DRAFT International Standard

ISO/IEC DIS 23988

Information technology — A code of practice for the use of information technology (IT) in the delivery of assessments

Technologies de l'information — Code de pratique pour l'emploi des technologies de l'information (TI) dans la livraison des évaluations

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

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 ISO documents 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 on 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*, Subcommittee SC 36, *Information technology for learning, education and training*.

This second edition cancels and replaces the edition (ISO/IEC 23988:2007), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Integration of advanced IT technologies, including AI-assisted scoring, adaptive testing, and remote proctoring.

— Enhanced candidate identification procedures with the incorporation of biometric verification.

— Expanded registration and scheduling processes, including provisions for secure payment processing for high-stakes assessments.

— Comprehensive data return mechanisms with standardized, interoperable formats (e.g., 1EdTech QTI, XML, JSON) and enhanced security controls.

— Robust analytics and reporting frameworks supporting continuous improvement and data-driven decision-making.

— Detailed procedures for managing irregularities, including systematic detection, documentation, investigation, and resolution.

— Updated content creation processes with a strong focus on fairness, accessibility, and validity, including rigorous item development and content validation.

— New credentialing approaches incorporating digital badges alongside traditional certificates to provide dynamic, verifiable, and shareable recognition of achievements.

A list of all parts in the ISO/IEC 23988 series can be found on the ISO website.

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 atwww.iso.org/members.html.

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Introduction

The rapid evolution of information technology and its pervasive impact on education, training, and professional certification have necessitated a comprehensive update to the Code of Practice for the Use of Information Technology in the Delivery of Assessments. Over the past decade, the landscape of assessment has transformed dramatically, driven by advancements in artificial intelligence, adaptive testing, remote proctoring, and data analytics. In response to these changes, this second edition has been developed through a collaborative, international effort to reflect best practices and emerging trends, ensuring that the standard remains both relevant and practical for all stakeholders.

Background and Rationale

Historically, assessments were predominantly delivered using paper-based methods or simple computer systems. However, the advent of digital technologies has revolutionized how assessments are designed, administered, and analyzed. As institutions and organizations increasingly rely on IT-enabled assessments, it is essential to address not only the technical challenges associated with digital delivery but also the broader implications for fairness, security, and quality. This edition places a strong emphasis on integrating advanced IT solutions—such as AI-assisted scoring, adaptive testing, and biometric identification—to enhance the validity and reliability of assessments while safeguarding candidate data and ensuring equitable access for all.

The impetus for revising this standard arose from several key developments:

— The widespread adoption of artificial intelligence in scoring processes has enabled rapid, consistent, and multidimensional evaluation of candidate responses.

— The expansion of remote and hybrid assessment models, accelerated by global events such as the COVID-19 pandemic, has underscored the need for robust remote proctoring and candidate verification methods.

— Increasing concerns over data security and privacy in digital assessments have prompted the incorporation of enhanced security measures and adherence to international data protection regulations.

— The emergence of digital credentialing, including interactive digital badges alongside traditional certificates, provides a more comprehensive and dynamic approach to recognizing candidate achievements.

— Advancements in learning analytics and big data have transformed the way assessment outcomes are analyzed, enabling institutions to make data-driven decisions for continuous improvement in both instructional practices and assessment design.

Scope and Structure of the Standard

This standard is designed to serve as a comprehensive guide for organizations involved in the design, delivery, scoring, and analysis of IT-enabled assessments. It is applicable across a broad range of assessment types, including high-stakes certification examinations, academic assessments, and formative evaluations in both educational and professional contexts. The document is structured into clearly defined chapters that address the entire assessment lifecycle—from content creation and candidate registration to data return, analysis, and appeals. Each chapter provides detailed guidance on best practices, technical requirements, and security measures, ensuring that assessments are not only effective and efficient but also fair and transparent.

Key areas covered in this edition include:

— **Content Creation:** Emphasizing the development of valid, reliable, and unbiased assessment items that align with specific learning outcomes and competencies. The standard highlights modern approaches such as technology-enhanced items and adaptive testing frameworks.

— **Candidate Identification:** Introducing rigorous identification procedures that integrate biometric verification to confirm candidate identity and prevent impersonation, thereby upholding the integrity of the assessment process.

