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Information technology — Artificial intelligence — Guidance for AI applications

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

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Foreword

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This document was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 42, *Artificial intelligence*.

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

Artificial intelligence (AI) systems have the potential to create incremental changes and achieve new levels of performance and capability in domains such as agriculture, transportation, fintech, education, energy, healthcare and manufacturing. However, the potential risks related to lack of trustworthiness can impact AI implementations and their acceptance. AI applications can involve and impact many stakeholders, including individuals, organizations and society as a whole. The impact of AI applications can evolve over time, in some cases due to the nature of the underlying data or legal environment. The stakeholders should be made aware of their roles and responsibilities in their engagement. While detailed AI-related standards can serve the interest of technical experts involved in engineering and development, this document provides a macro-level context of the AI application life cycle, to facilitate multi-stakeholder communication, engagement and acceptance.

This document contains guidance for AI applications based on a common framework, to provide multiple macro-level perspectives. The framework incorporates “make”, “use” and “impact” perspectives. It also incorporates AI characteristics and non-functional characteristics such as trustworthiness and risk management. The guidance can be used by standards developers, application developers and other interested parties to provide answers to the question: “What are the characteristics and considerations of an AI application?”. The stakeholders are mapped to various stages of the AI system life cycle, highlighting their roles and responsibilities and making them aware of the processes to follow to enable a coherent stakeholder engagement for the AI application. These stakeholders can have various levels of AI expertise and knowledge. Since AI applications can differ from non-AI software applications due to their continuously evolving nature and aspects of trustworthiness, all stakeholders should be made aware of AI-specific characteristics.

This document provides:

— this document’s motivation and objectives (Clause 4);

— an approach to identifying an AI application’s stakeholders, context, functional characteristics and non-functional characteristics (Clause 5);

— an AI application framework that can be used to answer the question: “What are the characteristics and considerations of an AI application?” (Clause 6);

— guidance for AI applications based on the make, use and impact perspectives (Clause 7).

Information technology — Artificial intelligence — Guidance for AI applications

1 Scope

This document provides guidance for identifying the context, opportunities and processes for developing and applying AI applications. The guidance provides a macro-level view of the AI application context, the stakeholders and their roles, relationship to the life cycle of the system, and common AI application characteristics and considerations.

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 22989:2022, *Information technology — Artificial intelligence — Artificial intelligence concepts and terminology*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 22989:2022 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
AI application
use of AI with functional characteristics that operates in stakeholder contexts to deliver an intended result

3.2
cloud service
one or more capabilities offered via *cloud computing* (3.6) invoked using a defined interface

[SOURCE: ISO/IEC 22123-1:2023, 3.1.2]

3.3
private cloud
cloud deployment model (3.5) where *cloud services* (3.2) are used exclusively by a single *cloud service customer* (3.4) and resources are controlled by that cloud service customer

[SOURCE: ISO/IEC 22123-1:2023, 3.2.4]

3.4
cloud service customer
party that is in a business relationship for the purpose of using *cloud services* (3.2)

Note 1 to entry: A business relationship does not necessarily imply financial agreements.

[SOURCE: ISO/IEC 22123-1:2023, 3.3.2, modified —"acting in a cloud service customer role" changed to "in a business relationship for the purpose of using cloud services", Note 1 to entry added]

3.5
cloud deployment model
way in which *cloud computing* (3.6) can be organized based on the control and sharing of physical or virtual resources

Note 1 to entry: The cloud deployment models include community cloud, hybrid cloud, private cloud and public cloud.

[SOURCE: ISO/IEC 22123-1:2023, 3.2.1]

3.6
cloud computing
paradigm for enabling network access to a scalable and elastic pool of shareable physical or virtual resources with self-service provisioning and administration on-demand

Note 1 to entry: Examples of resources include servers, operating systems, networks, software, applications, and storage equipment.

[SOURCE: ISO/IEC 22123-1:2023, 3.1.1, modified — Note 2 to entry deleted]

4 Motivations and objectives

This document establishes guidance based on the question: “What are the characteristics and considerations of an AI application?” It provides a basis for a common understanding among stakeholders to promote communication, engagement and acceptance of an AI application.

The formulation of this document is as follows:

— the context of an AI application described with respect to Who (stakeholders), What, When, Where, Why and How at various stages of an AI system life cycle;

— the stakeholders – AI stakeholder roles such as AI provider, AI producer, AI customer, AI partner, AI subject, consumers, community and relevant authorities;

— common AI application functional and non-functional characteristics and considerations.

