and documentation with correct function and high usability. |
| **Actors** | *Developers of E-Learning systems, Project Manager, Documentation Specialists, IT technicians, test persons of the target group, where applicable independent test institutions* |
| **Metrics/Criteria** | *Test results are reviewed by a Change Control Board, which sets priorities for changes. Usually at least the Chief Developer and the Project Manager are members of the CCB (see DP.2) and where applicable a user representative.* |
| **Standards** | *IEEE Software Validation* |
| **Annotation/Example** | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IM.2** | Implementation | Adaptation of learning resources | Description of configuration management, adaptation, and documentation control | *DP.x, LP.1* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Configuration Management<br>— Adaptation and change of resources<br>— Documentation | | | |
| **Objective** | Securing that all change requests (see DP.1) for a defined system are done in an effective and controlled manner | | | |
| **Method** | *Configuration Management consists of documented program version control of freezed code, hardware and network configuration, document version control and authorized personnel.*<br><br>*Changes in program code, graphical design, in the system design or the didactical approach is done in a controlled manner.*<br><br>*All quality documents like requirements, specifications, test plans and results and the project documentation are created, reviewed, approved, changed, archived and changed in a controlled manner.*<br><br>*A Design Review Summary Report gives an overview of processed changes.*<br><br>*For an increased efficiency a Documentation Management database should be used.* | | | |
| **Result** | — Configuration Management Plan, Change Control Plan, Documentation Control Plan and processed Change Request Forms and a Design Review Summary Report.<br>— All change requests are either processed or on hold resp. omitted, in agreement with the customer.<br>— Updated system version | | | |
| **Actors** | *Developer, screen designer, project manager, customer* | | | |
| **Metrics/Criteria** | *Evaluation of Configuration and Change Control System by the Change Control Board (see DP.1)* | | | |
| **Standards** | *IEEE Software Validation* | | | |
| **Annotation/Example** | *XML based DMS, Visual SourceSafe, CC database* | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IM.3** | Implementation | Activation of learning resources | Learning products have to be approved by the customer/provider before they can go into operation. This process describes the staging and deployment of the product. | *DP.6* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Provision<br>— Registration<br>— Release<br>— Activation | | |
| **Objective** | | — Supply of customers/providers with the necessary technical equipment and learning material<br><br>— Authorized Access to the learning platform (test modus) and transition of the product into the production environment | | |
| **Method** | | *Staging: Deployment, System Administration, Installation, configuration and test of base components of the production environment*<br><br>*Registration: licences, users, courses, etc.*<br><br>*Release: user acceptance test, handout of product documentation, formal sign-off* | | |
| **Result** | | Learning environment and learning materials are supplied to the customer, access to the learning platform is granted | | |
| **Actors** | | *Supplier, provider, third party vendors, learner, system administrator, user* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IM.4** | Implementation | Organization of Use | Providing the organizational requirements for the operation of the learning scenario | *FA.2, FA.4* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Organizational structure<br>— Qualification of the administration personal<br>— Technical competence and pre-knowledge of users<br>— Support | | |
| **Objective** | | Providing the operational requirements | | |
| **Method** | | | | |
| **Result** | | Implementation of the organizational framework | | |
| **Actors** | | *Project Manager, IT Manager, representative of the legal and finance department* | | |
| **Metrics / Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IM.5** | Implementation | Technical Infrastructure | Providing the organizational requirements for the operation of the learning scenario | *NA.4, FA.1, FA.5, DP.3, DP.4, IM.1* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Infrastructure components<br>— Data security<br>— Documentation<br>— Support | | |
| **Objective** | | Providing the organizational requirements for the operation of the learning scenario | | |
| **Method** | | — *Challenge testing, disaster simulation*<br>— *Troubleshooting guidelines for technical problem solution and workarounds* | | |
| **Result** | | Providing tested infrastructure<br>— *Technical configuration summary report*<br>— *Technical training records*<br>— *Disaster recovery plan*<br>— *Completed technical checklists*<br>— *Vendor audits, Summary Report reviewed by the Change Control Board* | | |
| **Actors** | | *Supplier, third party vendors, onsite system administrators* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | ISO 9241 | | |
| **Annotation/Example** | | | | |

