INTERNATIONAL STANDARD

ISO 21801-1

First edition
2020-01

Cognitive accessibility —

Part 1: General guidelines

Accessibilité cognitive —

Partie 1: Lignes directrices générales

Reference number
ISO 21801-1:2020(E)

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

Published in Switzerland

Contents

Page

Foreword

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

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

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO 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/TC 173, *Assistive products*.

A list of all parts in the ISO 21801 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

Cognitive impairment can affect anyone. It can be temporary or permanent. Cognitive impairment might affect a person's ability to

— perceive information including visual, auditory and haptic (e.g. reduced visual perception which can cause problems recognizing words, pictures or other visual input),

— sustain, direct and divide attention (e.g. reduced ability to filter unwanted stimuli, such as light or sound, or difficulties multi-tasking),

— register and store information and retrieve it as needed, including: store and maintain new episodes, knowledge and skills, and retrieve and maintain former episodes, knowledge and skills,

— communicate, including understand and express oneself both verbally and non-verbally,

— orientate oneself, and navigate spatially and topographically,

— execute activities, including solve problems; organize; plan; hold on to a plan or strategy and change strategy when appropriate; initiate, carry out, and terminate activities appropriately,

— think and reason in an abstract manner (e.g. understand generalizations and associations and causal connections), or

— understand and manage numbers and time (e.g. calculate or comprehend concepts of money, size, or lapses of time).

Activity limitations and participation restrictions for people with cognitive impairment can be reduced significantly through the design of systems and the built environment. The adoption of Universal Design (UD) approaches in standards and policies is key to facilitate access to mainstream systems. Strategies and principles consistent with the UD approach strive to promote features in systems and the built environment that are functional and comfortable for everyone.

Mainstream systems are often considered to be more affordable and socially acceptable than assistive products. Unlimited access to mainstream technologies and systems, including information technologies, contributes to the inclusion of people with the widest range of cognitive needs, in the widest range of life situations. Knowledge about the widest range of cognitive needs and how activities and environmental factors can be modified to increase participation is extensive but not easy to comprehend and transfer to the design and delivery of systems. Designers and manufacturers of mainstream systems who are aware of those needs can significantly contribute to accessible and usable systems.

Although named cognitive 'accessibility', this document also adopts the concept of 'usability' to ensure that design principles are based on the unique experiences of users rather than on assumptions of human abilities.

This document is structured around three concepts, each presenting a set of guidelines:

— Motivation and focus;

— Representation and understanding;

— Action.

This document is a general guideline on cognitive accessibility for all systems. In a specific domain or in a specific context there, can be more detailed standards and guidelines addressing cognitive accessibility, see References [5] and [6].

It is important to engage people with cognitive impairments and their significant others, in the development of mainstream and assistive products for people with cognitive impairments.

Cognitive accessibility —

Part 1:
General guidelines

1 Scope

This document presents guidelines for the design and development of cognitively accessible systems, including products and services and built environments.

This document is relevant to mainstream systems as well as those designed specifically for people with disability.

Within the broad field of accessibility, this document is limited to guidance related to cognitive accessibility.

NOTE 1 It acknowledges, however, that diverse sensory perceptions can impact cognitive accessibility.

NOTE 2 While the following guidance in this document can benefit all users, it is included here because failure to follow it could lead to barriers that would prevent some potential users from being able to use the system at all.

This document is relevant to all types of systems. However, some particular recommendations can only be followed for some types of systems:

— Some of the guidance is relevant to a fixed system (e.g. a non-computerized consumer product or a user manual);

— Some of the guidance applies to systems containing some level of computer-based processing (e.g. a microwave oven or an ICT-system);

— Some of the guidance applies to systems that use advanced computer processing that supports individualization (e.g. an application in a smart phone);

— Some guidance applies to combinations of the above.

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:

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

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

3.1
accessibility
extent to which products, *systems* (3.5), 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]

3.2
cognition
mental actions or processes of acquiring knowledge and understanding through thought, experience, and the senses

Note 1 to entry: Specific cognitive functions include; perception, attention, memory, linguistic functions (verbal, non-verbal), reasoning, planning, problem solving, decision making, reading and calculating. Cognition interacts with global mental functions (e.g. consciousness, energy, motivation) and affective functions (e.g. emotion, mood and self-regulation).

3.3
cognitive accessibility
extent to which *systems* (3.5) can be used by people from a population with the widest range of user needs, cognitive characteristics and capabilities to achieve identified goals in identified contexts of use

3.4
haptic
relating to the sense of touch, in particular relating to the perception and manipulation of objects using the senses of touch and proprioception

Note 1 to entry: While there is no difference between haptic and tactile in most dictionary definitions, in the area of haptics, researchers and developers use haptic to include all haptic sensations, while tactile is limited to mechanical stimulation of the skin.

3.5
system
product, service, or built environment or any combination of them with which the *user* (3.7) interacts

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

3.6
time management
mental functions of ordering events in chronological sequence, allocating amounts of time to events and activities

Note 1 to entry: This definition is taken from Reference [9].

3.7
user
individual who accesses or interacts with a *system* (3.5)

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

3.8
user profile
set of user requirements stored in a way that it can be re-used by a *system* (3.5)

4 Implementing the recommendations

In order to implement the recommendations in this document,

a) the ability to follow each recommendation in the document shall be determined;

b) any recommendation determined not being able to be followed shall be justified;

c) any recommendation being able to be followed but that is not followed shall be justified.

