TECHNICAL REPORT

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Health informatics — Health informatics profiling framework

Informatique de santé — Cadre de profil d'informatique de santé

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Foreword

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In exceptional circumstances, when a technical committee has collected data of a different kind from that which is normally published as an International Standard ("state of the art", for example), it may decide by a simple majority vote of its participating members to publish a Technical Report. A Technical Report is entirely informative in nature and does not have to be reviewed until the data it provides are considered to be no longer valid or useful.

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ISO/TR 17119 was prepared by Technical Committee ISO/TC 215, *Health informatics*.

Introduction

The health informatics profiling framework (HIPF) is designed to bring order to the description of health informatics standards artefacts. A common means of description is necessary to facilitate the coordination, communication and comparability of health informatics standards across and between disciplines and jurisdictions. The HIPF is an approach and tool to describe the variety of artefacts within the domain of health informatics standards. It builds upon other key information frameworks. This Technical Report does not constrain or drive conformance across informatics standards or their development, but it provides a useful descriptive tool to describe existing and developing health informatics standards.

Health informatics — Health informatics profiling framework

1 Scope

1.1 General

This Technical Report provides a common description framework for health informatics standards artefacts. The aim of the health informatics profiling framework (HIPF) is to provide a consistent method for describing and classifying artefacts within the domain of health informatics standards.

The HIPF establishes common concepts and a vocabulary for describing the complex domain of various health informatics standards initiatives and their supporting artefacts. The use of the HIPF should promote the reuse of health informatics knowledge and improve the identification of opportunities for health informatics standards alignment, collaboration and coordination.

1.2 Purpose

The purpose of the HIPF is to facilitate shared descriptions and comparisons of health informatics standards. In particular, it is the aim of the HIPF to:

— provide the capability to comprehensively define and classify health informatics standards artefacts,

— facilitate the coordination, communication and comparability of health informatics standards through a common understanding of intended uses and content,

— help identify and coordinate health informatics standards development,

— provide a potential foundation for the development of a global health informatics standards knowledge base,

— promote health informatics standards integration and alignment within and between standards from different jurisdictions, and

— provide a framework to assist with the coordination of ISO/TC 215 work items both within the technical committee and with related initiatives from other sources.

1.3 Benefits

The potential benefits of the HIPF include:

— introduction of classification concepts and terminology for health informatics standards artefacts,

— enhancement of health informatics standards development coordination through the identification of potential duplication between standards initiatives, and

— enhancement of global understanding of health informatics standards in support of their knowledge management.

1.4 Target users

The target users of the HIPF include:

— health informatics standards developers, and

— users of health informatics standards.

2 Terms and definitions

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

2.1
artefact
any model, document, or work product

2.2
compatibility
capability of a functional unit to meet the requirements of a specified interface without appreciable modification

[ENV 12443:1996]

2.3
concept
units of thought constituted through abstraction on the basis of properties common to a set of objects

[ENV 12443:1996]

2.4
context
related conditions and situations that provide a useful understanding and meaning of a subject

2.5
data
“raw” alphanumeric text, objects, and symbols defined without any context in such a way that by itself one cannot tell its correct meaning

2.6
framework
a structure for supporting or enclosing something else, often acting to partition something complex into simple components

2.7
granularity
the boundary where an object functions as a self-contained, stand-alone unit to support a common vision or goal

2.8
health informatics profiling framework
HIPF
an approach and tool to describe the variety of artefacts within the domain of health informatics standards

2.9
HIPF cell
the intersection of an HIPF perspective and an HIPF level of specificity that is defined within the context of the HIPF classification matrix

2.10
HIPF classification matrix
a structure that includes dimensions for health informatics standards artefacts, levels of specificity, and perspectives

2.11
HIPF perspective
a classification dimension for differentiating health informatics standards artefacts based on their viewpoints, intended purpose or focus

NOTE This dimension includes the perspectives of what, how, where, who, when and why, which are further described in 4.2.1.2.

2.12
HIPF specificity
a classification dimension for differentiating health informatics standards artefacts based on their level of abstraction with respect to implementation specifications

NOTE This dimension includes the conceptual, logical and physical levels, which are further described in 4.2.1.1.

2.13
information
data in context that enable interpretation with meaning and relevance

2.14
interface
the shared boundary between two functional units defined by various characteristics pertaining to the functions, physical interconnections, signal exchanges and other characteristics as appropriate

[ENV 12443:1996]

2.15
profile
a brief description, outline or overview

2.16
top-down
method or procedure that starts at the highest level of abstraction and proceeds towards the lowest level

[ENV 12443:1996]

3 Health informatics profiling framework — Overview

3.1 General

The HIPF provides the basis for a management tool to support the coordination of health informatics standards initiatives. It does this by providing an approach for the classification of health informatics standards artefacts. This approach is supported by an extensible architecture.

The HIPF is a descriptive tool. It includes a simple two-dimensional HIPF classification matrix that articulates the dimensions of specificity and perspective. Although a simple structure, the matrix is capable of reflecting complexity through multiple relationships between a standard artefact and the HIPF matrix components. These relationships may be used to provide a comprehensive and comparable description of health informatics standards.

Artefact profiles may be further enhanced through the use of optional HIPF attributes, in addition to the classification matrix.

This Technical Report describes a methodological approach for using the HIPF matrix to “profile” health informatics standards, and it also describes how these classifications may contribute to the evolution of a health informatics standards knowledge base. This approach includes the following processes:

— health informatics standards profiling, and

— framework evolution.

These processes are intended to support the goal of sharing knowledge about and supporting the comparison of health informatics standards artefacts.

3.2 What is the health informatics profiling framework?

The first component to be addressed is the concept of a “framework”. A framework is a structure for supporting or enclosing something else. The HIPF is such a structure.

One of the essential features of both frameworks and models is that they allow highly complex systems to become conceptually manageable. The difference between them is primarily in terms of comprehensiveness and approach. Models are mostly concerned with describing what is wanted or what is available, often in a visual manner. Frameworks are more commonly used to describe and structure enterprise architectures or other comprehensive domains.