## Learning Process/Realization (LP)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **LP** | | Learning Process | Realization and use of the learning process | |
| | | | | |
| **Sub-processes/ Sub-aspects** | | LP.1 Administration<br>LP.2 Activities<br>LP.3 Review of competence levels | | |
| **Objective** | | To perform the learning process | | |
| **Method** | | | | |
| **Result** | | Completed process of learning, education and training. | | |
| **Actor** | | *Learners, trainers, tutors* | | |
| **Metrics/Criteria** | | *User performance, user satisfaction* | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **LP.1** | Learning Process | Administration | Description of the administrative requirements and conditions of the learning process | *FA; CD; IM* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Information<br>— Consultation of learners<br>— Educational Planning/qualification requirement analysis<br>— Technical support<br>— Registration<br>— Billing/Accounting<br>— Complaint management<br>— Contract<br>— Certification<br>— Transparency<br>— Organizational context, situational context, social context | | |
| **Objective** | | To specify and provide administrative functions according to the needs of the stakeholder of the learning process | | |
| **Method** | | Using the organizational, economic and technological operational concepts | | |
| **Result** | | Realization and documentation of administrative processes | | |
| **Actor** | | *Administrator, project management* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **LP.2** | Learning Process | Activities | Description of the learning, support, and transfer activities | *CD, LP.1, LP.3* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Learning activities <br> — Support activities <br> — Transfer activities | | |
| **Objective** | | Initiation of individual learning processes through learning/support/transfer activities | | |
| **Method** | | Using the learning scenario conception | | |
| **Result** | | Documentation of the observable learning progression and learning activities | | |
| **Actor** | | | | |
| **Metrics/Criteria** | | *Category 6 of RQC* | | |
| **Standards** | | DIN PAS 1032–2, *IMS Learning Design* | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relations |
|---|---|---|---|---|
| **LP.3** | Learning Process | Review of Competence Level | Activities to determine the competence level | *CD.9* |
| | | | | |
| **Sub-processes/ Sub-aspects** | | — Procedures <br> — Performance/Phases <br> — Certificate/Degrees/Reports | | |
| **Objective** | | Measurement and Appraisal of Learning progression/Increase in Competence/ Knowledge acquisition | | |
| **Method** | | *Pretest, Performance monitoring, final exam, transfer review* | | |
| **Result** | | Documentation of learning performance | | |
| **Actor** | | *HR responsible, teacher* | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

## Evaluation/Optimization (EO)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| EO | | Evaluation/ Optimization | Description of the evaluation methods, principles, and procedures | |
| | | | | |
| Sub-processes/ Sub-aspects | | EO.1 Planning<br><br>EO.2 Realization<br><br>EO.3 Analysis<br><br>EO.4 Optimization/Improvement | | |
| Objective | | To describe the evaluation of the educational process | | |
| Method | | Evaluation methods *(Questionnaires, User tracking, user feedback report)* | | |
| Result | | To perform an evaluation of the educational process; to optimize and improve the educational process | | |
| Actor | | *Evaluators, learners, teachers* | | |
| Metrics/Criteria | | | | |
| Standards | | | | |
| Annotation/Example | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| EO.1 | Evaluation/ Optimization | Evaluation planning | Description of evaluation planning | *all categories* |
| | | | | |
| Sub-processes/ Sub-aspects | | — Goals of an evaluation<br><br>— Approach to evaluation<br><br>— Time frame<br><br>— Selection of and number of evaluators involved<br><br>— Definition of parameters and criteria<br><br>— Selection of methods and instruments | | |
| Objective | | Development of a plan for evaluating results both in terms of didactic and economic criteria; | | |
| Methods | | | | |
| Result | | Detailed plan of the evaluation | | |
| Actor | | *Internal/External evaluators, project manager;* | | |
| Metrics/Criteria | | | | |
| Standards | | | | |
| Annotation/Example | | *Evaluation activities are possible on different levels (cf. Kirkpatrick, Schenkel, Phillips):*<br><br>*Product – reaction – learning (individual and organizational) – behaviour and processes – business results – ROI/ROE* | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| EO.2 | Evaluation/ Optimization | Realization | Realization of the evaluation | *all categories* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Organization of evaluation activities<br>— Sampling and sample | | | |
| **Objective** | To obtain data in order to pass judgment on the results achieved and the relationship of results to resources that were required | | | |
| **Methods** | Using the evaluation plan | | | |
| **Result** | — Documentation of the realization of evaluation activities<br>— Documentation of the data obtained | | | |
| **Actor** | | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| EO.3 | Evaluation/ Optimization | Data Analysis | Description of the data analysis | *all categories* |
| | | | | |
| **Sub-processes/ Sub-aspects** | — Summary<br>— Analysis<br>— Interpretation<br>— Recommendation | | | |
| **Objective** | To obtain insights/understanding as to the methods, tools and resources applied with respect to costs, results, usability; | | | |
| **Methods** | *Statistical analysis* | | | |
| **Result** | Description and justification of<br>— analysis of results and interpretation<br>— summary of analysis and interpretation<br>— recommendations | | | |
| **Actor** | *Project manager, evaluator, external consultants* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| EO.4 | Evaluation/ Optimization | Optimization/ Improvement | Description of the adaptation and optimization of products and processes | *all categories* |
| | | | | |

