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Terminology work — Principles and methods

Travail terminologique — Principes et méthodes

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Fax + 41 22 749 09 47
E-mail copyright@iso.ch
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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

International Standards are drafted in accordance with the rules given in the ISO/IEC Directives, Part 3.

Draft International Standards adopted by the technical committees are circulated to the member bodies for voting. Publication as an International Standard requires approval by at least 75 % of the member bodies casting a vote.

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

International Standard ISO 704 was prepared by Technical Committee ISO/TC 37, *Terminology (principles and coordination)*, Subcommittee SC 1, *Principles of terminology*.

This second edition cancels and replaces the first edition (ISO 704:1987), of which it constitutes a technical revision.

Annex A of this International Standard is for information only.

0 Introduction

0.1 Overview

The terminological principles and methods laid down in this International Standard are based on current thinking and practices in terminology.

Terminology is multidisciplinary and draws support from a number of disciplines (e.g., logic, epistemology, philosophy of science, linguistics, information science and cognitive sciences) in its study of concepts and their representations in special language. It combines elements from many theoretical approaches that deal with the description, ordering and transfer of knowledge.

In line with current standardization trends to include guiding principles, this International Standard is intended to standardize the essential elements for quality work in terminology. The general purpose of this International Standard is to provide a common framework of thinking and explain how this thinking should be implemented by an organization or individuals involved in terminology.

It is further intended to provide assistance to those involved in terminology management. The principles and methods should be observed not only for the manipulation of terminological information but also in the planning and decision-making involved in managing a stock of terminology. The main activities include, but are not limited to the following:

— identifying concepts and concept relations;

— analysing and modelling concept systems on the basis of identified concepts and concept relations;

— establishing representations of concept systems through concept diagrams;

— defining concepts;

— attributing designations (predominantly terms) to each concept in one or more languages;

— recording and presenting terminological data, principally in print and electronic media (terminography).

Objects, concepts, designations and definitions are fundamental to terminology and therefore form the basis of this International Standard. Objects are perceived or conceived and abstracted into concepts which, in special language, are represented by designations and described in definitions. A set of designations belonging to one special language constitutes the terminology of a specific subject field.

0.2 Conventions and notation

In this International Standard and for the English language, “terminology” used in the singular and without an article designates the discipline, while “terminology” used in the plural or preceded by an article refers to the set of designations of a particular subject field, such as the terminology of chemistry.

For the sake of consistency in reference to objects, concepts, definitions and designations, the following wording conventions are used in this International Standard:

— objects

are **perceived** or **conceived**;

are **abstracted** or **conceptualized** into concepts;

— concepts

depict or **correspond** to a set of objects;

are **represented** or **expressed in language** by designations or by definitions;

are **organized into concept systems**;

— designations (terms, appellations or symbols)

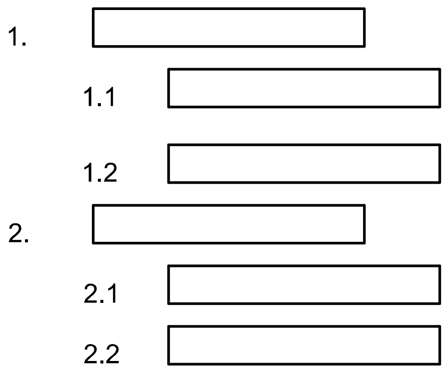
designate or **represent** a concept;

are **attributed to** a concept;

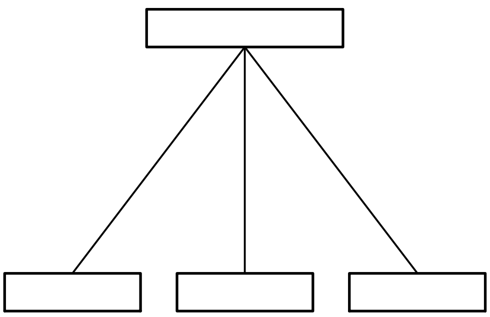
— definitions

define or **describe** the concept.

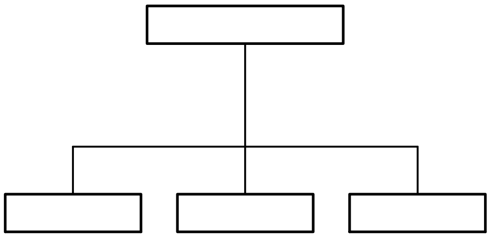
The more complex a concept system, the more useful it is to clarify relations among concepts by representing them formally or graphically. Concept relations can be represented formally in a list. The formal representation used in this International Standard is a numbered and indented list as exemplified by the following:



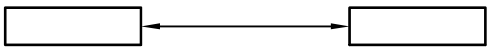
The graphic representations used in this International Standard are the most typical ones.



Tree diagram to represent generic concept relations



Rake or bracket diagram to represent partitive concept relations



Line with arrowheads at each end to represent associative concept relations

The notation used throughout this International Standard is as follows:

— terms defined in ISO 1087-1 are in italics;

— concepts are indicated by single quotes;

— designations (terms, appellations or symbols) are in boldface;

— characteristics are underlined;

— examples are boxed.

It should be noted that the examples in this International Standard have been chosen and simplified for illustrative purposes. The translation into other languages may necessitate the selection of other examples to illustrate the point.

It should also be noted that the examples of term-formation methods, in informative annex A, are specific to the English language in the English version and to the French language in the French version. Annex A should not be translated but adapted to the needs of each language.

Terminology work — Principles and methods

1 Scope

This International Standard establishes and harmonizes the basic principles and methods for preparing and compiling terminologies both inside and outside the framework of standardization.

This International Standard describes the links between objects, concepts, and their representations through the use of terminologies. It also establishes general principles governing the formation of designations and the formulation of definitions. Full and complete understanding of these principles requires some background knowledge of terminology. The principles are general in nature and this International Standard is applicable to terminology work in scientific, technological, industrial, administrative, and other fields of knowledge.

This International Standard does not stipulate procedures for the layout of International Terminology Standards that are treated in ISO 10241.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this International Standard. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this International Standard are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies. Members of ISO and IEC maintain registers of currently valid International Standards.

ISO 9:1995, *Information and documentation —Transliteration of Cyrillic characters into Latin characters — Slavic and non-Slavic languages.*

ISO 233:1984, *Documentation — Transliteration of Arabic characters into Latin characters.*

ISO 233-2:1993, *Information and documentation — Transliteration of Arabic characters into Latin characters — Part 2: Arabic language — Simplified transliteration.*

ISO 233-3:1999, *Information and documentation — Transliteration of Arabic characters into Latin characters — Part 3: Persian language — Simplified transliteration.*

ISO 259:1984, *Documentation — Transliteration of Hebrew characters into Latin characters.*

ISO 259-2:1994, *Information and documentation — Transliteration of Hebrew characters into Latin characters — Part 2: Simplified transliteration.*

ISO 843:1997, *Information and documentation — Conversion of Greek characters into Latin characters.*

ISO 860:1996, *Terminology work — Harmonization of concepts and terms.*

ISO 1087-1:—[1)], *Terminology work — Vocabulary — Part 1: Theory and application.*

ISO 3602:1989, *Documentation — Romanization of Japanese (kana script).*

ISO 7098:1991, *Information and documentation — Romanization of Chinese*.

ISO 10241:1992, *International terminology standards — Preparation and layout.*

3 Terms and definitions

For the purposes of this International Standard, the definitions given in ISO 1087-1 apply. The terminology defined in ISO 1087-1 appears as italicized terms in this International Standard. It should be noted that terms not italicized but found and defined in ISO 1087-1 are to be interpreted by their general language meaning.

4 Objects

For the purposes of this International Standard, an *object* is defined as anything perceived or conceived. Some *objects*, concrete objects such as a machine, a diamond, or a river, shall be considered material; other *objects* shall be considered immaterial or abstract, such as each manifestation of financial planning, gravity, flowability, or a conversion ratio; still others shall be considered purely imagined, for example, a unicorn**,** a philosopher's stone or a literary character. In the course of producing a *terminology*, philosophical discussions on whether an *object* actually exists in reality are beyond the scope of this International Standard and shall be avoided. *Objects* are assumed to exist and attention shall be focused on how one deals with *objects* for the purposes of communication.

5 Concepts

5.1 Nature of concepts for terminology

To communicate, not every individual *object* in the world is differentiated and named. Instead, through observation and a process of abstraction called conceptualization, *objects* are categorized into mental constructs or units of thought called *concepts* which are represented in various forms of communication (*object* → *concept* → communication). This International Standard does not deal with all *concepts* represented in language but only with those represented by *terminologies.* For *terminology, concepts* are to be considered mental representations of *objects* within a specialized context or field.

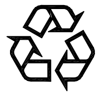
Concepts are not to be confused with abstract or imagined *objects* (i.e., concrete, abstract or imagined objects in a given context are observed and conceptualized mentally and then a *designation* is attributed to the *concept* rather than to the *objects* themselves). For this International Standard, the link between an *object* and its *designation* or *definition* is made through the *concept,* a higher level of abstraction.

Producing a *terminology* requires understanding the conceptualization that underpins human knowledge in a subject area. Because a *terminology* always deals with *special language* in a particular field of knowledge, the *concept* shall be viewed not only as a unit of thought but also as a unit of knowledge.

The *concepts* contextualized in the *special language* of the *subject field* can be expressed in the various forms of human communication according to the system used. In natural language, *concepts* can take the form of *terms*, *appellations*, *definitions* or other linguistic forms; in artificial language, they can take the form of codes or formulae while in graphics, they can take the form of icons, pictures, diagrams or other graphic representations. *Concepts* may also be expressed with the human body as they are in sign language, facial expressions or body movements. This International Standard does not deal with the expression of *concepts* by sign or body language.

1) To be published.

5.2 Individual and general concepts

When the *concept* depicts a single *object*, it is called an *individual concept* and is represented in *special language* as an *appellation* (e.g., United Nations, Internet, Worldwide Web) or a *symbol* (e.g:  Möbius Loop;  Africa;  Statue of Liberty). When the *concept* depicts a set of two or more *objects*, it is called a *general concept* and, in *special languages,* the *designation* takes the form of a *term* (e.g., floppy disk, liquidity, money market fund, etc.) or a symbol (◎, ⩾, $).

5.3 Characteristics

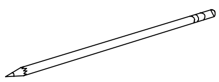
5.3.1 Nature of characteristics

Concept formation plays a pivotal role in organizing human knowledge because it provides the means for recognizing *objects* and for grouping them into meaningful units in a particular field. *Objects* perceived as sharing the same properties are grouped into units. Once similar *objects*, or occasionally a single *object*, are viewed as a meaningful unit of thought within a branch of human knowledge, the properties of an *object* or common to a set of *objects* are abstracted as *characteristics* which are combined as a set in the formation of a *concept*. *Characteristics* are constantly being combined in order to create *concepts,* although differently in different cultures, fields or schools of thought. The combination of unique sets of *characteristics* is represented in *special language* by a *designation* (i.e., a *term*, *appellation* or *symbol*). Since a *designation* is not attributed to every individual *object,* terminological analysis cannot begin unless the specific *object* in question corresponds to a *concept* represented by means of a *designation* or a *definition.* Therefore, the methodology used in the analysis of *terminologies* requires identifying the context or *subject field* in question, identifying the properties attributed to *objects* in the *subject field*, determining those properties which are abstracted into *characteristics* and then combining the *characteristics* to form a *concept*. It may be useful to begin an analysis with those *concepts* corresponding to concrete objects, since the *characteristics* are more easily abstracted given that the properties of the *objects* can be physically observed or examined.

