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Information technology — Development of user interface accessibility —

Part 1: Code of practice for creating accessible ICT products and services

Technologies de l'information — Développement de l'accessibilité des interfaces utilisateur —

Partie 1: Code de bonnes pratiques pour créer des produits et services TIC accessibles

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ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: +41 22 749 01 11
Fax: +41 22 749 09 47
Email: copyright@iso.org
Website: www.iso.org

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Foreword

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

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

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

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

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

This document was prepared by Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 35, *User interfaces*.

A list of all parts in the ISO/IEC 30071 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 at www.iso.org/members.html.

Introduction

This document provides guidance on developing and implementing an organizational accessibility policy for creating accessible ICT systems (including products and services). It can help organizations to ensure that their ICT systems are accessible to diverse users.

The design of many ICT systems unnecessarily excludes users with disabilities or others with accessibility requirements, for example, older persons, which can leave organizations that provide these systems subject to legal challenge on the grounds of discrimination. However, by following good practice in creating, updating or procuring ICT systems, this exclusion can generally be prevented.

This document contains process-related guidance rather than technical requirements. It brings together and summarizes important information needed to enable organizations that create ICT systems to understand:

— how to create organizational policies to embed accessibility considerations into their "business as usual" processes;

— how to consider the needs of users with disabilities and older people at all stages of the ICT development process.

The document is intended for:

— persons responsible for setting high-level organizational policies;

— persons responsible for setting accessibility policies and procedures at the system, product or service level;

— persons responsible for directly designing or implementing accessibility activities derived from the policies applied within the organization.

The guidance in this document focuses on activities and outcomes rather than specifying complete processes and methods, allowing organizations to implement this guidance in the manner most suited to their individual organizational culture and operations.

Drivers for organizations to make their ICT systems more accessible and usable include:

a) legal reasons;

b) commercial reasons;

c) ethical reasons/human rights/social responsibility;

d) innovation reasons.

Often, these drivers interrelate. These include the accessibility of ICT systems that support employment, those used in public and private transport, in public buildings, in the home, in education, in social networking and in the ubiquitous use of ICT known as the Internet of Things. Ensuring systems are accessible to the widest range of diverse users will increase inclusion. This can create benefits for many sectors of society.

Information technology — Development of user interface accessibility —

Part 1: Code of practice for creating accessible ICT products and services

1 Scope

This document takes a holistic approach to the accessibility of information and communications technology (ICT) by combining guidance on implementing the accessibility of ICT systems (ICT accessibility) both at organizational and system development levels.

This document gives guidelines for building and maintaining ICT systems (including products and services) that are accessible to diverse users (including users with disabilities and older people).

This document is applicable to all types of organizations. This document applies to the breadth of ICT systems and the results of convergent and emerging technologies within an organization including, but not limited to: information systems; intranet systems; websites; mobile and wearable applications; social media; and Internet of Things (IoT) systems.

It gives requirements and recommendations for organizations:

a) ensuring accessibility is considered in their policies or strategy by creating an organizational ICT accessibility policy;

b) embedding the consideration of accessibility decisions through the entire process of developing procuring, installing, operating and maintaining ICT systems, and documenting these choices;

c) justifying decisions on accessibility;

d) communicating the ICT system's accessibility decisions to its users at launch, through creating and publishing its accessibility statement.

2 Normative references

There are no normative references in this document.

3 Terms and definitions

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

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

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

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

3.1 Accessibility and related definitions

3.1.1
accessibility
extent to which products, systems, services, environments and facilities can be used by people from a population with the widest range of user needs, characteristics and capabilities to achieve identified goals in identified contexts of use

Note 1 to entry: Context of use includes direct use or use supported by assistive technologies.

[SOURCE: ISO 9241-112:2017, 3.15]

3.1.2
usability
extent to which a system, product or service can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use

Note 1 to entry: The "specified" users, goals and context of use refer to the particular combination of users, goals and context of use for which usability is being considered.

Note 2 to entry: The word "usability" is also used as a qualifier to refer to the design knowledge, competencies, activities and design attributes that contribute to usability, such as usability expertise, usability professional, usability engineering, usability method, usability evaluation, usability heuristic.

[SOURCE: ISO 9241-11:2018, 3.1.1]

3.1.3
effectiveness
accuracy and completeness with which users achieved specified goals

[SOURCE: ISO 9241-11:2018, 3.1.12]

3.1.4
efficiency
resources used in relation to the results achieved

Note 1 to entry: Typical resources include time, human effort, costs and materials.

[SOURCE: ISO 9241-11:2018, 3.1.13]

3.1.5
satisfaction
extent to which the user's physical, cognitive and emotional responses that result from the use of a system, product or service meet the user's needs and expectations

[SOURCE: ISO 9241-11:2018, 3.1.14 — modified, Notes 1 and 2 to entry removed]

3.1.6
user experience
person's perceptions and responses resulting from the use and/or anticipated use of a product, system or service

Note 1 to entry: User experience includes all the users' emotions, beliefs, preferences, perceptions, physical and psychological responses, behaviours and accomplishments that occur before, during and after use.

Note 2 to entry: User experience is a consequence of brand image, presentation, functionality, system performance, interactive behaviour and assistive capabilities of a system, product or service. It also results from the user's internal and physical state resulting from prior experiences, attitudes, skills and personality, and the context of use.

[SOURCE: ISO 9241-11:2018, 3.2.3]

3.1.7
goal
intended outcome

[SOURCE: ISO 9241-11:2018, 3.1.10]

3.1.8
accessibility experience
experience of an individual of the accessibility of a system

Note 1 to entry: Accessibility experience can be considered at three levels: technical, effective and efficient, and satisfying.

Note 2 to entry: The basic level of accessibility experience that is acceptable in a particular country will depend on that country's accessibility legislation.

3.1.9
individualization
modification of interaction and presentation of information to suit individual capabilities and needs of users

[SOURCE: ISO 9241-171:2008, 3.17]

3.2 Users and systems related definitions

3.2.1
user
individual who accesses or interacts with a system

[SOURCE: ISO/IEC Guide 71:2014, 2.2]

3.2.2
diverse users
individuals with differing abilities and characteristics or accessibility needs

[SOURCE: ISO/IEC Guide 71:2014, 2.3]

3.2.3
user group
subset of intended users who are differentiated from other intended users by characteristics of the users, tasks or environments that could influence usability

[SOURCE: ISO 9241-11:2018, 3.1.8]

3.2.4
system
product, service, or built environment or any combination of them with which the user interacts

[SOURCE: ISO/IEC Guide 71:2014, 2.1]

3.2.5
ICT
information and communication technology
technology for gathering, storing, retrieving, processing, analysing and transmitting information

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

3.2.6
ICT system
system utilizing ICT

3.3 Definitions relating to developing accessibility

3.3.1
user accessibility need
user need related to features or attributes that are necessary for a system to be accessible

Note 1 to entry: User accessibility needs vary over time and across contexts of use.

[SOURCE: ISO/IEC Guide 71:2014, 2.4]

3.3.2
activity
set of cohesive tasks of a process

[SOURCE: ISO/IEC/IEEE 15288:2015, 4.3]

Note 1 to entry: Organizations can use checkpoints to ensure that activities are performed.

3.3.3
organization
company, non-profit organization, government department, local council, public sector organization or academic institution

3.3.4
content author
individual or organization responsible for authoring ICT content, as distinct from designing it, or coding it

3.3.5
context of use
physical and social environments in which a system is used, including users, tasks, equipment and materials

[SOURCE: ISO/IEC Guide 71:2014, 2.7]

3.3.6
diverse contexts
differing contexts of use and differing economic, cultural and organizational conditions

[SOURCE: ISO/IEC Guide 71:2014, 2.8]

3.3.7
assistive technology
hardware or software that is added to or incorporated within an ICT system that increases accessibility for an individual

Note 1 to entry: This includes all such software which is either: part of the operating system, installed into the operating system (executable extensions or applications), installed into the browser (plug-ins), or included on the website.

EXAMPLE Screen readers and text-to-speech systems; screen-magnification software; tactile Braille displays, trackballs, touch pads/screens, etc.; alternatives to standard computer mice, keyboards, switches and speech recognition software.

Note 2 to entry: Also referred to as “access technology” and “adaptive technology”.

[SOURCE: ISO 9241-171:2008, 3.4 — modified with the additions of the Notes to entry and EXAMPLE]

4 Conformity

If an organization claims conformity with this document, then the decisions about how it addresses the requirements and recommendations in this document or the justifications for any course of action that deviates from any of the recommendations shall be documented.

Documentation of a claim of conformity with this document should be specific about the basis on which the claim is made and should provide evidence to support the claim. An organization can claim conformity on the basis of a self-assessment or an assessment carried out by another party.

Annex F provides assistance in documenting conformity.

5 Introduction to ICT accessibility within an organization

This document contains process-related guidance rather than technical requirements. It brings together and summarizes important information needed to enable organizations that create ICT systems to understand:

a) how to create organizational policies to embed accessibility considerations into their "business as usual" processes (Clause 6 and 7);

NOTE Policies can support communication internally with staff and/or externally with many different stakeholders.

b) how to consider the needs of users with disabilities and older people at all stages of the ICT system development life cycle (Clause 8).

The document is intended for:

— persons responsible for setting high-level organizational policies;

— persons responsible for setting accessibility policies and procedures at the system, product or service level;

— persons responsible for directly designing or implementing accessibility activities derived from the policies applied within the organization.

This document presents requirements and recommendations appropriate for the management of ICT accessibility throughout the organization.

NOTE Different organizations can approach implementation differently according to the organization's:

— type (e.g. public or private);

— size;

— diverse users;

— development methodologies (used to create and maintain its ICT systems).

6 Responsibilities and documentation for embedding accessibility of ICT systems within an organization

6.1 Taking responsibility and setting policy

ICT accessibility exists within a larger framework of the overall organizational accessibility policy. Top management shall commit to integrate an ICT accessibility policy in its management systems and ensure the organization’s compliance with this document through delegation of responsibilities.

As part of an organization’s strategy for dealing with accessibility, the organization shall ensure that a department or specified role is responsible for the organization’s compliance with this document.

NOTE 1 This specified role could be, for example, the chief technology officer, user experience director, digital development director, governance director, communications director or marketing director depending on the size and structure of the organization.

Through this department or role, the organization should:

a) analyse the organization's operations to consider how the drivers of ICT accessibility (see Annex E) will impact the following:

   1) the organization's legal duties;

   2) (for services provided to the public) the organization's duties to the public;

   3) the organization's ability to engage the widest pool of potential users, corporate social responsibility and innovation strategy;

   4) the activities that can be taken to develop or procure ICT systems;

b) prepare an ICT accessibility policy for the organization (see 6.2);

   NOTE 2 This could form part of the organization's overall management system or could stand alone, mentioned in the management system.

c) delegate ICT accessibility responsibilities across the different departments of the organization and ensure staff in those departments are adequately trained to be able to fulfil these responsibilities;

d) take responsibility for ensuring that the organization implements and maintains the ICT accessibility policy.