This implementation can be evaluated by self-assessment, or by an assessment carried out by another party.

Annex A provides assistance in documenting the implementation of the recommendations in this document.

5 Motivation and focus

5.1 General

People differ markedly in their means of engagement or motivation to learn or to perform a task. There are a variety of factors that can influence individuals including neurology, culture, personal relevance, subjectivity, and background knowledge. Some people are highly engaged by spontaneity and novelty while others might feel disengaged or even frightened by those aspects, preferring a strict routine. There is no single means of engagement that will be optimal for everyone, so providing multiple options for engagement is essential.

5.2 Means of motivation

5.2.1 Recruiting interest

The system should provide options for recruiting interest. People differ significantly in what interests them and this changes over time. A person's interests might shift with age, the gaining of new insights or activities, or changes in the environment.

NOTE 1 A way of recruiting interest and engagement is to highlight the usefulness and to demonstrate the relevance of the system.

NOTE 2 It might be useful to find alternative ways of recruiting interest, since recruiting interest leads to attention and attention leads to engagement.

NOTE 3 If the system does not interest people, it might not be used.

5.2.2 Individual options

The system should optimize individual options. Once a goal for a system has been determined, options can be given on how to access and how to use the system. Options can be related to context, use, support, or means of achieving the overall objective of the system.

NOTE 1 Optimizing options is not about presenting as many options as possible, it is about presenting a set of meaningful and appropriate options.

NOTE 2 Options are a way of maximizing the chances of success. People are more likely to succeed in using the system when there are meaningful options.

NOTE 3 See also ISO/IEC Guide 71:2014, 8.2.5.

5.2.3 Autonomous use

The system should support autonomous use. In situations of individual use or in cooperation between individuals, means to provide autonomy for each individual is important.

NOTE 1 Some people might always need support from either humans or assistive technology to achieve the desired outcome.

NOTE 2 If the use of the system is likely to involve cooperation, means for cooperation might be useful.

5.2.4 Usefulness and relevance

The system should optimize usefulness and relevance. People find different qualities useful and relevant. Usefulness draws on how relevant and valuable the system is for people.

NOTE Usefulness and relevance can be dependent on personal preferences, lifestyles, contexts, socio-cultural aspects, age and ability.

5.2.5 Level of abstraction

The system should provide options for the level of abstraction. Any design uses some level of abstraction. People might have difficulty with both high and low levels of abstraction.

EXAMPLE 1 People using digital maps and support for wayfinding can switch between satellite (real world) presentations, map view and text view. The detail shown in both satellite and map view can be increased or decreased by zooming in and out.

EXAMPLE 2 Orientation with the help of arrows pointing the direction at intervals is more abstract compared with following a continuous painted line on the floor.

5.2.6 Focus on the desired outcome

The system should support sustained focus on the desired outcome. Over the course of any sustained usage, there are many sources of interest and engagement that compete for attention and effort.

NOTE 1 Some people depend on support to remember their initial goal or to maintain a consistent vision of the rewards of achieving that goal. For these people, it is useful to build in periodic or persistent reminders or prompts of both the goal and its value, in order to sustain effort and concentration in the face of distraction.

NOTE 2 The goal can be displayed in multiple ways and at different stages. Long-term goals can be divided into short-term objectives or tasks.

NOTE 3 The desired outcome can be visualized and supported in different ways

5.2.7 Challenge by varying demands and resources

The system should optimize challenge by varying demands and resources. People vary in what motivates them to do things. They respond to different challenges and they respond to challenges differently.

NOTE 1 The right level of challenge is useful for maintaining interest. Engagement and motivation can be maintained by providing a balanced and varied range of challenges and resources.

NOTE 2 Differentiation in degrees of complexity or difficulty, availability of alternatives, degrees of freedom in performance, and access to appropriate resources can be tools for optimizing challenge.

5.2.8 Self-regulation, self-assessment and coping

The system should provide options for self-regulation, self-assessment and coping. People might have difficulty regulating their own emotions and motivations. Careful assessment of the design solutions' impact on an individual's emotions and affect can assist with self-regulation, self-assessment and coping.

NOTE Self-regulation of emotions can be affected by the design of the system.

EXAMPLE 1 An option to undo a previous action or a previous decision is self-regulatory support.

EXAMPLE 2 An overview before accepting a purchase, or a warning before a known risk factor might support self-assessment.

EXAMPLE 3 Features and functions that help people monitor and reflect on their usage and levels of success in use will help them to recognize both difficulties and progress. Access to statistics and results, or other kinds of positive or negative feedback, and reports on changes can be helpful.

5.2.9 Unintentional triggers of inappropriate reactions

The system should avoid unintentional triggers of inappropriate reactions.

NOTE Design that intentionally interferes with self-regulatory processes, or that attempts to coerce people to make decisions or take actions that are inappropriate for or detrimental to them is unethical. However not all intentional interference with self-regulatory processes is unethical.

5.2.10 Differences in coping abilities

The system should provide means to meet individual differences in coping abilities. People have different coping abilities and strategies. They also have different abilities in adopting strategies that will enhance their coping skills.

NOTE 1 Coping skills and strategies might include reminders, models, checklists, examples as well as adjustable settings, personal profiles, support or guidance, etc.