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— **Delivery and Data Management:** Outlining requirements for the secure and efficient delivery of assessments, including the use of interoperable data formats and real-time monitoring systems. This section ensures that candidate responses are transmitted, stored, and analyzed in compliance with international security standards.

— **Scoring and Feedback:** Detailing automated and hybrid scoring mechanisms that combine AI-assisted scoring with human oversight, and establishing protocols for providing immediate and constructive feedback to candidates.

— **Analysis and Continuous Improvement:** Providing guidance on how to leverage data analytics and learning analytics to monitor assessment performance, identify trends, and drive ongoing improvements in assessment design and administration.

— **Appeals and Irregularities:** Setting forth procedures for managing and resolving irregularities and appeals, ensuring that any deviations from established protocols are addressed in a fair, transparent, and systematic manner.

— **Certification and Credentialing:** Introducing updated approaches to credentialing that incorporate both traditional certificates and digital badges, enabling a more dynamic and detailed recognition of candidate achievements.

Impact on Stakeholders

The revisions in this second edition are intended to benefit a wide array of stakeholders. Educational institutions, professional certification bodies, training organizations, and IT solution providers will find that the updated standard addresses current challenges and leverages modern technologies to enhance assessment practices. Candidates, in particular, benefit from a more secure and accessible assessment environment that offers timely feedback and a fair opportunity to demonstrate their competencies. Additionally, the enhanced data analytics and reporting mechanisms support administrators and policymakers in making informed decisions that can improve educational outcomes and ensure compliance with regulatory requirements.

International Collaboration and Future Directions

This edition has been developed under the auspices of ISO/IEC JTC 1/SC 36, in collaboration with experts and stakeholders from around the world. The standard reflects a consensus on best practices in IT-enabled assessment delivery and incorporates feedback from multiple sectors, including education, industry, and government. It is anticipated that this standard will serve as a living document, periodically updated to reflect new technological advancements, emerging pedagogical insights, and evolving policy frameworks.

As digital transformation continues to reshape the educational and professional landscape, this standard provides a robust framework that can adapt to future challenges. Its comprehensive approach ensures that assessments remain secure, valid, reliable, and accessible, thereby fostering an environment of continuous improvement and excellence.

By integrating cutting-edge technologies with established best practices, ISO/IEC 23988 2nd Edition represents a significant advancement over previous versions. It offers a holistic and adaptable framework for IT-enabled assessments, one that not only addresses the technical dimensions of digital delivery but also embraces broader educational, societal, and policy considerations. Through this standard, stakeholders can be assured of a fair, secure, and effective assessment process that supports the dynamic needs of modern education and professional certification.

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Information technology — A code of practice for the use of information technology (IT) in the delivery of assessments

1 Scope

1.1 General

This document is aimed at those organisations wanting to create, fair, valid and reliable assessments in any context. The word high-stakes is often used, as opposed to low-stakes exams which are used in a formative context. The document takes a user through the process that they need to go through to create assessments and also identifies key roles within the assessment process.

This Standard provides comprehensive guidelines on the application of information technology (IT) in delivering assessments. It outlines the scope of IT usage across various types of assessments, detailing the life cycle stages, security protocols, and privacy considerations specific to IT-enabled assessments.

1.2 Types of assessment

The standard covers a broad range of assessment types, each tailored to specific contexts and objectives. These types of assessments ensure that the standard can be applied across various domains, from education to professional certification, and each has distinct characteristics and requirements. The key aspect of this is that the exams are high-stakes and have some specific use case, rather than for formative assessment, which typically has less rigorous requirements for creation and delivery.

The primary types of assessment covered in the standard:

a) **K-12 Assessments**

1) **Purpose**: These assessments are designed for students in primary and secondary education (Kindergarten through 12th grade). They are used to evaluate students' understanding of curriculum content, track progress, and determine readiness for advancement to higher education levels.

2) **Characteristics**: K-12 assessments often include a mix of item types, such as multiple-choice, short answer, and essays. They must align with national or regional educational standards and consider the diverse needs of young learners, including accommodations for disabilities.

b) **Academic Assessments**

1) **Purpose**: Academic assessments are used in higher education institutions to evaluate students' mastery of course content, critical thinking, and research skills. These assessments play a crucial role in determining grades, awarding degrees, and ensuring academic integrity.

