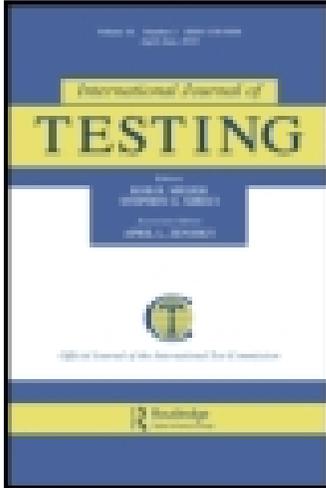


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International Guidelines on Computer-Based and Internet-Delivered Testing

The International Test Commission

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International Guidelines on Computer-Based and Internet-Delivered Testing

The International Test Commission
Gainesville, FL

Developed by the International Test Commission, the International Guidelines on Computer-Based and Internet-Delivered Testing are a set of guidelines specifically developed to highlight good practice issues in relation to computer/Internet tests and testing. These guidelines have been developed from an international perspective and are directed at various stakeholders in the testing process. Although specifically structured under headings of test developers, test publishers, and test users, the guidelines are a useful reference for other stakeholders in the testing process. The guidelines address 4 main issues identified as key areas to ensure good practice in computer/Internet testing: technological issues, quality issues, control issues, and security issues. These 4 issues are considered high-level issues and are further broken down into second-level specific guidelines. A third-level set of accompanying examples is provided to the relevant stakeholder mentioned previously.

The International Test Commission (ITC) agreed to invest in a program of research, conferences, and consultations focused on good practice issues within computer and Internet testing. The aims and objectives of the project were to produce a set of internationally developed and recognized guidelines that highlight good practice issues in computer-based testing (CBT) and Internet-delivered testing and to raise awareness among all stakeholders in the testing process of what constitutes good practice. This article presents the full guidelines.

It was agreed not to “invent” new guidelines but to draw together common themes that run through existing guidelines, codes of practice, standards, research papers, and other sources and to create a coherent structure within which these guidelines can be used and understood.¹ Furthermore, the focus was on the development of guidelines specific to CBT and Internet-based testing and not to reiterate good practice issues in testing in general.

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¹The Appendix includes a list of articles consulted in the process of the drafting of the guidelines.

Before presenting the guidelines, it is important to set out some of the parameters of the guidelines (in terms of scope, who they are for, and contextual factors). Once these have been defined, the guidelines are presented.

SCOPE

As with the International Guidelines of Test Use (ITC, 2001), the current guidelines use the terms *test* and *testing* in their broadest sense and include psychological and educational tests used in clinical, health, educational, and work and organizational assessment settings. CBT/Internet tests should be supported by evidence of their technical adequacy for their intended purpose. These guidelines are aimed at tests conducted both online and onscreen (offline), which can include testing via the use of a CD-ROM or a download executable. The document includes guidance for fully computerized testing and for part-computerized testing, and the reader can refer to the most appropriate elements. For example, only the sending and scoring of assessment papers may be computerized. Given this, guidelines dealing with security and confidentiality of data are important.

In general, the guidelines can apply to both high and low stakes assessment. As an example, high stakes assessments are those where a third party requires the results of the test for use in the process of making an important decision about a test-taker. (High-stakes testing may also include those that are used to make decisions about groups of test-takers, such as a school class.) By contrast, an example of low stakes assessment would be where the test-taker obtains the information for his or her own interest. That some guidelines apply only to high-stakes testing environments is made clear within the text itself.

Again, unless otherwise specified in the text, the guidelines presented here should be considered as applying to a number of modes of supervision and across a number of testing scenarios. Four modes of test administration are considered:

- Open mode—where there is no direct human supervision of the assessment session, and hence, there is no means of authenticating the identity of the test-taker. Internet-based tests without any requirement for registration can be considered an example of this mode of administration.
- Controlled mode—no direct human supervision of the assessment session is involved, but the test is made available only to known test-takers. Internet tests will require test-takers to obtain a logon username and password. These often are designed to operate on a one-time-only basis.²

²Standardization of the testing environment is not possible with open mode testing, and often not possible in the Controlled mode of testing.

- Supervised (proctored) mode—where there is a level of direct human supervision over test-taking conditions. In this mode, test-taker identity can be authenticated. For Internet testing, this would require an administrator to login a candidate and confirm that the test had been properly administered and completed.
- Managed mode—where there is a high level of human supervision and control over the test-taking environment. In CBT, this is normally achieved by the use of dedicated testing centers, where there is a high level of control over access, security, the qualification of test administration staff, and the quality and technical specifications of the test equipment.³

Application of these guidelines needs to be considered in terms of their relevance for a range of different testing scenarios (e.g., guidelines are more appropriate for the more high-stakes forms of scenarios). For example, in relation to testing in work and organizational settings, four main scenarios can be identified:

- Guidance—personnel development or career guidance, where the test-taker requires the information for his or her own interest.
- Prescreening recruitment—covers assessment carried out on people up to the point at which they are sifted to form a short-list.
- Postsift selection—assessments on a known set of applicants who have been previously short-listed.
- Posthire assessment—assessments carried out on employees of an organization by or on behalf of the organization. This may be either high or low stakes assessment.

In addition, in clinical/counseling settings, four scenarios could be

- Development and decision-making purposes—where the information is used by the client and therapist/counselor to identify aspects of functioning that require development or to make decisions (e.g., career assessment).
- Screening—to get a global picture of the client's functioning.
- Diagnostic purposes—to identify specific strengths and weaknesses that can guide intervention planning.
- Planning and evaluating intervention/therapy.

Each of these raises different issues regarding control and security.

³Standardization is possible with supervised mode and managed mode.

WHO ARE THE GUIDELINES FOR?

