

First edition
2011-08-15

**Information and documentation —
Thesauri and interoperability with other
vocabularies —**

**Part 1:
Thesauri for information retrieval**

*Information et documentation — Thésaurus et interopérabilité avec
d'autres vocabulaires —*

Partie 1: Thésaurus pour la recherche documentaire

Reference number
ISO 25964-1:2011(E)



Licensed to National Agricultural Library / Patsy Graves (patsy.graves@ars.usda.gov)
ISO Store# 15137 / 11597 / Downloaded: 2016-02-01
Single user license. Only viewing and networking prohibited.

© ISO 2011



COPYRIGHT PROTECTED DOCUMENT

© ISO 2011

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either ISO at the address below or ISO's member body in the country of the requester.

ISO copyright office
Case postale 56 • CH-1211 Geneva 20
Tel. + 41 22 749 01 11
Fax + 41 22 749 09 47
E-mail copyright@iso.org
Web www.iso.org

Published in Switzerland

Contents

Page

Foreword	v
Introduction.....	vi
1 Scope	1
2 Terms and definitions	1
3 Symbols, abbreviated terms and other conventions.....	12
4 Thesaurus overview and objectives	15
4.1 Overall objective	15
4.2 Vocabulary control and its purpose	16
4.3 Paradigmatic versus syntagmatic relationships.....	16
4.4 Types of paradigmatic relationship.....	17
5 Concepts and their scope in a thesaurus	18
5.1 Conceptual basis.....	18
5.2 Scope notes	20
5.3 Reciprocal scope notes	21
6 Thesaurus terms.....	21
6.1 Form of terms	21
6.2 Clarification and disambiguation of thesaurus terms	21
6.3 Grammatical form of terms.....	23
6.4 Capitalization, punctuation and special characters	26
6.5 Singular or plural forms.....	27
6.6 Selection of the preferred form.....	30
7 Complex concepts.....	37
7.1 General	37
7.2 The nature of compound terms	38
7.3 Deciding whether or not to admit a complex concept.....	39
7.4 How to split a complex concept.....	43
7.5 Retention of constituent concepts	43
7.6 Consistency in the treatment of complex concepts	44
7.7 Order of words in multi-word terms	44
8 The equivalence relationship, in a monolingual context	44
8.1 General	44
8.2 Synonyms.....	45
8.3 Quasi-synonyms.....	48
8.4 Specific terms subsumed in a broader concept	48
8.5 Representation of complex concepts by a combination of terms	49
9 Equivalence across languages	50
9.1 General	50
9.2 Degrees of equivalence	51
9.3 Typical problems and solutions	52
9.4 Representation of cross-language equivalence between preferred terms	57
9.5 Cross-language equivalence between non-preferred terms.....	57
10 Relationships between concepts.....	57
10.1 Introduction.....	57
10.2 The hierarchical relationship	58
10.3 The associative relationship	63
10.4 Customized relationships	67

11	Facet analysis	68
12	Presentation and layout	70
12.1	General.....	70
12.2	Alternative display styles.....	71
12.3	Presentation and layout of multilingual thesauri	80
12.4	Language and character encoding issues	85
13	Managing thesaurus construction and maintenance	88
13.1	Planning a thesaurus	88
13.2	Early stages of compilation	90
13.3	Construction.....	91
13.4	Introduction to the thesaurus.....	93
13.5	Dissemination	93
13.6	Updating	95
14	Guidelines for thesaurus management software	98
14.1	General.....	98
14.2	Size and character limitations	98
14.3	Relationships between terms and between concepts	99
14.4	Notes applying to terms or concepts	100
14.5	Codes and notation	100
14.6	Node labels	100
14.7	Status of languages.....	100
14.8	Data import/export	101
14.9	Editorial navigation and support.....	102
14.10	Editorial safeguards	102
14.11	Housekeeping tools.....	103
15	Data model.....	103
15.1	General.....	103
15.2	Notes on the model.....	105
15.3	Tabular presentation	109
16	Integration of thesauri with applications	115
16.1	Introduction	115
16.2	Interoperability needs for thesauri.....	116
16.3	Integration with indexing and searching applications.....	116
17	Exchange formats.....	118
18	Protocols	119
18.1	General.....	119
18.2	Purposes and use cases	119
18.3	Application environment and architecture	120
18.4	Thesaurus-specific protocols.....	120
18.5	General-purpose web database protocols used with thesauri	120
	Annex A (informative) Examples of displays found in published thesauri	122
	Annex B (informative) XML Schema for data exchange	139
	Bibliography	140
	Index.....	144
	Table 1 — Symbols and abbreviations	13
	Table 2 — English language tags and their equivalents in other languages	14
	Table A.1 — Tags used in Inspec Thesaurus alphabetical display	122
	Figure 1 — Paradigmatic and syntagmatic relationships.....	17

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 2.

The main task of technical committees is to prepare International Standards. 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 document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights.

ISO 25964-1 was prepared by Technical Committee ISO/TC 46, *Information and documentation*, Subcommittee SC 9, *Identification and description*.

This first edition of ISO 25964-1 cancels and replaces ISO 2788:1986 and ISO 5964:1985, which have been merged and technically revised. Clauses 1 to 13 of this part of ISO 25964 correspond broadly to the content of ISO 2788:1986 and ISO 5964:1985. The remaining clauses cover new material.

ISO 25964 consists of the following parts, under the general title *Information and documentation — Thesauri and interoperability with other vocabularies*:

- *Part 1: Thesauri for information retrieval*

The following parts are under preparation:

- *Part 2: Interoperability with other vocabularies*

This part of ISO 25964 covers the development and maintenance of thesauri, both monolingual and multilingual, including formats and protocols for data exchange.

ISO 25964-2 will cover interoperability between different thesauri and with other types of structured vocabulary, such as classification schemes, name authority lists, ontologies, etc., not previously covered in any International Standard.

Introduction

Today's thesauri are mostly electronic tools, having moved on from the paper-based era when thesaurus standards were first developed. They are built and maintained with the support of software and need to integrate with other software, such as search engines and content management systems. (For example, data from the thesaurus database might need to be presented in combination with the number of postings found by a search application.) Whereas in the past thesauri were designed for information professionals trained in indexing and searching, today there is a demand for vocabularies that untrained users will find to be intuitive, and for vocabularies that enable inferencing by machines.

ISO 25964 makes the transition that is needed in order to be compatible with the world of electronic information management. However, this part of ISO 25964 retains the assumption that human intellect is usually involved in the selection of indexing terms and in the selection of search terms. If both the indexer and the searcher are guided to choose the same term for the same concept, then relevant documents will be retrieved. This is the main principle underlying thesaurus design, even though a thesaurus may also be applied in situations where computers make the choices.

Efficient exchange of data is a vital component of thesaurus management and exploitation. This part of ISO 25964 therefore includes recommendations for exchange formats and protocols. Adoption of these will facilitate interoperability between thesaurus management systems and other computer applications, such as indexing and retrieval systems, that will utilize the data.

This part of ISO 25964 covers development and maintenance of thesauri rather than how to use them in indexing. Where multilingual issues and examples are addressed, efforts have been made to cover as wide a selection of languages as possible, consistent with clarity and comprehensibility.

Thesauri are typically used in post-coordinate retrieval systems, but may also be applied to hierarchical directories, pre-coordinate indexes and classification systems. Increasingly, thesaurus applications need to mesh with others, such as automatic categorization schemes, free-text search systems, etc. ISO 25964-2 will address additional types of structured vocabulary (such as classification schemes, name authority lists, ontologies, etc.) and give recommendations to enable interoperation of the vocabularies at all stages of the information storage and retrieval process.

Information and documentation — Thesauri and interoperability with other vocabularies —

Part 1: Thesauri for information retrieval

1 Scope

This part of ISO 25964 gives recommendations for the development and maintenance of thesauri intended for information retrieval applications. It is applicable to vocabularies used for retrieving information from all types of information resources, irrespective of the media used (text, sound, still or moving image, physical object or multimedia) including knowledge bases and portals, bibliographic databases, text, museum or multimedia collections, and the items within them.

This part of ISO 25964 also provides a data model and recommended format for the import and export of thesaurus data.

This part of ISO 25964 is applicable to monolingual and multilingual thesauri.

This part of ISO 25964 is not applicable to the preparation of back-of-the-book indexes, although many of its recommendations could be useful for that purpose.

This part of ISO 25964 is not applicable to the databases or software used directly in search or indexing applications, but does anticipate the needs of such applications among its recommendations for thesaurus management.

2 Terms and definitions

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

2.1

array

group of **sibling concepts** (2.52)

EXAMPLE

In the following, the sibling concepts outerwear and underwear form an array within the concept “clothing”.

clothing
 outerwear
 overcoats
 underwear

2.2

associative relationship

relationship between a pair of **concepts** (2.11) that are not related hierarchically but share a strong semantic connection

2.3

broader term

preferred term (2.45) representing a **concept** (2.11) that is broader than the one in question

NOTE The scope of the narrower concept falls completely within the scope of the broader. The relationship between the two is commonly indicated with the tag BT. For more explanation see 10.2.1.

2.4

characteristic of division

attribute by which a **concept** (2.11) can be subdivided into an **array** (2.1) of narrower **concepts** (2.11), each having a distinct value of that attribute

cf. **facet analysis** (2.21), **node label** (2.38)

EXAMPLE

In the following, age group is the characteristic of division applied to the concept of people:

people
(people by age group)
children
youths
adults

2.5

classification

classifying

activity involving the components of grouping similar or related things together; separating dissimilar or unrelated things; and arranging the resulting groups in a logical and helpful sequence

2.6

classification scheme

schedule (2.49) of **concepts** (2.11) and pre-coordinated combinations of **concepts** (2.11), arranged by **classification** (2.5)

NOTE A classification scheme often also includes an index.

2.7

coined term

new **term** (2.61) created to express a **concept** (2.11) for which no suitable **term** (2.61) exists in the required language

NOTE For a further explanation and examples, see 6.6.5 and 9.3.3.3

2.8

compound equivalence

relationship or mapping in which one **term** (2.61) or **concept** (2.11) in one context is represented by two or more **terms** (2.61) or **concepts** (2.11) in another

2.9**compound term**

term (2.61) that can be split morphologically into separate components

EXAMPLE

In English:

"copper mines" can be split into "copper" and "mines"; "lawnmowers" can be split into "lawns" and "mowers"

In French:

"mine de cuivre" can be split into "mine" and "cuivre"; "biodiversité" can be split into "biologie" and "diversité"

NOTE Compound terms can be multi-word terms, or can consist of only one word.

2.10**computer application**

computer program or set of programs that provides high-level processing related to a specific user need

NOTE In ISO 25964, a computer application is sometimes referred to as an application.

2.11**concept**

unit of thought

NOTE Concepts can often be expressed in a variety of different ways. They exist in the mind as abstract entities independent of terms used to express them. They range from the very simple, e.g. "child", to the very complex, e.g. "child protection legislation".

2.12**controlled vocabulary**

prescribed list of **terms** (2.61), headings or codes, each representing a **concept** (2.11)

NOTE Controlled vocabularies are designed for applications in which it is useful to identify each concept with one consistent label, for example when classifying documents, indexing them and/or searching them. Thesauri, subject heading schemes and name authority lists are examples of controlled vocabularies.

2.13**cross-language equivalence**

equivalence relationship (2.18) between **terms** (2.61) representing the same **concept** (2.11) in different languages

2.14**data model**

abstract model that describes how data is represented and used

NOTE The data model in this part of ISO 25964 provides a generic definition of thesaurus structure and semantics. It can be used as the basis for defining a database model or an exchange format for thesauri.

2.15**document**

any resource that can be classified or indexed in order that the data or information in it can be retrieved

NOTE This definition refers not only to written and printed materials in paper or microform versions (for example, conventional books, journals, diagrams, maps), but also to non-printed media such as machine-readable and digitized records, Internet and intranet resources, films, sound recordings, people and organizations as knowledge resources, buildings, sites, monuments, three-dimensional objects or realia; and to collections of such items or parts of such items.

2.16

entry term

lead-in term

term (2.61) provided in a **controlled vocabulary** (2.12), not for direct use in **metadata** (2.33), but for the purpose of guiding the user to another **term** (2.61) that can be used as a category label, subject heading or **preferred term** (2.45)

NOTE Entry terms occurring in a thesaurus are generally known as non-preferred terms.

2.17

equivalence mapping

mapping that states that the **concept** (2.11) in the target vocabulary is considered identical in scope to the **concept** (2.11) in the source vocabulary

cf. **equivalence relationship** (2.18)

2.18

equivalence relationship

relationship between two **terms** (2.61) in a **thesaurus** (2.62) that both represent the same **concept** (2.11)

NOTE In ordinary discourse, terms that are quasi-synonyms may represent slightly different concepts. After inclusion in the thesaurus, however, the equivalence relationship clarifies that both are regarded as representing the same concept. When two or more such terms are in the same language within a monolingual or multilingual thesaurus, one of them is designated a preferred term and the other(s) non-preferred term(s); when two or more such terms are in the different languages of a multilingual thesaurus, each of them may be a preferred term in its own language respectively, and the relationship is known as cross-language equivalence.

2.19

exchange format

machine-readable format for representing information that is intended to facilitate exchange of the information between different applications

NOTE The exchange format for a thesaurus often uses a markup language based on a standard such as XML (Extensible Markup Language) [63][64][65][66], and is based on a data model for thesauri. While the data model provides a generic description of thesaurus structure and semantics, the exchange format expresses this in a formal language for the purpose of exchanging thesauri.

2.20

facet

grouping of **concepts** (2.11) of the same inherent category

EXAMPLE 1 Animals, mice, daffodils and bacteria could all be members of a living organisms facet.

EXAMPLE 2 Digging, writing and cooking could all be members of an actions facet.

EXAMPLE 3 Paris, the United Kingdom and the Alps could all be members of a places facet.

NOTE Examples of high-level categories that can be used for grouping concepts into facets are: objects, materials, agents, actions, places and times.

cf. **node label** (2.38)

2.21

facet analysis

analysis of subject areas into constituent **concepts** (2.11) grouped into **facets** (2.20), and the subdivision of **concepts** (2.11) into narrower **concepts** (2.11) by specified characteristics of division

2.22**facet indicator**

notational device that indicates the start of a new **facet** (2.20) within a synthesized compound **notation** (2.40)

NOTE Examples of facet indicators are the 0 in the Dewey Decimal Classification, and parentheses and quotation symbols in the Universal Decimal Classification. In the past, the term facet indicator has been used as synonymous with node label but that usage is deprecated by ISO 25964, to avoid confusion.

2.23**hierarchical relationship**

relationship between a pair of **concepts** (2.11) of which one has a scope falling completely within the scope of the other

cf. **broader term** (2.3), **narrower term** (2.37)

NOTE Several different types of hierarchical relationship exist. For a further explanation, see 10.2.

2.24**homograph**

one of two or more words that are written in the same way, but have different meanings

EXAMPLES

In English:

The word "bank" could refer to a financial institution or the side of a river.

In French:

The word "avocat" could refer to a lawyer or to a fruit.

NOTE Homographs are sometimes referred to as homonyms, although the latter term applies more broadly, as it also includes pairs of terms such as "weights" and "waits" in English or "mer" and "mère" in French, which sound the same although they are spelt differently.

2.25**identifier**

set of symbols, usually alphanumeric, designating a **concept** (2.11) or a **term** (2.61) or another entity for purposes of unique identification within a determined context or resource, especially in a computer system or network

NOTE A notation is sometimes used as an identifier.

2.26**index term**

term (2.61) assigned to a **document** (2.15) in the process of **indexing** (2.27)

NOTE Sometimes index terms are referred to as indexing terms, as keywords or as tags, but the latter terms have other meanings too. Preferred terms from a thesaurus are very often used as index terms.

2.27**indexing**

intellectual analysis of the subject matter of a **document** (2.15) to identify the **concepts** (2.11) represented in it, and allocation of the corresponding **index terms** (2.26) to allow the information to be retrieved

NOTE The term "subject indexing" is often used for this concept, but as ISO 25964 does not deal with the indexing of other elements such as authors or dates, "indexing" is sufficient. Indexing can be carried out by human users or by automated agents.

2.28

information retrieval

all the techniques and processes used to identify **documents** (2.15) relevant to an information need, from a collection or network of information resources

NOTE Selection and inclusion of items in the collection are included in this definition; likewise browsing and other forms of information seeking.

2.29

interoperability

ability of two or more systems or components to exchange information and to use the information that has been exchanged

NOTE Vocabularies can support interoperability by including relations to other vocabularies, by presenting data in standard formats and by using systems that support common computer protocols.

2.30

loan term

term (2.61) borrowed from another language that has become accepted in the borrowing language

EXAMPLES

"glasnost" is a Russian term that has become accepted in English
"gourmet" is a French term that has become accepted in English

2.31

markup

annotations or other type of encoding embedded in text, in conformity with a **markup language** (2.32)

2.32

markup language

set of encoding conventions that can be used to provide instructions for the interpretation of a text, by the use of annotations embedded in the text itself

NOTE The interpretation often concerns issues such as content, structure or rendering of the text. Widely used examples include HTML (Hypertext Markup Language)^[59], which is largely concerned with presentation, and XML (Extensible Markup Language) ^{[63][64][65][66]}, which addresses the structure of text.

2.33

metadata

data that identify attributes of a **document** (2.15) typically used to support functions such as location, discovery, documentation, evaluation and/or selection

NOTE Preferred terms or notations selected during the indexing process are commonly applied as metadata values.

2.34

monohierarchical structure

hierarchical arrangement of **concepts** (2.11), in a **thesaurus** (2.62) or **classification scheme** (2.6), in which each **concept** (2.11) can have only one broader **concept** (2.11) at the level immediately above

cf. **polyhierarchical structure** (2.42)

EXAMPLE In a monohierarchical structure, the concept of pianos cannot be listed under keyboard instruments as well as under stringed instruments; a choice has to be made of one of these concepts to determine its placing.

2.35**multilingual thesaurus**

thesaurus (2.62) in which **terms** (2.61) and relational structures are available in two or more natural languages

2.36**multi-word term**

term (2.61) consisting of more than one word

cf. **compound term** (2.9)

EXAMPLE

cost benefit analysis

2.37**narrower term**

preferred term (2.45) representing a **concept** (2.11) that is narrower than the one in question

NOTE The scope of the narrower concept falls completely within the scope of the broader concept. The relationship between the two is commonly indicated with the tag NT. For more explanation see 10.2.1.

2.38**node label**

label inserted into a hierarchical or classified display to show how the **terms** (2.61) have been arranged

NOTE A node label is neither a preferred term nor a non-preferred term. It contains one of two different types of information:

- a) the name of a facet to which following terms belong; or
- b) the attribute or characteristic of division by which an array of sibling concepts has been sorted or grouped.

See examples in Clause 11.

2.39**non-preferred term**

non-descriptor

term (2.61) that is not assigned to **documents** (2.15) but is provided as an entry point in a **thesaurus** (2.62) or index

cf. **entry term** (2.16)

EXAMPLE

hounds
USE dogs

NOTE In this example, "hounds" is a non-preferred term, while "dogs" is the preferred term that should be used in its place.

2.40**notation**

class code

class number

classmark

set of symbols representing a **concept** (2.11) in a **structured vocabulary** (2.56), especially a **classification scheme** (2.6)

EXAMPLES

Notation	Source vocabulary	Concept
07.04.4	ILO Thesaurus	fishery policy and development
622.342 2	Dewey Decimal Classification	gold mining
373.3.016:51	Universal Decimal Classification	mathematics curriculum in primary schools
SBS XEJ B	Bliss Bibliographic Classification	endangered species law
H40-H42	International Statistical Classification of Diseases and Related Health Problems	glaucoma

NOTE Notation is sometimes used to sort and/or locate concepts in a predetermined systematic order and, optionally, to display how the components of complex concepts have been structured and grouped. A notation can provide the link between alphabetical and systematic lists in a thesaurus. In the context of classification schemes, "concepts" are often known as "subjects", especially when they are complex, as in the examples above.

2.41**paradigmatic relationship**

a priori relationship

relationship between **concepts** (2.11) that is inherent in the **concepts** (2.11) themselves

NOTE Such relationships are shown in a structured vocabulary, independently of any indexed document. For a more complete discussion of paradigmatic and syntagmatic relationships, see 4.3.

2.42**polyhierarchical structure**

hierarchical arrangement of **concepts** (2.11), in a **thesaurus** (2.62) or **classification scheme** (2.6), in which each **concept** (2.11) can have more than one broader **concept** (2.11)

cf. **monohierarchical structure** (2.34)

EXAMPLE

In a polyhierarchical structure, organs (musical instruments) could be listed under keyboard instruments as well as under wind instruments.

NOTE In a polyhierarchical structure, a single concept can occur in more than one place in the hierarchical structure of the thesaurus. Its attributes and relationships, and specifically its narrower and related terms, are the same wherever it occurs.

2.43**post-coordination**

combination of **preferred terms** (2.45) of a **controlled vocabulary** (2.12) at the time of searching

cf. **pre-coordination** (2.44)

EXAMPLE

The post-coordinated search expression "microwaves AND radiation" can be used to retrieve documents on microwave radiation, when these have been indexed under the separate terms "microwaves" and "radiation" rather than a compound term.

2.44**pre-coordination**

combination of **concepts** (2.11), **classes** or **terms** (2.61) of a **controlled vocabulary** (2.12) at the time of its construction or at the time of using it for **indexing** (2.27) or **classification** (2.5)

cf. **post-coordination** (2.43)

EXAMPLE 1

The class "general theory", when placed within the broader class "music", refers only to the pre-coordinated subject "theory of music" and not to theory in general.

EXAMPLE 2

The pre-coordinated string "cardboard – recycling" might appear in a subject heading scheme or, if not enumerated there, might be synthesized by an indexer when needed for a particular document.

2.45**preferred term**

descriptor

term (2.61) used to represent a **concept** (2.11) when **indexing** (2.27)

cf. **non-preferred term** (2.39)

NOTE A preferred term is usually a noun or noun phrase.

2.46**protocol**

convention that defines the syntax, semantics and synchronization of the communication process between two computers in order to enable a particular service

2.47**quasi-synonym**

near-synonym

one of two or more **terms** (2.61) whose meanings are generally regarded as different in ordinary usage but which may be treated as labels for the same **concept** (2.11), in a given **controlled vocabulary** (2.12)

EXAMPLES

diseases, disorders
earthquakes, earth tremors

2.48

related term

preferred term (2.45) representing a **concept** (2.11) that has an **associative relationship** (2.2) with the one in question

NOTE The relationship between related terms is commonly indicated with the tag RT. For a further explanation, see 10.3.

2.49

schedule

terms (2.61), **notations** (2.40), captions, cross-references and **scope notes** (2.50) set out to exhibit the content and structure of a **structured vocabulary** (2.56)

2.50

scope note

note that defines or clarifies the semantic boundaries of a **concept** (2.11) as it is used in the **structured vocabulary** (2.56)

NOTE A term used to label a concept can have several meanings in normal usage. A scope note is used to restrict the concept to only one of those meanings, and where necessary refers to other concepts that are included or excluded from the scope of the concept being clarified.

2.51

search term

term (2.61) forming all or part of a search query

NOTE In the context of ISO 25964, search terms are usually drawn from a controlled vocabulary.

2.52

sibling concept

one of two or more **concepts** (2.11) with the same immediate broader **concept** (2.11), each of these being represented by a **preferred term** (2.45)

EXAMPLE

In the following, outerwear and underwear are preferred terms representing sibling concepts in the same array:

clothing
 outerwear
 overcoats
underwear

2.53

sibling term

one of two or more **preferred terms** (2.45) with the same immediate **broader term** (2.3)

EXAMPLE

In the following, chairs and tables are sibling terms in the same array, while no siblings are shown for “furniture”, “armchairs” or “dining tables”:

furniture
 chairs
 armchairs
tables
 dining tables

2.54**source language**

language serving as a starting point in translation or in a search for **term** (2.61) equivalents

2.55**specificity**

capability of a **structured vocabulary** (2.56) to express a subject in depth and in detail

NOTE For a further explanation, see the discussion of specificity in 8.4 and other places.

2.56**structured vocabulary**

organized set of **terms** (2.61), headings or codes representing **concepts** (2.11) and their inter-relationships, which can be used to support **information retrieval** (2.28)

NOTE A structured vocabulary can also be used for other purposes. In the context of information retrieval, the vocabulary needs to be accompanied by rules for how to apply the terms. Various types of structured vocabulary will be addressed in ISO 25964-2, including classification schemes, subject heading schemes, etc.

2.57**subject heading scheme**

subject heading language

subject heading list

SHL

structured vocabulary (2.56) comprising **terms** (2.61) available for subject **indexing** (2.27), plus rules for combining them into pre-coordinated strings of **terms** (2.61) where necessary

2.58**synonym**

one of two or more **terms** (2.61) denoting the same **concept** (2.11)

EXAMPLES

In English:

guarantees, warranties
heart attack, myocardial infarction
HIV, human immunodeficiency virus

In French:

schiste, phyllade
VIH, virus de l'immunodéficience humaine
crise cardiaque, infarctus du myocarde

NOTE Abbreviations and their full forms can be treated as synonyms.

2.59**syntagmatic relationship**

a posteriori relationship

relationship between **concepts** (2.11) that exists only because they occur together in a **document** (2.15) being indexed

NOTE Such relationships are not generally valid in contexts other than the document being indexed, and therefore they do not form part of the structure of a thesaurus. For a more complete discussion of syntagmatic and paradigmatic relationships, see 4.3.

2.60

target language

language providing a translation or an equivalent for a **term** (2.61) existing in a **source language** (2.54)

2.61

term

word or phrase used to label a **concept** (2.11)

EXAMPLES

schools
school uniform
costs of schooling
teaching

NOTE Thesaurus terms can be either preferred terms or non-preferred terms.

2.62

thesaurus

controlled (2.12) and **structured vocabulary** (2.56) in which **concepts** (2.11) are represented by **terms** (2.61), organized so that relationships between **concepts** (2.11) are made explicit, and **preferred terms** (2.45) are accompanied by lead-in entries for **synonyms** (2.58) or **quasi-synonyms** (2.47)

NOTE The purpose of a thesaurus is to guide both the indexer and the searcher to select the same preferred term or combination of preferred terms to represent a given subject. For this reason a thesaurus is optimized for human navigability and terminological coverage of a domain.

2.63

top term

preferred term (2.45) representing a **concept** (2.11) that has no broader **concept** (2.11) in the **thesaurus** (2.62)

2.64

vocabulary control

management of a vocabulary in order to disambiguate and constrain the form of the **terms** (2.61) and limit the number of **concepts** (2.11) and **terms** (2.61) available for **indexing** (2.27)

NOTE Control is achieved by distinguishing between homographs, so that each one has just one meaning, and by picking out from a set of synonyms or quasi-synonyms, the one which is to be preferred for use in indexing. The purpose of these restrictions is to increase the likelihood of indexers and searchers choosing the same term to label a particular concept.

3 Symbols, abbreviated terms and other conventions

3.1 Table 1 shows the abbreviated terms that are used in English language examples of thesaurus records as tags to prefix terms and notes. Each tag indicates the relationship or function of the term or note that follows.

Table 1 — Symbols and abbreviations

Description	Symbol	Tag	Meaning
<i>Descriptive elements</i>		SN	Scope note
		DEF	Definition
		HN	History note
<i>Codes</i>		SC	Subject category; a code or notation applied to a group of concepts relevant to a particular subject
		CC	Concept code or notation
<i>Relationships</i>	→	USE	Use; the term that follows the tag is the preferred term that should be used in place of the non-preferred term that precedes the tag
	=	UF	Use for or Used for; the term that follows the tag is a non-preferred term for which the preferred term preceding the tag should be used instead
		USE...+	The two or more preferred terms following the tags should be used together to represent the indicated concept
		UF+	The non-preferred term that follows should be represented by a combination of preferred terms including the preferred term that precedes the tag
		TT	Top term; the preferred term that follows the tag represents the broadest concept in a hierarchy to which the specific concept belongs
	<	BT	Broader term; the term that follows the tag represents a concept having a wider meaning
		BTG	Broader term (generic)
		BTI	Broader term (instantial)
	-<	BTP	Broader term (partitive)
	>	NT	Narrower term; the term that follows the tag refers to a concept with a more specific meaning
		NTG	Narrower term (generic)
		NTI	Narrower term (instantial)
	>-	NTP	Narrower term (partitive)
	—	RT	Related term; the term that follows the tag is associated, but is not a synonym, a quasi-synonym, a broader term or a narrower term

Table 2 — English language tags and their equivalents in other languages

Tags in English	Tags in French	Tags in German	Tags in Danish	Tags in Finnish	Tags in Norwegian	Tags in Swedish	Tags in Spanish	Tags in Chinese	Tags in Russian
SN Scope note	NE Note explicative ^b Note d'emploi	H Erhäutering (Hinweis)	SN Forklarende note	Huomautus ^c	NO Note	SN Anmärkning	NA Nota de aplicación Nota de alcance	J 解 jie	лп Лексическое примечание см
USE Use	EM Employer	BS Benutze	USE Brug	KÄ käytä	BRUK Bruk	USE Använd	USE Usé	Y 用 yong	Смотря
UF Use for Used for ^a	EP Employer pour Employer pour	BF Benutzt für Benutze für	UF Brugt for	KT konvattu termi	BF Brukt for	UF Används istället för	UP Usado por Use por	D 代 dai	с Синоним
BT Broader term	TG Terme générique	OB Oberbegriff	BT Overordnet term	LT laajempi termi	OT Overordnet term	BT Överordnad term	TG Término genérico	S 属 shu	в Выше
NT Narrower term	TS Terme spécifique	UB Unterbegriff	NT Underordnet term	ST suppeampi termi	UT Underordnet term	NT Underordnad term	TE Término específico	F 分 fen	н Ниже
RT Related term	TA Terme associé	VB Verwandter Begriff	RT Relateret term	RT rikkakaistermi	SO Se også	RT Relaterad term	TR Término relacionado	C 参 can	а Ассоциация
BTG Broader term (generic)	TGG Terme générique (générique)	OA Oberbegriff (Abstraktionsrelation)	BTG Overordnet term (generisk)					ВР Выше—род	
BTP Broader term (partitive)	TGP Terme générique (partitif)	SP Verbandsbegriff (Bestandsrelation)	BTP Overordnet term (partitiv)					ВЧ Выше—целое	
BTI Broader term (instantial)	TGI Terme générique (instance)		BTI Overordnet term (instans)						
NTG Narrower term (generic)	TSG Terme spécifique (générique)	UA Unterbegriff (Abstraktionsrelation)	NTG Underordnet term (generisk)					НВ Ниже—вид	
NTP Narrower term (partitive)	TSP Terme spécifique (partitif)	TP Teilbegriff (Bestandsrelation)	NTP Underordnet term (partitiv)					НЧ Ниже—часть	
NTI Narrower term (instantial)	TSI Terme spécifique (instance)		NTI Underordnet term (instans)						

NOTE The selection of languages in Table 2 is open-ended. Future editions of this part of ISO 2964 could include additional tags.

a Lines in italics show variant tags and/or expansions.

b French AFNOR Standard (AFNOR Z47-100) proposed NA: Note d'application

c In the Finnish standard 'Scope note' is translated "Selitys" at the moment, but "Huomautus" would be a better translation. There is no associated tag.

3.2 Thesauri in Dutch use the same tags as in English, without translation.

3.3 The abbreviations listed as tags in Table 2 have acquired status as generally recognized conventions, and they occur in many published thesauri. They have mnemonic value, but apply only in particular languages. If a more neutral system of abbreviation is required, the language-independent symbols in the left-hand column of Table 1 are recommended.

3.4 The following conventions are also used in examples throughout this part of ISO 25964. Note that these conventions are not required of all thesauri.

- a) Preferred terms are printed in the case they would normally have in full text. Typically that means lower case throughout, with the exception of upper case for abbreviations and acronyms, and initial capital letters for proper names.

EXAMPLES

cars
animals

- b) Non-preferred terms are printed in italics.

EXAMPLES

cars	<i>automobiles</i>
UF <i>automobiles</i>	USE cars
animals	<i>fauna</i>
UF <i>fauna</i>	USE animals
World Health Organization	<i>WHO</i>
UF WHO	USE World Health Organization

4 Thesaurus overview and objectives

4.1 Overall objective

The traditional aim of a thesaurus is to guide the indexer and the searcher to choose the same term for the same concept. In order to achieve this, a thesaurus should first list all the concepts that might be useful for retrieval purposes in a given domain. The concepts are represented by terms, and for each concept, one of the possible representations is selected as the preferred term (see 4.2 and 6.6). Secondly, a thesaurus should present the preferred terms in such a way that people will easily identify the one(s) they need. This is achieved by establishing relationships (see Clauses 8 to 10) between terms — and/or between concepts — and using the relationships to present the terms in a structured display.

