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20943-1:2003

Information technology — Procedures for achieving metadata registry (MDR) content consistency —

Part 1: Data elements

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Summary of pages

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TECHNICAL REPORT

ISO/IEC TR 20943-1

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Information technology — Procedures for achieving metadata registry (MDR) content consistency —

Part 1: Data elements

Technologies de l'information — Procédures en vue d'obtenir la cohérence du contenu d'un registre de metadonnées (RM) —

Partie 1: Éléments de données

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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. In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 2.

The main task of the joint technical committee is to prepare International Standards. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

In exceptional circumstances, the joint technical committee may propose the publication of a Technical Report of one of the following types:

— type 1, when the required support cannot be obtained for the publication of an International Standard, despite repeated efforts;

— type 2, when the subject is still under technical development or where for any other reason there is the future but not immediate possibility of an agreement on an International Standard;

— type 3, when the joint 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).

Technical Reports of types 1 and 2 are subject to review within three years of publication, to decide whether they can be transformed into International Standards. Technical Reports of type 3 do not necessarily have to be reviewed until the data they provide are considered to be no longer valid or useful.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO and IEC shall not be held responsible for identifying any or all such patent rights.

ISO/IEC TR 20943-1:2003, which is a Technical Report of type 3, was prepared by Joint Technical Committee ISO/IEC JTC 1, *Information technology*, Subcommittee SC 32, *Data management and interchange*.

ISO/IEC 20943 consists of the following parts, under the general title *Information technology — Procedures for achieving metadata registry (MDR) content consistency*:

Note: Parts 2 and 3 are currently under development.

— *Part 1: Data elements*

— *Part 2: XML structured data*

— *Part 3: Value domains*

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Introduction

The exchange of metadata between metadata registries based on International Organization for Standardization/International Electrotechnical Commission (ISO/IEC) 11179 *Information technology — metadata registries (MDR)*, depends not only on registry software that conforms to the standard, but also on metadata contents that are comparable between registries. While the standard has provisions for data specification and registration, there are pragmatic issues pertaining to populating the registries with content. Based on the experiences of organizations that are implementing the standard, a Technical Report to explore content issues will help current and future users.

Metadata registries can be used to register data elements, value domains, and associated attributes for many kinds of organizational data resource collections. Metadata registries can store information on data elements used on forms, represented in enterprise data models, contained in EDI message sets, and described in documents and standards, as well as those data elements that are part of computer system applications. Some organizations use the registry to record essential facts about how data elements are used in existing applications, while other organizations use the registry as a repository of standard data elements to be used as models for data elements in application development. ISO/IEC 11179-6 specifically addresses the development and population of metadata registries.

ISO/IEC 11179-3 models a data element and its associated data element concept. Conceptualization and articulation of rules and relationships are needed in the creation of data element concepts, data elements, and value domains. Explication of the various possible levels of data elements and data element concepts and their relationships would greatly assist in the creation of shareable, well-formed data. Relationship and inheritance from the most generalized data element to the most specialized application data element need to be specified. Reuse of data value domains should be enabled and regularized.

While metadata registries can be used for storing information about a variety of metadata entities, this report addresses only data elements and associated metadata items. The goal of this paper is to ensure that there is a common understanding of the content of the data element attributes so that metadata can be shared between registries, despite their differences.

This Technical Report is based ISO/IEC 11179-3 of the six-part ISO/IEC standard that describes the organization of a registry for managing the semantics of data. The standard specifies the structure of a registry in the form of a conceptual model. The conceptual model is not intended to be a logical or physical data model for a computer system.

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Information technology — Procedures for achieving metadata registry (MDR) content consistency —

Part 1:
Data elements

1 Scope

1.1 Background

An ISO/IEC 11179-based metadata registry (MDR) (hereafter referred to as a "registry") is a tool for the management of shareable data; a comprehensive, authoritative source of reference information about data. It supports the standardization and harmonization processes by recording and disseminating data standards, which facilitates data sharing among organizations and users. It provides links to documents that refer to data elements and to information systems where data elements are used. When used in conjunction with an information database, the registry enables users to better understand the information obtained.

A registry does not contain data itself. It contains the metadata that is necessary to clearly describe, inventory, analyse, and classify data. It provides an understanding of the meaning, representation, and identification of units of data. The standard identifies the information elements that need to be available for determining the meaning of a data element (DE) to be shared between systems.

1.2 Purpose

The purpose of ISO/IEC TR 20943-1:2003 is to describe a set of procedures for the consistent registration of data elements and their attributes in a registry. ISO/IEC TR 20943-1:2003 is not a data entry manual, but a user's guide for conceptualizing a data element and its associated metadata items for the purpose of consistently establishing good quality data elements. An organization may adapt and/or add to these procedures as necessary.

1.3 Scope

The scope of ISO/IEC TR 20943-1:2003 is limited to the associated items of a data element: the data element identifier, names and definitions in particular contexts, and examples; data element concept; conceptual domain with its value meanings; and value domain with its permissible values.

1.4 Registration approach — data elements and value domains

There is a choice when registering code sets and other value domains in an ISO/IEC 11179 metadata registry. Some Registration Authorities treat these sets as value domains, and others treat them as data elements. For the purposes of ISO/IEC TR 20943-1:2003, the choice will always be to treat the sets as data elements unless explicitly stated. This choice is made to help illustrate the way to register many different kinds of data elements, including examples for registering standard code sets as data elements.

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2 Normative references

The following referenced documents are indispensable for the application 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:—[1], *Information technology — Metadata registries (MDR) — Part 1: Framework for the specification and standardization of data elements*

ISO/IEC 11179-2:—[1], *Information technology — Metadata registries (MDR) — Part 2: Classification for data elements*

ISO/IEC 11179-3:2003, *Information technology — Metadata registries (MDR) — Part 3: Registry metamodel and basic attributes*

ISO/IEC 11179-4:—[1], *Information technology — Metadata registries (MDR) — Part 4: Rules and guidelines for the formulation of data definitions*

ISO/IEC 11179-5:—[1], *Information technology — Metadata registries (MDR) — Part 5: Naming and identification principles for data elements*

ISO/IEC 11179-6:—[1], *Information technology — Metadata registries (MDR) — Part 6: Registration of data elements*

ISO/IEC TR 15452:2000, *Information technology — Specification of data value domains*

Standards from which examples have been drawn to be used in this document are listed in the Bibliography.

3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/IEC 11179 and ISO/IEC TR 15452 apply.

4 Data element abstraction

This clause presents a conceptual framework for structuring data elements and data element contents in a registry. Data elements are ideally the result of a process of development, involving several types of abstraction, producing a series of "layers" related to each other by the method of abstraction used to produce one from the other. Layers may progress from the more general to the more specific.

Depending on the type of abstraction, relationships among the members of each layer and between layers are meaningful in terms of defining the structure of the registry contents. This provides a means of comparison of the contents of different registries and of searching within a registry. In addition to the data element definition and other attributes, comparing the type and level of abstraction by which the data element was derived can ensure that content can be shared among registries.

One could use layers to structure development of a system, for instance, with the highest layers of definition contained in a business view, and development progressing to the implemented system layer. The number and granularity of layers are driven by user requirements. This clause will describe two ways to derive layers, neither of which are intended to be mandatory for any particular implementation, and will present examples of the types of abstraction most useful to registry implementations.

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4.1 Abstraction types

Abstraction is a well-developed tool for analysis and conceptualization. It is used as a way of focusing on parts of the model of interest to a particular process or function. The term "abstraction" is used to refer both to the process and the results of the process. Abstraction can be applied to the registry environment as a way to articulate the development of data elements and their relationships to each other.

Several methods can be used to achieve the decomposition of layers from the most abstract to the more concrete. Starting with the most general conceptual notions and progressing to the data elements in applications, these layers can be labeled by the type or types of abstraction used to produce them from another layer. Although this description of the process of abstraction development implies that it always proceeds in one direction (from the general to the concrete), there may certainly be cases where the reverse is true. Also, after the structures are in place, there is no implication that the relationships are all in single directions. Indeed, the names of the abstraction types deliberately include two levels in a effort to avoid that assumption.

The three types of abstraction of most interest to data element development are *specialization/generalization, concatenation/decomposition* and *aggregation.*

- **Specialization/generalization** is a relationship between two classes, where all items in one (subclass) are also in the other (superclass).

- **Concatenation (**or **composition)** involves the development of composite values by concatenation of character sequences from source values. **Decomposition** involves the separation out of the component portions of value sequences into their source character values.

- **Aggregation** involves the derivation of values by means of mathematical operations on source values. It is not usually possible to reverse the operation (called **derivation**) to recover the component parts.

All three types are commonly found in registries.

4.2 Example of specialization/generalization

The mechanism of specialization/generalization can be used to express a hierarchical structural relationship among data elements.

The United States Postal Service (USPS) establishes postal codes for the United States. The data element State USPS Code (figure 1) forms part of an address group. It might be used to map to application data elements directly, but it could also be the highest layer of a hierarchy of data elements, each displaying a greater degree of specialization according to its position in the structure.

The next layer down contains the elements Geographic Address State Code and Mailing Address State Code. The two State Code elements are now members of two differing address groups. The conceptual domains of the two elements are still identical, however, as the set of potentially valid values of geographic addresses and mailing addresses are the same.

Further specialization takes place at the next layer. Mailing Address State Code is partitioned into Facility Mailing Address State Code and Customer Mailing Address State Code. As before, the address groups of these elements differ, and in addition the data value domains do not necessarily contain the same sets of valid values. The domain of Customer Mailing Address State Code might remain the same as Mailing Address State Code, but the domain of Facility Mailing Address State Code might now be restricted to the subset of states in which facilities are located.

In this example, application data elements are mapped to the registry elements at this layer. Subclause 6.7 describes linking data elements that occur in different databases, under different names, to one registry data element. These relationships encourage data interchange by assuring semantic equivalency among disparately appearing data elements.