NOTE 2 See also ISO/IEC Guide 71:2014, 8.2.5.

5.2.11 Self-determination and confidence

The system should optimize for self-determination and confidence. Success in usage and autonomous usage in particular, builds self-determination, pride, trust and confidence in the system.

5.2.12 Threats and trust

The system should minimize threats and maximize trust. Psychological barriers in a system can exist in the form of threats that inhibit or prevent people from usage, or decrease self-determination, independence and satisfaction.

NOTE 1 These barriers can exist as intrinsic feelings even when no physical threat exists. Some design patterns and shapes can be regarded as threatening by some people. It is beneficial if design, concepts and content are used to build trust.

NOTE 2 Design that contributes to the reduction of potential threats creates trustworthy systems.

EXAMPLE Examples of known features that, in some situations, can be regarded as threatening include

— haptic: sharp angles, uncomfortable textures, hot or cold surfaces,

— audio: continuous noises or beeps; buzzing from machinery,

— visual: excessive information displayed with poor typography, shapes with sharp angles.

5.2.13 Accessibility and safety

The system should avoid enhanced accessibility compromising safety. It is important that solutions designed to increase accessibility do not result in loss of privacy, increased risks to personal safety or security, or the stigmatization of individuals.

5.3 Focus, attention and feedback

5.3.1 Object in focus

The system should clarify the object in focus. It is important for the user to understand which object or feature is intended to be in focus. Different means of drawing attention to the intended focus can be used and preferably consistently.

NOTE 1 Focus is often drawn by visual cues, but visualization is often not enough to ensure perception of focus for all people in all situations. Other means such as sound or haptic cues might be needed.

NOTE 2 Focus is useful in processes where a logical order of interaction or presentation is present.

EXAMPLE 1 Insufficient colour contrast can cause difficulties perceiving what is in focus.

EXAMPLE 2 A visually and haptically highlighted button can provide clues as to what might be in focus.

EXAMPLE 3 Calling the user's name might help that person to focus on a relevant object.

5.3.2 Shifts in focus

When a new object is supposed to be in the user's focus, support should be provided for the user to shift focus from one object to the next. The system should support/facilitate shifts in focus

NOTE Information about present location is often useful to assist users to change focus from one object in order to focus on the next. This can be supported by design that emphasizes both the previous and the new focus.

5.3.3 Inadvertent changes of focus or division of attention

The system should avoid features that inadvertently change focus or divide attention. Distractions might prevent people from fulfilling a desired task. Design strategies aimed at avoiding inappropriate changes in focus and attention are important.

NOTE 1 Environmental conditions can result in people losing attention.

NOTE 2 Losing focus is related to losing interest and some users have significant difficulty maintaining focus on the intended target.

NOTE 3 Known features that might divide attention could include

— flickering objects,

— moving objects or movement in an interface,

— sounds,

— irrelevant or illogical content,

— automated actions outside the user's control,

— complex or unclear demand, and

— long processes that cannot be paused.

5.3.4 Feedback

The system should provide relevant feedback. Feedback should be provided at all stages, with not providing feedback being the exception. Providing people with relevant feedback is often a matter of balance and timing. People need feedback to know the outcome of a task, when something has happened, or just to be reassured that they are progressing as expected.

NOTE Determining what type of feedback is appropriate is a useful design consideration.

EXAMPLE Feedback can be:

— Positive: Aiming to engage and motivate. Providing reassurance to the user.

— Neutral: Displaying what has happened. Summarizing activity or presenting current status and values, e.g. sound feedback/rewarding click. Presenting options.

— Negative: Alerting the user to possible errors.

6 Representation and understanding

6.1 General

People differ in the ways that they perceive and comprehend information presented to them. Different needs require different ways of approaching content. Some people might simply grasp information faster or more efficiently through audio or visual aids rather than text. Learning and transfer of learning occurs when multiple representations are used, because it allows people to make connections within, as well as between, concepts. Words, symbols, numbers, and icons are semantic elements used to present information. In short, there is no single representation that will be optimal for everyone, so providing options for representation is essential.

Decoding of words, symbols, numbers, and icons is a more or less automatic process that differs between people. For people struggling with automaticity, the result is a higher cognitive load leading to a reduced ability in information processing and comprehension.

6.2 Multiple means of representation and understanding

6.2.1 Simplify the language — Dealing with words

The system should simplify the language — dealing with words. Systems presenting information that exceeds the language comprehension of the user can interfere with their understanding and performance. The vocabulary used should be as easy as possible to understand and complicated word should be explained, in a way that doesn't interfere with readability and comprehension.

NOTE 1 Unusual words, abbreviations, idioms, jargon, poorly constructed sentences and grammatical errors are known to cause reading problems.

NOTE 2 Other representations than text (e.g. pictograms, video, audio) might be needed to ensure clarity and comprehension for all people.

NOTE 3 See also ISO 9241-112.

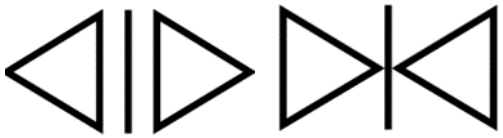
6.2.2 Simplify the language — Dealing with symbols

The system should simplify the symbolism. Non-linguistic features (pictures, animations, videos, standardized pictograms, etc.) can be used to clarify or substitute linguistic information.