The guidelines apply to the use of CBT and Internet tests in professional practice. Thus, they are directed toward *test users* who

- Purchase and use CBT/Internet tests.
- Are responsible for selecting tests and determining the use to which tests will be put.
- Administer, score, or interpret tests (invigilators/proctors).
- Provide advice to others on the basis of test results (e.g., recruitment consultants, educational and career counselors, educational and school psychologists, trainers, succession planners, organizational development consultants).
- Are concerned with the process of reporting test results and providing feedback to people who have been tested.

These guidelines also specifically address three other main stakeholders in the testing process:

- Developers of CBT and Internet tests.
- Publishers of CBT and Internet tests (who also may be involved in test development).
- Consultants to developers and publishers of CBT and Internet tests.

The guidelines are relevant to others involved in the use of CBT and Internet tests. These include

- Those involved in the training of test users.
- Those who take tests and their relevant others (e.g., parents, spouses, partners).
- Professional bodies and other associations with an interest in the use of psychological and educational testing.
- Policymakers and legislators.

CONTEXTUAL FACTORS

The guidelines are intended to be applicable internationally. Many factors may affect how standards may be managed and realized in practice. These contextual factors have to be considered at the local level when interpreting these guidelines and defining what they would mean in practice within any particular setting.

The factors that need to be considered for turning the guidelines into specific standards include

- Social, political, institutional, linguistic, and cultural differences between assessment settings.
- Laws, statutes, policy, and other legal documentation that addresses testing issues.
- Laws applying to the various countries through which test data may pass or be stored.
- Existing national guidelines and performance standards set by professional psychological societies and associations.
- Differences relating to individual versus group assessment.
- Differences related to the test setting (educational, clinical, work-related, and other assessment).
- Who the primary recipients of the test results are (e.g., the test-takers, their parents or guardian, the test developer, an employer, or other third party).
- Differences relating to the use of test results (e.g., for decision making, as in selection screening, or for providing information to support guidance or counseling).
- Variations in the degree to which opportunity exists for the accuracy of interpretations to be checked in light of subsequent information and amended, if needed.

THE ITC GUIDELINES

1. Give due regard to technological issues in CBT and Internet testing
 - a. *Give consideration to hardware and software requirements*
 1. Test Developers
 1. Provide a clear description of the minimum hardware and software requirements of the CBT. For Internet testing, specify browsers that will support the test.
 2. Conduct adequate usability testing of the system requirements using the appropriate delivery platforms to ensure consistency of appearance and delivery.
 3. Use appropriate technological features to enhance usability and follow established graphical user interface (GUI) design standards. For example, complex graphics and interactive features may reduce software running speed or increase download time. Items should be designed to fit the test purpose and objectives of assessment, and advanced multimedia features should be used only where justified by validity.
 4. Design the system to accommodate likely advances in technology.
 5. Design the Internet-delivered testing system to take account of the possibility of fluctuations in demand at different times.

6. Ensure applications of technology advances are tested, documented, and explained to users.
 7. Minimize the number of updates and version changes that are issued.
 8. Take account of the widely differing connection speeds that apply globally.
2. Test Publishers
 1. Verify the documented minimum hardware, software, or browser requirements to ensure that they are communicated clearly to the user. Ensure that other technical and operational requirements for the test are explained to the user.
 2. Confirm that adequate testing of the system has been completed and documented on the appropriate delivery platforms stated to be suitable.
 3. Use only software or hardware features that are essential for measuring the construct and that are likely to be available on systems used by the intended test users and test-takers.
 4. Ensure that the test will be as easy as possible to support and maintain in light of likely developments in hardware and software (operating systems, etc.).
 5. Test and document any new features added to the program after publication.
 3. Test Users
 1. Ensure that you have sufficient understanding of the technical and operational requirements of the test (i.e., hardware and software), as well as the necessary hardware, software, and human resources to obtain, use, and maintain the CBT on an ongoing basis.
 2. Confirm that the system the test-taker is using is documented as being suitable.
 3. Ensure there is a good justification for the use of complex software, graphics, and technical IT features in the CBT/Internet test.
 4. Monitor supplier for information on future changes to the hardware requirements, test system, or software.
 5. Ensure understanding of the implications of changes and their impact on the testing process.
 - b. Take account of the robustness of the CBT/Internet test*
 4. Test Developers
 1. Test the system to confirm that it is sufficiently robust and capable of dealing with likely system failures and user error.
 2. Ensure that the CBT/Internet test is as “fail-safe” as possible to minimize problems arising while the test-taker is responding. Where possible and appropriate,
 - Treat upper and lower case fonts as equivalent.
 - Prevent operation of keys or controls that have no function in the test.

- Eliminate auto-repeat functions of keys.
 - Prevent a test-taker from exiting the test by accident.
 - Provide timely and helpful error feedback.
 - Follow GUI standards regarding features such as color, layout, and design, and
 - If standardization is not important, allow the user multiple ways to navigate through the system, or allow the user to modify the interface to their liking.
3. When the CBT/Internet test is timed, design the system to respond promptly so that commands have an immediate effect on the screen (e.g., GUI design standards would indicate no more than a 2-sec delay onscreen).
 4. When the CBT/Internet test is timed, design features so that the time required to move between questions and for the system to record the answer is not part of the timed element (e.g., the test engine should deduct these times from the timing of the test or the timing clock should stop during access transitions).
 5. For Internet testing, minimize the impact of hang-ups, lost Internet connections, and slow downloading (e.g., the system should ensure that no information is lost when the Internet connection is lost).
 6. Provide documentation that specifies what to do in the event of routine problems with hardware and/or software.
5. Test Publishers
 1. Confirm that the robustness of the system has been checked across a range of suitable platforms.
 2. Provide sufficient redundancy on all systems throughout the testing site (including incoming and outgoing communications) to allow the site to operate even if one of its components fails.
 3. Check the degree to which the test prevents user errors from causing administration problems. Provide users with guidance on what to do in the event that “bugs” occur during testing (e.g., a test user should be able to report bugs and problems that may be experienced during the testing process).
 4. Provide users with contact details (e.g., telephone number, Internet address) for technical support.
 5. Confirm that the CBT/Internet test responds in a timely manner when taking the test. Where this does not occur, inform test developers and discontinue use of the test until the problem is solved.
 6. For Internet testing, put procedures in place to deal fairly with the impact of hang-ups, lost connections, and slow downloads. Where download or other technical problems occur, advise the test

user/taker of alternatives (e.g., using alternative media or an alternative venue).