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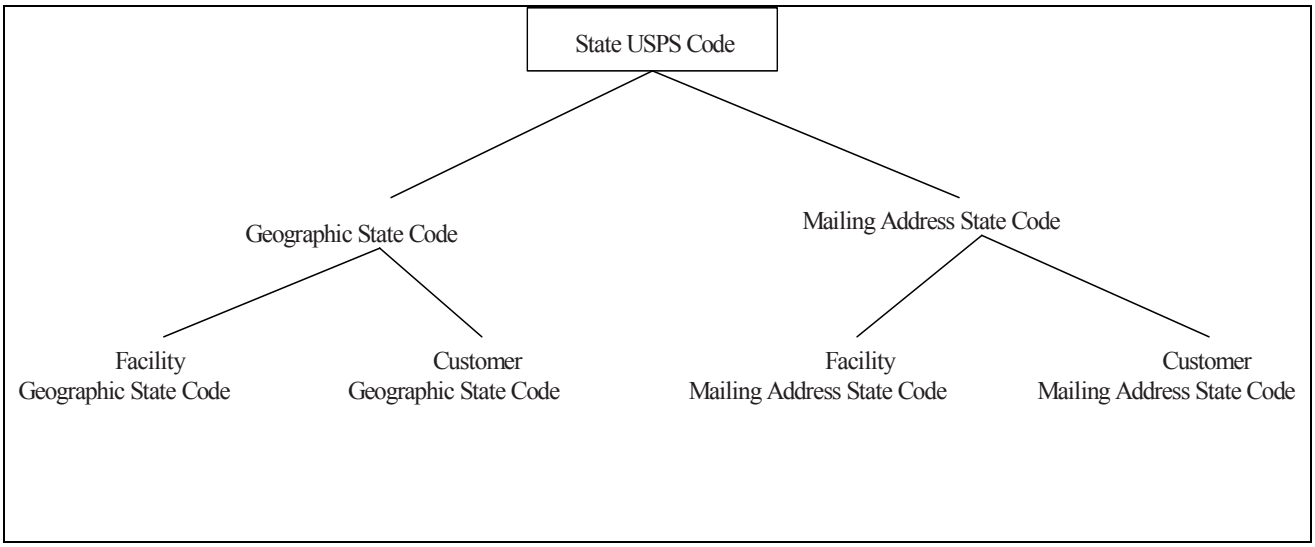

Figure 1 — Specialization/generalization hierarchy

Clauses 6, 7 and Annex A show a way to track the layers of specialization by assigning Layer of Abstraction Type as a value of Classification_Scheme_Item.csi_type_name and values such as specialization, generalization, aggregation, and concatenation to the attribute Classification_Scheme_Item.csi_value in the data element description. These attributes show the type of abstraction of the data element in the abstraction structure. In the example above, the attribute value for data element State USPS Code's Classification_Scheme_Item.csi_value is designated as Generalization. This designation indicates that this data element is at the top of the specialization/generalization structure for data elements in this registry. The data elements in the next layer, Geographic State Code and Mailing Address State Code, are assigned the attribute value Specialization. The data elements in the third layer, namely Facility Geographic State Code, Customer Geographic State Code, Facility Mailing Address State Code, and Customer Mailing Address State Code, are also assigned Specialization.

There may be other structures in the registry in which data elements are placed relative to other registry entries, such as data element concepts. In that case, other attributes may be needed to locate the example data elements in those structures.

4.2.1 Example of sharing a value domain

Figure 1 shows a specialization/generalization hierarchy where State USPS Code is viewed as a data element that is specialized as Geographic State Code and Mailing Address State Code. If the ranges of permissible values for Geographic State Code and Mailing Address State Code are identical, then an alternative representation of this scenario is to consider State USPS Code as a data value domain that is shared by the data elements Geographic State Code and Mailing Address State Code.

4.3 Example of concatenation/decomposition

Use concatenation/decomposition to express a relationship among data elements in which the higher layer describes a whole sequence, and the lower layers are component parts of that sequence. They may or may not be discrete; that is, some of the lower layer components may overlap in their descriptions or domains.

An example of this type of abstraction is the dividing of mailing address sequences into their subcomponents (figure 2). These divisions are based on ISO 11180, Postal Addressing. The figure shows some of the subdivisions for the data element group Mailing Address Group.

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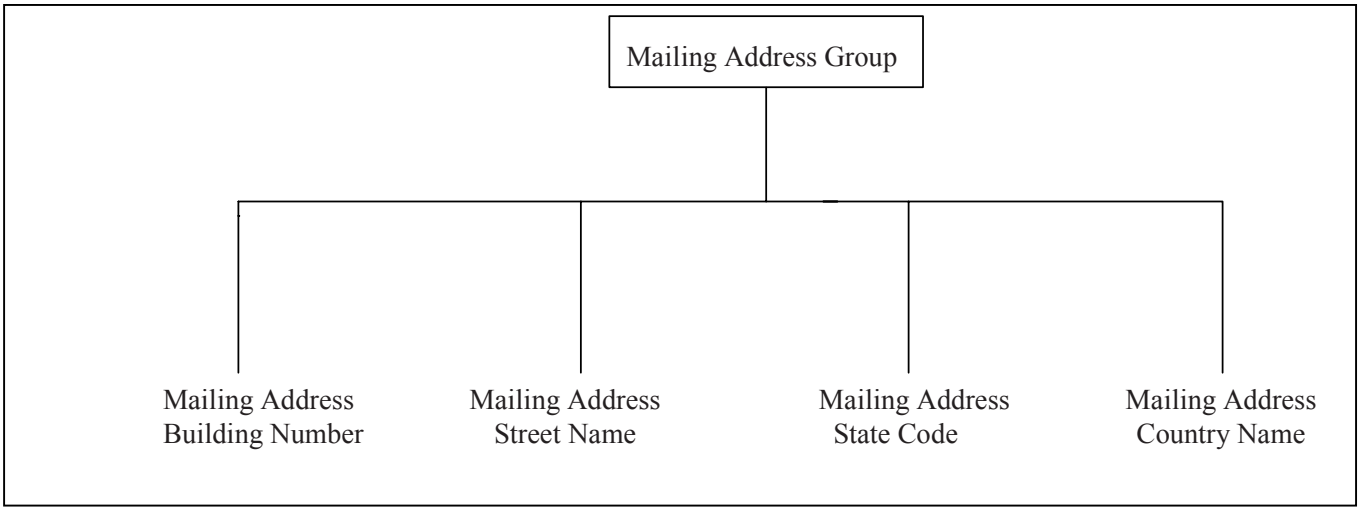

Figure 2 — Concatenation/decomposition example

4.4 Example of aggregation

Use aggregation to express a relationship among data elements in which the higher layer describes a characteristic of a whole and the lower layers are factors affecting that characteristic. They may or may not be discrete; that is, some of the lower layer components may overlap in their descriptions or domains.

Examples of this type of abstraction include:

- the derivation of a period of operation by subtraction of the commencement time, and any temporary stoppage periods, from the finishing time.
- the derivation of an average and standard deviation from a population of values and the count of those values.

It should be noted that it is not usually possible to reverse the aggregation operation (which is called derivation). This is because the derivation process produces a different type of information to the original data instances. In a strict analysis of derivation, information is usually lost in the process.

Clauses 6, 7 and Annex A show a way to track the layers of concatenation by assigning Layer of Abstraction Type as a value of Classification_Scheme_Item.csi_type_name and values such as specialization, generalization, aggregation, and concatenation to the attribute Classification_Scheme_Item.csi_value in the data element description. These attributes show the type of abstraction of the data element in the abstraction structure. In the example above, the attribute value for data element Mailing Address Group's Classification_Scheme_Item.csi_value is designated as Concatenation. This designation indicates that this data element group is at the top of the concatenation/decomposition structure for data elements in this registry. The data elements in the next layer of decomposition are assigned the attribute value Decomposition.

Throughout Clauses 6 and 7, reference will be made to the layer of abstraction for each example data element. The relationship of elements in any particular layer to those above and below it will help the user to choose which data element contains the appropriate information for a particular use.

There may be other structures in the registry in which data elements are placed relative to other registry entries, such as data element concepts. In that case, other attributes may be needed to locate the example data elements in those structures.

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5 Data element registration

Registration of a data element in a registry requires that certain characteristics of the data element be recorded to clearly describe and define it. These characteristics are stored as attributes of the data element. A registry can be used to record information about a range of data elements, from those found in carefully crafted data standards to those found in applications. The amount and quality of metadata information available can vary from good, complete information to poor, incomplete information. This Technical Report is intended to describe the population of a registry with data elements for which good quality, consistent metadata can be created. ISO/IEC 11179-3 specifies attributes for recording information about a data element in a registry. This Technical Report gives examples that demonstrate the population of a registry. It includes attributes that are mandatory and fully defined by the metamodel, as well as those where the Registration Authority must establish its own profile of required attributes.

There are often problems associated with poorly-formed data elements. For instance, values with definitions other than those defined in the formal definition attribute may be mixed into a value domain along with those which are properly defined. Two data elements may contain overlapping values. This document does not address these kinds of problems.

The metamodel provides for the recording of administrative data about many metadata items of the registry. These are considered to be Administration records. Administration records must contain an identifier, the date the item was created, and the registration and administrative status of the item. Administration records must have a name and a definition in context. An administration record may also contain dates when data about the item were changed, an effective date, and an end date. Explanatory notes and the origin of the item, as well as administrative notes, change description, and unresolved issues may also be recorded. The exact process for determining registration status of administration records other than data element itself, has not been established in the current ISO/IEC 11179-6, where registration is described. For the purpose of this Technical Report, the characteristics of completeness and data quality that are to be used to determine registration status for all items is considered to be the same as for data elements themselves.

Two approaches to data element registration are included in this report: a bottom-up approach, where limited information about the data element is available prior to registration, and a top-down approach, where conceptual information has previously been identified.

- The bottom-up registration procedure provides for the basic metadata attributes about the data element (e.g., definition, name, and permissible values) to be completed prior to defining the conceptual information about the data element. This approach is described in Clause 6 of the Technical Report.

- A top-down approach is useful in many circumstances. Although it requires more "up front" effort, top-down registration has the potential to produce more stable and uniform metadata. An example of a top-down registration, where registration begins with identification of data element concepts, is provided in Clause 7.