In developing the classification matrix portion of the HIPF, Zachman's widely known Enterprise Architecture Framework was used as a starting point. The “domain” of the framework or, in Zachman's terms, the “Enterprise”, which this architectural framework is to support, is the domain of “health informatics”.

Frameworks have the following properties.

— They partition the universe of interest into manageable chunks.

— They are comprehensive yet simple.

— They are composed of two or more dimensions. Most frameworks have two core dimensions though multidimensional (e.g. cube) frameworks may also be used.

— One dimension is often contextual (e.g. concerned with a specific perspective). Often this is related to the user of the information (e.g. designer, database builder) or domain (e.g. party, recipient).

— One can create one’s own framework or use an existing one if an appropriate structure is available for the domain of interest.

The HIPF classification matrix partitions this domain in terms of the level of specificity and the perspective (or focus area) as a consistent and generic method for describing health informatics standards artefacts. The profile of an artefact may be further enhanced by additional attributers, such as approval status and other optional detail.

In the HIPF, a “profile” is a brief description (including a classification) of a health informatics standards artefact.

3.3 How to use the health informatics profiling framework

The HIPF provides classification guidelines so that a model or other standards artefact can be placed in one or more of the cells defined in the matrix. The matrix partitions the domain of health informatics into 18 separate sub-domains. The classification matrix can help avoid unnecessary problems or confusion as the cell placement indicates which artefacts are unlikely or likely candidates for comparison or integration. Those that are placed in or mapped to the same cell have at least the characteristics of the cells to provide some basis for comparison or collaboration.

The classification of a model or other standards artefact requires analysis of the model or standard against the rows and columns of the matrix. The matrix allows for the co-location of artefacts that have like characteristics. It does not ensure that these artefacts can or should be compared or aligned. Decisions regarding alignment would be a subsequent exercise. The framework subdivides the health informatics universe into more manageable conceptual “chunks”. Most likely, transformations will need to be determined and scope alignment performed before comparisons of models within a cell can be conducted. As per set theory, meaningful comparisons may only be made within the intersection space of the two sets or models.

The framework will require updating and re-versioning. A versioning process will enable the ongoing “greening” of the framework and will continue to increase the validity and value for its using community.

It is important to note that the HIPF is not an end in itself. Determining the placement of standards artefacts in the framework is only the first step. Working within a primary cell or a closely aligned group of cells to achieve objectives, such as aligning or comparing design artefacts, is where the real benefits are derived.

The basic construct of the two-dimensional HIPF classification matrix including three rows of specificity and six columns of perspectives provides a means of identifying and classifying the content of a health informatics standards artefact. The intersection of these dimensions constitutes a framework cell. Artefact classification is complete when an artefact is placed in one or multiple framework cell(s).

This matrix is a special application of Zachman's “Enterprise Architecture Framework”, but with different sets of rows based upon observations about the nature of the various domains of interest and specificity. Zachman uses perspectives of roles of people in the enterprise as criteria. During the development of this report, it was determined that “levels of specificity” was a more appropriate criterion than Zachman's criteria for the classification of artefacts of interest to the health informatics standards community.

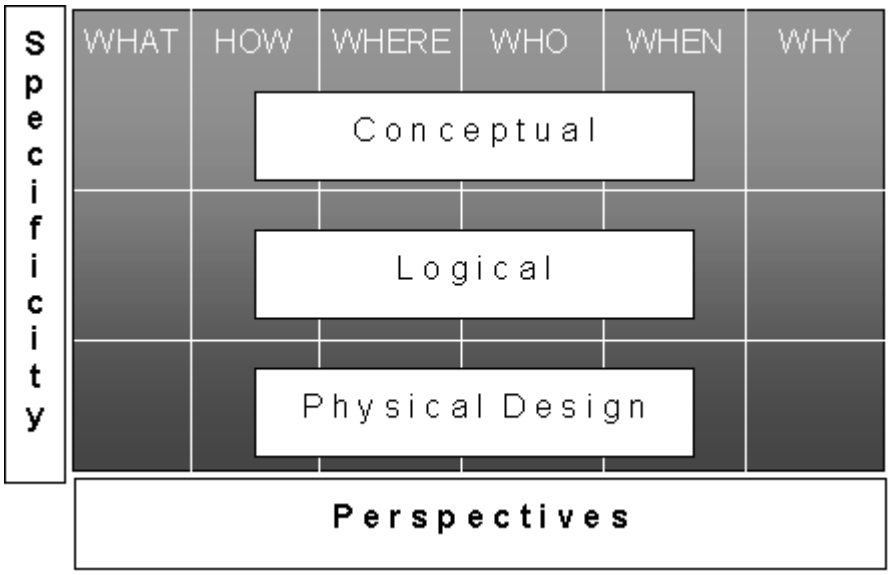

Figure 1 — Health informatics profiling framework classification matrix

Some of the background to the evolution of this framework has been provided in Annex A.

In addition, a proposed formalized approach to artefact definition and classification has been suggested and an example meta-model has been created to support artefact profiling and knowledge base development. This example meta-model, representing the inter-relationships between HIPF constructs, has been provided in Annex B.

4 Health informatics profiling framework approach

4.1 Overview of approach

The HIPF approach includes two processes: artefact profiling and framework evolution. Both of these processes should support the profiling of health informatics artefacts and the ongoing evolution of an HIPF knowledge base.

The artefact profiling process provides a brief description and common classification for health informatics standards and their artefacts. This process may be iterative, as additional knowledge on the definition and classification of an artefact may be attained at a later time. Profiled artefacts can be collected to form a knowledge base of health informatics artefacts.

Framework evolution should be a continuous process to ensure the proactive support of the artefact profiling requirements. The work products of framework evolution could be critical success factors for the artefact profiling process.

4.2 Artefact profiling

The artefact profiling process includes artefact classification, mapping assessment and artefact definition (with optional attributes).

This multi-step process is iterative. The definition of an artefact may change over time as more knowledge is gained about the artefact and as changes in the HIPF definition are made.

