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Information technology — Process assessment — Framework for assessor training

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Email: copyright@iso.org
Website: www.iso.org

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Contents

Page

Foreword

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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).

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For an explanation of 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 www.iso.org/iso/foreword.html.

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 7, *Software and systems engineering*.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

This document provides a framework for assessor training aimed at training providers who design, develop, and/or deliver training courses for assessors conducting assessments conformant with ISO/IEC 33002.

The goal is to ensure that training offered by training providers adequately addresses the relevant content of the ISO/IEC 330xx family of process assessment standards together with the relevant content of process models and measurement frameworks used as the basis for assessment.

Each training course element is defined with a syllabus structured as a set of training modules which provide a recommended minimum set of competencies to be met by the assessor or lead assessor in conducting an assessment conformant with ISO/IEC 33002.

Each training module is defined with learning objectives with reference to the cognitive levels of learning defined in Bloom's taxonomy of learning objectives.

Competencies are the skills, knowledge, and personal attributes that enable effective performance. The competencies defined by assessor training are those pertaining only to knowledge and skills. A set of auxiliary personal attributes are however included in this document for reference.

The competency-based approach focuses on the desired participant outcomes of the training. One benefit to be derived from a competency-based approach is that it emphasizes results participants expect to achieve, not just content to be covered.

This document replaces the SPICE Assessor Training Syllabus version 4.0 dated 13 September 1999, released by the SPICE project, SC 7 WG 10 N 96.

Information technology — Process assessment — Framework for assessor training

1 Scope

This document provides a framework for assessor training aimed at training providers who design, develop, and/or deliver training courses for assessors conducting assessments conformant with ISO/IEC 33002.

The document defines four training course elements:

— Foundation

— Process assessment model

— Assessor

— Practical assessment performance

Whilst the training is defined as separate training course elements, the elements can be combined into one or more training courses for delivery. Furthermore, training modules and learning objectives can be addressed in training courses in any combination or sequence.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

No terms and definitions are listed in this document.

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

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

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

4 Training content and delivery

The following are a set of best practices for the content and delivery of training courses:

— Participants receive preparatory information prior to the training event that includes a complete course outline, course schedule and an overview of the learning goals. Participants also receive background reading or work needed to prepare for the training accompanied by instructions.

— Training courses are built around a syllabus with content geared toward a particular target group. The level and prior experiences of participants is considered in designing the course.

— Training modules and materials include learning objectives with reference to the cognitive levels of learning.

— Training materials provided to participants include a set of presentation notes with support materials for each session (e.g. PowerPoint, participant worksheets, and handouts).

— Training includes diverse ways of presenting the material and involving the participants. The materials are designed to include a variety of learning methods including discussions in both small and large groups, interactive exercises, case studies, and role plays providing opportunities for participants to clarify, question, apply, and consolidate new knowledge. The facilitators encourage group participation and are comfortable in modifying activities as needed.

— Case study or other experiential methods are supported and facilitated by discussion which give participants the opportunity to seek information beyond what is contained in the case study, and to raise and debate various points of view on the case issues. Participants are encouraged to defend their opinions with evidence and reason. The discussion permits the Instructor to check participant skills in inquiry, analysis, and decision making.

— Participants will come to the training event with their own experiences and concerns. Those experiences can be valuable for discussion and application. Using participant experiences will help them see how what they are learning can be carried back into their work. Case studies and specific examples can increase involvement and learning.

— Training includes a mechanism for soliciting participant course evaluations and for recording, analysing, and acting on participant feedback received. Such assessment mechanisms may include both daily and end-of-course assessments to provide evidence that the course offers an appropriate "learning opportunity" for participants. Participants are provided with an evaluation form to complete at the end of the training event.

5 Declaration of conformance

5.1 Statement of conformance

Any training course wishing to claim conformance to the minimum set (or a subset) of the competencies to be met by the assessor in conducting an assessment conformant with ISO/IEC 33002 as defined in this document may provide a statement of conformance.