NOTE Logotypes and pictograms can help to find information.

EXAMPLE Pictograms showing the open/close-door buttons of elevators, see Figure 1

a) Chinese pictograms



b) Pictograms designed within the universal design tradition [a]

[a] Reference numbers: IEC 60417-5555, referent: Tape running direction and IEC 60417-5554, referent: Still mode.

Figure 1 — Examples of pictograms for open and close buttons of elevators.

6.2.3 Simplify the message structure

The system should simplify the message structure. The use of well-constructed sentences and commonly used vocabularies will increase understanding.

It is recommended that the system has a clear structure and divides information. A clear structure and syntax increase the probability of comprehension. Well-structured information supports comprehension.

NOTE 1 It is often useful to divide information into chunks such as paragraphs, chapters, sections in text, or chapters in videos. Chunks make it easier to process and comprehend pieces of information and to return to the task when completing it in intervals. To limit a sentence to a single idea could be a useful way of simplifying the message structure.

NOTE 2 It is often useful to sort information hierarchically, for example using headers and sub-headers or sections and sub-sections. Hierarchies make it easier to understand relations in information.

NOTE 3 The order of presentation is often relevant. For people with difficulty sustaining attention and engagement, it can be beneficial to present the most important information first.

NOTE 4 Considering the sequencing of information that is presented might be useful. This can include taking into account the history and context of where information is being presented.

NOTE 5 Provision of contextual information prior to information that needs to be understood in context might be a useful strategy.

EXAMPLE The system reminds the person that today is the day to go to day care prior to reminding the person to get ready to go.

NOTE 6 It might be useful to provide a summary for a long text.

NOTE 7 See also ISO 9241-112:2017, 6.3.2.

6.2.4 Understanding across language barriers

The system should promote understanding across language barriers. If a system is monolingual, people not familiar with the chosen language will face problems or even find the information inaccessible.

NOTE Cross-linguistic solutions increase the range of potential users. Providing alternatives in the form of different language versions is a way of addressing barriers, but the number of supported languages is often limited. If full versions are not possible, it could be useful that at least the critical information and terms are explained.

6.2.5 Translation processes

The system should support translation processes. Digital information can be translated by automated translation services. Simplifying the language can increase the quality of the outcomes from such translation processes.

6.2.6 Options for finding information

The system should provide and optimize options for finding information. It is important that systems provide appropriate cues to assist people in paying attention to important information or finding required information.

NOTE Headers, menus, tabs, search-functions, links, and indexes can help people find information.

6.2.7 Equal opportunities for comprehension

The system should make available equivalent presentations of information to support comprehension. Text is a common media used for providing information, but not all people comprehend text easily. Different modalities and formats, such as visual, audio or haptic, can be helpful to provide opportunities

for comprehension. The availability of alternative media and modalities can provide opportunities to enhance comprehension.

NOTE 1 It might be useful for people to transform information from one modality to another, such as converting text to speech, speech to text, text to braille (touch).

NOTE 2 See also ISO/IEC Guide 71:2014, 6.2.10.

NOTE 3 See also ISO 9241-112:2017, 6.4.2.

6.3 Spatial orientation and understanding of values and sizes

6.3.1 Entities and sizes

The system should provide means for comparing entities and sizes. People might have difficulty understanding and comparing entities and sizes. Design should incorporate strategies to support people to understand and compare entities and sizes.

NOTE Abstract information can be transformed into information that is more meaningful for the person, see Figure 2.

EXAMPLE 1 Colour coding of measuring cups can be used to better understand different quantities used in a recipe, e.g. a red cup can be smaller than a blue cup.

EXAMPLE 2 Degrees of temperature can be presented alongside a visual display of the kinds of clothes to wear.

EXAMPLE 3 A person takes a loan but in order to pay it back, a change in daily activities and associated expenditure is needed. The changes are presented visually allowing the current situation to be compared with a potential new situation, see Figure 2.