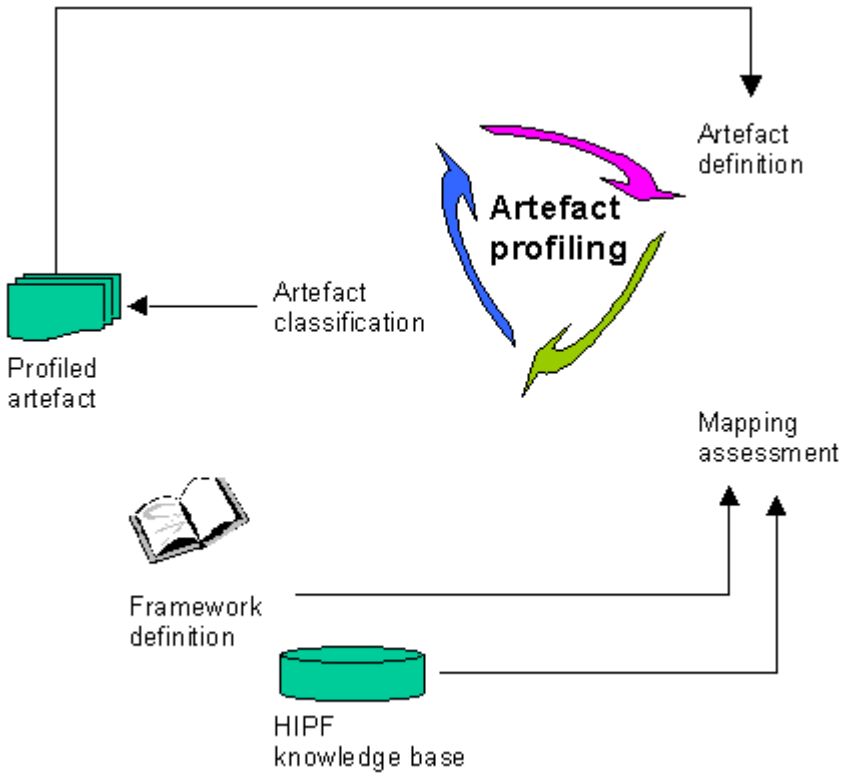

Figure 2 — Artefact profiling process

4.2.1 Artefact classification

Artefact classification includes the mapping (placement) of an artefact with respect to one or many matrix cells. An artefact is deemed classified once it has been placed within the context of the HIPF dimensions of specificity and perspective. Artefact classification also provides the capability to cross-reference two or more mapped artefacts.

The HIPF classification matrix provides a two-dimensional view of perspective (six columns) and levels of specificity (three rows). This two-dimensional view is intended to encompass the universe of health informatics artefacts. The HIPF classification matrix divides the domain of health informatics standards artefacts into 18 separate content sub-domains. These artefacts include models, standards, documents and other such components of health informatics that provide the design or "architecture" for health information.

Example mappings to the HIPF matrix may be found in Annex C.

4.2.1.1 Levels of specificity

Levels of specificity provide differentiation of health informatics standards artefacts by defining levels that move from abstract to exact implementation specifications. For example, one may move through the framework from general population characteristics to specific attributes of a person. The main categories are conceptual, logical and physical design.

4.2.1.1.1 Conceptual

This specificity level contains classes of things of interest within health informatics. This level has no specifics, but contains shared fundamental meanings. It does not contain detailed health information characteristics. This level may address health information management and administration from a strategic level.

Key mapping question: Does the artefact define fundamental meanings, without any detailed characteristics and health information inter-relationships?

Examples: High-level and generic classifications of healthcare organizations or of health information, guidelines for health information management, governance rules and regulations.

4.2.1.1.2 Logical

This specificity level contains generalized models or informatics standards. It deals with specifics that provide coherence, without concern for technological constraints. This level addresses health information management and administration from a tactical level.

Key mapping question: Does the artefact define characteristics of information, without concern for technological constraints?

Examples: Inter-related and detailed roles and responsibilities, data flow diagrams, interaction models, business rules.

4.2.1.1.3 Physical design

This specificity level contains models and protocols with defined technological constraints. This level addresses health information management and administration from an operational level.

Key mapping question: Does the artefact define information with technological constraints?

Examples: Information storage architectures, physical layouts, application system models.

4.2.1.2 Perspectives

Perspectives form the columns of the HIPF classification matrix.

It is important to note that many models, documents or artefacts may have characteristics of more than one perspective. The challenge in placing or mapping them to the matrix lies in determining which characteristics are most predominant in the model or standard (i.e. “What is the main purpose of this artefact in terms of health informatics standards?”) or which collection of matrix cells is inherent in the model or standard.

In some cases, it may be necessary to place or map a particular artefact in more than one of the framework cells. In addition, it is recommended that in the instance of multi-cell mapping, the primary and secondary mappings should be differentiated. Multi-cell mapping is further described in 4.2.2.

Interrogatives are the basic questions that can be reviewed for any model or standard in order to address the perspective dimension. By mapping health informatics standards artefacts to each of the interrogatives below at the conceptual, logical and physical levels, all necessary information should be obtained to facilitate artefact classification. For examples of artefacts for each matrix cell, see Annex D.

4.2.1.2.1 The “what” perspective

The “what” perspective contains models or other documents describing health information of interest. These artefacts may help plan for the collection, use or dissemination of health data and information as a significant business or scientific resource.

Key mapping question: Does the artefact define the subjects, topics or categories of interest in health data and information?

Examples: Vocabularies and terminology definitions, data and information models and classes, clinical models, models to measure treatment effectiveness, population health characteristics and economic viability and sustainability models.

4.2.1.2.2 The “how” perspective

The “how” perspective contains models or directions for the way things should be done.

Key mapping question: Does the artefact define methods, processes, architectures, or procedures in health information management or use?

Examples: Procedural business process models, application architectures, functionality standards, methodologies, procedures, guidelines and data flow diagrams.

4.2.1.2.3 The “where” perspective

The “where” perspective includes artefacts dealing with location definitions. Note that “where” factors include geography, climatic conditions, and environment. “Where” can have a geographical, jurisdictional (e.g. a nation) or a functional viewpoint (e.g. a surgery room) in terms of location.