It should be noted that the same rules and guidelines apply to the associated metadata items and attributes of a data element, regardless of the approach. The bottom-up and top-down procedures differ only in the order that the practitioner analyzes the data element and formulates its associated items and attributes. The complete registration process is described in context in Clause 6. Except for the order described, the same processes are applicable in Clause 7.

6 Bottom-up approach to data element registration

In many cases where a data element is submitted for registration, only a limited amount of information (e.g., a name, definition, and a set of permissible values) is provided by the submitter. Other attributes must be determined based on an understanding of the underlying data values and concepts that are implied by those facts. Registry practitioners, working from existing systems, may find that working from data elements to data element concepts is appropriate. This approach is referred to as bottom-up in this Technical Report. A bottom-up approach might also be used where the registry is intended to serve as a distribution mechanism for metadata that describes the data in data products such as public data sets, query results, etc.

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The examples provided in this clause describe how to formulate attributes about a data element, based on a bottom-up procedure. The registration procedures are presented in a logical order for analysing and formulating attributes for a data element. First a general procedure for registering data elements is described, followed by examples of registration of four types of data elements, including data elements from:

- an International Standard with an enumerated domain;
- an information system, where the application data element uses that standard enumerated domain;
- an International Standard with a non-enumerated domain;
- another standard, where the application data element uses that standard non-enumerated domain.

This Technical Report is intended to be used to help registry practitioners to formulate the attributes that describe and define a data element. Subclause 6.1 presents an example of an overall approach to bottom-up data element registration. Subclauses 6.2, 6.3, 6.4, and 6.5 should be consulted for more specific examples of registering the kinds of data elements described in International Standards, national standards, and in information systems. Annex A contains a table that concisely summarizes the information registered for each data element in the examples that follow in Clause 6. Annex B, which is based on ISO/IEC 11179-2, -4, -5 and -6, contains more detailed information and examples to assist the practitioner who is registering data elements. Annex C provides a crosswalk from the example attributes named in this Technical Report to the ISO/IEC 11179-3 metamodel.

6.1 General procedures for registering a data element

Often only a limited amount of information is available about a data element that has been submitted for registration, e.g., the name and definition contained in a document or provided by the submitting organization and a set of permissible values, where appropriate. The general procedures that follow are intended to result in the registration of a complete, well-defined data element that meets the requirements of a particular registration authority.

It should be noted that the metadata for some data elements in a registry will never be complete. This is true of application data elements that are obtained from computer software, where very little information is known except the representational attributes (e.g., field length and datatype). For these data elements, only the most basic attributes will be entered, and the data element's registration status will remain incomplete.

6.1.1 Understanding the data element

When examining existing computer systems, the practitioner should not automatically assume that there will be a one-to-one correspondence between a field in a record and a data element in the registry. Often as systems evolve, fields become used for multiple purposes under various conditions. When such a situation is detected, it may be desirable to establish more than one data element, corresponding to a single field. The reverse situation where multiple fields correspond to a single data element is also possible, though less likely.

The first step in the registration procedure is to gain an understanding of the data element. What kind of data will be stored in this data element? Is there a definition or description of the data values? Were permissible values or examples of the data provided? Will the data values be determined by an arithmetic or statistical procedure? What will the data values look like; e.g., are they names or descriptions of things, numerals to be calculated, strings of characters and numbers that are identifiers? Where documentation is inadequate to fully understand the data element, the practitioner must consult those who represent the source of the data element to obtain the necessary information.

The result of this first step is an understanding of the semantic content of the data element.

6.1.2 Content research

Prior to formulating attributes toward registration of a new data element, the registrar should perform content research to determine the following:

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- Is the data element described in an existing International, National, or organizational standard?
- Does a data element exist in the registry, or a federation of registries, that has the potential for being reused?

It is necessary to recognize that the registration practitioner must make value decisions when recording metadata into the registry. The practitioner will determine if a data element might be adapted to meet new requirements, or if some attributes of an existing data element (e.g., value domain, data element concept, or conceptual domain) might be reused with the new data element. Content research should include a search of conceptual domains, data element concepts, and value domains, as well as data elements, to identify attributes that might be relevant to the data element to be registered. If a standard data element exists that can be used as a model to meet the particular specifications for a new purpose, some of its associated metadata items may be reused for registration of the new data element.

The result of this step is confirmation that a new data element is needed, or a decision to modify or reuse an existing data element or some of its attributes.

6.1.3 Data element definition

The essential semantic content of a data element must be captured in a data element definition. ISO/IEC 11179-4 describes rules and guidelines for formulating definitions. Examples are provided in Annex B for formulating definitions, based on the rules and guidelines set forth in ISO/IEC 11179-4. Definitions and names are entered in context (i.e., a designation of the discipline in which a name and definition are applied or from which it originates). For many of the examples used in this report, the context is recorded as “Registry.” “Registry” in this example indicates that the name and definition have been formulated according to the rules and guidelines established by the registration authority for this particular registry. In addition to designating context, the language represented by a name and definition can also be designated as a Language identifier. For this report, all examples have been provided in English.

6.1.4 Permissible values and value domain

ISO/IEC 11179-3 identifies the attributes that describe the domain of permissible values. The permissible values for a data element are the value domain for the data element. Annex B also contains detailed information about the attributes in value domains and examples of how those attributes are used for both enumerated domains (i.e., established through a list) and non-enumerated domains (e.g., specified through a formula, rule, procedure, or reference). Datatypes must be associated with the name of the schema or source where the datatype name originated. Annex B provides examples of datatype sources. Format is used to indicate the position of punctuation symbols, or other editing requirements for the data item value (e.g., YYYYMMDD is a format for date).

Different attributes are used depending upon whether the permissible values are enumerated or non-enumerated. Each enumerated permissible value is associated with a valid value meaning that provides meaning to the permissible value, as described in Subclause 6.1.8.

Each enumerated permissible value is also entered in the registry with its begin date (i.e., the date when that permissible value became valid for a value meaning in that registry). End dates will also be entered, when the permissible value for a value meaning becomes invalid.

Value domains for non-enumerated domains must include a description of the values that are valid for the data element. This report contains specific examples of registering data elements with enumerated domains (Subclauses 6.2 and 6.3) and with a non-enumerated domains (Subclause 6.4 and 6.5).

The value domain is an administration record, requiring that administrative data be recorded for the value domain, including name and definition in context, the origin of the domain, and any explanatory comments, as well as the administrative and registration status of the value domain.

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6.1.5 Representation class

At this time in the registration process, it is appropriate to enter the representation class that describes how the data element is represented. Representation class is an optional attribute in an ISO 11179 registry. Where representation class is used, it is an administration record. An identifier, name, definition, and context are required for each representation class, as well as the other attributes: registration status, administrative status, and creation date. Optional attributes (e.g., explanatory comments, origin) may also be included with representation class.

When registering a data element, a representation class is selected from the administered representation classes and recorded for the data element. A representation class qualifier can also be recorded where appropriate. For a description of the usage of representation class and examples of representation classes, see Subclause B.2.3.

6.1.6 Names and identifiers

ISO/IEC 11179-5 gives principles for naming and identification of data elements. Most people prefer to use names when talking about a data element. At least one name must be assigned to a data element, associated with the context in which the name is used. A name can be developed for a scientific discipline, an organization, a particular computer language, a database management system, or other purpose. Each name is developed according to the naming convention for a particular name context. The naming convention can vary from "whatever you want to call it" to a highly structured name. The description of the naming convention should be stored in the metadata registry as a reference document. ISO/IEC 11179-5 does not specify a mandatory naming convention, but does explain how to document one. Annex B also expands on ISO/IEC 11179-5 by providing examples of the use of names and name contexts.

Each data element registered within a Registration Authority (RA) is unambiguously identified with a unique identifier. Although the standard does not specify the format or content of the data element identifier (DI), the identifier should carry no useful information about the data element, e.g., it might be a number assigned sequentially by an automated system. If the attributes of a data element change, a new version of the data element is created and registered with a version identifier (VI).

Since each registration authority establishes its own identification scheme, the same identifier might be used to identify a different data element in another registry or even in the same registry for a different registration authority. Therefore, a Registration Authority Identifier (RAI) must be established and used with the data identifier and version identifier for unique identification of a data element. Data elements registered under the provisions of ISO/IEC 11179 are assigned an international registration data identifier (IRDI), which is a composite of the RAI, the DI, and the VI. ISO/IEC 11179-6 describes the requirements for an RA and the construction of an RAI. The RAI is composed of an International Code Designator (ICD), an Organization Identifier (OI), an Organization Part Identifier (OPI), and an OPI Source (SRC). The IRDI is discussed further in ISO/IEC 11179-6. For this Technical Report, the example RAI is designated to be {RAI}.

All administration records within an ISO/IEC 11179 registry are assigned identifiers, established by the same process as described above for data elements.

6.1.7 Other metadata attributes

Other mandatory and optional data element attributes are described in ISO/IEC 11179-3. In addition to the definitional attributes described in Subclause 6.1.3 and the identifying attributes described in Subclause 6.1.6, there are administrative, relational, classifying, and other miscellaneous attributes that serve to define and describe a data element. The standard for an ISO/IEC 11179 metadata registry requires that a data element be documented with an administration record.

In addition to the mandatory attributes specified by ISO/IEC 11179-3, a registration authority might establish a profile for a particular registry. The profile specifies such requirements as:

- where attributes described as optional in the standard are mandatory for that registry;
- optional attributes in the standard are not included in the registry;

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- attributes not included in the standard might be identified and added to the registry.

The attributes that relate data elements through data element concepts (Subclause 6.1.8) and those that classify data elements (Subclause 6.1.9) are described in subsequent clauses of this report. Many information sources do not provide concept or classification information about the data element. Some administrative information is related to registration and administrative status, and is described in Subclause 6.1.10. Annex B includes detailed information about these metadata attributes.

For the bottom-up registration procedure described in this report, some administrative and miscellaneous attributes are recorded at this time, including the following.