   NOTE 3 It is important that the policies for accessibility are both consistent with each other and are consistently implemented within the organization.

6.2 Contents of an organizational ICT accessibility policy

An organization's ICT accessibility policy shall explain the commitment to ICT accessibility and summarize its approach. This should include where accessibility considerations have been included in the organization's wider ICT policies, procedures, activities and standards including:

a) the ICT accessibility goals;

b) any policies, procedures, activities or standards the organization has which should hold (including policies for development, procurement, technology, privacy and security) for all of its ICT systems.

6.3 Organizational ICT accessibility goals

Organizations should identify and document in the organization's ICT accessibility policy how they will address the ISO/IEC Guide 71 accessibility goals, according to ISO/IEC 29138-1, discussed in Annex A.

NOTE 1 The ISO/IEC Guide 71 accessibility goals are worded in a general manner that can apply to all types of accessibility for all types of systems. In order to address these goals within an organization's ICT accessibility policy, the organization will identify how it intends to ensure the application of each of these goals to its ICT systems. Annex A identifies some important issues for an organization's ICT accessibility goals to address.

Organizations may also include guidance within the ICT accessibility policy on how to identify and justify further expectations, beyond those identified in Annex A.

While accessibility goals are focused on overall outcomes, user accessibility needs focus on the needs of individual users.

Organizations may wish to identify a set of user accessibility needs for all of their ICT systems to meet.

NOTE 2 ISO/IEC 29138-1 identifies a range of user accessibility needs associated with each of the ISO/IEC Guide 71 accessibility goals.

6.4 Accessibility considerations in the organization's ICT policies

Organizations should identify and document how to incorporate considerations regarding accessibility within the organization's relevant policies, procedures, activities or standards (including policies for development, procurement, technology, privacy and security) for all of its ICT systems.

It is important that accessibility is incorporated within the organization's procedures and is not being treated as an optional extra.

The relevant policies, procedures, activities or standards for ICT systems should:

a) apply the organization's ICT accessibility goals;

b) integrate the achievement of the requirements and recommendations in Clause 8 with other relevant activities;

c) include checkpoints to monitor the performance of these accessibility requirements and recommendations;

d) recognize the difference in meeting general accessibility requirements and an individual's user accessibility needs (including the need for on-going support) in the case of reasonable accommodation;

e) include progressively increasing the accessibility of existing ICT systems (including increasing the accessibility in replacements to those systems).

7 Embedding ICT accessibility within the system development life cycle

7.1 Taking accessibility into account throughout ICT system development

The organization shall ensure that accessibility is taken into account at all points of an ICT system's development life cycle.

The requirements and recommendations in Clause 8 should be situated within the existing ICT development life cycle to ensure the accessibility impact of key development decisions is not missed. They are not intended to present an alternate life cycle but should be harmonized with the development process that the organization follows.

NOTE 1 These requirements and recommendations can be situated within various life cycle approaches including:

a) human-centred design (HCD) (ISO 9241-210, ISO 9241-220);

b) software engineering (SE) (ISO/IEC/IEEE 12207);

c) systems engineering (SysE) (ISO/IEC/IEEE 15288);

d) agile development (ISO/IEC/IEEE 26515).

Iteration is used to progressively eliminate uncertainty during the development of ICT systems.

NOTE 2 Iteration implies that descriptions, specifications and prototypes are revised and refined when new information is obtained in order to minimize the risk of the system under development failing to meet user requirements. ISO 9241-210:2010, 4.5 provides guidance on the use of iteration to eliminate uncertainty in the identification of user needs and expectations.

NOTE 3 The needs of iteration recognize that the actual grouping and order of requirements and recommendations can vary from the activities contained in Clause 8 and will be based on how they are best situated within an organization's development life cycle processes.

The organization should ensure that each recommendation in Clause 8 is met as much as is feasible, rather than omitting dealing with recommendations. If a recommendation is not applicable, the reason why should be documented.

7.2 Making justifiable decisions on accessibility

The activities in Clause 8 include a number of decisions for the organization to take for dealing with accessibility. There are often a number of options that could be used to meet a recommendation.

At each stage in development, the organization should:

a) carefully consider which of the options it will choose, preferably choosing the option that maximizes accessibility;

b) be able to justify its choice based on reasoned evidence, especially where the option to maximize accessibility is not chosen;

NOTE 1 It is recognized that organizations that provide ICT systems to the public cannot anticipate the user accessibility needs of every user. However, organizations are expected to provide access for all users. Once an organization has become aware of the user accessibility needs of a particular individual, anti-discrimination legislation could apply to assess reasonable accommodation.

c) record the reasons for its choices in the ICT system accessibility log.

Factors relevant to such a decision may include:

1) the financial, resource and time costs of choosing more accessible options, considering the financial and other resources of the organization, and the amount of any justifiable resources already spent on making adjustments for accessibility;

NOTE 2 A more accessible option would be one that provides a greater level of accessibility experience for a particular audience or provides the intended level of accessibility experience to a wider range of users.

NOTE 3 It is important to include the provision of accessibility (e.g. including user testing methods, research and provision of sign language interpreting or audio description for video content) in budgeting from the start of the process, so that costs are properly considered and related to benefits rather than discounted because no budget has previously been set aside.

2) the nature of the benefit, including the number and breadth of diverse users who would benefit from more accessible options, and the impact on each of these users if the ICT system excludes them.

7.3 Assuring accessibility throughout the system life cycle

Organizations should ensure that the needs of diverse users of the ICT system, which are gathered at the start of an ICT system's development and inform the product's accessibility requirements, are tested throughout the life cycle of the ICT system rather than treated as an additional discrete testing phase at the end of the project.

NOTE Identifying accessibility issues as early as possible, in whatever development life cycle processes that the organization uses, improves the feasibility of addressing the issues and is likely to decrease the cost of doing so.

Organizations should integrate accessibility assurance as follows:

a) **Development of system requirements:** Ensure that the needs of diverse users are gathered while defining the ICT system's requirements specification.

b) **Procurement or development of the ICT system:** Ensure that an accessibility test plan is created and adhered to for the design, prototyping and development parts of the system's life cycle.

c) **Post-launch maintenance:** Ensure that all post-launch operation, maintenance and updates of the ICT system are tested to ensure the system continues to uphold that level of accessibility experience.

Organizations should ensure that any accessibility issues found in the testing are fixed.

Organizations are encouraged to involve diverse users (including users with disabilities and older users) in the development process to help development teams understand real-world accessibility issues and implement more effective accessibility solutions.

7.4 Creating accessibility logs and statements for each ICT system

Each of the organization's ICT systems shall have its own:

a) ICT system accessibility log (see 7.5);

b) ICT system accessibility statement (see 7.6).

An ICT system accessibility log is an active accessibility document (for internal organizational use) into which each accessibility decision made over the system's life cycle (after launch as well as before launch) is documented.

An ICT system accessibility statement (for public use) summarizes the ICT system accessibility log for users of the ICT system (see 7.2). It is created and published on the ICT system when it launches and should always reflect the current state of accessibility of the ICT system.

The organization should ensure that a person from the system's development team takes responsibility for keeping the ICT system accessibility log and statement up-to-date throughout the system's life cycle.

NOTE For the purposes of this documentation, it is up to the organization to define what it regards as an individual ICT system.

EXAMPLE 1 An organization considers an ICT system to be the result of any ICT project it embarks upon (so every update to a large ICT system could be considered a new ICT system).

EXAMPLE 2 An organization takes a life cycle view of a system, where an ICT system is created and new projects to update or augment the system are written into that ICT system's accessibility log, rather than prompting a new log.

Where a complete user task requires the use of a set of ICT systems or subsystems (e.g. if different steps of the task are developed or procured at different times or from different suppliers) it is important to consider the accessibility of each ICT system. The overall level of accessibility experience for the task will necessarily be determined by the weakest ICT system in the set.

7.5 Contents of an ICT system accessibility log

An ICT system accessibility log for an ICT system should:

a) take into account the broad strategic aims set out in the organization's ICT accessibility policy (see 6.2);

b) be created at the initial conception of an ICT system;

c) be maintained as an active, accessible document into which each accessibility decision is made over the system's life cycle (after launch as well as before launch) is documented;

d) be used to store the accessibility requirements and aims that have been decided on for the system in the initial requirements analysis for the system (this will include the results from the various activities in Clause 8);

e) be referenced during the procurement process in invitations to tender and contract documents for systems that are procured rather than developed by the organization itself (this will contain

accessibility requirements for contractors (i.e. ICT development agencies) undertaking the development and maintenance of the ICT system);

f) be used to keep an ongoing register of the cumulative level of risks related to accessibility and the financial or other costs of all decisions made throughout the system's life cycle.

7.6 Contents of an ICT system accessibility statement

An ICT system's accessibility statement should inform diverse users about:

a) how they can get the most accessible experience when using the ICT system by customizing the experience to suit their individual needs, either through:

   1) using the accessibility customization controls in their operating system, browser or hardware; or

      NOTE 1 It is important for the statement to include information on where these customization controls can be found in all of the delivery platforms that the ICT system is available on. As these controls are often in a different place in the menus of different platforms, and this placement can change between different versions of the same platform, organizations could consider providing this information by linking to a third-party repository or repositories of this information.

   2) using the preference setting, adaptation or version selection tools the ICT system itself provides or responds to, where a user-personalized approach to accessibility has been chosen;

b) any accessibility deficiencies the ICT system has, any plans to fix these deficiencies and any alternate accessible means which have been provided to get around these deficiencies;

c) contact mechanisms for diverse users who wish to request further information about the ICT system's accessibility decisions, or to lodge accessibility suggestions, comments and complaints with the organization.

   NOTE 2 It is important for these contact mechanisms to be sufficient to ensure that a prospective user has at least one mechanism they find accessible to provide this feedback (e.g. an email address, contact form or phone number).

   NOTE 3 To assist diverse users to effectively provide this feedback, the accessibility statement could include a note asking them to provide information necessary to reproduce their accessibility issue. An example of this information is provided by W3C [47].

   The accessibility statement may include a summary of the ICT system accessibility log to show how accessibility has been catered for in its development. This may include a reference to the ISO, ISO/IEC and W3C guidelines and specifications that the ICT system implements, as well as the level of compliance if applicable.

   The accessibility statement should:

   1) communicate using clear and easy language so that as many of the ICT system's users, as reasonably possible, can understand the accessibility statement;

   2) avoid the inclusion of technical terms and jargon;

   3) not assume knowledge of the relative roles of specific ICT technologies, as many less experienced users may have difficulty understanding this;

   4) include the date when it was last updated or reviewed.