2) **Characteristics**: Academic assessments can range from written exams and oral presentations to research papers and practical demonstrations. They require rigorous validity and reliability checks to maintain academic standards.

c) **Employment Testing**

1) **Purpose**: These assessments are used by employers to evaluate the skills, knowledge, and aptitudes of potential or current employees. Employment testing is crucial in hiring, promotion, and talent management processes.

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2) **Characteristics**: Employment tests often include psychometric tests, skills assessments, and situational judgment tests. They must be designed to minimize bias and ensure fairness across different demographic groups.

d) **Professional Certification**

1) **Purpose**: Professional certification assessments validate the expertise and competencies of individuals in specific professions. They are essential for certifying professionals in fields where specific skills and knowledge are critical, such as healthcare, engineering, and IT.

2) **Characteristics**: These assessments are typically high-stakes and must adhere to strict standards of validity, reliability, and security. Outcome is typically binary/dichotomous; you are either certified or not. They may include written exams, practical skills tests, and continuing education requirements.

1.3 Assessment life cycle

The assessment lifecycle is a comprehensive process that encompasses the various stages involved in the creation, implementation, and evaluation of assessments. Although assessment procedures vary, the typical life cycle of assessment consists of the following steps:

a) identification of need to assess

b) design of outcomes/rubrics/assessment methodology

c) creation, preparation and calibration of content

d) preparation of assessment content (includes computer adaptive test engine/model)

e) registration (may include payment)

f) distribution

g) authentication (includes identification)

h) delivery

i) response return (and/or submission)

j) irregularities

k) scoring, result determination and/or feedback

l) data return

m) analysis

n) appeals and

o) credentialing (certification, licensure, degree, badge, micro-credential, etc.)

The design and instruments for computer adaptive testing and assessment methodology are not covered by this Standard. However, when IT is used for delivery, the relevant clauses of this Standard should be considered during the lifecycle.

1.4 Focus on specifically IT aspects

The emphasis throughout this Standard is on the additional and distinct measures required with the integration of modern IT in assessment systems. While measures that are common to both traditional paper-based and IT-delivered assessments are mentioned only in general terms, this Standard addresses the novel challenges and opportunities introduced by digital technologies.

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This edition expands on the previous version by incorporating advanced technologies that were not previously covered. These include, but are not limited to, AI-assisted scoring, automatic feedback systems, adaptive testing, and remote proctoring solutions. The use of IT now supports a more comprehensive range of assessment functions:

— AI-Based Automated Scoring and Feedback: Modern systems employ machine learning algorithms to provide instant scoring and multi-dimensional feedback. Although the quality and validity of the assessment content remain paramount, IT is now capable of offering detailed, rubric-based evaluations that can be reviewed and validated by human markers.

— Adaptive Testing and Dynamic Item Banking: The introduction of computerized adaptive testing (CAT) and robust item banking systems allows assessments to adjust in real time to the test-taker's ability, ensuring a more personalized and efficient measurement of competency. IT supports the maintenance and continuous updating of these item banks, including automatic generation and statistical calibration of test items.

— Remote Proctoring and Data Security: The transition to online assessments has necessitated the incorporation of remote proctoring technologies that combine AI monitoring with human oversight to mitigate fraud while safeguarding student privacy. This Standard specifies requirements for secure data transmission, storage, and compliance with international data protection regulations such as GDPR and ISO/IEC 27001.

— Learning Analytics and Data-Driven Decision Making: IT now plays a significant role in collecting and analyzing assessment data, enabling educators to leverage learning analytics for real-time feedback, formative assessment, and instructional adjustments. The interface between assessment content and IT delivery is enhanced to support a data-driven approach to both scoring and pedagogical decision-making.

It is important to note that this Standard does not address the purely pedagogical aspects of assessment design or the intrinsic quality of assessment content. Rather, it focuses on the IT mechanisms that implement pedagogical decisions, facilitate the efficient transmission and secure handling of assessment data, and enable innovative evaluation methods. Compliance with this Standard does not imply that an assessment is pedagogically robust; rather, it ensures that the IT infrastructure supporting the assessment adheres to best practices in security, transparency, and reliability.