- Submitting Organization: The submitting organization is the name of the organization that has submitted the data element for addition to the registry. The submission contact for the submitting organization is also recorded in the registry.

- Stewardship Contact: The organization that has been delegated the responsibility for managing a set of data resources is the stewardship contact. The stewardship contact may be a position within the organization, or even a hot line answering service. Additional information about the contact, including telephone number, email address, and mail code can be entered at this time.

- DE Explanatory Comment: A data element may have an explanatory comment that can be used to provide remarks about the data element, including usage, procedure, and other explanatory information that is not appropriate to include in the data element definition attribute.

- DE Origin. A data element can be associated with any type of source, including a document, standard, system, group, form, or message set. Only one source is associated with a data element to indicate the origin of information about the data element. Additional information can be entered about the source at this time, including abstract and bibliographic information.

The System Date is generally captured by the application software for the administrative attributes Creation Date and Last Change Date. Other administrative data may be entered manually.

6.1.8 Data element concept

At this stage in registering a data element, it is possible to specify conceptual information about the data element through the data element concept. The data element concept may relate several data elements that record data about that concept with different representations, e.g., both names and codes that represent provinces of Canada and share the same concept, which in this example is "Canadian Province Identifier."

Data element concepts may be identified with object class, property, and qualifiers. A data element concept is singular (only one concept is represented). It can be associated with many data elements, including other names and codes, and it does not include a representation class term in its name or definition. The data element concept is associated with only one conceptual domain, as described in the following paragraph.

Data element concepts are specified through a conceptual domain, i.e., a set of possible valid value meanings of an administered data item concept, whose representation in a registry shall be independent of (and shall not constrain) their representation in any corresponding value domain. The conceptual domain, "Canadian Provinces", would include valid value meanings such as "The Canadian province of (Alberta, ... Yukon Territory)," where each value meaning would identify one Canadian province. Each value meaning is entered in the registry, associated with its conceptual domain, its begin date (i.e., the date when that value meaning became effective in the conceptual domain for that registry) and end date (i.e., the date when the value meaning became invalid). Permissible values are associated with value meanings, according to the representation defined by the value domain. For example, the permissible value “CA”, the 2-character alphabetic code for Canada, would be associated with the value meaning “The primary geopolitical entity known as Canada” in a Conceptual Domain entitled, "Countries of the World."

Data element concepts and conceptual domains are always administration records and must be specified with administrative data, as is the data element itself. Therefore, at least one name and definition must be recorded in context for the data element concept and for the conceptual domain. The dates when they are entered into

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the registry and both registration status and administrative status are required for both. Comment, origin, and other administrative attributes might also be stored about a data element concept and a conceptual domain.

Derivation of data element concepts and conceptual domains, including value meanings are described in detail in Annex B.

6.1.9 Classification schemes

The classification scheme attributes are recorded, where appropriate, at this time. Classification helps to add information to data elements that is not easily included in definitions, helps to organize the contents of a registry, and helps to provide access by supporting more meaningful queries. ISO/IEC 11179-2 describes general categories of classification.

Each registration authority should determine the types of classification to be included in a registry. The classification scheme type name is always recorded. The registration authority might choose to classify data elements as groups, such as the following.

- Data elements used in a mailing address.
- Data elements used to identify facilities.
- Data elements that locate a point on the surface of the earth.
- Data elements that are listed in a data standard.
- Data elements included in an application system.
- Data elements identified on a data collection form.

Examples of other types of classification that the registration authority might choose, are to classify data elements with one or more keywords, e.g., altitude, date, facility, industrial, and organization, and by object class. Classification schemes always contain administrative data, and are related to such items as organization, reference document, registration authority, and contact information. In this Technical Report, only examples of classification scheme types and examples of classification values for those types are provided.

6.1.10 Registration and administrative status information

Initially, only some of the attributes will be recorded for a newly registered data element. Such a data element will be assigned the registration status of "incomplete." When all of the mandatory attributes for a data element have been entered into the registry but the quality of the metadata has not been verified, the registration status will be "recorded." Through the quality review process, some data elements will be assigned the status of "certified" and some might become "standard." The "standard" data element is the preferred data element to be used for data sharing, to ensure consistent representation and understanding of the data being communicated.

ISO/IEC 11179-6 describes the registration process and the registration status assigned to a data element as the metadata are reviewed and quality is improved. Many data elements might be entered into a registry, but only a relatively small number of them might be assigned a "standard" registration status. Annex B describes the assignment of registration and administrative status throughout the life cycle of a registered data element. ISO/IEC 11179-6 specifies the layers of registration status; the administrative statuses, however, are established by each registration authority. Although ISO/IEC 11179-6 does not provide for the registration of metadata items other than data element, this Technical Report has followed the same process for all administration records as has been established for data element.

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6.2 Example of International Standard with enumerated domain

This clause provides a specific example of the registration of a data element from an International Standard, where the possible valid values are itemized. The International Organization for Standardization (ISO) 3166-1:1997(E/F), *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*, is used as the source for this example. ISO 3166:1997 is a complete revision of ISO 3166, which was first published in 1974.

ISO 3166 includes the following value domains: short country name in English, full (official) country name in English (not provided for all countries), 2-character alphabetic code, 3-character alphabetic code, 3-character numeric code, short country name in French, and full country name in French.

The following paragraphs are presented in the logical order for formulating attributes for a standard enumerated data element, using the English-language short country name as the example. The table in Subclause 6.2.12 contains all of the metadata attributes recorded for this example of an enumerated data element from an International Standard.

6.2.1 Understanding the data element

The data element to be registered is taken from an International Standard, and it includes an authoritative conceptual domain of country identifiers for all of the countries of the world. The English-language short name was selected for standardization because it has the most utility for information systems used by United States (U.S.) federal agencies as well as the private sector. The short form of the English-language name is used by the U.S. Postal Service (USPS) for all outgoing international mail, in preference to any of the codes or full names that are included in the standard. The name is also preferred by the USPS to any names that are used locally by a country to identify itself. For example, "Japan" is recognized by the USPS in preference to "Nihon," which is the country name commonly used by that country itself. The short form of the name in English has been used in the development of ISO 3166 as the basis for assigning codes in preference to the full name, to avoid, wherever possible, any reflection of a country's political status (e.g., "People's Republic of …" or "Kingdom of…").

Some registration authorities might choose to register short English-language names as a value domain, rather than as a data element. (Note: See Subclause 1.4). ISO 3166 contains names and codes for territories that are not always considered to be countries. A data element based on ISO 3166 might use a subset of the value domain that represents only countries and not territories.

The English language short name in the standard varies in length from four alphabetic characters (e.g., Peru) to 44 alphabetic characters (i.e., South Georgia and the South Sandwich Islands).

6.2.2 Content research

Other standards that contain conceptual domains for country identification include the U.S. Federal Information Processing Standards (FIPS), published by the U.S. Department of Commerce, Technology Administration, National Institute of Standards and Technology (NIST). FIPS 10-4 was developed for use by the U.S. Department of State and was maintained by the Office of the Geographer and Global Issues, U.S. Department of State. FIPS 10-4, published in April 1995, reflects changes through May 6, 1993. FIPS 104-1 implements an American National Standards Institute standard ANSI Z39.27-1984, and adopts entities, names, and codes prescribed by ISO 3166, with some qualifications. For example, FIPS 104-1 does not identify freely associated territories and possessions of the United States as countries, as they are in ISO 3166. FIPS 104-1 was last updated on May 12, 1986. The maintenance organization for FIPS 104-1 has been the National Bureau of Standards (now NIST) in coordination with the U.S. Department of State, the U.S. Board of Geographic Names, and the maintenance organization for ISO 3166. There are no known plans to update either of the FIPS standards, and neither of these standards is recognized internationally.

A standard for data elements that identify countries must be an authoritative international source of value domains with ongoing maintenance. Therefore, the ISO 3166:1997 is used as the origin of the data element for country name.

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6.2.3 Data element definition

Formulate the definition using the mandatory rules and guidelines established in ISO/IEC 11179-4. The rules and guidelines from ISO/IEC 11179-4 are described with examples in Annex B. The definition is singular, since any instance of the data element contains only one value. Understanding that the essential meaning of this data element is to identify countries by the use of a short name in the English-language, the data element definition can be formulated as "The short, ISO-recognized name of a country, represented in the English language."

6.2.4 Permissible values and value domain

The permissible values for the data element are the short names in English, listed in ISO 3166 (e.g., Afghanistan, Albania, ... Zimbabwe). Each permissible value is entered into a registry with the date when that permissible value was valid for that value meaning in that particular registry. In this example the "begin date" is arbitrarily listed as January 10, 1997, the date when the standard became effective. There is no "end date" to enter at this time.

The scope of the permissible values for this data element includes the short English-language name for all countries. A value domain is defined as a set of permissible values. It can be labeled with a name and a definition, in context. For this example, the context is considered to be “Registry”; the name of the value domain is “Short English-language Country Names”; and the definition is "All short, ISO-recognized English-language names of all countries." Value domains must also have an identifier and a version number, which can be assigned through application software. Refer to Annex B.2.2, Value Domain, and record the other value domain attributes for this example at this time, including the following.

- Datatype: The datatype for country name is "CHARACTER VARYING" and the datatype source is "ANSI ISO SQL."
- Maximum characters: Based on prior research (Subclause 6.2.1), the known maximum length for this value domain is 44.
- Format: There is no required format for this character string.
- VD Origin: The standard from which the permissible values are obtained is ISO 3166-1:1997, Codes for the representation of names of countries and their subdivisions — Part 1: Country codes.
- Identifier: {RAI} 5678:1.

6.2.5 Representation Class

The representation class "Name" is selected from previously registered values for representation class (each of which has its own administration record). For this example, the representation qualifier of "Short" should also be recorded to distinguish the name from the long English-language name in ISO 3166.

6.2.6 Identification and naming the data element

Names do not identify a data element. ISO/IEC 11179-5 requires that data elements be identified with a unique identifier and designated with one or more names, recorded in context.