8 Activities in ICT system development or procurement

8.1 Performing and documenting accessibility activities

This clause organizes important requirements and recommendations into a set of general accessibility-oriented activities which are to be situated within the organization's existing ICT development life cycle to ensure accessibility. As stated in 7.1 these activities can be situated within various life cycle processes. It is recognized that different organizations operate with different development methodologies, such as the waterfall model or agile development. Regardless of the methodologies an organization uses in acquiring, developing, operating and maintaining a system it is important that the activities described in the document are incorporated within those methodologies.

In order to fit with an organization's existing ICT development life cycle, different requirements and recommendations can even be mapped to different organizational activities. What is important is that the requirements and recommendations are followed throughout the development and life of an ICT system. The activities described in this document are not necessarily new to the organization but are often variations on activities already expected within human-centred, software engineering and systems engineering approaches to ICT.

NOTE The guidance in this document can be integrated into the organization's existing management systems (MSS) processes. Further information relating to these activities and their requirements and recommendations are provided in Annex B.

The activities are:

— Activity 1: Specify widest range of potential users

— Activity 2: Specify user goals and tasks

— Activity 3: Specify user accessibility needs

— Activity 4: Specify accessibility requirements

— Activity 5: Specify accessibility design approach

— Activity 6: Ensure accessibility requirements are met

— Activity 7: Ensure communication about accessibility

— Activity 8: Ensure integration of accessibility in system updates

All activities involve making decisions, documenting these decisions and applying them within ICT development. The first 5 activities lead to the inclusion of accessibility requirements into ICT developments, which are often performed by ICT professionals without a strong accessibility background. The last 3 activities are best performed by professionals with accessibility skills.

The results and justifications of these activities and of their requirements and recommendations should be documented in the ICT system accessibility log (see 7.5).

8.2 Activities

8.2.1 Activity 1: Specify widest range of potential users

The ICT system's groups of intended users (e.g. the general public, customers, internal staff, marketing staff, or a specific age group of customers) shall be specified to include the widest range of potential users.

Users should not be excluded from the system's target audiences on the basis of their disability.

In the event that it becomes clear during development that the ICT system will not provide the defined accessibility for each combination of user group and user goal, the log should be updated with a justification.

If individual users are not able to access the ICT system, alternative access to information, systems, or services or to other accommodations (not necessarily by ICT) shall be provided.

The organization should prepare a process to accommodate individual user needs for alternative access to information, systems, or services (not necessarily by ICT). Individual solutions for access may be logged as they might provide learning for future improvement of the system.

The organization should choose whether the intended users of the ICT system will be considered:

a) individuals, each of whom can get a personalized experience (e.g. via a login, user profile or cookie);

b) general members of a group of users, where a group is defined as all users with a common set of needs.

Users with diverse needs should be consulted in the procurement or development of the ICT system.

8.2.2 Activity 2: Specify user goals and tasks

The user goals and tasks (e.g. buy a book) that need to be supported on the ICT system shall be specified.

NOTE Goals are what users use a system to achieve. Tasks are how they achieve these goals. It is these tasks that are usually validated during requirements gathering sessions and tested during user evaluations.

These goals and tasks should be separated into core and non-core tasks, by considering which tasks are most important to the ICT system's different groups of users.

Any constraints, which the context of use places on users' ability to use their preferred technologies (especially assistive technologies), should be noted.

8.2.3 Activity 3: Specify user accessibility needs

User accessibility needs (in addition to those identified in the organizational ICT accessibility policy) that are specific to the ICT system being developed or procured shall be identified in relation to the goals and tasks of the ICT system.

NOTE 1 ISO/IEC 29138-1 can provide a starting point for investigating the particular accessibility needs of diverse users. While it identifies accessibility needs that "some users have", it is important to see how these needs could or could not apply to the diverse target audiences of the ICT system being developed or procured.

The identified user needs (including user accessibility needs) should be used to inform all accessibility decisions made from this point onwards in the system's development project.

Criteria should be defined for each user goal and its related user needs, which can be used to assess whether the system enables its intended users to achieve that user goal. These success criteria can be set at three levels of accessibility experience that build upon one another:

1) **Technical:** At the technical level of accessibility experience, a system meets specified accessibility guidelines and accessibility requirements that are focused on the technology, without an analysis of its users or contexts of use. These accessibility requirements are intended to enable use by people with diverse characteristics and needs in diverse contexts of use, however, they do not ensure that users will be able to accomplish their tasks effectively and efficiently. The technical level can be ensured by complying with applicable accessibility guidelines and accessibility requirements.

2) **Effective and efficient:** A system goes beyond a technical level of accessibility experience to ensure that diverse users can effectively and efficiently complete their user tasks. While the effective and efficient level is a necessary prerequisite to satisfaction, it does not consider whether or not a user will be sufficiently satisfied to actually use the system. Components of effectiveness and efficiency are defined in ISO 9241-11.

3) **Satisfying:** A system provides satisfaction when it provides equitable experiences to diverse users in diverse contexts. This goes beyond effectiveness and efficiency to ensure that the user's

experiences are satisfying/enjoyable. Satisfying users can be ensured by measuring satisfaction as defined in ISO 9241-11.

In order for an ICT system to be considered to be accessible, it should meet the currently applicable international and national technical accessibility requirements in applicable standards.

NOTE 2 Accessibility experience goes beyond meeting these technical requirements, as typical accessibility requirements do not guarantee persons with disabilities equivalent access to persons without disabilities. Different users can find the accessibility of a system more or less effective and efficient and be more or less satisfied by it.

Organizations should be able to justify any decision that does not aim to provide more than a technical level of accessibility experience for all user groups across all core user tasks.

Relevant accessibility guidelines (see Annex C) that could be applied to meet user needs with a suitable accessibility experience should be identified or, if not available, developed.

8.2.4 Activity 4: Specify accessibility requirements

Accessibility requirements shall be incorporated into the requirements specification of the ICT system.

All the identified user accessibility needs should be evaluated to select which user accessibility needs are to be transformed into accessibility requirements.

Any decisions not to transform any user accessibility needs into accessibility requirements for the ICT system should be justified.

The selected user needs shall be converted into accessibility requirements that can be applied in the development and evaluation of the ICT system.

— Accessibility requirements are a type of quality requirement that work with user-system interaction requirements to ensure the accessibility of interactions to individual users.

— Accessibility requirements can apply to the entire system, a task or group of tasks performed with the system, or a particular interaction.

Accessibility requirements should be specified in terms of the intended outcome of interacting with the system, the criteria for achieving the outcome and any applicable conditions under which this requirement applies.

NOTE 1 ISO 25065 provides a framework that can be used for specifying accessibility requirements.

NOTE 2 ISO 20400 provides guidance on sustainable procurement. EN 301549 provides accessibility requirements for public procurement within the EU.

Accessibility requirements should also include other important decisions from other accessibility activities that need to be met.

All personnel developing the ICT system should be able to understand and implement the accessibility requirements.

Where the organization contracts out the ICT system's development or procures elements of the system from an external supplier, it should specifically reference those accessibility requirements and aims in procurement invitations to tender and contract documents (as specified in the organization's ICT procurement policy) to assure itself that the supplier is able to understand and deliver the accessibility requirements and experiences specified in the ICT system accessibility log.

Where accessibility requirements are already encompassed in a set of accessibility guidelines, the set of accessibility guidelines may be referenced, rather than copied, into procurement invitations to tender and contract documents.

8.2.5 Activity 5: Specify accessibility design approach

The design approach to build accessibility into the ICT system shall be specified.

The selection or development of an accessibility design approach should consider how a blending of a single design strategy can be combined with a user-personalization/individualisation strategy to best meet user needs and to deliver the intended accessibility experience.

— **A single design** strategy aims to ensure accessibility via following recognized guidelines or techniques known to ensure accessibility to a wide-range of audiences without the need for special adaptation, other than the use of assistive technologies. It also relies on user-testing the ICT system with a representative range of users from the system's target audiences for verification.

— **A user-personalized/individualised** strategy adapts what is provided by the system to the identified accessibility needs of the individual user in respect of using that system in that context. A system might enable users to specify their accessibility preferences and then adapt its interactions or content automatically to suit those preferences. Alternatively, a similar level of adaptation to individual needs might be provided manually or with the provision of services or content generated for that user.

User-personalized/individualized strategies should complement but not normally be used as a replacement for a single design strategy.

When using a user-personalized/individualized strategy, boundaries around what user needs that the ICT system will and will not respond to should be established based on the reasonableness of the costs of responding to those user needs.

The accessibility design approach should ensure that any software, services and technologies that are used in the development of the ICT system support the development of accessible ICT systems.

The accessibility design approach should ensure how the intended level of accessibility experience will be achieved for users who access the ICT system across different families of devices to be supported.

The accessibility design approach should take into account the level of support for accessibility that each combination of supported OS, browser and assistive technology provides and the platform and technology preferences and restrictions of the ICT system's intended users.

8.2.6 Activity 6: Ensure accessibility requirements are met

The ICT system’s test plan shall explicitly include accessibility testing to be measured throughout the ICT system's development or procurement.

The test plan should specify and justify which accessibility testing methodologies will be used (see Annex D) at which points of the ICT system’s development life cycle in order to ensure the intended level of accessibility experience.

The organization should ensure that time and other resources are set aside in the ICT system’s implementation plan for the results of testing to be reviewed and actions made to rectify issues identified in the testing.

The organization shall ensure that developers (whether internal or suppliers) provide evidence that they have adhered to the plans for accessibility testing through the system’s development as part of the formal acceptance that the ICT system conforms to its accessibility requirements.

When making decisions about whether each release of the ICT system is ready to launch, organizations should gather evidence from their accessibility testing as to whether the ICT system meets their intended level of accessibility experience, or whether accessibility issues found are unresolved.

The organization should consider whether the risks of delaying their ICT system’s launch until the accessibility issues are resolved (e.g., missing being first to market with the system, or missing pre-

booked launch publicity) outweigh the risks in launching a system which does not yet meet the intended level of accessibility experience.

8.2.7 Activity 7: Ensure communication about accessibility

The organization should plan and decide on communications about the ICT system's accessibility which will be provided at the launch of each release.

The organization shall create and publish the ICT system's accessibility statement (see 7.6) on the ICT system, at launch, ensuring that the accessibility statement itself is fully accessible to and usable by diverse users, even if other content in the system is not fully accessible.

The ICT system's accessibility statement should document the accessibility capabilities and any remaining accessibility issues along with the timescales for when such issues will be fixed and any accessible workarounds currently available, and provide information on how users can report any accessibility issues not acknowledged in the statement.

8.2.8 Activity 8: Ensure integration of accessibility in system updates

The organization shall ensure continued accessibility throughout the operational life of the system and, when new releases are planned, include updates to maintain or improve accessibility.

Once a release of the ICT system is launched, any accessibility deficiencies that were identified but not fixed pre-launch should be addressed within the estimated timescales.

Planning the frequency of new releases of the ICT systems which substantially change the system's user interface or functionality should consider the impact on people with impairments who might experience greater difficulty in re-learning how to use the ICT system when the way it looks and works has been updated.