7. Document and disseminate relevant technical support to test users. Where appropriate, offer technical support services with trained staff.
6. Test Users
1. Before beginning a test, verify that its robustness has been adequately tested (e.g., documentation provides supporting evidence).
 2. Ensure processes are in place to log and resolve problems that may arise during testing.
 3. Check availability of the information necessary for contacting the provider of technical support, and use technical support services as necessary.
 4. Inform test publishers/developers where problems occur with the responsiveness of the computer to the test-taker input.
 5. For Internet testing, know the recommended procedures for dealing with hang-ups, lost connections, and slow downloads, and advise test-takers accordingly.
 6. Provide the test-taker with the technical support specified in the test documentation if any routine problems occur.
- c. *Consider human factors issues in the presentation of material via computer or the Internet*
7. Test Developers
1. Design systems to follow GUI design standards that have been established by groups such as Human Factors International, including but not limited to
 - Ensuring screens have adequate resolution and color.
 - Using consistent screen locations and color for instructional text and prompts.
 - Using consistent screen design, layout, and colors.
 - Differentiating between test items and test instructions.
 - Displaying only relevant information on screen and ensuring the screen is not overfilled.
 - Placing critical information at the start of the text.
 - Providing instruction screens with clear fonts and avoiding distracting logos/images.
 - Allowing test-takers to review or return to the instruction screen(s) where appropriate.
 - Ensuring representation of status change of display entities (e.g., dimming, highlighting) is consistent in appearance and logical and meaningful.
 2. Display test name, item number, and test prompts or directions at the same location on the screen for each test page.

3. Produce nonalarming, clear, and concise error messages that inform how to proceed. Following an error alert, allow the test-taker to correct any errors and continue the test in the most efficient manner possible.
8. Test Publishers
 1. Verify that screen design issues have been taken into account in the development of the CBT/Internet test. Where problems are noticed, provide clear and detailed information about the problems to the test developer.
 2. Verify that item presentation is consistent throughout the test.
 3. Verify that appropriate and informative error messages are presented when necessary.
 9. Test Users
 1. Be familiar with the screen design requirements of the test, and ensure that such features are compatible with the systems being used.
 2. Ensure that test-takers are informed of screen design conventions, including where instructional text and prompts are placed and how instructions can be accessed once testing begins.
 3. Be familiar with how items are presented and how the test-taker is required to respond.
 4. Verify that error messages are nonalarming and inform how to proceed.
 - d. Consider reasonable adjustments to the technical features of the test for candidates with disabilities*
 10. Test Developers
 1. Design CBT/Internet tests with hardware/software (e.g., response format) that facilitates the participation of test-takers with disabilities and special needs.
 2. Design CBT/Internet tests with hardware and software that can be modified to allow for appropriate test accommodations (e.g., increased font size).
 11. Test Publishers
 1. Confirm that the hardware/software features of the CBT/Internet test facilitate the participation of test-takers with disabilities and those with special needs (e.g., those who need larger page font).
 2. Inform test users about the types of accommodations and modifications that can be made for test-takers with disabilities and those with special needs.
 3. Inform test users of the acceptable limits to which tests can be modified or accommodations provided to test-takers.
 4. Ensure that test modification and accommodations provided to test users are consistent with legislation regarding individuals with disabilities and special needs.

12. Test Users

1. Check that the hardware/software features facilitate the participation of test-takers with disabilities and those with special needs.
 2. Follow best practice as in other modes of testing (see ITC, 2001, Guidelines for Test Use).
 3. Ensure that any necessary test modifications specifically address the test-taker's special needs and are within acceptable limits so as to not adversely affect score validity.
 4. Be aware of the impact that these modifications may have on the test-taker's score.
 5. Consider the use of alternative assessment procedures rather than modifications to CBT/Internet tests (e.g., paper-and-pencil test or alternative structured forms of assessment).
- e. Provide help, information, and practice items within the CBT/Internet test*

13. Test Developers

1. Provide clear, accurate, and appropriate technical support documentation in both electronic and paper formats. Ensure that such documentation is written at an appropriate level for its target audience.
2. Provide clear instructions on how to load and set up the testing system. For Internet testing, information should be provided on how to log test-takers on and off the system.
3. Provide sufficient and easily available on-screen instructions and help for test-takers. This should include, at a minimum, information about the test (number of items, timing, and types of items) and the testing procedure (how to navigate through the system and how to exit).
4. Where appropriate, develop tutorials or practice tests/items that provide test-takers the opportunity to familiarize themselves with the CBT/Internet test.

14. Test Publishers

1. Provide technical support documentation at a level appropriate for test users. Where appropriate, provide additional customer support services.
2. Disseminate instructions on how to set up the system to test users. For Internet testing, inform, where appropriate, test users about how to log a test-taker onto and off the system.
3. Provide clear and sufficient on-screen instructions.
4. Where appropriate, verify that suitable practice items and tutorials are available. For Internet testing, provide procedures to verify whether a test-taker has accessed practice items and tutorials. Often a test cannot be started until certain practice items have been completed.

15. Test Users

1. Understand the technical support documentation provided with the test and how to access additional technical support when needed.
2. Know how to set up, load, and logon to the system.
3. Ensure that the test-taker has access to information on the test and the testing process before beginning the test and is able to access on-screen help while completing the test.
4. For Internet testing, provide clear information to the test-taker on how to logon to and off of the system (e.g., the use of passwords).
5. Provide sufficient opportunity for the test-taker to become familiar with the testing software and the required hardware.
6. Where appropriate, direct test-takers to appropriate Internet testing practice sites.
7. Where appropriate, inform the test-taker about available practice tests. Make it clear that it is the test-taker's responsibility to practice any embedded tutorials and responses to test items (e.g., use of the input device).
8. Where appropriate, collect data on test-taker reactions toward Internet-delivered testing and provide feedback to test developers to help them ensure a more positive experience for test-takers.