| Sub-processes/ Sub-aspects | — Preventive measures<br>— Corrective measures |
|---|---|
| **Goal** | Maintaining/increasing the efficiency and effectiveness of products and processes on the basis of experiences and recommendations |
| **Methods** | |
| **Results** | Documentation and justification of measures for improvement taken<br><br>— *maintenance/improvement of the efficiency and effectiveness of products and processes*<br><br>— *preventive measures: adaptation to changed circumstances*<br><br>— *corrective measures: implementation of recommendations based on evaluation* |
| **Actors** | *Project manager, evaluators, designer, teacher, programmer* |
| **Metrics/Criteria** | |
| **Standards** | |
| **Annotation/Example** | — *The work group is discussing a differentiation of two processes: preventive and corrective measures; these will be different with respect to input and methods;*<br><br>— *Taking into account circumstances, for example with respect to the organization, staff, (technical) resources etc.;*<br><br>— *The results of evaluation activities serve as input for improvement of planning and implementation in future projects („lessons learned")* |

# Annex C
## (informative)

# French code of practice in E-Learning (AFNOR Z76-001)

The French code of practice in E-Learning shows how the model can be used with different process models. The processes from the French model can be mapped to the QRF (see Table C.1 and Figure C.1).

### Table C.1 — Mapping the processes of the French model to the QRF

| ID | Process | Sub-process(es) | QRF ID | QRF Process |
|----|---------|-----------------|--------|-------------|
| AN | Analysis | AN1: Strategic analysis/context of demand<br><br>AN2: Needs and resources analysis/feasibility of demand | NA<br><br>FA | Needs Analysis<br><br>Framework Analysis |
