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Health informatics — Terminological resources —

Part 3: Terminology implementation maturity model (TIMM)

Informatique de santé — Ressources terminologiques —

Partie 3: Modèle de maturité pour la mise en œuvre de la terminologie

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Foreword

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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).

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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.

This document was prepared by Technical Committee ISO/TC 215, *Health informatics*.

A list of all parts in the ISO 17117 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 identifies a model for evaluation of the maturity of terminology implementation in healthcare systems and identifies a maturity module for terminology implementation for use in electronic health records (EHRs) and healthcare systems in general.

This document supports common activities of healthcare including:

— identification of the relationship between each terminology resource capability to the safety and effectiveness of system use in healthcare;

— support healthcare software vendors and organizations to;

  — compare software terminological resource capabilities and organizational requirements for those resources;

  — plan improvements, i.e. align requirements and capabilities, as needed;

— improve the safety and utility of healthcare information systems and the data in them, and the use of terminological resources in applications such as clinical decision support systems;

— improve information sharing (semantic interoperability) between organizations and systems;

— support short and long-term analytics within the organization and more broadly to enable knowledge acquisition.

The impact of tooling (including computer-assisted coding, speech recognition, template development) on the capability of the terminological resources is not covered in detail in this document.

This document provides a model against which conformity can be measured and improvements made to products and implementations with a positive impact both on efficiency and patient safety. This assists implementation, reduces inappropriate spending, manages expectations more effectively and encourages software vendors and decision makers at all levels to progress their products into higher functional capacity. This document is also produced to encourage the development of the skills required to safely and efficiently implement and use terminologies in healthcare systems.

The users of this document include:

— health care organisation, to assess product capabilities and plan future directions and purchases;

— vendors (including cloud services and conventional software products), to:

  — support implementation of terminological resources in their products;

  — enable semantic interoperability across different systems;

  — assess product conformance requirements influencing future directions for software development;

— government and other decision makers;

— educators and educational organizations;

— terminological resource developers.

Health informatics — Terminological resources —

Part 3: Terminology implementation maturity model (TIMM)

1 Scope

The document defines the progression of implementation of terminology capability in information systems.

This document does not specify requirements for any specific terminological resource. It is intended to provide a basis for conformance criteria for terminological resources capabilities in specific use cases. This document does not cover in detail the software being used, though the capabilities of that software are included and impact the level of maturity reached. This document is applicable to terminological resources of all types, terminologies, classifications, value sets, code systems, and value domains.

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 11179-1, *Information technology — Metadata registries (MDR) — Part 1: Framework*

ISO/IEC 11179-3, *Information technology — Metadata registries (MDR) — Part 3: Metamodel for registry common facilities*

ISO/IEC 11179-4, *Information technology — Metadata registries (MDR) — Part 4: Formulation of data definitions*

ISO/TS 21526, *Health informatics — Metadata repository requirements (MetaRep)*

ISO/TS 21564, *Health informatics — Terminology resource map quality measures (MapQual)*

ISO 22287, *Health informatics — Workforce roles and capabilities for terminology and terminology services in healthcare (term workforce)*

HL7, *Value Set Specification*[1)]

3 Terms and definitions

For the purposes of this document, the following terms and definitions 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/

1) Available at https://www.hl7.org/fhir/valueset.html.

3.1
concept
unit of knowledge created by a unique combination of characteristics

Note 1 to entry: Informally, the term 'concept' is often used when what is meant is 'concept representation'. However, this leads to confusion when precise meanings are required. Concepts arise out of human individual and social conceptualizations of the world around them. Concept representations are artefacts constructed of symbols.

Note 2 to entry: Concept representations are not necessarily bound to particular languages. However, they are influenced by the social or cultural context of use often leading to different categorizations.

[SOURCE: ISO 17117-1:2018, 3.1.1]

3.2
implementation
<information technology> life cycle phase at the end of which the hardware, software and procedures of the system considered become operational

[SOURCE: ISO 81001-1:2021, 3.2.6]

3.3
term
linguistic representation of a *concept* (3.1) in a specific subject field

[SOURCE: ISO 17117-1:2018, 3.1.2]

3.4
terminology implementation
process of taking a terminological system and applying it for *concept* (3.1) representation to achieve efficient and accurate concept representation

Note 1 to entry: Terminology implementation relates to implementing a terminological resource in a system rather than the system itself. So, during a design and development of a system that uses a terminology, its implementation occurs at that stage of the SDLC and not after Software Development Life Cycle.

[SOURCE: ISO/TS 17117-2:2022, 3.4, modified — Note 1 to entry was added.]

3.5
terminological resource
controlled set of *terms* (3.3) in healthcare

Note 1 to entry: Usually designed and controlled for use with computers for specific healthcare purposes, such as data entry, aggregation, retrieval and analysis.

Note 2 to entry: Value domains, ontologies, computable terminologies, code sets and classifications.