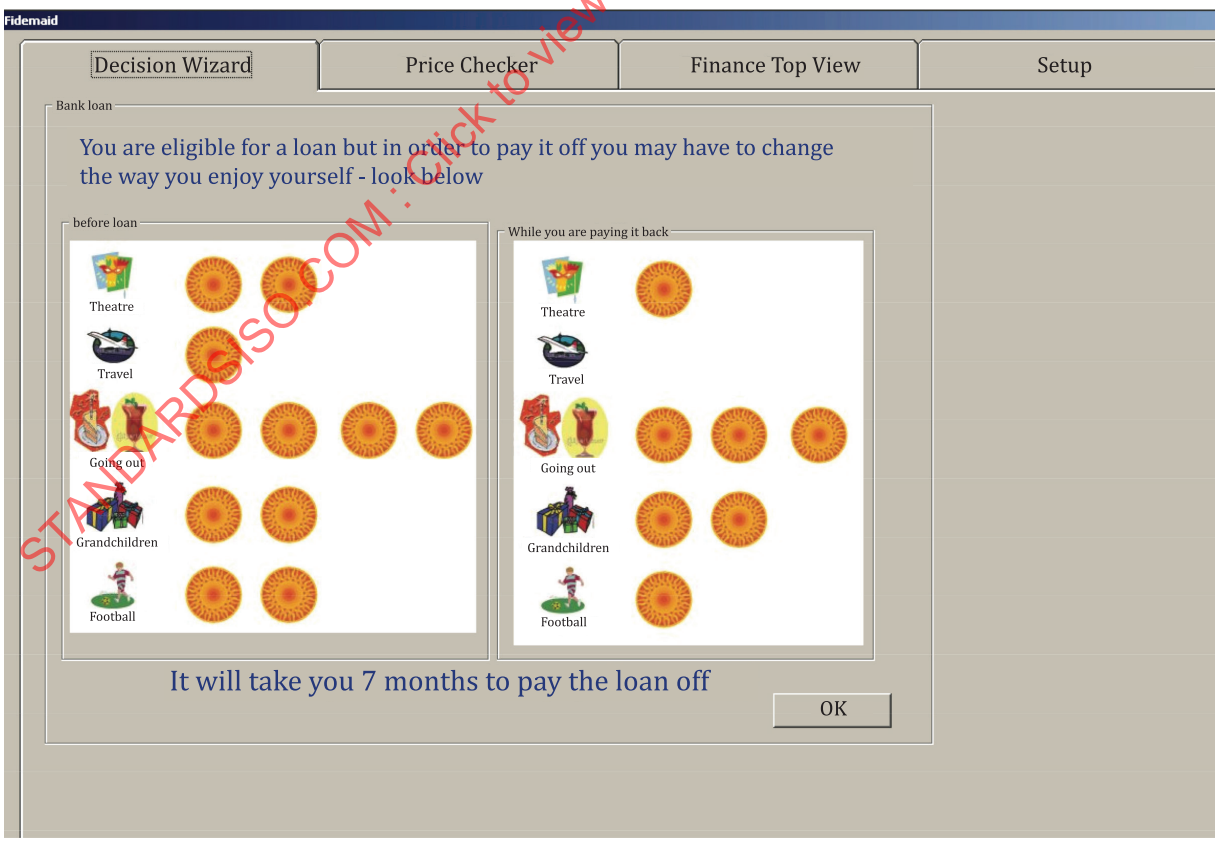


Figure 2 — Visual presentation of activities and spending in relation to a bank loan.

6.3.2 Scales and relative values

The system should provide means for understanding scales and relative values. Designers should aim to support people to easily recognize and comprehend patterns, changes and relationships between scale, proportion, or quantity.

6.3.3 Position in space

The system should provide means for understanding position in space. If the understanding of position in space is important, then the design should help people to understand position of oneself, other persons or other objects and functions.

NOTE Maps, positioning systems or signs can be used to provide information about position. Landmarks or the position of other persons or objects can provide cues about position.

EXAMPLE GPS and a map in a mobile phone can help people understand position.

6.4 Simple, understandable and logical design

6.4.1 Logical and consistent design

The system should use a logical and consistent design. It is important to use concepts, patterns, designs, and typography consistently within a whole system. When this is done, people can intuitively do the right thing or predict what the right action is, without having to think too much. When people can draw on experience and familiarity with a system, the cognitive load is reduced.

6.4.2 Background knowledge

The system should activate or supply background knowledge. When designs draw on previous experience or knowledge, rather than presenting something completely new, it can be easier for the user. This is particularly the case when dealing with abstract concepts.

NOTE 1 Use of prior knowledge decreases the cognitive load compared to learning something new.

NOTE 2 Information is more likely to be understood if it is presented and communicated in a way that primes, activates, or provides pre-requisite knowledge. Systems that are simple, understandable, and logical can adopt linking or bridging strategies to support the user to go from the known to the unknown.

NOTE 3 Drawing on prior knowledge minimizes the need for additional information, training, and learning.

NOTE 4 Intentions to break with people´s expectations can be followed with extensive testing to assure that the system performs as well as or better than it would when conforming to people´s expectations.

6.4.3 Transfer and generalization

The system should maximize transfer and generalization. People often need to transfer and generalize knowledge to new domains and new contexts or to use previous knowledge in new situations. A system that allows people to reuse something already known to work out what to do is usually simple, understandable and logical.

NOTE See also ISO/IEC Guide 71:2014, 6.2.2.

6.4.4 Understanding underlying concepts and ideas

The system should provide options to understand underlying concepts and ideas. People differ in their ability to understand broad concepts and principles and their application in systems. A lack

of understanding or misunderstanding of underlying concepts and ideas can prevent proper and efficient usage.

NOTE The aim is to acquire a global understanding of the ideas, concepts, critical features and relationships between them that are in the system.

EXAMPLE Money is withdrawn from a travel card when presented to a ticket machine and the amount of money withdrawn is calculated based on the number of zones travelled. Understanding the concepts of pre-loading money on a card, travel zones, and pricing structures, assists in planning and completing travel with a travel card.

6.4.5 Complexity

The system should minimize complexity. The level of complexity of a task or system has a direct impact on user performance. Complexity also contributes to user errors.

NOTE 1 When designing a system, it is often useful to consider how to

— simplify the performance requirements,

— minimize unnecessary complexity and steps, and

— allow for adjustment of speed in interaction

NOTE 2 Simplification and minimization of complexity often necessitates a complementary process of guiding and helping people. Where there is a possibility for misunderstanding or making mistakes, some people will misunderstand or make mistakes.

NOTE 3 See also ISO/IEC Guide 71:2014, 8.2.4.