Key mapping question: Does the artefact define physical or logical locations for health information management or use?

Examples: Climate models, facility infrastructure and blueprints, controlled environment models, technical architecture and network architectures.

4.2.1.2.4 The “who” perspective

The “who” perspective includes artefacts that address the management and administration of people in health informatics.

Key mapping question: Does the artefact define the attributes of people involved in health information management and use? For example, does it define any of the following:

- people management or administration,
- workflow,
- skills, or
- roles and responsibilities.

Examples: Organization charts, organization flow and workflow models (who does what), who has access (e.g. security profiles, systems, security classifications), skills descriptions, personnel classifications and scope models, roles and responsibilities, and population models.

4.2.1.2.5 The “when” perspective

The “when” perspective includes artefacts that define time-related factors.

Key mapping question: Does the artefact define schedules, events, cycles, timeframes or frequencies for health information management or use?

Examples: Schedules, events, cycles, timeframes, frequencies, state transitions, critical paths and reproductive cycles.

4.2.1.2.6 The “why” perspective

The “why” perspective contains informatics standards artefacts that describe the reason things are done. It has been observed that not many models only focus on “why”. Certain aspects of health informatics standards artefacts, however, may be “why” oriented. “Why” artefacts may also overlap with procedures (“how”).

Key mapping question: Does the artefact define strategy, goals, success criteria, purpose, policies or governance for health information management or use?

Examples: Mission and strategic statements, clinical guidelines, goal models, success factors, objectives, statements of purpose, rules and policies.

4.2.2 Artefact mapping

The framework provides for multi-cell mapping of artefacts. Every artefact mapping definition requires a mapping designation that indicates the relative strength of the artefact mapping.

The HIPF classification matrix diagram (see Figure 1) shows the characteristics for mapping artefacts to various specificity (row) and perspective (column) cells. The placement into the matrix cells can be determined by asking questions about the intentions of the health informatics standards artefact. Answers about the specificity and perspective of the artefact should be only one of the following:

- yes, it is a primary focus of the artefact,
- yes, it is a secondary focus of the artefact, or
- no, it is not a focus (or is a negligible focus) of the artefact.

4.2.3 Profile refinement

This section describes optional attributes for further refining a health informatics standards profile.

Optional HIPF artefact attribute sets have been suggested as follows:

— title (e.g. “Health informatics profiling framework”),

— reference code,

— organization responsible,

— contact details,

— level of standards approval (e.g. “working draft”),

— short narrative description,

— scope description,

— next planned update,

— previous version(s),

— language,

— technical or organizational implementation considerations (e.g. “local implementation profiles may be needed”),

— setting/jurisdiction of application,

— target groups (expected primary users),

— other standards classification (e.g. referencing another standards category),

— related standards or projects,

— keywords, and

— comments.

4.3 Framework evolution

The framework evolution process supports the dynamic nature of the domain of health informatics standards artefacts. Each of the products of this process (HIPF meta-model, knowledge base, and framework definition) will continuously evolve to meet the requirements of standards artefacts profiling. The HIPF knowledge base will grow as artefacts are profiled and re-profiled, as more is understood about the artefact profiling process, and its inherent profiling patterns. The framework definition, which serves as a guideline for artefact profiling, can be responsive to change through the analysis of the HIPF knowledge base and feedback from the HIPF community of users and stakeholders.

4.3.1 Knowledge base assessment

This step involves the analysis of profiled artefacts within an HIPF knowledge base. A knowledge base analysis is critical to the meta-model definition and framework definition steps as artefact profiling patterns can be determined and gaps in the HIPF meta-model can be identified.

4.3.2 Meta-model architecture

The HIPF and its supporting meta-model architecture will continuously evolve to reflect the dynamic domain of healthcare and health informatics artefacts. One of the key features of the HIPF is its supporting extensible meta-model structure. The HIPF meta-model supports the inherent HIPF approach concepts through the implementation of inter-relationships between HIPF meta-model constructs.

The meta-model step includes the analysis of the existing HIPF meta-model in the context of a thorough knowledge base assessment and resulting framework definition. The objective of this step is to proactively engineer meta-model constructs to support the ever-changing domain of health informatics standards artefacts and evolving patterns of artefact profiling.

4.3.3 Framework definition

The framework definition will evolve as knowledge is gained about artefact types and their utility. The framework definition can support the predictive modelling of key framework constructs such as artefact type and objective.

During the framework definition step, previously mapped artefacts may be analysed for the determination of patterns with respect to indirect artefact type and objective mappings to HIPF classification matrix cells. This analysis may identify possible mappings of artefact type, objectives, and other meta-model concepts to the HIPF classification matrix to be used during the mapping assessment phase.

5 Reference and comparisons of health informatics profiling framework to other initiatives

Many frameworks related to health informatics have been developed and published over the past several years. Several key frameworks and reference models were analysed from a purpose, scope, and difference point of view, to determine use or possible adoption as informatics standards profiling frameworks. The goal was to find a means to “coordinate, communicate, and compare models of health informatics and health information standards”.

See Annex D for a comparison of the HIPF to the Health Level Seven Version 3 Reference Information Model, the Zachman Enterprise Architecture — A Framework, ENV 12443:1996 [3], and ISO/IEC 10746-2:1996 [5].

In addition, a prototype HIPF mapping and knowledge base tool is described in Annex E, along with a short discussion of potential opportunities for future exploration.

Annex A
(informative)

Background

A.1 Overview

Health information is very complex, even at the “micro” or single situation (clinical encounter incident) level. In many situations, individual health service providers cannot (and maybe should not) respond to a problem or situation by themselves. It is often the case that an integrated network of skills, information, technologies and facilities is required to accomplish a successful health outcome.

To assist in managing this complexity, health information models are developed. Models are patterns, plans, examples or standards that may be used for imitation or comparison. One of the key benefits of modelling is that it provides for the division of complexity into manageable components. In fact, one could argue that one facet of medical education is the assimilation of models by the student.