2. Attend to quality issues in CBT and Internet testing

- a. *Ensure knowledge, competence, and appropriate use of CBT/Internet testing*

16. Test Developers

1. Document the constructs that are intended to be measured and investigate whether CBT/Internet mode of delivery is appropriate in terms of content and technical adequacy to access the relevant constructs.
2. Ensure all those involved in test design and development (item writers, psychometricians, software developers, etc.) have sufficient knowledge and competence to develop CBT/Internet tests.
3. Remain current on recent advances in CBT/Internet testing, including advances in computer hardware and software technologies and capabilities.
4. Adhere to legal, professional, and ethical mandates and guidelines related to CBT/Internet testing.
5. It is important that, during the development of items and tests, the content is protected through the use of agreements as well as sound security procedures.

17. Test Publishers

1. Ensure that the CBT/Internet test is suitable in terms of content and technical adequacy for its stated purpose and intended test-taker groups.

2. Provide test users with sufficient information about the CBT/Internet test, its modes of operation, and basic computer functions. If appropriate, provide training materials that are specific to CBT/Internet tests and testing.
 3. Provide test users with “best practice” testing policies.
 4. Provide test users with clear instructions on how to correctly access and administer Internet tests, including how to log test-takers onto the system.
 5. Maintain and regularly update documentation relating to CBT/Internet testing, including pertinent changes in legislation and policy.
 6. Adhere to legal, professional, and ethical mandates related to CBT/Internet testing.
 7. For Internet testing, document the limitations of the test in terms of the professional context in which it operates:
 - Provide a statement indicating the limitations of the relationships between test user and test-taker that can be achieved through this mode (e.g., the Internet is an impersonal medium and a test user may provide only limited advice).
 - Provide a statement indicating that there are limitations to the conclusions that can be reached just using the Internet test scores.
18. Test Users
1. Assess the appropriateness of the content and technical adequacy of CBT/Internet testing relative to alternative testing methods for each client. Inform test-takers of the purpose of the testing so that they are able to make an informed decision on the appropriateness of the test for their situation.
 2. Have adequate knowledge of the CBT/Internet test and its modes of operation. When required, attend appropriate training events and read and have knowledge of relevant training materials.
 3. Follow best practices in the use of CBT/Internet testing, and, where appropriate, create “best practice” testing policies.
 4. Verify that test-takers know how to interact with an Internet testing system (e.g., basic browser operation, use of access passwords).
 5. Maintain and regularly update knowledge about CBT/Internet testing, including pertinent changes in legislation and policy.
 6. Adhere to legal, professional, and ethical mandates related to CBT/Internet testing.
 7. Inform test-takers of the limitations of the Internet test in terms of the professional relationship expected from this medium.
 8. For Internet testing, provide a contact point (e.g., e-mail or phone) for those who do not understand the purpose of the test.

b. Consider the psychometric qualities of the CBT/Internet test

19. Test Developers

1. Document and disseminate information on the validity, reliability, and fairness of the CBT/Internet testing process.
2. Ensure that current psychometric standards (test reliability, validity, etc.) apply even though the way in which the tests are developed and delivered may differ.
3. Take care that the CBT/Internet test does not require knowledge, skills, or abilities (e.g., computer skills) that are irrelevant to or might impede the test-taker's ability to perform the test.
4. Describe the theoretical and practical applications of algorithms used in test-item selection and/or controlling item or test order (as in adaptive testing).
5. Where test-item content changes, retest and evaluate the changes.

20. Test Publishers

1. Provide appropriate documentation for the psychometric properties of the CBT/Internet test.
2. Ensure that current psychometric standards (test reliability, validity, etc.) have been met even though the way in which the tests are developed and delivered may differ.
3. Publish and offer online only those tests that have appropriate psychometric evidence to support their use.
4. When offering assessments online, give advice to test users as to what to look for to help them distinguish between tests with and without documented psychometric properties.
5. Verify that the CBT/Internet test does not require knowledge, skills, or abilities that are irrelevant to the construct being assessed.
6. Provide documentation that describes the algorithms and measurement models used, and present evidence showing that the test has been validated using these algorithms or models.
7. For tests based on models that may be unfamiliar to test users, provide explanations of the relevant concepts for the user.
8. Verify that psychometric model fit has been re-evaluated when changes are made to the test content.

21. Test Users

1. Ensure that documentation of the appropriate psychometric evidence is supplied with the CBT/Internet test.
2. Ensure that current psychometric standards (test reliability, validity, etc.) have been met even though the way in which the tests are developed and delivered may differ.

3. Be able to distinguish between tests with and without documented psychometric properties. Those with documented evidence ensure that the evidence is appropriate for the intended use of the test.
 4. For Internet testing, use only those Web sites supported by publishers who offer validated psychometric tests.
 5. Check that the CBT/Internet test does not require knowledge, skills, or abilities that are irrelevant to the construct being assessed.
 6. Where appropriate, review and understand the documentation that describes how the CBT/Internet test uses algorithms for item generation, selection, or test construction; controlling the order of testing; and the model underlying the development of the test.
 7. When necessary, access appropriate training to ensure continuing professional development.
 8. Document information provided about changes to test items or parameters and their impact on the test properties.
- c. *Where the CBT/Internet test has been developed from a paper-and-pencil version, ensure that there is evidence of equivalence*
22. Test Developers
 1. Provide clear documented evidence of the equivalence between the CBT/Internet test and noncomputer versions (if the CBT/Internet version is a parallel form). Specifically, to show that the two versions
 - Have comparable reliabilities.
 - Correlate with each other at the expected level from the reliability estimates.
 - Correlate comparably with other tests and external criteria.
 - Produce comparable means and standard deviations or have been appropriately calibrated to render comparable scores.
 2. When designing a CBT/Internet version of a noncomputerized test, ensure that
 - There is equivalent test-taker control (such as the ability to skip or review items) as on the manual version.
 - The method of item presentation ensures that the results from the CBT/Internet test are equivalent to the manual version.
 - The format for responding is equivalent.
 3. For Internet-based tests, studies of test equivalence and norming should be conducted over the Internet, with participants completing the test under conditions that represent those that the intended target population will experience (e.g., unproctored or unstandardized testing conditions).
 23. Test Publishers
 1. Evaluate the documented evidence of the equivalence of the CBT/Internet test, especially if norms from manual versions are to be