7 Action

7.1 General

People have different cognitive needs for how they initiate and take action. Action involves strategy, practice, and organization, of which there is a diversity of approaches. There is no single form of action that will be optimal for everyone, so providing options for action is essential.

7.2 Means of expression

7.2.1 Customizable media for information, expression and communication

The system should provide multiple customizable media for information, expression and communication. Unless there is a specific reason not to, it is important to provide alternative and augmentative media for information, expression and communication. Alternatives reduce media-specific barriers and provide the opportunity for the user to make choices.

NOTE 1 Some people perform significantly better in one media compared with others. People might also want to practice using a specific media regardless of their performance.

NOTE 2 Since user preferences differ for each type of media, useful strategy can be to provide options for people to customize the media used.

NOTE 3 People might want to use a combination of media (sometimes described as channels) to

— create information,

— publish information,

— receive information,

— express themselves, or

— communicate with others.

NOTE 4 Frequently used media for presentation and expression include text, speech, video, picture, illustration, animation, drawing, music, and dance/movement.

NOTE 5 Frequently used media for interactive communications include text messaging, picture messaging, discussion forums, telephone, videos, presentations.

NOTE 6 See also ISO/IEC Guide 71:2014, 8.2.1.

7.3 Organization, planning and time management

7.3.1 Goal-setting

The system should guide goal-setting. People might need to establish goals for what they want to achieve by using the system, or what they can afford to spend in terms of money, effort and time.

NOTE 1 People might need guidance for goal setting in a number of situations.

EXAMPLE 1 Desired outcomes, levels, values, achievements etc., differ.

EXAMPLE 2 Time or money spent can be related to the system.

NOTE 2 Goals can be used both as challenges and to establish attainable levels of some kind.

7.3.2 Decision-making

The system should simplify decision-making. Even when there is only one logical thing to do, people might have difficulty taking that action. With two or more possible actions, the process of decision-making can be difficult or even disruptive for some people.

Unambiguous options are not always possible, but helping people make the appropriate decision or choice in each situation, respectful of their preferences, can be helpful.

NOTE Useful strategies to simplify decision-making include the following:

— provide unambiguous options,

— guide and provide help through processes,

— automate tasks or sets of tasks,

— present suggestions of what to do.

7.3.3 Strategic activities

The system should support strategic activities. The introduction and use of many systems requires strategic activities including planning, development, monitoring progress, and task completion. Pre-requisite knowledge, tools or activities can be clarified to support effective use of the system.

NOTE 1 Some people find it difficult to plan and develop strategies and, instead of planning a process, attempt by trial and error or fail to reach a point where they can use the system.

NOTE 2 Monitoring progress is often a matter of appropriate feedback, but also a matter of self-reflection and self-monitoring of progress. Improved use of a system can be dependent on information about what to do differently, or information about current use or performance.

EXAMPLE Self-reflection and self-monitoring can be supported by representations of progress, models for self-assessment, examples from other users, and checklists.

7.3.4 Options for strategic activities

The system should provide options for strategic activities. People depend on different means and use different strategies for planning, strategy development, and monitoring progress.

NOTE 1 If possible, it can be useful for people to customize or adjust settings and properties for the system, intended to support planning, strategy development and monitoring progress.

NOTE 2 Instructions, checklists, examples, templates, mentors can support people to plan and to develop strategies.

7.3.5 Time constraints

The system should protect the user from time constraints. Since time is complex and many people face problems with time and time management, it is important to only use time-based concepts when required as an essential component, or when their use enhances the system.

If time limits are essential, a default time covering the widest possible time range is important, as well as the possibility to adjust time limits, or disable the time limit.

NOTE 1 If people exceed time limits in the middle of unfinished activities, a useful strategy is that the system allows them to continue the activity without losing the meaning of the previous actions or the data input after resuming the activity.

NOTE 2 If people perceive that a task will take too long, it is useful that the task can be paused or divided into sub-tasks.

7.3.6 Time awareness

The system should provide options for time perception. People might depend on different kinds of means to help them process and use time.

NOTE For specific guidelines for daily time management, see ISO 21802:2019, 4.2.

7.3.7 Options for orientation to time

The system should provide options for orientation to time. Time is often divided into manageable chunks. Intervals including years, months, hours, or seconds, are often used to help people understand when something is going to happen or how long an activity will last. Other concepts for dividing time include morning, midday, afternoon, evening or night, or concepts like “in a while”, “soon” or “later”.

NOTE For specific guidelines for daily time management, see ISO 21802:2019, 4.3.

7.3.8 Communication of time and time management

The system should provide options to communicate time or preferences for time management. People might have difficulty expressing time and might have specific preferences about how to communicate regarding time. Some might also need to communicate specific preferences regarding time management. Instead of people having to adapt to fixed settings in the system, it is important to provide options to use personally preferred ways of communicating time.

NOTE There are useful concepts to help people communicate time, including the following:

— Different input methods and input modalities: If a system uses time in the format [hours:minutes], it is possible for people to express that time in many different ways. If the system can correctly understand different ways for people to communicate time, it will be easier to use an input method/modality that a specific user can manage.

— User preferences about time in user profiles: Complex time management can be simplified if the user, or someone helping the user, can set a preferred profile and save it so that it can be re-used.

— Reminders or calls for action: Some people depend on specific functions to help them either be on time or finish a task in time. The option to set reminders and calls for action in task sequences, at different levels and in mixed modalities can be helpful.