5 AI application context and characteristics

5.1 Establishing approach for AI application context

This clause describes the approach for establishing the AI application context. This document uses the AI system life cycle stages in accordance with ISO/IEC 22989:2022, Clause 6 and ISO/IEC 5338 [1]. For each of the stages, various stakeholders, processes and relationships are defined and mapped thus:

— Who: The stakeholders (e.g. entities, persons or groups) associated with the context whose interests and values can be served, and whose concerns can be addressed.

— What: Activities associated with the context, such as

  — AI system and application capabilities

  — types of decisions being supported by the AI application.

— How: Specific methods associated with the context, such as

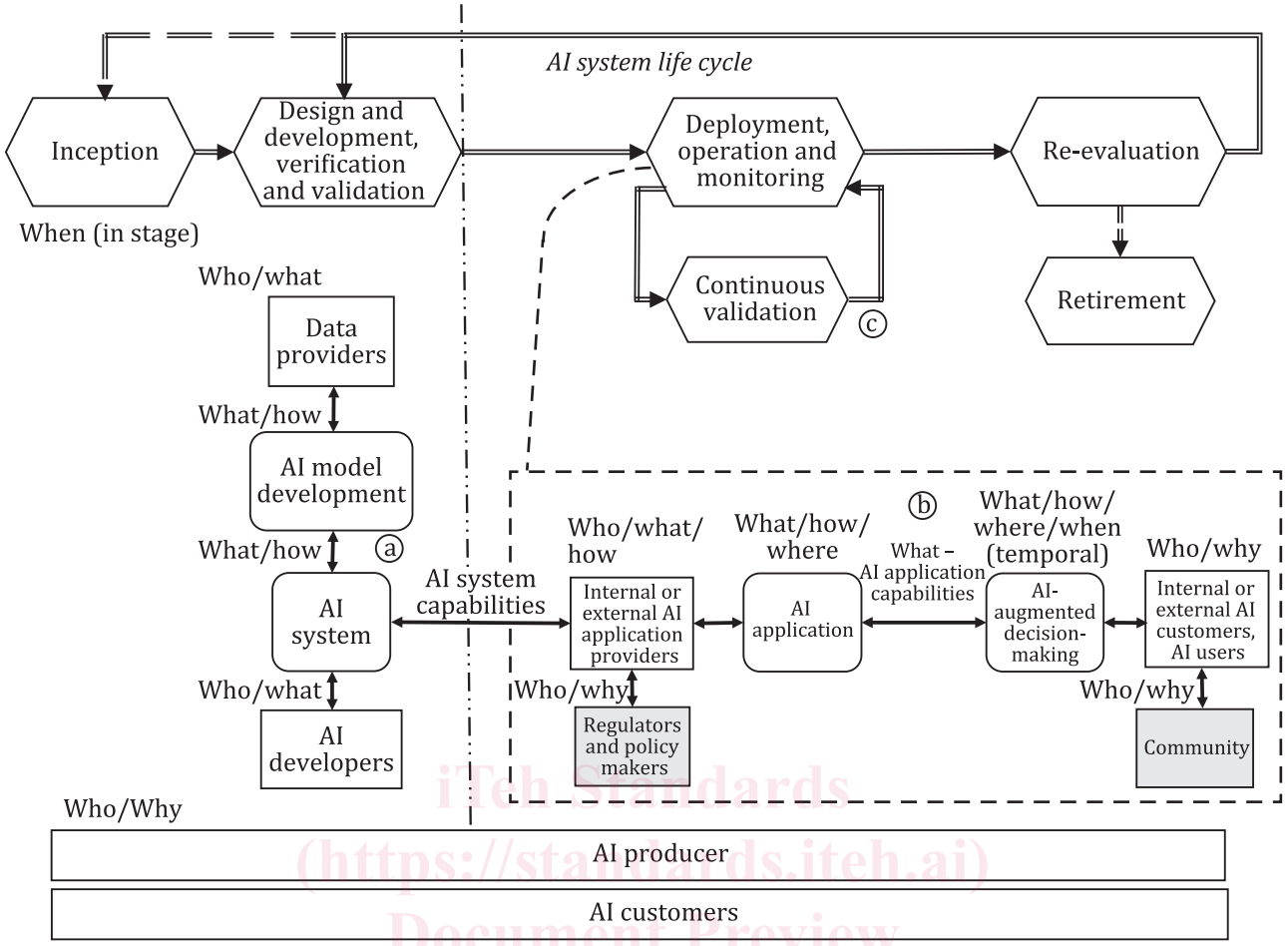
  — degree of human involvement in decision-making (e.g. autonomous or semi-autonomous)