A regular programme of post-launch accessibility testing should be performed to ensure that all updates to the ICT system (whether as minor as an update to a page, or as major as a new release of the system) do not compromise its accessibility.

The organization should ensure that all feedback about the ICT system, coming through the accessibility contact mechanisms noted in its accessibility statement (see 7.6), is working well and is regularly monitored; and all correspondence which complains about any aspect of the ICT system's accessibility is answered in a timely manner.

Annex A
(informative)

Applying the accessibility goals of ISO/IEC Guide 71:2014

A.1 Suitability for the widest range of users

The goal: A system is suitable for the widest range of users if it meets the needs of diverse users in diverse contexts.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.1.2] This goal recognizes that the widest range of users involves both diverse users and diverse contexts.

NOTE While all the potential users might not always be readily known, it is important to ensure that different identifiable user groups are considered separately rather than as one generic group of users.

It is important for the organization's ICT accessibility policy to:

a) specify how to identify the range of users to be supported by each of its systems;

a) provide guidance on how to identify the diversity of users for individual ICT systems and how limitations on this diversity are to be justified (see 7.2 and 8.2); and

b) provide guidance on how to identify and justify the contexts of use for individual ICT systems (see 7.2).

A.2 Conformity with user expectations

The goal: A system conforms to user expectations if it is predictable based on the user's past experience, the context of use, laws and standards, and/or commonly accepted conventions.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.2.2] This goal recognizes that failure to conform to user expectations can be confusing for diverse users and can lead to errors. Users can have expectations with regards to a number of aspects of a system including: terminology; actions; responses; and communications.

It is important for the organization's ICT accessibility policy to identify the major user expectations to be considered for all its systems.

A.3 Support for individualization

The goal: A system supports individualization if its components, functions or operations can be tailored to meet the needs of individual users.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.3.2] This goal recognizes that a single system design is seldom optimal in meeting the needs of every user and context of use and it can be important to provide users with choices in how to interact with a system. Individualization focuses on providing each user with means of obtaining the best possible solution for that user.

NOTE Individualization includes both the customization of a system for groups of users and the personalization of a system by/for an individual system.

It is important for the organization's ICT accessibility policy to identify the types of and extent of individualizations to be provided by all its ICT systems.

A.4 Approachability

The goal: A system is approachable if diverse users can overcome any physical or psychological barriers and physically or remotely access it to accomplish the task.

EXAMPLE 1 Sufficient space is provided in front of a kiosk for a person in a wheelchair to approach the kiosk and get into position to use it.

EXAMPLE 2 Users are assured that their anonymity will be protected so as not to discourage them from using a system to report the need for fixing potholes in a city's streets.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.4.2] This goal recognizes that a lack of approachability can create a barrier to use for some users and that physical or psychological barriers can inhibit or prevent users from accessing a system. This goal recognizes the importance of taking into account those barriers that can be reasonably identified and removed or controlled but that, within certain environments, some barriers might have to remain (in which case, alternative systems might also need to be provided).

NOTE 1 While perceivability, understandability and controllability are well understood in various accessibility standards (e.g. ISO/IEC 40500, also known as WCAG 2.0), approachability is a prerequisite to being able to access a system.

NOTE 2 While perceivability, understandability and controllability are all directly related to the system, approachability can be related to both the system and the environment of use.

It is important for the organization's ICT accessibility policy to identify the common barriers that are to be overcome by all its ICT systems.

A.5 Perceivability

The goal: A system is perceivable if diverse users in diverse contexts can sense the information and functionalities it presents.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.5.2] This goal recognizes that perceivability is focused on the human physical capability to sense information in the sensory modality in which it is presented. Making use of multiple modalities (i.e. more than one of visual, auditory, tactile, olfactory or taste) can provide perceivability for more diverse users and contexts. Providing information in a single sensory modality can exclude some users in some contexts from perceiving information and functionalities.

It is important for the organization's ICT accessibility policy to identify either:

a) appropriate ICT accessibility standards which provide guidance on perceivability (i.e. ISO 9241-171, ISO/IEC 40500) (see Annex C), or

b) the high-level perceivability needs to be met by all its ICT systems.

NOTE ISO/IEC 29138-1 identifies two levels of perceivability related needs.

A.6 Understandability

The goal: A system is understandable if its information and functionalities are interpretable by diverse users.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.6.2] This goal recognizes that understandability depends on the human cognitive ability to correctly interpret the meaning of the information that has been perceived. Different users can have different styles of thinking that can influence their ability to understand presented information. This goal recognizes that it is important for a system to minimize the need and effort required for diverse users to learn and to remember.

It is important for the organization's ICT accessibility policy to identify either:

a) appropriate ICT accessibility standards which provide guidance on understandability (i.e. ISO 9241-171, ISO/IEC 40500) (see Annex C), or

b) the high-level understandability needs to be met by all its ICT systems.

NOTE ISO/IEC 29138-1 identifies two levels of understandability related needs.

A.7 Controllability

The goal: A system is controllable if the user is able to initiate and complete the interaction(s) required to accomplish the task

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.7.2] This goal recognizes that it is important that diverse users can control their interactions with systems. This depends on the ability of users to interact with different control mechanisms that require different interaction modalities (e.g. by touch, gesture, voice) to use a system. Providing multiple means of operation can improve controllability.

It is important for the organization's ICT accessibility policy to identify either:

a) appropriate ICT accessibility standards which provide guidance on controllability (i.e. ISO 9241-171, ISO/IEC 40500) (see Annex C), or

b) the high-level controllability needs to be met by all its ICT systems.

NOTE ISO/IEC 29138-1 identifies two levels of controllability related needs.

A.8 Usability

The goal: A system is usable if it supports diverse users in their diverse contexts to accomplish their tasks with effectiveness, efficiency and satisfaction.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.8.2] If the minimum level of usability for a user in a context is not provided, then the user might not consider the system to be accessible enough to use. This goal recognizes that inadequate usability can discourage users from accessing a system.

It is important for the organization's ICT accessibility policy to identify any minimal levels of usability (effectiveness, efficiency and satisfaction) along with the minimum level of accessibility experience to be achieved by all its systems.

NOTE While absolute levels of effectiveness and satisfaction can be established for use across all users, only relative levels of efficiency can be established, because each user is likely to experience a different absolute amount of efficiency (e.g. different users will take different amounts of time to complete a task).

A.9 Error tolerance

The goal: A system has error tolerance if despite predictable errors, diverse users can complete the intended task or activity with either no, or minimal, corrective action or negative consequences.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.9.2] This goal recognizes the importance of minimizing the potential for error and that where errors cannot be avoided it is important to minimize their impact on users. Diverse users and diverse contexts can sometimes create situations in which a wide variety of errors can occur and where the effects of these errors can prevent the users from accomplishing their tasks.

It is important for the organization's ICT accessibility policy to identify either:

a) appropriate ICT accessibility standards which provide guidance on error tolerance (i.e. ISO 9241-171, ISO/IEC 40500) (see Annex C); or

b) the high-level error tolerance needs to be met by all its ICT systems.

A.10 Equitable use

The goal: A system provides equitable use if it allows diverse users to accomplish tasks in an identical manner whenever possible or in an equivalent manner when an identical manner is not possible.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.10.2] This goal recognizes that it is important to avoid situations that could discriminate against certain users or groups of users based on their accessibility needs. It expects that all potential users can be provided with a means to access and use the same system information and functionalities.

It is important for the organization's ICT accessibility policy to identify how to ensure that equitable use is provided to diverse users (see 7.2 and 7.3).

A.11 Compatibility with other systems

The goal: A system provides compatibility if it allows diverse users to use other systems as a means to interact with it to accomplish the task.

Implementing the goal: [according to ISO/IEC Guide 71:2014, 6.2.11.2] This goal recognizes that in some cases some users might not be able to use a system without the assistance of some intermediary system. While it is not feasible to make all systems directly accessible to all people, the provision of compatibility can make it possible for diverse users to use assistive products or assistive technology to utilize the system.

It is important for the organization's ICT accessibility policy to identify the types of assistive technologies (including external platforms) to be supported by all its systems.

Annex B
(informative)

Application of Clause 8

B.1 General

Subclause 8.2 contains a number of requirements and recommendations relating to activities involved in the development, procurement and ongoing maintenance of accessible ICT systems. This annex provides further information to be used to understand and apply those requirements and recommendations.

B.2 Further information on activities in subclause 8.2

B.2.1 Further information for Activity 1: Specify widest range of potential users

Most ICT systems are designed for multiple groups of intended users. Whether the ICT system is being created to be used by the general public, created for specific groups of intended users, or created for known internal staff, has an impact on the accessibility choices made in the creation of the system.

Groups of potential users can be based on their different goals, tasks, roles and contexts of use.

Groups of intended users can be identified depending on:

a) whether the organization is in any way able to predict or control access by the group [e.g. is the ICT system designed to be an internal (intranet), organization-to-organization (extranet) or public facing system];

NOTE 1 It is harder for an organization to predict the groups of intended users for its public services (who could be any member of the public, worldwide) than the groups for its internal or organization-to-organization services (as these groups will be its staff and the staff of its partner organizations, all of whom will have a login that the organization controls).

b) whether the purpose of the ICT system is designed to appeal to a particular group (e.g. an educational mobile app might be specifically targeted at students of a particular age, while a website to help older users get started on the internet might be specifically targeted at those older users and anyone helping them).

NOTE 2 Where an ICT system is targeted at a particular group, it is important to take care to not unreasonably exclude potential secondary groups from being able to use the ICT system (e.g. educational sites could be used by secondary users, such as parents wishing to check out the appropriateness of the site for their children).

This specification of the ICT system's groups of intended users can be useful later in the process in any situations where it is not possible to satisfy the needs of all potential audiences as they diverge or contradict each other. Where this occurs the needs of target audiences should take precedence over the needs of other audiences.

Specifying a number of groups of intended users does not mean that everyone else is excluded; it just means that the requirements, design and testing activities will focus on these user groups as the most likely users of the ICT system.

It is important to recognize that groups of intended users will include a diversity of user characteristics and capabilities.

EXAMPLE 1 An e-Commerce system could treat frequent customers, occasional customers and potential customers as separate groups of intended users. However, it would be inappropriate to treat sighted customers and non-sighted customers as separate groups of users.

It is only suitable to use user characteristics and capabilities to separate groups where differences in characteristics or capabilities are directly related to the goals, tasks, roles, or context of use.

EXAMPLE 2 Individuals under a certain age could be excluded from driving an automobile, owning firearms, or consuming alcohol in accordance with legislative restrictions, without this constituting a violation of accessibility.

Where an ICT system is targeted at a particular audience with disabilities, it might be reasonable to exclude other audiences with disabilities from being able to use the ICT system if the needs of the targeted audience and other audiences with disabilities clash.

EXAMPLE 3 An online audio game created specifically for blind persons not having a hearing impairment could reasonably exclude persons with hearing impairments.