6.2.6.1 Identification

Assign a unique identifier to the data element for short English-language country name, as described in Annex B for the identification of data elements. In the registry for this example, a unique date element identifier and version identifier (DI:VI = 20903:1) are assigned at the time of registry. The identifier is preceded by the identifier for registration authority, as described in Annex B of this document. For this example, the registration authority identifier is represented as {RAI}. An automated process usually assigns identification numbers when a record is created, including the RAI for which it has been recorded. The IRDI for this example data element is designated as {RAI} 20903 :1.

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6.2.6.2 Name context and naming convention

ISO/IEC 11179-5 describes the naming of data elements. Annex B gives examples of name contexts and naming conventions. For this International Standard data element, the name is derived from the naming convention that determines the name context "Registry." It is derived based on the example naming convention provided in Annex B and summarized as follows.

- Scope: The scope of this example naming convention is Registry Name.
- Authority: The authority for this example is the Environmental Data Registry.
- Semantic Rules: Names shall include an object and a property, where appropriate. Qualifiers shall be used to differentiate between names that would otherwise be the same. The representation class term shall be included as the last term in the name.
- Lexical Rules: A data element name shall have a maximum of 100 alphanumeric characters. The language of the registry shall be English.
- Name Uniqueness: Names shall be unique within this context for a particular registration authority.

6.2.6.3 Name the data element

Using the above naming convention, the name for this data element is entered with the context of "Registry." The convention specifies that the name should include the object "Country", to indicate the data values to be stored in the data element. The name, according to this registry's naming convention, should also include the representation for the concept, in this example "Name." For this particular example, it is necessary to qualify the name, since there are four value domains of country names in the ISO 3166 standard. The property "English-language" and qualifier "short" are appropriate to this example. The name that has been formulated for this data element, therefore, is "ISO English-Language Country Short Name."

6.2.7 Other metadata attributes

Examples of other metadata attributes that can be recorded at this time are described in the following paragraphs.

- Select the example for this data element. The example must be one of the permissible values in the value domain.

  Data Element Example: China

- Identify the origin for this data element as the standard from which the permissible values are obtained. For this example, the origin of the data element is the same as the origin of the value domain.

  Data Element Origin: ISO 3166-1:1997, *Codes for the representation of names of countries and their subdivisions — Part 1: Country codes*

- Record any explanatory comments not included in the definition that might provide additional information about the data element.

  Data Element Explanatory Comment: This data element is included in the mailing address standard.

- Enter the name of the submitting organization, which is the organization that submitted the data element for registration.

  Submitting Organization: Office of Information Collection

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- Record the name or title of the organization or other contact assigned the responsibility for monitoring and maintaining the data element as the stewardship contact.

  Stewardship Contact: Geopolitical Data Administrator

Administrative metadata, such as Creation Date is recorded or captured automatically by the system where applicable. Other administrative data may be entered manually.

6.2.8 Data element concept

Identification of the data element concept, as described in Subclause 6.1.8 is based on the data element name and definition, without the representation. The concept represented in the data element "Short English-Language Country Name" is "Country Identifier," defined as "An identifier for a primary geopolitical entity of the world." This concept can be represented by all seven of the names and codes included in ISO 3166. The name and definition of a data element concept are recorded in context, in the same manner as the name and definition of a data element. The context of the data element concept name and definition in this example is “Registry.”

The object class and property of the data element concept can be entered at this time, with qualifiers if appropriate. For Country Identifier, the object class is recorded as "Country" and the property as "Identifier." Data element concept is an administration record, as are object class and property. Administrative data are required for each of these items, including name and definition, as described above, and the dates when the items were created in the registry. The creation date is generally assigned by application software, captured from the system date.

The conceptual domain is a set of possible valid value meanings of an administered data item concept, whose representation in a registry shall be independent of (and shall not constrain) their representation in any corresponding value domain. The conceptual domain that contains value meanings related to the identity of countries of the world is named "Countries of the World." It is defined as "The primary geopolitical entities of the world." The value meanings associated with this conceptual domain are defined as "The primary geopolitical entity of the world known as <*country name*>," where <*country name*> is one of the country names listed in ISO 3166. Each value meaning is identified by its own value meaning identifier (VMID) and each is entered into the registry with the date when that value meaning became valid for the conceptual domain in its particular registry. In this example the date for each value meaning is set arbitrarily to January 10, 1997, the date when the standard became official. End dates will also be entered, whenever a value meaning becomes invalid within the registry (e.g., when a registry is updated to reflect a change to the usage of that value meaning description).

6.2.9 Classification

The following paragraphs provide examples of types of classification by which this example data element might be classified.

- Identify one or more keywords, where the keyword is a name or subject matter descriptor that will facilitate grouping like data elements for retrieval.

  Keyword: Country

- Group ISO English-Language Country Short Name with similar data elements according to concept for translation or by general subject matter.

  Concept group: Country Identifiers, where other data elements in the group might include the other six representations for "country identifiers."

  Subject group: Geopolitical Entities, where other data elements in the group might include such data elements as state or province name, county name, and city name.

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- One or more real world objects that identify this data element can be recorded at this time.

  Object Class: Country

- Identify the abstraction layer of this data element:

  Layer of Abstraction Type: Generalization

6.2.10 Registration and administrative status information

When all of the mandatory metadata attributes have been entered for this data element, it is assigned the registration status of "Recorded" and the administrative status of "In Quality Review." Refer to Annex B for descriptions of registration and administrative statuses. Because the data element was identified by an International Standard, and it is expected to be the preferred data element for representing country name within the example registry, the registration status will be updated to "Standard" with administrative status of "Final", after the necessary quality review has been completed.

The ISO/IEC 11179-3 metamodel requires that both registration status and administrative status be recorded for all administration records. When all of the mandatory metadata attributes have been entered for these administration records, it is assigned the registration status of "Recorded" and the administrative status of "In Quality Review." The descriptions of registration and administrative statuses in Annex B apply to all administration records. Because the data element concept in this example was identified by an International Standard, the registration statuses will be updated to "Standard" with administrative statuses to "Final", after the necessary quality reviews have been completed.

6.2.11 Other names and codes from ISO 3166

Other names, i.e., full English names, and French names (both short and full), and all codes from ISO 3166 can also be registered with their individual value domains, representation, data element definitions, and data element names and definitions. All of the data elements associated with ISO 3166 share the same data element concept (i.e., Country Identifier, defined as "An identifier for a primary geopolitical entity of the world.") and the same conceptual domain (i.e., Countries of the World, defined as "The primary geopolitical entities of the world."). All of the ISO 3166 data elements share the same value meanings. They do, however, have different sets of permissible values associated with the value meanings, depending upon the data element, its representation, and its value domain.

6.2.12 Summary of metadata attributes

The metadata attributes that have been assigned to this data element, i.e., the English-language country short name identified by the ISO 3166:1997 standard, are summarized in the following table and in the first metadata column of Table 1 of Annex A. A crosswalk of metadata attribute names used in this Technical Report to the actual ISO/IEC 11179-3 metamodel is provided in Annex C.

Metadata Attribute Name		ISO 3166, Enumerated
1	**Data Element Definition**	
	Data Element (DE) Definition Context	Registry
	DE Definition	The short, ISO-recognized name of a country, represented in the English language.
2	**Permissible Values and Value Domain**	
	Permissible Values (each PV)	All English-language short country names from ISO 3166, matched with value meanings. (recorded as: Afghanistan, Albania,...., Zimbabwe)
	PV Begin Date (each PV)	19970110
	PV End Date (each PV)	(Not applicable)

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Metadata Attribute Name		ISO 3166, Enumerated
	Value Domain (VD) Context	Registry
	VD Name	ISO English-Language Country Short Names
	VD Definition	All short, ISO-recognized English-language names of all countries.
	VD Description	(Not applicable)
	VD Item Identifier	{RAI} 5678:1
	Datatype	CHARACTER VARYING
	Datatype Schema/Source	ANSI ISO SQL
	Maximum Characters	44
	Format	(Not applicable)
	Unit of Measure	(Not applicable)
	Precision	(Not applicable)
	VD Origin	ISO 3166-1:1997
	VD Explanatory Comment	The value domain includes only the subset of ISO 3166 names that designate countries; it does not include names of territories.
3	**Representation Class Item**	
	Representation Class	Name
	Representation Class Qualifier	Short
4	**Data Element Name and Identifier**	
	DE Name Context	Registry
	DE Name	ISO English-Language Country Short Name
	DE Identifier	{RAI} 209033:1
5	**Other Data Element Attributes**	
	DE Example	China
	DE Origin	ISO 3166-1:1997, Codes for the representation of names of countries and their subdivisions -- Part 1: Country codes
	DE Explanatory Comment	This data element is included in the mailing address standard.
	Submitting organization	Office of Information Collection
	Stewardship Contact	Geopolitical Data Administrator
6	**Data Element Concept and Conceptual Domain**	
	Data Element Concept (DEC) Context	Registry
	DEC Name	Country Identifier
	DEC Definition	An identifier for a primary geopolitical entity of the world.
	Object Class	Country
	Object Class Qualifier	(Not applicable)

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Metadata Attribute Name		ISO 3166, Enumerated
	Property	Identifier
	Property Qualifier	(Not applicable)
	DEC Item Identifier	{RAI}12345:1
	Conceptual Domain (CD) Context	Registry
	CD Name	Countries of the World
	CD Definition	The primary geopolitical entities of the world.
	CD Item Identifier	{RAI} 2468:1
	CD Origin	ISO 3166:1
	Value Meaning (for each VM)	The primary geopolitical entity known as <China>
	VM Begin Date (for each VM)	19970110
	VM End date (for each VM)	(Not applicable)
	VM Identifier (for each VM)	<Assigned by system as 1001…1230: one to each VM>
7	**Classification Type Examples**	Classification Values for Classification Type
	Keyword	Country
	Group	Geopolitical Entities, Country Identifiers
	Object	Country
	Layer of Abstraction Type	Generalization
8	**Registration and Administrative Status**	
	DE Registration Status	Standard
	DE Administrative Status	Final
	VD Registration Status	Standard
	VD Administrative Status	Final
	DEC Registration Status	Standard
	DEC Administrative Status	Final
	CD Registration Status	Standard
	CD Administrative Status	Final

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6.3 Application system data element development examples

Application data elements are data elements that are used for a particular application. For this report, an application data element, such as is found in a computer system application, has been identified as an example for data registration. Data elements used in computer systems are associated with an entity (e.g., table) and might be identified with a qualifier. The country name attribute in the mailing address entity has been selected from an information management system that contains data about facilities (i.e., the Facility Data System). This data element was selected to illustrate the relationship between an application data element and a standard data element with the same data values. It also illustrates how a well-defined data element might differ from one that is identified from a computer application system. The methodology is the same as that described in Subclause 6.1. It should be noted that many computer application systems contain metadata that is incomplete. Often, only the data element name, the data type and the field length are known about a data element. Where the data element can reuse domain and conceptual information based on a standard data element, as in this example, the data element can be registered as Recorded. Many data elements, however, must be registered as Incomplete, and all metadata attributes identified in the model as Mandatory, might never be complete.