| DC | Design/Construction | DC1: Design of learning system and its environment<br><br>DC2: Design of learning resources and material | CD | Conception/Design |
| IN | Instrumentation | IN1: Choice of material and of technologies<br><br>IN2: Implementation of material and technologies<br><br>IN3: Definition of maintenance strategies<br><br>IN4: Definition of updating strategies | DP<br>IM | Development/Production<br>Implementation |
| RE | Realization | RE1: Negotiation/prescription<br><br>RE2: Coaching/Tutoring<br><br>RE3: Learning<br><br>RE4: Collaboration<br><br>RE5: Assessment | LP | Learning Process |
| EV | Evaluation | EV1: Planning who, what, when, how<br><br>EV2: Data collection and analysis<br><br>EV3: Recommendations for improvement | EO | Evaluation/Optimization |
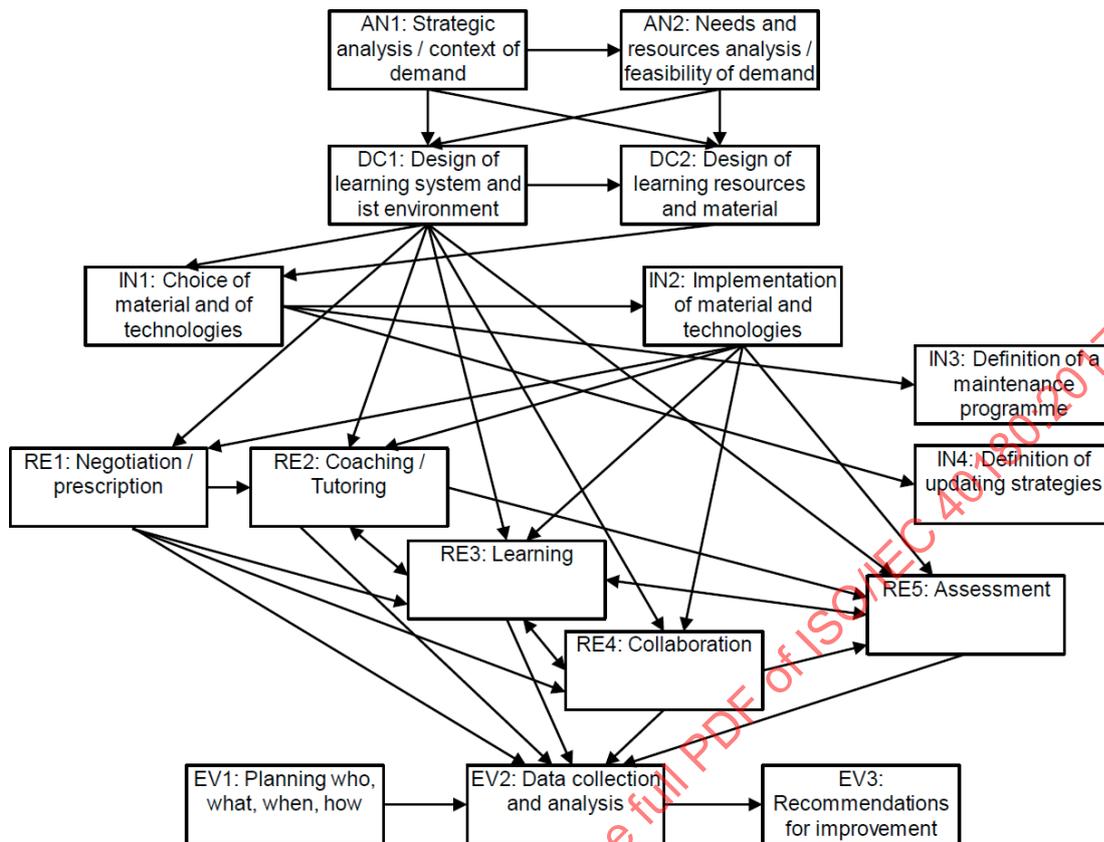
**Figure C.1 — Links between sub-processes in the French model**

## Analysis (AN)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **AN** | | Analysis | In the analysis phase, the context, the needs, requirements, demands, and constraints for the development of an E-Learning system are identified and defined. | |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | AN1: Strategic analysis/context of demand |
| | AN2: Needs and resources analysis/feasibility of demand |
| **Objective** | To describe the context and the reasons (the needs and demand) for the development of an E-Learning system; the resources available and the constraints for its implementation |
| **Method** | *Methods for field research in social and economic sciences, Strategic Analysis, Needs Analysis* |
| **Result** | Description of the context, the added value produced and the needs and demand which are met by the development of an E-Learning system |
| **Actors** | *Project manager; specialists* |
| **Metrics/Criteria** | |
| **Standards** | *Project Management Standards, National Standards AFNOR X50 — 749, 750, 756 and 760* |
| **Annotation/Example** | |