Terminological analysis shall begin with the *objects* in question and the *subject field* contextualizing the *objects* in question. Properties shall be ascribed only to *objects*.

EXAMPLE 1

The specific *object* designated by the visual representation below has the following specific properties:



— made of a long, thin piece of graphite;

— the graphite core is surrounded by a wood casing;

— the casing is yellow;

— at one end there is an eraser;

— at the other end, the graphite and casing have been sharpened to a point;

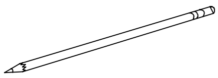
— it is used for writing or making marks.

If the *object* in example 1 is contextualized in the field of stationery, this particular *object* is recognized as belonging to the category of *objects* that has been conceptualized as lead pencil. In the process of conceptualization, the properties of the *objects* forming the set are abstracted into *characteristics*, that is, the properties of the *object* are converted into generalizations applied to the entire set as opposed to the individual *object*, as illustrated in example 2.

Like the properties of *objects*, *characteristics* are grouped into *types of characteristics* such as colour, composition, function, use, origin, shape, location, movement, etc. To obtain a comprehensive listing, the properties of numerous *objects* corresponding to the *concept* under analysis should be identified followed by their abstraction as *characteristics*. For practical purposes, beginning with one of the more typical *objects* is recommended. The identification of *characteristics* shall be based on specialized subject knowledge of the field and often requires research. Experienced terminologists for whom the *concept* in question is clear and straightforward may move directly to identifying the *characteristics*.

The following example is a preliminary analysis of the *concept* ‘lead pencil’.

EXAMPLE 2

	Object (visual representation):	***Concept:***	***Designation (term):***
		abstraction based on the set of all lead pencils	**Lead pencil**

Category	***Property***	***Characteristic***
Level of abstraction	Concreteness	Concreteness
Composition	Made of a long, thin piece of graphite	Graphite core
Composition	Wood casing surrounds graphite	Graphite core is encased in wood
Colour	Casing is yellow	Casing may be any colour
Composition	At one end there is an eraser	One end may have an eraser
Shape	Other end is sharpened to a point	One end may be sharpened to a point
Usage	Graphite and casing sharpened for usage	Graphite and casing must be sharpened for usage
Medium	Graphite is the writing medium	Graphite is the writing medium
Function	Used for writing or making marks	Used for writing or making marks

Characteristics shall be used in the analysis of *concepts,* the modelling of *concept systems,* in the formulation of *definitions* and, as often as possible**,** in the formation of *designations*.

5.3.2 Intension and extension

The set of *characteristics* that come together as a unit to form the *concept* is called the *intension*. The *objects* viewed as a set and conceptualized into a *concept* are known as the *extension*. The two, *intension* and *extension,* are interdependent. For example, the *characteristics* making up the *intension* of ‘lead pencil’ determines the *extension*, those *objects* that qualify as lead pencils and vice versa.

5.3.3 Essential vs. non-essential characteristics

Not all *characteristics* are equally important. For practical purposes, the *essential characteristics* of the *intension* shall be the focal point of any analysis and may differ according to specific fields. *Characteristics* are considered essential if they are indispensable for the understanding of the *concept* in a particular field of knowledge; the absence of an *essential characteristic* fundamentally changes the *concept*. The absence of an *essential characteristic* in the course of an analysis will lead to poor or even erroneous understanding of the *concept*. In the example of the ‘lead pencil’, if the *characteristic* graphite core is encased in wood were removed, the *concept* would be radically changed. It would represent a different *concept* corresponding to a different set of *objects*. Therefore, this is an *essential characteristic*. On the other hand, if the *characteristic* one end may be sharpened to a point were removed**,** the *concept* would not be altered. Although a lead pencil must be sharpened in order to write, it still qualifies as a lead pencil, even if it has not been sharpened. Therefore, this *characteristic* is not essential to the understanding of the *concept* of ‘lead pencil’. The *essential characteristics* of a *concept,* such as ‘lead pencil’, shall be identified. It is not always necessary to categorize the *characteristics* explicitly as in example 3; only in cases where the *concept* in question is highly complex.

EXAMPLE 3

Level of abstraction	1 Concreteness	Essential
Composition	2. Graphite core	Essential
Composition	3. Graphite is encased in wood	Essential
Colour	4. Casing may be coloured	Non-essential
Composition	5. One end may have an eraser	Non-essential
Shape	6. One end may be sharpened to a point	Non-essential
Usage	7. Must be sharpened for usage	Essential
Medium	8. Graphite is the writing medium	Essential
Function	9. Used for writing or making marks	Essential

It must be noted that the same property of a given *object* may be abstracted as an *essential characteristic* of a *concept* in one *subject field* but may be non-essential in another.

5.3.4 Delimiting characteristics

After identifying the *essential characteristics* that make up the *intension* of a *concept,* the terminological analysis shall be taken a step further. Each e*ssential characteristic* of the *concept* under study shall be analysed in relation to the related *concepts* in the *concept* system. Common or shared characteristics indicate similarities between *concepts*; *delimiting characteristics* signal differences which set a *concept* apart (see examples 7 and 8). A *delimiting characteristic* is an *essential characteristic* that distinguishes one *concept* from another. However, delimiting and common are relative terms. The same *essential characteristic* may be delimiting in relation to one *concept* but common in relation to another related *concept*. Analysing the similarities and differences between *concepts* will result in the unique set of *characteristics* that typify a given *concept.* This unique combination of *characteristics* will situate the *concept* within a network of related *concepts* with similar or different *characteristics.* The relations between the *concepts* shall be used to determine the basic structure of the *concept system*. Understanding the *characteristics* used to develop the *concept system* simplifies the task of defining a *concept*.

5.4 Concept relations

5.4.1 Types of concept relations

Concepts do not exist as isolated units of thought but always in relation to each other. Our thought processes constantly create and refine the relations between *concepts*, whether these relations are formally acknowledged or not.

In organizing *concepts* into a *concept system*, it is necessary to bear in mind the field of knowledge that gave rise to the *concept* and to consider the expectations and objectives of the target users. The *subject field* shall act as the framework within which the *concept field,* the set of related but unstructured *concepts,* is established.

EXAMPLE 4

If our task were to list and compile the *terminology* of writing instruments for the stationery industry, our example of ‘lead pencil’ would form part of the *concept field* dealing with pencils as conceptualized by those in the stationery industry. Pencils outside the field of stationery, such as eyebrow pencil or styptic pencil, would be excluded.

To model a *concept system*, the *concepts* of the *concept field* have to be examined and compared. For the purposes of this International Standard, at least the following relations shall be used to model a *concept system*:

- *hierarchical relations:*
  - *generic relations;*
  - *partitive relations;*
- *associative relations.*

5.4.2 Hierarchical relations

5.4.2.1 Types of hierarchical relations

In a *hierarchical relation*, *concepts* are organized into levels where the *superordinate concept* is subdivided into at least one *subordinate concept*. *Subordinate concepts* at the same level and having the same criterion of subdivision are called *coordinate concepts*. The *coordinate concepts* resulting from the application of the same criterion of subdivision to the *superordinate concept* constitute a dimension. A *superordinate concept* can have more than one dimension, in which case the *concept system* is said to be multidimensional. *Concepts* are superordinate, subordinate or coordinate, not on their own, but always in relation to each other in a hierarchy.

In this International Standard, two types of *hierarchical relations* are recognized:

- *generic relations*;
- *partitive relations.*

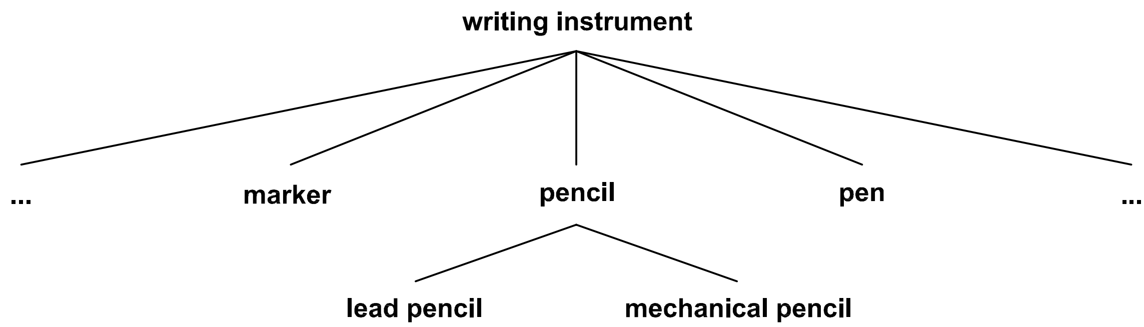
5.4.2.2 Generic relations

A *generic relation* exists between two concepts when the *intension* of the *subordinate concept* includes the *intension* of the *superordinate concept* plus at least one additional *delimiting characteristic*. The *superordinate concept* in a *generic relation* is called the *generic concept* and the *subordinate concept* is called the *specific concept*.

In a *generic relation*, there is an inverse relationship between the *intension* of a *concept* and its *extension*. Hence, if a *concept* has a narrow *intension*, its *extension* will be relatively broader and, inversely, if the *intension* is broad, the *extension* will be relatively narrower.

EXAMPLE 5

In the *concept diagram* below, 'pencil' is a *specific concept* in relation to the *generic concept* 'writing instrument'. Similarly, the *concepts* 'lead pencil' and 'mechanical pencil' are each a *specific concept* in relation to the *generic concept* 'pencil'. Each of the *coordinate concepts* 'lead pencil' and 'mechanical pencil' has a *generic relation* with the *generic concept* 'pencil'. The criterion used to increase the specificity of the *concept* is the nature of the outer casing and graphite core.