When implemented in a search system or indexing system, the terms and relationships in the thesaurus may be exploited in numerous ways, including:

- search expansion;
- suggestion of alternative search terms;
- support for clustering or other means of refining a search;
- identification of common spelling mistakes;
- support of automatic indexing.

The interplay between terms, concepts and relationships is illustrated in the data model in Clause 15. For reasons of practicality this part of ISO 25964 refers frequently to "terms". But it should never be forgotten that the purpose of manipulating terms is to support retrieval of the underlying concepts.

4.2 Vocabulary control and its purpose

Establishing an appropriate preferred term to represent a particular concept is not always straightforward because a concept can often be expressed in more than one way. Furthermore, in ordinary discourse one term can have more than one meaning. Vocabulary control is therefore essential, and thesauri are used to achieve this by the following two principal means.

- a) Concepts and terms are deliberately restricted in scope to selected meanings. Unlike the terms in a dictionary, which are often accompanied by a number of different definitions reflecting common usage, each term in a thesaurus is generally restricted to whichever single meaning serves the needs of a retrieval system most effectively. The structure of a thesaurus, notably its display of hierarchical relationships, frequently indicates the intended meaning of a term. If this technique is not sufficiently explicit, a scope note should accompany the term. This note should state the chosen meaning, and it may also indicate other meanings that are recognized in natural language but which have been deliberately excluded for indexing purposes.
- b) When the same concept can be expressed by two or more synonyms or quasi-synonyms in the same language, one of these terms is usually selected as the preferred term, which is then used consistently in indexing or simply as the first or only term representing the concept. Reference to the preferred term should be made from any synonym that might also function as a user's access point.

One consequence of using the measures in a) and b) for vocabulary control is that the resultant language might not correspond to a user's preferences. The thesaurus has an important role in mediating between terms used in discourse and those that function effectively for information retrieval. To achieve the retrieval benefits, users need to accept a degree of artificiality in the controlled vocabulary (although in some systems this difficulty can be overcome by automatic substitution of the user's term with the preferred form).

So that a thesaurus can function effectively in a multilingual context, the concepts included need to be represented in all of the languages present, enabling speakers of these languages to have access to them. If the thesaurus is "symmetrical" as described in this part of ISO 25964 and modelled in Clause 15, each concept should have a preferred term in each language, and the scope should be the same in all the languages. This constraint sometimes adds to the artificiality of the vocabulary. Alternative approaches (for example the use of mappings between vocabularies) will be described in ISO 25964-2.

4.3 Paradigmatic versus syntagmatic relationships

The purpose of establishing and displaying relationships is likewise to guide users (or intelligent agents acting on their behalf) to choose the most appropriate term(s) for expressing a given concept. This is achieved by presenting terms that a user might consider instead of, or as well as, the term entered first. Means for displaying relationships are described in Clause 12.

Two kinds of relationship are commonly encountered between indexing terms in any one language.

- a) Relationships that exist only because the concepts occur together in the context of a particular document are called syntagmatic relationships. When two or more indexing terms are assigned to the same document, this act effectively records a syntagmatic relationship between them. In a thesaurus, however, inclusion of syntagmatic relationships is not recommended.

EXAMPLE 1

An indexer dealing with a work on "Computers in banks in Amsterdam" might identify three concepts represented respectively by the terms: "banks (financial institutions)", "computers" and "Amsterdam". He assigns these to the document. In a post-coordinate system the relationship between these terms is not explicitly indicated in metadata, but the document would nonetheless be retrieved if any or all of these terms were used as retrieval keys. In a pre-coordinated index an entry can be provided for the combination of three terms, with a reference to the location where the corresponding document can be found. The concepts in this example are not normally associated according to common frames of reference, and their interrelationships can, therefore, be regarded as document-dependent.

- b) Relationships that are valid in almost all contexts, especially when they are inherent in the concepts that the terms represent, are known as paradigmatic relationships. It is useful to show paradigmatic relationships between thesaurus concepts, as they will frequently guide users to concepts closely related to the terms they first thought of.

EXAMPLE 2

Using concepts from the previous example, "banks (financial institutions)" has an inherent relationship with the broader concept "financial institutions"; "computers" has a strong association with "data processing", independent of the subject of the document being indexed; and "Amsterdam" is inseparably linked with "Netherlands". A user looking up any of these linked terms might be interested in information indexed with the former terms. These paradigmatic relationships are independent of any particular document. They are generally recognized and could be established through reference to standard works, such as dictionaries and encyclopaedias.

The distinction between these two kinds of relationships can be displayed as shown in Figure 1.

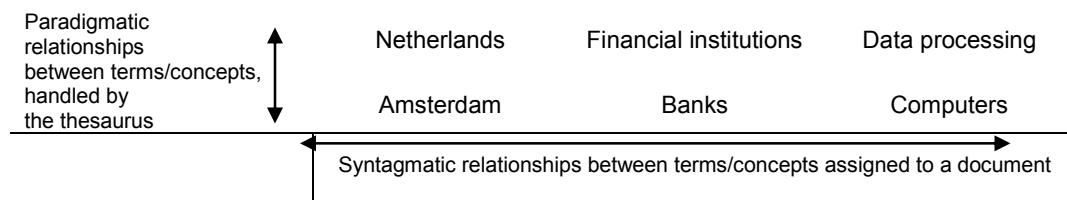


Figure 1 — Paradigmatic and syntagmatic relationships

4.4 Types of paradigmatic relationship

Three types of paradigmatic relationship between terms, a), or between concepts, b) and c), should be established and clearly distinguished:

- a) the equivalence relationship as it applies in both monolingual and multilingual situations (see Clauses 8 and 9 respectively);
- b) the hierarchical relationship (see 10.2);
- c) the associative relationship (see 10.3).

Further subdivisions of each of these classes are described in Clauses 8 to 10. Each of these relationships should be established reciprocally, and this should be indicated by a system of tags, symbols or abbreviations used to represent relationships in a thesaurus. The conventional tags described in Clause 3 are used in the examples that follow.

5 Concepts and their scope in a thesaurus

5.1 Conceptual basis

5.1.1 The prime application for a thesaurus is in information retrieval, where the aim is to search for concepts. As explained in 4.1 and 4.2, the concepts are represented by terms. Each term included in a thesaurus should represent a single concept (or unit of thought). Concepts can range from the simple (e.g. "cats") to the very complex (e.g. "racial discrimination among ethnic minorities"). Compound terms or phrases are generally needed to express the more complex concepts. See Clause 7 for a more complete discussion of these.

5.1.2 The concepts included in a thesaurus may be considered as belonging to mutually exclusive categories based on shared characteristics. The following examples are indicative but do not list all the possible categories.

- a) Things and their physical parts.

EXAMPLE SET 1

birds
birth certificates
limbs
microforms
monuments
mountain regions

NOTE Physical parts are also things, and can have their own parts.

- b) Materials.

EXAMPLE SET 2

adhesives
rubber
titanium

- c) Activities or processes.

EXAMPLE SET 3

dressmaking
fertilization
glaciation
land management

- d) Events or occurrences.

EXAMPLE SET 4

birthdays
civil wars
revolutions

- e) Properties of persons, things, materials or actions.

EXAMPLE SET 5

consciousness
elasticity
personality
speed

- f) Disciplines or subject fields.

EXAMPLE SET 6

archaeology
organic chemistry
theology

- g) Units of measurement.

EXAMPLE SET 7

hertz
kilometres

- h) Types of people and organizations.

EXAMPLE SET 8

charities
children
international nongovernmental organizations
nations
poets
visually impaired people

5.1.3 Unique entities expressed as proper names may also be included in a thesaurus, where they should be used only for records that are *about* the person, document or object, etc. When the entity represented by the proper name is not the subject of a document, but has a different relationship, such as being its creator or title, the proper name should not be recorded together with subject terms, but elsewhere.

Proper names also belong to categories such as those listed in 5.1.2.

- a) Places.

EXAMPLE SET 1

Australia
Milky Way
South Kensington
Sri Lanka

- b) Specific objects, topographical features, and other entities.

EXAMPLE SET 2

Magna Carta
Mona Lisa
Nelson's Column
Romeo and Juliet
Skylab

- c) Individuals, organizational posts, and corporate bodies.

EXAMPLE SET 3

Burns, Robert
United Nations Secretary-General
World Health Organization

5.2 Scope notes

The intended scope of a concept in the thesaurus is not always the most common meaning associated with its preferred term (or any one of its non-preferred terms) in ordinary discourse. In the thesaurus, context is usually provided by the hierarchy of broader and narrower concepts linked to the concept in question and this helps to elucidate the intended scope. Often it is possible to formulate the preferred term of the concept in an unambiguous way that conveys the intended scope to any user (see 6.2.2). However, in cases where these measures are not appropriate or sufficient, or where additional information would help to clarify the meaning and make the usage more consistent, an explicit scope note should be used.

A scope note should be used to clarify the boundaries of a concept, especially when the meaning of the preferred term in ordinary discourse can be interpreted too broadly or too narrowly, or to distinguish between preferred terms that have overlapping meanings in natural language. It can also be used to provide other advice on term usage to either the indexer or the searcher. A scope note need not be a full definition but should clarify the intended use of a term within the thesaurus. Other types of note may be conveyed separately; see 6.2.3 for definitions and 6.2.4 for history notes.

Unlike the qualifiers considered in 6.2.2, a scope note is not regarded as forming part of the term to which it is attached.

EXAMPLE 1

microwave frequencies
SN 1 GHz to 300 GHz

EXAMPLE 2

illuminations
SN Includes both the ornamental decoration and the illustrations in manuscripts, as well as in some early printed books, if done by hand

5.3 Reciprocal scope notes

When reference is made to other concepts in a scope note, a reciprocal scope note should generally be provided for each concept mentioned.

EXAMPLE

In English:

food products

SN Use only for products intended for human consumption. For products for animals, see **petfoods** or **feeds**.

petfoods

SN Food products for animals maintained as domestic pets. For products for human consumption, see **food products**. For products intended for non-domestic animals, see **feeds**.

feeds

SN Products intended for non-domestic animals. For products for domestic pets, see **petfoods**. For products for human consumption, see **food products**.

In French:

statistique

NE Désigne la science statistique; pour les données statistiques employer "statistiques"

statistiques

NE Désigne les données statistiques; pour la science statistique, employer "statistique"

Even where the scope of only one of the concepts requires clarification, it is useful to make an editorial note (see 15.2.14) in the record for any additional concept, of where it has been cited. The purpose of the reciprocal reference is to ensure that when a change is made to one of the concepts, or it is deleted, the effect on the other concept is considered.

6 Thesaurus terms

6.1 Form of terms

The terms selected to represent concepts may be single-word terms or multi-word terms (see Clause 7).

6.2 Clarification and disambiguation of thesaurus terms

6.2.1 General

In ordinary discourse, a single term might have more than one meaning, and the most common meaning is not always the one needed to represent the concept wanted in the thesaurus. If the context provided by the hierarchy of broader and narrower concepts linked to the concept in question is insufficient to elucidate the intended scope, additional measures should be applied. While all thesaurus terms should be expressed as unambiguously as possible, it is especially important to formulate the preferred term of a given concept in such a way that it conveys the intended scope to any user. For example, the multi-meaning term "depression" could be reformulated as "economic depression" or "meteorological depression", as appropriate. Alternatively a qualifier (see 6.2.2) may be used. In cases where these measures are not appropriate or sufficient, or where additional information would help to clarify the meaning and make the usage more consistent, an explicit scope note should be used (see 5.2).

6.2.2 Homographs and qualifiers

Homographs (sometimes referred to by the broader term "homonyms") are words with the same spelling but different meanings.

EXAMPLE 1

cranes (This term can refer either to birds or to lifting equipment.)

When homographs are needed as thesaurus terms, the meaning of each term should be clarified and the traditional way to do this is by adding to it a qualifier in parentheses. The qualifier should be as brief as possible, ideally consisting of one word. Often a broader term, the qualifier should indicate the context or subject area to which the concept belongs. It forms part of the term and does not serve as a scope note (see 5.2).

EXAMPLE 2

cranes (birds)
cranes (lifting equipment)

A qualifier should be added to each homographic term, even when one of its senses is more common than the other in the domain of the thesaurus. For example in English, "beams (structures)" is an appropriate preferred term in an engineering thesaurus that also includes "beams (radiation)". For example in French, "eau (boisson)" is an appropriate preferred term in an environmental thesaurus that also includes "eau (environnement)".

If only one of the homographic terms is used in a specialized thesaurus, and its meaning is obvious to the users of the thesaurus, the qualifier may be left out. However, consideration should be given to the possibility that the thesaurus scope may be expanded in the future, or that interoperability with other vocabularies covering different scopes might be needed.

Since the qualifiers make the terms slightly cumbersome to apply, and since some electronic systems have difficulties in applying them, their use (especially in preferred terms) should be avoided if another means of resolving ambiguity can be found. For this reason, a multi-word term should be preferred to a single-word term with a qualifier, as long as the compound form occurs in natural language.

EXAMPLE 3

For example, "industrial plants" should be preferred to "plants (facilities)". The latter expression, however, might be entered as a non-preferred term.

Parenthetical qualifiers should not be used to provide a term in inverted form.

EXAMPLE 4

For example the inverted forms "cookery (fish)" and "pens (fountain)" are incorrect and the direct forms "fish cookery" and "fountain pens" should be used instead. "Fountain" is used in the latter example to indicate a type of pen rather than to disambiguate the word "pen". (See also 7.7 on the order of words in multi-word terms). Appropriate uses of qualifiers with the term "pens" in English are: "pens (enclosures)" and "pens (writing implements)". Appropriate uses of qualifiers with the term "audition" in French are: "audition (physiologie)" and "audition (communication)".

In the case of acronyms and abbreviations, which are often homographs, the qualifier should be the full form of the term (see also 6.6.8). Qualifiers for acronyms and abbreviations should only be used when their meaning is considered to be ambiguous to the users of the thesaurus, i.e. when they have another known meaning either in the domain covered by the thesaurus or in common language.

6.2.3 Definitions

A full definition is not usually required to clarify the way in which a preferred term should be used. However, if a definition is required for another reason, a separate note field should be established for the definitions so that they do not become confused with any scope notes. The source of each definition should be recorded alongside the definition itself.

EXAMPLE

chiaroscuro

DEF The style of pictorial art in which only the light and shade are represented (OED)

NOTE "OED" refers to the Oxford English Dictionary (www.oed.com). Any such acronyms in thesaurus definitions or scope notes should be explained in the introduction to the thesaurus (see 13.4).

6.2.4 History notes

When a thesaurus is updated, changes in terms can affect the retrievability of a concept. In such cases a history note may be used.

A history note may apply to a single preferred or non-preferred term, or to a concept. It should be used when a new preferred term is added to the thesaurus or a change is made to an existing term that affects the concept's scope in different periods of application. While it is possible to include such information in the scope note, a separate history note is preferable. A history note may record the date of introduction, or it may give more complex advice on how to search for the concept in earlier or later times.

EXAMPLE 1

microwave ovens

HN Concept introduced 1985

EXAMPLE 2

notebook computers

HN Term introduced 1999; prior to that use "laptop computers"

6.3 Grammatical form of terms

6.3.1 Nouns and noun phrases

A thesaurus term should preferably consist of a noun or a noun phrase. This includes gerunds, which are verbal nouns (see 6.3.4). In the English language (and in others, such as German, French and other romance languages) noun phrases occur in two forms:

- a) adjectival phrases (including some where a noun or possessive functions as adjective)

EXAMPLE SET 1

Burkitt's lymphoma
cold fusion
environmental luminosity
stone walls
tropical diseases

- b) prepositional phrases

EXAMPLE SET 2

accessories after the fact
hospitals for children
prisoners of war

As prepositions can unnecessarily add to the length and clumsiness of a term, they should be avoided if possible, especially in preferred terms. For example, use "carbohydrate metabolism" rather than "metabolism of carbohydrates". (However, the latter term could still be admitted as a non-preferred term.)

In some other languages such as Chinese, prepositional phrases do not occur, but other types of noun phrase are available and should be used.

6.3.2 Adjectives

Adjectives can be useful as components of noun phrases, but if used standing alone they are a potential cause of problems in retrieval. A search for an article about "the use of red lights as warning signals for low bridges", if indexed with adjectival terms such as "red" and "low", could result in the retrieval of information about low lights and/or red bridges.

For this reason the use of adjectives as thesaurus terms should be avoided. The same caution applies even if the adjective is converted to the corresponding noun, e.g. "red" to "redness".

Exceptions may be made where there are strong reasons, for example in a thesaurus for indexing reports of medical symptoms or for images or other non-text collections, where adjectives describing the appearance might be very important.

EXAMPLES

dark red
large
oval
smooth

6.3.3 Adverbs

Adverbs such as "very" or "highly" should not be used as thesaurus terms. A phrase beginning with an adverb should not be accepted as a thesaurus term unless it has acquired a special meaning.

EXAMPLES

very high frequency
very large scale integration

6.3.4 Verbs

In the English language verbs expressed as infinitives or participles should not be used alone as thesaurus terms, unless they are expressed as gerunds (for example, "weaving", "broadcasting"). Activities should be represented by nouns or verbal nouns. For some other languages, infinitives may be acceptable and this recommendation may be adapted to respect commonly accepted conventions for indexes.

EXAMPLES

cookery *or* cooking (not "cook", "to cook", "cooked", etc.)
distillation (not "distil")
swimming (not "swim")

6.3.5 Initial articles**6.3.5.1 Omission**

The use of initial articles in thesaurus terms should generally be avoided. If necessary, a parenthetical qualifier should be used.

EXAMPLES

arts	<i>rather than</i>	the arts
state (political entity)	<i>rather than</i>	the state

6.3.5.2 Retention

If the initial article is an integral part of a proper name and needs to be searchable, it should be included in the thesaurus term in direct order. Otherwise, the article should be omitted or the term inverted. If the omission causes ambiguity, a qualifier should be added. Whether or not the article is considered an integral part of the name depends on the language and the context. In the following examples, English is the assumed language of the thesaurus.

EXAMPLE 1

El Niño
Le Havre
Los Angeles
Needles (Isle of Wight)
The Who (rock music group)

Where a term might be sought with or without the article, a reference should be made from the non-preferred form.

EXAMPLE 2

<i>Salvador (country)</i>	USE	El Salvador
<i>The Needles</i>	USE	Needles (Isle of Wight)
<i>Who, The</i>	USE	The Who (rock music group)

6.4 Capitalization, punctuation and special characters**6.4.1 Capitalization**

A consistent style should be used for the presentation of thesaurus terms. This part of ISO 25964 uses lower case throughout, except where capitals are required in proper names. As computers are no longer restricted to using upper case only, either lower case or lower case with initial capitals should be used.

Exceptions may be made for abbreviations, acronyms, proper names or terms that are conventionally written in a special style. In these cases, the style that is most widely accepted among the anticipated users of the thesaurus should be used.

EXAMPLES

British Airways Plc
ActiveX
DNA
NPK fertilizers
pH
photocopies

6.4.2 Non-alphabetic characters

The use of punctuation marks, diacritics and other special characters can cause problems for entering terms, as well as sorting and processing in search applications. Apostrophes, parentheses, hyphens and numerical characters can complicate a search expression. The use of such characters should be minimized, especially in preferred terms.

EXAMPLE SET 1 (of avoidance of special characters)

In English:		
beta rays	<i>Not</i>	β-rays
databases	<i>Not</i>	data-bases
nonfiction	<i>Not</i>	non-fiction
research and development	<i>Not</i>	research & development
In French:		
rayon bête	<i>au lieu de</i>	rayon β
recherche et développement	<i>au lieu de</i>	recherche & développement

However, as their use cannot be avoided completely, they should be retained wherever the terminology would otherwise be ambiguous, ungrammatical or unacceptable to the user community of the thesaurus, particularly in abbreviations, chemical names, proper names and trademarks, or if these terms belong to a standardized vocabulary in the domain. For thesauri in languages other than English, diacritics are often essential.

EXAMPLE SET 2 (where special characters cannot be avoided)

In English:
2,4-D
bis(tributyltin) oxide
Boyle's law
Burkitt's lymphoma
X-rays
In French:
2,4-D
oxyde de bis(tributylétain)

Hyphens and diacritics should also be retained in non-preferred terms, especially when they are used as commonly recognized spelling variants in the language of the thesaurus.

EXAMPLE SET 3 (of special character retention in non-preferred terms)

In English:
non-fiction USE nonfiction
résumés USE resumes
In French:
contre-marche EM contremarche
contre-plaqué EM contreplaqué

Where possible (but not in the case of names of chemicals, and others where they form an integral part of the term) the use of parentheses should be limited to qualifiers.

6.5 Singular or plural forms

6.5.1 Cultural and linguistic factors

Different conventions exist in different natural languages concerning the use of singulars or plurals. Indexers in some language communities, for example French and German, tend to use the singular form so that the user can approach and use the thesaurus in the same way he would approach and use a dictionary. In English and Spanish, however, it is usual to base the choice on whether a particular term is a count noun or a non-count noun. The latter convention helps to distinguish between a process such as "painting", which can only be expressed in the singular, and the product of the same process, in this case "paintings". The form of the terms in each language should be based on the conventions applied in this language. As a consequence of such practice, a multilingual thesaurus is liable to have entries in which a term in the singular in French or German has an English equivalent in the plural form.

EXAMPLE

fr:	maison
de:	Haus
en:	houses
es:	casas

6.5.2 Treatment of count nouns in English and Spanish

NOTE The guidelines in this subclause are known to apply to English and Spanish, but not to French and German. For any other language, the best approach can be established by investigating practice in widely used thesauri in that language.

Count nouns are names of countable entities that are subject to the question "How many?" but not "How much?". They should be expressed as plurals.

EXAMPLE SET 1 (of count nouns)

documents
penguins
political parties
windows

One exception is the names of parts of the body, which are usually expressed in the singular.

EXAMPLE SET 2 (of exceptions)

digestive system
eye
head

Another exception is the names of living organisms. Many species, such as *Escherichia coli* or *Euonymus fortunei*, do not have a common name and are known only by their scientific name, which by convention is expressed in Latin, in the singular. In the interest of consistency, when Latin names and names accepted as English coexist in one compilation, the singular may be applied throughout. Use of the singular is not mandatory, however, and thesaurus editors may prefer the plural, for example "zebras", "whales" or "daffodils". Once a convention has been chosen, it should be applied consistently.

When a controlled vocabulary is used for naming museum objects, the singular forms of terms are commonly used. In general, however, concepts represent categories of objects rather than individual objects, and the plural form is more appropriate. A single item might be named a "chair", but the category likely to be sought by an enquirer is "chairs". Using the plural form of the preferred term in these cases can add consistency so that the same thesaurus may be used for museum objects as for other types of information resources.

6.5.3 Treatment of non-count nouns in English and Spanish

NOTE The guidelines in this subclause are known to apply to English and Spanish, but not to French and German. For any other language, the best approach can be established by investigating practice in widely used thesauri in that language.

Non-count nouns are names of concepts such as materials or substances that are subject to the question "How much?" but not "How many?". They should usually be expressed as singulars.

EXAMPLE SET 1 (of non-count nouns)

cotton
aluminium
steam

However, if the community of users served by the thesaurus regards a given substance or material as a class with more than one member, the class should be expressed in the plural.

EXAMPLE SET 2 (of exceptions)

grasses
poisons
steels

The names of abstract phenomena, properties, systems of belief, activities and disciplines are often non-count nouns that should be expressed in their singular forms.

EXAMPLE SET 3 (additional non-count nouns)

Abstract phenomena:	personality; winter
Properties:	brittleness; opacity; solubility
Systems of belief:	Catholicism; Shintoism; communism
Activities or processes:	cutting; immigration; shrinkage
Disciplines:	astronomy; sociology

However, when an abstract concept is regarded as a class with more than one member, the term representing the class should be expressed in the plural.

EXAMPLE SET 4 (additional exceptions)

chemical reactions
intelligence tests
physical sciences

6.5.4 Coexistence of singular and plural

In any language, where the singular and plural forms of a term refer to different concepts both should be entered in the thesaurus. The distinction between them should be reinforced by adding a scope note and if possible a qualifying term or phrase.

EXAMPLE 1

In English:
wood (material)
woods (areas of woodland)
In French:
statistique (science)
statistiques (données)

The added qualifier becomes an integral part of the term; it does not constitute a scope note (see also 5.2).

Where singular and plural denote the same concept, but their spelling differs to such an extent that the terms would be separated by unrelated terms when filed alphabetically, a reference should be made from the non-preferred form.

EXAMPLE 2

In English:
mouse USE mice
In French:
yeux EM oeil

Where singular and plural denote the same concept, and their spelling differs very little, e.g. "apron" and "aprons", it is usual to provide an entry only for the preferred term. But the non-preferred form may be added as an aid when computer look-up is anticipated.

6.6 Selection of the preferred form

6.6.1 General

Sometimes more than one term in the same language is available to represent the same concept. When multiple terms are included corresponding to the same concept, one of these should be designated the preferred term and the others non-preferred terms (see Clause 8). The situation across languages is described in Clause 9.

Where there is a choice between synonymous forms of expression, the preferences of the community to be served by the thesaurus should be adopted (subject to the avoidance of ambiguity or language that might be offensive to some users).

6.6.2 Spellings

The most widely accepted spelling of words should be adopted for preferred terms. If variant spellings exist and are commonly recognized, each should be entered in the thesaurus as a non-preferred-term, and a reference should be made from the non-preferred term to the preferred term.

EXAMPLE 1

In English:
<i>Roumania</i> USE Romania
<i>Rumania</i> USE Romania
In French:
<i>Lithuanie</i> EM Lituanie

EXAMPLE 2

In English:
non-fiction USE nonfiction
In French:
co-voiturage EM covoiturage

Where possible, spelling should follow the practice of a well-established dictionary or glossary in the language of the thesaurus. If a choice between spellings is made for reasons of dialect (for example between American English and British English), the chosen source should be stated in the introduction to the thesaurus (see 13.4), and the choice should be adhered to consistently throughout.

However, proper names can cause legitimate inconsistencies in spelling practice, as they should be spelt according to the practice of their owners or recognized authorities such as the Virtual International Authority File (VIAF)¹⁾. See Example set 3, which assumes British spelling for terms other than proper names as appropriate.

EXAMPLE SET 3

colour	UF	<i>color</i>
defence	UF	<i>defense</i>
Department of Defense		(a US government department)
Ministry of Defence		(a UK government department)

Misspelt words are not acceptable in preferred terms. However, some misspellings are so common that they can provide useful entry points, especially in electronic thesauri, and they may be used as or in non-preferred terms.

EXAMPLE 4

In English:
abattoirs
UF <i>abatoirs</i>
<i>abbatoirs</i>
<i>abattoirs</i>
In French:
Mitterrand François
EP <i>Mitterand François</i>

Misspelt entry points should be provided only where:

- a) the misspelling is common enough to be worthwhile; and
- b) there is no danger that the misspelling relates to a term other than the preferred term indicated.

The entries should be marked in some way to clarify that the terms are misspelt. One option is to substitute a tag such as MS (meaning MisSpelling) for UF as the introductory tag.

When misspelt words are entered as non-preferred terms, a choice may be made to suppress the misspelt entries in printed or electronic displays, where they add nothing to a user's understanding of the concept, but retain them in electronic versions used to interpret search terms entered by users.

1) VIAF is a joint project of several national libraries (17 at the time this part of ISO 25964 was prepared, contributing over 13 million personal name authority records), hosted by OCLC and available at <http://viaf.org/>.

6.6.3 Loan terms and translations of loan terms

Loan terms may be used as preferred terms if they are well-established. (See also 9.3.3.2 and 9.3.3.3.)

EXAMPLE SET 1 (of loan terms)

In English:
bouquets
gestalt therapy
ombudsmen
In French:
handball
permafrost
pizza

Occasionally a loan term and a putative translation coexist. If the loan term is more widely accepted, it should be treated as the preferred term, whereas the translation may be preferred if it has become well-established. Reciprocal references should be made between the two terms.

EXAMPLE SET 2 (of loan terms with translations)

In English:
<i>coiffeurs</i>
USE hairdressers
hairdressers
UF <i>coiffeurs</i>
abattoirs
UF <i>slaughterhouses</i>
<i>slaughterhouses</i>
USE abattoirs
In French:
baladodiffusion
EP <i>podcast</i>
podcast
EM <i>baladodiffusion</i>

6.6.4 Transliteration

When transliterating terms from languages with different alphabets, a recognized scheme should be followed. The scheme used should be specified in the introduction to the thesaurus. Some relevant schemes can be found within Reference [27] and the standards publications listed in the Bibliography. See also 12.4, which addresses machine encoding issues associated with use of alternative scripts.

6.6.5 Neologisms, slang terms and jargon

Established terms for concepts should in general be used instead of slang or jargon terms, since these are often transient.

Useful neologisms, however, are often coined in response to emerging technologies or developments in society or politics. They may be adopted as thesaurus terms as soon as they are judged useful for the retrieval of information.

EXAMPLE SET 1 (of useful neologisms)

In English:
carbon trading
smart cards
In French:
alicament
baladodiffusion
littérisme

Slang or jargon entries may be needed in circumstances such as the following:

- a) A newly-emerging concept is expressed by a term originating within a particular subculture or social group, and no widely accepted alternative exists. The slang or jargon term should then be accepted as a preferred term.

EXAMPLE SET 2 (of acceptable slang or jargon terms)

hippies
web feeds

- b) Where a slang or jargon term is widely used in place of the well-established term, many users would find it a useful entry point. A non-preferred term should be provided from the slang or jargon to the preferred term.

EXAMPLE SET 3 (of slang or jargon terms given non-preferred status)

In English:
psychiatrists
UF <i>shrink</i>
<i>shrink</i>
USE psychiatrists
In French:
<i>policier</i>
EP <i>flic</i>
<i>flic</i>
EM <i>policier</i>

- c) Where the anticipated audience has a strong preference for slang or jargon it may be helpful to use slang/jargon as preferred terms, entering the alternative terms as non-preferred. This could happen, for example, with an audience of young people (preferring slang).

6.6.6 Common names and trade names

A product is frequently known by a recognized trade name. Where a suitable common name also exists, this should normally be adopted as the preferred term, and the trade name should be admitted as a non-preferred term only if it is likely to serve as a user's access point. As registered trademarks enjoy legal protection, the symbol "®" should be added to the term to avoid legal problems.

EXAMPLE 1

soluble coffee
UF Nescafé®
Nescafé®
USE soluble coffee

Exceptions can occur, for example in applications where one generic product is sold under several competing trade names and the users want to distinguish between the different brands. In this case the preferred term for the generic product should be the common name, and the trade names may be used as narrower terms. See also the discussion of specificity in 8.4.

EXAMPLE 2

ballpoint pens
NT Bic pens
Biros

6.6.7 Popular names and scientific names

If a popular and a scientific name refer to the same concept, preference should be given to the form more likely to be sought by users of the thesaurus. For example, "penguins" might be chosen as the preferred term in a general thesaurus, but the scientific equivalent, "Sphenisciformes", may be preferred in a zoological thesaurus. Reciprocal references should be made in these cases.

6.6.8 Abbreviations and acronyms

Abbreviations and acronyms are often ambiguous, because they can refer to more than one concept. Therefore the full form of the name should normally function as the preferred term, with a reciprocal reference from the abbreviated form.

EXAMPLE SET 1 (of acronym/abbreviation disambiguation)

In English:

United Nations Environment Programme
UF UNEP

UNEP
USE United Nations Environment Programme

direct current
UF DC (*direct current*)

DC (*direct current*)
USE direct current

national insurance
UF NI (*national insurance*)

NI (*national insurance*)
USE national insurance

In French:

nouveaux pays industriels
EP NPI (*nouveaux pays industriels*)

NPI (*nouveaux pays industriels*)
EM nouveaux pays industriels

Exceptionally, abbreviations or acronyms may be used as preferred terms when they are widely known, unambiguous and readily understood within the field covered by the thesaurus, especially if they have become so well-established that the full form of the name is rarely used or is generally ignored. Reciprocal references should still be made between the full term and its abbreviation.