ISO/TC 215’s Working Group 1 (WG1) is focused on facilitating the coordination of health information models and standards across jurisdictional boundaries and determining how to interrelate models developed by different jurisdictions. In 1999 and 2000, WG1 meetings addressed a general domain model work item. Several challenges were encountered in launching this work item, including coming to consensus on the definition and description of a “general domain model”, the purpose of developing such a model, and the attempt to align or map high level health information models already in existence. More recent discussion has highlighted the fact that the participants had different concepts of what the general domain model was to accomplish. They recognized that the models being compared were developed to address different needs, thus a fair comparison of them was impossible.

WG1 also found that models proposed by various participants as a basis for the “General Domain Model” were too narrow in scope to meet all objectives. In some cases, attempts were being made to compare models that addressed different levels of abstraction. Some were physical models that specified exactly the data elements, their type and size and defined specific relationships, whereas others were conceptual, dealing with general relationships between entities without identifying any attributes. Comparisons would not be valid unless some preliminary transformation of the models was made first.

At the July 2000 WG1 meeting in Vancouver, Canada, WG1 members concluded that a single, all-encompassing health information model was likely impossible and, even if it were developed, it would be so complex that it would defeat the purpose of having an ISO model. It is important to note that there is not just one type of health information model, there are many. Some healthcare information models are in the form of standard medical practices and procedures. Other models specify:

— what information needs to be recorded,

— how they are to be done,

— where they need to be done,

— who needs to be involved,

— when tasks or activities need to be done and in what sequence, and

— why they need to be done.

At the government jurisdictional and at the inter-jurisdictional or ISO levels, another dimension is added to this complexity. Some of the models are specific to a given jurisdiction or a given purpose (i.e. some specific

subset of healthcare, such as the treatment of cancer). Others are general enough that they may be viewed as being independent of such “context”. Furthermore, the mission of ISO/TC 215 is to contribute to the improvement and maintenance of health through the use of standards for informatics and to facilitate the delivery of products, services and information over distances and across borders. This is a broad health perspective encompassing a wide context from health services to alternative medicine to socio-economic and environmental health factors. The coordination and facilitation of models need to encompass an equally wide and complex context.

ISO/TC 215 WG1 decided at their meeting in June 2000 that the “present Work Item — General Domain Model — be redefined and restarted at Stage 0, taking into account the related history and work, and addressing a high level data framework. Included with the new work item proposal would be a first draft based upon the concept of a high level data framework.”[1)]

At a December 2000 WG1 General Data Framework Exploratory and Working Meeting (hosted by Canada with participation from Japan and New Zealand), the possibilities, scope and purpose for a high-level framework were discussed. An initial draft of such a framework was also developed. The initial matrix that was developed was used as a basis for the draft developed in this document.

1) Draft minutes and presentation material from ISO TC215 WG1 Meeting in Vancouver, June 2000.

Annex B
(informative)

Health informatics profiling framework example meta-model

B.1 Introduction

The following is a depiction of an HIPF meta-model architecture. This example meta-model has been engineered to support the HIPF processes of artefact profiling and framework evolution.

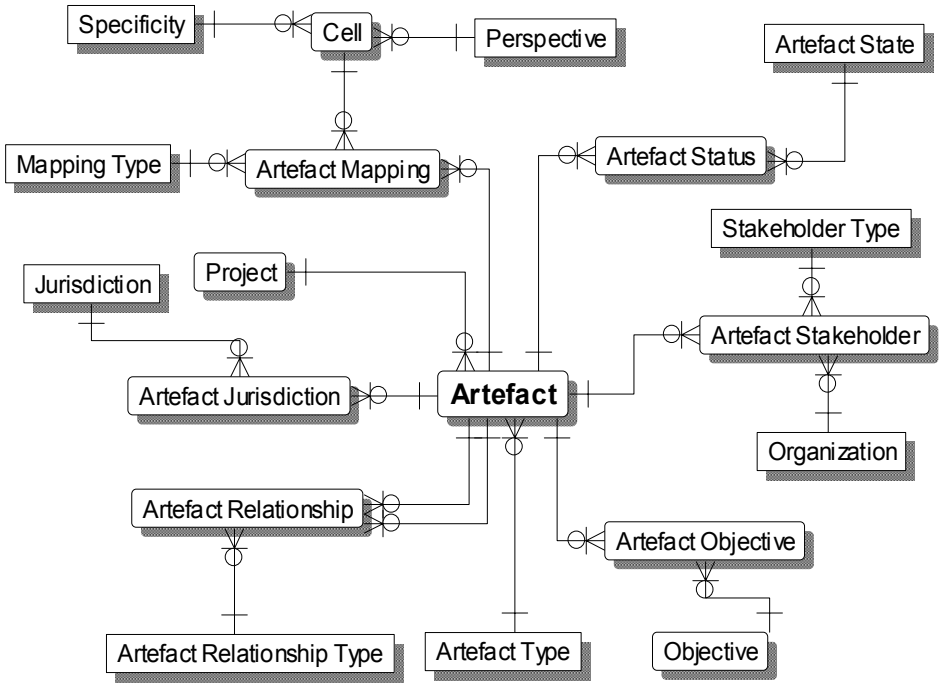

Figure B.1 — HIPF meta-model diagram

B.2 Health informatics profiling framework meta-model definitions

B.2.1 Artefact

The description of a model, document or work product that is used in healthcare by a jurisdiction to assist in the management of healthcare and planning of healthcare initiatives. The artefact will include such information as:

— full name of the artefact, as shown in source documents, as well as any commonly-used trademarks, acronyms or abbreviations,

— brief description of the artefact and a scope identifying the focus of the artefact, including secondary areas of note,

— technical and organizational implementation considerations, as stipulated in source data, or as determined by the analyst recording the data,

— next planned update, along with the next update's version number and/or name,

— any closely related artefacts that may be of interest to the user, under the heading “See also…”,

— the original language of source text. In the case of a difference in content between different language versions, the versions should be listed separately, with differences noted as an implementation consideration, and with the alternate version noted in “See also…”.

B.2.2 Artefact relationship and artefact relationship type

Defines the relationship between an artefact and an artefact component (parent/child), such as the immediately prior version of the standard, and any earlier versions of interest (note that the prior version of the standard is likely to also exist in the database, and would itself reference the current version under the heading of “Next Planned Update”).