| ID | Category | Process | Description | Relation |
|----|----------|---------|-------------|----------|
| **AN1** | Analysis | Strategic Analysis/ Context of demand | Identification and description of stakeholders and competitors, elicitation of the added value for E-Learning, identification of potential partnerships | *AN2, DC1, DC2* |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | Identification and description of actors |
| | Identification and description of stakeholders and interests |
| | Elicitation of the added value |
| | Identification and description of Interested parties |
| **Objective** | To have a clear vision of all stakeholders and of their interests, of the potential market, of the potential partners |
| **Method** | *Methods of market research and market analysis, trend analysis, need analysis, interviews, literature review, balanced scorecard...* |
| **Result** | Description of interested parties and competitors, justification of the added value for E-Learning |
| **Actors** | *Project manager, user groups, education and training managers, experts in education and training* |
| **Metrics/Criteria** | |
| **Standards** | |
| **Annotation/Example** | |

| ID | Category | Process | Description | Relation |
|----|----------|---------|-------------|----------|
| **AN2** | Analysis | Needs and resources analysis | Identification and description of needs, resources and constraints; evaluation of the feasibility of an E-Learning solution to meet the demand | *AN1, DC1, DC2* |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | Definition of the scope of the project |
| | Identification and description of the educational/training needs |
| | Plan of the project taking into account resources, constraints, potential partnerships |
| | Cost/benefits analysis |
| | Preparation of decision making |
| **Objective** | To prepare the decision by identifying the demand, the training needs, the resources available and required, the constraints, the costs and timeframe of the project, the benefits of the project |
| **Method** | *Needs analysis, project planning methodologies, cost-analysis methodologies, cost-benefit analysis...* |
| **Result** | Definition of the project and its objectives, feasibility study, provisional budget and schedule, |
| **Actors** | *Project manager and experts in needs analysis, costing and cost benefit analysis* |
| **Metrics/Criteria** | |
| **Standards** | |
| **Annotation/Example** | |

**Design/Construction (DC)**

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| DC | | Design/Construction | In the Design and Construction phase, the E-Learning system and its environment including the learning resources (material, support and tutoring...) are defined and designed | |
| | | | | |
| **Sub-processes/ Sub-aspects** | DC1: Design of the learning system and of its environment | | | |
| | DC2: Design of the learning resources and material | | | |
| **Objective** | To define and design the E-Learning system, its human and technical environment, including technologies and the learning resources (material and human resources) | | | |
| **Method** | *Use of Design Guidelines* | | | |
| **Result** | The architecture of the E-Learning system, its environment and the resources needed | | | |
| **Actors** | *Project manager, consultant or E-Learning specialists, subject matter experts* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | This Code of practice (AFNOR Z 76–001) | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| DC1 | Design/ Construction | Design of the learning system and of its environment | Definition of the architecture of the learning system and of the learning environment in order to meet the identified needs | AN1, AN2, DC2, IN1, RE1, RE2, RE3, RE4, RE5 |
| | | | | |
| **Sub-processes/ Sub-aspects** | Choosing the type of architecture according to a preferred typology | | | |
| | Overall specifications of the system and its environment according to needs and constraints | | | |
| | Design of the system in terms of learning activities, organization, roles of actors, support facilities, assessments, registration, tracking... | | | |
| | Planning quality assurance | | | |
| **Objective** | To define the learning situations in order to meet the learning needs; to specify how they are organized, when and where they take place; how they are supported, how they are administrated... | | | |
| **Method** | *Learning design methodologies, Educational modelling languages...* | | | |
| **Result** | The detailed organization of the learning system, of the learning environment and of support facilities | | | |
| **Actors** | *E-Learning course designers, specialists in distance education* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | *Reference taxonomies or typologies, Instruction Design Methodologies (ex: IMS Learning Design (LD),* DIN PAS 1032–2, ...) | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| DC2 | Design/ Construction | Design of the learning resources and material | Specification and design of learning resources needed to meet the needs within the specified architecture | AN1, AN2, DC1, IN1 |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | Organizing resources according to training paths |
| | Design and specification of learning resources and support, including use of existing resources... |
| | Design of specific material after having checked material available "off-the-shelf" |
| | Preparing delivery of newly created material |
| **Objective** | To specify and design resources required by the learning system, taking into account the type of support required and material existing on the market |
| **Method** | *Learning resources design methodologies, learning material evaluation methodologies, usability heuristics...* |
| **Result** | Specification of a consistent set of learning resources, including existing evaluated material |
| **Actors** | *Learning resource designers, subject matter experts, teachers, usability specialists, media specialists* |
| **Metrics/Criteria** | |
| **Standards** | Usability standards |
| **Annotation/Example** | |