  — AI system in an augmentation role (e.g. decision support, human-system collaboration)

  - algorithmic processes
  - sources, collection and provision of data
  - deployment as a product or service
- When: Associated with the temporal context, i.e. a process in a particular stage of the AI system life cycle, or a temporal activation of a process, such as the frequency of an application. This depends on the context established in “What”.
- Where: Location associated with the context, i.e. where the AI application is used; internal to the organization (e.g. for operations) or external to the organization (e.g. with customers); the deployment mode of the application (e.g. on-premise, as a cloud service or through third parties).
- Why: The external causal and explanatory structures associated with the context, i.e. part of the value proposition to the “Who” such as the customers, users and community, shows the application’s rationale, objectives, benefits, considerations and impacts including economic, social, societal, etc.

5.2 AI application context

Figure 1 shows a typical AI application context with its stakeholders, processes and relationships together with the different stages of an AI system life cycle.



Key

- AI stakeholder
- other stakeholder
- process
- AI system life cycle stage
- stage transition
- communication
- organizational boundary
- AI application characteristics (see 5.4)

Figure 1 — Typical AI application context

Other stakeholders are those in the community who are not involved with the development or use of the AI application but are still impacted or regulators and policy makers who have impact on the deployment of the application. The relationships between stakeholders include communication and exchanges. The organizational boundary is used to delineate what is inside or outside of the producer's organization (e.g. pre-deployment vs. post-deployment). In certain cases, the AI application provider can be part of the producer's organization but have an external role. The three AI application characteristics (see 5.4) are also reflected in Figure 1.

5.3 Stakeholders and processes

5.3.1 General

Figure 1 shows the relationship among the stakeholders (Who), their roles (What), (Where) and (When) the processes (What) are employed (How).

Figure 1 also shows that the producer, customer, regulators and community (Who) also have value considerations (Why) at stake in this context.

5.3.2 AI stakeholders

5.3.2.1 General

The AI stakeholders described here play one or more different roles and sub-roles in various stages of the AI system life cycle. The name of the stakeholder is also indicative of its role or sub-role as described in ISO/IEC 22989:2022, 5.19.

5.3.2.2 AI producer

An AI producer (Who) is an organization or entity that designs, develops, tests and deploys products or services that use one or more AI systems. The AI producer takes on these roles as part of its organization's objective (Why, e.g. profit as well as value creation for its customers). These roles span the whole AI system life cycle (When) and include management decisions about the inception and termination or retirement of the AI system.

5.3.2.3 AI developer

An AI developer (Who) is an organization or entity that is concerned with the development of AI products and services for the producer. The roles can include model and system design, development, implementation, verification and validation (What) in the pre-deployment stages of the AI system life cycle (When). An individual AI developer can be a member of the producer's organization or a contractor or partner.

5.3.2.4 AI customer

An AI customer (Who) is an organization or entity that uses an AI product or service either directly or by its provision to AI users. There is a business relationship between an AI application provider (see 5.3.2.6) and an AI customer, e.g. engagement, product purchase or service subscription. The customers' role spans the AI system life cycle (When) since they create the demand, realize the value and sustain the viability of the AI product (Why). They are often consulted by the AI producer during the inception to determine requirements and participate in the verification and validation, deployment, operation and monitoring, retirement stages of the AI system life cycle.

An AI customer or AI user (see 5.3.2.5) can be part of the AI application provider's organization (internal, e.g. a business function department) or have an arms-length relationship (external, e.g. the application provider is a third-party service provider) (Where).

5.3.2.5 AI user

An AI user (Who) is an organization or entity that uses AI products or services. An AI user can be an individual from the community (Who) or a member of the customer organization or entity. A customer can also be a user. An AI user does not have to be an AI customer [i.e. has a business relationship with the AI application provider (see 5.3.2.6)]. An AI user's role is usually centred around the operation and monitoring stage of the AI system life cycle (When) to realize value from use of the AI product or service (Why).