B.2.3 Artefact jurisdiction

The association of a level of approval and a specific artefact instance for an indication of governance that may be applied to the setting of a specific artefact. Identification of an artefact into an applicable jurisdiction is stipulated in source documents, or is determined by the analyst recording the data. Each artefact will be given one of the following levels of approval depending upon the state of the artefact:

— approved – the work has been formally approved as a standard in a jurisdiction by an organization with responsibility for the jurisdiction,

— de facto – the work is so widely used that it is considered to be a default standard by knowledgeable users across the jurisdiction,

— pilot phase – a potential standard that is in its final stages prior to be being promoted to “approved” status, or

— developmental – a work that is under development with the expectation that it will be adopted as a standard, but has not yet gone through pilot testing.

B.2.4 Artefact objective

The assignment of a purpose (global, jurisdictional, functional, etc.) to an artefact instance.

B.2.5 Artefact mapping

Maintains information specific to the placement of a specific artefact to an HIPF matrix cell. This “classification” attribute is best described as a navigational attribute that exists in order to group together artefacts with common characteristics.

B.2.6 Artefact stakeholder

The capability to define the role (e.g. publisher, sponsor, audience, approver) for an individual or entity with a vested interest in development and utility of a health informatics artefact. A stakeholder can be a:

— developer – the primary organization(s) responsible for the development of the standard, as noted in source documents. If an alternate organization is responsible for maintenance, this is also noted,

— contact or custodian – the primary organization(s) with the right to disseminate information on the standard and/or distribute the standard, or

— target groups – the expected primary users of the standard, as stipulated in source documents, or as determined by the analyst recording the data.

B.2.7 Artefact status

The current operational state of an artefact as prescribed by the artefact lifecycle (e.g. proposed, balloted, approved, development, cancelled).

B.2.8 Artefact type

The hierarchical categorisation (e.g. data model, object model, mission statement) of artefact instances.

B.2.9 Jurisdiction

A healthcare governance region that is administered by a governing administrative entity.

B.2.10 Objective

A goal related to the definition and classification of health informatics standards artefacts.

B.2.11 Organization

The capability to define artefacts with respect to organizations and organizational units involved in the various aspects of artefact development.

B.2.12 Project

An initiative that may relate to the development or implementation lifecycle of an artefact. This attribute, under the heading of “Related Projects”, facilitates cross-referencing projects where emerging standards may be implemented. A “Date of Entry” must be provided such that the user understands the currency of an individual project or effort.

B.2.13 Reference rationale

A justification for the mapping of a health informatics artefact to an HIPF matrix cell.

B.2.14 Stakeholder type

A broad categorisation of stakeholders for an indication of the nature of involvement specific to an individual or entity with a vested interest in the development and utility of a health informatics standards artefact.

Annex C
(informative)

Framework cell examples

Table C.1 — Framework cell example

Perspectives *(Abstractions)* — **each view/row must have internal consistency/ integrity across columns** ***Levels of Specificity***	**What** — **primary and derived data, and the vocabulary and code schemes that describe them** — **includes artefacts of vocabulary & classification models**	**How** — **procedures and processes** — **business function representations (models, lists or diagrams)** — **methods**	**Where** — **geographic area** — **facility requirements** — **climatic conditions**	**Who** — **organizational units** — **org charts** — **all participants (e.g. actors/ targets, source/ recipients)** — **roles** — **security profiles** — **workflow models**	**When** — **schedules** — **events** — **reproductive cycles** — **frequency models**	**Why** — **goal models** — **scope of purpose, mission** — **policy models** — **governance**
CONCEPTUAL	— Vocabularies and terminology definitions (international and jurisdictional); — Data models, conceptual and associative (e.g. models containing billing and appointment scheduling entities); — Models of factors affecting global health; — Models to measure medical treatments, living conditions, health behaviours; or — Intrinsic characteristics of population health. Economic viability/sustain-ability models.	— Guidelines for health information management; — General and context-dependent processes.	— Climate models; or — Facility requirements (infrastructure).	— Healthcare organization structures and structure models; — Classifications of healthcare organizations (e.g. government, business, charitable, religious); — Healthcare personnel typing and classification models; — Workflow models; — Skills description models; — Models of scope of global health personnel - medical and non-medical; — Security profile structures/ hierarchy (security levels) models;	— Global healthcare events and programs; — State transition models; — Frequency analysis models (e.g. plague or climatic variation frequencies); — Healthcare life-cycle models; — Schedule-driven versus event-driven models; or — Master schedules.	— Goals; — Strategies; — Business plans; — Governance rules and regulations models; — Mission statements and guidelines.

Table C.1 (*continued*)

Perspectives *(Abstractions)* — **each view/row must have internal consistency/ integrity across columns** ***Levels of Specificity***	**What** — **primary and derived data, and the vocabulary and code schemes that describe them** — **includes artefacts of vocabulary & classification models**	**How** — **procedures and processes** — **business function representations (models, lists or diagrams)** — **methods**	**Where** — **geographic area** — **facility requirements** — **climatic conditions**	**Who** — **organizational units** — **org charts** — **all participants (e.g. actors/ targets, source/ recipients)** — **roles** — **security profiles** — **workflow models**	**When** — **schedules** — **events** — **reproductive cycles** — **frequency models**	**Why** — **goal models** — **scope of purpose, mission** — **policy models** — **governance**
LOGICAL	— Intrinsic characteristics models (attributes such as height, weight); — Entity-relationship diagrams (include attributes, defined relationships, and data typing); — Vocabularies and terminology definitions; or — Models of health factors in a given jurisdiction.	— Data flow diagrams; — Use case models; — Methodologies; — Application architectures; — Security (firewall) models; or — “Functions”.	— Controlled environment models; or — Test area models.	— Population & demographic factor models. — General roles, responsibilities and relationships models; — Governance responsibility and accountability; — Organization charts, without personnel identified; — Skills profiles/ descriptions; — Demographic models; — Security profiles - roles to resources; — Signing authority models; — Demographics.	— Timeframe structures and cycles for clinical studies; — State transition diagrams; — Measurement of readings (readings schedules); or — Schedules (e.g. remote care programs - dentist every 6 months, doctor every 3 weeks).	— Business purpose; or — Business rules (Triage guidelines).