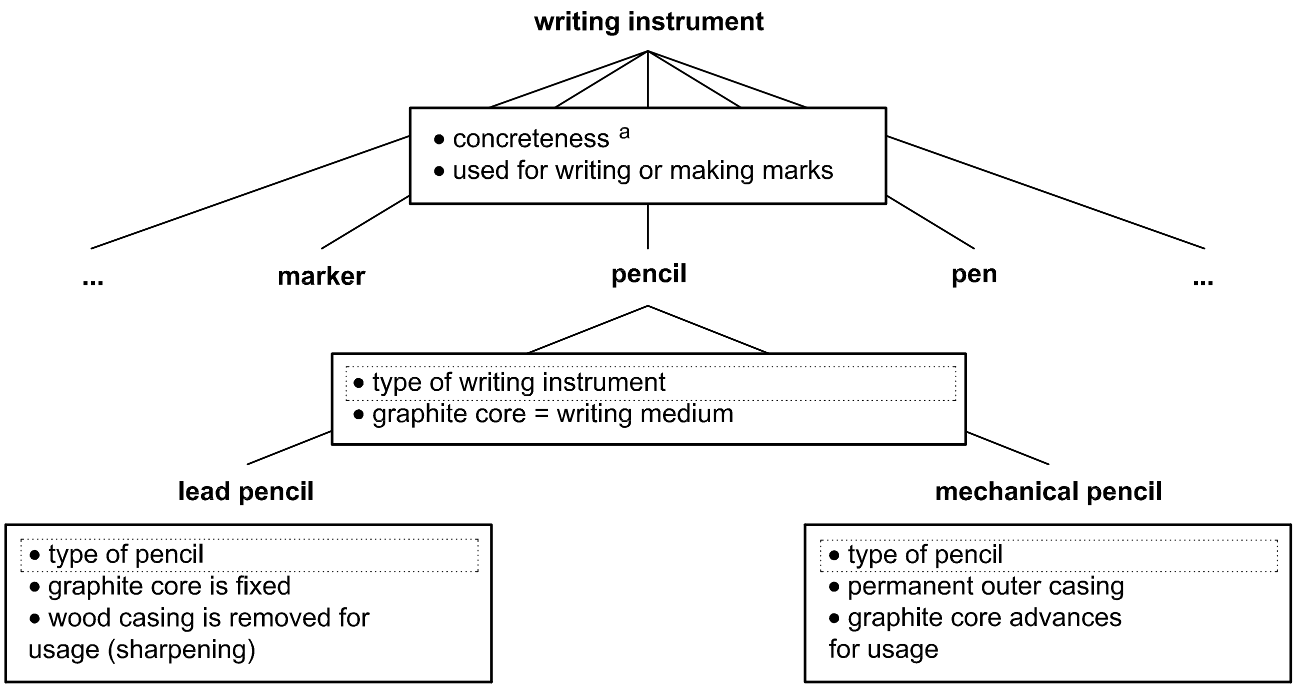
Comparing the *essential characteristics* of a *concept* and its related *concepts* (i.e., generic, coordinate and specific) may require an adjustment and refinement of the *intension*.

EXAMPLE 6

Comparison of the *essential characteristics* of ‘lead pencil’ with related *concepts* in example 5		
Level of abstraction	1. Concreteness	COMMON with those of the generic ‘writing instrument’, the generic ‘pencil’, and the coordinate ‘mechanical pencil’
Composition	2. Graphite core is fixed	DELIMITING in relation to all related *concepts* in question
Composition	3. Wood casing	DELIMITING in relation to all related *concepts* in question
Usage	4. Usage involves the removal of the casing (i.e., sharpening)	DELIMITING in relation to all related *concepts* in question
Function	5. Used for writing or making marks	COMMON with those of the generic ‘writing instrument’, marks the generic ‘pencil’, and the coordinate ‘mechanical pencil’

When modelling a *concept system*, one shall concentrate on the *essential* and *delimiting characteristics.*

EXAMPLE 7



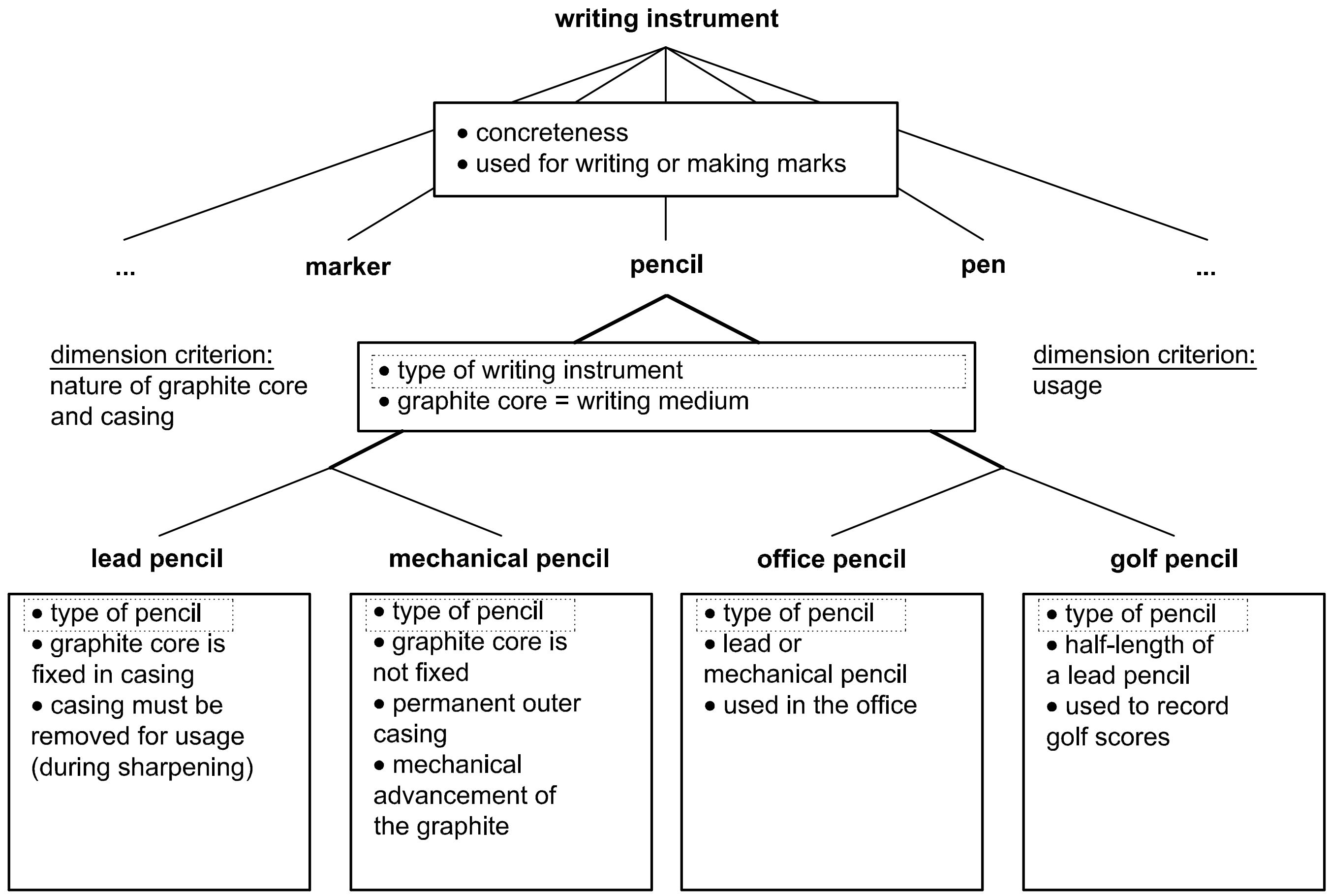
a concreteness is part of the intension of the superordinate concept above but is listed here as a reminder that the writing instruments are concrete objects.

‘Lead pencil’ is merely a type of ‘pencil’, which in turn is merely a type of ‘writing instrument’. Since the set of all lead pencils is a subset of all pencils, the *intension* (set of *characteristics*) of the *generic concept* ‘pencil’ is included in the *intension* of the *specific concept* ‘lead pencil’, hence the *characteristic* type of pencil. Accordingly, the *intension* of ‘pencil’ is narrower than that of ‘lead pencil’ while the *extension* of ‘pencil’ (the number of *objects*) is broader.

A sequence of *concepts* reflecting *generic relations* constitutes a vertical series of *concepts,* whereas a group of *coordinate concepts*, i.e., *concepts* that rank at the same level of abstraction in a *concept system*, form a horizontal series of *concepts*.

In a *generic relation*, there may be several ways of subdividing a *concept* into *subordinate concepts* depending on the criteria or *type of characteristic* chosen. When more than one criterion are used in the construction of a generic concept system, it is considered multidimensional. Only *subordinate concepts* on the same level and in the same dimension are called *coordinate concepts*. In a generic concept system, a node may not have an established *designation*, or may have a *designation* in one language but not in another.

EXAMPLE 8



'Lead pencil' and 'mechanical pencil' are *coordinate concepts* because they share the same dimension; 'office pencil' and 'golf pencil' constitute another set of *coordinate concepts.*

The *concept diagram* most commonly used to illustrate *generic relations* in a *concept system* is the tree diagram as in example 8 above or the indented list of *concepts* as in example 9.

EXAMPLE 9

1 writing instrument
- 1.1 marker
- 1.2 pencil
  - 1.2.1
    - 1.2.1.1 lead pencil
    - 1.2.1.2 mechanical pencil
  - 1.2.2
    - 1.2.2.1 office pencil
    - 1.2.2.2 golf pencil
- 1.3 pen …

5.4.2.3 Partitive relations

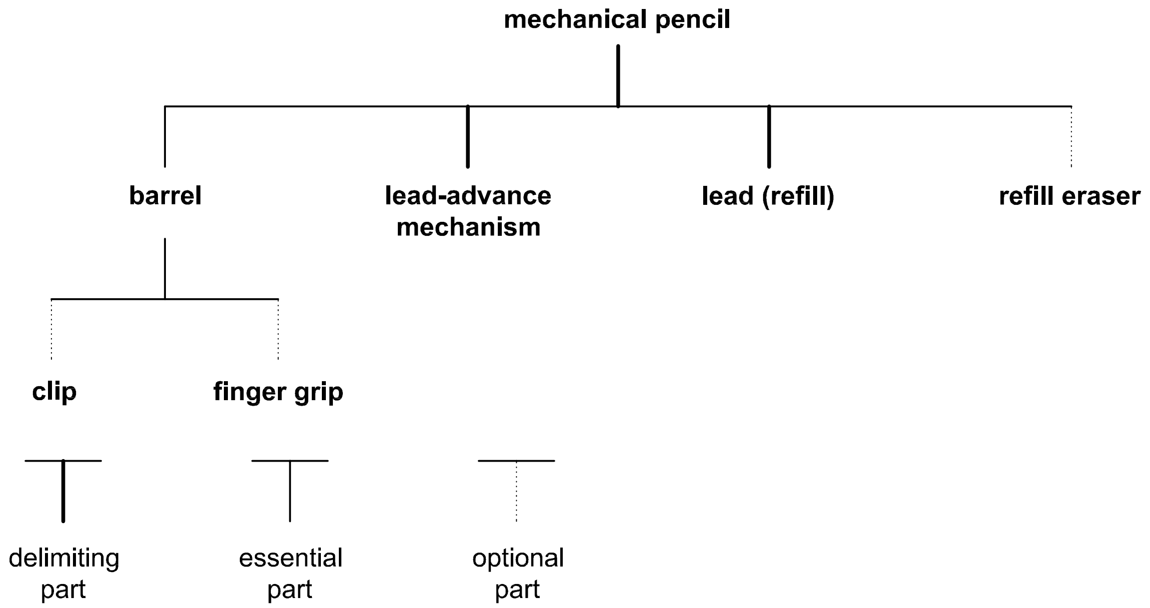
A *partitive relation* is said to exist when the *superordinate concept* represents a whole, while the *subordinate concepts* represent parts of that whole. The parts come together to form the whole. The *superordinate concept* in a *partitive relation* is called the *comprehensive concept* and the *subordinate concept* is called the *partitive concept*. *Subordinate concepts* at the same level and sharing the same dimension are also called *coordinate concepts*.

