
**Information technology — Cross-
jurisdictional and societal aspects
of implementation of biometric
technologies — Biometrics and elderly
people**

*Technologies de l'information — Aspects sociétaux et
transjuridictionnels de la mise en œuvre des technologies
biométriques — Biométrie et personnes âgées*

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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.

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 or www.iec.ch/members_experts/refdocs).

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

This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 37, *Biometrics*.

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 and www.iec.ch/national-committees.

Introduction

This document provides support for the further development of ISO/IEC International Standards on biometrics in the context of cross-jurisdictional and societal applications of biometrics, in relation to usage with elderly persons.

The contents of this document are descriptive and do not provide recommended practices and guidelines.

Examples of the benefits to be gained using this document are:

- operational support in using biometrics applied to the context of elderly people;
- enhanced acceptance by subjects of systems (elderly people and relatives) using biometric technology;
- improved public perception and understanding of these systems;
- smoother introduction and operation of these systems.

The primary stakeholders are identified as:

- users – those who use the results of the biometric data;
- developers - those who develop technical standards;
- subjects – those who provide the biometric sample;
- writers of system specifications, system architects and IT designers;
- public policy makers - those who make policies affecting the use of biometrics.

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Information technology — Cross-jurisdictional and societal aspects of implementation of biometric technologies — Biometrics and elderly people

1 Scope

This document builds upon the information provided in ISO/IEC TR 24714-1, ISO/IEC TR 29194 and ISO/IEC 29138-1 in order to highlight in a more detailed way the medical, physical and cognitive aspects that are specific for the use of biometrics by elderly persons.

2 Normative references

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

ISO/IEC 2382-37, *Information technology — Vocabulary — Part 37: Biometrics*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 2382-37 and the following apply.

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

- ISO Online browsing platform: available at <https://www.iso.org/obp>
- IEC Electropedia: available at <https://www.electropedia.org/>

3.1

elderly person

every human being over the age of 65 years

Note 1 to entry: For an explanation of why 65 years has been chosen as the age defining an elderly person, see [Clause 6](#).

4 Abbreviated terms

DG	Directorates-General of the European Commission
EU	European Union
JRC	Joint Research Centre of the European Commission
UN	United Nations

5 Fundamental concepts

ISO/IEC TR 29194:2015, Clause 2 states:

“There is a basic principle of designing biometric systems in a way that they can be used effectively and with minimum discomfort by the whole target population. There is also the need of reaching a common

understanding of the target population and an agreement of what is reasonably possible. This brings the requirement of designing biometric systems following the best possible guidance to create systems that are accessible”.

ISO/IEC 29138-1:2018, Clause 1 states:

“This document identifies a collection of user accessibility needs that diverse users have of ICT systems to make these systems accessible to them. Each user accessibility need might be required of a system by an individual. Different users can have different sets of user accessibility needs in different contexts”.

The issues raised in these two documents are particularly evident in the biometric context because age-related psychophysical complications often combine with a degradation of the biometric characteristics of the individuals.

The consequences are that elderly people often experience serious difficulties in using a biometric system.

6 Elderly people in terms of age

Although it cannot be considered as a general rule, and the UN-agreed age for referring to the elderly population is 60+ years, many countries have accepted the chronological age of 65 years as a definition of an 'elderly' or older person.

This document follows the latter convention and uses the definition provided in [3.1](#) when referring to "elderly people".

7 Critical points associated to the use of specific biometric modalities by elderly people

7.1 General considerations

The following subclauses provide a brief description of some typical characteristics of elderly people that can have a potential consequence on specific biometric technologies. They also consider certain pathologies which are frequently experienced by elderly people.

NOTE Although the focus of this document is on elderly people, some pathologies can also occur at an earlier age.

The biometric technologies analyzed in this document are those which are most prevalent in their use. If the use of a further biometric technology becomes particularly widespread in the future, such technology will be considered in subsequent revisions of this document.

7.2 Fingerprint recognition

7.2.1 Typical characteristics of an elderly person which can have consequences on fingerprint recognition: skin conditions

In elderly people, water loss from the stratum corneum, the outermost layer of the epidermis, can make skin dry (xerosis).^[1] This can result in an inconsistent contact of the finger ridges with the scanner's platen surface, which can cause broken ridges and several white pixels replacing ridge structure.^[2]

Furthermore, the differentiation between ridges and valleys reduces as ridges wear out with age. As a result, for a contact scanner, it can become difficult to capture a good quality fingerprint.

NOTE With the implementation of contactless fingerprint scanning technologies, this issue is lessened, and could potentially be eliminated in the future.