EXAMPLE SET 2 (of acronyms/abbreviations which do not need disambiguation)

In English:

UNICEF
UF *United Nations International Children's Emergency Fund*

United Nations International Children's Emergency Fund
USE UNICEF

HIV
UF *human immunodeficiency virus*

human immunodeficiency virus
USE HIV

In French:

SIDA
EP *Syndrome d'immunodéficience acquise*

Syndrome d'immunodéficience acquise
EM SIDA

6.6.9 Proper names

6.6.9.1 General

Proper names are often useful in a thesaurus but are sometimes excluded if there are too many candidates, especially if their forms are controlled by another authority list, or by a set of rules such as the *Anglo-American cataloguing rules*^{2)[37]}. However, they should be included if the thesaurus is the only means of validating index terms. Inclusion has the additional benefit that hierarchical or associative links (see Clause 10) can be established between subject terms and relevant proper names, for example when the latter represent instances of the former.

EXAMPLES

mountains
NT Ben Nevis
Mount Everest
Hockney, David (1937-)
BT artists
RT contemporary art

6.6.9.2 Place names

Names of countries and geographical regions sometimes vary from language to language. Variant terms referring to the same place also occur within a single language community for reasons such as the following:

- a) a "popular" and an "official" name are both in common use;

EXAMPLE 1

Republic of Korea
South Korea

- b) the vernacular form of the name differs from the usual form of the name in the language of the thesaurus;

EXAMPLE 2

Leghorn	(A thesaurus in English may include this translation of the Italian city locally known as "Livorno")
Livorno	(The same thesaurus may also include the vernacular name)

- c) in a country with more than one official language, two forms may commonly be used;

EXAMPLE 3

Gand	(In Belgium, this French name for the city of Ghent coexists with the name in Dutch)
Gent	(In Belgium, this Dutch name for the city of Ghent coexists with the name in French)

2) While this set of rules is widely used at the time of preparation of this part of ISO 25964, there are plans to replace it with a new standard known as RDA: Resource Description and Access.

The name that is most familiar to the users of the thesaurus should be designated as the preferred term. Preference should be given to the official rather than the popular name. The short form of the official name should be preferred. Standard authorities, such as ISO 3166, should be consulted for the official forms. Reciprocal references should be made between the preferred and non-preferred forms.

EXAMPLE 4

Ireland
UF <i>Irish Republic</i>
<i>Eire</i>
<i>Eire</i>
USE Ireland
<i>Irish Republic</i>
USE Ireland

6.6.9.3 Names of institutions and persons

Variant names are common and can create problems if they are not controlled. When included in a thesaurus, the form of the names should be selected in accordance with a recognized code of cataloguing practice, such as the *Anglo-American cataloguing rules*³[37]. Care should be taken to ensure the name used as the preferred term is correct, current and sufficiently complete to avoid confusion with other persons or institutions. Alternative forms of the name that are in common use should be established as non-preferred terms.

EXAMPLES

Armstrong, Louis (1901-1971)	UF	Satchmo (1901-1971)
Berners-Lee, Tim		
Otlet, Paul (1868-1944)		
Centre national de la danse (France)	UF	CND (Centre national de la danse)
Intergovernmental Committee for Physical Education and Sport		
Association for Professional Broadcasting Education (U.S.)	UF	Broadcast Education Association (U.S.)

7 Complex concepts

7.1 General

Concepts range from the very simple to the very complex. At the simple end are notions such as "silver" or "people". Greater complexity is found in "Georgian silver teapots" or "human rights campaigners". The latter expression, for example, combines at least three distinct concepts into one more complex concept.

Complex concepts are very often conveyed by compound terms, i.e. terms that can be morphologically split into two or more components. Some of these are multi-word terms, and some consist of just one word.

"Biodegradability", for example, is a single-word term combining the idea of being easy to break down with the notion that living organisms will be the cause of the breakdown. In theory one could synthesize the concept with a combination of "degradability + living organisms".

3) While this set of rules is widely used at the time of preparation of this part of ISO 25964, there are plans to replace it with a new standard known as RDA: Resource Description and Access.

Splitting "biodegradability" into two concepts might seem cumbersome or unsatisfactory, but when the complex concept is usually conveyed by a multi-word term, splitting into simpler concepts becomes a more easily understandable option. For example, "human rights campaigners" can easily be split into "human rights + campaigners", or "camping holidays" could be adequately conveyed using "camping + holidays". Some concepts present many options for synthesis. For example, "human resource management" could be conveyed by "human resources + management" or "people + resource management" or even "people + resources + management".

The availability of so many choices presents the thesaurus editor with a difficult and subjective decision: whether to admit the complex concept or whether to rely on simpler concepts for users to apply in combination. Where the thesaurus allows several options, an important consideration is to guide all users to use the same combination for a given concept. Consistency becomes even harder to achieve if the concept is split into more than two components, as in the example of "people + resources + management".

Another consideration is that the introduction of complex concepts, whether represented by single-word or multi-word terms, tends to increase specificity. Greater specificity helps users to achieve greater discrimination. For example, if "biodegradability" is admitted as a narrower term of "degradability", searchers have an easy way to find relevant documents without unwanted items on degradability by chemical means, the action of ultraviolet light, etc. However, there is a penalty in that the thesaurus becomes larger and sometimes separates like items, making it harder for users to identify the right term.

Most of the examples in Clause 7 are based on multi-word terms. However, similar considerations apply to many complex concepts conveyed by single-word terms. Furthermore, in languages such as German, which uses very many compound words, the option of splitting single-word terms will occur much more commonly than in English and the same guidance applies.

7.2 The nature of compound terms

In the English language, compound terms very often consist of more than one word.

EXAMPLE SET 1

road safety
thesaurus management software
birds of prey

The parts of most such terms can be distinguished as follows.

- a) The focus or head, i.e. the noun component that identifies the general class of concepts to which the term as a whole refers.

EXAMPLE SET 2 (of term focus)

- 1) the noun component "indexes" in the term "printed indexes"
 - 2) the noun "hospitals" in the prepositional phrase "hospitals for children"

- b) The difference or modifier, i.e. one or more further components that serve to narrow the scope of the focus and thereby specify one of its subclasses.

EXAMPLE SET 3 (of term difference)

- 1) the adjective "printed" in the term "printed indexes"
 - 2) the preposition-plus-noun combination "for children" in the term "hospitals for children"

A similar analysis can sometimes be applied to single-word compound terms.

EXAMPLE SET 4 (of single-word compound terms)

Term	Focus	Difference
agroindustry	industry	agro (derived from "agriculture")
biosecurity	security	bio (prefix associated with biology)

7.3 Deciding whether or not to admit a complex concept

7.3.1 The options in outline

Taking a straightforward example, a concept such as "road safety" could be represented using a combination of the simpler concepts "roads" and "safety". As the complexity increases, more choices have to be considered. Thus, thesaurus management software could be represented by "thesauri" + "management" + "software" or by "thesaurus management" + "software".

The following five main options should be considered for handling a proposed complex concept.

- a) Admit the concept, representing it with a single preferred term.

EXAMPLE SET 1

camping holidays road safety thesaurus management software
--

- b) Admit the concept, representing it as a combination of two or more terms. In this case, a non-preferred term for the whole concept should be entered, pointing to the appropriate combination of simpler preferred terms. This option is often referred to as "splitting" the concept.

EXAMPLE SET 2

camping holidays USE camping + holidays thesaurus management software USE thesaurus management + software
--

- c) Admit the concept as a candidate, for review after a trial period.
- d) Reject the complex concept, as too infrequently required, irrelevant or inappropriate.
- e) Reject the concept for direct inclusion, but retain a broader concept and admit a non-preferred term pointing to the broader preferred term.

EXAMPLE SET 3

road safety USE safety thesaurus management software USE software
--

7.3.2 Factors to consider

The decision on admission is often difficult and subjective. It may in part be guided by analysis of any transaction log files that are available (see 13.1.3.3 and 13.2.2). The thesaurus developer should also consider the balance of advantages in the retrieval situations that are likely to occur. Factors such as the following (which are not listed in order of priority) should be borne in mind.

- a) Frequency of use. Some provision should be made for a candidate complex concept if the concept is frequently sought or if it is of growing importance to the user community. This is all the more straightforward if the term representing it is widely used and understood by the audience. Option a) of 7.3.1 should usually be adopted but options b) and c) may also be considered.
- b) Degree of discrimination needed. If there is a large anticipated volume of relevant documents to be indexed, it may be important to discriminate between the complex concept and similar concepts. Where "road safety" occurs, for example, the same document collection may also deal with rail safety and/or transport safety more generally, as well as fire safety, safety in the home, etc. Many users might want to discriminate between these different aspects of safety. Admitting all these terms gives an increased level of specificity, allowing greater precision in both indexing and searching.
- c) Multiplicity of search options, leading to incomplete retrieval. The availability of a number of closely-related preferred terms complicates the choice of options. For example, if the thesaurus has all of the terms "safety", "transport safety", "passenger safety", "pedestrian safety", "vehicle safety" as well as "road safety", the searcher might need to try all these options (and also combinations of "safety" with terms such as "roads", "vehicles", "cars", "road traffic", etc.) to be sure of finding all the relevant material. If the total number of documents on safety is small, searching might be easier and more effective if none of the complex concepts is accepted as a preferred term and a post-coordinated search expression such as "roads + safety" is the only retrieval option.
- d) Compound terms in which one focus has more than one difference. In the preceding examples, relatively simple terms were used in which the focus "safety" was qualified by only one difference, for example "transport". Greater complexity occurs with terms such as "vehicle fire safety", for which the focus is qualified simultaneously by two differences. Terms like these multiply still further the search options and impede straightforward retrieval, and so they should be avoided. For example, the combination of "vehicle safety" + "fire safety" adequately represents the needed concept and causes no confusion.
- e) Expectations of the anticipated users. A term such as "pre-coordinate indexes" could be acceptable and useful in a thesaurus to serve information retrieval specialists, but could be confusing if the thesaurus is intended for a more general audience. In the latter case the best solution might be not to split the term into "pre-coordination" + "indexes", but to choose option e) of 7.3.1, making it a lead-in term to the broader term "indexes" (see 8.4).
- f) Avoiding ambiguity. Sometimes inclusion of a complex concept is needed to avoid ambiguity if the component concepts could be combined in different ways, having different meanings. For example, a combination of "libraries" and "science" could be used to represent "library science" or "science libraries". A preferred term for one or both of the complex concepts may, therefore, be admitted to avoid the retrieval of unwanted items.
- g) Multilingual complications (see Clause 9). In the case of multilingual thesauri, constraints or particular needs found in any one of the languages may influence inclusion or exclusion of a complex concept across all the languages.
- h) Anticipated search environment. If the search software offers sophisticated capabilities such as clustering of search results, customization to reflect the interests of particular users or user communities, etc., the level of specificity needed in the thesaurus can be affected. This factor should be balanced against the probability that the software and other aspects of the environment might change in future.

7.3.3 Circumstances that favour splitting a complex concept

The following circumstances favour splitting.

- a) Splitting may be considered when the concept is quite specific and falls outside the core scope of the thesaurus. Inclusion of a large number of peripheral terms increases the bulk and complexity of the vocabulary without giving much retrieval benefit.
- b) If very few documents are likely to be indexed with the proposed term, inclusion as a preferred term might not be worthwhile, and splitting is an option to consider.
- c) The complex concept should be split if the focus is qualified by more than one difference. For example, "underwater cine cameras" should be split into "underwater cameras" and "cine cameras".
- d) The complex concept should usually be split if the focus represents a property, part or component of the difference.

EXAMPLES

aircraft engines
hospital floors
instrument reliability
soil acidity

However, exceptions can occur if the concept is well-defined and distinctive, for example "lamp shades" or "body temperature". References to body temperature are likely to differ significantly from references to the temperature of other inanimate objects or substances that might be discussed in the same document collection.

7.3.4 Circumstances that rule against splitting a complex concept

A complex concept should not be split if the following conditions apply.

- a) A term for the concept has become so familiar in common use, or in the field covered by the thesaurus, that its expression as separate elements would hinder comprehension.

EXAMPLE SET 1

data processing
gross domestic product

- b) Splitting the concept into its parts would lead to a loss of meaning, or ambiguity.

EXAMPLE SET 2

In English:
plant food
("food" + "plants" could represent either "food" for "plants" or "plants" as "food".)
In French:
marque de voiture
("marque" + "voiture" could represent either a "voiture" used as a "marque" or a "marque" of a "voiture".)
société de construction
("société" + "construction" could represent either a "société" for "construction" or the "construction" of a "société".)

- c) The concept is represented by an established term that is a proper name, or incorporates a proper name.

EXAMPLE SET 3

Boolean logic
United Nations

- d) The difference in an established term has lost its original meaning.

EXAMPLE SET 4

In English:	
lawn tennis	
deck chairs	
trade winds	
In French:	
pistolet à température	
maison mère	
police d'assurance	

- e) The concept is represented by a term containing a difference suggesting a resemblance, as a metaphor, to an unrelated thing or event.

EXAMPLE SET 5

tree structures
wing nuts

- f) The parts of the concept when separated do not convey the overall concept. Thus, it would be misleading to index the corresponding documents with terms representing the part concepts.

EXAMPLE SET 6

In English:	
fire escapes	(a discussion of fire escapes might say nothing about fires or escaping)
swimming pools	(a discussion of swimming pools might have little information on swimming)
In French:	
établissement de santé	(a discussion of "établissement de santé" might have little information on "santé")
classe de neige	(a discussion of "classe de neige" might have little information on "neige")

- g) The concept is represented by a term in which the focus has another meaning in the absence of the difference.

EXAMPLE SET 7

artificial flowers chocolate eggs	(It would be misleading to use the term "eggs" to index items dealing with chocolate eggs, since the chocolate ones are a type of confectionery rather than a type of egg.)
--------------------------------------	---

7.4 How to split a complex concept

In simple cases, for example that of road safety, the concept may be adequately expressed using the words in the multi-word term, i.e. "roads" + "safety". The justification for doing this in a particular thesaurus might be that any document dealing with road safety is likely to contain information relevant to both of the constituent terms and that somebody looking for information about roads is likely to judge an article on road safety as relevant.

When a concept is split, the constituent concepts may be represented by preferred terms that differ from the words of the multi-word term. Often the constituent words need to be modified to convey the correct concept. For example, "rail safety" should not be split into "rails" + "safety", but might be expressed as "railways" + "safety". For "human resources" the combination of "people" + "resources" is probably more acceptable to users than "humans" + "resources".

For complex concepts that do not justify a single preferred term but are likely to be sought by users, thesaurus entries of the following form should be provided (see 8.5 for more details).

EXAMPLE

rail safety USE railways + safety
--

7.5 Retention of constituent concepts

7.5.1 General

In the event that a compound term is accepted as a preferred term, consideration should be given to inclusion of preferred terms representing each of its constituent concepts if they are not already present in the thesaurus. For example, if "road safety" is accepted, the thesaurus should usually also contain the preferred terms "roads" and "safety". The latter term would be established as a broader term of "road safety", and "roads" as a related term (see 10.3).

7.5.2 Parts and components

Confusion can arise when the difference of the compound term is a machine or other complex assembly of which the focus refers to a component. For example, if "aircraft engines" is split into "aircraft" and "engines", a search for the term "aircraft" on its own will return records of all aircraft components as well as complete aircraft.

This might be acceptable for some collections, but in others will result in an overloading of the term "aircraft" and provide no means of isolating the documents dealing with whole aircraft. One solution is to create a preferred term such as "aircraft components". This term may be used in combination with "engines", or "instrumentation" or "under-carriages" or any other type of component.

7.6 Consistency in the treatment of complex concepts

In general, consistency of practice is a useful aim as it encourages consistent application by users. However, absolute consistency in the admission of complex concepts is difficult to achieve and is not always necessary. As the specificity needed in core areas of the thesaurus is usually greater than that for peripheral areas, some inconsistencies are inevitable. This type of inconsistency does not have a negative effect on retrieval performance as long as there are enough clear and helpful entries in the thesaurus, and so it may be disregarded.

In some circumstances, however, consistent rules are helpful for thesaurus editors. For example, when a thesaurus is shared among several organizations, using it for different document collections and user groups, judgements about the level of specificity are harder for one person to make. Similarly, if thesaurus compilation is a networked project, in which suggestions are invited from hundreds of contributors around the world, some guidance is necessary.

To achieve consistency, a set of criteria appropriate to the subject field should be established. For example, the *Art & Architecture Thesaurus*^[26] has a set of rules for when to split compound terms, with an emphasis on the needs in cataloguing objects in museums and galleries. One such rule is to split a compound if the difference is a style or period term, thus the concept "baroque gilding" would be represented by the combination "baroque" + "gilding".

7.7 Order of words in multi-word terms

Preferred terms that are either adjectival or prepositional noun phrases should be entered in the thesaurus in natural language order, not as inverted terms. However, the inverted form of a prepositional phrase may be entered as a non-preferred term. This is especially useful if the thesaurus is used in printed form; it might not be necessary for an electronic thesaurus that can be searched for any word embedded in a term.

EXAMPLES

matter, states of	USE	states of matter
prey, birds of	USE	birds of prey

For adjectival phrases (for example "brown bread" or "double beds") an inverted entry might not be necessary because the focal noun is usually present as a broader term (see 10.2). The entry for the broader term (for example "bread" or "beds") provides an entry point from which all its narrower terms can be found.

8 The equivalence relationship, in a monolingual context

8.1 General

The equivalence relationship is the relationship between a preferred term and its corresponding non-preferred term(s) in the same natural language. As shown in the data model in Clause 15, this relationship applies between terms rather than between concepts.

NOTE The equivalence relationship between terms representing the same concept in different natural languages, often referred to as cross-language equivalence, is discussed in Clause 9.

The relationship is reciprocal, and reciprocity between preferred and non-preferred terms should be expressed by the following conventions:

USE, written as a prefix to the preferred term;

UF (use for or used for), written as a prefix to the non-preferred term.

EXAMPLE

In English:
greenhouses
UF <i>glasshouses</i>
<i>glasshouses</i>
USE greenhouses
In French:
biodiversité
EP <i>diversité biologique</i>
<i>diversité biologique</i>
EM biodiversité

Equivalence is established in four general situations:

- a) the terms are synonyms (see 8.2);
- b) the terms are quasi-synonyms (see 8.3)
- c) the term is regarded as unnecessarily specific and it is represented by another term with broader scope (see 8.4);
- d) the term is regarded as unnecessarily specific and it is represented by a combination of two or more terms (known as "compound equivalence"). (See 8.5).

8.2 Synonyms

Various types of synonym are encountered in practice. The following list is not exhaustive, but it indicates some of the more common classes of synonyms.

- a) Terms of different linguistic origin.

EXAMPLE SET 1

In English:
freedom; liberty
sweat; perspiration
In French:
marketing; mercatique
lobby; groupe de pression

- b) Popular names and scientific names.

EXAMPLE SET 2

In English:

baking soda; sodium bicarbonate
rock roses; Cistus

In French:

aspirine; acide acetylsalicylique
ail; Allium sativum

- c) Common nouns and trade names.

EXAMPLE 3

vacuum flasks; Thermos® flasks; Thermos® bottles

- d) Variant names for emergent concepts.

EXAMPLE SET 4

hovercraft; air cushion vehicles
laptop computers; notebook computers

- e) Current or favoured terms versus outdated or deprecated terms.

EXAMPLE SET 5

developing countries; underdeveloped countries
radio; wireless

- f) Variant spellings, including stem variants, inverted word order and irregular plurals. Among the variant spellings, it might be useful to include some misspellings (see 6.6.2).

EXAMPLE SET 6

In English:

geese; goose
groundwater; ground-water; ground water
paediatrics; pediatrics
radiation, ionizing; ionizing radiation; ionising radiation
Romania; Rumania; Roumania

In French:

clef; clé
Lithuanie; Lituanie
nénuphar, nénufar
bioénergie, bio-énergie
oeil, yeux

- g) Terms originating from different cultures sharing a common language.

EXAMPLE SET 7

In English:
flats; apartments
lifts; elevators
In French:
mitaine (fr-CA); moufle (fr-FR)
journal de classe (fr-BE) ; agenda scolaire (fr-FR)

- h) Abbreviations or acronyms and full names.

EXAMPLE SET 8

FAO; Food and Agriculture Organization
pvc; polyvinyl chloride

- i) Common nouns and slang or jargon terms.

EXAMPLE SET 9

In English:
psychiatrists; shrinks
soluble coffee; instant coffee
In French:
policier; flic
café soluble; café instantané

In these and similar cases, preferred terms should be selected to serve the needs of the majority of users, bearing in mind the recommendations in 6.4 and 6.6. For the sake of predictability, these criteria should be applied consistently throughout the thesaurus. If, for example, it is decided that popular names rather than scientific names should serve as preferred terms, this decision should be applied consistently except when an appropriate popular name does not exist. Similarly, consistent spelling conventions should be adopted. The editorial conventions and criteria should be noted in an introduction to the thesaurus (see 13.4).

As an option, it is possible to designate which type of equivalence prevails between a pair of terms, by using tags other than USE/UF. The following tags are sometimes used (in English).

SP Spelling variant

MS MisSpelling (see also 6.6.2)

AB ABbreivation

FT Full form of the Term

Additional tags may be devised to extend this principle to the cases described in 8.3 and 8.4. However, customization should only be undertaken with caution (see 10.4). All non-standard tags should be fully explained in the Introduction (see 13.4).

8.3 Quasi-synonyms

Quasi-synonyms frequently represent points on a continuum, and can even be antonyms (opposites).

EXAMPLE SET 1 (of opposites treated as quasi-synonyms)

consistency, inconsistency wetness, dryness
--

In the second line of Example set 1 above, the concept sought in the thesaurus is "the amount of moisture in an object or material", which could be expressed in terms either of wetness or of dryness. Arbitrarily, one of the terms is chosen as the preferred term and the other as the non-preferred term.

In other cases, the concepts are so closely related that discussion of one is likely to interest a user seeking the other.

EXAMPLE SET 2 (of related concepts treated as quasi-synonyms)

bushes, shrubs mallets, hammers

The extent to which terms are treated as quasi-synonyms depends to a large extent upon the subject field covered by the thesaurus. In a thesaurus specializing in clothing manufacture, the terms "gloves" and "mittens" might both be established as preferred terms, whereas a more general thesaurus for the textile industry as a whole might treat the two terms as quasi-synonyms. The decision should be based on anticipating the degree of discrimination required at the time of searching.

8.4 Specific terms subsumed in a broader concept

It is sometimes helpful to treat the name of a class, and also the names of its members, as an equivalence set, with the broader term functioning as the preferred term.

EXAMPLE

rock UF <i>basalt</i> <i>granite</i> <i>slate</i> <i>etc.</i>
<i>basalt</i> USE rock
<i>granite</i> USE rock
<i>slate</i> USE rock

This technique is sometimes used to reduce the number of preferred terms in a thesaurus. It limits the specificity of indexing and searching that can be achieved, and is beneficial when the collection to be indexed has very little information on the subject area in question. The presence of the non-preferred terms provides extra entry points to assist user access. Subsumption of narrower concepts in a broader one should not, however, be used when there is a wealth of information on the subject in question and greater specificity is needed to pinpoint concepts with accuracy.

8.5 Representation of complex concepts by a combination of terms

Where a multi-word term is deemed to be unsuitable as a preferred term, but might be sought by some users, it may be represented by a combination of two or more preferred terms [sometimes known as compound equivalence; see also 7.3.1, option b)]. An entry of the following type may be admitted in the thesaurus.

EXAMPLE SET 1 (of entries for complex concepts)

<i>coal mining</i>
USE coal
+ mining
<i>ferromagnetic films</i>
USE ferromagnetic materials
+ films

Reciprocals in the following form should be provided.

EXAMPLE SET 2 (of reciprocal entries for a complex concept)

coal
UF+ <i>coal mining</i>
mining
UF+ <i>coal mining</i>

The three-way relationship appears complex, but the tags **USE** and + are differentiated only for ease of legibility. In functional terms, the relationship between "coal" and "*coal mining*" is identical to that between "mining" and "*coal mining*", in both directions.

Hypothetically, combinations of terms could be linked with "OR" rather than "AND" (see Example set 3). However, this situation should be handled as a case of homography (see 6.2.2). The "OR" connector should be avoided, and entries that clarify the scope of the alternatives should be provided instead (see Example set 4 below).

EXAMPLE SET 3 (of practice to be avoided)

In English:
<i>pitch</i>
USE audio frequency
OR gradient
In French:
<i>ton</i>
EM nuance de couleur
OU tonalité (musique)

However, this type of usage should be avoided, and entries that clarify the scope of the alternatives should be provided instead.

EXAMPLE SET 4 (of avoidance of complex relationships involving "OR")

In English:
<i>pitch (sound)</i> USE audio frequency
<i>pitch (steepness)</i> USE gradient
In French:
<i>ton (couleur)</i> EM nuance de couleur
<i>ton (musique)</i> EM tonalité (musique)

9 Equivalence across languages

9.1 General

In a multilingual thesaurus, all languages should have equal status and, if possible, each concept should be represented in every language of the thesaurus. A collection that has been indexed using any one of the languages can then be searched equally effectively using any of the other languages.

When every concept in a multilingual thesaurus has a preferred term in each language and all languages share exactly the same structure of hierarchical and associative relationships, the structure is said to be "symmetrical". For discussion of non-symmetrical structures, see 9.2 c), 10.2.6 and 10.3.4.

It is possible also to treat different dialects or sublanguages as though they were separate languages. For example, American English, British English and Indian English may be treated as different languages, all three presented separately in one trilingual thesaurus. Many of the terms are common to two or three of the languages, but other terms are different. Similarly, the terminology preferred by scientists may be presented as a different language to that of marketing and sales personnel. If the thesaurus is treated as monolingual, one preferred term is assigned to each concept, and the alternative scientific term or dialect term appears as a non-preferred term [(see 6.6.2 and 8.2 g)]. Treating it as a multilingual thesaurus allows equal status to be given to each dialect or sublanguage.

In a multilingual thesaurus, a bi-directional cross-language equivalence relationship should be shown between preferred terms that represent the same concept in each of the languages. As an option, each concept may be given a notation and/or unique identifier (see 12.1.3).

In cases where a suitable term is not available in one language, it is often possible to modify the scope of the concept so that it can be represented by a suitable term in each of the thesaurus languages. Alternatively, an inexact or partial equivalent may be accepted in one language, or a gap in one of the languages may be filled with a loan term or a coined term (see 9.3.3).

Where it proves impossible to find suitable terms to represent every concept in each of the languages of a multilingual thesaurus, it might be necessary to treat the different language versions of the multilingual thesaurus as if they were two or more parallel monolingual thesauri and to establish mappings between the corresponding terms. The establishment of mappings will be described in ISO 25964-2.

NOTE: Approaches for managing the construction of a multilingual thesaurus are discussed in 13.3.3.

9.2 Degrees of equivalence

During preparation of a multilingual thesaurus, the following degrees of equivalence are most frequently encountered. They are not to be treated as distinct relationship types but rather as points along the spectrum of possibilities that lie between the extremes of exact equivalence and absence of equivalence.

- a) **Exact equivalence.** In this ideal situation, a concept is represented in every language of a multilingual thesaurus, and it is possible to identify preferred terms that are semantically and culturally equivalent. A cross-language equivalence relationship should be established between the corresponding preferred terms.

EXAMPLE SET 1

en: sun / es: sol / fr: soleil / de: Sonne
 en: rail network / fr: réseau ferroviaire / de: Schienennetz / nl: spoorwegnet
 fr: physique / en: physics / es: física / de: Physik

- b) **Inexact or near-equivalence.** The terms found in different languages sometimes carry a small difference in scope, perhaps due to differences of culture, connotation or appreciation (similar to the case of quasi-synonyms within one language; see 8.3.) If, however, the terms are accepted as being close enough to represent the same concept when used in the thesaurus, then a preferred term for each language should be selected, equivalence between them established, and the scope of the concept understood as including all the cultural variations.

EXAMPLE SET 2

en: information retrieval / fr: repérage d'information
 fr: jeu didactique / en: learning games
 en: legal education / fr: enseignement du droit
 en: farms / es: granjas

- c) **Partial equivalence**, also known as **broader/narrower equivalence**. Sometimes one language has no term that accurately represents the concept for which a label is sought, but does have a term that is normally considered to represent a broader or narrower concept. If the scope of the concept represented by one term falls completely within the scope of the concept represented by the other, the terms are said to be partially equivalent. If the difference in scope is small enough, it might be acceptable to admit the terms to the thesaurus, treating the two as equivalents that both represent the same concept (similar to the case of specific terms subsumed in a broader concept, within one language; see 8.4.) A scope note should be added to the concept in one or both languages, to clarify any doubts. In Example 3, a German scope note is unnecessary, as the thesaurus concept corresponds closely to the normal meaning of "Wissenschaft"; but a scope note in English is needed, to clarify that a very broad definition of "science" should be understood when using the thesaurus.

EXAMPLE 3

de: Wissenschaft / en: science
 SN: Includes natural and social sciences and knowledge in general

A special case of partial equivalence can arise when one of the languages offers two or more partial equivalents that, in combination, represent the whole of the concept represented by one term in the source language. This situation is sometimes described as "**compound equivalence**".

EXAMPLE 4

fr: sécurité / de: Sicherheit / en: safety, security

In Example 4, the concept represented by the French term "sécurité" is accurately labelled in German by "Sicherheit"; in English "security" normally represents part of its scope, while "safety" covers the other part. A term to cover both at once is hard to find in the English language. The situation can sometimes be handled by adding qualifiers and/or accepting coined terms in one or more of the languages (see examples in 9.3.2 and 9.3.4). If this type of solution is not acceptable it might become necessary to introduce non-symmetrical structures, or to treat the terms as belonging to separate monolingual thesauri, and establish one-to-many mappings between them as will be described in ISO 25964-2.

- d) **Non-equivalence.** Sometimes no term in one language can be found that even partially or inexactly represents a concept that is needed in the thesaurus. This problem can usually be solved by means of a coined term or a loan term (see 9.3.3). For example, the Gaelic term "ceilidh" is often borrowed by English speakers to describe a social event originating in the Gaelic culture. Similarly, the concept of "régime pédagogique" is unique to the Canadian culture and if needed in a bilingual thesaurus might have to be represented in English by borrowing the French term itself, or by coining a term such as "pedagogic regime".

ISO 25964-2 will extend the discussion by covering equivalence mappings. These are used when identifying equivalent concepts in different vocabularies, or where non-symmetrical structures are found in a single multilingual thesaurus. When the concepts and structure provided in one language are not matched comprehensively in the other languages, mappings between equivalent concepts should be established selectively wherever possible, to enable navigation and support interoperability.

9.3 Typical problems and solutions

9.3.1 General

In the ideal situation, for each concept a preferred term can be found in each of the languages, and these terms are exact equivalents in normal discourse. Thus, it becomes possible for one-to-one relationships between preferred terms in all cases, and for all languages to share the same structure of hierarchical and associative relationships. The difficulties that occur in practice can sometimes be resolved by accepting inexact or partial equivalents as preferred terms [see 9.2 b) and c)]. But additional problems are often caused by quasi-synonyms (see 8.3) or unidentified homographs (see 6.2.2) in one or more of the languages, or by the complete absence of a term to represent a concept in one or more of the languages [see 9.2 d)]. There is rarely a unique correct solution. It is important to weigh up the merits of the alternatives in each case and consider what is best for most retrieval situations.

9.3.2 Problems caused by quasi-synonyms or homographs

If the problem is caused by homography, it can be resolved as recommended in 6.2.2, by adding qualifiers where appropriate (see Example 1, below). The same solution may also be applied even when the problem terms are much closer in meaning, to the extent that they could be treated as quasi-synonyms. In Example 2, there is enough difference between the near-synonyms to justify separation into two concepts, with qualifiers to bring out the difference in one of the languages. In Examples 3 and 4, a more acceptable solution is to treat the near-synonyms as equivalents in one language, with just one term to represent the same concept in the other language.

EXAMPLE 1

English	French
spring	printemps
	source
<i>Solution</i>	
spring (season)	printemps
spring (water)	source

EXAMPLE 2

French	English
lisibilité	legibility readability
<i>Solution</i>	
lisibilité (calligraphie)	legibility
lisibilité (style)	readability

EXAMPLE 3

French	English
énergie	energy power
<i>Solution</i>	
énergie	energy <i>UF power</i>
	<i>power</i> USE energy

EXAMPLE 4

English	French
walls	mur paroi
<i>Solution</i>	
walls	mur <i>EP paroi</i>
	<i>paroi</i> EM mur

9.3.3 Absence of an equivalent term in one or more languages

A source term without a cross-language equivalent is often more specific than other terms in the same thesaurus. If this is the case, one simple solution is to remove the concept and the source term that does not have an equivalent from the thesaurus. Where such removal is not possible, three solutions are available to preserve one-to-one cross-language equivalence relationships between preferred terms in a multilingual thesaurus.