Partitive, like *generic relations* can be expressed as vertical and horizontal series.

The parts that make up the whole may be similar in nature (e.g., atom in an oxygen molecule) or distinctly different from each other. One or more parts may be compulsory (i.e., essential) or optional (i.e., non-essential). Some parts are not only essential but delimiting in that they allow the whole to be distinguished from other similar *comprehensive concepts*. Some parts may be multiple (e.g., *concept* of ‘page’ as part of a book) or variable within a range (e.g., a pen may have as a part an ink reservoir, an ink cartridge or an ink refill).

EXAMPLE 10

In the following *concept diagram*, the *comprehensive concept* ‘mechanical pencil’ represents a whole, while the *partitive concepts* ‘barrel’, ‘lead-advance mechanism’, ‘lead (refill)’, ‘clip’, ‘refill eraser’, and ‘finger grip’ are the parts that make up the whole. The parts ‘clip’, ‘eraser (refill)’ and ‘finger grip’ are optional since they are not found on all mechanical pencils. The parts, ‘barrel’, ‘lead-advance mechanism’ and ‘lead (refill)’ are essential components of all mechanical pencils. The *partitive concepts* ‘lead (refill)’ and ‘lead-advance mechanism’ are delimiting parts because they behave like *delimiting characteristics* in that they allow one to distinguish the *comprehensive concept*, mechanical pencil, from other closely related writing instruments such as ball-point pens, fine-tipped markers, etc.



To identify the *essential characteristics* of the *partitive concepts*, it is necessary to determine the *intension* of the *comprehensive concept* first.

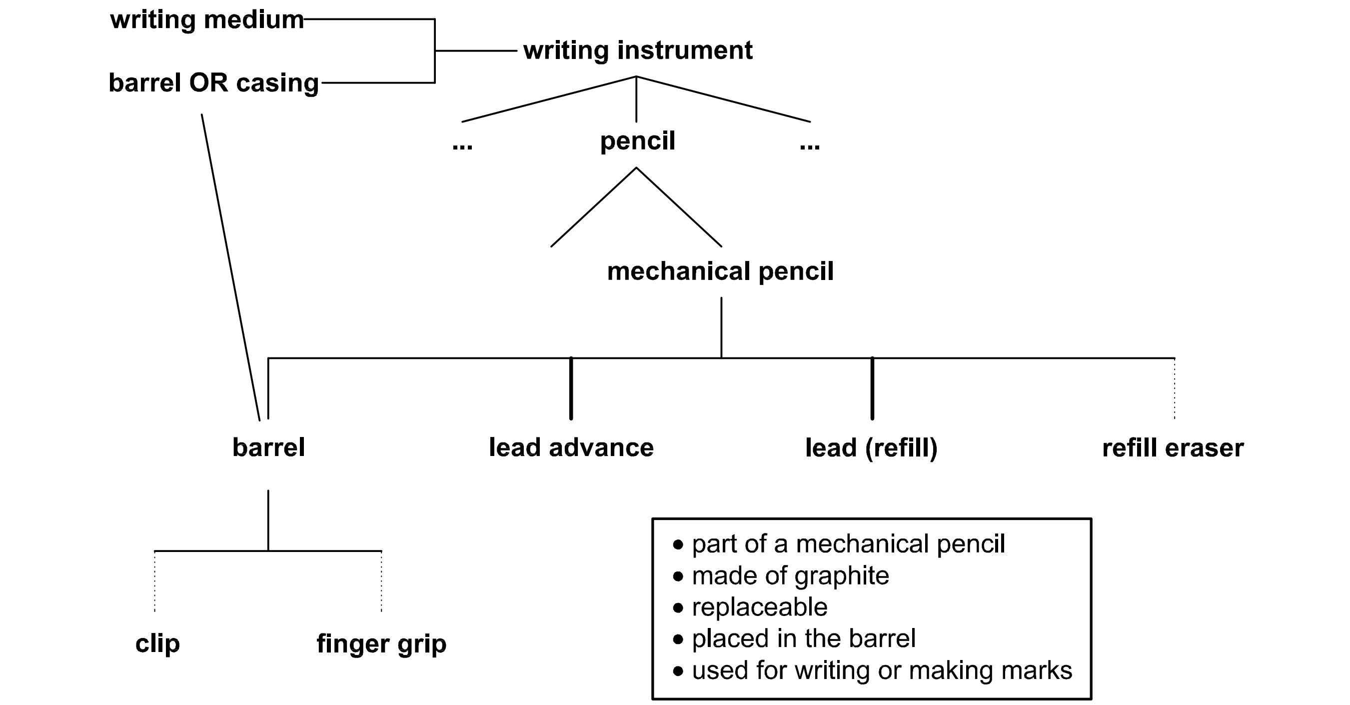
EXAMPLE 11

In relation to other pencils (see example 8), one of the *delimiting characteristics* of the *concept* ‘mechanical pencil’ is the graphite core is not fixed. It should be noted that, as in the case of *delimiting characteristics*, considering a part to be delimiting is relative and depends on the *concept system* and on the *coordinate concepts* being compared.

In the *partitive relation* (see example 10), the graphite core is conceptualized as ‘lead (refill)’. Hence, the *characteristic* replaceable is an *essential characteristic* of the *partitive concept* ‘lead (refill)’.

A partitive concept system does not always allow for a complete analysis of a *concept*. If a *partitive concept* is not particular to the *comprehensive concept*, then the *extension* of the *partitive concept* is not accounted for completely and *essential characteristics* of its *intension* may be lacking. A *partitive concept* shall be defined on the basis of a *partitive relation* only if the complete *extension* and the *essential characteristics* of the *intension* can be determined.

EXAMPLE 12



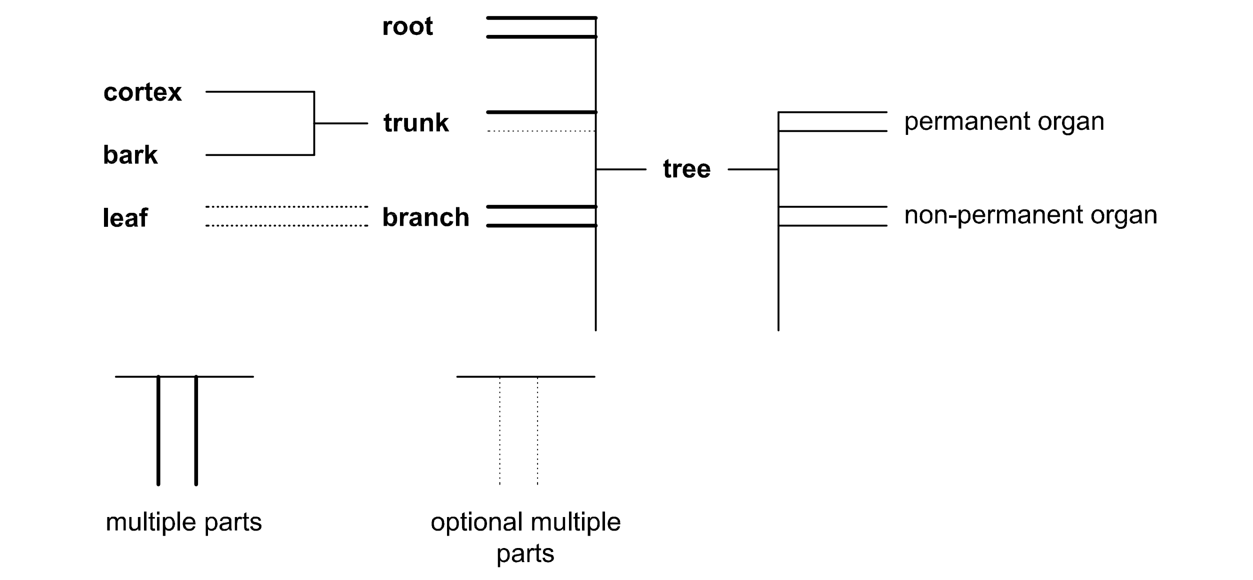
The part ‘barrel’ is not conceptually unique to mechanical pencils. In English, the barrel of a mechanical pencil does not form a separate *concept* with its own *designation* but rather constitutes a portion of the set of *objects* that make up the *extension* of the *concept* ‘barrel’. Other types of writing instruments also have barrels. The complete *extension* of the *concept* ‘barrel’ can only be determined when ‘barrel’ is analysed in relation to the more *generic concept* ‘writing instrument’.

The parts ‘lead-advance mechanism’, ‘lead (refill)’ and ‘eraser (refill)’ designate *partitive concepts* with complete *extensions*. Only the *terms* ‘lead-advance mechanism’, ‘lead (refill)’ and ‘eraser (refill)’ should be defined on the basis of *partitive relations.*

Hierarchical relations, generic or partitive, may be either monodimensional or multidimensional.

EXAMPLE 13

Dimension:	Parts of the *concept* ‘tree’ viewed as a living plant	
	Comprehensive concept:	***Partitive concepts:***
	tree	root, trunk, branch, leaf
Dimension:	Parts of the *concept* ‘tree’ viewed according to the permanence of its organs	
	Comprehensive concept:	***Partitive concepts:***
	tree	permanent organ, non-permanent organ



The *concept diagrams* commonly used to illustrate *partitive relations* in a *concept system* are the bracket or rake diagrams (see examples 10, 12, 13) or the indented list below.

EXAMPLE 14

1. tree
    - 1.1 (“parts based on composition”)
        - 1.1.1 branch
            - 1.1.1.1 leaf
        - 1.1.2 root
        - 1.1.3 trunk
            - 1.1.3.1 bark
            - 1.1.3.2 cortex
    - 1.2 (“parts based on permanence”)
        - 1.2.1 permanent organ
        - 1.2.2 non-permanent organ

It is to be noted that the indented display only indicates a hierarchical relationship; it does not allow one to distinguish between *generic* and *partitive relations*.

5.4.3 Associative relations

Associative relations are non-hierarchical. An *associative relation* exists when a thematic connection can be established between *concepts* by virtue of experience.

Some *associative relations* exist when dependence is established between *concepts* with respect to their proximity in space or time. These relations may involve raw material – product, action – equipment/tool, quantity – unit, material – property, material – state, matter/substance – property, concrete item – material, concrete item – shape, action – target, action – place/location, action – actor, etc. Some relations involve events in time such as a process dependent on time or sequence; others relate cause and effect.

There are many kinds of *associative relations*. The following are some examples.

EXAMPLE 15

Concepts			Associative relation
pencil case	⇔	pencil	container – contained
writing	⇔	pencil	activity – tool
gametes	⇔	zygote ⇔ zygospore	steps of a cycle
humidity	⇔	corrosion	cause – effect
baker	⇔	bread	producer – product
time	⇔	clock	duration – measuring device
painter	⇔	brush	profession – typical tool
screw	⇔	screwdriver	object – associated tool
Islam	⇔	mosque	organization – associated building

5.5 Concept systems

5.5.1 Nature of concept systems

The *terminology* of a field shall not be an arbitrary collection of *terms.* The *terminology* of a *subject field* is the collection of *designations* attributed to *concepts* making up the knowledge structure of the field. The *concepts* shall constitute a coherent *concept system* based on the relations established between *concepts*. The unique position of each *concept* within a system is determined by the *intension*, i.e. the unique set of *characteristics* constituting the *concept*, and the *extension*.