Consequently, it can be pertinent to evaluate whether fingerprint recognition is the appropriate biometric to use for elderly people (particularly those aged over 70) in certain situations.

EXAMPLE The US VISIT Entry/Exit systems exempts persons over the age of 79 from releasing fingerprints during the phase of verifying the credential to access to the USA at an entry point.

If contact fingerprint sensor technology is used, some scanner manufacturers provide elderly people with appropriate moisturizing solutions to be applied prior to fingerprint capture.

An advantage of using sub-dermal or touchless fingerprint sensors is that they are less affected by changes to the surface of the skin.

7.2.2 Typical pathologies experienced by elderly people which can have consequences on fingerprint recognition

7.2.2.1 Arthritis and arthrosis

An elderly person's ability to use a fingerprint device can be severely limited by arthritis, arthrosis or a loss of motor performance. Consequently, the quality of images captured by fingerprint sensors can be affected in the population of elderly people.

NOTE It is not advisable to treat unintentional poor fingerprint presentations due to age-degraded motor functions as a presentation attack to the fingerprint system.

A solution for overcoming such issues is to re-capture the fingerprint until image quality is sufficient for system processing or, again, use touchless fingerprint sensors.

7.2.2.2 Neuromuscular diseases

Neuromuscular disease is a very broad term that encompasses many diseases and affections that impair the functioning of the muscles, either directly (pathologies of the muscles), or indirectly (pathologies of nerves or neuromuscular junctions).

Neuromuscular diseases increase with age, and can influence the use of fingerprint scanners by elderly people.

7.2.2.3 Eye diseases

Reduced visual acuity among the elderly is a very important healthcare problem. According to Reference [3], approximately one person in three has some form of vision-reducing eye disease by the age of 65.

As described in ISO/IEC TR 29194, a series of countermeasures can mitigate reduced visual acuity of people using fingerprint sensors:

- the scanner area of the fingerprint sensor can be recessed into the surrounding raised casing, thereby guiding the finger into the correct location;
- a tactile marking (consisting of, for example, a circular area with a different texture) in the very centre of the scanner area can allow accurate positioning of the finger, while not limiting the size of the scanner area;
- an internally illuminated scanner area can help people with impaired vision. If this feature applies, the light only turns on when the reader is awaiting input or starts flashing slowly when the reader is awaiting input.

Another option is the use of multi-sensory alerts (lights and sound; lights, sound and vibration, etc.) to inform the subject.

7.2.3 Data concerning the use of fingerprint recognition by elderly people

The JRC has started a study on the physiological development of the fingertip ridge structure over time and its impact on automated fingerprint recognition.^[4]

For those in the elderly category, experiments have shown evidence of a significant age effect (variation of accuracy of fingerprint recognition systems due to the age of the subject).

In particular, the findings highlight that:

- for elderly people in the range 65-90, fingerprint quality decreases linearly with age (according to the estimation made in the study, this linear decrease starts at around 40-45 years of age);
- for elderly people, as for adults in general, the fingerprint size and ridge-width remains basically invariable.

However, the skin gradually loses its elasticity and, as highlighted in [7.2.1](#), becomes drier.^[5] These changes can result in a decrease of the quality of the fingerprint when contact scanners are used.

7.3 Face recognition

7.3.1 Typical characteristics of elderly people which can have consequences on face recognition

7.3.1.1 General

The appearance of the face and neck typically changes with age. Loss of muscle tone and thinning skin can give the face a flaccid or drooping appearance. In some people, sagging jowls can create the look of a double chin.

As highlighted in [7.2.2.3](#), elderly people can experience a significant decrease of visual acuity, requiring the use of corrective eyewear for daily tasks. This can be specifically important to know for operators who require the subjects to take their glasses off. In such cases, additional assistance to the subject rendered by the operator can be appropriate.

7.3.1.2 Stroke

Stroke risk increases with age^[6] and is the result of sudden cut off of blood supply to a part of the brain.

A frequent effect of a stroke is facial palsy because of damage to the facial nerve inside the brain.

Several changes can occur in the face of a subject who experiences a stroke and the lower part of one side of the face is often affected (e.g. the corner of the mouth can be weak, resulting in drooling).^[7]

In the case of biometric systems usage based on face recognition, a re-enrolment represents a possible procedure for people having experienced a stroke.

7.3.2 Typical pathologies experienced by elderly people which can have consequences on fingerprint recognition: neuromuscular problems

Elderly people can experience problems in maintaining a stable position in front of a biometric sensor due to different neuromuscular problems.

7.3.3 Data concerning the use of face recognition by elderly people

Research into age-related face recognition has recently gained prominence due to a growing demand of robust face recognition systems across age.