9.3.3.1 Solution 1: Transform preferred term into a non-preferred term

In the source language, transform the preferred term that does not have an equivalent in the target language into a non-preferred term. This non-preferred term can then be linked to a more general preferred term with

equivalents in the other languages of the multilingual thesaurus. Effectively the concept has been changed to a broader one than that first considered.

EXAMPLE 1

English	French
teenagers	?
<i>Solution</i>	
adolescents <i>UF teenagers</i>	adolescent
<i>teenagers</i> USE adolescents	

EXAMPLE 2

English	French
classroom environment	?
<i>Solution</i>	
<i>classroom environment</i> USE learning environment	
learning environment <i>UF classroom environment</i>	milieu d'apprentissage

9.3.3.2 Solution 2: Import the term as a loan term

Import the preferred source term into the target language as a loan term (see also 6.6.3). Native speakers of the target language should be consulted before any loan term is integrated in a multilingual thesaurus.

EXAMPLE SET 1 (of easily accepted loan terms)

German	English
Schadenfreude	Schadenfreude
Afrikaans	
veld	veld

A loan term may also be used when its translation calls for a long definition or explanation that cannot be used effectively as a preferred term in the target language.

EXAMPLE 2 (of a loan term that needs an explanatory scope note)

English	German
teenagers	Teenager H: Zwischen 13 und 19 Jahren

A loan term is sometimes used in natural language, before a coined translation becomes prevalent. This commonly occurs with scientific discoveries or new technologies. If it appears that a translation is likely to become accepted, this should be adopted as the preferred term, and the loan term should be designated as a non-preferred term.

EXAMPLE 3 (of a loan term designated to be non-preferred)

German	English
Bremsstrahlung	braking radiation UF <i>Bremsstrahlung</i> <i>Bremsstrahlung</i> USE braking radiation

9.3.3.3 Solution 3: Create an equivalent (coined) term

Create an equivalent (coined term) in the target language. Terms should be coined only after consultation between indexers, language specialists and subject specialists. Such terms may be created in the following circumstances.

- The source language term, which represents a new concept to the users of the target language, is for some reason not acceptable as a loan term.
- The source language term has already been used as a loan term by authors writing in the target language, but the term needs to be replaced because it is deemed inappropriate or unacceptable. Until the newly-coined term has become established, the loan term should continue to appear in the thesaurus as a non-preferred term.
- In a multilingual thesaurus containing three or more languages, a concept first expressed in one of the languages is already represented by a coined term in one of the other languages. An indexer working in a third language, facing a choice between two available loan terms, might prefer instead to coin an equivalent, particularly if that concept is likely to occur in the third language.

EXAMPLE 1

German	English	French
Schlüsselkind	latchkey children	enfant à clé NE Enfant dont les parents travaillent pendant la journée et qui est muni d'une clé pour pouvoir rentrer chez lui en sortant de l'école.

Coined terms can be created in the following ways (not in order of preference).

- By literal translation of the source language term or its semantic components.

EXAMPLE 2

French	English
cuisine minceur	lean cuisine

- b) By construction of a term or phrase that expresses the general meaning of the source language term.

EXAMPLE 3

German	English	French
Bremsstrahlung	braking radiation	rayonnement de freinage

- c) By invention of a neologism, which should be as concise as possible to foster acceptance (these inventions sometimes approximate to literal translations).

EXAMPLE 4

English	French
gender mainstreaming	intégration de la dimension de genre

9.3.4 Combined problems

Multiple problems often arise in one situation, and a solution might be quite complex.

EXAMPLE

Spanish	English
aislamiento	insulation isolation
<i>Solution</i>	
aislamiento acústico	acoustic insulation <i>UF insulation (acoustic)</i>
aislamiento eléctrico	electrical insulation <i>UF insulation (electrical)</i>
aislamiento físico	isolation
aislamiento térmico	thermal insulation <i>UF insulation (thermal)</i>

In Spanish, "aislamiento" can be considered a homograph, since it has the two meanings indicated. But separate terms do not exist for the two concepts, and qualifiers to make the difference clear are very hard to find. In English too, it can be argued that the term "insulation" is homographic, since the different types of insulation are quite different from each other. The solution illustrated therefore removes the broad concept of insulation altogether, replacing it with three narrower concepts to cover the main types of insulation needed in this thesaurus. At the same time a term "aislamiento físico" is coined in Spanish, corresponding to the English term "isolation".

9.4 Representation of cross-language equivalence between preferred terms

The alpha-2 language codes in ISO 639-1, which always use lower-case characters, should be applied to show equivalence between corresponding preferred terms in different languages (see also 15.2.10), as illustrated in the example below. If an appropriate code is not found in ISO 639-1, an alpha-3 code from ISO 639-2 may be used. These codes may be extended where necessary with the additional codes described in RFC 4646^[45] and listed in the IANA subtag registry^[35].

EXAMPLE

English version	Spanish version	French version
economic aid	ayuda económica	aide économique
es ayuda económica	en economic aid	en economic aid
fr aide économique	fr aide économique	es ayuda económica
UF <i>economic assistance</i>		

The example above shows the preferred terms and equivalence relationships for one concept in each language version of a multilingual thesaurus (English, Spanish and French). Cross-language equivalents are shown before intra-language equivalents. See 12.3 for additional guidance on the display of relationships in a multilingual thesaurus.

9.5 Cross-language equivalence between non-preferred terms

The number of synonyms or quasi-synonyms for a term usually varies from one language to another, and it is not necessary in a multilingual thesaurus to show cross-language equivalents for non-preferred terms. In the example in 9.4, "economic assistance" has been entered as a synonym for "economic aid". However, no synonyms have been entered for the Spanish and French preferred terms "ayuda económica" and "aide économique" respectively.

Showing cross-language equivalents for non-preferred terms in the different languages of a multilingual thesaurus can be useful when the non-preferred terms are quasi-synonyms conveying a specific aspect of the scope of the concept. Non-preferred terms are sometimes established for concepts at the boundaries of the subject scope of the thesaurus because the quantity of information to be described does not warrant the inclusion of a narrower concept with its own preferred term. As and when the scope of the thesaurus expands, the status of these terms can change so that they become preferred terms. When this happens, it is convenient if equivalents in all languages have already been identified.

For example, the term "narcissus" could be a preferred term in both the English and the French versions of a multilingual thesaurus, with "daffodils" and "jonquille" as non-preferred terms for the same concept, in the respective languages. It is possible to establish direct correspondence between "daffodils" and "jonquille", although this is not usually necessary.

10 Relationships between concepts

10.1 Introduction

Apart from the equivalence relationship there are various other types of relationships that can be established in a thesaurus. While equivalence relationships in a monolingual thesaurus apply only between (preferred and non-preferred) *terms*, the relationships introduced in this chapter are established between *concepts* (see also the data model in Clause 15). Such relationships should be included in a thesaurus only if they are paradigmatic, i.e. they have validity in a wide variety of contexts.

NOTE Such relationships are hard to display, since concepts exist only in the mind, and therefore the conventional way to display them is to show each such relationship as applying between the preferred terms that represent the concepts in question. Likewise the tags BT, NT and RT, while they stand for broader term, narrower term and related term respectively, can equally be taken as representing the notions of broader concept, narrower concept and related concept.

10.2 The hierarchical relationship

10.2.1 General

The hierarchical relationship should be established between a pair of concepts when the scope of one of them falls completely within the scope of the other. It should be based on degrees or levels of superordination and subordination, where the superordinate concept represents a class or whole, and subordinate concepts refer to its members or parts.

The following tags should be used, reciprocally:

BT (i.e. broader term), written as a prefix to the superordinate term;

NT (i.e. narrower term), written as a prefix to the subordinate term.

EXAMPLE 1

animals
NT mammals
mammals
BT animals

The hierarchical relationship may be one of three types, corresponding to three logically different situations as follows:

- a) the generic relationship;
- b) the hierarchical whole-part relationship;
- c) the instance relationship.

Each of these leads to hierarchies that are amenable to a logical test through reference to the types of concept involved, for example those listed in 5.1.2. Every subordinate concept should belong to the same inherent category as its superordinate concept, i.e. both the broader and narrower term should represent a thing, or an action, or a property, etc. (See additional discussion of facet analysis in Clause 11.)

EXAMPLE 2

- | |
|---|
| <ul style="list-style-type: none"> a) "metals" (a class of materials) and "casting" (an action) represent different types of concept and, therefore, cannot be related hierarchically; b) "metals" and "gold" both represent materials and could, therefore, be hierarchically related. |
|---|

It is possible to distinguish explicitly among the three types of hierarchical relationship using the conventions described in 10.2.2, 10.2.3 and 10.2.4. The extra work and complexity required in doing so should be balanced against the benefits for the application anticipated.

The main function of hierarchical relationships is to help both indexers and searchers choose the appropriate level of specificity. A search can be broadened or narrowed by moving up or down, respectively, in the hierarchy. A common technique for improving search recall is called "search explosion", in which the search is extended to include all of the narrower terms of the preferred term first selected [see also 16.3.3 e), 16.3.3 f) and 16.3.4 c)]. Careful adherence to the guidelines in 10.2.2 to 10.2.5 ensures that exploded searches retrieve only items that fall within the scope of the superordinate concept.

NOTE Search explosion, unlike search expansion, does not extend to associatively related terms (see 10.3).

10.2.2 The generic relationship

10.2.2.1 The generic relationship is the link between a class or category and its members or species. In addition to the test for validity described in 10.2.1, this relationship is also amenable to a logical "all-and-some test", as shown in Figure 2.



Figure 2 — Relationship that satisfies the "all-and-some test"

Figure 2 indicates that some members of the class "birds" are known as "parrots", and all "parrots", by definition and irrespective of context, are regarded as "birds". This test usually ensures that a term such as "parrots" is not subordinated to a class such as "pets", as not all parrots are pets. Figure 3 shows the relationship between the latter pair of terms.



Figure 3 — Relationship that does not satisfy the "all-and-some test"

In Figure 3, some members of the class "pets" are "parrots", and only some parrots are regarded as pets. These terms should, therefore, not be given a BT/NT linkage.

NOTE When indexing a work on "parrots as pets", preferred terms representing both of these concepts should be assigned.

10.2.2.2 This argument might not apply in the context of a specialist thesaurus devoted to domestic animals, in which the only parrots in the frame of reference are pets. In such a case, "parrots" could be subordinated to "pets" in the same hierarchy. Such approximations should be applied with caution, however, especially in networked environments in which the records from one system may be mixed with those of another. When interoperability is required, the relationships established should be universally acceptable.

10.2.2.3 The tags BT/NT are normally adequate to identify the generic relationship, but optionally, the following tags may be used:

BTG: Broader term (generic)

NTG: Narrower term (generic)

EXAMPLE

rats
BTG rodents
rodents
NTG rats

10.2.3 The hierarchical whole-part relationship

10.2.3.1 The hierarchical whole-part relationship covers a limited range of situations in which a part of an entity or system belongs uniquely to a particular possessing whole. This applies to four main classes of terms.

- a) Systems and organs of the body.

EXAMPLE 1

cardiovascular system
blood vessels
arteries
veins

- b) Geographical locations.

EXAMPLE 2

Canada
Ontario
Ottawa
Toronto

- c) Disciplines or fields of discourse.

EXAMPLE 3

science
biology
botany
zoology

- d) Hierarchical social structures.

EXAMPLE 4

armies
corps
divisions (army)
battalions
regiments

Most other cases of the whole-part relationship are not eligible for a hierarchical linkage because the part could belong to more than one whole. For example, a BT/NT relationship should not be established between "bicycles" and "wheels" because a wheel could be part of a motor car, a wheelbarrow or one of many other artefacts. An exploded search for bicycles would retrieve much unwanted material if it were extended to all types of wheel. It is sometimes the case, however, that the parts of an artefact are unique to that artefact, at least in the field of application of the thesaurus. It might be appropriate to establish a BT/NT link between "fireplaces" and "hearts", or between "bows" and "bowstrings", for example. This would usually cause no confusion and would help with exploded searches under the broader term. However, this practice is not recommended in the case of complex machines and their components, for which a more appropriate solution is to create a broader term such as "engine components", with the various components listed as narrower terms (see 7.5.2).

10.2.3.2 The tags BT/NT are normally adequate to identify the partitive relationship, but the following tags may also be used:

BTP = broader term (partitive)

NTP = narrower term (partitive)

EXAMPLE

central nervous system
BTP nervous system
nervous system
NTP central nervous system

10.2.4 The instance relationship

10.2.4.1 The instance relationship links a general concept, such as a class of things or events, and an individual instance of that class, which is often represented by a proper name (see also 6.6.9).

EXAMPLE

mountain regions	{ class
Alps	
Himalayas	{ instances

In this example, "Alps" and "Himalayas" are assigned to subordinate positions in a hierarchy. However, they are neither kinds nor parts of "mountain regions", but represent individual instances.

10.2.4.2 The tags BT/NT are normally adequate to identify the instance relationship, but the following tags may also be used:

BTI = broader term (instantial)

NTI = narrower term (instantial)

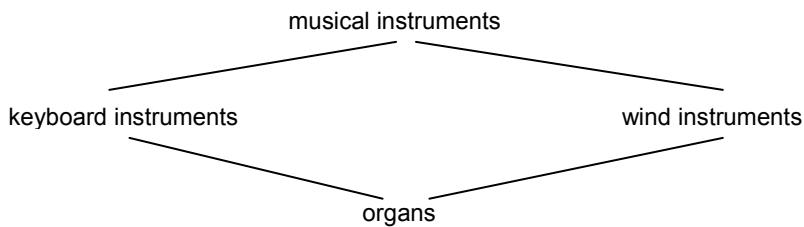
EXAMPLES

Paris
BTI capital cities
capital cities
NTI Paris

10.2.5 Polyhierarchical relationships

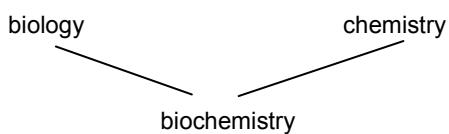
Some concepts can belong, on logical grounds, to more than one group or class at the same time. In such cases, a direct hierarchical link should be established to all of the appropriate broader concepts and the structure of the thesaurus is said to be polyhierarchical. This contrasts with a monohierarchical structure, which, for a particular concept, would allow only one of the valid BT links to be established.

EXAMPLE 1



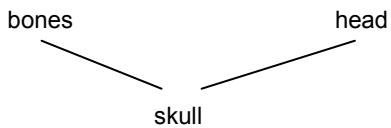
In Example 1, the term "organs" is assigned to subordinate positions on the basis of its generic relationship to two broader terms. In other cases, polyhierarchical links may be based upon whole-part relationships.

EXAMPLE 2



In some cases, polyhierarchical links can be based upon logically different relationships.

EXAMPLE 3



In Example 3, the link between "bones" and "skull" is based upon the generic relationship (the skull is a kind of bone), whereas the link between "head" and "skull" is based upon the hierarchical whole-part relationship (the skull is a part of the head).

Where one concept has more than one broader concept, all the applicable relationships should be displayed. As an option, the difference in relationship type may be explicitly shown by using the appropriate tags.

EXAMPLE 4

skull BT bones head	or	skull BTG bones BTP head
----------------------------------	----	--

10.2.6 Non-symmetrical structures in multilingual and multicultural thesauri

Normally the same structure for a given hierarchy of concepts is shared by all the language versions of a multilingual thesaurus. However, difficulties in establishing an appropriate hierarchical structure can arise when two or more culturally different communities share one thesaurus, particularly if the concepts and terms familiar to one community do not have a one-to-one correspondence with equivalent concepts and terms used by the others [see also 9.2 c)]. To accommodate cultural and linguistic differences, and to ensure that all the language versions of one multilingual thesaurus have equal status, non-symmetrical structures may sometimes be introduced. See 13.3.3 for a discussion of approaches to building a multilingual thesaurus.

NOTE If non-symmetrical structures are admitted, the data model as described in Clause 15 has to be modified.

10.3 The associative relationship

10.3.1 General

The associative relationship covers associations between pairs of concepts that are not related hierarchically, but are semantically or conceptually associated to such an extent that the link between them needs to be made explicit in the thesaurus, on the grounds that it may suggest additional or alternative terms for use in indexing or retrieval. The relationship is indicated by the tag "**RT**" (related term) and it should be applied reciprocally.

EXAMPLE

birds
RT ornithology
ornithology
RT birds

A general guideline for associative relationships is that whenever the preferred term for one concept is used, the other should always be implied within the common frames of reference shared by the users of the thesaurus. Moreover, one of the terms is often a necessary component in any explanation or definition of the other; the term "birds", for example, forms a necessary part of the explanation of "ornithology".

It is particularly important to establish an associative relationship between concepts that overlap in scope.

10.3.2 Terms and concepts with overlapping meanings

10.3.2.1 In ordinary discourse a pair of terms can often be used interchangeably in some contexts but not in others. For example, the terms "ships" and "boats" may be said to represent different concepts because while they have much in common, neither of them adequately covers the scope of the other. If two such concepts are entered in the thesaurus and represented by distinct preferred terms, it is essential to provide an associative relationship between the two. This reminds searchers that they may need to use both preferred terms to be sure of finding all the relevant material.

EXAMPLE

boats
RT ships
ships
RT boats

10.3.2.2 A pair of preferred terms with overlapping meanings may often be siblings, i.e. they share a common broader term. However, it is not necessary to interrelate all sibling terms in this way. For example, there is no need to associate terms such as "horses" and "donkeys" on the grounds that they share a common broader term, e.g. "equines", since the meanings of the terms do not overlap in this case.

10.3.3 Other cases of associative linkage

When one term is strongly implied by another, there are sufficient grounds for associating the two terms. The following groups are offered only as representative examples of typical relational situations encountered in practice.

- a) A discipline or field of study and the objects or phenomena studied.

EXAMPLE 1

forestry
RT forests

forests
RT forestry

EXAMPLE 2

neurology
RT nervous system

nervous system
RT neurology

- b) An operation or process and its agent or instrument.

EXAMPLE 3

temperature control
RT thermostats

thermostats
RT temperature control

EXAMPLE 4

crime investigation
RT detectives

detectives
RT crime investigation

- c) An action and the product of the action.

EXAMPLE 5

weaving
RT cloth

cloth
RT weaving

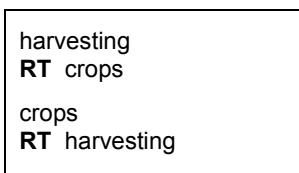
EXAMPLE 6

ploughing
RT furrows

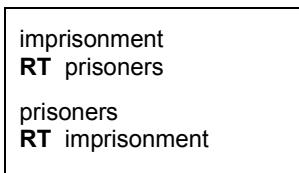
furrows
RT ploughing

- d) An action and its recipient or target.

EXAMPLE 7

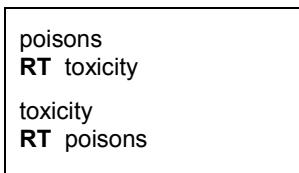


EXAMPLE 8

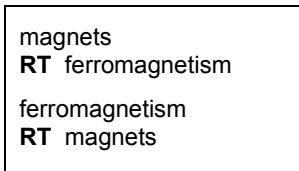


- e) Objects or materials and their defining properties.

EXAMPLE 9

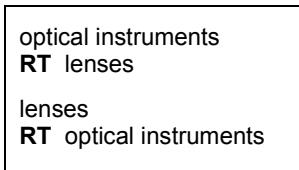


EXAMPLE 10



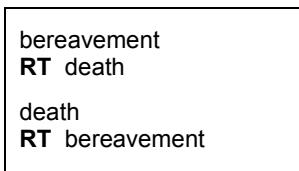
- f) An artefact and its parts, if they do not qualify for the hierarchical whole-part relationship (see 10.2.3).

EXAMPLE 11



- g) Concepts linked by causal dependence.

EXAMPLE 12



EXAMPLE 13

diseases
RT pathogens
pathogens
RT diseases

- h) An object or process and its counter agent.

EXAMPLE 14

plants
RT herbicides
herbicides
RT plants

EXAMPLE 15

inflammation
RT anti-inflammatory agents
anti-inflammatory agents
RT inflammation

- i) A concept and its unit of measurement.

EXAMPLE 16

electric current
RT amperes
amperes
RT electric current

- j) A compound term and the noun that is its focus, if the two do not have a true hierarchical relationship.

EXAMPLE 17

model ships
RT ships
ships
RT model ships

EXAMPLE 18

fossil reptiles
RT reptiles
reptiles
RT fossil reptiles

- k) An organism or substance bred or derived from another.

EXAMPLE 19

mules
RT donkeys
donkeys
RT mules

EXAMPLE 20

brass
RT copper
copper
RT brass

10.3.4 Multilingual and multicultural thesauri

In order to provide sufficient associative relationships in a multilingual thesaurus, the needs of users of all the language versions should be considered and appropriate relationships established (see also 13.3.3).

As already described in 9.1, 9.2 and 10.2.6, communities of different cultures and/or languages sharing a common thesaurus sometimes require concepts, and inter-relationships between concepts, that are unfamiliar to each other. When non-symmetrical hierarchical structures are introduced to accommodate these differences, non-symmetrical associative relationships are usually needed too.

NOTE If non-symmetrical structures are admitted, the data model as described in Clause 15 should be modified.

10.4 Customized relationships

The equivalence, hierarchical and associative relationship types described in 8, 10.2 and 10.3 are well established, widely used and generally found to be adequate in contexts whereby a human operator views a display of broader, narrower or related terms before choosing how to express a search query. Sometimes, however, there might be a need for additional or more closely specified relationship types.

In the same way that the hierarchical relationship may be optionally subdivided into generic, partitive or instantial, the equivalence and associative relationships may optionally be subdivided for a particular application. For example, abbreviations and/or acronyms may be designated separately from all the other equivalence relationships. Tags distinct from USE/UF should be assigned, for example FT/AB for Full Term and Abbreviation. Similarly, for the associative relationship, it is possible to subdivide into types such as cause and effect, designated with tags such as CAUSE/EFFECT.

Before embarking on an exercise to provide more specific relationship types, the thesaurus developer should first check that the refined relationships are really necessary, and not simply an intellectually attractive construct. The purpose of the thesaurus is to serve a set of users in a given context. The benefits of the extra relationships could be outweighed by the extra complications perceived by the users. However, there may be other justifications for the extra work, if the thesaurus is wanted to interoperate with or function as an ontology. (Ontologies usually provide more specific and closely defined relationships.)

NOTE See ISO 25964-2 for recommendations on these issues.

In the event that customization is undertaken, it is important that users understand the practice, and that confusion does not arise when the customized thesaurus is handled together with a conventional one. The introduction of non-standard tags or symbols carries the risk of incompatibility in circumstances where the thesaurus in question interoperates with others. The risks can be reduced by ensuring that the introduced relationships are true subtypes of the established relationship types.

11 Facet analysis

Facet analysis is useful in generating hierarchies that conform to the rules for hierarchical relationships, as set out in 10.2, because these relationships are valid only for concepts belonging to the same general category.

The choice of facets can vary depending on the subject field, but at the highest levels it is usual to use fundamental categories such as objects, materials, agents, actions, places, times, etc. Where it is helpful to do so, these fundamental facets may be analyzed into subfacets down to the level required; for example, actions may be subdivided into intransitive *processes* such as "ripening" or "deterioration" and transitive *operations* such as "cutting" or "repairing".

NOTE An action is said to be intransitive when the "actor" does not act upon any object; whereas the actor of a transitive action does act upon an object. Thus an apple ripens by an internal process, but in cutting an apple, a knife acts upon an external object.

An example of applying facet analysis in a classified arrangement appears in Figure 4. This shows some terms from the general subject of "industries". Directly under this term are the two narrower terms "agricultural industries" and "engineering industries". One of the facets shown under "agricultural industries" is **products**. Within this facet, only two levels of hierarchy are shown, except for the term "milk", which has been expanded to show how its narrower terms have been grouped into arrays, each preceded by a node label showing the characteristic of division. These arrays each represent a different way of subdividing the concept of milk, by fat content, by source animal, etc., and the word "by" occurs in each of these node labels. The node labels that introduce new facets, such as (people) and (products) do not contain the word "by".

It is important to note the pattern of hierarchical relationships around the node labels. Where the label shows the characteristic of division of the superordinate term, all the terms in the array following it are true narrower terms of the superordinate term. Thus, in Figure 4, "whole milk", "buffalo milk" and "sterilized milk" are all narrower terms of "milk". In contrast, where the label introduces a new facet, the terms that follow are typically not narrower terms of the preceding term. For example, "farm managers" and "cereal products", etc., are not narrower terms of "agricultural industries".

Node labels are not thesaurus terms. They are present only for the purposes of systematic display, and they do not qualify for any of the relationships described in Clauses 8 to 10. To avoid confusion, node labels should be distinguished typographically from the thesaurus terms. Generally, italics and parentheses or angle brackets are used, as shown in Figure 4. Some alternative ways of applying facet analysis are illustrated in 12.2.4 and 12.2.5.

The terms representing concepts in an array may be arranged either alphabetically or systematically. Alphabetical sequence should be used when there is no other obvious way to arrange a group of concepts. Systematic sequence should be used when it is likely to be familiar to most users, or when the arrangement helps to clarify the scope of the terms. In the example for electromagnetic radiation, the types of radiation are presented in order of increasing wavelength, as this might help some indexers in selecting the correct term(s).

EXAMPLE

```
electromagnetic radiation
<by wavelength>
ultraviolet radiation
visible radiation
infrared radiation
microwave radiation
radio waves
```

NOTE This example uses slightly different but equally acceptable conventions in the node label: angle brackets instead of round brackets, and the parent term is not spelt out at the start of the node label. The presence of the word "by", however, indicates that the node label specifies the characteristic of division by which the types of radiation are differentiated.

In some thesauri, facet names are included as preferred terms and treated as top terms, under which complete hierarchies may be shown (see 12.2.4). Alternatively there may be no explicit display of complete facets and the facet names appear only in node labels, as in Figure 4, or as the names of concept groups (see 15.2.18). See also 15.2.19.

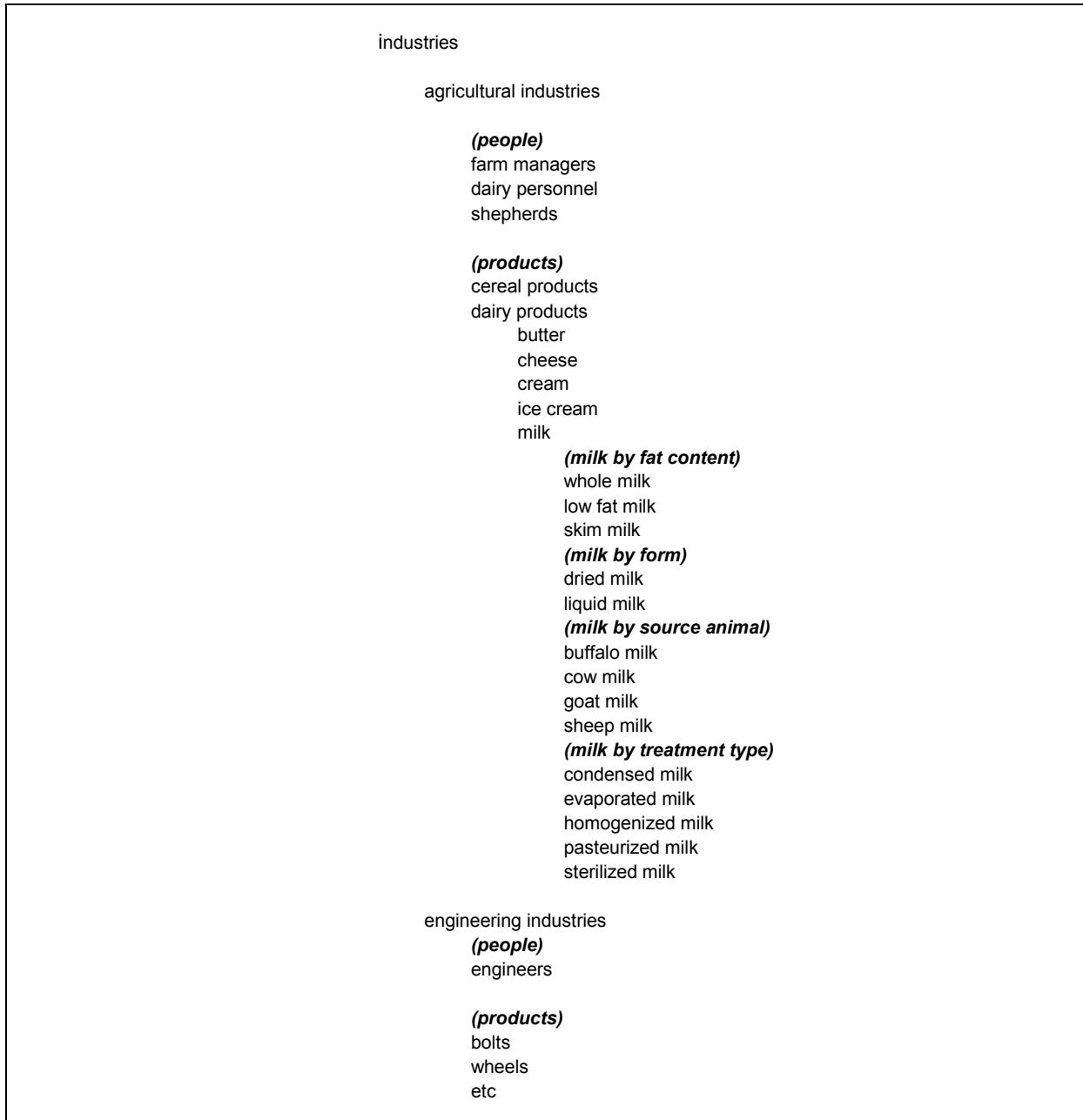


Figure 4 — Partially expanded classified display of an "industries" class, with node labels indicating changes of facet and characteristics of division of arrays

12 Presentation and layout

12.1 General

12.1.1 Use of a database for maintaining presentation information

Within a computer system a thesaurus will normally be held in a database structure (see Clause 15), in which each individual term and each link between a pair of terms is stored once only. This maintains the consistency of the relationships and allows terms to be extracted and displayed in different ways.

12.1.2 Summary of display styles

When presented for human use, on a screen or in printed form, a thesaurus may be displayed in the following ways.

- a) A single record is the most elementary form of display, showing the preferred term or non-preferred term itself and (optionally) any or all of the relationships, codes and notes that attach to it.
- b) An alphabetical arrangement allows access to concepts from the words in which they are initially expressed by the user. In a printed thesaurus it acts as an index, while in a computer display it can supplement a direct search function.
- c) A hierarchical sequence based on BT/NT relationships helps in expanding or refining the concept being indexed or sought.
- d) A classified sequence allows browsing in a subject area, drawing attention to related concepts.
- e) A graphical display shows terms and their relationships laid out pictorially.
- f) A permuted display helps to find words embedded in multi-word terms.

These different arrangements complement each other. Alphabetical access is essential and should be provided by direct search or by an alphabetical sequence as described in b). At least one of c) and d) should be provided to give an overview of the systematic arrangement. Additional information about each concept, such as scope notes and relationships to other concepts, may be shown in any of these sequences. Thesauri can differ widely in their approaches to the relative importance and functions of the different sequences, and also in the arrangement and the kind of relational information provided in each. A graphical presentation can sometimes give a useful overview of a field, but it is complex to create and update and the structure is obscured if it contains too much additional information. A permuted display serves as an index to all the words in all the terms (preferred and non-preferred), using either KWIC (key word in context) or KWOC (key word out of context) format; this is useful in a printed thesaurus, but not usually necessary in a computerized system in which searches for character strings are possible.

12.1.3 Notation and links between sequences

When presented in printed form, the alphabetical sequence should act as an index to show where terms are located in the other sequences, using either line numbers, a system of notation, or, if the hierarchies are not too extensive, by showing the top term of each hierarchy in which the term of interest will be found. To provide links to a graphical display from the alphabetical index it might be necessary to use a system of coordinates. Explicit linking symbols might not be necessary when a thesaurus is displayed on a computer screen, as automatically generated hyperlinks should allow easy switching from one sequence to another, while keeping the focus on the term of interest.

In a classified sequence, notation could, but need not, be expressive of the classified structure and can be designed to allow synthesis of notational symbols to create pre-coordinated class numbers for complex concepts. Any system of notation should provide for the insertion of new concepts at any point in the classified sequence.