[SOURCE: ISO/TR 12300:2014, 2.2.11, modified — The example was added.]

3.6
terminological resource capability
services and functionality that a terminology is able to deliver when implemented

Note 1 to entry: These services and functionality are dependent upon the design structure, maintenance and scope of the terminological.

Note 2 to entry: For example, terminologies which do not have multilingual features are not able to support multiple languages or translations.

Note 3 to entry: For example, a single hierarchy terminological resource is not able to support multi-hierarchical reporting or retrieval.

3.7
software terminology capability
specification of a software's ability to deliver the *terminological resource capabilities* (3.6) in an *implementation* (3.2)

Note 1 to entry: This includes functionality such as the ability to calculate subsumption, equivalence, post-coordination requirements.

Note 2 to entry: Software includes terminology servers but also the health software product within which the terminology is used. The software terminology capability is dependent upon the suite of software, available to support the implementation.

Note 3 to entry: Software tool includes the use of servers but also the software system within which the terminology is used, including:

— functions used to access and manage maintenance of the terminology within the organisation (server capabilities) processing operations using the knowledge in the terminology resource;

— maintenance functions used to maintain a terminological resources implementation within the organisation;

— user software - user interface and retrieval and display name requirements.

4 Terminology implementation maturity

4.1 General

This document provides a method to assess the capability of an implemented terminological resource based on the information lifecycle (5 maturity pillars) and levels of maturity within these pillars. Capability is defined across each of these 5 pillars and a method of calculation is included.

The 5 pillars are described in detail in ISO/TS 17117-2. These pillars are:

a) Pillar 1: Data design (data specifications);

b) Pillar 2: Data capture (user interface), including data validation, binding;

c) Pillar 3: Data storage (meaning management over time, binding);

d) Pillar 4: Data retrieval in health systems (includes use of retrieval and comparison tools such as queries, subsumption, equivalence checking);

e) Pillar 5: Data exchange and data re-use (includes use of maps).

The pillars cover representation of instances of patient information captured in health systems including conformity to standards, terminology governance capability, terminology implementation workforce capability, software terminology capability and terminology resource (the code system) capability.

ISO/TS 17117-2 defines the determinants of maturity for each pillar and sub pillar activities, maturity levels.

4.2 Purpose and audience

The maturity model helps vendors, implementers, project leaders and decision makers to:

— identify implementation best practice for clinical safety;

— ensure that the environment for using terminologies is efficient, safe and fit for use (both existing and newly introduced terminological resources);

— benchmark where an organization, data collection or product stands in relation to others with respect to terminology implementation;

— assess the areas of strength and performance gaps in implementations;

— identify the steps that can be taken to close gaps and move to the next stage of maturity;

— communicate progress to the broader community and within the organization;

— identify resource requirements for quality terminology use (technical and workforce).

4.3 Implementation maturity levels

The following levels are used throughout this document and are based upon ISO 30401, modified to reflect clearer common usage.

a) Level 1: Initial (Ad Hoc) – implementation where terminologies, code systems and classifications may be used but are not governed across the implementation. This includes code sets created for initial use to meet a single need, often without consideration of other potential uses or the need to communicate or share data. The terminology may represent some of the concepts but is not governed to ensure completeness of representation.

b) Level 2: Repeatable (Rudimentary) – includes implementations where terminologies are maintained and deployed within software implementation but are largely reactive. The terminological resource is maintained locally, i.e. not governed outside the organisation.

c) Level 3: Defined (Organized and Repeatable) – terminologies that are clearly defined. The definition may be textual or computable and that definition informs the collection and use of the data. The terminological resource is well maintained and governed at least at national level with clear context associated with the information mode.

d) Level 4: Capable (Managed and Standardised)– where the implementation supports safe care and the data supply chain, and where terminology implementation is capable of clear and safe information exchange through semantic interoperability. A capable terminology represents all concepts, with longevity of meaning, is nationally governed and implemented with a standard information model supporting semantic interoperability.

e) Level 5: Efficient (harmonised terminology and information model). Safe use of data requires that the data is defined and capable and governed at all levels and where terminology and the information model are optimised. The terminological resource can represent all concepts, with longevity of meaning, is internationally governed and implemented with a standard information model supporting international semantic interoperability.

Clauses 5 to 10 of this document identify the capabilities of terminology implementation and where each of these fit in the maturity evaluation of an implementation. A checklist is also provided to assist in such evaluations.

Determination of the importance of each capability was influenced by the Desiderata for controlled medical vocabularies in the twenty-first century[12] and SNOMED International Implementation Maturity[13].

5 Pillar 1: Design of the data (data specifications)

5.1 Terminological capabilities

5.1.1 General

When collecting data, the ability of the code system or terminological resource selected to represent the data impacts the capacity to represent the concepts required. This pillar assesses the ability of the selected concept representations to accurately meet the needs of clinical care in a health record.