Going beyond grouping of users, some ICT systems are intended to treat their users as individuals and to provide personalisation to make this possible.

The ease in which an ICT system includes personalisation to an individual user's accessibility needs and the likelihood that that user would expect the system to offer such personalization is impacted by whether the product considers users to be individuals or general members of a group of users.

NOTE 3 Educational establishments, eLearning websites, staff intranets and any ICT system where users become a member by creating a login (such as social networking sites) are more likely to regard their users as individuals with whom they have entered a relationship. This could set up an expectation of an individualized accessibility experience in the mind of their users.

NOTE 4 More traditional public internet sites are likely to consider their users as user groups and not raise user expectations beyond meeting common needs.

NOTE 5 This activity helps to incorporate accessibility within the HCD 3.2.1, identify the intended user population and differentiate groups of users process (see ISO 9241-220:2019, 7.3.2.1) and/or SE and SysE Stakeholder requirements definition process (see ISO/IEC/IEEE 12207:2017, 6.4.1 and ISO/IEC/IEEE 15288:2015, 6.4.1).

B.2.2 Further information for Activity 2: Specify user goals and tasks

The purpose of an ICT system can have a huge impact on how easily it can be made accessible. Systems can pose particular challenges if they include any of the following aspects: allowing users to publish their own content (i.e. where it is not clear who is responsible to ensure the accessibility of content uploaded to social networking sites and blogs); including video content (i.e. where it is expensive to make fully accessible); or including richly interactive content like games (i.e. where it might be too complex to make the content accessible to all).

The system's purpose might also impact the expectations of users. If the purpose of an ICT system is to replace a non-digital service (for example, a phone helpline), and that existing service will be discontinued when the system is launched, then diverse users are likely to expect the system to be at least as accessible as the existing service.

The separation of the ICT system's tasks into core and non-core tasks might be useful later in any situations where it is not possible to make all user tasks accessible due to resource or time constraints. Where this occurs, making core user tasks accessible should take precedence over making non-core user tasks accessible.

It is important to take particular note of any platform or technology expectations, constraints and preferences of users with impairments in the system's target audiences, and the impact on these in the various contexts of use in which the ICT system will be used.

EXAMPLE 1 Some office workers or school or university students could be constrained by using a "standard desktop" or organization-issued mobile device, which could dictate the operating system, browser, the preferences they can set in their browser, or the assistive technologies they can install.

EXAMPLE 2 Some people could be constrained in their choice of assistive technology by cost. For example, a blind person could have a costly screen reader provided for them at work, but only be able to afford a free screen reader at home.

EXAMPLE 3 Some people who use the accessibility features present in most browsers could be resistant to updating their browser as the menu locations of the control panels to turn on these features can vary quite considerably between versions of a browser, which can prevent the features from being found.

EXAMPLE 4 Some people could be using older platforms and have difficulty in understanding how to update their platforms or install plug-ins or other helper systems. They could therefore need ICT systems to be delivered solely using technologies supported "out of the box" in older platforms.

EXAMPLE 5 Some people could have a preference for viewing ICT systems on platforms (such as tablets or IPTV), which currently are less vulnerable to threats that cause concern about safety (for example, viruses or phishing emails).

NOTE 1 Information on constraints will be of use when making decisions on how to blend inclusive design and user-personalized approaches to accessibility in the system's design and the hardware and software platforms and assistive technologies that the ICT system will support.

NOTE 2 ISO/IEC 25063 provides a Common Industry Format (CIF) for the context of use description that can be used to document the results of this activity.

NOTE 3 This activity helps to incorporate accessibility within the HCD 3.2.2 Identify other aspects of the context of use and reported issues process (see ISO 9241-220:2019, 7.3.2.2) and/or SE and SysE Project Planning Process (see ISO/IEC/IEEE 12207:2017, 6.3.1 and ISO/IEC/IEEE 15288:2015, 6.3.1).

B.2.3 Further information for Activity 3: Specify user accessibility needs

It is important that user accessibility needs are considered in the context of use and in relation to tasks and goals of the ICT system and platform or technology preferences and restrictions.

To apply the user accessibility needs (such as those from ISO/IEC 29138-1) to a specific ICT system, it is important to relate the relevant needs to specific characteristics of the particular ICT system and its intended contexts of use. This typically involves identifying a number of system and context specific instances of the need.

It is important that research into user needs and preferences:

a) includes users with disabilities and older users alongside other users;

b) ensure that the research methods chosen to gather needs are able to accurately capture the particular needs of diverse users.

If the ICT system is a new version of an existing system, or if competitors to the system already exist, this might involve viewing diverse users using the product to identify what elements work for them and areas which could benefit from improvement. If the ICT system is entirely new, this might involve asking users how such a system might fit into their lifestyle and what elements of it might be most important to them.

It is important to ensure needs within a group of intended users are taken account of and not hidden by assumptions about the nature of the group. It is common for needs of individuals to not be put forwards for consideration because of lack of experience of technology capabilities and/or personal embarrassments or choices. Cognitive needs particularly are often not explicit.

The technical level of accessibility experience can provide a basis for identifying criteria being associated with individual user needs when they are transformed into accessibility requirements.

While achieving a technical level of accessibility experience is very important, it does not guarantee that a system is actually usable by a user.

NOTE 1 ISO/IEC 24756 describes a common access profile approach to determining potential technical access.

The effective and efficient level of accessibility experience considers:

— Effectiveness is the accuracy and completeness with which users achieve specified tasks. Equitable use expects that expectations for effectiveness can be established that are similar for all users.

— Efficiency is the resources used in relation to the results achieved. Each user is likely to have a different experience of efficiency (e.g. different users will take different amounts of time to complete a task). Equitable use expects that a user will be able to complete similar tasks with similar (relative) efficiency but that the (absolute measures of) efficiency might differ from user to user.

Satisfying accessibility experience has been separated from effective and efficient accessibility experience, as satisfaction can be more challenging to achieve for diverse users than effectiveness and efficiency.

A satisfying accessibility experience provides the fullest level of accessibility. The decision to aim for a lower level of accessibility experience will increase the risks related to accessibility in the system.

The organization may decide to create a policy that prescribes the default level of accessibility experience that it will aim for in all of its ICT systems. Individual ICT systems may aim for a higher level of accessibility experience: for the entire ICT system, for select goals or tasks (and especially for core tasks), or for individual user accessibility needs. This will very much depend on the type of ICT system and the amount of challenge (including cost) in enabling the different levels of support for each user goal. In practice, the organization is likely to aim for a higher level of accessibility experience for core user goals than non-core user goals.

Relevant accessibility guidelines can aid in identifying user accessibility needs and provide guidance that can help to meet these needs. It is important to identify relevant accessibility guidelines early in the development or procurement of an ICT system. Existing accessibility guidelines typically focus on achieving at least a technical level of accessibility experience.

Some sets of accessibility guidelines contain various levels of conformity that can be chosen. The level of conformity chosen will have an impact on cost and timescales. It is important for the organization to justify its decision, based on the balance between this cost and the benefits to the product's users.

NOTE 2 The organization might be free to choose its own specific level of conformity for its ICT systems, or it might have its level of conformity set by its regulators (e.g. local government having to comply with central government standards, requiring WCAG 2.1 level AA).

NOTE 3 ISO 25065 provides a format for a user needs report that can be used to document the results of this activity.

NOTE 4 This activity helps to incorporate accessibility within the HCD 3.3.1 Identify the user needs process (see ISO 9241-220:2019, 7.3.3.1) and/or SE and SysE Stakeholder requirements definition process (see ISO/IEC/IEEE 12207:2017, 6.4.1 and ISO/IEC/IEEE 15288:2015, 6.4.1).

B.2.4 Further information for Activity 4: Specify accessibility requirements

User needs can lead to both functionality (interaction) and quality requirements. While many accessibility requirements are quality rather than functionality (interaction) requirements, it is important to avoid treating them as second-class requirements.

The following elements (based on ISO 25065 and expanded relating to accessibility) are applicable to specifying each accessibility requirement:

a) the object of the accessibility requirement;

b) the required accessibility outcome;

c) the criterion/criteria associated with the outcome;

d) if applicable, the condition(s) under which the accessibility requirement applies.

Accessibility requirements can apply to a range of objects from the entire ICT system down to an individual interaction within the ICT system. While many accessibility requirements apply to the entire system, there are also instances where an accessibility requirement only applies to some user groups, goals, tasks or parts of a system. Specifying the object of the accessibility requirement can involve identifying:

— the ICT system;

— if only some user group(s): the user group(s) that the accessibility requirement applies to;

— if only some goal(s) or task(s): the goal(s) or task(s) that the accessibility requirement applies to;

— if only some part(s) of the ICT system, the part(s) of the ICT system that the accessibility requirement applies to;

— if only some interaction(s): the interaction(s) that the accessibility requirement applies to.

The accessibility outcome focuses on meeting one or more user accessibility needs to achieve the intended level of accessibility experience for:

— the technical level of accessibility experiences, outcomes focus on system capabilities;

— the effective and efficient and the satisfying levels of accessibility experiences, outcomes focus on outcomes of the user interacting with the ICT system.

Outcomes can also focus on a combination of system capabilities and outcomes of interaction.

EXAMPLE 1 The following requirements illustrate various intended outcomes:

— the ICT system supports the users' assistive technology;

— (with the ICT system) the user is able to complete the task using only auditory interactions;

— (with the ICT system) the user is able to input information using various devices including assistive technology.

The criteria chosen will have an impact on cost and timescales. It is important for the organization to justify its decision, based on the balance between this cost and the benefits to the product's users.

EXAMPLE 2 The following requirements illustrate various criteria:

— all interactions (with the ICT system) are at Level AA of WCAG 2.1;

— (with the ICT system) 98 % of non-sighted users are able to set the alarm within 5 seconds.

The organization might be free to choose its own outcomes and criteria for its ICT systems, or it might have the outcomes and criteria set by its regulators (e.g. local government having to comply with central government standards, requiring WCAG 2.1 level AA).

Clear and verifiable criteria are important both to the design and evaluation of accessibility within ICT systems. It is typical for more specific criteria to be able to be specified on specific tasks within the system.

Where a requirement applies to only a limited context of use, conditions can reference other relevant aspects of the context of use not already specified in the accessibility requirement.

EXAMPLE 3 Some conditions include:

— at home;

— while travelling on a bus;

— using their choice of language that is available from the ICT system.

NOTE 1 ISO 25065 includes guidance on user requirement specification that can be applied to the specification of accessibility requirements.

NOTE 2 This activity helps to incorporate accessibility within the HCD 3.3.2 Specify the user requirements process (see ISO 9241-220:2019, 7.3.3.2) and/or SE and SysE System architectural design process (see ISO/IEC/IEEE 12207:2017, 6.4.3 and ISO/IEC/IEEE 15288:2015, 6.4.3).