The scope includes:

— IT scoring systems that are designed for subsequent human review;

— The IT-facilitated transmission and delivery of assessments, where responses may be scored either automatically or by human markers;

— The provision of automated feedback and immediate result reporting, while result-determination processes requiring human judgment remain outside this scope.

By addressing these enhanced IT aspects, this Standard aims to support the evolution of assessment practices in a digital age, ensuring that technological innovations are harnessed effectively while maintaining the validity and fairness of the assessment process.

1.5 Focus on principles

The aim of this Standard is to articulate overarching principles and best practices without prescribing specific technical implementations. The recommendations can be achieved through a variety of technological or procedural approaches, reflecting the expanded range of modern IT applications—including AI-assisted scoring, adaptive testing, and remote proctoring—without being tied to any specific hardware or software platform.

In many instances, the principles outlined herein may be supplemented by additional regulations set by assessment providers, ensuring that while the underlying IT-enabled processes evolve, the core values of validity, fairness, and security remain paramount.

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1.6 Compliance

Assessment sponsors, assessment distributors and assessment centres may claim compliance with this Standard if they comply with all the clauses or subclauses applicable to their role (see table below).

Notes to the clauses indicate the role(s) to which each clause or subclause is applicable.

This Standard is applicable to both high-stakes and low-stakes assessments, but some clauses or subclauses are applicable only to high-stakes assessments; this is indicated in Table 1.

Table 1 — Application of ISO/IEC 23988 2nd edition

Role	Assessment type	Relevant clauses or sub-clauses
Assessment sponsors	High-stakes and low-stakes	Clause 5, 6.2, Clause 7, Clause 8, Clause 9, Clause 10, Clause 11, Clause 12, Clause 13, Clause 14, Clause 15, Clause 16, Clause 17, Clause 18, Clause 19, Clause 20, Clause 21
Assessment distributors	High-stakes	Clause 5, 6.3, Clause 7, 9.2, Clause 13, Clause 14, Clause 15, Clause 16, Clause 17, Clause 18, Clause 19, Clause 20, Clause 21
Assessment distributors	Low-stakes	Clause 5, 6.3, 7.2, Clause 9, Clause 10, Clause 11, Clause 15, Clause 17, Clause 18, Clause 19
Assessment centres	High-stakes	Clause 5, 6.4, 9.2, Clause 13, Clause 14, Clause 15, Clause 16, Clause 17, Clause 18, Clause 20
Assessment centres	Low-stakes	Clause 5, 6.4, 7.2, Clause 9, Clause 15, Clause 17, Clause 18, Clause 19

The scenarios given in Annex A illustrate how different types of organisation might need to comply with different clauses of this Standard.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 9241-20:2008, *Ergonomics of human-system interaction — Part 20: Accessibility guidelines for information/communication technology (ICT) equipment and services*

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
assessment
means of measuring or evaluating learner understanding or competency

Note 1 to entry: It can be high-stakes or low-stakes (see 3.13 and 3.19).

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3.2
assessment centre
formally designated location where assessments are taken, not necessarily used exclusively for assessments

Note 1 to entry: An assessment centre has staff with responsibility for the conduct and security of the assessment. Assessment centres are often, but not always, remote from the assessment distributor and part of a different organisation. In high-stakes assessment, centres are normally subject to the approval and monitoring of the assessment distributor. Some assessments, especially those which are low stakes, can be taken outside assessment centres.

3.3
assessment content
the questions and associated images or additional information which is provided to the candidate during the assessment

3.4
assessment distributor
organisation responsible for delivering assessments (especially high-stakes assessments) via information technology, this could include overseeing assessment centres, but not necessarily responsible for assessment content

3.5
assessment form
alternative version of an assessment; two or more different assessment forms each contain a different mix of items but are designed to assess the same knowledge, understanding or skills based around an assessment specification

3.6
assessment software
software which presents the assessment to the candidate and records the candidate's responses

Note 1 to entry: It can be generic (capable of running numerous different assessments) or integral with assessment content. Usually (but not necessarily) separate from software to develop and store the assessment items, log candidate entries, manage assessment sessions etc.