12.2 Alternative display styles

12.2.1 General

Many different styles of display are possible, with too many variations to illustrate here. Sections 12.2.2 to 12.2.6 show examples of the basic types of display. To facilitate comparison and contrast, most are illustrated using a common set of terms expressing the concept of "cameras" and related concepts. The content has been selected to include all the basic types of relationships, as well as some optional features such as node labels and notation, which are not so easy to manage. Where notation is present, a simple line-number system has been used. Further examples of displays from published thesauri are included in Annex A.

NOTE Multilingual displays have been omitted from this subclause, for the sake of clarity. Instead they are described in 12.3.

12.2.2 Single record display

When the record for a concept or a preferred term is viewed individually the preferred term should normally be displayed first and the other fields are customarily presented after it in the following sequence:

- a) **CC** concept code or notation, locating the term/concept in a hierarchical sequence;
- b) **SN** scope note;
- c) **UF** references to non-preferred equivalent term(s);
- d) **TT** references to top terms;
- e) **BT** references to broader terms;
- f) **NT** references to narrower terms;
- g) **RT** references to related terms;
- h) **DEF** definition of the preferred term (see 6.2.3);
- i) **HN** history note (see 6.2.4);
- j) **SC** subject category or other concept group to which the concept has been assigned.

In this arrangement, the **SN** and **UF** are given near the beginning of the list because they clarify the scope of the concept. They are followed by relationships with other terms. **DEF** and **HN** are given last because they are viewed as administrative fields, used more by the thesaurus editor than the indexer or searcher. As an option, these last fields may be shown after the scope note, bringing all text fields together. However, it is important to ensure that **SN** and **DEF** are not confused when both are present.

The sequence for a non-preferred term is as follows:

- **USE** reference to corresponding preferred term;
- **DEF** definition of the non-preferred term (see 6.2.3);
- **HN** history note (see 6.2.4).

For particular applications the selection and sequence of fields may be varied. For example, the thesaurus editor might wish to include some housekeeping fields (see, for example, 15.2.4, 15.2.9, 15.2.14) in a display for his/her own use.

12.2.3 Alphabetical display

12.2.3.1 In an alphabetical display all terms, whether preferred or non-preferred, are organized as a single alphabetical sequence. Preferred and non-preferred terms should be distinguished typographically whenever possible, so that the non-preferred status of the non-preferred terms is obvious. (In printed media italics may be used for this purpose.) For some purposes a simple list of the terms alone may be sufficient. More commonly the complete record for each term is included, as in 12.2.2.

12.2.3.2 An example of this form of display is shown in Figure 5. Apart from single record displays, this is probably the easiest type of display to construct and reproduce. The most common convention is to show immediate broader and narrower terms only, in which case space is saved but any additional levels of hierarchy are not obvious.

35 mm cameras	diving equipment	physical properties
CC: H012	CC: D001	CC: A202
BT: film cameras	BT: equipment	BT: properties
aqualungs	NT: aqualungs	NT: pressure
CC: D002	diving suits	temperature
BT: diving equipment	face masks	
camera accessories	swimming fins	
CC: H002	underwater cameras	
BT: photographic equipment	RT: diving	
NT: flash guns	diving suits	physicists
light meters	CC: D003	CC: P005
tripods	BT: diving equipment	BT: people
RT: cameras	NT: dry suits	RT: physics
camera components	wet suits	
CC: H006	dry suits	physics
BT: cameras and camera	CC: D004	CC: P000
components	BT: diving suits	BT: fields of work
NT: camera lenses	equipment	RT: physicists
camera viewfinders	CC: A001	
CC: H007	NT: diving equipment	<i>Polaroid® cameras</i>
BT: camera components	electrically-powered equipment	USE: instant picture cameras
camera viewfinders	fixed equipment	
CC: H008	human-powered equipment	pressure
BT: camera components	photographic equipment	CC: A208
cameras	physics equipment	BT: physical properties
CC: H009	portable equipment	
BT: cameras and camera	exposure meters	properties
components	USE: light meters	CC: A200
NT: digital cameras	face masks	NT: physical properties
film cameras	CC: D006	
instant picture cameras	BT: diving equipment	reflex cameras
plate cameras	fields of work	CC: H017
reflex cameras	CC: A300	SN: Cameras in which the image is
special-purpose cameras	NT: diving	reflected on to a glass
RT: camera accessories	photography	screen for composing and
photography	physics	focusing.
cameras and camera components	film cameras	BT: cameras
CC: H005	CC: H011	NT: single lens reflex cameras
BT: photographic equipment	BT: cameras	twin lens reflex cameras
NT: camera components	NT: 35 mm cameras	
cameras	medium format cameras	single lens reflex cameras
colour	miniature cameras	CC: H018
CC: A204	instant picture cameras	UF: SLR cameras
BT: optical properties	CC: H015	BT: reflex cameras
contrast	SN: Cameras which produce a finished	
CC: A205	print directly	<i>SLR cameras</i>
BT: optical properties	UF: <i>Polaroid cameras®</i>	USE: single lens reflex cameras
digital cameras	BT: cameras	special-purpose cameras
CC: H010	people	CC: H021
UF+: <i>underwater digital cameras</i>	CC: A100	BT: cameras
BT: cameras	NT: adults	NT: stereo cameras
divers	children	underwater cameras
CC: D008	divers	
BT: people	infants	stereo cameras
RT: diving	models (people)	CC: H022
diving	photographers	BT: special-purpose cameras
CC: D000	physicists	
BT: fields of work	photographic equipment	swimming fins
RT: divers	CC: H001	CC: D007
diving equipment	BT: equipment	BT: diving equipment
	NT: camera accessories	
	cameras and camera components	temperature
	RT: photography	CC: A209
	photography	BT: physical properties
	CC: H000	
	BT: fields of work	tripods
	RT: cameras	CC: H004
	photographers	BT: camera accessories
	photographic equipment	
	CC: H001	twin lens reflex cameras
	BT: equipment	CC: H019
	NT: camera accessories	BT: reflex cameras
	cameras and camera components	
	RT: photography	underwater cameras
	photography	CC: D028, H023
	CC: H000	UF+: <i>underwater digital cameras</i>
	BT: fields of work	BT: special purpose cameras
	RT: cameras	diving equipment
	photographers	RT: diving
	photographic equipment	
		<i>underwater digital cameras</i>
		USE: digital cameras
		+ underwater cameras

Figure 5 — Alphabetical display of thesaurus terms (some terms omitted to save space)

12.2.3.3 Alternatively, it can be useful to indicate more than one level of subordination and/or superordination by different levels of indentation and/or by numbering the levels as shown in the example. If this convention is used to show all the levels of hierarchy for every term, however, it can produce a lengthy display.

EXAMPLE

Bovidae
BT1 ruminants
BT2 mammals
BT3 vertebrates
NT1 buffaloes
NT1 cattle
NT2 beef cattle
NT2 dairy cattle
NT1 yaks

12.2.4 Hierarchical display

A hierarchical display for one language is constructed by indenting each array of narrower terms under its parent broader term. Other relationships (such as equivalence and associative relationships) are not normally shown in this form of display as they would make the structure more difficult to follow. Many hierarchies may result, each headed by a distinct top term (a term with no broader term relationships). For an example, see Annex A, Figure A2.

Alternatively, by applying facet analysis at the top level of the thesaurus, all terms from the same facet may be grouped into a single hierarchy headed by a node label containing the facet name, as shown in Figure 6. (The facet names in Figure 6 are "objects", "fields of work", "people" and "properties".)

When facet analysis is applied in this way, terms are organized into facets according to the basic categories of concept they represent (see 10.2.1 and Clause 11), with no initial regard for the field or fields with which a given concept is usually associated.

Comparing this approach with that described in 12.2.5.2, where the primary organization is by subject and facets are applied within these, primary organization of terms into facets offers certain advantages:

- a) the need for a major revision is less likely to occur if a given concept changes the field with which it is usually associated;
- b) a higher level of agreement between different documentation centres could be expected.

It is also necessary, however, to note the following disadvantages.

- a) Organization by facets tends to scatter the concepts usually associated with a given field or discipline.
- b) The basis on which the thesaurus is organized will be generally less self-evident to both indexers and searchers.
- c) If the thesaurus covers all disciplines, or a broad range of disciplines, bringing the entities and activities of different disciplines together is unlikely to produce a useful and intelligible sequence of terms. This type of display is, therefore, particularly useful in a thesaurus devoted to a single discipline.

(objects)	(objects) (cont.)
equipment	equipment (cont.)
. <equipment by portability>	. <equipment by application> (cont.)
. . fixed equipment	. . physics equipment
. . portable equipment	. . optical instruments
. <equipment by power source>	. . . light meters
. . electrically-powered equipment	. . . microscopes
. . human-powered equipment	
. <equipment by application>	(fields of work)
. . diving equipment	fields of work
. . . aqualungs	. diving
. . . diving suits	. photography
. . . dry suits	. physics
. . . wet suits	
. . . face masks	(people)
. . . swimming fins	people
. . . underwater cameras	. <people by age>
. . photographic equipment	. . infants
. . . camera accessories	. . children
. . . flash guns	. . adults
. . . light meters	. <people by profession>
. . . tripods	. . divers
. . . cameras and camera components	. . models (people)
. . . camera components	. . photographers
. . . . camera lenses	. . physicists
. . . . camera view finders	
. . . . cameras	(properties)
. . . . <cameras by imaging technique>	properties
. digital cameras	. physical properties
. film cameras	. . optical properties
. <film cameras by film size>	. . colour
. 35 mm cameras	. . contrast
. medium format cameras	. . luminance
. miniature cameras	. . luminosity
. instant picture cameras	. . pressure
. plate cameras	. . temperature
. . . . <cameras by viewing method>	
. reflex cameras	
. single lens reflex cameras	
. twin lens reflex cameras	
. viewfinder cameras	
. special-purpose cameras	
. stereo cameras	
. underwater cameras	

Figure 6 — Hierarchical display of thesaurus terms arranged by facets

12.2.5 Classified display

12.2.5.1 Thesaurus terms arranged by subject fields

The approach of arranging thesaurus terms by disciplines or subject fields is similar to that adopted by the developer of a library classification who begins by organizing the universe of concepts into main classes or disciplines. When applied to a thesaurus, categories of concepts should be grouped initially to reflect the various fields of interest of its users. This technique applies to a thesaurus covering a range of different domains. Concepts that are usually associated with a given field, such as "art", are brought together, and are also effectively separated from those belonging to different areas of interest, such as "economics" or "physics".

This approach can also be applied to a thesaurus that is restricted to a single field. A thesaurus devoted to "medicine", for example, might be organized initially into subfields such as "surgery", "physiology", "anatomy", etc. To complement the core concepts, concepts from different disciplines may also be used, for example "management", "law" and "data processing", which should be separated from the medical terms.

The subject approach has the advantage of organizing concepts into groups that generally correspond to the modes of thinking of the users. One difficulty is that some concepts are used habitually in several different fields, for example, if a thesaurus covers forestry as well as agronomy, there will be many concepts, such as planting, which occur in both. Such concepts should be either repeated in each field in which they occur or given in a separate list of general concepts not limited to a specific field.

Grouping concepts by subject field, with sibling terms arranged either alphabetically or systematically, and with indentation of some under others, produces displays that look like hierarchies but in which the subordinate terms might not follow the rules for hierarchical relationships described in 10.2. Node labels giving the facet names should, therefore, be inserted into such displays to indicate where different facets occur and where the relationships are not hierarchical, as discussed in Clause 11.

12.2.5.2 Thesaurus terms arranged by facets within subject fields

In practice, the different approaches described in 12.2.4 and 12.2.5.1 are frequently combined, for example when a thesaurus organized primarily into subject fields is further subdivided by facets.

Figure 7 illustrates the combined approach using the example of a thesaurus that takes in the fields of diving, photography and physics. Only the preferred terms relevant to a particular field are shown within that field. Some terms common to all three fields are presented in a section of general terms. After the primary organization by subject, the next subdivision is by facet. In Figure 7, the facets "objects", "people" and "properties" have been applied to each subject section in turn.

In printed displays, it is often necessary to limit the total size of the compilation by choosing one principal location for each term. The term may be repeated in other locations but space is saved by avoiding repetition of all its narrower terms. The user is expected to refer to the principal location to find the complete hierarchy. Thus, in Figure 7, the "principal location" of "properties" is at A200, where "chemical properties", "physical properties" and all their narrower terms are also displayed. In the diving section, the only physical properties to be mentioned are "pressure" and "temperature". In the photography section, only the optical properties are fully spelt out.

Figure 7 also illustrates the use of notation for locating terms in a classified display. In this example, a term has only one notation, corresponding to its principal location. Where the term is repeated in other locations, it is followed by the notation in brackets, helping the user to refer to the principal location. Some thesauri allow a term to have subsidiary notations, so that every repetition can easily be located.

The designation of a "principal location" is convenient for restricting the size of a printed thesaurus, but adds extra steps to the process of thoroughly researching a concept. Computer displays can make the look-up process much easier if they allow users to expand or collapse portions of hierarchy, showing as much detail as users require, only when they want to see it.

A000	general terms <i>(objects)</i>	H000	photography <i>(objects)</i>
A001	. equipment ... <equipment by portability>	H001	. equipment (A001) ... photographic equipment
A002	... fixed equipment	H002	... camera accessories
A003	... portable equipment ... <equipment by power source>	H003	... flash guns light meters (P003)
A004	... electrically-powered equipment	H004 tripods
A005	... human-powered equipment ... <equipment by application>	H005	... cameras and camera components
	... diving equipment (D001)	H006 camera components
	... photographic equipment (H001)	H007 camera lenses
	... physics equipment (P001)	H008 camera viewfinders
	<i>(people)</i>	H009 cameras <cameras by imaging technique>
A100	. people ... <people by age>	H010 digital cameras
A101	... infants	H011 film cameras <film cameras by film size>
A102	... children	H012 35 mm cameras
A103	... adults ... <people by profession>	H013 medium format cameras
	... divers (D008)	H014 miniature cameras
	... models (people) (H025)	H015 instant picture cameras
	... photographers (H026)	H016 plate cameras <cameras by viewing method>
	... physicists (P005)	H017 reflex cameras
	<i>(properties)</i>	H018 single lens reflex cameras
A200	. properties	H019 twin lens reflex cameras
A201	... chemical properties	H020 viewfinder cameras
A202	... physical properties	H021 special-purpose cameras
A203	... optical properties	H022 stereo cameras
A204	... colour	H023 underwater cameras
A205	... contrast	H024 high pressure underwater cameras
A206	... luminance		<i>(people)</i>
A207	... luminosity	H025	. people (A100)
A208	... pressure	H026	.. models (people)
A209	... temperature		.. photographers
	<i>(fields of work)</i>		<i>(properties)</i>
A300	. fields of work ... diving (D000)		. properties (A200)
	... photography (H000)		.. physical properties (A202)
	... physics (P000)		... optical properties (A203)
			... colour (A204)
			... contrast (A205)
			... luminance (A206)
			... luminosity (A207)
D000	diving <i>(objects)</i>	P000	physics <i>(objects)</i>
	. equipment (A001)		. equipment (A100)
D001	... diving equipment	P001	... physics equipment
D002	... aqualungs	P002	... optical instruments
D003	... diving suits	P003	... light meters
D004	... dry suits	P004	... microscopes
D005	... wet suits		<i>(people)</i>
D006	... face masks	P005	. people (A100)
D007	... swimming fins ... underwater cameras (H023)		.. physicists
	<i>(people)</i>		<i>(properties)</i>
	. people (A100)		. properties (A200)
D008	.. divers		.. physical properties (A202)
	<i>(properties)</i>		
	. properties (A200)		
	.. physical properties (A202)		
	.. pressure (A208)		
	.. temperature (A209)		

Figure 7 — Classified display of thesaurus terms arranged by facets within subject fields

12.2.5.3 Expanded classified display

It is possible to add to the type of display shown in Figure 7 all of the data described in the single record display, as in 12.2.2, in order to present each term in every one of its locations. Although Figure 8 does not go to this length, it illustrates the inclusion of additional information such as scope notes, non-preferred terms and related terms, but not any cross-language equivalents.

NOTE Compare, for example, underwater cameras at H023.

The inclusion of extra data adds to length. To counteract at least some of this, Figure 8 adopts a slightly different convention regarding repetition of hierarchies. Comparing Figure 8 with Figure 7, it can be seen that the mention of "pressure" and "temperature" in the diving section of Figure 8 does not include their broader terms "physical properties" and "properties" as shown at the corresponding location in Figure 7. To find these, the user is obliged to follow the notation links to A208 and A209, where the full hierarchies are visible. Apart from saving some space, this approach avoids giving a false impression of the scope of a broad term such as properties or physical properties, when appearing in its secondary locations.

To conclude the comparison of the merits of Figure 6, Figure 7 and Figure 8, it should be clarified that no one of these is being recommended as the best for all situations. Each of the approaches has advantages and disadvantages, the importance of which varies according to the context of application. Further variations such as concept groups are also possible, as described in 15.2.18 (see also Annex A, Figures A2, A4, A7, A9, A10, A13, A16.) However, it is essential that at least one form of systematic display, hierarchical or classified, should be available to users in addition to the customary alphabetical display. (See also 12.3.4 for inclusion of multilingual issues).

A000	general terms	photography (cont.)
	<objects>	<objects>(cont.)
A001	. equipment	. photographic equipment(<i>cont.</i>)
	... < <i>equipment by portability</i> >	... cameras and camera components (<i>cont.</i>)
A002	... fixed equipment	H006 ... camera components
A003	... portable equipment	H007 ... camera lenses
	... < <i>equipment by power source</i> >	H008 ... camera viewfinders
A004	... electrically-powered equipment	H009 ... cameras
A005	... human-powered equipment	... < <i>cameras by imaging technique</i> >
	... < <i>equipment by application</i> >	H010 ... digital cameras UF+: <i>underwater digital cameras</i>
	... diving equipment [D001]	H011 ... film cameras ... < <i>film cameras by film size</i> >
	... photographic equipment [H001]	H012 ... 35 mm cameras
	... physics equipment [P001]	H013 ... medium format cameras
	<people>	H014 ... miniature cameras
A100	. people	H015 ... instant picture cameras
	... < <i>people by age</i> >	SN: Cameras which produce a finished print directly
A101	... infants	UF: <i>Polaroid® cameras</i>
A102	... children	H016 ... plate cameras
A103	... adults	... < <i>cameras by viewing method</i> >
	... < <i>people by profession</i> >	H017 ... reflex cameras
	... divers [D008]	SN: Cameras in which the image is reflected on to a glass screen for composing and focusing
	... models (people) [H025]	H018 ... single lens reflex cameras
	... photographers [H026]	UF: <i>SLR cameras</i>
	... physicists [P005]	H019 ... twin lens reflex cameras
	<properties>	H020 ... viewfinder cameras
A200	. properties	H021 ... special-purpose cameras
A201	... chemical properties	H022 ... stereo cameras
A202	... physical properties	H023 ... underwater cameras
A203	... optical properties	SN: cameras for taking pictures under water
A204	... colour	UF+: <i>underwater digital cameras</i>
A205	... contrast	BT: diving equipment [D001]
A206	... luminance	H024 ... high pressure underwater cameras
	RT: light meters [P003]	<people>
A207	... luminosity	. people [A100]
A208	... pressure	... models (people)
A209	... temperature	... photographers
	<fields of work>	<properties>
A300	. fields of work	. optical properties [A203]
	... diving [D000]	... colour [A204]
	... photography [H000]	... contrast [A205]
	... physics [P000]	... luminance [A206]
		... luminosity [A207]
D000	diving	P000 physics
	<objects>	<objects>
D001	. diving equipment	. physics equipment
	BT: equipment [A001]	BT: equipment [A100]
D002	... aqua lungs	P002 . optical instruments
D003	... diving suits	P003 . light meters
D004	... dry suits	UF: <i>exposure meters</i>
D005	... wet suits	RT: luminance [A206]
D006	... face masks	P004 . microscopes
D007	... swimming fins	<people>
	... underwater cameras [H023]	. physicists
	<people>	BT: people [A100]
D008	. divers	<properties>
	BT: people [A100]	. physical properties [A202]
	<properties>	... optical properties [A203]
	. pressure [A208]	... colour [A204]
	. temperature [A209]	... contrast [A205]
		... luminance [A206]
		... luminosity [A207]
		... pressure [A208]
		... temperature [A209]
H000	photography	
	<objects>	
H001	. photographic equipment	
	BT: equipment [A001]	
H002	... camera accessories	
H003	... flash guns	
	... light meters [P003]	
H004	... tripods	
H005	... cameras and camera components	

Figure 8 — Classified display of thesaurus terms arranged by facets within subject fields, with additional information such as SN, UF and RT

12.2.6 Displaying polyhierarchical relationships

12.2.6.1 The standard treatment of polyhierarchical relationships (see 10.2.5) is demonstrated in Figure 5, in which the term "underwater cameras" has the two broader terms "special purpose cameras" and "diving equipment". Therefore, it appears at two positions in the equipment facet of Figure 6. If it had narrower terms as well, these would be shown in both positions.

12.2.6.2 A different approach may be adopted in the classified or hierarchical section of a printed thesaurus in which space is strictly limited and an extensive entry is needed for the polyhierarchical term. It might have a large hierarchy of narrower terms, and possibly also a long scope note and/or several non-preferred synonyms and related terms. As in Figure 6 and Figure 7, one "principal location" might be chosen for the polyhierarchical term, and in other locations a less complete display might be shown. See, for example, the treatment of "underwater cameras" in Figure 8.

12.2.6.3 Computer displays should offer users the facility to see all the relationships for a polyhierarchical term, wherever it occurs.

12.3 Presentation and layout of multilingual thesauri

12.3.1 General

In addition to the general recommendations applying to all thesauri (see 12.1 and 12.2), two important requirements should be taken into account when dealing with presentation and layout of multilingual thesauri:

- a) To confer equal status on all languages of the multilingual thesaurus, the alphabetical sequence conventionally established for each language should be respected (see 12.4.3). This applies not only to alphabetical presentations of thesauri, but also to alphabetical sequences found in preferred term records.
- b) Cross-language equivalents should be available for preferred terms in each language version.

In addition to the examples shown in 12.3, Annex A shows several further examples taken from published thesauri.

12.3.2 Single-record display

The user interface should allow selection of one of the included languages as the basis for single record display. The display described in 12.2.2 should be augmented to include all cross-language equivalents. Each language is identified by an alpha-2 language code, as stipulated by ISO 639-1 (see Figure 9). If an appropriate code is not found in ISO 639-1, an alpha-3 code from ISO 639-2 may be used. These codes may be extended where necessary with the additional codes described in RFC 4646^[45] and listed in the IANA subtag registry^[35].

NOTE The colons shown in Figures 9, 10 and 11 are optional.

pesticides
es: plaguicidas
CC: FF120
SN: Excludes growth regulators and repellents
UF: <i>fumigants</i>
TT: agrochemicals
BT: agrochemicals
NT: fungicides
herbicides
insecticides
RT: pests
DEF: A substance for destroying pests
HN: Added 1975-04-01

Figure 9 — Single record display in a bilingual thesaurus (English – Spanish)

A similar, complete, single-record display should be available for each term in each language version of the multilingual thesaurus. Thus if the editor chooses the second language available in this particular bilingual Spanish-English thesaurus, the display shown in Figure 10 should be visible.

plaguicidas
en: pesticides
CC: FF120
SN: Excluye repelentes y reguladores del crecimiento
UF: <i>fumigantes</i>
TT: productos químicos agrícolas
BT: productos químicos agrícolas
NT: fungicidas
herbicidas
insecticidas
RT: plagas
DEF: Agente que combate las plagas del campo
HN: Agregado 1975-04-01

Figure 10 — Single record display in a bilingual thesaurus (Spanish - English)

Except where equivalences between non-preferred terms have been established (see 9.5), the single record display for a non-preferred term in a multilingual thesaurus is identical to that in a monolingual thesaurus (see 12.2.2).

12.3.3 Alphabetical display

There should be a distinct alphabetical sequence for each language of a multilingual thesaurus. Integration of multiple languages in a single alphabetic sequence is not recommended.

The preferred term records in the alphabetical display for a given language should be augmented with the corresponding cross-language equivalents in each language of the multilingual thesaurus. Records for non-preferred terms do not require such augmentation. Figure 11 shows an extract from a bilingual display in this style. A corresponding display should be prepared for each of the languages of the thesaurus.

mosquitoes	plant products
es: mosquitos	es: productos de origen vegetal
CC: HH120	CC: PD100
BT: pests	NT: cereals
	fruits
pesticides	spices
es: plaguicidas	vegetables
CC: FF120	RT: plants
SN: Excludes growth regulators and repellents	
UF: <i>fumigants</i>	plants
BT: agrochemicals	es: plantas
NT: fungicides	CC: HM100
herbicides	RT: plant products
insecticides	
RT: pests	<i>porkers</i>
	USE: pigs
pests	poultry
es: plagas	es: aves de corral
CC: HH100	CC: HB140
NT: locusts	BT: livestock
mosquitoes	NT: chickens
slugs	ducks
snails	geese
RT: pesticides	turkeys
pigs	RT: eggs
es: cerdos	
CC: HB130	sheep
UF: <i>hogs</i>	es: ovinos
<i>porkers</i>	CC: HB190
<i>sows</i>	BT: livestock
BT: livestock	RT: wool

Figure 11 — Alphabetical display for the English version of a bilingual thesaurus

12.3.4 Systematic displays

It can be useful to see the structure of the thesaurus laid out in parallel in each of the language versions. Either a hierarchical display, as in Figure 6, or a classified display, as in Figure 7, may be chosen. These separate monolingual displays, if they are prepared for each language, might be adequate when viewed side by side. Alternatively, the language versions may be presented in columns on the same page, so that the correspondence is plainly visible. Figure 12 shows an excerpt from a hierarchical display in this style.

Figure 12 shows notation in a central column for ease of reading across. Notation is optional, but more useful in a multilingual thesaurus than a monolingual one, because it is independent of language. It should be noted, however, that alphabetical ordering of siblings in more than one language simultaneously is usually impossible to achieve, thus giving the impression that one language is dominant. To avoid this problem, some other sequence of siblings may be used throughout, in both languages.

In a multilingual thesaurus of more than two or three languages, parallel hierarchical displays become cumbersome. An alternative option for online displays is to use a split screen approach whereby one side of the screen shows the hierarchical display in one language only, while the other side of the screen shows equivalents in all the other languages for the preferred term selected in the hierarchy. Figure A.11 in Annex A illustrates this approach. Figure A.7, although monolingual, is also helpful for visualizing what can be done.

<materials>	FF100	<materiales>
. agrochemicals	FF110	. productos químicos agrícolas
. . fertilizers	FF120	. . fertilizantes
. . pesticides	FF130	. . plaguicidas
. . fungicides	FF140	. . fungicidas
. . herbicides	FF150	. . herbicidas
. . insecticides	FM100	. . insecticidas
. feeds	FP100	. piensos
. fuel		. combustibles
<organisms>	HB100	<organismos>
. livestock	HB110	. ganado
. . cattle	HB120	. . ganado bovino
. . goats	HB130	. . caprinos
. . pigs	HB140	. . cerdos
. . poultry	HB150	. . aves de corral
. . chickens	HB160	. . pollos
. . ducks	HB170	. . patos
. . geese	HB180	. . gansos
. . turkeys	HB190	. . pavos
. . sheep	HH100	. . ovinos
. pests	HH110	. . plagas
. . locusts	HH120	. . langostas de tierra
. . mosquitoes	HH130	. . mosquitos
. . slugs	HH140	. . babosas
. . snails	HM100	. . caracoles
. plants		. . plantas
<products>	PC100	<productos>
. animal products	PC200	. . productos animales
. . dairy products	PC210	. . . productos lácteos
. . butter	PC220	. . . mantequilla
. . cheese	PC230	. . . queso
. . cream	PC240	. . . crema
. . milk	PC250	. . . leche
. . eggs	PC260	. . . huevos
. . leather	PC270	. . . cuero
. . meat	PC300	. . . carne
. . wool	PD100	. . . lana
. plant products	PD110	. . . productos de origen vegetal
. . cereals	PD120	. . . cereales
. . fruits	PD130	. . . frutas
. . spices	PD140	. . . especias
. . vegetables		. . . hortalizas

Figure 12 — Hierarchical display for a bilingual thesaurus

12.3.5 Correspondence tables for multilingual thesauri

For some purposes it is sufficient to display only the equivalences between the languages in a correspondence table, without any other relationships. Figures 13 and 14 show a convenient layout. A separate table should be prepared for each of the languages of a multilingual thesaurus, each table applying the alphabetical filing conventions of the language used as source language.

English	Spanish
agrochemicals	productos químicos agrícolas
<i>agricultural chemicals</i> see: agrochemicals	
animal products	productos animales
butter	mantequilla
cattle	ganado bovino
cereals	cereales
cheese	queso
chickens	pollos
cream	crema
dairy products	productos lácteos
ducks	patos
eggs	huevos
feeds	piensos
fertilizers	fertilizantes
fruits	frutas
fuel	combustibles
<i>fumigants</i> see: pesticides	
fungicides	fungicidas
geese	gansos
goats	caprinos
<i>hens</i> see: chickens	
herbicides	herbicidas
<i>hogs</i> see: pigs	
insecticides	insecticidas
leather	cuero
livestock	ganado
locusts	langostas de tierra
meat	carne
milk	leche
mosquitoes	mosquitos
pesticides	plaguicidas
pests	plagas
pigs	cerdos
plant products	productos de origen vegetal
plants	plantas
<i>porkers</i> see: pigs	
poultry	aves de corral
sheep	ovinos
slugs	babosas
snails	caracoles
<i>sows</i> see: pigs	
spices	especias
turkeys	pavos
vegetables	hortalizas
wool	lana

Figure 13 — Correspondence table for a bilingual thesaurus (English – Spanish)

Español	Inglés
aves de corral	poultry
babosas	slugs
caprinos	goats
caracoles	snails
carne	meat
cerdos	pigs
cereals	cereals
<i>chanchos</i> véase: cerdos	
combustibles	fuel
crema	cream
cuero	leather
especias	spices
fertilizantes	fertilizers
frutas	fruits
<i>fumigantes</i> véase: plaguicidas	
fungicidas	fungicides
Ganado	livestock
ganado bovino	cattle
<i>ganado porcino</i> véase: cerdos	
gansos	geese
herbicidas	herbicides
hortalizas	vegetables
huevos	eggs
insecticidas	insecticides
lana	wool
langostas de tierra	locusts
leche	milk
mantequilla	butter
mosquitos	mosquitoes
ovinos	sheep
patos	ducks
pavos	turkeys
piensos	feeds
plagas	pests
plaguicidas	pesticides
plantas	plants
pollos	chickens
productos animales	animal products
productos de origen vegetal	plant products
productos lácteos	dairy products
productos químicos agrícolas	agrochemicals
<i>puercos</i> véase: cerdos	
queso	cheese

Figure 14 — Correspondence table for a bilingual thesaurus (Spanish – English)

12.4 Language and character encoding issues

12.4.1 General

The different languages used in a multilingual vocabulary sometimes use different writing systems. Even languages that share many characters (such as languages using the Latin alphabet) sometimes use different diacritics or other symbols in conjunction with some of those characters. Transliteration schemes are also

used to transpose characters in these languages into other writing systems, where there are limitations of printing or display, or in the ability of users to read unfamiliar scripts.

Use of the Universal Character Set (UCS) is recommended, in order to provide for as many languages and scripts as possible. The UCS is defined jointly by the Unicode Standard and ISO/IEC 10646.

The UCS has been specified in other standards (see References [57] to [59]), and has been widely supported by computer manufacturers and software developers. The use of these standards for character encoding promotes interoperability with other systems. In the case that rare characters are found beyond the coverage of the Universal Character Set, national or industry standards should be consulted and appropriately incorporated.

Care should be taken to ensure that all components of a vocabulary management system are compatible and properly configured with the particular languages and character sets. These components include not only the vocabulary management software but also computer hardware for data entry (e.g. keyboards, input software), computer operating systems, and fonts and formats for display purposes (for print publications and computer-based displays). Special consideration should also be given to display issues, filing orders and normalization required for searching and index creation.

12.4.2 Display issues

In each language, characters should appear consistently throughout the vocabulary in a form acceptable to speakers of that language, including diacritics where appropriate. Although German speakers sometimes find it acceptable to convert "ä" to "ae" and "ö" to "oe" etc., it is preferable that the form in which characters appear on the printed page or on the computer screen is the form most familiar to users. Languages that are written from right to left, such as Arabic and Hebrew, usually need special consideration to ensure that text appears correctly displayed and aligned.