Different *subject fields* view the same bodies of knowledge in different ways. The same *objects* may be combined to form different units of knowledge with different *intensions* and *extensions*, thus resulting in different *concept systems* and distinct *designations*. For example: hypothetical-deductive approaches such as mathematics may create *concept systems* based on statistics or abstract mathematical formulae, whereas the natural sciences may view the same body of knowledge, but draw up systems resulting from the classification of observed phenomena. Engineering and technology may structure a system according to production processes, whereas specialists in law or sociology can view the same phenomena in terms of legal liability or social interaction. A *concept system* serves to:

— model concept structures based on specialized knowledge of a field;

— clarify the relations between *concepts*;

— form the basis for a uniform and standardized *terminology*;

— facilitate the comparative analysis of *concepts* and *designations* across languages;

— facilitate the writing of *definitions*.

5.5.2 Types of concept systems

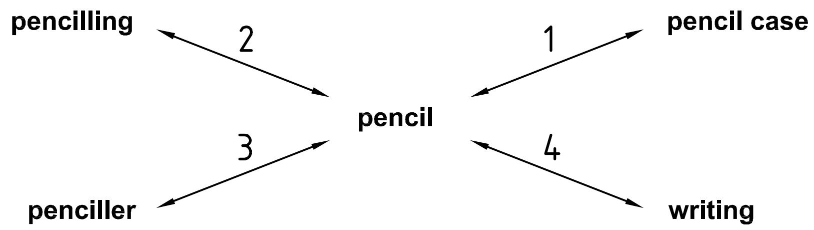
The types of *concept systems* are:

— generic concept system: a system in which all the *concepts* in a vertical series relate to each other as *generic* and *specific concepts*, see examples 7 and 8;

— partitive concept system: a system in which all the *concepts* in a vertical series relate to each other as a whole and its parts, see example 10;

— associative concept system: a system in which all the *concepts* relate to each other by association. The type of *associative relation* between any two *concepts* may vary within a system, see example 16.

EXAMPLE 16

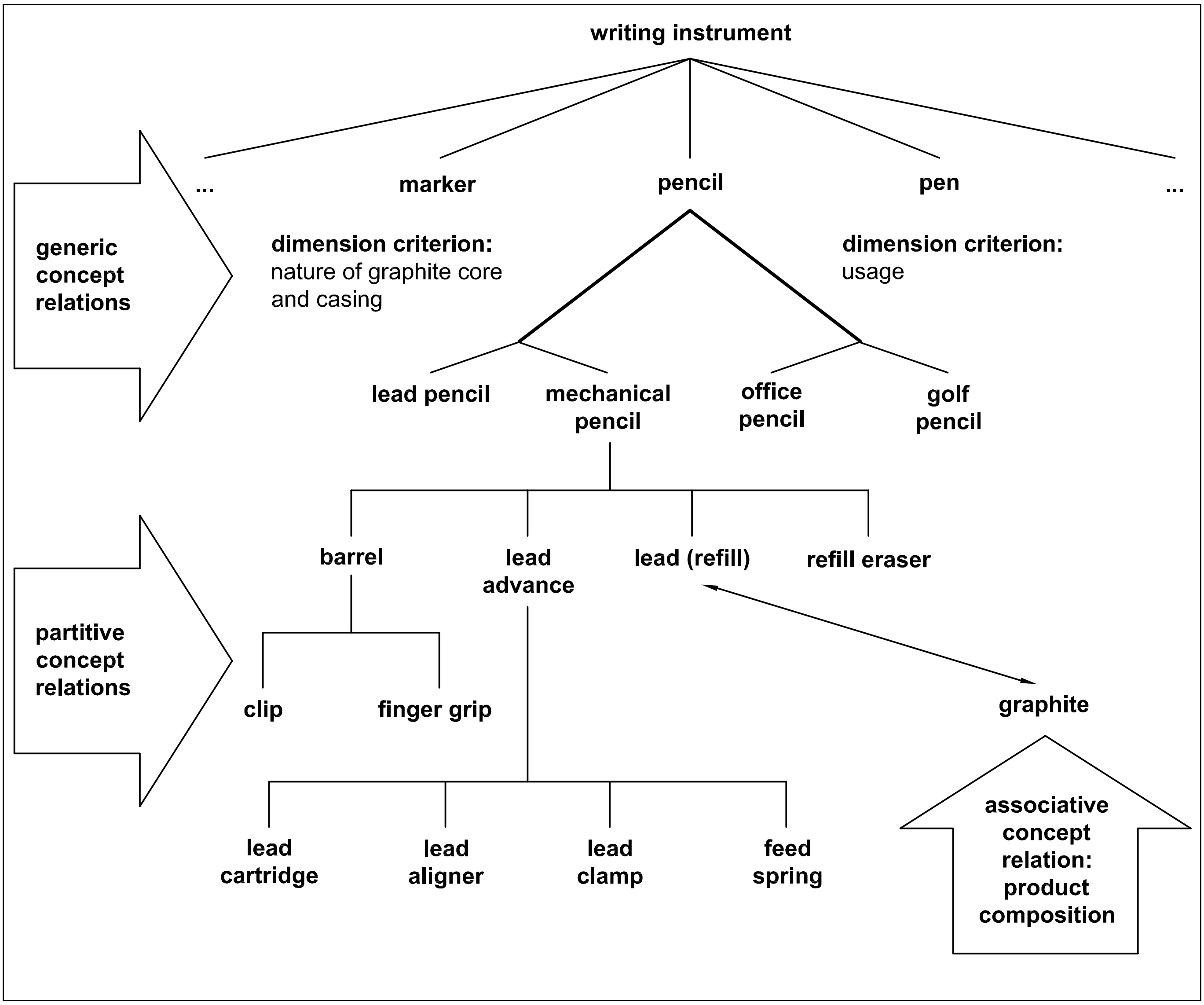


Associative relations

1 contained – container 2 tool – action 3 tool – user 4 tool – activity

— mixed concept system: a system constructed using a combination of the concept relations, see example 17.

EXAMPLE 17



5.6 Developing concept systems

A *concept field* is the group of unstructured but thematically related *concepts* that shall be used as the starting point for building a concept model.

The modelling of *concept systems* involves a series of interactive operations leading, for example, to the compilation of a *vocabulary* in a specific *subject field*. These operations generally include:

— selecting the *concept field*, the preliminary *designations* and *concepts* to be treated by taking into account the *subject field*, the user group and its needs;

— analysing the *intension* and *extension* of each *concept*;

— determining the relation and position of these *concepts* within the *concept system*;

— formulating and evaluating *definitions* for the *concepts* based on the concept relations;

— attributing *designations* to each *concept.*

The steps involved in modelling *concept systems* and defining *concepts* are closely related. *Definitions* shall reflect the *concept system*; the relations within the system shall be established primarily by analysing the *characteristics* of each *concept* included in its respective *definition*, if a formal *definition* already exists. Consequently, modelling and diagramming the structure of a *concept system*, and writing *definitions* for the *concepts* treated in that system, can require review and repetition of some operations.

6 Definitions

6.1 Nature of definitions

A *definition* shall define the *concept* as a unit with a unique *intension* and *extension.* The unique combination of *characteristics* creating the *intension* shall identify the *concept* and differentiate it from other *concepts*. The quality of most *terminological products* will be determined by the quality of the *definitions*.

Some *terms* are so long and complex that they could almost serve as *definitions*; some *definitions* are so short they could almost be thought of as *terms*. In spite of this, the *definition* should not be confused with the *designation*.

A *definition* may be complemented by a *note* or a graphic representation.

In *terminology*, the following types of *definitions* are recognized:

— *intensional definition*;

— *extensional definition.*

6.2 Types of definitions

6.2.1 Intensional definitions

Intensional definitions shall indicate the *superordinate concept*, either immediately above or at a higher level, followed by the *characteristic(s*) that distinguish the *concept* from other *concepts*. The *superordinate concept* situates the *concept* in its proper context in the *concept system* (e.g., pencils among writing instruments, trees among plants). In practice, *intensional definitions* are preferable to other concept descriptions. *Intensional definitions* should be used whenever possible as they most clearly reveal the *essential characteristics* of a *concept* within a *concept* system.

The *intensional definition* should be based on the concept relations determined during analysis. A *definition* based on a *generic relation* shall state the *generic concept* sharing the same dimension, either immediately above or at some higher level, followed by the *essential characteristics* that differentiate the given *concept* from *coordinate concepts* in a generic *concept* system.

By stating the *generic concept*, the *characteristics* that make up the *intension* of the *superordinate concept* are implicitly assumed in the *definition*.

EXAMPLE 18

lead pencil

pencil whose graphite core is fixed in a wooden casing that is removed for usage by sharpening

NOTE To be used for writing or making marks, a lead pencil must be sharpened at least at one end.

The *definition* of ‘lead pencil’ is based on the generic concept system in example 8:

Superordinate concepts: pencil and writing instrument

Essential and *delimiting characteristics*:

— casing must be removed for usage by sharpening;

— graphite core is fixed in wood casing.

A *definition* based on a *partitive relation* shall describe a *concept* as a part of a particular whole or *comprehensive concept*. It is therefore necessary to analyse the *comprehensive concept* first and to indicate its relation to the *partitive concepts*. Partitive definitions typically begin with formulations that clearly indicate the *partitive relation* such as: part of, component of, section of, period of, element in, ingredients making up, etc., followed by the *superordinate concept* (i.e., *the comprehensive concept*) and the *delimiting characteristics*. To avoid circularity, defining *concepts* on the basis of a partitive analysis is to be restricted to one level, either the subordinate level or the superordinate level, not both.

A *concept* should be defined as a *partitive concept* only if it constitutes an essential part of the *comprehensive concept* and the *extension* of the *concept* is complete.

EXAMPLE 19

lead cartridge

that part of a lead advance mechanism which stores and guides the lead refill as it advances forward

The *definition* of 'lead cartridge' is based on the *partitive concept* system in example 17:

Superordinate concept: lead-advance mechanism

Essential and delimiting characteristics:

— stores the lead;

— guides the lead as it is advanced forward.

If the *partitive concepts* of the lead advance mechanism (lead cartridge, lead aligner, lead clamp and feed spring) are defined on the basis of a *partitive relation*, then the *comprehensive concept* "lead-advance mechanism" must not be defined on the basis of a *partitive relation* of the whole to its parts. This avoids circularity.

A *comprehensive concept* may be defined on the basis of a mixed concept system. The *definition* shall state the *generic concept* above followed by the essential parts that make up the *comprehensive concept* in question. Optional parts shall not be included in the *definition.* Optional parts frequently associated with a *concept* may be mentioned in a *note*. This type of *definition* is practical only if the number of parts to be enumerated is limited.