The statement of conformance is accompanied by a training curriculum defining the training course as a collection of training modules, defining pre-requisite training and experience needed for participation in the course, and defining for each training module the following:

— Module ID and name

— Module learning objectives

— Module type (see 5.2)

— Module cognitive level of learning (using Bloom's taxonomy)

— Module recommended duration (in hours or minutes)

— A cross reference from the training module or learning objectives to the relevant module and/or learning objectives in this document

5.2 Module type

The module type is referenced as one or more of:

a) Instructor presentation (IP) – given by tutor

b) Delegate presentation (DP) – given by delegate

c) Discussions (DI) – exchanging of ideas and experiences amongst delegates and coached by tutor

d) Role play (RP) – simulation of real world examples by exercises performed by delegates

e) Working groups (WG) – group work performed by delegates

f) Exercises (EXER) – work done by delegate on his/her own

g) Test (TEST) – formal multiple choice test questions

h) Examination (EXAM) – formal case examinations

i) Evaluation (EVAL) – evaluation of assessment performance

5.3 Cognitive levels of learning

Cognitive levels of learning with reference to Bloom's taxonomy of learning objectives[10] are defined in Table 1.

Table 1 — Cognitive levels of learning

Level	Category or 'level'	Behaviour descriptions	Examples of activity to be trained, or demonstration and evidence to be measured	'Key words' (verbs which describe the activity to be trained or measured at each level)
1	Knowledge	recall or recognise information	multiple-choice test, recount facts or statistics, recall a process, rules, definitions; quote law or procedure	arrange, define, describe, label, list, memorise, recognise, relate, reproduce, select, state
2	Comprehension	understand meaning, re-state data in one's own words, interpret, extrapolate, translate	explain or interpret meaning from a given scenario or statement, suggest treatment, reaction or solution to given problem, create examples or metaphors	explain, reiterate, reword, critique, classify, summarise, illustrate, translate, review, report, discuss, re-write, estimate, interpret, theorise, paraphrase, reference, example
3	Application	use or apply knowledge, put theory into practice, use knowledge in response to real circumstances	put a theory into practical effect, demonstrate, solve a problem, manage an activity	use, apply, discover, manage, execute, solve, produce, implement, construct, change, prepare, conduct, perform, react, respond, role-play
4	Analysis	interpret elements, organizational principles, structure, construction, internal relationships; quality, reliability of individual components	identify constituent parts and functions of a process or concept, or de-construct a methodology or process, making qualitative assessment of elements, relationships, values and effects; measure requirements or needs	analyse, break down, catalogue, compare, quantify, measure, test, examine, experiment, relate, graph, diagram, plot, extrapolate, value, divide
5	Synthesis (create/ build)	develop new unique structures, systems, models, approaches, ideas; creative thinking, operations	develop plans or procedures, design solutions, integrate methods, resources, ideas, parts; create teams or new approaches, write protocols or contingencies	develop, plan, build, create, design, organise, revise, formulate, propose, establish, assemble, integrate, re-arrange, modify

Table 1 *(continued)*

Level	Category or 'level'	Behaviour descriptions	Examples of activity to be trained, or demonstration and evidence to be measured	'Key words' (verbs which describe the activity to be trained or measured at each level)
6	Evaluation	assess effectiveness of whole concepts, in relation to values, outputs, efficacy, viability; critical thinking, strategic comparison and review; judgement relating to external criteria	review strategic options or plans in terms of efficacy, return on investment or cost-effectiveness, practicability; assess sustainability; perform a SWOT analysis in relation to alternatives; produce a financial justification for a proposition or venture, calculate the effects of a plan or strategy; perform a detailed and costed risk analysis with recommendations and justifications	review, justify, assess, present a case for, defend, report on, investigate, direct, appraise, argue, project-manage

6 Course elements

6.1 General

This document defines four training course elements:

— Foundation (see Table 2)

— Process assessment model (see Table 3)

— Assessor (see Table 4)

— Practical assessment performance (see Table 5)

6.2 Foundation

Table 2 — Foundation

Module name	Learning objectives	Module type	Module cognitive level of learning
General principles of process assessment	Understand the key terminology. What is process assessment and how it is used? What are the origins of process assessment? What is the history and timeline of the development of ISO/IEC 330xx?	IP, RP	1
Process assessment standards and best practices	What are the key components of the ISO/IEC 330xx standards framework? What are the content and relationships of the documents that comprise ISO/IEC 330xx family? What is the relationship of ISO/IEC 330xx to other key standards including management standards? What is the generic framework for the performance of assessments? What are the typical contexts of use?	IP	1, 2