- used by test users to interpret scores on a computerized version of the test.
2. If the developer does not provide evidence of equivalence (e.g., comparable reliabilities, etc.), conduct appropriate equivalence studies.
 3. If the developer does not provide evidence relating to the use of the test under conditions that represent those that the intended target population will experience (e.g., unproctored, unstandardized testing), additional studies of test equivalence and norming should be conducted.
 4. Verify that the technical features of the CBT/Internet test (e.g., test-taker control and item presentation) allow the results from the CBT/Internet test to be equivalent to the manual version.
24. Test Users
1. Confirm that the evidence regarding the equivalence of the CBT/Internet test to the manual version is sufficient.
 2. If norms are based on manual versions of the test, confirm that evidence has been obtained to show equivalence of test means and standard deviations across versions and for appropriate subpopulations.
 3. Verify that the technical features of the CBT/Internet test (e.g., test-taker control and item presentation) allow the results from the CBT/Internet test to be equivalent to the manual version.
 4. Only use the test in those modes of administration for which it has been designed (e.g., do not use a test in an unproctored mode when it is specified for use only in proctored modes).
- d. Score and analyze CBT/Internet testing results accurately*
25. Test Developers
1. Ensure the accuracy of rules/algorithms underlying the scoring of the CBT/Internet test.
 2. Provide appropriate documentation of the use and validity of scoring rules.
 3. Where reports classify test respondents into categories, such as “Introverted type” or “High sales potential,” provide information in the test manual that specifies the accuracy of the classification system used to generate computer-based test interpretations (CBTI).
 4. Describe the rationale for CBTI statements and how statements are derived from particular scores or score patterns.
 5. When test data are hand-entered into a computer, devise procedures to allow for data to be checked for accuracy.
26. Test Publishers
1. Confirm that the accuracy of scoring rules has been adequately evaluated prior to test use.

2. Inform test users about the scoring rules employed within the CBT/Internet test (e.g., use of nonscored items, penalties for guessing).
 3. Inform test users how CBTI statements are derived and the validity of that methodology.
 4. Stress to test users the importance of carefully checking data input by hand into a computer for scoring.
27. Test Users
1. Review and understand the rules underlying the scoring of the CBT/Internet test.
 2. Inform test-takers, when appropriate, about how scores are generated.
 3. Know how the statements in the CBTI are derived, and be aware of the limitations such methods may have.
 4. Ensure the accuracy of test data that are hand-entered into the computer.
- e. Interpret results appropriately and provide appropriate feedback*
28. Test Developers
1. Illustrate potential limitations of the CBTI specific to the current CBT/Internet test.
 2. Design and embed individual CBTI report templates for all stakeholders in the testing process.
 3. Illustrate how to obtain these various reports and what is contained within each report. In particular, consider the
 - Media (e.g., text, graphics, etc.).
 - Complexity of the report.
 - Report structure.
 - Purposes of testing.
 - Degree of modifiability.
 - Style and tone of report.
 - Intended recipients.
 4. Provide appropriate guidance on giving feedback, including necessary training requirements for interpreting the CBTI.
29. Test Publishers
1. Inform test users of the potential limitations of interpreting results using CBTI. Specifically,
 - Statements in a report may be general and not directed toward the specific purpose of the assessment (or specific individuals).
 - Interpretation is based only on scores of those tests whose data were used as input; therefore, other ancillary data that may be important cannot be taken into account (e.g., scores on other, noncomputerized forms of assessment).

- For open or controlled modes of Internet testing, test-takers may have been tested in nonstandardized, unproctored, or variable conditions, whereas score interpretations are based on administration in proctored, standardized conditions.
 - Some tests are completed in an administration mode that makes it impossible to guarantee the true identity of the test-taker.
2. Assess the suitability of the CBTI provided within the CBT/Internet test system. In particular, take note of
 - Evidence of the validity and utility of reports.
 - The coverage of the reports.
 - The consistency of the reports based on similar sets of data.
 - The acceptability of the report to intended audiences.
 - Time, cost, and length implications for a test user.
 - Freedom from systematic bias.
 3. Advise test users on how best to share CBTI with test-takers and other relevant stakeholders.
 4. Inform test users of ethical and other accepted practice issues related to providing CBTI feedback to test-takers.
30. Test Users
1. When interpreting the CBTI results, be aware of potential limitations, general and specific, to the reports being used. For example:
 - Score interpretations are based on administration in proctored, standardized conditions and the test has been administered under open or controlled modes, and there is no evidence provided to support the validity of the report under such conditions.
 - Tests are completed in an administration mode that makes it impossible to guarantee the true identity of the test-taker.
 - Tests alone, however administered, may not provide a complete assessment of an individual, as other confirmatory or ancillary information is not considered.
 2. Select and use the most appropriate CBTI template for the client or intended audience.
 3. Ensure that the language and information given in the CBTI fit the needs of the intended stakeholder (e.g., test-taker, organization, and client).
 4. Confirm that there is a sound basis for the CBTI and that its rationale is well-documented.
 5. Where possible, edit CBTI reports to include information obtained from other sources to ensure a comprehensive treatment of the test-taker's background, behavior, ability, aptitude, and personality.
 6. Ensure appropriate, relevant, and timely feedback is provided to the test-taker and other relevant stakeholders.