— Information for reassurance and confirmation: Information is often used to confirm time, for example whether it is night or day or what the time is. The purpose of these reminders is not for people to initiate or complete a task, but instead to provide reassurance. This can help some people experience, or relate to, where they are in a timeframe.

7.3.9 Adapting time demands

The system should provide options for adapting time demands. When something unexpected happens or when additional information is provided, people often have to re-schedule or re-plan tasks and activities. Time-adaptation to such changes can be very difficult for some people.

NOTE 1 There are some useful concepts to help users adapting to time demands including the following:

— Information can be displayed/provided as soon as possible**:** The longer the time available for re-planning, the better. It is therefore useful to provide people with information that might affect previously made plans as soon as this information is known.

— If a system can use known information to provide people with different and relevant options or calls for action, it is useful that such options are presented.

— Forecasts and predictions can be used to create awareness: If possible, people can benefit from being provided with information about what might happen/what is likely to happen so that they can be mentally prepared to adapt to time demands.

— A crisis response/management plan can be displayed: People might have prepared a personal plan that can be activated under specific circumstances. Sometimes, the provider of a system is better suited to propose a crisis response/management plan.

— Real-time monitoring and real-time support can be provided**:** A direct contact between people and a support-function can help them to adapt to time demands, especially in complicated contexts.

NOTE 2 For specific guidelines for daily time management, see ISO 21802:2019, 4.5.

7.4 Flexibility and equal opportunities

7.4.1 Equality

The system should provide support to accomplishment of tasks in an identical manner whenever possible or in an equivalent manner when an identical manner is not possible. It is important that systems provide the same means of use for all users whenever possible, or an equivalent when not. To accomplish these goals, flexibility is essential.

NOTE 1 If the differences in how to accomplish tasks is considerable, there might be a risk that users will not understand if accomplishment is achieved.

NOTE 2 See also ISO/IEC Guide 71:2014, 6.2.10.

7.4.2 Access to systems and interoperability

The system should optimize access to systems and interoperability. Interoperability between systems (both mainstream and those designed especially for people with disability) is important to ensure that users with specific needs can access and use the system.

NOTE 1 Even when conforming to accessibility standards and guidelines, there might be people unable to use the system as it is.

NOTE 2 If the system is, for any reason, closed and does not allow access to external systems (e.g. text magnification software or portable CCTV), it is relevant that the closed system is designed for use by people from a population with the widest range of characteristics and abilities.

NOTE 3 The ways of connecting systems or ensuring interoperability between systems and devices can be standardized in domain-specific contexts. If incompatibilities between systems are known, it is important that information about these incompatibilities is available to people.

NOTE 4 See also ISO/IEC Guide 71:2014, 6.2.11, 8.2.7, and 8.2.8.

EXAMPLE The use of software to automatically transform text to speech in a computer.

7.4.3 Alternative and multiple means of user interaction

The system should provide alternative and multiple means of user interaction. It is important that there is more than one way to complete a task or activity or to interact with a system to achieve the same objective(s).

NOTE 1 It is often relevant that systems support as many simultaneous and alternative means of interaction as possible in order to support preferences or needs from the widest range of people and for the widest range of contexts and situations.

NOTE 2 See also ISO/IEC Guide 71:2014, 8.2.1.

7.4.4 Alternatives and decisions

The system should clarify options and alternatives that can be chosen and decisions that need to be taken. Choices, possibilities for adaptions, and options for settings or actions can be difficult to understand. If not clearly presented and explained, people might experience barriers even when an appropriate solution is available. If the system contains obligations in the form of decisions that need to be taken those should be presented as clearly as possible.

7.4.5 Default configuration and adjustable parameters

The system should provide default configuration and adjustable parameters. It is important to avoid fixed parameters and consider whether a fixed design parameter could actually be adjustable. People with needs outside fixed parameters might find the system inaccessible or problematic to use.

NOTE 1 It is often relevant that default configuration (or alternative selectable default configurations) cover preferences from as wide a range of users as possible. In addition, adjustable parameters can allow people with preferences outside the default configuration to adjust the system.

NOTE 2 When using adjustable parameters, it is relevant to ensure that the range for adjustability is sufficient to enable access for the widest range of users.

NOTE 3 Providing adjustable parameters with an easy option to return to a default configuration is a common strategy for meeting diverse user needs.

NOTE 4 If fixed parameters are used, it is useful that they cover the widest possible range of users.

NOTE 5 An alternative strategy to providing adjustable options is to design the system to automatically adapt to user behaviour.

NOTE 6 See also ISO/IEC Guide 71:2014, 8.2.2 and 8.2.3.

7.4.6 Individualized access and reuse of user profiles

The system should provide individualized access and reuse of user profiles. If possible, it is important that the system provides means for individualization. Individualized access aims to address specific needs and preferences of users that are not possible when using default settings.

NOTE 1 Individual requirements might be stored in the system or accessed from a user profile stored outside the system.

NOTE 2 If people have a user profile or a set of preferences stored in a cloud service, the possibility to use these can simplify the use of the system.

NOTE 3 See also ISO/IEC Guide 71:2014, 6.2.3 and 8.2.5.