Table 2 *(continued)*

Module name	Learning objectives	Module type	Module cognitive level of learning
Generic process measurement framework	Understand the definition and concept of process quality characteristics. Understand the definition and concept of a process measurement framework as part of the process quality dimension. Understand the framework and requirements for process measurement frameworks as defined in ISO/IEC 33003. Understand the sample process capability measurement framework as defined in ISO/IEC 33020: including the Capability Levels and Process Attributes that comprise the process measurement framework.	IP, EXER	2, 3, 4
General process models framework (PRM/PAM/MM)	Understand the concept of a process and how it is defined. Understand the concept of a "Process Reference Model"; the relationship between Process Reference Models and the framework for assessment; how processes are described in the Process Reference Model; requirements for Process Reference Models; existing PRMs. Understand the concept of a "Process Assessment Model"; the relationship between Process Assessment Models and Process Reference Models; requirements for Process Assessment Models; existing PAMs. Understand the concept of a "Maturity Model"; the relationship between Maturity Models and Process Reference Models and Process Assessment Models; requirements for Maturity Models; existing MMs. Reference published (or planned) process models conformant to the requirements of ISO/IEC 33004 (including those within the scope of ISO/IEC JTC 1/SC 7, and both public domain and proprietary models).	IP	1, 2
Generic process attribute rating	Understand the scale for rating achievement of the Process Attributes. Understand how the rating scale is calibrated. Understand the outcome of an assessment including the generation of process profiles. Explain how rating results can be presented. Understand how Process Attribute ratings can be converted into a Process Quality Level rating.	IP, EXER	2, 3, 4
Contexts of assessment	Understand the contexts of use for the application of assessment results. Understand issues in utilising assessment results for process improvement. Understand issues in utilising assessment results for process risk determination.	IP	1

Table 2 *(continued)*

Module name	Learning objectives	Module type	Module cognitive level of learning
Requirements and phases for performing an assessment	Understand the requirements for performing an assessment. Understand the key activities in performing an assessment. Understand the different classes of assessment and the Types of assessment bodies performing assessments.	IP	1
Conformance and conformity assessment	Understand conformance of assessments, PRM, PAM, MM, Measurement framework, and documented assessment process. Understand the role of conformity assessment with reference to ISO/IEC 29169.	IP	1
General roles and responsibilities during an assessment	Understand the different roles and responsibilities in an assessment. Understand and describe the role of the assessor. Understand assessor competence.	IP	1
Test	10 Multiple choice or true/false test questions. The test is an integral part of the course element, but may be taken on a separate timeline.	TEST	6

6.3 Process assessment model

A process assessment model course element (Table 3) is associated with a single process quality characteristic (e.g. process capability) and a single process measurement framework.

Table 3 — Process assessment model

Module name	Module learning objectives	Module type	Module cognitive level of learning
Base standards	Explain the base documents (standards) that are used as the basis to construct the specific process assessment model scope of the course: — Where is the PRM defined? — Where are the process assessment model defined and its relation with the PRM? — Where are the maturity model defined (if relevant) and its relation with process assessment model?	IP	1
The process dimension	Obtain a more detailed understanding of the process categories, processes, process purpose, process outcomes for the PRM(s) selected for the appropriate scope of the course. Describe each of the process categories. Describe processes in terms of process purpose and outcomes.	IP, DI	1, 3

Table 3 *(continued)*

Module name	Module learning objectives	Module type	Module cognitive level of learning
The process quality dimension	Obtain a more detailed understanding of the process attributes and process quality levels that comprise the measurement framework for the PAM scope of the course. Obtain a more detailed understanding of the indicators defined in the PAM. Understand how indicators are used to assess process performance and process quality attributes. Understand how process attribute ratings can be converted into process quality levels.	IP, DI	1, 3
Rating method and aggregation method	Understand the scale for rating achievement of the process attributes. Understand how the rating scale is calibrated and aggregated (if applicable).	IP, DI	1, 3
Maturity model (if relevant) and other profiling techniques	Acquire a conceptual understanding of the process maturity models. Understand the key terms upon which process maturity models concepts are based. Understand and explain a sample maturity model (if the PAM does not have an associated maturity model defined then one from another model can be used for illustration).	IP	1
Process assessment process	Understand at a basic introductory level the activities and requirements of a documented assessment process. Understand that a process assessment is performed according to a documented assessment process conformant with the requirements of ISO/IEC 33002.	IP	1
Test	10 Multiple choice or true/false test questions. The test is an integral part of the course element, but may be taken on a separate timeline.	TEST	6

6.4 Assessor

Table 4 — Assessor

Module name	Module learning objectives	Module type	Module cognitive level of learning
The process assessment process	Introduce the process assessment process, the context for performing and assessment and the key activities in the performance of an assessment. Reference the exemplar documented assessment process in ISO/IEC TS 33030.	IP	1