EXAMPLE 20

mechanical pencil

writing instrument composed of a barrel, lead and a lead-advance mechanism

The *definition* is based on the mixed concept system in example 17:

Superordinate concepts: pencil and writing instrument

Essential and delimiting parts:

— barrel;

— lead refill;

— lead advance mechanism.

A *concept* may be defined on the basis of the *associative relation* between two *concepts*. The *definition* should state the *superordinate concept* followed by *characteristics* that indicate the relationship between the *concepts* in question. It should be noted that, in many cases, the *superordinate concept* is not a specialized concept and therefore, care shall be taken to ensure that the complete *intension* and *extension* of the *concept* have been analysed thoroughly before defining the *concept* on the basis of an *associative relation*. For example, the associative *concept* system in example 16 shows a container-contained relationship between pencil case and pencil. However, a pencil case is a container designed to hold and carry not only pencils but writing instruments in general.

EXAMPLE 21

pencil case
container designed to hold and carry pencils and other writing instruments
The *definition* is based on the associative concept system in example 16 and on the associative relationship of container-contained.
Superordinate concept: container
Essential characteristics:
— designed to hold and carry pencils and other writing instruments.

6.2.2 Extensional definitions

In highly specialized terminological documents directed at field specialists, the *definition* can be formulated as a list of the *subordinate concepts,* in only one dimension, which correspond to *objects* making up the *extension* of the *concept*. The list of *subordinate concepts* may consist of either *individual* or *general concepts*. It is important to remember that the *extension* is not the same as an *extensional definition*. The list stands for *concepts* that depict the *objects* making up the *extension* and not the *objects* themselves. The operator “or” in the *definition* shall be used to indicate a *generic relation* between the *subordinate concepts* in the *definition* and the *superordinate concept* that is being defined; the operator “and” shall be used to indicate a *partitive relation*.

Extensional definitions are to be used only when *intensional definitions* are difficult to elaborate. *Extensional definitions* shall be used only if the number of *concepts* to be enumerated is limited, the list of *concepts* is complete in one dimension and the *subordinate concepts* can be clarified by *intensional definitions* or are well known.

EXAMPLE 22

threatened species
critically endangered species, endangered species or vulnerable species

6.3 Definition writing

6.3.1 Principles for definition writing

A *terminological entry* shall be composed of a statement explaining what the *concept* is. The statement is made up of a subject, copula and predicate. The subject is the *designation*, the copula is understood to be the verb “is“ and the predicate constitutes the *definition.* Typographical conventions, such as a colon, a dash or by starting a new line of text, introduce the beginning of the predicate (see ISO 10241 for layout).

EXAMPLE 23

lead pencil
pencil whose graphite core is fixed in a wooden casing that is removed for usage by sharpening
NOTE To be used for writing or making marks, a lead pencil must be sharpened at least at one end.
The entry should read as follows:
“[A] lead pencil [is a] pencil whose graphite core is fixed in a wooden casing that is removed for usage by sharpening”.

A *definition* shall describe a *concept*, not the words that make up a *designation.*

EXAMPLE 24

	coniferous	**coniferous** = bearing cones
inappropriate definition	tree bearing cones	
	coniferous tree	
definition of the concept	tree with needle-like or scale-like leaves and exposed or naked seeds	
	dependability	
inappropriate definition	the collective term used to describe the availability performance and its influencing factors: reliability performance, maintainability performance and maintenance support performance	
	dependability	
definition of the concept	totality of the characteristics of an entity related to availability performance and its influencing factors: reliability performance, maintainability performance and maintenance support performance	

Before drafting a *definition* for a given *concept*, it is necessary to determine the relations between the *concept* and its related *concepts* and to model a *concept system* within which the *concept* is situated.

If a *definition* already exists, in an International Standard for example, it shall be adopted as it stands only if it reflects the *concept system* in question. Otherwise, it shall be adapted.

When modelling the *concept system* and formulating the corresponding system of *definitions*, it is essential to determine which *concepts* are so basic and familiar that they need not be defined. Generally, one begins by defining *superordinate concepts*. When drafting a new *definition*, use shall be made of basic *concepts* or *concepts* defined elsewhere in the document as far as possible.

6.3.2 Systemic nature of definitions

A *definition* shall reflect the *concept system* describing the *concept* and its relations to others in the system. *Definitions* shall be coordinated so as to be able to reconstruct the *concept system*. The *characteristics* used in the *definition* should therefore be selected to indicate the connection between the *concepts* or the delimitation that distinguish one *concept* from another.

6.3.3 Conciseness

Ideally, *definitions* shall be as brief as possible and as complex as necessary. Complex *definitions* can contain several dependent clauses, but carefully written *definitions* contain only that information which makes the *concept* unique. Any additional descriptive information deemed necessary should be included in a *note*.

EXAMPLE 25

	lead pencil
	pencil whose graphite core is fixed in a wooden casing that is removed for usage by sharpening
NOTE	To be used for writing or making marks, a lead pencil must be sharpened at least at one end.

A *definition* shall describe only one *concept*. It shall not include hidden *definitions* for any *concepts* used to identify *characteristics*. Any *characteristic* that requires an explanation shall be defined separately as a *concept* or given in a *note*.

EXAMPLE 26

> **lead pencil**
>
> pencil whose wooden casing is fixed around graphite, a soft, black form of carbon
>
> This *definition* of 'lead pencil' includes a hidden *definition* for the *concept* 'graphite', an *essential characteristic*. The *characteristic* a soft, black form of carbon, should be removed and used in a separate *definition* for the *concept* 'graphite'.

The definition should not contain characteristics that belong logically to *superordinate* or *subordinate concepts*.

EXAMPLE 27

> In the *definition* of 'mechanical pencil', it is not necessary to indicate the *characteristic* concreteness (all the *objects* in the *extension* are concrete) since this *characteristic* is part of the *intension* of the *superordinate concept*.
>
> In the *definition* of 'pencil', it is unnecessary to note that a pencil can be either a 'lead pencil' or a 'mechanical pencil' because the *generic concept* 'pencil' allows for both of these *subordinate concepts.*

6.3.4 Subject field

The *extension* and the *characteristics* reflected in a *definition* shall be appropriate to the *concept system* in a given *subject field*.

If the specific field of the *concept* is not clearly indicated in the *designation* or is not generally understood, it shall be added to the beginning of the *definition* (see example 28 and ISO 10241 for layout).

EXAMPLE 28

> **pointer**
>
> 〈programming〉 variable that contains the memory location of some data rather than the data itself
>
> **pointer**
>
> 〈user interface〉 on-screen symbol that is controlled by an input device and is used as a means of indicating and selecting locations or choices on the screen
>
> NOTE An example of an on-screen symbol is an arrowhead and a mouse is a common input device.

When restricting the *definition* to a specific *subject field*, the *extension* of the *concept* should not be narrowed incorrectly, as illustrated in example 29.

EXAMPLE 29

> **fertility**
>
> 〈forest management〉 ability of a tree to produce offspring
>
> The *concept* of 'fertility' was created to designate a unit of knowledge arising from the field of biology, not forest management. The *extension* includes all living things, not just trees. Limiting 'fertility' to forest management and trees narrows and distorts the *extension*.

6.3.5 Principle of substitution

The substitution principle shall be used to test the validity of a *definition*. A *definition* is valid if it can replace a *designation* in a text without loss of or change in meaning. See example 32.

6.4 Deficient definitions

6.4.1 Circular definitions

Common types of deficient definitions are: circular, incomplete and negative definitions.

If one *concept* is defined using a second *concept,* and that second *concept* is defined using the *term* or elements of the *term* designating the first *concept*, the resulting *definitions* are said to be circular. Circular definitions do not add to our understanding of the *concept* and shall be avoided as much as possible.

Definitions can be circular:

— within a single *definition*;

— within a system of *definitions.*

Circularity within a *definition* occurs when the *designation* is repeated to introduce the *definition* or an element of the *designation* is used as a *characteristic*. When formulating a *definition,* it is not permissible to repeat the *designation* to introduce the *definition* (see example 30). The use of an element of the *designation*, other than the head word, as a *characteristic* in the *definition* should be avoided as much as possible (see example 31).

EXAMPLE 30

	tree height
circular definition	***tree height*** measured from the ground surface to the top of a tree
corrected definition	distance between the ground surface and the top of a tree

EXAMPLE 31

	evergreen tree
circular definition	tree with ***evergreen*** foliage
corrected definition	tree that retains its foliage throughout its lifetime

A *definition* is circular within a system of *definitions* when two or more *concepts* are defined by means of each other. The substitution principle clearly reveals repetition and circularity.

EXAMPLE 32

circular definitions	**virgin forest**
	forest constituted of a ***natural tree stand***
	natural tree stand
	stand of trees grown in a ***virgin forest***
The substitution of the *term* ‘virgin forest’ in the *definition* of ‘natural tree stand’ results in:	
substitution	stand of trees grown in a ***forest constituted of a natural tree stand***
corrected definition	stand of trees grown without interference by man
Once the *definition* of ‘natural tree stand’ has been modified to remove the circularity, the *definition* of ‘virgin forest’ can remain as it is.	

6.4.2 Incomplete definitions

A *definition* shall describe the content of the *concept* precisely. It shall be neither too narrow nor too broad. Otherwise, the *definition* is considered incomplete. Non-essential or irrelevant *characteristics* in the *definition* may unintentionally include or exclude *objects* from the *extension* of the *concept*. A *definition* is considered too broad if the *characteristics* selected to describe the *concept* allow for *objects* that should not be part of the *extension.* A *definition* is considered too narrow if the *characteristics* selected exclude *objects* that should be part of the *extension.*

EXAMPLE 33

	mechanical pencil
too broad	writing instrument composed of a barrel and a refill
By not specifying precisely the type of refills, this *definition* broadens the *extension* to include ball-point, roller-ball and felt-tip pens as well as mechanical pencils.	
	mechanical pencil
too narrow	writing instrument composed of a barrel, a lead refill and push-button advance mechanism
By specifying a push-button advance mechanism, this *definition* narrows the *extension* to exclude those mechanical pencils using other types of advance mechanisms.	
	mechanical pencil
corrected definition	writing instrument composed of a barrel, a lead refill and a lead-advance mechanism

In adapting an existing *definition* to a specific *subject field* or context, care should be taken not to change the *extension* of the *concept.* A change to the *extension* leads to a new unit and a different *concept*. Similarly, changes to any of the *essential characteristics* in a *definition* result in a new *concept*.

A particular context rarely refers to all the *objects* making up the *extension* of a *concept*. *Definitions* in laws and regulations tend to be interpretive rather than defining. *Definitions* in International Standards should be defining rather than interpretive. If a *concept* is restricted to a particular interpretation for a given text, it shall be explained in the body of the International Standard rather than by creating a new *concept* with a narrower *extension*. If specification information is associated with the *concept,* then this should be given in an appropriate specification clause rather than in a *definition.*

EXAMPLE 34

too narrow	**organization**
	for the purposes of this regulation, bodies not operating for profit
This *definition* of ‘organization’ does not define the *concept* ‘organization’ but merely signals how to interpret the *concept* in a given context. From all the *objects* that make up *extension* of the *concept* ‘organization’, this context considers only those not operating for profit.	