12.4.3 Filing orders

Different languages (and even different contexts within the same language) sometimes conventionally require the use of different filing orders, also known as sorting orders. For each language, it might be necessary to specify both the characters and diacritics that are ignored for filing purposes and the sequence in which characters should file. For example:

- a) the difference between upper and lower case letters is ignored in sorting for English (and in most other languages in the Latin, Greek, Cyrillic and Georgian scripts);
- b) in Spanish, the letter ñ files after the letter n, and before the letter o;
- c) in French, all diacritics are ignored in filing and the letter ñ interfiles with the letter n;
- d) in Czech, ch is treated as a single letter coming after the letter h and before i;
- e) in Croatian, dž, lj and nj are also treated as single letters coming after d, l and n, and before đ, m and o respectively;
- f) several alternatives exist for sorting of ideographic characters, as used in Chinese, Japanese and Korean. In addition, simplified and traditional versions of ideographic characters exist, although the simplified and traditional forms might file identically (and are coded identically in ISO/IEC 10646);
- g) numerical strings are sometimes filed as text, e.g. 1, 10, 102, 11, 120, 2, but other times as numbers, e.g. 1, 2, 10, 11, 102, 120.

Refer to References [11] and [3] for basic guidance on filing order suitable for indexes and listings for monolingual applications.

Filing orders in multilingual contexts are defined by ISO/IEC 14651, and also in the equivalent *Unicode Collation Algorithm*. However, users might also find it useful to take account of practice in specific languages, which is documented (for languages that use the Latin script) in ISO 12199.

Computer software for multilingual vocabularies should be capable of producing conventional filing sequences for each of the different languages in order to facilitate user consultation. If the conventional order cannot be supported, text accompanying each language version of the vocabulary should explain clearly the filing order used.

If displays are required as shown in Figure 12, in which visual correspondence across languages is important, any attempt to use alphabetical order for the sequence of siblings produces unsatisfactory results for at least one of the languages. Figure 12 illustrates this problem. To avoid giving any language preference, it is necessary either to:

- produce multiple outputs, one for each language, in which the sequence of all the others is driven by correspondence to the first one; or
- choose an underlying systematic sequence (e.g. from smallest to largest or from south to north), applying across all the languages.

12.4.4 Normalization for information retrieval

Searching, either within a vocabulary management system or within an information retrieval system using terms taken from a controlled vocabulary, involves matching a string of characters entered by a searcher (search term) with a string of characters extracted from metadata and stored into an index (index term). The search term and the index term sometimes differ in ways that are not considered to be significant, including encoding and the use of upper or lower case characters, diacritics or punctuation. Normalization is the process of converting search and index terms into canonical forms that facilitate string matching and thereby enhance information retrieval by increasing recall.

EXAMPLE

If a vocabulary management system contains, as a French term, the name of the organization Alliance coopérative internationale, normalization rules applied during the index building process might convert all characters to upper case, and convert accented characters to unaccented equivalents, so that the index contains the string ALLIANCE COOPERATIVE INTERNATIONALE. Similar rules apply when a user enters a search string so that this term record is retrieved by any of the following search strings:

alliance cooperative internationale
 Alliance Cooperative Internationale
 Alliance Coopérative Internationale
 ALLIANCE COOPERATIVE INTERNATIONALE
 ALLIANCE COOPÉRATIVE INTERNATIONALE

Regardless of the form the user enters, the two normalized canonical forms match, and the user successfully retrieves the record for the term in the controlled vocabulary.

The above example presents a simple scenario, within a single vocabulary management system. However, normalization rules can also affect the use of spaces (e.g. in place names or pairs of words such as data bases and databases), punctuation characters (particularly hyphens as in words such as fish-breeding), the way that words are extracted, and the use of special symbols such as & (ampersand). This is described further in ISO/IEC 14651 and in the equivalent *Unicode Collation Algorithm*.

In rare cases, terms for different concepts might have the same normalized form (e.g. AIDS and aids) and should be treated within the vocabulary as homographs (see 6.2.2). Rules for normalization should be made clear to the vocabulary user, and spelling and punctuation rules for the form of terms should take into account the normalization supported by the vocabulary management system.

12.4.5 Identification of dialects and/or alternative scripts

If dialects are treated as separate languages, or if a transliteration scheme is used in conjunction with a particular language, the dialect or transliteration scheme should be identified in the tags used in multilingual displays. The alpha-2 codes from ISO 639-2 should be supplemented with the additional codes described in RFC 4646^[45] and listed in the IANA subtag registry^[35]. These allow the specification of languages, scripts, regions and other variants, including transliteration. Thus text transliterated from Mandarin Chinese into latin characters using the Pinyin transliteration scheme should be encoded as zh-Latn-pinyin, while English as used in the United States should be encoded as en-US.

13 Managing thesaurus construction and maintenance

13.1 Planning a thesaurus

13.1.1 Determining objectives

Building a thesaurus is a labour-intensive job, requiring commitment for many years if it is to prove worthwhile. Therefore, before significant time and money are spent, objectives should be clarified based on considerations such as the following:

- a) what the thesaurus is to be used for, and by whom;
- b) whether it will be limited by the constraints of existing software with which it is to be used;
- c) how knowledgeable the users will be in the subject area of the thesaurus and in thesaurus use.

Different stakeholders (such as senior managerial staff, IT support staff and the prospective users) have different expectations about what a thesaurus is and how it will perform. A statement of objectives should be agreed by all parties as a key step in procuring effective teamwork.

13.1.2 Determining thesaurus features

When knowledge of objectives and of the planned uses and user community has been obtained, the scope and style of the thesaurus should be defined.

The following features should be determined:

- a) whether the thesaurus will be used in print or electronic format, or both;
- b) the style of display required;
- c) whether special formats are needed for integration with other systems, such as searching or indexing systems;
- d) what format is envisaged for updates, and how frequently these will be required.

Decisions should be taken on optional features, such as whether to subdivide the hierarchical relationship as described in 10.2.1, whether to introduce customized relationships (see 10.4), whether to show node labels in output displays and whether it is important to store term definitions, sources, and date information.

At a more detailed level, decisions should be taken on the conventions to be used for singular/plural, spelling and capitalization. It might be useful to consider practical constraints such as the maximum length of term that will be permitted, any diacritics or other special characters needed, and whether or not there needs to be any limit to the number of levels of hierarchy.

13.1.3 Taking stock of resources

13.1.3.1 General

During the planning phases of a thesaurus project, the key resources, such as people, funding, software tools and vocabulary resources should be determined. If the thesaurus is multilingual, the budget should allow for the extra cost of communication overheads, as well as the cost of any specialized software that might be required.

13.1.3.2 Human resources

Human resources should include the following:

- a) a champion at the senior management level, and preferably corporate commitment to the thesaurus project;
- b) interest and support from users, particularly from any terminology experts in one or more areas of the subject field;
- c) information professionals knowledgeable in the subject area, with aptitude and preferably training in thesaurus work, to take on the main task of thesaurus construction and maintenance;
- d) support from IT professionals who can help with installation/adaptation of thesaurus management software, any programming required to integrate thesaurus outputs with the systems in which the thesaurus will be applied, and the day-to-day running of normal desktop tools.

If more than one thesaurus editor is involved, careful planning should be undertaken to avoid simultaneous, potentially conflicting, inputs to the same portion of the thesaurus.

If the thesaurus is multilingual, the people who undertake construction and maintenance should ideally have all of the following attributes:

- a good understanding of each of the natural languages involved;
- a good knowledge of the subject area of the vocabulary; and
- a good understanding of the difference between translation and identification of terminological equivalents for information retrieval purposes.

Such people are scarce and often located in different countries. For this reason, it is important to maintain frequent, effective and efficient communication between all team members. Agreement on procedures and formats for unambiguous communication of structured data should be sought.

13.1.3.3 Vocabulary resources

Existing vocabulary resources should be researched before construction begins. Any or all of the following might prove useful:

- a) Existing thesauri or classification schemes with a scope that partially or wholly matches the requirement. In extreme cases, it might be cost-effective simply to adopt an existing thesaurus unchanged. More commonly, portions of an existing vocabulary can be taken and/or adapted, subject to copyright. Existing works are a source of ideas for terms, or structure, or both.
- b) Collections of terminology or frequently asked queries that colleagues might have assembled in the course of their work.

- c) The indexes of existing databases or other relevant reference tools, showing useful entry points to the subject matter. If an existing relevant database has been indexed with a controlled vocabulary, it might be possible to obtain from it a report of all the index terms used, and their frequency of usage.
- d) The transaction log of a relevant website, showing the search terms most frequently employed by users.
- e) Standard reference works such as dictionaries, terminologies, nomenclatures and encyclopaedias are useful for verification of a term's meaning and validation of hierarchical structures, rather than as a guide to selection of terms.

13.1.4 Establishing responsibilities

At an early stage an editor should be appointed to take responsibility for managing the project through all of its stages, possibly including continuing maintenance as well as compilation of the first edition. Depending on the size of the project, the editor may be supported by an editorial team, and possibly by an editorial review board. There are some advantages in combining thesaurus editorial responsibility with quality control of the subject indexing of resources using the thesaurus.

13.1.5 Choosing thesaurus management software

Although it is possible to compile and produce a thesaurus entirely without software support, this procedure is not recommended. Purpose-built thesaurus management software should be used for efficiency and to avoid clerical errors.

When choosing software, a list of requirements should be drawn up based on the features outlined in Clause 14, and any additional requirements. Existing software products on the market should be evaluated. If none of them meets all of the requirements, some compromises might be necessary. Alternatively, one of the existing software products could be customized, or a new one developed.

13.2 Early stages of compilation

13.2.1 General: how and when to start

Assuming that the thesaurus is needed to support the indexing and searching of a database or other resource, the thesaurus should be completed before database compilation begins in order to ensure that indexing is conducted systematically. However, it is difficult to decide which terms will be needed in the thesaurus until a substantial part of the database has been built. To avoid a later need for re-indexing, at least part of the thesaurus should be prepared in advance, but the need for substantial continuing work on the thesaurus should be anticipated.

Software tools are available that analyze a corpus of text in the relevant subject field(s) and extract significant words or phrases, together with their frequency of use. Some packages also organize the terms into a structured format. While an automatically created thesaurus is unlikely to match the quality of one prepared intellectually, as a source of ideas it can speed up the intellectual process.

13.2.2 Collecting terms and concepts

As stressed in 5.1, the terms appearing in a thesaurus are only representations of the underlying concepts on which the thesaurus is based. During construction of the thesaurus, the overall aim is to collect and organize concepts, but in practice this is achieved by collecting terms and arranging them so that they adequately represent the required concepts.

Prime sources of terms are listed in a) to d) of 13.1.3.3. The full text of literature central to the required scope is also useful. As described in 13.2.1, automatic techniques can be used to extract key words and phrases from the literature. While it is relatively easy to study the material to be input, at least as much emphasis should be given to any indications of what it is that users want to search for, such as lists of queries registered at an enquiry desk. The users themselves may be invited to suggest useful terms and concepts.

At this early stage, it is not necessary to make decisions as to the best representation of a required concept. The initial task is to collect all the terms available, noting the source of each and the frequency of occurrence.

13.2.3 Analysing terms

The terms collected should be sorted into systematic order before they can be studied properly and entered into the thesaurus. If the thesaurus management software does not support this task, standard desktop tools such as spreadsheets can be useful for this preliminary sorting out. The process is made easy and efficient if the terms are obtained from a machine-readable source. Once the collected terms are in a spreadsheet, together with their source and frequency, they should be sorted into subject areas or facets (see Clause 11) so that like terms with all their variants and synonyms are brought together. Although the classification or facet structure employed at this stage might be rudimentary, and need not determine the eventual structure of the thesaurus, it can help in developing ideas for the latter. The main product of this analytical stage should be a list or set of small lists of terms, grouped by subject and/or facet, with indications of the source and frequency of use of each term. Armed with these data, the editor is then able to begin systematic construction.

13.3 Construction

13.3.1 Input

Terms should be handled in subject/facet groups or hierarchies. Groups of synonyms and near-synonyms should be considered together and preferences and equivalence relationships established. At this stage, the terms and their hierarchical relationships should be selected carefully, taking into account potential duplications, overlaps, omissions and the degree of specificity required. Scope notes may also be considered and entered at the same time. If desired, source and definition may also be entered. It is best that the date of input and term identifier are added automatically by the software, rather than by manual keying.

If the initial stocktaking exercise has revealed an existing thesaurus of which a substantial portion should be adopted, it might be possible to import this directly into the chosen thesaurus management software. This procedure can save time, particularly if the software permits import of structured data with scope notes and relationships as well as the terms. However, it is essential that the permission of the copyright holder is obtained.

Unstructured lists of terms can also be imported directly into some software products. This does not save as much time since relationships still need to be entered and careful inspection is needed to ensure that spelling inconsistencies are not introduced accidentally.

13.3.2 Construction sequence

When working with hierarchies, the question arises of whether to build from the top downwards or from the bottom upwards. A view of the top layers is useful in ensuring that the thesaurus has the appropriate coverage and balance to meet the desired scope. It is also useful when inviting contributions from experts and other users to be able to place their advice in the context of the overall structure.

On the other hand, work at the more specific level tends to throw up anomalies that can affect structure at the higher levels. The availability of low-level portions of hierarchy, revealing many concepts that need to be accommodated somewhere, tends to inform development of a sound superstructure.

Both strategies are useful and should be pursued in combination. A sketch of the high-level structure should be prepared before work proceeds on lower-level sections of hierarchy, one at a time. As the work proceeds, the high-level sketch should be modified to meet emerging needs.

It is efficient to work with groups of hierarchically clustered terms, entering them together with equivalence and hierarchical relationships. However, associative relationships cannot be entered as easily at this stage because the terms at the other end of the association are usually in another hierarchy, still to be developed. Associative relationships are usually entered at a later stage when the bulk of the terms are present in the system.

Whichever sequence is followed, quality control should be undertaken to cover aspects such as completeness, absence of duplication, accuracy of spelling, correct choice of relationships, etc.

13.3.3 Construction of a multilingual thesaurus

Three approaches for constructing a multilingual thesaurus can be considered. The choice of approach is dependent on the available human, time and financial resources. It should also take into account the context of the intended application, for example whether monolingual thesauri already exist for the intended domain and whether they have already been used to index the documents to which access is required.

a) Translation of a monolingual thesaurus

The translation approach is a popular and relatively economical way of constructing a multilingual thesaurus. It is especially cost effective if the documents to be searched have already been indexed with the monolingual thesaurus. If this approach is adopted, however, the language of the original monolingual thesaurus acquires the status of dominant language. The translation process produces multiple target language versions, with terms and identical relationship structures that might not always correspond to the cultural and conceptual expectations of the user communities in the target languages.

b) Merging of several distinct monolingual thesauri

The merging of distinct monolingual thesauri is a complex process. It is more respectful of the integrity of the different conceptual and linguistic systems that must be reconciled, as it allows all languages to assume the role of source language in turn. However, as the various thesauri used as sources typically exhibit different levels of specificity and pre-coordination, this approach is the most challenging from a management perspective.

c) Simultaneous construction of the various language versions of the multilingual thesaurus

This third approach enables all languages in the thesaurus to have equal status. Each language becomes source and target language in turn, and can have an impact on the establishment of hierarchical and associative relationships. The project should be managed in such a way that the terminological and structural adaptations required to maintain cross-language equivalence are not always made in the same language. Careful coordination and teamwork should be applied from the start, to ensure a successful outcome.

13.3.4 Involving experts and stakeholders

The following benefits can be obtained from involving other people at various stages of the work. All should be pursued.

a) Specialist terminology can be difficult to grasp and have surprising nuances of meaning. Someone who knows a specialized area well can quickly check whether the terminology chosen is appropriate and relationships correctly appointed. If terms are applied in ways that are unacceptable to experts within the user community, the thesaurus will not easily gain acceptance. In principle, therefore, it is a good idea to involve experts in checking as work proceeds. However, terms typically have more than one meaning, and the meaning favoured by one expert might not meet the approval of another. Furthermore, as the concept most useful for information retrieval purposes might be slightly broader or narrower than the term preferred for representing it, some experts find it difficult to accept the perceived "inaccuracy". The experts chosen to assist should be well briefed in the purposes and conventions of a controlled vocabulary (see Clause 4). The thesaurus developer should be prepared to guide and mediate all contributions.

b) It is difficult for one person to make all the correct choices at the first attempt. A great deal can be gained from discussing difficult terms among an editorial team, with a degree of lateral thinking. If the team consists of one editor, it might be beneficial to set up a committee or panel to review sections of the work in progress, or to consult selected colleagues ad hoc. Optionally, the editorial review board might be asked to approve all elements of the thesaurus before they are issued.

- c) The occasional involvement of senior management and/or other stakeholders can be an asset in securing continued funding, acceptance and implementation of the finished product.
- d) Involvement of the users can greatly enhance buy-in. People with a stake in the project are much more likely to use it.
- e) The involvement of experts in all the languages of a multilingual thesaurus, from the start, greatly improves the prospects for acceptability to communities speaking the various languages.

13.4 Introduction to the thesaurus

All thesauri should provide a comprehensive introduction that clearly states the purpose of the thesaurus and why, how, and by whom the thesaurus was developed. The following points should be addressed:

- a) the subject field(s) covered, with core and fringe areas identified;
- b) the languages in which the thesaurus is presented;
- c) confirmation of which national and/or international standards have been followed;
- d) the meaning of all conventions, abbreviations and any punctuation marks used in non-standard ways;
- e) the total number of terms, with separate totals of preferred and non-preferred terms;
- f) any rules governing the selection of concepts, including complex concepts;
- g) the rules adopted in selecting the forms of preferred terms, including a reference to any style manual that is followed, and the rules for deciding their interrelationships;
- h) the filing rules employed, following (and quoting) an appropriate national or international standard where possible;
- i) a statement on the updating policy, including the frequency, dates and procedures, and the name and address of the responsible agency to whom comments and suggestions should be sent;
- j) references to, and acknowledgements of, sources used in compiling and reviewing the thesaurus.

Whenever possible, these points should be illustrated by examples and accompanied by definitions of any technical terms used in the introduction.

If the thesaurus was designed for a particular system or application, the introduction should also explain how to use it in that context.

13.5 Dissemination

13.5.1 Integration with an electronic system

The needs of people using a thesaurus, either for indexing or for searching, should be considered. Access is most convenient if the thesaurus with all its terms, relationships and scope notes is fully integrated with the indexing, browsing and searching functions, as discussed in 16.3.

Some indexing and/or searching systems have an integrated thesaurus maintenance module. If this is used for the thesaurus development, no import or export is required, and no special preparations are needed. However, if the integrated system has no mechanism for exporting the thesaurus in a standard format, difficulties will occur if the need arises to change systems or to make the same thesaurus available for additional applications.

Whether or not routine dissemination is needed, a capability for exporting the thesaurus in a standard format should be available. Indexing and searching systems that use the thesaurus should be capable of importing the thesaurus in the same format. Guidance on formats is given in Clause 17 and Annex B.

13.5.2 Electronic publication

The thesaurus may also be made available in stand-alone mode, i.e. not linked to any particular application. An electronic thesaurus may be distributed on CD-ROM, on a website, an intranet or the Internet. The applicable browse functions are described in 16.3.

Even when a thesaurus is published on a network without a direct linkage to any particular application, some search applications on the same network (an intranet or the Internet) can use it for real-time interrogation while a search is in progress. To make this easier, the thesaurus should be made available in XML format, accessible as an XML "namespace".

Certain characters have restricted use in XML (e.g. < > & '"). These characters should be avoided where possible as described in 6.4.2. Where, however, they are needed for user acceptability (e.g. Boyle's Law, women's rights) they should be encoded by the thesaurus management software as set out in References [57] and [58] when generating the XML output.

13.5.3 Limited distribution of hard copy

The thesaurus may be made available in hard copy for limited distribution under the following circumstances:

- a) a full-scale print run would be too expensive;
- b) most users prefer an electronic version;
- c) the thesaurus is strictly an in-house product;
- d) the thesaurus editorial team find a printout convenient for display and/or note-taking.

Realistically, this option is a simple extension of the routine practice of obtaining reports from the thesaurus database on demand. It offers the flexibility to tailor-make the report(s) for ad hoc needs, for example to include or exclude the "housekeeping fields", to issue a subset for a particular user group, to choose between the various styles of display, etc. Such reports may be distributed electronically, leaving individual users to print them out as required.

13.5.4 Conventional publication

While conventional publication has largely been superseded by electronic publication, it is still appropriate in some cases, if justified by user demand. Printed displays have some advantages over electronic ones, particularly in locations where access to a computer is limited. Furthermore, conventional publication can bring the thesaurus to the notice of a different, important audience.

When an organization has decided to develop and publish a new thesaurus, notification of intent should be announced in a professional journal in the relevant field(s), as well as through relevant electronic discussion forums.

13.5.5 Deposit with a clearinghouse

A copy of the first and any subsequent edition of a published thesaurus should be deposited with an appropriate national depository library. If the thesaurus is in English, or includes English as one of its languages, a copy should also be deposited with the North American clearinghouse in Toronto⁴⁾.

4) Subject Analysis Systems Collection (SAS) is held at The Inforum, Faculty of Information, University of Toronto, 140 St George Street Toronto, Ontario M5S 3G6 Canada. See details at <http://discover.library.utoronto.ca/general-information/libraries/FISINFORUM/>. SAS records are included in the University's catalogue.

13.5.6 Website directories

Lists of thesauri are shown on a number of websites available through the Internet. Some of these sites publicize thesaurus projects in advance of publication. Additionally, the Dublin Core Metadata Initiative (DCMI) has encouraged several ongoing projects to establish metadata registries, including a "terminology registry" intended for controlled vocabularies among other resources^[31]. On or before publication, the thesaurus developer should send full details of the thesaurus, whether electronic or printed, to the administrator of suitable websites or registry services. In the case of an electronic thesaurus available through the Internet, the service might provide a direct link to it.

13.6 Updating

13.6.1 General

Thesaurus maintenance should be active throughout the lifetime of the product. It is essential to provide for changes, both in the natural evolution of terminology and in the scope of the databases or other resources that the thesaurus serves. The need for updating begins the day a thesaurus is issued, if not before. Suggestions for change might be particularly frequent in the first few months after issue, as that is the time when the vocabulary is undergoing its first serious testing. Editorial procedures should be in place from the start.

While change is essential to cope with emerging requirements, it is important to recognize that every change potentially impairs retrieval performance for the "backfile" (i.e. for the resources already indexed with the original vocabulary). When a new term is introduced, it is available for searching the database from that date on, but relevant resources already in the system will not have used the term in their indexing. If the database management software allows automatic or semi-automatic correction of backfile records, changes to existing preferred terms can be implemented. However, other types of changes might be less susceptible to retrospective fixing. Therefore, a compromise might be required between meeting new needs and maintaining stability.

If the thesaurus is multilingual, the impact of the proposed change on all the languages should be considered, before approval.

13.6.2 Suggestion procedure

An easy mechanism for suggesting changes should be provided for all users of the thesaurus, in particular indexers. The mechanism provided may be a form, either printed or electronic. The form should invite people to suggest a new term or other change that is required, and provide as much background information as possible. Useful background information includes a definition of the concept required, any references to its occurrence in the literature, any synonyms or alternative forms of expression, any relationships with terms already present in the thesaurus, and a justification for why the change is needed.

Indexers often discover the need for a new term while processing documents for input to a database. As there might not be time to consult the thesaurus editor before completing the indexing, the proposed term should be applied as a "candidate preferred term". The candidate terms become available for searching, but are not required to pass thesaurus validation. The thesaurus editor should regularly review all the candidates proposed (see 13.6.3) and may admit them to the thesaurus management system with "candidate" status. As and when a candidate is approved, the appropriate adjustment should be made to the status of the term. Candidates not approved should be deleted or corrected as appropriate.

13.6.3 Review procedure

At regular intervals the thesaurus editor should review all the suggestions received and candidate terms proposed. Furthermore, the editor should monitor the usage frequency of preferred terms in the database(s) served. Any that are used too often or too little are candidates for deletion or amendment.

User queries may also be used as an aid to maintenance. Terms used in unsuccessful searches can be examined to see if they are valid concepts for the thesaurus. Heavy use or non-use of a term in queries can indicate that it should be considered for division or deletion, respectively.

Many of today's information retrieval systems offer a free-text search for finding information resources and keep a log of the transactions, including search terms entered by the users. Such transaction logs can serve as an objective guide to user preferences and habits, indicating, for example, which subject areas need more depth of coverage, and whether simple or more complex concepts are sought. Sometimes they suggest additional non-preferred terms for a concept already in the thesaurus, or even the replacement of an existing preferred term with a synonym that is more frequently sought. Any transaction logs that are available should be fully exploited as a guide to thesaurus maintenance.

The suggestions, user search terms and indexers' candidates should be researched thoroughly. Careful study can show that the suggested concept was already present in the thesaurus under another name. As the most common proposals are for new preferred terms, they rarely give consideration to all the alternative or complementary actions required, such as adding a lead-in entry, changing a scope note, adjusting hierarchical or associative relationships, etc. They might also add unacceptably to the level of specificity. The editor should flesh out each proposal to a fully coherent and consistent set of amendments before approval can be given. If the thesaurus is multilingual, the proposal should be worked out, with adaptations wherever necessary, in all the languages.

In a small establishment the editor may need to make all the decisions, although consultation with users is advisable, particularly if the thesaurus is used for several applications. A note of all the proposed changes can be circulated to users with an invitation to comment; alternatively, a review board, with representation from each major application, can be consulted. This board should meet regularly or organize a regular electronic forum. After fully researching and fleshing out the proposals, the editor should present them to the board. The implications for each application should be taken into account before a decision is reached.

13.6.4 The nature of changes

While the main focus of updates tends to be adding new terms, other types of change should not be neglected. Any of the following listed in a) to n) can occur:

- a) adding a new concept, represented by a preferred term;
- b) adding a new non-preferred term as a lead-in entry;
- c) amending a preferred term or a non-preferred term;
- d) deleting a preferred term;
- e) making a preferred term a non-preferred term of another preferred term;
- f) deleting a non-preferred term;
- g) reversing the preference between a preferred and a non-preferred term;
- h) adding or changing a scope note, definition, history note or editorial note;
- i) merging two concepts into one;
- j) splitting a concept into two or more, which can sometimes involve selecting an existing non-preferred term to be a preferred term;
- k) altering the hierarchical structure;
- l) moving a branch of the hierarchy from one place to another;

- m) adding or removing associative relationships;
- n) almost any combination of a) to m), sometimes involving different changes in the different languages of a multilingual thesaurus. For example, the addition of a non-preferred term in one language may or may not need to be reflected in other languages.

It is essential that the original editorial criteria continue to apply, with the added criterion of respecting the convenience of existing users. Deletions are of particular concern, especially if the term has been used in the past. Instead of deleting a preferred term, the term should be demoted to have non-preferred status and point to the appropriate preferred term, with a history note showing the date until which it was valid. The corresponding preferred term should also have a history note pointing out the change.

While the editor should craft an appropriate history note when terms are changed significantly, the date of input and date last modified should be filled automatically by the software. Similarly, the identifier for new terms should be added automatically.

The changes should be implemented at the same time in all the languages of a multilingual thesaurus.

13.6.5 Dissemination of updates

13.6.5.1 General

The mechanism by which updates are distributed should be planned before the thesaurus is first issued. Communication of changes can be complex, particularly when the attributes and relationships of one term have changed in several ways. While it is straightforward to send out a list of new terms, it is difficult if the users need to know where the terms fit into the hierarchical structure, particularly if several different types of display need to be distributed. Assuming that a simple list of new terms is acceptable to users, the likelihood is that the new terms will be ignored at the time of using the thesaurus because they have not been fully integrated into the look-up procedure.

The simplest way of disseminating changes is to distribute a new edition of the thesaurus. If this is carried out electronically, costs are kept to a minimum. Furthermore, it avoids the difficulty of communicating the nature of the changes and ensures that users all have access to the same vocabulary authority when selecting terms. Additionally, there is a need to communicate the details of the changes both to human users and to computer systems that will import the update.

13.6.5.2 Reader-friendly updates

For human users, notification may take the form of a list in alphabetical order, possibly complemented by one in classified order, or a categorized list showing all the new preferred terms that have been added or altered, new lead-in entries, etc. Feedback should be invited on the format. The list can be made more or less elaborate depending on the views expressed. Some user groups might want to see the full details of every new or amended term and relationship. Electronic displays can incorporate devices such as tracking or highlighting to draw attention to the changes. All users should be encouraged to note the most important changes, such as new terms and deletions, in their printed copy if they use it. For printed thesauri, this can be facilitated by producing them in loose-leaf form whereby amendments take the form of complete pages that can replace outdated ones.

13.6.5.3 Updates for computers

When a copy of the thesaurus is held in another computer system, the easiest option for updating the copy is often to delete the old one and import a whole new thesaurus with the changes implemented. However, this might not be acceptable if the target system links thesaurus terms with other data, such as postings to bibliographic records or mappings to another vocabulary. For computer systems such as these, reports or files of all the entities, attributes and relationships (see Clause 15) that have been deleted, added or modified should be provided as a minimum.

To support these requirements, the thesaurus management system should be capable of recording the date on which the entities, attributes or relationships were last modified, and using this date to extract a report of the modified data. Alternatively, an external log file can record all additions, deletions and changes to entities, attributes and relationships.

For importing systems, some of the changes will be insignificant, while others will be important. For this reason, some thesaurus management systems record the nature of the change as well as the change itself. This allows the importing computer system to separate relatively straightforward changes, e.g. spelling changes, from complex changes, e.g. splits of a term into two terms. As a standard categorization of the possible changes does not exist, the procedures for achieving this should be developed ad hoc.

13.6.5.4 Tracking changes

The importance of the date last modified field has already been noted in connection with updates for computers. It is sometimes also needed for reader-friendly updates, as is the date of input. The date should be entered in the standard format yyyy-mm-dd in accordance with ISO 8601. The concept identifier and/or term identifier is also vital, in case the spelling of a term is changed. (Without the identifier, a computer has no way of finding out that a given term is intended to replace another with a different spelling.) All of the attributes mentioned should be filled in automatically to avoid human error.

It is highly recommended that a note be kept of all terms deleted. However, few thesaurus management packages have a mechanism for retaining a list of terms deleted and providing reports of them. Therefore, the editor should keep a note, recording the identifier as well as the term itself.

14 Guidelines for thesaurus management software

14.1 General

Thesaurus management software should be capable of managing, importing and exporting the data as described in Clause 15. It should be chosen on the basis of the requirements of the project in hand (see 13.1.5). While the characteristics and functions outlined in 14.2 to 14.10 are usually needed, exceptions can occur. Also, additional features are often required. For example, it can be advantageous if the software is capable of simultaneously handling more than one thesaurus.

NOTE No guidance is given in this document on the criteria applied to software selection in general, such as the availability of good documentation, training and other forms of support, the general user-friendliness of the interface and an acceptable price. Considerations applicable to vocabulary mapping will be covered in ISO 25964-2.

14.2 Size and character limitations

The software should not impose the following limitations.

- a) There should be no limitations on the number of terms in the vocabulary that prevent it expanding to the size needed. The same is applicable to other elements such as node labels, scope notes, etc.
- b) There should preferably be no limitations on the length of terms or of node labels, notes, etc. While relatively few terms exceed 40 characters, some need 100 characters or more.
- c) There should be no limitation on the number of hierarchical levels admissible, nor on the number of hierarchical, associative or equivalence relationships possessed by any preferred term.
- d) The software should be capable of handling all the characters in the Universal Character Set, as defined in ISO/IEC 10646, when used in any of the text elements (including terms, node labels and notes).
- e) The editor should be able to choose upper or lower case characters as appropriate.

- f) For multilingual thesauri, there should be no limit on the number of languages that can be included. It should be possible to apply all the desired languages to any or all of the text elements, such as terms, node labels and notes.

14.3 Relationships between terms and between concepts

The software should conform to the requirements specified in a) to i) below.

NOTE Where this section refers to the English tags BT, NT, RT, USE, UF, SN the corresponding tags in other languages should be applied in those languages (see Table 2 in Clause 3).