The table in Subclause 6.3.12 contains a summary of all the metadata for the application data element described in this report.

6.3.1 Understanding the data element

The application data element for country code, used in a mailing address, must be capable of being used on a mail piece for delivery of mail to any country throughout the world. The country must be represented in such a way that it is easily read and conforms to a known identifier for that country. Therefore, authoritative names of all countries must be included in the value domain. The name must be of a length that will fit on one line of the address block.

6.3.2 Content research

The United States Postal Service mailing address standard requires that the country name be included as the last line of a mail piece. Before a data element for the mailing address country name is registered, the registry for the registration authority is examined to determine if there is a data element, value domain or permissible values, or data element concept and conceptual domain that might be reused in attributing this data element.

A search of the registry will find that a standard data element has been registered, based on the International Standard ISO 3166. The standard data element is not specific enough to describe the application of the data element to a mailing address entity. The appropriate value domain for country name to be used in a mailing address, however, should be the short name from the ISO 3166 standard. All value domain information for this application data element (i.e., country name used in a mailing address) is the same as for the ISO standard Short English-Language Country Name, described in Subclause 6.2, and the conceptual domain for this data element is the same. Therefore, the data element will be registered, reusing the conceptual domain and permissible values from the standard data element.

6.3.3 Data element definition

The definition for the country name attribute in the mailing address entity is formulated according to the rules and guidelines listed in ISO/IEC 11179-4. The rules and guidelines are provided in Annex B of this Technical Report, with additional examples that will provide assistance in formulating the definition. Because this data element has been submitted through a computer application system (i.e., the Facility Data System), the definition provided by the application system is retained, identified by its context. In this instance, the context is the system name, according to the naming convention for that system. Name Context for this application data element is described in Subclause 6.3.6.2. Definitions may be entered into the registry in conjunction with the context used for the data element name. The definition with the context for the Facility Data System is "The name of a country where the addressee is located." The Registry name context definition includes the concepts for country identifier, mailing address, and representation. The rules and guidelines specified in ISO/IEC 11179-4 are used to formulate the data element definition as "The name of the country where a mail piece is delivered."

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6.3.4 Permissible values and value domain

The permissible values for a data element are determined by the value domain. The application data element for mailing address country name uses the same permissible values as the standard data element for English-language short country names listed in the ISO 3166 standard (e.g., Afghanistan, Albania, ..., Zimbabwe). The scope of the permissible values for this data element includes the short English-language name for all countries. The registration authority has determined that this data element is represented by the same value domain as exists for the data element {RAI} 209033:1, ISO English-Language Country Short Name. It is not necessary to record additional permissible values or other value domain information for this data element, since value domain {RAI} 5678:1 is being reused.

6.3.5 Representation Class

The representation class "Name" is selected from the representation class administration record. For this example, the representation qualifier of "Short" should also be recorded to distinguish the name from the long English-language name in ISO 3166.

6.3.6 Identify and name the data element

Names do not identify a data element. ISO/IEC 11179-5 requires that data elements be identified with a unique identifier and designated with one or more names, recorded in context.

6.3.6.1 Identification

For this example, the data element for the country name used in a mailing address is assigned a unique data identifier (DI) and version identifier (VI) (5394:1) by the computer application software when it is entered into the registry. The Registration Authority for this data element in this example is represented as {RAI}.

6.3.6.2 Name context and naming convention

In this example, the data element is assigned two names, each with its own context. First is the system name context, since this data element was identified as being part of an application system, and retention of the name used by the system is valuable for documenting the system. The naming convention that has been established for the system name context, i.e., the "Facility Data System" context, is as follows.

- Scope: The scope of this example naming convention is application data elements in the Facility Data System.
- Authority: The authority for this example is the Environmental Data Registry
- Semantic Rules: Names shall be the same as those used by the application software, using the convention of Entity Name.Attribute Name (i.e., table name.column name).
- Lexical Rules: A data element name shall have a maximum of 200 alphanumeric characters. The language of the registry shall be English.
- Name Uniqueness: Names shall be unique within a registration authority for the entity/attribute relationship.

The second name to be assigned to this data element has the context "Registry." It follows the naming convention for registry name context, as described in Annex B.

- Scope: The scope of this example naming convention is Registry Name.
- Authority: The authority for this example is the Environmental Data Registry.

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- Semantic Rules: Names shall include an object and a property, where appropriate. Qualifiers shall be used to differentiate between names that would otherwise be the same. The representation class term shall always be included as the last term in the name.

- Lexical Rules: A data element name shall have a maximum of 100 alphanumeric characters. The language of the registry shall be English. There are no controlled word lists for naming application data elements.

- Name Uniqueness: Names shall be unique within a name context for a particular registration authority.

6.3.6.3 Name the data element

When documenting an application system, it is important to know the name of the system and the entity in which the data element exists as an attribute. This data element is assigned a name for the context "Facility Data System." It is also valuable to know the name of the attribute in that system. For this example, the system name is Facility Data System, which is documented in the registry as a system. The name of the attribute in the system is Country_Name, and the entity name is Mailing_Address. Therefore, the data element name for the context Facility Data System is Mailing_Address.Country_Name.

The data element name with Registry as its context should identify the data values to be contained in the value domain (i.e., country) and the entity (i.e., address) associated with the data element. It should also include the representation term. The representation is the same as for the ISO standard data element. For the application data element (e.g., country name in a mailing address entity) the entity is "address" qualified by "mailing." The qualifier is appropriate, since the registry might also have an application data element that designates the country name in a geographic (i.e., physical location) address entity. The qualifier is needed to discriminate between the country name in mailing and geographic addresses. The guidelines described in Subclause 6.1.6 should be followed. The Registry name of this data element, based on ISO/IEC 11179-5 guidelines is "Mailing Address Country Name."

6.3.7 Other metadata attributes

Other metadata attributes that can be recorded at this time are the following.

- Select the example for this data element; it must be one of the permissible values in the value domain.

  Data Element Example: Denmark

- Identify the origin for this data element as the standard from which the permissible values are obtained.

  Data Element Origin: Facility Data System

- Record any notes or comments that might provide additional information about the data element that is not included in the definition.

  Data Element Explanatory Comment: The country name is always located as the last line of a mail piece for international mailings.

- Enter the name of the submitting organization, which is the Office that submitted the data element for registration.

  Submitting Organization: Office of Enforcement and Compliance Assurance

- Record the name of the individual or organization assigned the responsibility for monitoring and maintaining the data element as the stewardship contact.

  Stewardship Contact: Facility Data Systems Hot Line

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Other administrative metadata, such as Creation Date are recorded or captured automatically by the system where applicable. Other administrative data may be entered manually.

6.3.8 Data element concept

The data element concept for this data element includes the object class (entity) of address, as well as the property of being a country identifier. It does not include the qualifier for "mailing." This data element concept is not the same as the concept for the standard Country Short Name data element, which is limited to the concept of country identifier. The name of this data element concept, following the guidelines described in Subclause 6.1.8, is "Address Country Identifier" and the data element concept definition is "An identifier for an address of a primary geopolitical entity of the world." This data element concept could be reused for other address country identifiers, such as a geographic address country name, a geographic country code, or other representations and data element qualifiers. This is a new data element concept, and it requires that administrative data be recorded for this item.

The conceptual domain for this application data element is the conceptual domain for all the countries of the world. It uses the same value meanings and the same permissible values as the standard data element for country name. Therefore it reuses the conceptual domain (CD ID 2468:1) and the value domain (5678:1) that were established for the standard data element, ISO English-Language Short Name ({RAI} 209033:1), described in Subclause 6.2.

6.3.9 Classification

This data element might be classified by source or according to one or more of the following classification schemes.

- Identify one or more keywords, where the keyword is a name or subject matter descriptor that will facilitate grouping similar data elements for retrieval.

  Keyword: Country, Mailing Address

- Group the mailing address country name with similar data elements according to concept for translation or by general subject matter.

  Subject group: Mailing Address, which might include such data elements as street address name, city name, and postal code.

- One or more real world objects that identify this data element can be identified at this time.

  Object Class: Country, Mailing Address

- Identify the abstraction layer(s) of this data element:

  Layer of Abstraction Type: Specification; Decomposition

6.3.10 Registration and administrative status information

When all of the mandatory metadata attributes have been entered for this data element, it is assigned the registration status of "Recorded" and the administrative status of "In Quality Review." This data element was identified by an application, and so it often would not be completely attributed. This particular application data element, however, has been completed by reusing the value domain, permissible values, and conceptual domain of a standard data element, and so can be entered with a registration status of Recorded. The reused value domain and conceptual domain have been assigned the registration statuses of "Standard" and administrative statuses of "Final," as described in Subclause 6.2.10.

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6.3.11 Related data elements

Data elements related to this application data element for Country Name are other data elements that are used in the mailing address entity. This includes such data elements as street name or other delivery point, city or other jurisdictional name, state or province name or code, and ZIP+4 code or other international postal code. None of these share the same value domains, conceptual domains, or permissible values. The data elements, however, can be classified as a group that make up the Mailing Address entity.