Table C.1 *(continued)*

Perspectives *(Abstractions)* — **each view/row must have internal consistency/ integrity across columns** ***Levels of Specificity***	**What** — **primary and derived data, and the vocabulary and code schemes that describe them** — **includes artefacts of vocabulary & classification models**	**How** — **procedures and processes** — **business function representations (models, lists or diagrams)** — **methods**	**Where** — **geographic area** — **facility requirements** — **climatic conditions**	**Who** — **organizational units** — **org charts** — **all participants (e.g. actors/ targets, source/ recipients)** — **roles** — **security profiles** — **workflow models**	**When** — **schedules** — **events** — **reproductive cycles** — **frequency models**	**Why** — **goal models** — **scope of purpose, mission** — **policy models** — **governance**
PHYSICAL DESIGN	— Communication protocols; — XML (eXtensible Markup Language) — Document Type — Definitions (DTDs); — Physical data models, including field sizes and DBMS specific data types (e.g. Oracle's VARCHAR2); or — Language syntax e.g. Data Definition Language (DDL), software programming language syntax.	— System designs; — Tasks; — User manuals; or — Protocol definitions (e.g. ANSI X.12 transaction sets).	— Technical architecture (firewalls, servers, etc.); — Medical facility blueprints; — Network architectures (routers, WANs, LANs); — Laboratory plans; or — Medical facilities plans.	— Security policy (i.e. what groups have access to which resources); — Organization charts, without names; — Roles and responsibilities models; or — Emergency measures models.	— Project plans; — Critical path models; or — PERT charts (without date allocation).	— Detailed regulations; or — Rule books.

Annex D
(informative)

Comparisons to other frameworks and models

Table D.1 — Framework comparisons

Model or Framework		Purpose	Scope	Difference to HIPF
HIPF	To facilitate the coordination, communication and comparability of models of health informatics and health information standards.	Specifies two dimensions of health information modelling and standards: Perspectives and Specificity.		
Health Level Seven Version 3 Reference Information Model	Common source of general information structures for messaging and interoperability.	Includes messages, structure documents, software components and decision support logic modules.		HL7 RIM addresses the “What/logical” cell only and does not describe other aspects such as “Who”, etc.
Zachman Enterprise Architecture — A Framework	Classification for design components needed to assemble applications for various purposes.	Includes the necessary primitive application design artefacts.		Zachman does not describe artefacts in general. The framework is better suited to information systems, rather than information. The HIPF deals with multiple rather than single enterprises.
ENV 12443:1999, *Medical Informatics — Healthcare Information Framework (HIF)*	A healthcare information framework for standards developers and for health information system developers. The focus is on systems and technology in healthcare.	Healthcare and health system domain. The scope is constrained by the provider perspective and does not address non-medical determinants of health.		This approach provides a health system management perspective, rather than a health information framework. It is focused on knowledge rather than data. Although the purpose is congruent with HIPF, and maps across all HIPF columns at the conceptual level, it lacks the additional levels that offer the specificity of HIPF.
ISO/IEC 10746-2:1996, *Information technology — Open Distributed Processing — Reference Model:Foundations*	Identifies Common Information System Products for building of information systems.	Includes enterprises and communities of interest, each sharing distributed processing. It is inter-organization in a shared enterprise with multiple views.		Each view or model is being mapped to HIPF (enterprise, information, computational).
NOTE Refer to the Bibliography for details on the comparison documents.				

Annex E
(informative)

Health informatics profiling framework prototype tool and further exploration opportunities

E.1 General introduction

The HIPF is designed to provide for the classification of artefacts so that like items from disparate sources can be co-located in terms of specificity and perspective. It provides a mechanism for description, navigation, integration and alignment of similar health informatics standards artefacts to help avoid undue comparisons of artefacts that are from different cells in the framework.

E.2 Health informatics profiling framework prototype tool

E.2.1 Introduction

A web-based tool has been designed and developed in concordance with the HIPF proposed structure and purpose. The tool seeks to:

a) clearly display the artefact registration detail;

b) provide support for the registration process;

c) enable the search of artefacts according to its framework profile and any keywords supplied; and

d) progressively develop with experience.

The design requirement was coordinated by the Canadian Institute for Health Information (CIHI) and the implementation undertaken by the Centre of Research-Effective Diagnostics (CRED) at the University of Sherbrooke, Quebec, Canada. The first prototype was discussed at the ISO/TC 215/WG1 meeting in Melbourne (August 2002) and a small evaluation exercise was undertaken in the following autumn and winter.

E.2.2 Evaluation exercise

The evaluation exercise requested volunteer ISO/TC215 WG1 experts to enter two health informatics standards artefacts and to record their impressions of the tool using an online questionnaire. The tool, questionnaire and support documents were accessible on the internet. The following artefact profiles based on the HIPF were registered:

a) ISO/TR 17119, *Health informatics — Health informatics profiling framework*

b) ISO/TS 21667, *Health informatics — Health indicators conceptual framework*

c) *PWI Health indicators — Definitions, attributes and relationships*

d) ISO/TR 21089, *Health informatics — Trusted end-to-end information flows*

e) ISO/DIS 17113, *Health informatics — Exchange of information between healthcare information systems — Development of messages*

f) ISO/TS 18308, *Health informatics — Requirements for an electronic health record architecture*

g) ISO 18104, *Health informatics — Integration of a reference terminology model for nursing*

Participants in the evaluation exercise included:

— Peter Schloeffel (Australia)

— Mihoko Okada (Japan)

— Andrew Grant, Laura Sato, Julie Richards (Canada)

— Jane Curry, Benjamin So (Canada)[2)]

— Kevin Smith (USA)[3)].

E.2.3 Tool evaluation results

E.2.3.1 Artefact registration

The results are summarized in the following table.