- a) It should not permit the coexistence of duplicate terms for the same language. Any duplicates entered should be rejected upon entry or at least submitted to the editor for correction, amalgamation, the addition of a qualifier, or other remedial action. The matching algorithm for duplicate detection should be capable of customization so that, for example, typographical differences such as italics or capitalization may be ignored for the purposes of duplicate detection.
- b) It should support the basic relationships BT/NT, RT/RT, USE/UF as defined in Clauses 8 and 10.
- c) It should support the reciprocity requirements described in Clauses 8 and 10, i.e. if Concept A has a BT relationship with Concept B, then Concept B should have an NT relationship with Concept A and vice versa; if Concept C has an RT relationship with Concept D, then Concept D should have an RT relationship with Concept C; if Term E has a USE relationship with Term F, then Term F should have a UF relationship with Term E and vice versa. Preferably, the software should make the reciprocal relationships available automatically in response to the editor's insertion one way round, but as a minimum the software should issue a warning if any non-reciprocal relationship is present.
- d) When a term or concept is amended or deleted, the change should be propagated automatically in all places in which that term or concept appears related to another (whether as BT, NT, RT, USE or UF). In the event of term or concept deletion, all relationships to and from that term or concept should be deleted. However, if deletion of a term or concept or relationship would leave any concept without at least one broader term/concept, or any non-preferred term without a preferred term, the editor should be warned.
- e) There should be no limitation on the number of relationships a given concept or preferred term can have with others. Thus one concept can have any number of BTs, NTs and RTs, and one preferred term can have any number of non-preferred terms.

NOTE Certain combinations are inadmissible (see g) below).

- f) It should be possible to set up user-defined reciprocal relationships, for example to distinguish between different types of BT/NT or different types of associative relationship.
- g) Validation checks should prevent the entry of inadmissible relationship combinations, as follows:
 - If two terms or concepts already have one of the basic relationships, no other basic relationship between the same terms or concepts is admissible.
 - If Concept A has BT Concept B, none of the concepts in the BT hierarchy above Concept B should be admissible as BT, NT or RT of Concept A.
 - Non-preferred terms (i.e. any term with a USE or USE+ relationship to another term) cannot have any BT, NT, RT or UF relationships.
 - In the case of the USE+ relationship occurring, the software should check that the relationship is at least ternary.
- h) No relationship from a term or a concept to itself is admissible, i.e. all the basic relationships are irreflexive.
- i) Only one preferred term should be admissible for each concept, in each language of the thesaurus.

14.4 Notes applying to terms or concepts

The software should support notes as follows:

- a) It should support entry of a scope note, associated with any concept.
NOTE Scope notes can be of any length.
- b) If a note (of any type) makes reference to another term or concept in the vocabulary, the software should preferably support addition of a marker or hyperlink to the record for that term or concept. The software should check the validity of the link target.
- c) It should support the setting up of user-defined notes associated with any term or concept, for example history notes, editorial notes etc.

14.5 Codes and notation

The software should support subject categories, codes and notation as follows:

- a) It should be possible to associate at least one code, number or other type of notation with any term or concept, concept group or array (see 12.2.2 and 15.2.18). Preferably more than one coding/numbering type should be supported.
- b) It should be possible to associate one or more subject category/ies with any term or concept, concept group or array (see 12.2.2 and 15.2.18).
- c) It should be possible to assign a unique identifier to each term and to each concept. Preferably, the assignment of the identifier(s) should be automatic whenever a new term and/or concept is entered, in such a way as never to duplicate any of the existing identifiers or identifiers of terms or concepts previously deleted. The identifier should not change when term or concept attributes or relationships are modified in any way.
- d) It should be possible to output the vocabulary using the sequence of each type of notation, coding or identifier.

14.6 Node labels

The software should support node labels as follows:

- a) Node labels are not regarded as thesaurus terms or concepts (see Clause 11, especially the examples in Figure 4) and, therefore, are not subject to the relationship requirements under 14.3. Furthermore, they do not need to be unique and so should not be subject to the duplicate control described in 14.3 a).
- b) The software should have means for locating a node label in displays in the correct position relative to any parent term and to the highest level terms that come within the corresponding facet or array.

14.7 Status of languages

The software should allow each language of a multilingual thesaurus to have equal status, avoiding predominance of one of the languages over the others. For example:

- a) The number of non-preferred terms applying to any one concept in each language should not be determined by the number present in another language, and the non-preferred terms in different languages should not be required to correspond to each other.
- b) The existence of a scope note for a given concept in one language should not require a corresponding scope note in any of the other languages.

14.8 Data import/export

It is essential to be able to export and import data so that the thesaurus content is not restricted to the software or application initially used to develop it. Import/export formats are discussed in Clause 17. The following mechanisms should be provided.

- a) Bulk import of datasets from existing vocabularies, comprising terms, scope notes, node labels, standard relationships between the terms and concepts, and all other attributes of the terms, concepts and node labels.
 - All of the mentioned features should be retained after import, as well as all characters from the Universal Character Set wherever used.
- b) Producing reports or exporting the vocabulary, including all terms, scope notes, notation and standard relationships between the terms and concepts.
 - It should also be possible to export editor-defined subsets, such as non-preferred terms only, or preferred terms with their scope notes and NTs only, or preferred terms of concepts that have no hierarchical or associative relationships, etc.
- c) Batch edit/delete facility.
 - It should be possible to delete or edit batches of records in the same way, preferably using a facility native to the software. If this is not possible, an option might be to use functions of the underlying database management system, or to export the selected records, edit them externally and re-import. This technique can be used, for example, to add the same history note or relationship to a batch of terms, or perhaps a mapping to terms in another vocabulary. If this method is used, the customary validations should be applied on import.
- d) Exporting all terms that have been amended after a given date, with or without their full details.
 - The option should be available of selecting only certain types of amendment, for example only new terms, or only those in a particular language, or of including all terms that have undergone any change of attributes or relationships. It should also be possible to report all terms that have been deleted from a certain date.
- e) Outputting thesaurus displays, either in hard copy or on the screen.
 - It should be possible to choose between a variety of sequences and layouts for the display, of which the alphabetical display is essential and either a hierarchical or a classified display is highly recommended. See Clause 12 for a description of the various types of display.
- f) When sibling terms in alphabetical, hierarchical or classified displays are presented in alphabetical order, either the word-by-word or the letter-by-letter convention may be used. The same convention should then be applied throughout the thesaurus. (An explanation of the conventions can be found in ISO 999; see also the example below.) However, it should be possible to force a different sequence when appropriate (see Clause 11).

EXAMPLE

Word by word sequence	Letter by letter sequence
national insurance	national insurance
national parks	nationality
nationality	national parks

14.9 Editorial navigation and support

The software should support the following editorial functions.

- a) The thesaurus editor should be able to locate the full details of any term (and the corresponding concept) by direct entry of that term, preferably only needing to enter a portion of the term, with the software assisting the selection by identifying all terms that contain the portion.
- b) The editor should be able to locate the full details for any term (and the corresponding concept) by browsing via the term/concept relationships. The browse facilities should preferably enable him/her to start off from a list of top terms, but in the absence of this he/she should at least be able to navigate from any term to the record for any of its NTs, BTs, RTs, USEs or UFs.
- c) The editorial interface should allow viewing of the full hierarchical context of a term or concept, at the same time as the term itself, with all its notes, codes and relationships presented for editing.
- d) It should be possible to move a concept (together with all its NTs, NTs of those NTs, etc.) easily from one hierarchical position to another, preferably using drag-and-drop. This requires breaking one set of BT/NT relationships and making another. Any RT relationships thus invalidated should be drawn to the editor's attention.
- e) Editing capabilities should include standard word processing facilities, such as the ability to add, modify and delete characters without rekeying an entire field. A spell-checking function might also be useful.
- f) When an editor takes steps to delete a term or concept, the software should first seek confirmation that the deletion of that term or concept is intended, before completing the action.
- g) When a relationship is to be established between two terms or concepts already present in the vocabulary, it should be possible to achieve this by navigation and selection rather than by having to key in the whole of a term already known to the system. This is important to prevent errors, as well as to support efficiency.
- h) The editor should be able to switch easily from a display in one language to the corresponding display for any of the other languages in the thesaurus.

14.10 Editorial safeguards

The software should embody the following safeguards.

- a) Editorial changes should be made in the first instance to a master database from which outputs are derived periodically for downstream processes such as indexing or resource discovery applications.
- b) If more than one person is editing the master database simultaneously, an inbuilt mechanism should prevent simultaneous write access to the same records.
- c) Security/password controls should prevent editorial changes from unauthorized persons.
- d) Preferably, the software should allow for different levels of access so that provisional changes can be made, which are not finally admitted until approved.
- e) For each editor, a roll-back (undo) function should allow progressive reversal of the most recent editorial changes he/she has entered.
- f) A log should be kept so that the database can be restored from an earlier version.

14.11 Housekeeping tools

It should be possible to obtain reports of the numbers of terms with particular characteristics, particularly the total number of preferred and non-preferred terms.

As described in 13.6.3, the frequency of use of thesaurus terms in indexing and searching should be monitored. Also, the thesaurus management software should be capable of importing and storing the usage data if another tool does not already perform this function. One or more user-defined fields [see 14.4 c)] or custom attributes (see 15.2.16) might be needed for storage of the data.

15 Data model

15.1 General

This clause models the underlying structure of the data that can be conveyed in a thesaurus conforming to earlier clauses of this part of ISO 25964. For multilingual thesauri, however, this data model applies only to those that are fully symmetrical. If data structures differ between languages it might be necessary to employ mapping techniques, at least for the parts of the thesaurus where this occurs. Mapping techniques will be discussed in ISO 25964-2.

The XML schema described in Annex B is derived from this model and may be used when sending or receiving thesaurus data in electronic form. The model represents a logical structure that should be maintained, although it does not necessarily represent the way in which data is held within a computer system.

The basic recommendations in Clauses 5 to 12 are quite simple, needing only a simple model. But there are also a number of optional features that require much greater complexity in the model. For thesaurus exchange to be successful in a wide range of situations, it is important to have a format hospitable to sophisticated as well as simple thesauri.

The model presented here accommodates the full range of options described in Clauses 5 to 12. Some elements of this model are shown as optional and need not be used when exchanging thesauri that lack the optional features. Software systems importing data may ignore optional elements that they do not support, and assume appropriate default values (which might be null) for optional elements that they do support but that are not present in the imported data, while interpreting the remaining elements consistently and correctly.

The model is presented first in Figure 15 using UML (Unified Modelling Language^{[42][43][44]}) conventions, but stops short of specifying the thesaurus behaviours and class methods that might be needed in a software implementation specification. UML is highly expressive and discourages ambiguity, but as some users might be unfamiliar with its conventions, an alternative tabular presentation is added at 15.3. The data elements and attributes in the UML diagram and the data tables are identical in substance, though some details of relationships are not made explicit in the tabular presentation. In case of doubt, the diagram should be regarded as the authority.

UML defines its own special conventions and terminology for modelling purposes. In the present clause, the term "class" is used in the UML sense to describe a set of objects that have similar structure, behaviour and relationships. Similarly, UML gives special meanings to the expressions "String", "Boolean" and "aggregation". More information about UML can be found from references in the Bibliography. In Reference [44], Chapter 5 is a guide to UML notation, and Section 4.5.4 describes detailed semantics.

The notes on the model given in 15.2 apply to the tabular presentation in 15.3, as well as to the diagram in Figure 15.

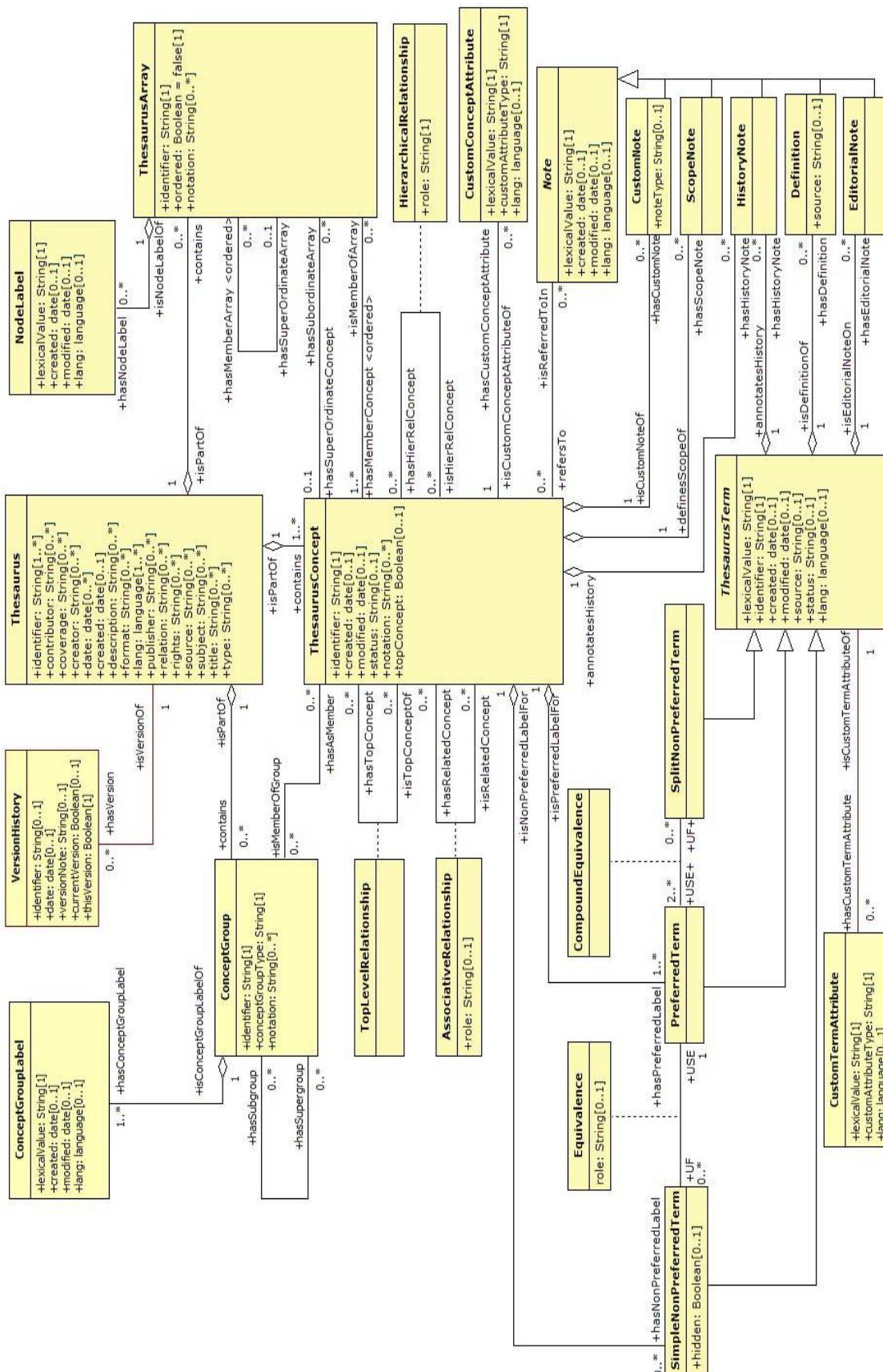


Figure 15 — UML model

15.2 Notes on the model

15.2.1 Naming conventions

The names of all attributes, including some Dublin Core metadata elements (see Reference [33]) that appear in the model and in the derived XML schema, follow the Dublin Core "lowerCamelCase" convention (i.e. no spaces between words and each word except the first starting with a capital letter). Names of UML classes use "UpperCamelCase" (i.e. no spaces between words and each word starting with a capital letter).

15.2.2 Symbols for associations

The diamond symbol in the diagram represents an "aggregation", i.e. a "has-a" relationship. This symbol is used to indicate that in the derived XML schema the definition of an object will be nested in its parent object.

The triangle symbol indicates "generalization", i.e. an "is-a" relationship, linking a general class with more specific types of that class, which inherit all the attributes of the parent class.

Normal associations (without a diamond) indicate a relationship of the type key/keyref in XML, where each instance of one class contains a reference key that links it to an instance of another class. Note that the XML schema described in Annex B does not actually enforce the key/keyref constraints. The reason for this relaxation of the constraints is that enforcement would have the effect of invalidating XML output files that contain only an extracted portion of the thesaurus rather than a whole thesaurus.

15.2.3 Concept

Each concept in the thesaurus is represented by one preferred term per language, and by any number of non-preferred terms. The notation, scope note and broader/narrower/related term relationships apply to the concept as a whole, rather than to its preferred term. A unique identifier may be assigned to each concept. In some systems, the concept is identified only by its preferred term or by the identifier of its preferred term, but this has disadvantages if the spelling of the term changes.

15.2.4 Identifier

Thesaurus, *ThesaurusConcept*, *ThesaurusTerm*, *ThesaurusArray* and *ConceptGroup* each have a unique identifier that is used in the XML schema described in Annex B. The identifier and date attributes of *ThesaurusTerm* are essential for the provision of a good updating service because if the spelling of a term changes, a constant Term identifier facilitates continuity during successive updates. The use of a concept identifier is strongly recommended to promote interoperability among networked search applications.

15.2.5 Dates

The date created and date modified are strongly recommended but formally optional attributes of several classes. They should be given in YYYY-MM-DD format, in line with ISO 8601. In the case of *Thesaurus*, another option is to use the simple attribute "date", in which case the value will be interpreted as applying to the date when the version to which it is attached was issued. The same format should be used.

15.2.6 Versions and version history

The class *VersionHistory* optionally allows any copy of a thesaurus to carry a record of versions or editions that have been created.

Although the class is optional and might not be needed when only one version exists, adoption is highly recommended as soon as there is more than one. Each version should be identified by an identifier or a date or both.

versionNote can be used to explain the nature of the version, e.g. whether it is an updated version, an extract or a translation, or to explain its relationship to other versions.

`currentVersion` is a Boolean (true/false) flag to indicate for each version whether it is still current or whether it has been superseded or withdrawn. More than one version can be current simultaneously.

`thisVersion` is a Boolean flag to indicate which of the versions listed is the one to which this history is attached.

Distinguishing between those thesaurus variants which are "versions" and those which should be identified as separate works is not always easy. In the present context, versioning control relates mainly to successive updating of an original thesaurus. Thus:

- a) Updates done or adopted by the original owner/creator, i.e. new concepts, terms, relationships, notes, changes to existing parts of the thesaurus and special editions for different purposes, should normally be treated as new versions of a given thesaurus.
- b) True subsets, even though they might have a subtitle such as "Abridged version", are more conveniently treated as concept groups (see 15.2.18), since they are based on the content of an existing version.
- c) Similarly, different language versions, provided they correspond to the original work and share the same conceptual structure (even though they might be referred to as "English version", French version", etc.), should be treated as belonging to the same thesaurus version. For data exchange purposes, they should be distinguished by using the language attribute of *Thesaurus*.
- d) Any work incorporating changes of terms, concepts or relationships, new translations, simplification/reductions of relationships and similar, if it is issued by others than the owners/original creators, should be identified as a separate thesaurus. Changes in the Thesaurus attributes creator, created, publisher, rights or title might indicate that it is a separate work. In such cases, it should be given a distinct identifier and linked to the original work by data in attributes such as relation, description and source.

15.2.7 Status

This is an optional attribute of *ThesaurusConcept* and *ThesaurusTerm*, which records whether they are, for example, approved, candidates, superseded or deprecated (see 13.6.2).

15.2.8 Notation

This is an optional attribute of *ThesaurusConcept*, *NodeLabel* and *ConceptGroup* (see 12.1.3 and 12.2.5.2).

If the thesaurus uses an expressive notation, then applying it to node labels will allow them to be shown in the correct place in hierarchical displays.

If there is no expressive notation, some other means must be found of outputting the node labels correctly in the display, such as a sort code attribute that is not displayed to users. In this event, the same attribute will be required at the display level for preferred terms.

The system of notation used for *ConceptGroup* may be quite distinct from that used for *ThesaurusConcept*, and one of these systems may be present without the other.

15.2.9 Source

This is an optional attribute of *Thesaurus* and *ThesaurusTerm*, which can be used to note the reference work or individual who contributed the term in question.

15.2.10 Language codes

Language is an optional attribute of *ThesaurusTerm*, *Note* and *NodeLabel* and a mandatory attribute of *Thesaurus*. It should be given as an alpha-2 code selected from ISO 639-1 if present in that list, or an alpha-3 code from ISO 639-2 if not. These codes may be extended where necessary with the additional codes described in RFC 4646^[45] and listed in the IANA subtag registry^[35] (see 12.4.5).

15.2.11 Dublin Core elements

The *Thesaurus* class has a number of attributes intended for assigning Dublin Core metadata^[33] to a file using the ISO 25964 format. As well as identifier, date, source and language already described, these include contributor, coverage, creator, description, format, publisher, relation, rights, subject, title and type. All except language and identifier are optional.

15.2.12 Multiplicity of Preferred Term

The model allows more than one preferred term per concept, to provide for multilingual thesauri where one is permitted per language. For monolingual thesauri the multiplicity is reduced to one.

15.2.13 Top level concepts

Clause 12 makes brief mention of "Top Terms", i.e. terms representing top concepts, as an optional feature of alphabetical displays and single term displays (see 12.2.2 and 12.1.3), linking a concept to the top concept of the hierarchy in which it occurs. The class *TopLevelRelationship* enables this.

A browse capability that starts by presenting editors with a list of top terms is also recommended in 14.9 b). The attribute **topConcept** addresses this, specifying that a concept is at the top of a hierarchy, i.e. it has no broader concepts. This makes it easier, on importing a thesaurus, to pick out all the top level concepts from which to build a navigational tree.

15.2.14 Notes

Zero or more notes of each type in each language may be recorded.

Editorial notes are useful for entries such as "Review this term after the company merger complete" or "This term is mentioned in the scope note of Concept X" (see 5.3) or "Check spelling with expert A". Notes such as this, and several of the attributes, are more useful for housekeeping than for user consultation. A choice can be made whether or not to allow users to view them.

15.2.15 Note references

The association between *Note* and *ThesaurusConcept* enables any note for one concept to refer to any other concept in the thesaurus. This capability is particularly useful for scope notes (see 5.3).

15.2.16 Custom attributes

The model includes classes *CustomConceptAttribute* and *CustomTermAttribute* for custom attributes of concepts and terms. These enable recording of custom information about concepts and terms.

These are included as separate classes rather than as normal attributes so that the administrator of the thesaurus management system can specify the values of custom attributes that can be assigned. The classes have an attribute *customAttributeType*, allowing the administrator to specify which type of attribute is being used. Values of *customAttributeType* should normally be taken from a controlled list.

15.2.17 Arrays and node labels

Although all thesauri have arrays of sibling terms, it is not always necessary to model them explicitly and so this class is optional. The *ThesaurusArray* and *NodeLabel* classes of the model are needed particularly to support the generation of displays incorporating node labels and/or non-alphabetic sequences of sibling terms (see examples in Figures 4, 6, 7, 8 and 12; see also 12.4.3).

The attribute **ordered** enables non-alphabetic sequences when necessary.

In each language of the thesaurus a maximum of one node label per array should be present.

Some systems organize the display by treating node labels as though they were concepts, with relationships to broader and narrower concepts. This is done only for display purposes and not for the normal functions of broader and narrower relationships. Only a concept can have true broader and narrower relationships.

15.2.18 Concept groups

Many thesauri group concepts using a classification structure that exists in parallel to the hierarchies of thesaurus concepts based on BT/NT relationships. Groups created by the classification are often based on disciplines, subject areas or areas of business activity. They are sometimes called "subject categories", "themes", "domains", "groups", "subsets" or "microthesauri". The model provides for all of these by providing the classes *ConceptGroup* and *ConceptGroupLabel* and the specific type may be indicated by the attribute *conceptGroupType*. In general, there is not a BT/NT relationship between a *ConceptGroup* and the concepts that it contains.

Concepts may be gathered into *ConceptGroups* from many different facets or hierarchies of the thesaurus, and the notation used for the classification into groups may be quite distinct from any notation that might be used for the concepts themselves. Groups may have subgroups, being nested to any level. Each group should be given one verbal label per language.

If it is important to exclude selected non-preferred terms from a given subset of concepts, it might be necessary to mark the selected terms, which may be done using a custom attribute (see 15.2.16).

15.2.19 Treatment of facets

Facets are provided for in the data model although not modelled explicitly, since different thesauri apply facet analysis in different ways. If facet names are included as top terms, they should be treated as normal preferred terms applying to top level concepts (see 15.2.13). Alternatively, they may be the names of concept groups (15.2.18), and/or they may appear in node labels (15.2.17).

15.2.20 Relationship roles

The classes *Equivalence*, *HierarchicalRelationship* and *AssociativeRelationship* each have a "role" attribute. This can be used to convey the common relationships USE/UF, BT/NT and RT/RT. It can also be used for the optional relationship types described in 10.2.1, as well as custom relationship types as suggested in 10.4. Each occurrence of a relationship is expressed in one direction only, between instances of a "source" class and a "target" class. For example, "Concept A has a broader concept, namely Concept B", where the role is "broader". If the complementary relationship "Concept B has a narrower concept, namely Concept A" needs to be expressed, then this is shown as a separate occurrence with the role "narrower".

For custom relationship types, the text given in the "role" attribute should be composed of (a) the name of the parent relationship type, followed by (b) the symbol forward slash "/", and finally (c) the name of the custom relationship type. If necessary, custom relationship types can be subdivided further in the same way.

EXAMPLE

The text in the 'role' attribute of *HierarchicalRelationship* may be one of the following, where NTX indicates some further subdivision of NTI:

NT
NT/NTP
NT/NTI
NT/NTG
NT/NTI/NTX
BT
BT/BTP
BT/BTI
BT/BTG
BT/BTI/BTX
etc.

15.2.21 Split non-preferred terms

The classes *SplitNonPreferredTerm* and *CompoundEquivalence* enable representation of complex concepts by a combination of terms, as described in 8.5.

15.2.22 Role of relationship tags

Figure 15 shows a relationship between *SimpleNonPreferredTerm* and *PreferredTerm*, with the tags USE and UF, which are described in Clauses 3 and 8 in the context of conventions and displays for human readers. In the context of data exchange, it could be argued that this relationship is redundant, since all the preferred and non-preferred terms for a given concept are linked to that concept. However, some redundancy is retained to facilitate exchange of data for simpler thesauri and to make it easier to exchange update information and other specialized subsets of the data.

Another detail concerns "USE...+". In displays for human readers, there is always a gap between "USE" and "+", to accommodate the term in between (e.g. "Coal mining USE coal + mining"). But if the tag is to be used behind the scenes by computers, it needs to be compressed, in the style "coal mining USE+ coal"; "coal mining USE+ mining". For this reason, the gap is omitted in the diagram.

15.3 Tabular presentation

The elements of the model shown in Figure 15 are listed in Tables 4 to 9, based on the five classes *Thesaurus*, *ThesaurusArray*, *ThesaurusConcept*, *ThesaurusTerm* and *Note*. Other subsidiary classes have been shown within these tables. The brief text in the description columns is complemented by the more extensive notes in 15.2. See also definitions for many of the terms in Clause 2.

The Type column indicates the data type, using the UML data types "String" and "Boolean" where applicable, the XML data types "Date" and "Language" where no UML type is applicable, and "Class" in the case of an initial or associated class in the model.

The columns headed "Occurs" describe whether the elements are mandatory and/or repeatable as shown in Table 3.

Table 3 — Definitions of Occurs as used in Tables 4 to 9

Occurs	Meaning
1	mandatory, not repeatable (one occurrence only)
1..*	mandatory, repeatable (one or more occurrences)
0..1	optional, not repeatable (zero or one occurrence)
0..*	optional, repeatable (zero or more occurrences)

Table 4 — Attributes and associations of *Thesaurus*

Element	Type	Occurs	Description
Thesaurus	Class	1	The thesaurus as a whole
Attributes of <i>Thesaurus</i>			
identifier	String	1..*	Identifier for the thesaurus as a whole
contributor	String	0..*	Person or organization who contributed to the thesaurus
coverage	String	0..*	Spatial or temporal coverage of the thesaurus
creator	String	0..*	Person or organization primarily responsible for making the resource
date	Date	0..*	Any date associated with the thesaurus
created	Date	0..1	The date the thesaurus was created
modified	Date	0..*	A date when this version was modified
description	String	0..*	An account of the thesaurus
format	String	0..*	The file format or physical medium of the thesaurus
language	Language	1..*	Codes showing languages supported by the thesaurus
publisher	String	0..*	Entity responsible for publication
relation	String	0..*	A related publication
rights	String	0..*	Copyright or other rights information
source	String	0..*	Resource from which the thesaurus was derived
subject	String	0..*	Index terms indicating the subject content
title	String	0..*	Title of the thesaurus
type	String	0..*	The genre of the vocabulary, e.g. "thesaurus"
Associated classes of <i>Thesaurus</i>			
ThesaurusArray	Class	0..*	An array of sibling concepts forming part of the thesaurus
ThesaurusConcept	Class	1..*	A concept forming part of the thesaurus
ConceptGroup	Class	0..*	A group of concepts selected by some specified criterion, such as relevance to a particular subject area
VersionHistory	Class	0..*	May provide confirmation of currency as well as relationships with other versions of the same thesaurus

Table 5 — Attributes and associations of *ThesaurusArray*

Element	Type	Occurs	Description
ThesaurusArray	Class	0..*	An array of sibling concepts forming part of the thesaurus
Attributes of <i>ThesaurusArray</i>			
identifier	String	1	A unique identifier for the array
ordered	Boolean	1	A true/false label indicating whether the order of concepts in the array has to be maintained. Default is "false".
notation	String	0..1	A symbolic notation attached to the array, which may be used for sorting and display
Associated classes of <i>ThesaurusArray</i>			
hasSuperOrdinateArray	Class	0..1	A higher-level array of which this array is a member
hasMemberArray	Class	0..*	A lower-level array that is a member of this array <i>An array needs to have at least one member, but this can be a concept or another array.</i>
hasSuperOrdinateConcept	Class	0..1	A higher-level concept to which this array is subordinated
hasMemberConcept	Class	0..*	A concept that is a member of this array <i>An array needs to have at least one member, but this can be a concept or another array.</i>
NodeLabel	Class	0..*	A label showing the basis on which the concepts in the array have been chosen and ordered
— Attributes of <i>NodeLabel</i>			
— lexicalValue	String	1	The wording of the node label
— created	Date	0..1	The date when the node label was created
— modified	Date	0..1	The date when the node label was last modified
— lang	Language	0..1	A code showing the language of the node label. This should be included if the thesaurus supports more than one language

Table 6 — Attributes and associations of *ThesaurusConcept*

Element	Type	Occurs	Description
ThesaurusConcept	Class	1..*	A concept that is a member of the thesaurus
Attributes of ThesaurusConcept			
identifier	String	1	A unique identifier for the concept
created	Date	0..1	The date when the concept was created
modified	Date	0..1	The date when the concept was last modified
status	String	0..1	An indication of whether the concept is candidate, superseded, etc.
notation	String	0..*	A symbolic notation attached to the concept, which may be used for sorting and display
topConcept	Boolean	0..1	A true/false label indicating whether the concept is at the top of a hierarchy, i.e. has no broader concepts
Associated classes of ThesaurusConcept			
PreferredTerm	Class	1..*	The term used as a label for this concept. There should be one preferred term per language.
SimpleNonPreferredTerm	Class	0..*	Alternative terms by which this concept could be sought
ScopeNote	Class	0..*	A note defining or clarifying the scope of the concept within this thesaurus
HistoryNote	Class	0..*	A note recording changes to this concept within this thesaurus
CustomNote	Class	0..*	A note of any other kind relating to this concept
— Attributes of CustomNote			
— noteType	String	0..1	Specification of a particular kind of note
Note	Class	0..*	A note of any kind that contains a reference to this concept although it applies more directly to another concept
isMemberOfArray	Class	0..*	An array of which this concept is a member
hasSubordinateArray	Class	0..*	An array that is subordinate to this concept
CustomConceptAttribute	class	0..*	An additional attribute of a concept
— Attributes of CustomConceptAttribute			
— lexicalValue	String	1	The wording of the custom attribute
— customAttributeType	String	1	Specification of particular kinds of attribute
— lang	Language	0..1	The language of the LexicalValue
TopLevelRelationship	association class		
— Classes linked by TopLevelRelationship			
— hasTopConcept	Class	0..*	The concept at the top of a hierarchy containing this concept
— isTopConceptOf	Class	0..*	A concept in the hierarchy of which this concept is top
HierarchicalRelationship	association class		
— Attributes of HierarchicalRelationship			
— role	String	1	Specification of the kind of hierarchical relationship that the target concept has to the source concept, e.g. BT, BTI, NT, NTP etc.