## Instrumentation (IN)

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| IN | | Instrumentation | In the instrumentation phase, material, tools and technologies are chosen and implemented, and the maintenance and updating strategies are defined | |

| | |
|---|---|
| **Sub-processes/ Sub-aspects** | IN1: Choice of material and technologies |
| | IN2: Implementation of material and technologies |
| | IN3: Definition of a maintenance programme |
| | IN4: Definition of updating strategies |
| **Objective** | To choose and implement appropriate technological components being used in the educational system, and to define strategies for maintenance and updating of these components |
| **Method** | |
| **Result** | |
| **Actors** | *Project manager, implementers, IT-specialists* |
| **Metrics/Criteria** | |
| **Standards** | |
| **Annotation/Example** | |

| ID | Category | Process | Description | Relation |
|---|---|---|---|---|
| **IN1** | Instrumentation | Choice of material and technologies | Preparation of decisions concerning the technical components of the learning system: off-the-shelf learning material, tools and technologies. | *DC1, DC2, IN2, IN3, IN4* |
| | | | | |
| **Sub-processes/ Sub-aspects** | Definition of a set of criteria to select material, tools, technologies… <br><br> Collection of information about uses from other users, internet forums, … <br><br> Preparing the decision about the dilemma: make or buy? | | | |
| **Objective** | To prepare the decisions about technological choices for decision makers | | | |
| **Method** | | | | |
| **Result** | Information about advantages and disadvantages of various solutions, a set of criteria and arguments to support the decisions | | | |
| **Actor** | *Project manager, consultants, other users* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IN2** | Instrumentation | Implementation of material and technologies | According to the chosen alternative (make or buy), sub-processes are different: buying and installing equipment, software or material in one case; deciding to use or not Open Source software, developing and testing software tools and material before installing it in the other. | *IN1, RE1, RE2, RE3, RE4, RE5* |
| | | | | |
| **Sub-processes/ Sub-aspects** | Buying equipment, software and learning material <br><br> Use of Open Source software <br><br> Developing and testing tailor-made material and software tools <br><br> Installing the equipment, software, material | | | |
| **Objective** | To buy or develop the technical components of the system, and to install them | | | |
| **Method** | *In case of tailor-made software, use of Software development methodologies is highly recommended* | | | |
| **Result** | Operational technological components of the learning system | | | |
| **Actors** | *Project Manager, Software Developers, Documentation Specialists, IT technicians, Media specialist, test persons of the target group…* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | *W3C recommendations, AICC, SCORM, Metadata models (IEEE 1484.12.1:2003 Learning Object Metadata)* | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IN3** | Instrumentation | Definition of a maintenance programme | The definition of a maintenance programme is part of the implementation process | *IN1* |
| | | | | |
| **Sub-processes/ Sub-aspects** | Choosing between prevention and repair | | | |
| | Definition of a maintenance programme | | | |
| **Objective** | To define a maintenance programme | | | |
| **Method** | | | | |
| **Result** | A Maintenance programme | | | |
| **Actors** | *Project manager, IT specialists* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |

| ID | Category | Process Name | Description | Relations |
|---|---|---|---|---|
| **IN4** | Instrumentation | Definition of updating strategies | Definition of updating strategies is also part of the implementation process | IN1 |
| | | | | |
| **Sub-processes/ Sub-aspects** | Monitor technological changes and evolution of uses or changes in users practices | | | |
| | Organizing technological watch | | | |
| **Objective** | To be able to anticipate technological obsolescence by watching the evolutions and planning systematic updating | | | |
| **Method** | | | | |
| **Result** | An updating plan for technological components | | | |
| **Actors** | *Project manager, IT specialists* | | | |
| **Metrics/Criteria** | | | | |
| **Standards** | | | | |
| **Annotation/Example** | | | | |