6.3.12 Summary of metadata attributes

The following table contains a summary of the values assigned to the metadata attributes in the preceding paragraphs of Subclause 6.3. Annex A also contains this metadata in the second metadata column in Table 1. A crosswalk of metadata attribute names used in this Technical Report to the actual ISO/IEC 11179-3 metamodel is provided in Annex C.

Metadata Attribute Name		Application System	
1	**Data Element Definition**		
	Data Element (DE) Definition Context	Registry	Facility Data System
	DE Definition	The name of the country where a mail piece is delivered.	The name of a country where the addressee is located.
2	**Permissible Values and Value Domain**		
	Permissible Values (each PV)	All English-language short country names from ISO 3166, matched with value meanings. (recorded as: Afghanistan, Albania,....., Zimbabwe)	
	PV Begin Date (each PV)	19970110	
	PV End Date (each PV)	(Not applicable)	
	Value Domain (VD) Context	Registry	
	VD Name	ISO English-Language Country Short Names	
	VD Definition	All short, ISO-recognized English-language names of all countries.	
	VD Description	(Not applicable)	
	VD Item Identifier	{RAI} 5678:1	
	Datatype	CHARACTER VARYING	
	Datatype Schema/Source	ANSI ISO SQL	
	Maximum Characters	44	
	Format	(Not applicable)	
	Unit of Measure	(Not applicable)	
	Precision	(Not applicable)	
	VD Origin	ISO 3166-1:1997	
	VD Explanatory Comment	The value domain includes only the subset of names that designate countries; it does not include names of territories.	
3	**Representation Class Item**		
	Representation Class	Name	

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Metadata Attribute Name		Application System	
	Representation Class Qualifier	Short	
4	**Data Element Name and Identifier**		
	DE Name Context	Registry	Facility Data System
	DE Name	Mailing Address Country Name	Mailing_Address.Country_Name
	DE Identifier	{RAI} 5394:1	
5	**Other Data Element Attributes**		
	DE Example	Denmark	
	DE Origin	Application system	
	DE Explanatory Comment	This data element is required for delivery of mail outside the country of origin.	
	Submitting organization	Office of Enforcement and Compliance Assurance	
	Stewardship Contact	Facility Data Systems Administrator	
6	**Data Element Concept and Conceptual Domain**		
	Data Element Concept (DEC) Context	Registry	
	DEC Name	Address Country Identifier	
	DEC Definition	An identifier for a primary geopolitical entity of the world that indicates a mailing address.	
	Object Class	Address	
	Object Class Qualifier	(Not applicable)	
	Property	Identifier	
	Property Qualifier	Country	
	DEC Item Identifier	{RAI}12468:1	
	Conceptual Domain (CD) Context	Registry	
	CD Name	Countries of the World	
	CD Definition	The primary geopolitical entities of the world.	
	CD Item Identifier	{RAI} 2468:1	
	CD Origin	ISO 3166:1	
	Value Meaning (for each VM)	The primary geopolitical entity known as <China>	
	VM Begin Date (for each VM)	19970110	
	VM End Date (for each VM)	(Not applicable)	
	VM Identifier (for each VM)	<Assigned by system as 1001…1230: one to each VM>	
7	**Classification Type Examples**	Classification Values for Classification Type	

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Metadata Attribute Name		Application System
	Keyword	Country, Address., Mailing
	Group	Mailing Address
	Object	Address, Country
	Layer of Abstraction Type	Specialization
8	**Registration and Administrative Status**	
	DE Registration Status	Recorded
	DE Administrative Status	In Quality Review
	VD Registration Status	Standard
	VD Administrative Status	Final
	DEC Registration Status	Recorded
	DEC Administrative Status	In Quality Review
	CD Registration Status	Standard
	CD Administrative Status	Final

6.4 Example of International Standard with non-enumerated domain

This clause provides a specific example of the registration of a data element from an International Standard, where the possible valid values are not enumerated, but must be determined by a procedure. The International Organization for Standardization (ISO) 6709:1983 (E), *Standard representation of latitude, longitude and altitude for geographic point locations*, is used as the source for this example.

The table in Subclause 6.4.12 contains all of the metadata attributes recorded for the non-enumerated data element from an International Standard.

6.4.1 Understanding the data element

Latitude is a measure of the angular distance on a meridian north or south of the equator. The standard provides for a variable format and more than one representation for recording the latitude measure: degrees and decimal degrees, and sexagesimal (i.e., degrees, minutes, and seconds). The standard also includes more than one representation and format for longitude, and a flexible format for altitude. In addition, a standard format for data transfer is included in the standard.

Although new technology and new tools (e.g. Global Positioning System [GPS]) and analytical and mapping software have caused some geographic information specialists to prefer the measurement of locational coordinates in degrees and decimal degrees, many organizations continue to measure latitude and longitude in degrees, minutes, and seconds. Therefore, the registration authority of the registry in this example, has determined a need to register a data element for latitude measured in degrees, minutes, and seconds. According to the standard, the placement of the decimal point indicates the transition from degrees to sexagesimal measures. Examples of data in the standard include sexagesimal latitudes that are measured to a range of one or two decimal places for seconds. The standard, however, does not limit the precision, but requires only that the number of decimal places indicate the precision of the measurement. The registration authority for this example requires that latitude be recorded up to 5 decimal positions, where it can be measured to that level of precision.

Latitude values are measured in a range of 0 (on the equator) to 90 degrees. Minutes and seconds each are measured in a range of 60 degrees (0 to 59). Latitude values on or North of the equator are recorded as

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positive numbers; those South of the equator are negative. Where latitude degrees are measured in single digit, they must be recorded with a preceding zero. For data transfer, latitude measures must be preceded by the directional symbol (+ or -), and they must include decimal point, where the measurement includes decimal seconds. In data transfer, latitude always precedes longitude, which precedes altitude. The latitude and longitude must be expressed in the same format style and to the same precision (indicated by the number of decimal positions). There are no separators between the latitude, longitude, and altitude; the directional symbol serves as a separator for the data element values.

6.4.2 Content research

ISO 19111, Spatial referencing by coordinates, describes the data required to define 1-, 2-, and 3-dimensional coordinate reference systems. The coordinate reference system must be fully defined for a position to be unambiguous. Knowledge of the reference system is necessary to determine if coordinate points are comparable. The standard does not, however, provide information about representation of the coordinates. ISO/TC 211/ WG 3, the workgroup that is currently revising ISO 15046, has expressed an interest in revising (ISO) 6709:1983 (E), *Standard representation of latitude, longitude and altitude for geographic point locations*. Because of TC211's interest in ISO 6709, and their current work on the closely related standard, ISO 15046, it seems likely that ISO 6709 will soon be reviewed and updated if needed. Therefore, ISO 6709 seems appropriate to be identified as a standard data element for latitude measure where latitude is measured as sexagesimal (i.e., in degrees, minutes, and seconds).

A search of the registry in our example reveals about 40 data elements related to latitude measure. One, an interim standard in the example registry for latitude, measured in degrees and decimal degrees, is compliant with the ISO 6709 data element for degrees. None of the other data elements has the potential for compliance with ISO 6709 for sexagesimal measure of latitude. The other latitude data elements in the registry have been assigned the registration status of incomplete, and many data elements are qualified (e.g., latitude where a facility is located, latitude of a smokestack). For the purpose of this example, none have the potential for being modified to meet the requirements of the ISO 6709 standard for latitude, measured in degrees, minutes, and seconds.

Therefore, in this example, the ISO 6709 latitude, sexagesimal measure, is selected for registration as a new data element.

6.4.3 Data element definition

The data element definition is formulated according to the rules and guidelines described in Annex B, based on ISO/IEC 11179-4. The rules require that a data element definition be unique within a registration authority, so the unit of measure has been included in the definition as "The sexagesimal measure of the angular distance on a meridian north or south of the equator." Including the unit of measure in the definition distinguishes the data element from the existing standard for latitude in the example registry. That standard data element is defined simply as "The measure of the angular distance on a meridian north or south of the equator." The definition is singular, because it refers to only one instance of the data value. Note that ISO 6709 does not include a definition for latitude.

6.4.4 Permissible values and value domain

ISO 6709 is an International Standard that does not list specific values that are valid for the data element; the measure of latitude is a non-enumerated domain. There are no stored permissible values in a registry for non-enumerated domains. A description of the data values for a non-enumerated domain is required. The values that are permissible for the ISO 6709 sexagesimal latitude data element are those values that conform to the description of the value domain and the attributes for datatype, unit of measure, and precision. The value domain name for sexagesimal latitude is "Sexagesimal Measures of Latitude," and the value domain definitions is "All sexagesimal measures of the distance of an angle north or south of the equator." This non-enumerated domain can be described as " Latitude measure on or north of the equator is positive; latitude measure south of the equator is negative. The range limit for degrees is 0-90, for minutes is 0-59, and for seconds is 0-59." By including the unit of measure in the definition, the value domain is distinguished from the value domain definition for latitude measured in degrees. The definition is plural, because it includes all possible measurements of latitude determined by this type of measurement.

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Value domain information is recorded for this non-enumerated value domain. The ISO/IEC 11179-3 metamodel provides for the collection of administrative data for value domains.

Other value domain attributes for this example include the following.

- Item Identifier: A system generated identifier for the value domain and its version identifier.
- Name: Sexagesimal Measures of Latitude.
- Definition: All sexagesimal measures of the distance of an angle north or south of the equator.
- Description: Latitude measure on or north of the equator is positive; latitude measure south of the equator is negative. The range limit for degrees is 0-90, for minutes is 0-59, and for seconds is 0-59.
- Datatype: The datatype for latitude measure is "alphanumeric" to explicitly include the directional symbol and decimal point, where appropriate.
- Datatype schema/source: ANSI ISO SQL
- Maximum characters: The maximum field length for sexagesimal latitude is 13 (+/- DDMMSS.sssss), to accommodate up to five decimal places for seconds.
- Format: +/-DDMMSS to +/-DDMMSS.SSSSS.
- Unit of Measure: Latitude for this example is measured in sexagesimal units.
- Precision: The number of decimal places recorded indicates the precision of the measure.