Designations for parts whose *extension* extends beyond the *partitive relation* under study are not to be defined narrowly in terms of the *comprehensive concept*.

EXAMPLE 35

too narrow	**eraser**
	〈pencil〉 rubber part found at the end of pencils and used to rub out pencil marks
The *definition* of the *concept* ‘eraser’ should not be written in terms of pencils, even though erasers are often found at the end of pencils.	

An *extensional definition* must list all the subordinate *concepts* corresponding to *objects* in the *extension*. Open-ended formulations (such as, for example, the following items, etc.) are not acceptable. Incomplete lists may be given in a *note* to the *definition*.

EXAMPLE 36

	coniferous tree
incomplete	conifer such as cedars, cypresses, firs, larches, pines, etc.
(open-ended formulation)	
	coniferous tree
extensional definition	juniper, larch, fir, cedar, cypress, redwood or pine
(not all concepts listed)	
	coniferous tree
corrected definition	tree with needle-like leaves and exposed or naked seeds
	NOTE Familiar representatives of conifers are cedars, yews, firs, junipers, larches, redwoods and pines.

6.4.3 Negative definitions

A *definition* shall describe what a *concept* is, not what it is not.

EXAMPLE 37

	deciduous tree
inappropriate negative definition	tree other than an evergreen tree
	deciduous tree
corrected definition	tree that loses its foliage seasonally

However, when the absence or non-existence of a *characteristic* is essential to the understanding of a *concept*, a negative definition may be required.

EXAMPLE 38

nonconformity
non-fulfilment of a specified requirement

6.5 Notes

All secondary and extra information on a *concept* and its *designations* shall be given in a *note* that complements the *definition*. A *note* shall be clearly distinguished from the *definition*, for example, by its typography or indentation (see ISO 10241 for layout).

Notes may include non-essential characteristics or optional parts often associated with the *concept*, typical elements that make up the *extension* of the *concept,* or explanatory information that complements the *definition* but is not essential for understanding the *concept*. See examples 18 and 36.

6.6 Graphic representations

Graphic representations of a *concept* may be used to complement a *definition*. A graphic representation serves its purpose well if it illustrates the *characteristics* of a given *concept* and/or its relations to other *concepts*.

There are various types of graphic representations.

- Iconic illustrations:
  - drawings, etchings, etc.,
  - photographs;
- Abstract illustrations:
  - network diagrams,
  - matrix diagrams,
  - schematic diagrams;
- Statistical diagrams:
  - line charts,
  - bar charts,
  - pie charts, etc.;
- Mixed figures, which combine two or more forms.

Iconic illustrations present images of *objects* that may be unfamiliar, such as a photograph or drawing of an exotic plant. They are especially useful in complementing partitive definitions since they show the relationship between the whole and its parts (e.g., an industrial machine and its parts).

However, it is necessary not to confuse the *concept* and the *object* selected to illustrate the *concept*. A graphic representation is but a depiction of only one *object* among all the other *objects* that make up the *extension* of the *concept*.

EXAMPLE 39

This picture of a fir tree could be used to illustrate the *concept* tree. However, it must be noted that this is merely an illustration of the object, not the object itself. Furthermore, one must not confuse the specific tree illustrated with the *concept* tree whose extension includes other *objects* such as deciduous trees, palm trees, etc.

More abstract illustrations such as diagrams, schematics or statistical data are also graphic representations. They provide a means of visualizing a complex *concept* that may be difficult to grasp from textual descriptions alone.

EXAMPLE 40

— functional diagrams for machines;
— computer flow charts;
— functional diagrams used in neural anatomy.

7 Designations

7.1 Types of designations

The *designation* acts as a synthesis of the *definition*. A *designation* is a representation of a *concept* by linguistic or non-linguistic means. For the purposes of this International Standard, *designations* are categorized as

— *terms* designating *general concepts*;

— *appellations* designating *individual concepts*, and

— symbols designating both *individual* and *general concepts*.

It should be noted that not all symbols are *designations*.

7.2 Terms

7.2.1 Term-concept relations

A *term* is a *designation* consisting of one or more words representing a *general concept* in a *special language*. A *simple term* contains only one root while a *term* containing two or more roots is called a *complex term.*

A *term* has to be accepted and used by subject specialists. A new *term* created to designate a *concept* is a type of neologism and is called a *neoterm*. Although most *neoterms* designate new *concepts*, some designate established *concepts*.

Ideally, the objective of term-concept assignment in a given *special language* is to ensure that a given *term* is attributed to only one *concept* and a given *concept* is represented by only one *term*, a condition called *monosemy.* This condition reduces ambiguity while *homonymy* and *synonymy* can lead to ambiguity.

7.2.2 Monosemy

Monosemy is the relation between *designations* and *concepts* in which one *designation* represents only one *concept*. *Designations* in such a relation are called monosemes.

7.2.3 Homonymy

Homonymy involves the relation between *designations* and *concepts* in which *designations* in a given language have identical forms, either phonetic or written, but designate different and unrelated *concepts*.

Terms that are phonetically identical but written differently are called homophones, while homographs have identical written forms but are pronounced differently. Full homonyms are both written and pronounced the same way.

EXAMPLE 41

homophones	sun – son
homographs	tear (weeping) – tear (separating)
full homonyms	bloom (efflorescence) – bloom (type of ingot)

7.2.4 Synonymy

Synonymy is the relation between differing *designations* that designate the same *concept*, i.e., having the same *intension,* in a given language. *Designations* in a synonymous relation are called synonyms. Given the same level of language, synonyms are interchangeable. If two or more *terms* are attributed to *concepts* whose *intensions* are almost identical, they are called quasi-synonyms and are interchangeable only in some contexts.

EXAMPLE 42

synonyms	term bank = terminological data bank
quasi-synonyms	dashboard ≈ instrument panel

7.3 Term formation

7.3.1 Principles for term formation

Since term formation patterns depend on the lexical, morphosyntactic, and phonological structures of individual languages, language-specific principles of term formation shall be described in national and regional standards dealing with a particular language rather than in International Standards. See annex A for examples of term formation methods applicable to the English language.

For a standardized terminology, it is desirable that a *term* be attributed to a single *concept.* Before creating a new *term*, it is required to ascertain whether a *term* already exists for the *concept* in question. Well-established usage has to be respected. Established and widely used *designations*, even if they are poorly formed or poorly motivated, should not be changed unless there are compelling reasons. If several *designations* exist for a single *concept*, the one that satisfies the largest number of principles listed below should be selected.

The following principles, even though they are not all applicable for any one *term,* can provide assistance when creating new *terms* or systematizing existing *terminologies.*

7.3.2 Transparency

A *term* is considered transparent when the *concept* it designates can be inferred, at least partially, without a *definition*. In other words, its meaning is visible in its morphology. To make a *term* transparent, a key *characteristic*, usually a *delimiting characteristic*, is used in the creation of the *term* itself.

It is advisable that only *essential or delimiting characteristics* not likely to change quickly as a result of technological evolution be used. Otherwise, one may be faced with the task of renaming the *concept* as soon as the technology changes.

EXAMPLE 43

1. torque wrench vs. **monkey wrench**
The *term* **torque wrench** (wrench used to measure torque, usually when tightening a nut or bolt component of an assembly) is transparent while the *term* **monkey wrench** (wrench named after its inventor, Möncke) is opaque (not transparent).
2. thermal noise vs. **Johnson noise**
Similarly, the *term* **thermal noise** is more transparent than and therefore preferred over the *term* **Johnson noise**.
3. chalk board vs. **blackboard**
The once transparent *term* **blackboard** has been replaced by another transparent *term* **chalk board**. With the introduction of green surfaces and white boards for markers, the complexity of the *concept system* increased. It is no longer clear whether the *concept* 'blackboard' includes these green surfaces and how it is related to marker boards. The *term* **chalk board** is now more transparent.

7.3.3 Consistency

The *terminology* of any *subject field* should not be an arbitrary and random collection of *terms*, but rather a coherent terminological system corresponding to the *concept system*. Existing *terms* and new *terms* must integrate into and be consistent with the *concept system*.

EXAMPLE 44

synthetic fabrics: **nylon, orlon, dacron, rayon**, … etc.
Any *designation* for a new synthetic fabric should be consistent (end in "on") and respect the pattern arising from the *concept system*.

7.3.4 Appropriateness

Proposed *terms* should adhere to familiar, established patterns of meaning within a language community. Term formations that cause confusion shall be avoided.

EXAMPLE 45

The *term* **atomic energy** is confusing and misleading because it suggests that the energy or power is created from the atom. A more scientifically precise and appropriate *term* is **nuclear energy**.

Terms shall be as neutral as possible. They should avoid connotations, especially negative ones.

EXAMPLE 46

The *term* **genetic manipulation** was replaced with a more appropriate *designation*, **genetic engineering,** a *term* without the negative connotations of the word manipulation.

7.3.5 Linguistic economy

A *term* shall be as concise as possible. Undue length is a serious shortcoming. It violates the principle of linguistic economy and it frequently leads to ellipsis (omission).

EXAMPLE 47

term bank instead of **terminological data bank**

The requirement for conciseness often conflicts with that for accuracy. The greater the number of *characteristics* included in a *term*, the greater the precision and transparency of the *term.* However, increasing the number of *characteristics* often makes a *term* too long and inconvenient to use. Practicality should govern any decision to give preference to one pattern of term formation over another. For instance, shortened forms should be favoured whenever a long, precise *term* is not suitable (e.g., oral communication in a factory). In contrast, *complex terms*, even made up of five or six words, are acceptable in scientific publications.

7.3.6 Derivability

Productive term formations that allow derivatives (according to whatever conventions prevail in an individual language) should be favoured.

EXAMPLE 48

herb vs. **medicinal plant**

The *term* **herb** with its derived *terms* **herbaceous, herbal, herbalist** and **herby** is preferred over **medicinal plant** which produces no derivatives.

7.3.7 Linguistic correctness

A *term* shall conform to the morphological, morphosyntactic and phonological norms of the language in question.

7.3.8 Preference for native language

Even though borrowing from other languages is an accepted form of term creation, native language expressions should be given preference over direct loans.

7.4 Appellations

An *appellation* designates an *individual concept*, that is, a *concept* whose *extension* is made up of a single *object.* In *terminology,* the focus is placed on the names of *individual concepts* representing *objects* which are members of a set but manifest a certain individuality rather than names designating individuals as individuals (e.g., Mary, Tom). In a generic concept system, they occupy the very bottom level of the hierarchy.

EXAMPLE 49

The House of Commons, Ministry of Agriculture	—	specific political institutions or units
United Nations, The Liver Foundation	—	specific organizations
Distinguished Service Cross, Nobel Peace Prize	—	specific awards
Haley's Comet, Saturn	—	specific scientific phenomena
Tylenol, Nike, Kleenex	—	specific brand names

The formation of *appellations* should follow the principles and formation processes used for *terms.*

7.5 Symbols

Symbols are an important aid to international communication because their visual representation of *concepts* functions independently of any given language. They can communicate information directly under difficult circumstances (e.g., traffic signs).