7. Ensure that Internet testing presents test interpretations in a comprehensible and meaningful form.
8. Provide client test interpretations that are appropriate for the context and intended use of the test (e.g., high-or low-stakes testing, corporate vs. individual applications).
9. Take account of ethical issues surrounding the provision of feedback using the Internet (e.g., the difficulty of knowing the effect of providing negative feedback to a test-taker, the lack of knowledge of the emotional state of the test-taker, or the difficulty of providing immediate support to a test-taker when feedback has a negative impact). Where appropriate, feedback should include directions on how to access support and other information.

f. Consider equality of access for all groups

31. Test Developers

1. Document the methods used to enhance psychometric fairness and equality of access.
2. Assess differential item functioning (DIF), and, where DIF might be a problem for one or more groups, identify where this problem occurs and attempt to modify the test to overcome such problems.
3. When developing CBT/Internet tests that may be used internationally, take into account the fact that countries differ in their access to computer technology or the Internet.
4. For tests that are to be used internationally,
 - Avoid the use of language, drawings, content, graphics (etc.) that are country or culture specific.
 - Where culture-specific tests may be more suitable than culturally neutral ones, ensure that there is construct equivalence across the different forms.
5. If developing adapted versions of an Internet test for use in specific countries, ensure the equivalence of the adapted version and that the adaptation conforms to the ITC Guidelines on Test Adaptation.

32. Test Publishers

1. Where possible, encourage test users to collect biographical data on test-takers to monitor the number of people from protected/minority groups who take any CBT/Internet test.
2. Where unequal access to CBT/Internet tests may occur, recommend that test users make alternative forms of assessment available.
3. Inform test users of any evidence regarding DIF for different test-taker groups.
4. When tests are published internationally, provide test users with advice on how to ensure equivalent access to computer technology or the Internet for geographically diverse groups of test-takers.

5. Where an adapted version of a test is available, provide documentation specifying the equivalence of the adaptation to the original assessment.
33. Test Users
 1. To monitor for possible adverse impact, collect data on the number of individuals accessing the CBT/Internet test from protected/minority groups.
 2. For most countries, such groups may be legally defined in terms of one or more of the following: ethnicity, gender, age, disability, religion, and sexual orientation.
 3. Where there is evidence of possible inequality of access, offer the use of alternative methods of testing.
 4. Where possible, collect data to monitor group differences in test scores.
 5. Consider the appropriateness and feasibility of Internet testing if testing in locations with limited access to computer technology or the Internet.
 6. If testing internationally, use the country-specific adapted versions of the test, if available.
 3. Provide appropriate levels of control over CBT and Internet testing
 - a. *Detail the level of control over the test conditions*
 34. Test Developers
 1. Document the hardware, software, and procedural requirements for administration of a CBT/Internet test.
 2. Provide a description of the test-taking conditions required for appropriate CBT/Internet test administration.
 3. Design the CBT/Internet test to be compatible with country-specific health and safety, legal, and union regulations and rules (e.g., time on task).
 35. Test Publishers
 1. Provide sufficient details to test users on hardware, software, and procedural requirements for administering the CBT/Internet test.
 2. Describe the test-taking conditions that candidates should consider when undertaking an Internet-based test.
 3. Inform test users of the need to consider health and safety rules during CBT/Internet testing. For example, identify whether an Internet test has the facility for breaks if the testing process is lengthy.
 36. Test Users
 1. When administering the test, adhere to the standard hardware, software, and procedural requirements specified in the test manual. Before testing, ensure that software and hardware are working properly.

2. When testing at a specific test center, ensure that the test-taker is comfortable with the workstation and work surface (e.g., the ergonomics are suitable). For example, test-takers should
 - Be encouraged to maintain proper seating posture.
 - Be able to easily reach and manipulate all keys and controls.
 - Have sufficient leg room.
 - Not be required to sit in one position for too long.
 3. When testing via the Internet, provide instructions to test-takers that specify the best methods of taking the test.
 4. Ensure that the facilities, conditions, and requirements of the testing conform to national health and safety and union rules. For example, there may be rules governing the length of time a person should work at a monitor before having a break, or rules as to adequate lighting, heating, and ventilation. When testing over the Internet, inform test-takers of such rules and regulations.
- b. Detail the appropriate control over the supervision of the testing*
37. Test Developers
 1. Document the level of supervision required for the CBT/Internet test.
 - Open mode—no direct human supervision required.
 - Controlled mode—although no direct human supervision is required, the test is made available only to known test-takers.
 - Supervised mode—test users are required to log on a candidate and confirm that the testing was administered and completed correctly.
 - Managed mode—a high level of human supervision and control over test-taking conditions is required (as in a dedicated test center).
 2. Provide documentation for the testing scenarios for which the CBT/Internet test has been designed.
 38. Test Publishers
 1. Document the level of supervision expected for the CBT/Internet test.
 2. Specify and restrict the use of specific CBT/Internet tests for particular testing scenarios. For example, psychometric tests for use in postsift selection testing and/or posthire assessment normally would not be available in open mode.
 39. Test Users
 1. Identify the level of supervision required to administer the CBT/Internet test.
 2. Use the CBT/Internet test only in the appropriate testing scenarios for which it was designed.