6.4.5 Representation Class

The representation class "Measure" is selected for this data element from the administration record for representation class. The representation class qualifier "Sexagesimal" is assigned to this data element to distinguish the data element from one where the representation is "Degree."

6.4.6 Identifying and naming the data element

ISO/IEC 11179-5 requires that data elements be identified with a unique identifier and designated with one or more names, recorded in context.

6.4.6.1 Identifiers

A unique identifier is required for the latitude data element. For the registration authority in this example, the data element identifier and version identifier (DI:VI = 312345:1) are assigned automatically by the registry software. The IRDI for this example data element is {RAI} 312345 :1.

6.4.6.2 Name context and naming convention

For this ISO standard data element, the name is assigned with the context of "Registry," using the naming convention described in the example in Annex B, summarized as follows.

- Scope: The scope of this example naming convention is Registry Name.
- Authority: The authority for this example is the Environmental Data Registry.
- Semantic Rules: Names shall include an object class and a property, where appropriate. Qualifiers shall be used to differentiate between names that would otherwise be the same. The representation class term shall be included as the last term in the name.

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- Lexical Rules: A data element name shall have a maximum of 100 alphanumeric characters. The language of the registry shall be English.

- Name Uniqueness: Names shall be unique within a context for a particular registration authority.

6.4.6.3 Name the data element

Using the above naming convention, the name is entered with the context of "Registry." The convention specifies that the name should include the object "Latitude", to indicate the data values to be stored in the data element. Include the representation for the concept in the name; in this example "Measure." There is no requirement in ISO/IEC 11179-5 that data element names be unique in a registry. However, the naming convention used in this example specifies that names must be unique within a context for a particular registration authority. It is advisable to use a qualifier in the data element name to differentiate between data elements that might otherwise have the same name. The name includes the object (latitude) and the representation (measure). For this example, the name of the latitude data element will carry the qualifier "sexagesimal" as a discriminator. The name that has been derived for the latitude data element is "Latitude Sexagesimal Measure."

6.4.7 Other metadata attributes

Other metadata attributes that can be recorded at this time are the following.

- Provide an example of the data value that conforms to the description in the value domain, and to the datatype and other value domain attributes for this data element.

  Data Element Example: +674532 and +674531.85435

- Record the origin of this data element as the standard where the data element was identified.

  Data Element Origin: ISO 6709:1983 (E), *Standard representation of latitude, longitude and altitude for geographic point locations*.

- Record explanatory comments that contain additional information about the data element that is not appropriate for the definition.

  Data Element Explanatory Comment: Latitude sexagesimal converts to latitude degrees by the following formula: seconds/60 = minutes, decimal minutes/60 = decimal degrees.

- List the organization that submitted the data element for registration as the submitting organization.

  Submitting Organization: Office of Information Collection

- The organization or individual that has responsibility for maintaining and updating the data element is recorded as the stewardship contact for that data element.

  Stewardship Contact: Geographic Information Systems Administrator

Administrative metadata, such as Creation Date are recorded or captured automatically by the system where applicable. Other administrative data may be entered manually.

6.4.8 Data element concept

The methodology to be used for deriving a data element concept is described in Subclause 6.1.8 and Annex B of this Technical Report. Latitude is a distance measure, where measure is its representation. The data element concept for latitude measure is "Latitude Distance" with the definition, "A measure of the angular distance of a point on the surface of the earth north or south of the equator." Note that this concept definition incorporates the term "measure," which is a representation term. The concept of latitude, however, is the

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measure of a distance. Therefore, it is appropriate in this instance to use the term measure when defining the concept. A data element concept is the data element without representation.

Administrative information must be collected about a data element concept. Therefore, both name and definition are recorded in context, which for this example is the context of the Registry (i.e., the rules that have been established by the registration authority for this example registry).

Both object classes and properties may be stored for data element concepts. For this example, Latitude is recorded as the object class and Distance as its property. No qualifiers are recorded.

A conceptual domain is a set of possible value meanings for a data element concept. The value meanings for this conceptual domain, however, are not enumerated. For non-enumerated domains, such as latitude distance measure, the value meanings are not explicitly identified. The conceptual domain for the Latitude Distance data element concept is the implied repository of all latitudes that mark positions on the earth with relation to the equator. The value meanings could be defined as "The distance measure of a point north or south of the equator that is <value>." No explicit value meanings are stored in the registry for latitude coordinates.

Recording of administrative information about conceptual domains is required according to the metamodel. An administered conceptual domain has the advantage of being maintained, with identification of the source of the information. This is especially appropriate where there is a possiblity that the domain will be reused. Names and definitions have been assigned to the conceptual domain, and the conceptual domain is treated as an administration record. The name of the conceptual domain is "Measures of Latitude" and the definition of the conceptual domain is "All latitude measures of points north or south of the equator."

6.4.9 Classification

This data element might be classified according to a source or by one or more of the following classification schemes.

- Identify one or more keywords, where the keyword is a name or subject matter descriptor that will facilitate grouping like data elements for retrieval.

  Keyword: Latitude, Horizontal Coordinate, Spatial

- Group Latitiude Sexagesimal Measure with similar data elements for translation or by general subject matter.

  Subject group: Geographic Point Location.

- One or more real world objects that identify this data element can be identified at this time.

  Object Class: Latitude

- Identify the abstraction layer of this data element:

  Layer of Abstraction Type: Generalization

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6.4.10 Registration and administrative status informaiton

When all of the mandatory metadata attributes have been entered for this data element, it is assigned the registration status of "Recorded" and the administrative status of "In Quality Review." This data element was identified in an International Standard, and so would soon be updated to reflect a higher status of the data element. The data element, however, would not be expected to be assigned the status of "Standard." The data element is not expected to become the preferred representation for latitude measure, since geographic information specialists prefer that latitude and longitude be recorded in degrees. Therefore, after quality review has been completed, the data element will be assigned the registration status of "Certified" with an administrative status of "No further action."

The metamodel requires that both registration status and administrative status also be recorded for data element concept. The descriptions of registration and administrative statuses in Annex B also apply to data element concepts. When all of the mandatory metadata attributes have been entered for this data element concept, it is assigned the registration status of "Recorded" and the administrative status of "In Quality Review." Because the data element concept and its associated conceptual domain in this example were identified by an International Standard, the registration status will be updated to "Standard" with administrative status to "Final" for both, after the necessary quality reviews have been completed. The value domain for sexagesimal measure is based on the ISO 6709 standard, and is expected to become the standard value domain for sexagesimal latitude. Therefore, the registration status is assigned the value of "Standard" and the administrative status of "Final."

6.4.11 Other data elements in ISO 6709

ISO 6709 identifies five data elements: sexagesimal latitude, degrees latitude, sexagesimal longitude, degrees longitude, and altitude. The different formats represented by the units of measure for latitude (i.e., degrees and sexagesimal) express representation (i.e., unit of measure). The two latitude data elements from ISO 6709 are translatable at the concept level, based on their unit of measure representations. They share the same conceptual domain, because their implied value meanings are the same. Likewise, the longitude data elements share a longitude data element concept and conceptual domain, and longitude data can be translated based on unit of measure conversions.

Whereas the multiple data elements identified in ISO 3166 share the same data element concept and the same conceptual domain, the data elements identified in ISO 6709 do not share data element concepts and conceptual domains. All three concepts: latitude, longitude, and altitude, are distance measures. Latitude, however, is a north/south measure with respect to the equator; longitude is an east/west measure with respect to the prime meridian; and altitude is a vertical measure with respect to a point of reference such as sea level. Each has its own data element concept and its own conceptual domain.

These data elements do share classification. All can be classified as the group "Geographic Point Location."

6.4.12 Summary of metadata attributes

The following table summarizes the metadata attributes assigned to latitude sexagesimal measure in the preceding paragraphs in Subclause 6.4. The first column in Table 2 in Annex A also contains this metadata. A crosswalk of metadata attribute names used in this Technical Report to the actual ISO/IEC 11179-3 metamodel is provided in Annex C.

	Metadata Attribute Name	ISO 6709, Non-enumerated
1	**Data Element Definition**	
	Data Element (DE) Definition Context	Registry
	DE Definition	The sexagesimal measure of the angular distance of a position on the earth on a meridian north or south of the equator.
2	**Permissible Values and Value Domain**	

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Metadata Attribute Name		ISO 6709, Non-enumerated
	Permissible Values (each PV)	Measures of latitude in degrees, minutes, and seconds. (Informational only; not recorded for non-enumerated domains)
	PV Begin Date (each PV)	(Not applicable for non-enumerated domains)
	PV End Date (each PV)	(Not applicable for non-enumerated domains)
	Value Domain (VD) Context	Registry
	VD Name	Sexagesimal Measures of Latitude
	VD Definition	All sexagesimal measures of the distance of an angle north or south of the equator.
	VD Description	Latitude measure on or north of the equator is positive; latitude measure south of the equator is negative. The range limit for degrees is 0-90, for minutes is 0-59, and for seconds is 0-59.
	VD Item Identifier	{RAI} 9876:1
	Datatype	CHARACTER VARYING
	Datatype Schema/Source	ANSI ISO SQL
	Maximum Characters	13
	Format	+/-DDMMSS to +/-DDMMSS.SSSSS
	Unit of Measure	Sexagesimal
	Precision	Number of decimal places recorded.
	VD Origin	ISO 6709
	VD Explanatory Comment	(not applicable)
3	**Representation Class**	
	Representation Class	Measure
	Representation Class Qualifier	Sexagesimal
4	**Data Element Name and Identifier**	
	DE Name Context	Registry
	DE Name	Latitude Sexagesimal Measure
	DE Identifier	{RAI} 312345:1
5	**Other Data Element Attributes**	
	DE Example	+674532 and +674531.85435
	DE Origin	ISO 6709-1983 (E), Standard representation of latitude, longitude and altitude for geographic point locations.
	DE Explanatory Comment	Latitude sexagesimal converts to latitude degrees by the following formula: seconds/60 = minutes, decimal minutes/60 = decimal degrees.
	Submitting organization	Office of Information Collection
	Stewardship Contact	Geographic Information Systems Administrator
6	**Data Element Concept and Conceptual Domain**	

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