3.7
assessment sponsor
organisation responsible for determining assessment content and awarding certificates or some other formal recognition

Note 1 to entry: Assessment sponsors often delegate assessment delivery to an assessment distributor.

3.8
assistive technology
functional units and services that facilitate the use of IT by users, such as people with functioning disabilities (e.g., sensory or physical impairment)

3.9
candidate
person taking an assessment

3.10
correct response
predetermined response which will give a positive score

Note 1 to entry: Use of this term is not intended to imply that there is only one possible correct response per item. See also 3.19 and 3.20.

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3.11
delivery platform
computer hardware, system software and, where applicable, telecommunication software and associated features which support the delivery of assessments to the candidate and the return of computer held information (e.g., results) to a specific location for scoring purposes, or reporting if scored locally

3.12
fairness
principle that every candidate should be assessed using procedures that are equitable and free from bias

Note 1 to entry: Computer delivery and scoring should be fair to all candidates and, as far as possible, should not disadvantage any candidate as a result of factors which are irrelevant to the knowledge, understanding or skills being assessed (such factors include lack of advanced computer skills, if these are irrelevant).

3.13
high-stakes assessment
assessment where the result is of importance to the candidate or to an organisation and therefore has to be reliable and valid

Note 1 to entry: High-stakes assessments include most end-of-course educational examinations leading to a certificate (and also module assessments which contribute to an overall result), proficiency and licensing examinations. Assessments can also be considered high-stakes if the evaluation of an organisation depends on the performance of its employees or students, as might be the case with safety assessments. See also 3.19.

3.14
ICT
information and communications technology
technology for gathering, storing, retrieving, processing, analysing and transmitting information

Note 1 to entry: This term includes internet connectivity speed or 'bandwidth'.

[SOURCE: ISO 9241-20:2008, 3.4]

3.15
IT
information technology

3.16
invigilation
process of overseeing the conduct of an assessment, especially to ensure that there is assessment security and no cheating

Note 1 to entry: Proctoring is an alternative term for invigilation. Although not covered in this Standard, invigilation could be undertaken remotely using monitoring equipment, if accepted by the assessment sponsor.

3.17
invigilator
person responsible for invigilation

Note 1 to entry: Proctor is an alternative term for invigilator.

3.18
item
smallest separately identified question, piece of information relating to a question, or task within an assessment

Note 1 to entry: It can be a closed-response question, an open-ended question, an essay or the performance of a task (e.g., "centre a heading in a given passage of text").

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3.19
low–stakes assessment
assessment where the result is of lower importance to the candidate or to a relevant organisation

Note 1 to entry: Formative and diagnostic assessments are usually low-stakes. See also 3.13. Low-stake assessments need not be invigilated or take place in a test-centre if approved by the test sponsor.

3.20
open-ended response
response which is not limited to choosing from a list of options

Note 1 to entry: Open-ended response items are most likely to require text input, but can require numerical input or computer graphics. See also 3.10 and 3.24.

3.21
reliability
consistency with which an assessment measures

EXAMPLE An assessment will have low reliability if two assessment forms are of unequal difficulty or coverage or if there are errors in the scoring procedures or in the reporting of scores.

3.22
response
candidate's answer to an item

Note 1 to entry: Responses can consist of the selection of one or more from a given set of options, open-ended IT-scorable responses, more complex IT-scorable activities or production of text which has to be marked by a human, but can be transmitted by IT. Or could include the recording of an audio response. See also 3.9 and 3.18.

3.23
result
outcome of the assessment taken by the candidate

Note 1 to entry: A result can be expressed as pass/fail, as a grade, as a percentage or in other ways such as item or syllabus level feeback in a diagnostic or formative assessment.

3.24
score
numerical measure of the candidate's achievement in the assessment as a whole or on the individual items

3.25
validity
extent to which an assessment achieves its aim by measuring what it is supposed to measure and producing results which can be used for their intended purpose

Note 1 to entry: An assessment has low validity if the results are unduly influenced by skills which are irrelevant to the stated aims of the assessment.

3.26
workstation
equipment provided for an individual candidate at an assessment centre, including IT hardware, seating and desk or table space

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