B.2.5 Further information for Activity 5: Specify accessibility design approach

The design approach can take into account:

a) an analysis of the user needs of the ICT system's intended users (from activities 1–4);

b) whether the ICT system will regard users as individuals or user groups;

c) any platform or technology preferences or restrictions the users have;

d) the strengths and weaknesses of different design strategies.

Universal design, including similar approaches such as inclusive design and design for all, are examples of design approaches that have been developed and tested to include the widest range of users and avoid excluding users (including users with disabilities and older persons).

A universal design approach aims at making systems products and services accessible and usable by all people, to the greatest extent possible, without the need for adaptation or specialized design. It also relies on user-testing the ICT system with a representative range of users from the system's target audiences for verification.

Universal design includes principles of equitable and flexible use, often provided via user-personalization/individualization allowing users to specify preferences that will make the system adapt interactions or content automatically to suit those preferences.

Inclusive design strategies often need to be enhanced by user-personalized/individualized strategies. This is especially important where it becomes obvious that the difference between the needs of individuals or groups of users will prevent a "one size fits all" approach giving an experience which works for all. It is often the case that the needs of one user conflict at a technical level with the needs of a different user and make it impossible for one system to meet such conflicting access needs without taking a personalisation/individualization approach.

Individualized user-personalized approaches allow users to be treated as individuals. When implementing user-personalized/individualized functionality, it is important not to inadvertently exclude users with combined disabilities.

Some user-personalized approaches include:

a) User-personalization/individualization achieved by the use of "accessibility provisions" such as text-resizing controls or "speak this page" functionality in ICT systems. This is usually done where research into the needs, preferences and restrictions of the systems intended users (see 7.2) suggests that a reasonable number of the system's users might be unable to use the accessibility features in their browser or operating system (e.g., if local administration policies disallow this), where assistive technologies do not yet exist, or where the system's users are unlikely to be able to install or use the assistive technologies needed to make a site based on applicable accessibility standards accessible.

b) User-personalization/individualization achieved by alternative systems with the creation or procurement of "multiple alternate versions" of part of a system. This is usually done where

research into the needs of the system's intended users suggests that different users would be better supported by significantly different sets of interactions.

EXAMPLE 1 Learning through different learning styles and modalities, for example, visual graphs will make mathematical equations easier to understand for most students, but will not make equations easier for blind students, who might prefer an alternative using audio or even touch.

It is important for the design approach to take into account that the underlying technologies used to implement the ICT system can have a huge impact on the ability of the product's developers to deliver its accessibility requirements.

The different hardware devices that the system will support often have huge differences in: screen size; expectation of the user's proximity to the screen; base input mechanism (e.g. touch screen, mouse, keyboard, remote control); and common usage context, whether it is commonly used in groups (e.g. TV) or on your own (e.g. mobile) and whether it is commonly used in buildings or on the move.

These differences might create different challenges and opportunities to create the aimed-for level of accessibility experience across devices.

EXAMPLE 2 An organization classifies hardware into six different types of hardware platforms:

— computer (e.g. desktop, laptop, netbook);

— mobile (e.g. mobile phones, internet tablets);

— wearables (e.g. watches, glasses);

— games consoles;

— IPTV and aircraft entertainment systems;

— kiosks.

To provide the aimed-for level of accessibility experience on different devices, an organization might choose between:

— responsive design: creation of one accessible ICT system which is optimized for computers, with some added support and testing (usually via device detection and adaptations of the user interface) for ensuring that it gives a usable and accessible experience on a wider set of supported platforms; or

— adaptive design: creation of a set of connected and optimized versions of the ICT system, one for each supported platform; each version targeted, designed and tested to give an accessible, usable and context-optimized accessibility experience on that platform, including:

  — an appropriate user interface for the device;

    EXAMPLE 3 An IPTV system is designed with a user interface optimized for user input by a remote control and a display which is intended to be viewed at least six to ten feet away from the big screen.

    EXAMPLE 4 A mobile system is designed for touch-screen or multi-directional user navigation user input and a small display which is intended to be viewed in the user's hand, probably on the move. Mobile functionality also includes location-awareness to optimize efficiency of interaction.

  — an appropriate set of functionalities for the device in context.

    EXAMPLE 5 The smart-watch version of a mobile app includes a subset of the mobile app's functionality due to their slower user input mechanisms and smaller screens.

Support for accessibility features can vary in different operating systems, browsers and assistive technologies. The level of accessibility experience might also be constrained by whether the device family's infrastructure (e.g. accessibility settings, provision of assistive technologies or the ability to install them, and the accessibility APIs to allow the ICT service to interface with those settings and assistive technologies) has the attributes necessary to support the creation of accessible ICT systems.

As accessibility features in operating systems and browsers themselves can be great enablers of accessibility, it is important to consider supporting any operating systems and browsers which have accessibility features over and above the common set, even if they are not widely used. Some common features include: the ability to zoom a page; zoom just the text on the page; and the ability to override the page colours specified by the designer by allowing the use of a custom cascading stylesheet (CSS).

The choice of operating systems, target browsers and assistive technologies the ICT system will support will be affected by:

a) the operating systems, browsers and assistive technologies which are available on the hardware platforms that are intended to support the ICT system;

b) whether the organization has any control over the browser, operating system and assistive technologies the ICT system's target audiences will use;

EXAMPLE 6 If the system is an intranet that will only be used by staff members who have been provided with their computers pre-loaded with company-approved browsers, operating systems and assistive technologies, support for those approved browsers, operating systems and assistive technologies will be sufficient.

c) the platform and technology preferences and restrictions of the ICT system's intended users, depending on the approach to accessibility chosen.

Different versions of the same operating system, browser or assistive technology can also have hugely different levels of support for accessibility features. Therefore, it is important for the choice of operating systems, web browsers and assistive technologies to identify version numbers.

In practice, the organization might quickly specify the ICT system's target web browsers, operating systems and assistive technologies, by taking it from an organizational-level standard to be used for all its ICT systems, as long as it reviews the appropriateness of this list against the intended users of the individual ICT system.

Technologies that the system will be created in can expose content, structure and functionality to assistive technologies used by diverse users and can provide techniques for developers to use in assuring their ICT systems conform to applicable accessibility standards. It is important that any authoring tools in the software or services are themselves are accessible to ICT developers with disabilities and content authors.

In circumstances where no accessible technology exists to create a particular type of ICT system (e.g. the provision of immersive 3D environments), non-accessible technologies can be used if alternative solutions and technologies are identified as a route to accessibility for persons not able to use the non-accessible technology. This would be an example of "multiple alternate versions in the user-personalized/individualized approach".

Finally, it is important to check any third-party software and services (such as content management systems, software libraries or frameworks, or cloud-services) used to provide functionality in the ICT system before use to ensure they deliver (either inherently, or after customization for their use in the ICT system) the accessibility requirements of any functionality they provide.

NOTE This activity helps to incorporate accessibility within the HCD 3.4 Design solutions that meet user requirements process (see ISO 9241-220:2019, 7.3.4) and/or SE Software Architectural Design (see ISO/IEC/IEEE 12207:2017, 7.3.1). This activity also helps to incorporate accessibility within the HCD 3.2.2 Identify other aspects of the context of use and reported issues process (see ISO 9241-220:2019, 7.3.2.2) and/or SE and SysE System architectural design process (see ISO/IEC/IEEE 12207:2017, 6.4.3 and ISO/IEC/IEEE 15288:2015, 6.4.3).

B.2.6 Further information for Activity 6: Ensure accessibility requirements are met

Accessibility testing is a relevant component of user iterations in several stages of development of new systems, including testing to prove conformity with agreed accessibility requirements and in contracts related to grievance mechanisms when flaws are discovered after delivery of the system.

NOTE 1 In procurements, this activity concentrates on ensuring that statements about accessibility (e.g. completed Accessibility Conformance Reports based on the Voluntary Product Accessibility Template®) provided by a vendor are reliable and are sufficient to ensure the intended level of accessibility experience.

Subsystems might be developed by different organizations or parts of the same organization, to integrate into a larger system. It is important to coordinate accessibility testing across the subsystems and the system integration.

Ensuring accessibility requirements are met usually involves a combination of testing methods depending on the nature of the system being tested and the resources of the organization. It is important to choose test methodologies which provide a justifiable balance between the reliability of the test methodology to prove that the ICT system has delivered the level of accessibility experience they are aiming for and the costs of those test methodologies.

A minimal accessibility testing plan typically involves inspecting a sample number of interactions with the system, where that sample includes interactions with high usage and interactions that are critical or complex (e.g. form filling) using:

a) Manual conformity testing to determine conformity to accessibility criteria from the accessibility requirements (see C.1).

NOTE 2 While some accessibility issues can be validated automatically, there are a range of issues that can only be validated manually.

NOTE 3 Organizations regularly contract out (or sub-contract) accessibility testing to external suppliers who are specialists in this field, to benefit from their specialist expertise and the impartiality of their test results.

b) Assistive technology and platform accessibility settings testing to determine whether the system and its content can be accessed using tools commonly used by users with disabilities (see C.2).

1) Ideally, this testing would cover each combination of target browser, operating system and assistive technology, all the accessibility settings in the target browsers and operating systems, and navigation with the keyboard alone. It is important that a choice to test with fewer combinations is justified.

2) Where accessibility issues are found during such testing, which are due to differences in accessibility experience found between different combinations of target browsers and assistive technologies, it is important to make a justifiable decision about whether to provide work-arounds to provide a consistently good accessibility experience across all the combinations.

Further testing is valuable if the organization has the aim and resources to test the effective and efficient and/or the satisfying levels of accessibility experience of the ICT system as well as the technical level of accessibility experience. Methodologies to achieve this include:

c) Cognitive walkthroughs of early designs or prototypes (to identify any potential accessibility problems with the interface and interaction design) and finished code (to identify any potential accessibility problems with the coding of those designs) (see C.4).

d) User testing with representative diverse users from the ICT system's intended user groups, attempting to achieve tasks based on the ICT system's user goals. It is important for this to be conducted on early designs or prototypes and, later, on finished code (see C.5).

NOTE 4 While it is possible to user test early design and prototypes with most users with disabilities and older users, prototypes created using many common techniques and tools (for example, clickable-jpegs) are difficult to user test with persons who are blind. This is because the prototypes are designed to approximate a product's surface interaction rather than the underlying semantic interaction, which screen readers use. In such circumstances, a cognitive review could be used in place of user testing.

Organizations are strongly advised to harmonize their usability and accessibility test plans with each other. It makes good financial and logistical sense to conduct any user testing with diverse users (including users with disabilities and older people) alongside user testing with more general audiences.

Where user testing is included, it is important for the accessibility test plan to provide:

a) justification of the choice of the number of different diverse user groups included in the user testing;

b) justification of the number of participants in each user group (i.e. the sample size), including at least a mix of beginners and experienced ICT system /assistive technology users;

c) identification of the person or persons responsible for conducting the testing, documenting the test results and ensuring that the test results are acted upon.