7.4.7 Access to the intended outcome of the system

The system should ensure that the intended outcome of the system is easily accessible. If it is not possible to maintain the same level across the whole system, it can be accepted that additional functions might demand more actions and a higher level of complexity.

EXAMPLE If the intended outcome is to buy a train ticket from a ticket vending machine but there is also the opportunity to buy an additional meal on the train, it can be relevant that the process of buying the ticket be really easy while it can be accepted that buying the meal is not as easy.

NOTE See also ISO/IEC Guide 71:2014, 8.2.

7.5 Support for completion of tasks

7.5.1 Sustained attention and concentration

The system should support sustained attention and concentration throughout the process. Some people can regulate and allocate enough attention to complete a task while others can have significant problems.

NOTE 1 Means to support completion of tasks include

— reminders,

— feedback,

— encouragement,

— display of steps, and

— display of time left to completion.

NOTE 2 See also ISO/IEC Guide 71:2014, 6.2.9.

7.5.2 Avoiding mistakes

The system should provide means for avoiding mistakes.

NOTE 1 If a potential mistake can be detected, it is often useful to provide warnings and descriptions of consequences, allowing people to reflect before taking further action.

NOTE 2 If the system can automatically detect input errors or mistakes, suggestions for corrections can be provided to people in a way that makes it easy to accept the suggested corrections or take other proposed actions.

NOTE 3 One central concept in this field is the “undo-action”. If the system responds to user activity in an unwanted way (from the user perspective), it is relevant to provide the option to undo actions in one or several steps. For actions that are impossible to undo, it is often useful that the user can be required to confirm the action before it is performed by the system.

NOTE 4 Another central concept is reviewing and checking, allowing people to control, check and potentially change before confirming some kind of execution from the system.

NOTE 5 See also ISO/IEC Guide 71:2014, 6.2.9.

7.5.3 Mistakes and errors

The systems should clarify mistakes and errors. It is important to protect people from the consequences of accidental or unintended actions. This is particularly important for people who might experience difficulty in recovering from errors.

NOTE 1 If possible, fail-safe features and solutions can be used to improve the system by minimizing errors.

NOTE 2 Fail-safe solutions can follow different concepts. The “dead man’s switch” (like a switch that is automatically operated if the human operator becomes incapacitated); progressive enhancement or graceful degradation are known concepts.

NOTE 3 See also ISO/IEC Guide 71:2014, 6.2.9.

7.5.4 Correction of mistakes and errors

The system should simplify corrections of mistakes and errors. When something goes wrong, whether as a result of a user’s action or system malfunctions, it is important to first clarify what happened and then help people to recover from mistakes and errors.

NOTE 1 General references to manuals, policy documents and complete sets of instructions often act as barriers that prevent or delay people from recovering from mistakes or figuring out what to do.

NOTE 2 See also ISO/IEC Guide 71:2014, 6.2.9.

7.5.5 Support functions

The system should provide appropriate support functions. Complex systems often depend on elaborate support functions provided in direct contact with human support and/or built-in or stand-alone support functions.

The nature of the offered support function is often very important. The way support is provided, and the different options provided to support the user could, in themselves, work as both barriers and enablers. Providing multiple means for help and support can be as important as providing multiple means for the use of the system itself.

NOTE 1 Support is often provided by textual information but non-textual help and support in the form of, for example, icons, video, sound, and speech can also be useful for people struggling with text.

NOTE 2 In some cases, people depend on the possibility to train, learn and practice before use, to minimize the use of support and help.

7.5.6 Content-integrated contextual help

The system should provide content-integrated contextual help. Content-sensitive help can set focus directly on how to solve a specific issue.

NOTE 1 A content-integrated contextual help function provides help without people having to leave the current location in the system.

NOTE 2 Accessible help-functions can promote use of the system.

Annex A
(informative)

Checklist for following the recommendations of this document

Table A.1 provides an example of a checklist that can be used to determine whether the recommendations of this document, i.e. ISO 21801-1, have been addressed. The use of this table is not a substitute for understanding and using the entire document.

Table A.1 contains all recommendations expressed in this document, presented in sequence.

NOTE These abbreviated summaries of the recommendations are not intended to replace the full wording of the guidance in the body text of this document. They are only abbreviated to support quick recognition when using this checklist with the complete document.

Each table contains the following columns:

a) Column with pre-entered information based on this document;
   1) Identification information (pre-filled);
      i) Entries concerning principles are identified with
         — their sub-clause number (from the main body of this document), and
         — the name of the principle.
      ii) Entries concerning recommendations are identified in the table with
         — their sub-cause number (from the main body of this document), and
         — an abbreviated summary of the recommendation.

b) Columns intended to be filled out for the organization /system being reported on:
   1) Whether or not a recommendation has been followed;
   2) If the recommendation is considered not being able to be followed, then the justification for why;
   3) A statement of whether an applicable recommendation has or has not been followed;
   4) An explanation regarding how and why the recommendation has been followed or not;
      i) if followed, then brief statement as to how the recommendation has been followed;
      ii) if not followed, then the justification for why the recommendation has not been followed.

Table A.1 — Example checklist for following the recommendations of this document

Sub-clause	Recommendation	Being able to follow		Followed	
		Yes/ No	Reason, if not able to follow	Yes/ No	Comments
5.2	**Means of motivation**				
5.2.1	The system should provide options for recruiting interest				
5.2.2	The system should optimize individual options				