Iconic symbols should bear some visual resemblance to the *concept* they represent. Generally their meaning should be directly apparent without explanation. In some cases, however, the visual resemblance of the symbol is less pronounced or completely lost. Its meaning may be no longer directly recognizable and may be supported only by general agreement.

Terms using the letters of the alphabet as iconic symbols to communicate the shape of the letter itself rather than its sound shall not be considered a symbol (see example 50).

EXAMPLE 50

U-turn – a turn in the shape of a U
I-beam – a steel beam in the shape of an I

Characters that replace words or parts of words, such as mathematical symbols or currency symbols, are considered symbols.

EXAMPLE 51

§, $, £, &, @, %, #, =, <, –

It should be noted that the *designations* of SI units are considered symbols rather than *abbreviations* since they do not vary from language to language, have no plural and are never written with periods or full stops, except for normal punctuation.

EXAMPLE 52

m = metre	**l** = litre

Alphanumeric codes made up of combinations of letters, numbers or both are considered symbols, if they do not represent words in a natural language or abbreviated forms (see A.2.3 in informative annex A).

EXAMPLE 53

$\mathbf{C_2H_5OH}$ (chemical compound ethyl alcohol)
A4 (paper format, 210 mm $\times$ 297 mm)

A symbol should be

— simple and easy to recognize and, if possible, self-explanatory,

— monosemic in a specific context,

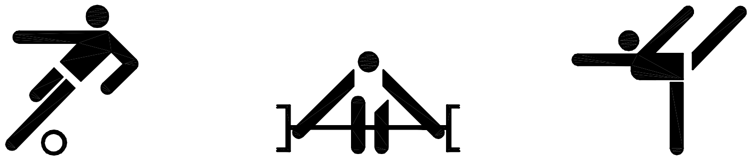
— unambiguous,

— easy and economical to reproduce, and

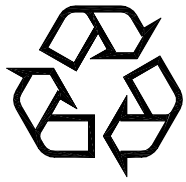
— consistent and appropriate, i.e., designed to permit coordination with and differentiation from other related symbols.

EXAMPLE 54

1. Symbols used to designate sports activities at the Olympics



2. The Möbius Loop used in the field of environment to designate recyclability



8 Standardization of terminologies

8.1 Deprecation of terms

Standardized terminologies shall reflect a coherent terminological system that corresponds to the *concept system* of the field in question. The *terminology* defined in an International Standard is to be precise and lead to increased clarity in communication.

One primary function of a standardized terminology shall be to indicate *preferred*, *admitted* and *deprecated terms*. A *term* recommended by a technical committee shall be considered a *preferred term* whereas an *admitted term* shall represent an acceptable synonym to a *preferred term. Deprecated terms* are *terms* that have been rejected.

Terms are rejected or deprecated for a number of reasons. A *term* may be a possible synonym for the *preferred term* but is deprecated in the interests of *monosemy*. A *term* may be flawed or inaccurate.

EXAMPLE 55

The *term* **fireproof** is misleading and inaccurate; the *terms* **fire resistant** or **fire retardant** are more precise.

The *term* **prebake resistance** is not necessarily false, but it is deprecated in favour of **precure heat tolerance**, a more precise *term.*

A *term* may be reserved for use in conjunction with another *concept*.

EXAMPLE 56

The *term* **load** is deprecated as a synonym for the *term* **force**, but is used to represent the related *concept* ‘application of a force’.

The inclusion of a *designation* in a terminology standard shall constitute an implicit deprecation of other *designations* that may be used as synonyms in the *subject field.* It is wise to consider these *terms* and to identify them explicitly as *admitted* or *deprecated terms* and to explain the reasons for deprecation if at all possible.

8.2 Harmonization

The standardization of *terminologies* in various *subject fields* frequently leads to harmonization within a *subject field,* across *subject fields* and across languages. To reduce duplication and to reduce the high cost of *terminology*, efforts should be made to harmonize whenever minor differences exist (see ISO 860).

8.3 Transliteration and transcription

In the dissemination of standardized terminologies, it may be necessary to render a *term* written in one alphabet by means of a different alphabet. In such instances, the latest International Standards on *transliteration* or *romanization* shall be used (e.g. ISO 9, ISO 233, ISO 259, ISO 843, ISO 3602 and ISO 7098).

In the case of phonetic transcription, the International Phonetic Alphabet (IPA) of the International Phonetics Association shall be used.

Annex A
(informative)

Examples of term-formation methods

A.1 General

The examples found in this annex are based on the English language and are not intended to cover all the methods used for English term formation. For a more complete description of the various formation methods of the English language, reference works on word formation should be consulted.

Term-formation patterns depend on the lexical, morphosyntactic, and phonological structures of individual languages and recommendations cannot be given in an International Standard. For instance, each language has its own rules for the abbreviation process and language-specific conventions dictate whether a term will consist of a single lexical element, several morphological elements combined to form a single unit, several words arranged in a string, or a terminological phrase. Therefore, this annex should <u>not</u> be translated but adapted to the specific rules applicable to the language in question.

However, the following term-formation methods apply to the English language, and may also apply to other languages:

- creating new forms;
- using existing forms;
- translingual borrowing.

A.2 New forms

A new form is the creation of a new lexical entity that never existed before. Formation processes such as derivation, compounding or abbreviation can be used to create new forms for terms or appellations.

A.2.1 Derivation

The derivation process involves forming a new term by adding one or more morphological elements, or affixes, to a root or a word.

EXAMPLE A.1

<u>phosphor</u> + ous	= phosphorous
co- + <u>education</u>- + al	= co-educational
de- + <u>toxi(n)</u> + fi + -cation	= detoxification

A.2.2 Compounding

Compounding involves combining existing words or word elements to create a new form that contains two or more roots but designates a single concept. Compounds may be complex terms, phrases or blends. The elements of the complex term or phrase may be joined by a hyphen or by fusing, or may not be joined at all. Blends result from fusing two or more words, after one or more of them have been clipped. The formation of blends uses a combination of two processes, compounding after clipping (see A.2.3).

When the combining of words involves an essential characteristic from the intension of the concept, the compound is considered a transparent term (see 7.3.2).

EXAMPLE A.2

complex terms	(joined by hyphenation): composer-conductor, high-definition television
	(joined by fusing): downsizing, outflow
	(not joined): member country, information highway
phrase	video-on-demand
blend	(back and front clipping) **info**rmation + enter**tainment** = infotainment
	(back and back clipping) **cyb**ernetics + **org**anism = cyborg
	(back clipping only) **cyber**netics + **space** = cyberspace
	(back and front, back clipping) **quas**i- + stell**ar** object = quasar

A.2.3 Abbreviated forms

Excessive length makes some terms difficult to use. Shortening the word or words designating a concept can create new abbreviated forms. The original long term is called the full or expanded form.

Good writing practice dictates that both the full form of a term and the abbreviated form be indicated the first time a potentially unfamiliar abbreviated form is used in a text. In general, an abbreviated form should be easy to pronounce.

In English, the types of abbreviated forms are:

— short forms,

— clipped terms,

— abbreviations,

— initialisms, and

— acronyms.

A very long complex term or appellation can be reduced. The short form uses fewer words to designate the same concept (see example A.3).

A clipped term is formed by truncating the front, middle or back portion of a simple term. Both ends may also be truncated.

Abbreviations are created by omitting words and/or parts of a word making up a term. In some cases, the first letter of a word will suffice. In others, the first letters of short phrases are grouped together. Abbreviations usually end with a period (full stop).

Initialisms are abbreviations created by using the first letter (or sound) of each or some of the elements of a complex term or appellation. Initialisms are always pronounced letter by letter.

Acronyms are abbreviations created by combining initial letters or syllables from each or some of the elements of the full form. The new designation is pronounced syllabically like a word.

EXAMPLE A.3

Full form	Abbreviated form
Intergovernmental **Group of Twenty-four** on International Monetary Affairs	***short form:***
	Group of Twenty-four
	clipped terms:
para**chute**	chute
taxonomy	taxon
in**flu**enza	flu
prefabricated house	prefab
	abbreviations:
page	p.
et cetera	etc.
	initialisms:
United **N**ations	U.N.
ante **m**eridian	a.m.
personal **c**omputer	PC
	acronyms:
United **N**ations **E**ducational, **S**cientific and **C**ultural **O**rganization	UNESCO
disc **o**perating **s**ystem	DOS
light **a**mplification by **s**timulated **e**mission of **r**adiation	laser
surface **act**ive **a**ge**nt**	surfactant

Terms can be formed by any combination of formation processes.

EXAMPLE A.4

CD-Rom technology	Compact Disk-Read only memory technology initialism + acronym + compounding
ARC	AIDS(Acquired Immune Deficiency Syndrome)-related complex acronym which includes an acronym

A.3 Existing forms

Existing forms can be used to create new terms by processes such as conversion, terminologization, semantic transfer and transdisciplinary borrowing. It should be borne in mind that using existing forms may lead to *homonymy*, and as a result lead to confusion and ambiguity. However, the use of existing terms in new combinations (e.g. compounding, derivation) can be useful in the creation of new forms.

A.3.1 Conversion

New terms can be created by changing the syntactic category (e.g., grammatical function) of existing forms.

EXAMPLE A.5

in economics	output (noun)	to output (verb)	
in mathematics	constant (adj.)	constant (noun)	
in recycling	empty (adj.)	to empty (verb)	an empty (noun)

A.3.2 Terminologization

Terminologization is the process by which a general language word or expression is transformed into a term designating a concept in a special language.

EXAMPLE A.6

	circuit
general language:	line enclosing an area
electrotechnical field:	arrangement of devices or media through which electric current can flow

A.3.3 Semantic transfer within a special language

Semantic transfer is the process whereby an existing term within a special language is used to designate another concept by logical extension: terms designating a concept corresponding to concrete objects can be extended to abstract objects, a part extended to the whole, a container extended to the substance contained, etc.

EXAMPLE A.7

	screen
concrete:	the portion of a computer monitor on which information is displayed
abstract:	the information displayed on a computer screen

A.3.4 Transdisciplinary borrowing

In transdisciplinary borrowing, also known as internal borrowing, a term from one subject field is borrowed and attributed to a new concept in another subject field within the same language. The characteristics that make up the intension of the concepts in the two fields are often comparable by analogy.

EXAMPLE A.8

	virus
	⟨medicine⟩ virus (infectious agent which causes diseases)
	⟨computer science⟩ virus (infectious agent causing computer malfunctions)

A.4 Translingual borrowing

Existing terms or concepts in one language can be introduced into another language by borrowing, either by direct loan or loan translation.

A.4.1 Direct loan

Existing terms are frequently adopted from one language to another if there is no current term for the concept in the second language. The borrowed term may be pronounced, spelled, or inflected differently in the borrowing language.

EXAMPLE A.9

de **Raster** ⇒	en **raster** (digitizer grid)

A.4.2 Loan translation

Loan translation is the process whereby the morphological elements of a foreign term are translated to form a new term.

EXAMPLE A.10

de **Weltanschauung** ⇒	en **worldview**

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