In addition to testing, it is important to provide a simple and obvious feedback mechanism for diverse users on the ICT system and monitor the results of this feedback to identify and fix accessibility problems.

NOTE 5 ISO/IEC 25066 provides an evaluation report that can be used to document the results of this activity.

Ensuring that test results are acted upon includes justifying decisions on how to deal with each of the issues identified in each round, to achieve the intended level of accessibility experience.

When needing to launch before achieving the intended level of accessibility experience, it is important to:

a) carefully consider whether an acceptable lesser level of accessibility experience can be achieved while still meet the release deadlines;

b) attempt to mitigate any remaining accessibility issues by either/both:

   1) providing an accessible alternate means for diverse users to get around the elements of the ICT system which have these accessibility deficiencies so they can still achieve their user goals;

   2) making plans for repairs to be made to fix these accessibility deficiencies, including setting a reasonable estimate for when the repairs will be made.

NOTE 6 This activity helps to incorporate accessibility within the HCD 3.5.1 Plan for evaluation throughout the project, 3.5.2 Plan each evaluation and 3.5.3 Carry out each evaluation processes (see ISO 9241-220:2019, 7.3.5), the SE Software qualification testing process (see ISO/IEC/IEEE 12207:2017, 7.1.7). and/or SysE Verification process (see ISO/IEC/IEEE 15288:2015, 6.4.6).

B.2.7 Further information for Activity 7: Ensure communication about accessibility

It is important to ensure two-way communications with diverse users concerning the accessibility of the ICT system via its accessibility statement.

It is desirable that organizations link to the ICT system's accessibility statement from all pages of the ICT system (usually by putting the link in the ICT system common page header or footer) and name the link "Accessibility".

If the organization cannot provide a fix, accessible alternate means or mitigation for each of the system's accessibility issues it is important to document an explanation of why it considers it reasonable for each issue to remain untreated.

EXAMPLE A phone helpline could be provided for people who are not able to read "captchas" and could be prevented from registering for logins on many social networking sites.

NOTE This activity helps to incorporate accessibility within the HCD 4.1 Introducing the system process (see ISO 9241-220:2019, 7.4.1) and/or SE and SysE Information management process (see ISO/IEC/IEEE 12207:2017, 6.3.6 and ISO/IEC/IEEE 15288:2015, 6.3.6).

B.2.8 Further information for Activity 8: Ensure integration of accessibility in system updates

One of the most important usability challenges to the users of an ICT system over time is how often that system is redesigned. While each of a ICT system's audiences might experience frustration or difficulty in re-learning how to use the ICT system when the way it looks and works has been updated, users with disabilities and older audiences can be particularly sensitive to "having to learn it all over again" as they might have greater difficulties in learning how to use new/updated systems quickly and so may give up.

It is important to develop and implement a regular programme of post-launch accessibility testing to ensure that all updates to the ICT system (whether as minor as an update to a page, or as major as a new release of the system) do not compromise its accessibility. This can involve:

a) for small updates to the ICT system, such as adding a new graphic, writing a new paragraph or changing a form testing at least conformity to relevant accessibility guidelines (automated conformity tools are very useful for this, see C.2);

b) for larger updates that affect important tasks within the interface (e.g. how a user logs onto a website or buys a product in an app) ideally performing user testing with diverse users;

c) in every release cycle of the ICT system it is important to:

   1) ensure that any accessibility deficiencies that were identified but not fixed in the previous release are addressed;

   2) review the ICT system's accessibility in light of any new developments in technology (such as new, or new versions, of assistive technologies), relevant accessibility guidelines, or context of use, to see if any new user needs have become apparent;

   3) ensure that the ICT system accessibility statement is updated with accessibility information about the new release;

   4) communicate changes to the ICT system's accessibility statement to known users of the system.

   It is also important to:

      i) annually benchmark the ICT system against its accessibility aims by performing user testing with diverse users or manual conformity testing to identify any new accessibility problems;

      ii) communicate changes to the ICT system's accessibility statement to known users of the system;

      iii) ensure that goals, policies and guidelines are reviewed and updated on a regular basis to comply with legislation, user feedback and ICT development.

It is important to recognize that a solution to an accessibility challenge that might previously have been an unreasonable one for the organization to undertake could subsequently become a reasonable solution in light of changed circumstances. Technological developments might provide new or better solutions to the problems of inaccessible services. It is important that the organization regularly reviews the effectiveness of reasonable adjustments and act on the findings of those reviews.

NOTE 5 This activity helps to incorporate accessibility within the HCD 4.2 Human-centred quality in operation and 4.3 Human-centred quality during upgrades process (see ISO 9241-220:2019, 7.4.2 and 7.4.3), the SE Software problem resolution process (see ISO/IEC/IEEE 12207:2017, 7.2.8). and/or SysE Maintenance process (see ISO/IEC/IEEE 15288:2015, 6.4.10).

Annex C
(informative)

Sources of ICT accessibility guidelines

C.1 User accessibility needs

ISO/IEC 29138-1 can be especially useful in creating the organizational ICT accessibility goals. It can help to:

a) understand the intention and extent of each of the goals (see 6.3); and

b) identify those user accessibility needs that are to be met in the all organization's ICT systems.

Developers or procurers of ICT systems can make use of ISO/IEC 29138-1 to identify the set of user accessibility needs that their ICT system is intended to meet and document these needs in the ICT system accessibility log (see 7.5).

NOTE 1 ISO/IEC 29138-1 identifies and describes a comprehensive set of user accessibility needs. It can be used as a basis for identifying specific user accessibility needs for an organization's or system's ICT accessibility policies.

NOTE 2 User accessibility needs identify accessibility needs that "some users need" which are often common across a number of diverse users. Meeting user accessibility needs can improve the accessibility of ICT systems for diverse users (including those not directly identified) in diverse contexts of use.

C.2 Accessibility guidance for software, content and hardware

It is important for the organization to:

a) identify relevant software accessibility standards to comply with;

NOTE 1 Major software accessibility standards include:

1) ISO 9241-171

2) ISO/IEC 40500 [also known as *W3C, Web Content Accessibility Guidelines (WCAG) 2.0*]

b) identify relevant hardware accessibility standards to comply with;

NOTE 2 ISO/IEC 29136 is the main hardware accessibility standard.

c) document this in the organizational ICT accessibility policy (see 6.2).

It is important for development or procurement projects to:

1) identify additional software, content and hardware accessibility standards that are particularly relevant to the ICT system being developed;

NOTE 4 Some additional software accessibility standards to be considered include: ISO/IEC/TS 20071-11; ISO/IEC/TS 20071-15; ISO/IEC/TS 20071-21; ISO/IEC 20071-23 and ISO/IEC/TS 20071-25.

2) ensure that they are using the latest version of applicable accessibility standards;

3) document conformity to accessibility standards in the ICT system accessibility log (see 7.5); and

4) test whether they have achieved that level of conformity in their ICT system before launch.

To make best use of the selected standards the organization can create internal documents to provide guidance on interpreting the standards in the context of the organization. It is useful for such documents to refer back to the related standards to provide readers with information on the source and intent of the original guidance.

C.3 Accessibility guidance for development tools

It is important for the organization to ensure that any development tool (including programming/authoring tools, content management systems and testing tools) they develop or procure:

a) creates systems and content that are accessible to diverse users; and

b) the tool is itself usable by developers with disabilities.

NOTE The *W3C WAI Authoring Tool Accessibility Guidelines (ATAG)* can assist in the procurement of accessible development tools.

C.4 Accessibility guidance supporting diverse platforms and assistive technologies

It is important for the organization to identify (or where they are not available create) appropriate standards to deal with the provision of accessibility across diverse platforms and assistive technologies.

NOTE 1 The *W3C WAI User Agent Accessibility Guidelines (UAAG)* can assist in the procurement of accessible development tools.

NOTE 2 ISO/IEC 13066-1 provides guidance on hardware and software interoperability issues that can extend the range of platforms and can aid in ensuring connectivity of assistive technologies.

NOTE 3 Accessibility application programming interfaces (accessibility APIs) can aid in making interoperability possible. Guidance on the use of some accessibility API's (and related technologies) includes: ISO/IEC TR 13066-2; ISO/IEC TR 13066-3; ISO/IEC TR 13066-4; ISO/IEC TR 13066-6; W3C WAI-ARIA Accessible Rich Internet Applications (especially relevant to improving the accessibility of dynamic web content); and guidance for other relevant accessibility APIs (e.g. for OS X, iOS and Android).

Organizations can consider creating workarounds for any accessibility issues they encounter, which are usually found through testing the product with the target assistive technologies.

It is important for the organization to test their ICT systems to ensure any workarounds provide a usable and accessible experience on the range of platforms and assistive technologies they have decided to support.

NOTE 4 It is not the responsibility of the organization to ensure that all platforms or assistive technologies used by their target audiences, unless the organization also provides those platforms and assistive technologies (e.g. for their staff to access their intranet).

C.5 Personalization guidelines for individualized ICT system adaptability

Where an individualized approach to ICT accessibility is being used, it is important for the organization to ensure that:

a) individualization serves the needs of the users;

NOTE 1 ISO 9241-129 provides guidance on the use of individualization to serve the needs of users.

b) at least one personalized version of the ICT system is accessible to each of the diverse users of the system;

c) the means of individualizing the ICT system are accessible;

NOTE 2 ISO/IEC 24786 provides guidance on ensuring that accessibility settings are themselves accessible.

d) any tool the ICT system includes which allows users to specify their needs (their accessibility preferences) is able to export and import those settings for interoperability to other accessibility preferences systems; and

e) all the alternate versions of content in the ICT system provide text equivalents for the content.

C.6 Accessibility guidelines for diverse systems and devices utilizing ICT

There are an increasing range of systems and devices involving ICT beyond traditional computer systems, currently including: kiosks, mobile devices, wearable devices, smart appliances and Internet of Things (IoT) devices. It is important for an organization to recognize that accessibility will be important for all systems with which humans interact, even for technologies/systems/devices that have not yet been envisioned.

It is important for the organization to apply accessibility to systems and devices, involving ICT with which humans interact, by;

a) taking into account the accessibility capabilities and restrictions of the type of system or device;

NOTE The accessibility settings available on mobile devices and IPTVs from different manufacturers, or different mobile devices or IPTVs from the same manufacturer, can vary enormously. Most of their accessibility settings and available assistive technologies are limited in comparison with the settings and assistive technologies available in computer operating systems and browsers. The type of input mechanism used on the device can also have an impact on its accessibility capabilities and restrictions:

b) identifying existing accessibility standards that apply to the particular type of system or device;

c) where there is an absence of applicable accessibility standards, developing internal accessibility standards (for use within the organization) applicable to the particular type of system or device;

d) establishing the level of accessibility experience for the type of system or device to provide;

e) wherever possible, creating their systems or devices using platforms which include an accessibility framework that supports accessible ICT systems; and

f) considering user-testing their systems or devices with persons with disabilities and non-disabled persons to ensure the level of accessibility experience meets their aims.