Table 4 *(continued)*

Module name	Module learning objectives	Module type	Module cognitive level of learning
Roles and responsibilities	Understand the different roles and responsibilities in an assessment. Understand and describe the role of the assessor. Understand assessor competence. Provide a detailed example of assessor responsibilities in a practical assessment.	IP	1
Classes of assessment	Understand the different classes of assessment and their level of rigour. Understand the specific requirements for each class of assessment.	IP	1
Types of independence of assessment bodies	Understand and explain the categories of independence of assessment bodies as described in ISO/IEC 33002. Explain the interactions between classes of assessment and categories of independence of assessment bodies.	IP	1
Assessment definition	Understand how to initiate and define an assessment, addressing the following: — Identification of assessment inputs (purpose, scope, and sample size, class of assessment, category of independence, rating method, constraints, and characteristics). — Criteria for selection of an assessment team. — Risk identification and to whom risk is reported.	IP, WG	1, 3

Table 4 *(continued)*

Module name	Module learning objectives	Module type	Module cognitive level of learning
Assessment planning and preparation	Understand how to plan and prepare an assessment, addressing the following: — Preparing an assessment plan, estimations and schedule. — The classes of assessments as described in ISO/IEC 33002. — Data sampling strategies. — Team roles. — The need for a team briefing. — Selection of appropriate assessment techniques (interviews, questionnaires, documentation reviews etc.). — Selection of an appropriate assessment tool. — The duties of organisational unit coordinators. — Preparing and conducting the organisational unit briefing. — Explaining how participants are selected. — Explaining confidentiality issues. — Identifying criteria for the support documentation and records. Best practices for planning and performing an assessment addressing the following: — Assessment approach including verification and discovery techniques. — Assessment scope including management structure, organisational structure and responsibilities geographical dispersion, cohesion and coupling of processes, institutionalisation of processes. — Assessment sample including management processes, representative lifecycles, product lines, site coverage, size of operations, safety/security/regulatory factors, geographic areas, constraints on availability etc. — Assessment performance including level of rigour and approach to data collection, direct and indirect sources of evidence. — Assessment data collection including affirmations, observations, work products, questionnaires.	IP, WG	1, 3

Table 4 *(continued)*

Module name	Module learning objectives	Module type	Module cognitive level of learning
Techniques for interviewing and document review	Introduce techniques for collecting and reviewing data from interviews of process performers: — Who to interview. — Using assessment indicators. — Planning for the interviews. — Type of questions and approach. — Conducting the interviews. — Closing the interviews. — Follow up interviews.	IP	1
Analysis of data in an assessment	Understand how information is collected, verified, cross-referenced, and the assessment plan implemented, addressing the following: — Explaining how information is collected. — Explaining and demonstrate how information is categorized. — Explaining how information is verified and how compliance is assessed. — Explaining how the achievement of the desired coverage is verified.	IP	1, 3
Reporting assessment results	Relate assessment results to the assessment context: — Explain and demonstrate how assessment outputs can be presented. — Explain the requirements for content of the Assessment Record. — Explain the requirements for reporting assessment results. Explain how to close out an assessment, including follow up actions or plans and the close out of any actions. Understand typical scenarios that occur after issuance of assessment report including how and in what timeline to address minor weaknesses, major gaps, opportunities for improvement.	IP	1, 3

Table 4 *(continued)*

Module name	Module learning objectives	Module type	Module cognitive level of learning
Verifying conformance	Explain and demonstrate how an assessment can be checked for conformity to the requirements of the Standard. — Conformance of process assessments. — Conformance of documented assessment processes. — Conformance of process reference models. — Conformance of process assessment models. — Conformance of maturity models. — Conformance of process measurement frameworks. Explain how conformance can be verified by: — Self-declaration (first party). — A second party. — A third party.	IP	1
Process improvement	Understand the general improvement process steps and roles as defined in ISO/IEC TR 33014. Understand how improvements could be defined within an organization and its projects. Understand the basis for: — Stakeholder analysis. — Change approaches. — Key success factors. — Improvement prioritisation.	IP, WG	1, 3
Conformity assessment	Review the scope of the international standard ISO/IEC 29169 for conformity assessment including: — Conformity assessment methodology and approach. — Concepts of conformity assessment. — Conformity assessment schemes.	IP	1
Conformity assessment scheme (optional)	Explain a relevant conformity assessment scheme that includes: — Pre-assessment activities. — Certification and surveillance activities. — The issuance of statements of conformity. — The use of conformity assessment marks; and — Requirements for reporting assessment results.	IP	1