Table E.1 — Artefact registration

Health Informatics Standard Artefact	No. of entries	Specificity allocation [Occurrence]	Perspective allocation (degree) [Occurrence]	Comments noted by tool users during the artefact profile registration process
a) ISO/TR 17119	1	Conceptual [1]	What (Primary) [1]	
b) ISO/TS 21667	1	Conceptual [1]	What (Primary) [1]	
c) *PWI Health indicators — Definitions, attributes and relationships*	1	Conceptual [1]	What (Primary) [1]	
d) ISO/TR 21089	1	Conceptual [1]	Who (Primary) [1] Why (Secondary) [1] How (Primary) [1]	• Who: Rights and obligations regarding information integrity of defined information management tools in the process of exchanging health information. Why: This methodology supports the application of security and privacy policy. How: The methodology describes the full set of processes that are required to ensure that information can be tracked and trusted from its initial capture to its end uses.

2) Jane Curry and Benjamin So provided preliminary artefact profiles prior to the formal evaluation exercise. Their data have been included here as they are further examples of potential health informatics standards profiles.

3) Unfortunately, because of technical difficulties, Kevin Smith was not able to properly access the tool for artefact registration purposes.

Table E.1 (*continued*)

Health Informatics Standard Artefact	No. of entries	Specificity allocation [Occurrence]	Perspective allocation (degree) [Occurrence]	Comments noted by tool users during the artefact profile registration process
e) ISO 17113	1	Conceptual	What (Secondary) [1] When (Secondary) [1] How (Primary) [1]	• What: The methodology defines the use of a set of increasingly specific linked models that define the structure and content of information exchanged around healthcare information systems, but does not define such information models directly. When: The methodology defines a mechanism to identify health business events that may cause information to flow between information systems, but does not define any such events directly. How: The methodology defines a related set of artefacts that together specify the context, timing, structure and content of health information exchanged between healthcare information systems.
f) ISO/TS 18308	4	Conceptual [3] Logical [1]	What (Primary) [3]* Why (Primary) [2]* Who (Secondary) [1] * one entry had both What and Why as Primary perspectives	• What: The set of EHR requirements constitutes a framework of requirements and defines what requirements are necessary to ensure a good quality and standards-compliant EHR reference architecture. • What: The following concepts are defined – judgement, dimensions, subject of information, site, has acuity/degree/potentiality/subject of info/site/timing, is applied to/perspective on, action, target, means, route, site, recipient of care, acts on, and has recipient of care/means/ route/ site/ timing. Who: Includes a reference terminology model for nursing actions, but this model does not normatively define those actions – provides a way of expressing any nursing action. • Why: At a high level – see support requirements (principles, goals) in Sections 1.4, PRO2: Process, COM 3: Communication, PRS 4: Privacy and Security, MEL 5: Medico-Legal, ETH6: Ethical, COC 7: Consumer / Cultural, and EVO 8: Evolution.
g) ISO 18104	3	Conceptual [3]	What (Primary) [3] Who (Secondary) [2]	• What: Integrated view of HER components.

E.2.3.2 Tool design issues identified

A simple on-line questionnaire was completed by four evaluation participants. The comments are listed below the questions.

1) Does the current design fit into an evolutionary pathway as predicted by the conceptors?

   — Strongly agree (4).

2) Is it user friendly?

   — Neither agree nor disagree (technical problem of upload encountered — two instances reported) (1).

   — Strongly agree (3).

3) Do you have any suggestions for improving the HIPF approach, concepts and descriptions (for purposes of editing the ISO Draft Technical Report)?

   — Not at the current time. We were in a hold pattern for some time and will be looking into classifying standards again in the very near future.

   — Still difficult sometimes to differentiate between Conceptual and Logical — What is the cut-off point? What are the key differences? (How should someone know what are “detailed characteristics”?)

   — The windows for entry could be a little bigger. However, the final display is very clear. The final display does not have a button to return to the home page. Some precision may be needed as to how to record updates of previous versions, e.g. supply a date field. Probably some access to a glossary of existing keywords visible at the time of choice could be useful, perhaps organized conceptually.

   — Not really — this is a very useful tool and the website works well apart from the one minor bug which I encountered.

Comments: The layout seems very clear including navigation and page layout. The search function does as intended for the first version.

E.2.3.3 Other technical issues

It was made clear beforehand that detailed error checking was not yet included in the tool. This probably led to two instances of failure to upload. One person in the United States could not access the website and the root cause of this was not concluded, possibly linked to a firewall restriction.

E.2.4 Tool evaluation conclusions

The evaluation exercise clearly showed both that the tool is compatible with the design requirement and that it is user friendly. The stated anticipation is that the tool should have the capacity to evolve with experience.

The difference in classification observed in (f) suggested that some further refinement of HIPF matrix definitions would be beneficial. The body of this Technical Report has taken this into account.

The tool's use of a comment associated with the focus is to be encouraged (visible with mouse-over). In any implementation, it may be appropriate to have a “seconder” for each artefact entry. The use of keywords is probably important but cannot really be assessed here — possibly an on-line dictionary of keywords should be developed.

It can also be anticipated that using the tool itself is a means of supporting consensus-building, particularly with standards requirements and definitions refinement as appropriate.

In a future iteration, the aim is to extend the mapping capacity of artefact registration so that key components of a standards document can also be registered and document cross-linking can be enhanced.

Continuing collaboration and scientific support with the ISO/TC 215 WG1 is an essential requirement for continued tool development.

E.3 Future use of the tool

The tool has the potential to support health informatics standards artefact profile registration, access and comparison for any interested organization.

For more information about the HIPF tool design and function, contact Andrew Grant (Andrew.grant@usherbrooke.ca) or Silven Rehel (Silven.rehel@chus.qc.ca) or see www.cred.ca.

E.4 Other exploration opportunities

An area for potential further investigation is to determine whether the distribution of artefacts across the HIPF classification matrix tends to be balanced or biased towards certain cells. Certain HIPF classification cells may receive a larger proportion of models and artefacts than other cells. The more populous cells could then be investigated to determine if a sub-framework is required to further classify the artefacts that are placed there.

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