Annex D
(informative)

Accessibility testing methods

D.1 Manual conformity testing

Manual conformity testing is a systematic manual review of each major interface and interaction of an ICT system against the user accessibility needs and requirements, and against the most appropriate set of guidelines for the platforms and technologies it uses. This is important for full conformity checking because most accessibility standards need human judgement to correctly evaluate a system's conformance.

This testing is best used for providing verifiable proof of conformance with guidelines by testing all checkpoints across a representative sample of the system's content and functionality [e.g. choosing representative pages of a website via Website Accessibility Conformance Evaluation Methodology (WCAG-EM) 1.0, see https://www.w3.org/TR/WCAG-EM/].

It is important for the organization to ensure that manual accessibility conformity testing is carried out by expert testers who understand the criteria and spirit of accessibility standards being used, and so can produce informed and reliable test findings.

D.2 Assistive technologies and platform accessibility settings testing

Testing with assistive technologies checks whether assistive technologies can read and interact with content in ICT systems and whether they can activate user interface controls.

This testing is best used when the ICT system has already been tested for manual conformity with guidelines, to check that the system will deliver the desired degree of accessibility for users with each combination of assistive technology and browser/OS specified.

It is important for the organization to ensure that the testers carrying out the testing with assistive technologies and browser/OS settings are trained in the use of the technologies and are using the technologies in the same way diverse users of those technologies would them.

D.3 Cognitive walkthroughs

Cognitive walkthroughs employ a more rigorous, reliable methodology for finding potential accessibility issues than manual conformity testing and are often useful as a pre-cursor to user testing.

In a cognitive walkthrough, an expert tester steps through a series of actions with the goal of completing a typical user task as if they were an individual user from each of the system target user groups. Cognitive walkthroughs can be applied both the system on its own and the system along with assistive technologies that the target users might use.

As part of this walkthrough, the expert tester inspects the system against a defined set of guidelines from suitable accessibility standards and performs other checks that the expert has found over time to identify potential accessibility problems which the current standards might miss.

This testing is best used on early designs and on finished code to identify quality and consistency issues not typically identified during user testing.

It is important for the organization to ensure that cognitive walkthroughs are carried out by expert testers who are trained in the methodologies and assistive technologies they are using so they can have

the best chance of emulating the way diverse users would use them, to capture as many of the issues they might face as possible.

D.4 User testing with diverse users

User testing with diverse users involves recruiting a set of representative users (including users with disabilities and older people) and asking them to attempt to use the ICT system to achieve a set of representative user tasks. As such it is the best way of checking whether diverse users will be able to use, as well as access, an organization's ICT systems.

This testing is best used when the ICT system is nearing completion and launch. Ideally this testing would be through a number of iterations, where findings from one round of user testing are used to improve the product and are tested again in another round.

It is important for the organization to ensure that the testers carrying out the testing follow best practice "Codes of Conduct" for user testing, so that they do not "lead" users in testing and that they know how to analyse observations to produce test findings which are insightful and reliable.

NOTE The APA provides guidance in its publication *Ethical Conduct of Behavioral Projects Involving Human Participants*.

D.5 Automated conformity testing

Automated testing tools determine conformity with subsets of checkpoints in various accessibility standards that can be reliably tested in an automated way (e.g. simple success criteria in WCAG, correct use of accessibility traits in iOS).

This testing is best used for minimising the cost of accessibility testing embedded in the continuous integration quality assurance (QA) testing of ICT systems during their development and ensuring that any post-launch maintenance has not compromised the system's accessibility.

Where an organization decides to include automated conformity testing in the ICT system's accessibility testing plan, it is important that they are aware that only a minority of the guidance in accessibility standards can be programmatically verified, so automated testing on its own is not sufficient to check conformance with guidelines.

Annex E
(informative)

Drivers of accessibility

Drivers for organizations to take action to make their ICT systems, products and services more accessible and usable include:

a) Legal reasons: If an organization's ICT system, product or service is not accessible to diverse users, some persons might have grounds for making a claim against the organization under various laws and regulations dealing with equality and accessibility.

NOTE Legal entitlements to accessibility vary between different jurisdictions.

b) Commercial reasons: Accessible ICT systems can be used by a much wider audience than inaccessible ICT systems, opening systems up to the widest pool of potential users/customers.

Significant numbers of persons might currently be prevented from using systems which are not accessible to them in some context or might have an experience of the systems which is less than it could be. These include persons interacting with a system that requires some capability or capabilities to access the system that are not available to the user, such as: enjoying television content without captions in a noisy environment; using a low-contrast display on an automatic teller machine (ATM) in bright sunshine; and persons having temporary or permanent access limitations (e.g. disabilities related to aging) with which the system was not designed to be used.

Moreover, ICT systems which include content with accessibility features (such as text alternatives to images and captions for videos) are more highly visible to search engines. These features can lead to improved search engine optimization resulting in increased audience numbers.

Following this document can help minimize the cost of accessibility while maximizing its benefits. It is less costly providing accessibility initially and throughout systems development or procurement than it is when needing to add it after a system has been developed.

c) Ethical reasons/human rights/social responsibility: There are many benefits that modern digital technologies can bring to users.

Many organizations want to ensure that users with disabilities and older people and other diverse users are not excluded from these benefits and are able to use new technologies to increase their ability to live independently and to be fully engaged members of society.

This is reinforced by the United Nations Convention on the Rights of Persons with Disabilities which includes obligations for countries to promote "universal design" of products which are "usable by all people, to the greatest extent possible".

Making usability and accessibility strategic business objectives is one of the 7 principles of being a human-centred organization according to ISO 27500.

Human rights, accessibility and universal design are included in ISO 26000 and ISO 20400.

d) Innovation reasons

Consideration of the needs of accessibility can lead an organization to the identification of innovative ways of serving its diverse users. These innovations have the potential to benefit all users.

Annex F
(informative)

Checklists for ISO/IEC 30071-1

This annex provides an example of checklists (see Table F.1 and Table F.2) that can be used to determine whether the requirements and applicable recommendations in this document have been met. Use of these tables is not a substitute for understanding and using the entire document.

The tables contain all recommendations from this document, presented in sequence.

— Table F.1 focuses on embedding ICT accessibility within an organization.

— Table F.2 focuses on embedding ICT accessibility within an ICT system.

Each table contains the following columns:

— Column with pre-entered information based on this document;

1) Identification information;

a) structural entries in the table (clauses/subclauses, which are only for the informative purpose of identifying the location in which guidance appears) are identified with:

i) their clause/subclause number;

ii) title;

iii) the entire row being shaded grey indicating that they are not directly complied with;

b) requirements entries in the table are identified with:

i) their clause/subclause number and, where multiple requirements and recommendations in a subclause, further information such as list item number [e.g. "a) 1)" for sub-item 1 within item a of a list] or the number of the paragraph (e.g. p3 for the third paragraph in the clause) and sentence within paragraph (e.g. s2 for the second sentence in the paragraph);

ii) an abbreviated summary of the requirement[1)];

iii) the word "REQUIRED:" placed at the start of column 3, indicting the need to have met the requirement in order to comply with ISO/IEC 30071-1;

c) recommendation entries in the table are identified with:

i) their clause/subclause number and, where multiple requirements and recommendations in a subclause, further information such as list item number [e.g. "a) 1)" for sub-item 1 within item a of a list] or the number of the paragraph (e.g. p3 for the third paragraph in the clause) and sentence within paragraph (e.g. s2 for the second sentence in the paragraph);

1) These abbreviated summaries of the requirement are not intended to replace the full wording of the guidance in the normative portion of this document. They are only abbreviated to support quick recognition when using this checklist with the complete document.

ii) an abbreviated summary of the recommendation[2)];

iii) the entire row being shaded grey where compliance with a recommendation is based on compliance with more detailed recommendations that are included in the table (and referenced in column 3);

— Columns intended to be filled out for the organization/system being reported on:

2) Whether or not the guidance

a) has been followed (Yes/No) in rows involving compliance answers; or

b) is dealt with by other recommendations (prefilled as "---");

3) An explanation of whether or not complied with;

a) if based on more detailed recommendations, then a pre-entered reference to those recommendations;

b) if complied with, then a brief statement as to how the guidance has been followed;

c) if not complied with, then the justification for why the guidance has not been followed.

2) These abbreviated summaries of the recommendation are not intended to replace the full wording of the guidance in the main document. They are only abbreviated to support quick recognition when using this checklist with the complete document.

Table F.1 — Example checklist for compliance of an organization's ICT accessibility policy

1. Identification of guidance	2. Followed (Yes/No)	3. Explanation for how followed/justification for when not followed
6. Embedding ICT accessibility within an organization	---	
6.1 Setting ICT accessibility responsibility and policy for the organization	---	
6.1 p1) commit to integrate an ICT accessibility policy in its management systems and ensure the organization's compliance		REQUIRED:
6.1 p2) ensure that a department or role is responsible for compliance		REQUIRED:
6.1 a)1) consider how ICT accessibility will affect the organization's legal duties		
6.1 a)2) consider how ICT accessibility will affect the organization's duties to the public		
6.1 a)3) consider how ICT accessibility will affect the organization's ability to engage users, social responsibility and innovation		
6.1 a)4) consider how ICT accessibility will affect the organization's ICT development or procurement activities		
6.1 b) prepare an organization's ICT policy	---	see 6.2
6.1 c) delegate ICT accessibility responsibilities		
6.1 d) ensure that the organization implements and maintains the ICT accessibility policy		
6.2 Contents of an organizational ICT accessibility policy	---	
6.2 s1 explain organization's commitment in its ICT accessibility policy		REQUIRED:
6.2 a) organization's ICT accessibility goals	---	see 6.3
6.2 b) accessibility in organization's ICT development policy	---	see 6.4

Table F.1 *(continued)*

1. Identification of guidance	2. Followed (Yes/No)	3. Explanation for how followed/justification for when not followed
6.2 c) accessibility in organization's ICT procurement policy	---	see 6.5
6.2 d) accessibility in organization's ICT technology policy	---	see 6.6
6.2 e) organization's default ICT accessibility policies, procedures, activities or standards		
6.3 Creating an organization's ICT accessibility goals	---	
6.3.p1) identify and document accessibility goals in the organization's ICT accessibility policy		
Adding accessibility to the organization's ICT development policies	---	
6.4 p1) identify and document how to incorporate accessibility considerations within the organization's ICT development policy		
6.4 a) policies, procedures, activities or standards to apply organization's accessibility goals		
6.4 b) policies, procedures, activities or standards to integrate accessibility activities		
6.4 c) policies, procedures, activities or standards to include checkpoints to monitor accessibility activities		
6.4 d) policies, procedures, activities or standards to recognize difference in meeting general accessibility requirements and individual's user accessibility needs		
6.4 e) policies, procedures, activities or standards to progressively increase accessibility of existing ICT systems		