- c. Give due consideration to controlling prior practice and item exposure*
40. Test Developers
1. For high-stakes Internet-based tests, use software that tries to equate item exposure rates for items drawn from item banks.
 2. Limit pilot testing of items on live tests to minimize unnecessary exposure.
 3. Make sure item banks are sufficiently large to permit making multiple parallel forms secure and to manage item exposure rates in adaptive testing.
 4. When parallel forms of a test are created, undertake appropriate psychometric analysis to document their equivalence.
 5. Contemplate delivery strategies that deter memorization of test content (e.g., by generation of unique tests for each candidate from item banks or by use of computer adaptive testing).
 6. Control exposure of fixed forms in geographies where cheating is more prevalent by restricted administration to supervised or managed modes.
41. Test Publishers
1. Verify that Internet-based maximum performance tests have appropriate controls to reduce item exposure.
 2. Provide test users with sufficient information on and training in how to control item exposure.
 3. Where appropriate, provide test-takers with practice without compromising the security of the test items.
42. Test Users
1. Document for test-takers the equivalence of parallel or multiple forms of a test.
 2. Protect the CBT/Internet test from previous item exposure by not coaching test-takers with actual test content.
 3. Where appropriate, provide test-takers with practice without compromising the security of the actual test items themselves.
- d. Give consideration to control over test-taker's authenticity and cheating*
43. Test Developers
1. Design features within the system (e.g., the facility for passwords and username access) that enables test publishers/users to have a level of control over access to various parts of the assessment system.
44. Test Publishers
1. Detail the level of authentication required to access various parts of the assessment system based on the mode of operation used. Exercise control by requiring test users (in the supervised and managed modes) and test-takers (in the controlled mode) to use a username and password when accessing the test.

2. For moderate or high stakes assessment involving multiple stages, provide information on how test users can reduce the risk of test-taker cheating (e.g., having another person to take the test as a proxy). Where an assessment is carried out in open or controlled mode, checks against cheating can be carried out by requiring the test-taker to undertake a subsequent validation assessment in proctored conditions (i.e., supervised or managed conditions) and a comparison of scores made.
 3. Identify the threats to test validity that exist if test control is not maintained properly.
 4. Provide advice on the design and implementation of “honesty (honor) policies” in assessment procedures if one or more stages of the process are to be carried out without direct human supervision.
45. Test Users
1. Ensure test-takers provide the appropriate level of authentication before testing begins. Remind test-takers (in the controlled mode) of the need to obtain a password and username to access the test. In supervised and managed testing conditions, test-takers should be required to provide authentic, government-approved picture identification.
 2. For moderate or high-stakes testing, confirm that procedures are in place to reduce the opportunity for cheating. Technological features may be used where appropriate and feasible (e.g., Closed Circuit Television), but it is likely that such testing will require the presence of a test administrator, a follow-up supervised assessment, or a face-to-face feedback session (e.g., for postsift assessment in job selection situations).
 3. For moderate and high stakes assessment (e.g., job recruitment and selection) where individuals are permitted to take a test in controlled mode (i.e., at their convenience in nonsecure locations), those obtaining qualifying scores should be required to take a supervised test to confirm their scores.
 - Procedures should be used to check whether the test-taker’s original responses are consistent with the responses from the confirmation test.
 - Test-takers should be informed in advance of these procedures and asked to confirm that they will complete the tests according to instructions given (e.g., not seek assistance, not collude with others, etc.).
 - This agreement may be represented in the form of an explicit honesty policy that the test-taker is required to accept.
 4. Provide test-takers with a list of expectations and consequences for fraudulent test-taking practices, and require test-takers to sign the agreement form indicating their commitment.

4. Make appropriate provision for security and safeguarding privacy in CBT and Internet testing
 - a. *Take account of the security of test materials*
46. Test Developers
 1. Design features into the CBT/Internet system that minimize the risk of test items, scoring keys, and interpretation algorithms being illegitimately printed, downloaded, copied, or sent electronically to another computer. For example, software can be developed that controls browser function by disabling access to menu selections (such as copy, paste).
 2. Design features into the system (e.g., firewalls) that protects the CBT/Internet test system and associated databases from illegal hacking and computer viruses.
47. Test Publishers
 1. Protect sensitive features of the test from illegitimate disclosure. For Internet testing, all important intellectual property (e.g., scoring rules, norms, interpretation algorithms) associated with a test should remain on the host server. Only test items and the outputs from report generators usually should appear on the test user's or test-taker's screens.
 2. Where appropriate, develop a policy that limits test material access to qualified and authorized test users and testing centers. For example, when testing over the Internet, test users would need to obtain and use a password before they were able to access test materials or set up an assessment for a test-taker.
 3. Passwords should be issued only to users qualified to use the Internet test.
 4. Verify and check that the CBT/Internet test has features to protect it from illegal hacking and computer viruses. Confirm for Internet testing that reasonable steps have been taken to prevent servers from being accessed by unauthorized or illegal means.
 5. For Internet testing, maintain control over the sensitive features of the test, and report copyright violations on the Internet. Monitor the Web for illegal versions, old/outdated versions, and part versions of the Internet test, and take steps (e.g., enforcing copyright law) to eliminate these violations.
 6. Take steps to secure protection of test content under existing laws.
 7. Take appropriate measures to identify stolen test material on the Internet and to estimate its impact of its distribution on the testing program.
 8. Take appropriate measures to control the distribution of stolen test material on the Internet, including notification of appropriate legal authorities.

9. Maintain a process for the adjudication of security breach allegations, and specify appropriate sanctions.
48. Test Users
1. Know the features that have been developed to ensure the security of test materials, and develop procedures that reduce unauthorized access to such materials.
 2. Respect the sensitive nature of test materials and intellectual property rights of test publishers/developers.
 3. Protect test materials from being copied, printed, or otherwise reproduced without the prior written permission of the holder of the copyright.
 4. Protect passwords and usernames from becoming known to others who are not authorized or qualified to have them.
 5. Inform the service provider/publisher of any breach in security.
- b. Consider the security of test-taker's data transferred over the Internet*
49. Test Developers
1. When designing an Internet test, build in features that safeguard test-taker data, and maintain the security of test material transferred over the Internet.
 2. Make use of proxy servers, where appropriate, and embed transactions within secure socket layers.
 3. Design data management systems to enable users to access, check, and/or delete data from the server in accordance with local data protection and privacy legislation.
 4. Design features that ensure regular and frequent backups of all collected data and that allow for recovery of data when problems emerge.
50. Test Publishers
1. Maintain the security of test-taker data transmitted over the Internet (e.g., by encryption).
 2. Ensure that test users and test-takers are informed that the host server has correctly received their data.
 3. Inform test users of their rights and obligations in relation to local data protection and privacy legislation.
 4. Conduct regular and frequent backups of all collected data, and provide test users with a detailed disaster recovery plan should problems emerge.
51. Test Users
1. Prior to test administration, have knowledge of and inform test-takers of the security procedures used to safeguard data transmitted over the Internet.
 2. Confirm with the service provider that they frequently back up data.

