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

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National foreword

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INTERNATIONAL STANDARD

ISO/IEC 40180

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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 title *Information technology — Learning, education and training — Quality management, assurance and metrics*) which has been technically revised.

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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.

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INTERNATIONAL STANDARD ISO/IEC 40180:2017(E)

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.

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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.

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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.

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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.

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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.

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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 Reference to guideline/ documents	Method selection shall be based on the target group Methods are selected based on the teachers' experience See Method Guidelines Handbook
Result	Expected result of a process	Method specification 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.

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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.

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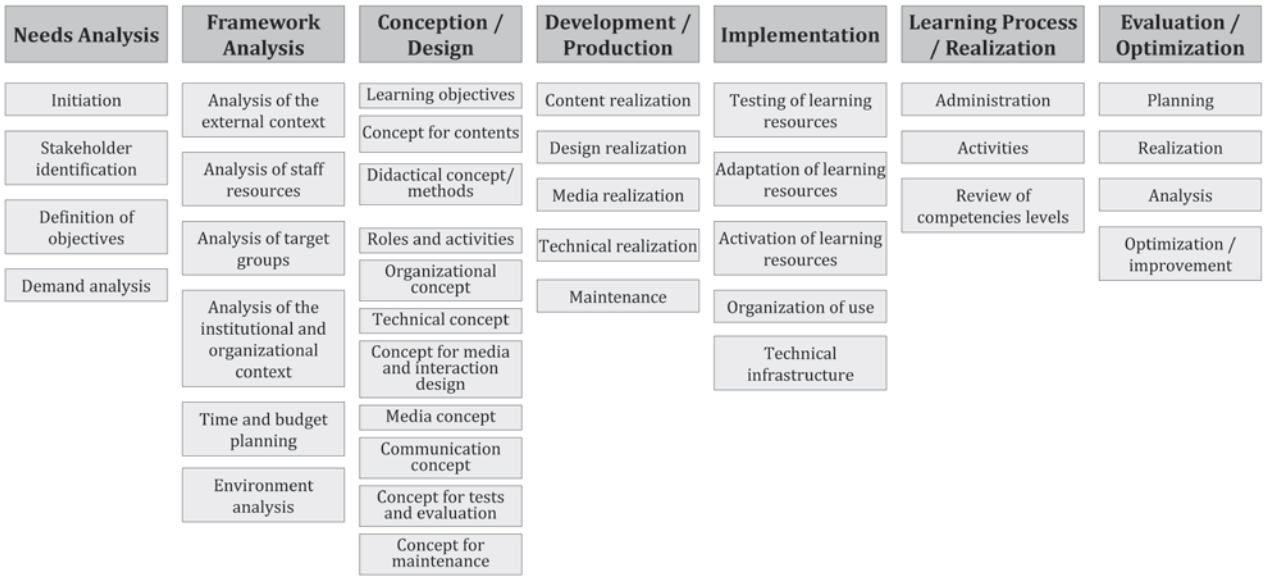

Figure 2 — Overview of the QRF process model

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).

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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 NA.2 Stakeholder identification NA.3 Definition of objectives 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				

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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 FA.2 Analysis of staff resources FA.3 Analysis of target groups FA.4 Analysis of the institutional and organizational context FA.5 Time and budget planning 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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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				

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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 DP.2 Design realization DP.3 Media realization DP.4 Technical realization 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				

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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 IM.2 Adaptation of learning resources IM.3 Activation of learning resources IM.4 Organization of use 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				

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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				

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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 EO.2 Realization EO.3 Analysis 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				

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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 Framework Analysis Conception/Design	Plan	Initiate
Development/Production Implementation Learning Process	Do	Do
Evaluation/Optimization	Check	Evaluate
Evaluation/Optimization	Act	Act

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

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