3. Verify that the service provider is able to allow test users and authorized others to discharge their responsibilities as data controllers under local data protection and privacy legislation (e.g., the European Union's Directive on Data Protection).
- c. *Maintain the confidentiality of test-taker results*
52. Test Developers
 1. Design features to allow secure storage of CBT/Internet test data on computer, disks, or server.
 2. Maintain the integrity of CBT/Internet test data by providing technology that does not allow unauthorized altering of information and that can detect unauthorized changes to information.
 3. Devise encryption devices and password protection that restrict access to test data.
 53. Test Publishers
 1. When test data must be stored with publishers, specify the procedures and systems to maintain the confidentiality and security of data.
 2. Inform test users of who has access to test data, for what purposes, and how long the data will be stored electronically.
 3. Adhere to country-specific data protection laws/regulations governing the storage of personal data.
 4. Restrict access to personal data stored on the host server to those who are qualified and authorized.
 5. Protect all sensitive personal material held on computer, disk, or a server with robust (nontrivial) encryption devices or passwords.
 6. Confirm the security and confidentiality of the backup data when used to store sensitive personal data.
 54. Test Users
 1. Know how confidentiality will be maintained when data are stored electronically.
 2. Adhere to country-specific data protection laws/regulations governing the collection, use, storage, and security of personal data.
 3. Protect all material via the use of encryption or passwords when storing sensitive personal data electronically on test center facilities.
 4. Apply the same levels of security and confidentiality to backup data as to the data on the live system when backups are used to store personal data.

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APPENDIX

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GLOSSARY

Browser. A program (e.g., Netscape or Internet Explorer) that allows an individual to view pages downloaded from the Internet.

Connection speed. The time taken for the browser to connect with the Internet test and download material.

Controlled mode. This is a mode of test administration in which control is exercised over who can access a test on the Internet and how often they can access it. It may also include controls over the location they can access it from and the time or date it is available.

Computer-based test interpretations (CBTI). Reports that are generated using algorithms to detail a test-takers' profile from computer/Internet testing. Such interpretations can be tailored to specific stakeholders and can differ in format.

Data management systems. Computer systems that handle file maintenance and disk space allocation, including data storage, record access, and the physical location of the files.

Delivery platforms. Combination of hardware and operating system for which the test has been developed. For example, designing a test to work on the Windows platform.

Differential item functioning (DIF). A difference in responses to a test item (or items) as a result of group membership (e.g., ethnicity) and not as a result of actual differences on the trait being measured.

Embedded tutorial. Help feature that is built into the computer software, which can be accessed by the test-taker and which provides a tutorial on how to use the test software.

Encryption device. Feature that allows data to be encrypted during transmission over the Internet.

Firewall. A server that protects data from outside or malicious access while allowing a reduced level of security precautions for internal communications (e.g., communications within an organization).

Graphical user interface (GUI) design standards. Industry standards for the effective design of the interactive outer layer (e.g., operating systems) of computer programs.

Hang-ups. A failure that results in the computer or Internet test not responding. Normally, a reset is required before testing can begin.

Input device. The hardware used to input information (data or commands) into the computer (e.g., keyboard, mouse, etc.).

Item bank. A large set of items, generally calibrated using Item Response Theory, that can be used for computer adaptive testing or to build up multiple unique Internet tests with known properties.

Item exposure. Repeated presentation of the same item. High levels of item exposure increase the likelihood that item security may be compromised.

Managed mode. A mode of administration in which there is both direct supervision and control over the equipment being used and other conditions. Typically, managed mode administration refers to the use of dedicated testing centers.

Multimedia. A combination of moving and still pictures as well as the use of sound by the computer software.

Open mode. A mode of administration where the test-taker has direct access to the test materials and there is no involvement of a test user or test administrator. Such tests include the books of tests you might buy in the local bookshop or the tests you can find on the Internet that are directly accessible to everyone. Often, the only requirement is that you pay some money before you can access the test. No qualifications are required from you, however, in terms of either test use or test administration.

Proctored. Testing in a supervised or managed format where there is direct human supervision over test-taking conditions.

Proxy servers. A server that acts as an intermediary between a user's computer and the computer they want to access. If a user makes a request for a resource from computer "A," this request is directed to the proxy server, which makes the request, gets the response from computer "A," and then forwards the response to the client.

Secure socket layers. A set of rules that enable encrypted communications to be made between devices (e.g., computers) over the Internet in a secure manner.

Servers. A server is a computer or a software application that provides a specific kind of service to client software running on other computers. The term can refer to a particular piece of software, such as a Web Server, or to the computer on which the software is running. A single computer may have several different server software applications running on it, thus providing many different servers to clients on a network.

Supervised mode. This is the mode in which the test administrator has direct face-to-face involvement with the test-taker. The test-takers will come to a location where the test administrator is able to supervise them taking the test. The test distributor, however, has no means of directly controlling the nature of the location or the type of equipment being used.

Test accommodations. Changes or adaptations made to the test (software, input devices, hardware, etc.) to accommodate individuals with disabilities.

Test developers. Those involved in designing and creating computer and Internet tests.

Test publishers. Those involved in selling and marketing computer and Internet tests. Publishers may also be involved in developing tests.

Test-takers. People who complete tests on computer or over the Internet.

Test users. A broad category of stakeholders who are involved in actually using the computer and Internet tests. This could involve purchasing tests, selecting appropriate tests, administering and scoring the tests, and providing feedback on test results to test-takers and others.

Unproctored. Testing in an open or controlled format where there is no direct human supervision over test-taking conditions.