Element	Type	Occurs	Description
— Classes linked by HierarchicalRelationship			
— hasHierRelConcept	Class	0..*	Target concept, linked to this source concept by the relationship specified in "role", e.g. if role is "BT", this is a link to a broader concept of this concept
— isHierRelConcept	Class	0..*	Source concept to which this target concept is linked by the relationship specified in role, e.g. if role is "BT", this is a link to the concept of which this is a broader concept
AssociativeRelationship	association class		
— Attributes of AssociativeRelationship			
— role	String	0..1	Specification of the kind of associative relationship that the target concept has to the source concept. This will usually be "RT", but relationship could be asymmetric, e.g. "CAUSE" as discussed in 10.4.
— Classes linked by AssociativeRelationship			
— hasRelatedConcept	Class	0..*	Target concept, linked to this source concept by the relationship specified in role, e.g. if role is "CAUSE", this is a link to a concept that is a cause of this concept
— isRelatedConcept	Class	0..*	Source concept to which this target concept is linked by the relationship specified in role, e.g. if role is "CAUSE", this is a link to the concept of which this concept is a cause
Table 7 — Attributes and associations of ConceptGroup			
Element	Type	Occurs	Description
ConceptGroup	Class	0..*	A group of concepts selected by some specified criterion, such as relevance to a particular subject area
Attributes of ConceptGroup			
identifier	String	1	A unique identifier for the group
conceptGroupType	String	1	A label identifying the type of group, e.g. "microthesaurus", "theme", or "subject category"
notation	String	0..1	A symbolic notation attached to the group, which may be used for sorting and display
Associated classes of ConceptGroup			
ThesaurusConcept	Class	0..*	A concept that is a member of this group
hasSuperGroup	Class	0..*	A higher-level group of which this group is a member
hasSubGroup	Class	0..*	A lower-level group that is a member of this group
ConceptGroupLabel	Class	1..*	A label providing a verbal description of the group. A group should have one label per language.
— Attributes of ConceptGroupLabel			
— lexicalValue	String	1	The wording of the label
— created	Date	0..1	The date when the label was created
— modified	Date	0..1	The date when the label was last modified
— lang	Language	0..1	A code showing the language of the label. This should be included if the thesaurus supports more than one language

Table 8 — Attributes and associations of *ThesaurusTerm*

Element	Type	Occurs	Description
ThesaurusTerm	Class	1	A term in the thesaurus by which a concept could be sought
Attributes of ThesaurusTerm			
lexicalValue	String	1	The wording of the term
identifier	String	1	A unique identifier for the term
created	Date	0..1	The date when the term was created
modified	Date	0..1	The date when the term was last modified
source	String	0..1	The person(s) or document(s) from which the term was taken
status	String	0..1	Indication of whether the term is candidate, approved, etc.
lang	Language	0..1	A code showing the language of the term. This should be included if the thesaurus supports more than one language
Associated classes of ThesaurusTerm			
HistoryNote	Class	0..*	A note recording changes to this term within this thesaurus
EditorialNote	Class	0..*	A note for use by the thesaurus editors during the editing process
Definition	Class	0..*	A note giving definitions of a term, not necessarily limited to the scope of the concept labelled by the term in this thesaurus
— Attributes of Definition			
— source	String	0..1	The person(s) or document(s) from which the definition was taken
CustomTermAttribute	Class	0..*	An additional attribute of a term
— Attributes of CustomAttribute			
— lexicalValue	String	1	The wording of the custom attribute
— CustomAttributeType	String	1	Specification of particular kinds of attribute
— lang	Language	0..1	The language of the lexicalValue
Specializations of ThesaurusTerm			
PreferredTerm	Class		A term that has been chosen to label a concept
SimpleNonPreferredTerm	Class		A term that serves as an alternative label for a concept, but that is not the preferred term
— Attributes of SimpleNonPreferredTerm			
— hidden	Boolean	0..1	A yes/no flag to show whether the term may be excluded from some forms of output, e.g. for misspellings of a term.
SplitNonPreferredTerm	Class		A term that represents a combination of two or more thesaurus concepts
— Associations of PreferredTerm and SimpleNonPreferredTerm			
— Equivalence	association class		
— Attributes of Equivalence			
— role	Class	0..1	Specification of a kind of equivalence relationship. This will normally be USE, linking the source SimpleNonPreferredTerm to the target PreferredTerm
— Classes linked by Equivalence			
— PreferredTerm	Class	1	Target term, linked to this source term by the relationship specified in role, e.g. if the role is "USE", this is a link to a PreferredTerm that is to be used in place of the current SimpleNonPreferredTerm
— SimpleNonPreferredTerm	Class	0..*	Source term to which this target term is linked by the relationship specified in role, e.g. if the role is "USE", this is a link to the SimpleNonPreferredTerm for which the current PreferredTerm should be used instead
— Associations of PreferredTerm and SplitNonPreferredTerm			
— CompoundEquivalence	association class		

Element	Type	Occurs	Description
— Classes linked by CompoundEquivalence			
— SplitNonPreferredTerm	Class	0..*	A non-preferred term naming a complex concept that is represented by a combination of preferred terms. See 8.5.
— PreferredTerm	Class	2..*	One of the two or more PreferredTerms that together represent the CompoundNonPreferredTerm

Table 9 — Attributes and associations of Note

Element	Type	Occurs	Description
Note	Class	0..*	A piece of text giving additional information about the term or concept to which it is linked
Attributes of Note			
lexicalValue	String	1	The wording of the note
created	Date	0..1	The date when the note was created
modified	Date	0..1	The date when the note was last modified
lang	Language	0..1	A code showing the language of the note. This should be included if the thesaurus supports more than one language
Associated classes of Note			
ThesaurusConcept	Class	0..*	A concept referred to in the note, other than the one to which it is directly attached
Specializations of Note, for particular types			
ScopeNote	Class	0..*	A note defining or clarifying the scope of the concept within this thesaurus
HistoryNote	Class	0..*	A note recording changes to a concept or a term within this thesaurus
Definition	Class	0..*	A note giving a definition of a term, not necessarily limited to the scope of the concept labelled by the term in this thesaurus
EditorialNote	Class	0..*	A note for use by the thesaurus editors during the editing process
CustomNote	Class	0..*	A note of any other kind relating to a concept
— Attributes of CustomNote			
— noteType	String	0..1	Specification of a particular kind of note

16 Integration of thesauri with applications

16.1 Introduction

The prime function of a thesaurus is to support information retrieval. The thesaurus is typically invoked at two main stages in the retrieval chain: at the time of indexing and at the time of search. While software suites exist that manage thesaurus development and maintenance, indexing and search in one integrated system, it is more common to manage these as separate applications. Thesaurus data therefore need to be exchanged smoothly between these applications, avoiding errors and inconsistencies as updating continues.

The scenario has become even more complex now that widespread electronic networks and the almost universal use of computers in information management present opportunities for sharing data and information on a scale not previously imaginable. From a single computer connected to the internet, one can simultaneously search different collections of books, articles, photographs, data sets, or museum artefacts residing on remote computers all over the world. To enable thesaurus exploitation in this sort of scenario, the

systems involved need interoperability, i.e. the capability of multiple systems or components to exchange and use information.

This clause describes:

- a) the features and functions that enable thesaurus interoperability across systems and networks, and
- b) the features and functions needed within a single indexing or search application that uses a thesaurus.

It does not describe the features and functions needed for applications that use two or more linked thesauri; such applications will be covered in ISO 25964-2.

16.2 Interoperability needs for thesauri

As described in 14.8, it should be possible to export and import a thesaurus, in part or in whole, from/to the application where it is maintained. A standard format should be used for the import/export (see Clause 17).

When a thesaurus has been updated, it should be possible to export all the records that are new or have changed in some way, including any that have been deleted.

When a thesaurus update is implemented, the system should be able to incorporate the new or changed terms without losing any data assigned to the previous terms, where still valid. For example, there may be links from the existing terms to resources indexed with them.

To make the thesaurus available to users of a network such as the Internet, it should be published on that network, using a standard format (see Clause 17).

A published thesaurus should be updated regularly. This might require import and implementation of an updating file from the application where the master version is maintained.

When the thesaurus has been published on a network, a standard protocol (see Clause 18) should be used to extract all the data, or a subset or some selection from it. For example, a search application might need to select some or all of the information associated with a particular concept or group of concepts. A unique identifier should be associated with each concept to facilitate distributed search applications.

For the convenience of users and wider dissemination, the thesaurus should be registered with any vocabulary registries serving the anticipated user community.

16.3 Integration with indexing and searching applications

16.3.1 If a thesaurus is to be used for information retrieval, it should be capable of integration with the systems in which indexing and searching take place. For a printed thesaurus, integration is achieved by the process of a person looking through the pages, selecting terms and re-entering them into the information retrieval system with the correct syntax. With an electronic thesaurus, these functions should be supported in a user-friendly way.

Unless thesaurus management is already integrated in one system with the indexing and search applications, the first requirement is to export the thesaurus data from the thesaurus management system into the information retrieval system. Formats and protocols for this purpose are discussed in Clauses 17 and 18.

16.3.2 All systems that are involved in the handling of thesaurus data should be able to support all of the characters likely to be present in the data. These typically include parentheses in term qualifiers, and sometimes other punctuation marks. In the case of a multilingual thesaurus, all of the characters in the script and/or alphabet of each of the languages need to be supported.

16.3.3 For indexing and searching applications, except when these are fully automated without provision for user interaction, facilities for browsing and searching the thesaurus are fundamental. These should include the following.

- a) The ability to search for terms containing any word, word combination or character string.
- b) The ability to search for terms and concepts using any notation and/or identifiers present.
- c) The ability to choose or switch the display language of a multilingual thesaurus, or limit the search and display to a single specified language.
- d) The ability to display the equivalents (preferred or non-preferred) for a given term, including cross-language equivalents if the thesaurus is multilingual.
- e) The ability to move from the record for one concept to that of any of its broader, narrower or related concepts, generally achieved by setting up hypertext links. This facility might remove the need for a notation to link the alphabetical and classified or hierarchical displays.
- f) The ability to expand and contract levels when viewing a classified or hierarchical display. To gain an initial overview of the structure it should be possible to start with a view of the top level, then expand progressively and selectively downwards. It should also be possible to expand or contract fully at one stroke.
- g) The ability to switch from one style of display to another, for example, from the classified to the alphabetical display. Preferably it should be possible to view them simultaneously.

16.3.4 When integrated with a searchable document collection and when provision is made for the user to refer to the thesaurus, the displays should also show the number of postings against each preferred term. While browsing the thesaurus, a user should be able to move directly to the searching phase. The following facilities should be provided.

- a) The ability to select one or more terms from a thesaurus display to be used in a search.
- b) The ability to build a search statement by copying terms from the thesaurus without retyping (for example by double-click or drag-and-drop). Help with applying valid search syntax (e.g. selecting Boolean operators) should ideally be provided.
- c) The ability to select subtrees from the thesaurus to be used in a search, i.e. to search for a given term and all its narrower terms combined with Boolean OR, sometimes called the "explode" function.
- d) Selection of a non-preferred term should lead to substitution with the corresponding preferred term in the search statement (ensuring that the searcher is notified of what has been done). In the event that the user enters a non-preferred term into a search statement without first browsing the thesaurus, he/she should be offered the option of converting it to the corresponding preferred term.
- e) During the process of search refinement, the numbers of postings in any of the thesaurus displays should be adjusted to show the numbers that apply in the subset of the collection already selected.

16.3.5 It is possible also to exploit a thesaurus within a search engine without exposing it for user browsing. Facilities 16.3.4 (c and d) may be adapted for this type of use.

EXAMPLES

- a) When a user enters a term similar to one or more thesaurus terms, the search engine might respond "Did you mean....?" thus offering the user the nearest matches found in the thesaurus.
- b) When a user enters a term similar to several thesaurus terms, the search engine might respond by retrieving results for all of these terms, and clustering them term by term. (For example, if a thesaurus has two terms "turkey (meat)" and "Turkey (country)", and the user searches simply for "Turkey", the search results may be presented in two groups, corresponding to each of the thesaurus terms respectively.)
- c) The user might be given the option to "broaden" or "narrow" the search without being told exactly how this is done.
- d) In the event of retrieving very few results, the search might be automatically expanded to broader, narrower and related terms.

When a search term is automatically converted, substituted, translated, replaced by a broader or narrower term, etc., the user should be informed that this has taken place.

16.3.6 The equivalence relationships in a thesaurus may also be exploited to search a database that has not been indexed with the thesaurus. For example, if a thesaurus includes "motor-bikes", "motor-cycles" and "motorcycles" among the preferred and non-preferred terms for the same concept, then a search for any of these terms can be expanded to include the others. See also the discussion of synonym rings in ISO 25964-2.

16.3.7 When integrated with an indexing or cataloguing system, the following functions should be provided.

- a) The ability to copy one or more terms directly into an indexing form or template without retying.
- b) Validation of terms entered directly, against the thesaurus. In the event that a non-preferred term is entered, this needs to be converted automatically to the corresponding preferred term with a notification to the indexer. When a string is entered that corresponds to the start of one or more thesaurus terms, the indexer should be offered all the matching preferred terms from which to choose.
- c) A facility to submit candidate terms to the thesaurus editor (see 13.6).

16.3.8 If the system is for automatic indexing, rather than for human indexers to use, a means of linking each preferred term with the algorithms or rules that drive its selection should also be provided.

17 Exchange formats

Interoperability between different computer applications requires use of a common format. Four existing formats are particularly well known:

— **MARC (MAchine-Readable Cataloguing)**^[51] – This set of standards, based on ISO 2709, is widely used for exchange of bibliographic information between libraries. While the prime application of the standards is to exchange cataloguing records, the set provides also for "authority records", i.e. those drawn from thesauri or other types of controlled vocabulary. Of particular relevance are:

- *MARC 21 Format for Authority Data* (available in full and concise versions)^[52];
- *MARC 21 Format for Classification Data* (available in full and concise versions)^[53];
- MADS (Metadata Authority Description Schema) a MARC21-compatible XML format for the type of data carried in records in the MARC Authorities format^[54].

MARC formats expressed in XML may also follow ISO 25577.

- **SKOS** – The SKOS (Simple Knowledge Organization Systems) format^{[60][61]} is a W3C recommendation particularly applicable to Semantic Web developments, and is encoded using XML and RDF (Resource Description Framework). As well as thesauri, it is being developed for classification schemes, taxonomies and other vocabulary types.
- **Zthes** – Zthes^[69] was originally developed as an application profile of Z39.50 to enable exchange of thesaurus data, but has since evolved, and has a version that can be used with SRU (Search and Retrieval via URL; see Clause 18).
- **DD 8723-5** – This BSI Draft for Development provides an XML schema that may be used for the exchange of a thesaurus compliant with BS 8723^[25]. The schema is available at <http://schemas.bs8723.org/>.

In addition to the four mentioned, others are sometimes used to meet the needs of specific domains.

Also relevant is ISO 16642, the Terminological Markup Framework (TMF) for computer applications in terminology. This framework is designed to provide guidance on the basic principles for representing data recorded in terminological data collections. It includes a meta-model and methods for describing specific terminological markup languages (TMLs) expressed in XML. It is designed to support the development and use of computer applications for terminological data and the exchange of such data between different applications. Data categories and methods for the specification of data structures are specified in ISO 12620 and other related International Standards.

As none of the existing formats is adequate to convey all the features of a thesaurus using the model in Clause 15, the XML format described in Annex B is recommended.

It seems likely that several different standard formats will coexist for some time. One way to minimize the inconvenience of multiple formats is to convert the data by a suitable transformation, even though some information is liable to be lost if a thesaurus is transformed into a format that does not support all the features of the source format. Some transformations are currently under development. The Schemas website (<http://www.niso.org/schemas/iso25964>) provides a space on which future developments can be found.

18 Protocols

18.1 General

A protocol is an essential tool in the communication process enabling thesauri to be used across digital networks. Several different protocols are already in existence, enabling the live querying of thesauri for purposes of indexing and/or retrieval as described in 16.3. New developments are frequent in this fast-moving field and so a comprehensive listing would be inappropriate. As each protocol has strengths in a different set of circumstances or application environment, those listed in 18.4 and 18.5 may be considered for a particular application. The selection and use of the protocol should be based on the needs of the application, especially the intended purpose and the software environment.

18.2 Purposes and use cases

It is important to distinguish between discovering or identifying a complete thesaurus and retrieving metadata about it, versus retrieving specific concepts and terms (or groups of concepts and terms). Protocols can be employed to present and apply thesauri, their member concepts, terms and relationships, to describe the meaning of terms and facilitate semantic interoperability. This is done for broader purposes of searching, browsing, discovery, translation, mapping, semantic reasoning, subject indexing and classification, harvesting, alerting etc. (see Reference [49]).

18.3 Application environment and architecture

Some existing protocols were designed specifically for thesauri (see 18.4) while others are general-purpose protocols that are being used (or adapted) to work with thesauri (see 18.5). The former type enables more powerful exploitation of thesaurus structure and relationships, while the general-purpose tools may facilitate integration with other functionality or existing skill-sets. It might also be possible to apply a thesaurus interface or profile to a general purpose protocol. In some cases, the limited set of function calls provided by a specific thesaurus protocol can offer advantages in hiding details of the underlying architecture or representation. On the other hand, sometimes the greater flexibility of a general purpose protocol can be exploited by developers familiar with it.

For a particular application it might be necessary to take into account the implementation platform, such as SOAP^[62] or a lighter weight HTTP protocol such as REST^[34] (and REST-like) XML-RPC^[68] or JSON-RPC^[38]. A few thesauri have recently been published as Linked Data^[40], a connection mechanism reliant on use of RDF and URIs, which could be considered a variant of REST.

18.4 Thesaurus-specific protocols

Three protocols deserve mention:

- **SWAD-E SKOS API** — This is a Web Service API (Application Programming Interface), designed to provide access to thesauri and other simple knowledge organization systems (SKOS) via the Web^[67]. It defines a core set of operations for programmatically accessing and querying a thesaurus. While intended for web service calls, the API itself remains independent of such concrete implementation details. The API could also be capable of adaptation to formats other than SKOS. Whereas the SKOS API was a product of the now complete Semantic Web Advanced Development (SWAD) Europe project^[46], SKOS itself is maintained by the W3C Semantic Web Deployment Working Group (SWDWG).
- **Other APIs** — Various adaptations of the SKOS API are currently in use on a variety of platforms. There are also some similar but unrelated thesaurus protocols, both SOAP and REST based. Non-exhaustive lists are maintained currently at References [39] and [47].
- **ADL Thesaurus Protocol** — The Alexandria Digital Library (ADL) Protocol^[36] is a protocol for accessing monolingual thesauri, adapted to use over the World Wide Web. It supports live querying of, and navigation around, the thesaurus. It offers a lightweight HTTP option for thesaurus access. The protocol's model of a thesaurus closely follows ANSI/NISO Z39.19^[22] and the definition is specified in an XML schema.

18.5 General-purpose web database protocols used with thesauri

For some applications, one of the following general-purpose protocols could be appropriate:

- **Search Web Services (OASIS)** — These protocols are based on an underlying Abstract Protocol Definition (APD)^[32], a reference model by which these and other protocols can be described. The most notable are OpenSearch^[28] and Search and Retrieval via URL (SRU)^[46] with its search language Contextual Query Language (CQL)^[29]. Designed for use across unstructured documents, OpenSearch is simpler while SRU gives more control over query and results. SRU is an XML-focused search protocol for Internet search queries. SRU/CQL is currently being revised by an OASIS Search Web Services Technical Committee^[41]. An earlier protocol known as SRW is now considered a variation of SRU ("SRU via HTTP SOAP"); SRU is REST-based whereas SRW is SOAP-based.
- **SPARQL** (Simple Protocol and RDF Query Language)^[63] — An official World Wide Web Consortium (W3C) recommendation as of 2008, it has been developed and promoted by the W3C as a key semantic web technology. This RDF query language is used to express queries across diverse data sources, whether the data is stored natively as RDF or viewed as RDF via middleware. SPARQL contains capabilities for querying required and optional graph patterns along with their conjunctions and disjunctions. It can be considered a general-purpose query language (as SQL is for relational databases) but can be used to query thesauri that have been represented in RDF, allowing integration with other RDF datasets.

- **Z39.50** – This protocol is more formally known as ANSI/NISO Z39.50, *Information retrieval (Z39.50): Application service definition and protocol specification*^[23]. SRU/SRW can be considered off-shoots of the earlier Z39.50 protocol.

Annex A (informative)

Examples of displays found in published thesauri

A.1 Introduction

To complement the Figures in Clause 12, this annex shows some alternative styles of display found in a selection of well-known thesauri published in print or online. Some of these have optional features not described in this part of ISO 25964 and some depart from the conventions recommended by this International Standard, for example by introducing non-standard tags. Nonetheless, all demonstrate ideas for how to display the data, which can be adopted in particular contexts.

A.2 Inspec Thesaurus

The printed version of the Inspec Thesaurus has two sections, showing two main forms of display respectively: alphabetical, as described in 12.2.3 and illustrated in Figure A.1, and hierarchical, as described in 12.2.4 and illustrated in Figure A.2. Table A.1 explains the tags used in the alphabetical section. Unlike the example illustrated in Figure 6 of 12.2.4, the *Inspec Thesaurus* does not group terms into facets at the top level and so the hierarchical display has a large number of top terms, of which just six appear in Figure A.2. As illustrated in Figure A.1, all the main entries for preferred terms in the alphabetical section include one or more lines for top term (TT), which helps the reader find the relevant place(s) in the hierarchical section. For example, the alphabetical display for “microphones” shows it has “acoustic equipment” as one of three top terms. Correspondingly, the hierarchical display for “acoustic equipment” includes “microphones” (marked in Figure A.2 using arrows) in a much more complete hierarchical context than can be shown in the alphabetical display.

Table A.1 — Tags used in Inspec Thesaurus alphabetical display

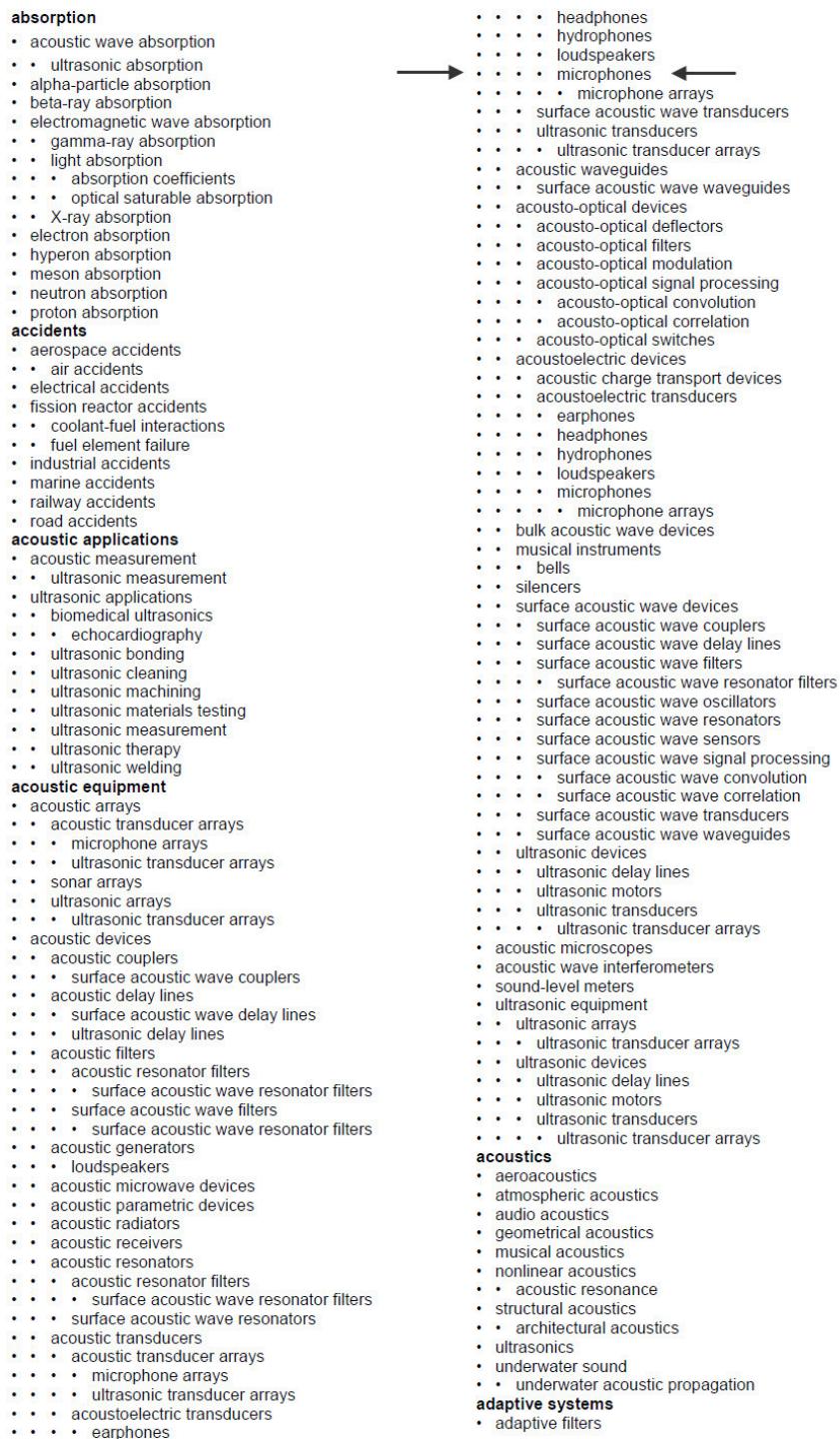
Tag	Meaning
USE	Use (see Table 1, Clause 4)
UF	Used for (see Table 1, Clause 4)
BT	Broader term (see Table 1, Clause 4)
TT	Top term (see Table 1, Clause 4)
NT	Narrower term (see Table 1, Clause 4)
RT	Related term (see Table 1, Clause 4)
CC	Classification code, referring to a separate Inspec Classification scheme
DI	Date of input, i.e. the date when the term in question was entered into the thesaurus
PT	Prior term, used to extend a search to a period earlier than the date of input of the current term, when necessary.

TT	mirrors	radio transmitters
TT	optics	sound reproduction
RT	optical arrays	television transmitters
CC	optical projectors	transmitters
CC	A4280A; A4283; B4145	A4385; A4388; B6450; B7810C;
DI	January 2003	E1780; E3644H
PT	micro-optics	DI January 1969
	mirrors	
		microphony
		<i>heading was preferred term until December 1992</i>
BT	micromotors	DI January 1969
BT	electric motors	
	micromechanical devices	
	small electric machines	
TT	machinery	
	micromechanical devices	microphotography
NT	electrostatic motors	UF microfilming
CC	B2575; B8340M; C3260B; C3260P; E1780; E2160; E2300; E3642A; E3644V	BT photography
DI	January 1995	TT photography
PT	micromechanical devices	RT microforms
	small electric machines	CC A0768; C7230
		DI January 1973
		PT photography
	microoptics	
USE	micro-optics	microphotometers
		USE densitometry
		photometers
		microphotonics
		USE micro-optics
		micropositioning
UF	microorganisms	BT position control
	bacteria	TT control of specific variables
	microbes	RT manipulators
	phytoplankton	microactuators
	plankton	nanopositioning
	viruses, microorganisms	CC A0660S; C3120C; C3260; C3390; E1550
	zooplankton	DI January 1999
RT	biohazards	PT position control
	cellular biophysics	
	extraterrestrial life	
	molecular biophysics	
	sterilisation (microbiological)	
CC	A8700	
DI	January 1999	
		microprobe analysis, electron
		USE electron probe analysis
		microprobe analysis, ion
		USE ion microprobe analysis
		microprocessor chips
UF	microphones	UF microcomputer chips
	acoustoelectric transducers	MPU
BT	audio equipment	single-chip microcomputers
TT	arrays	digital integrated circuits
	audio equipment	TT networks (circuits)
	transducers	NT coprocessors
RT	acoustic signal processing	digital signal processing chips
	array signal processing	microcontrollers
	direction-of-arrival estimation	transputers
CC	A4385; A4388; B6450; B7810C	RT CMOS digital integrated circuits
DI	January 2005	large scale integration
PT	acoustic transducer arrays	microcomputers
	microphones	storage management chips
		superconducting processor circuits
		system-on-chip
		CC B1265F; B2570; C5130
		DI January 1977
		PT digital integrated circuits
		microprocessor systems

NOTE Reproduced with permission of Inspec and the Institution of Engineering Technology.

Figure A.1 — Example page from the alphabetical section of the INSPEC Thesaurus 2007

2010 Hierarchical List of Thesaurus Terms



I

NOTE Reproduced with permission of Inspec and the Institution of Engineering Technology.

Figure A.2 — Example page from the hierarchical section of the INSPEC Thesaurus 2007

A.3 Art & Architecture Thesaurus (AAT)

Displays for the AAT can be found online as well as in print, and examples of both styles are shown here to enable comparison, even though the printed version is now considered out-of-date. Figures A.3 and A.4 are drawn from the printed edition of 1994 while the online displays in Figures A.5 and A.6 were found at http://www.getty.edu/research/conducting_research/vocabularies/aat/ in October 2010. While the online version is updated monthly, production of a printed version was discontinued after 1994 because it was judged not practical to publish such a large thesaurus in printed form annually. Where there are discrepancies between the displays in Figures A.3 and A.4 and those in Figures A.5 and A.6, it is because the printed version is now considered out of date.

Key—Kho		
keys, pass USE master keys	rugs, Khaden rugs, sitting-sleeping sitting-sleeping rugs	Khami FL.138
keys, pipe USE pipe keys		khanates HN.45 HN January 1993 descriptor added ALT khanate SN Administrative bodies subject to a khan.
keys, push USE push keys		Khasack USE Kazak
keys, round USE round keys		khaya USE African mahogany
keys, skeleton USE skeleton keys		Khaya anthotheea USE white mahogany
keys, sliding-door USE sliding-door keys		Khaydarabad-Tepe FL.1796 HN April 1993 descriptor moved
keys, stop USE stop keys		Khazineh FL.3097
keys, submaster USE submaster keys		khelim USE kilims
keys, thrust USE push keys		khen USE khaen
keys, warded USE warded keys		khevenhuller hats USE kevenhullers
keys, wing USE wing keys		Khiliji USE Khalji
keystones PJ.2024 HN March 1993 descriptor moved ALT keystone SN The central wedge-shaped voussoirs in arches or vaults; also, similar elements used as ornaments on the heads of doors or windows. (IGA) UF key blocks (keystones)	(A,B,R) TT.125 Motuh organs of Laos and Thailand, consisting of a set of bamboo pipes grouped in two rows and graduated from longest to shortest, held together by a windchest they pierce through. The reeds of copper or silver are mounted in the pipe walls within the windchest, and the fingerholes are cut in the pipes within fingers' reach above the windchest. UF kaen khen	khagangmas TC.61 ALT khagangma SN Small Tibetan rugs usually smaller than 3 feet square placed as the top rug on a pile of rugs for sitting. UF carpets, meditation carpets, Tibetan sitting meditation carpets sitting carpets, Tibetan Tibetan sitting carpets
keyword PJ.3228 SN Use to denote collectively the various mechanical contrivances devised to supplement the fingers in controlling the fingerholes of aerophones. (GROVE) UF key systems systems, key	USE light olive brown light yellowish brown moderate yellowish brown	khaki TT.314 ALT khalam SN Five-string plucked lute-like chordophones of the Wolof people of Senegal and the Gambia, having a narrow boat-shaped soundbox and an unfretted cylindrical neck. UF halams xalam
keyword, Boehm USE Boehm system	---	khalam TT.314 ALT khalam SN Five-string plucked lute-like chordophones of the Wolof people of Senegal and the Gambia, having a narrow boat-shaped soundbox and an unfretted cylindrical neck. UF halams xalam
		Khirbet Kerak FL.3028 HN May 1993 descriptor added UF burnished, red-black red-black burnished
		Khirbet Kerak ware HN May 1993 descriptor split, use Khirbet Kerak + ware
		khivi USE claw hammers
		Khmer FL.2499 (A,L,B)

NOTE Reproduced from Volume 4 (p.257) of *Art & Architecture Thesaurus* by Petersen, Toni (1994), by permission of Oxford University Press, Inc.

Figure A.3 — Detail from an example page in alphabetical section of the printed Art & Architecture Thesaurus

The simple ordinal notation shown in the left hand column of Figure A.4 appears only in printed versions of the AAT, where it was used by implementers to construct hierarchies. Thus the term "keystones" can be found in the hierarchy by looking up PJ.2024. The notation does not appear in the online displays, where it has no function.

In print, only minimal information was given for each term as shown in Figure A.3. Online, where the total number of pages is not a limiting factor, much more information is given for each term as shown in Figure A.5.

Table A.2 — Tags used in AAT alphabetical display

Tag	Meaning
SN	Scope Note (see Table 1, Clause 4)
USE	Use (see Table 1, Clause 4)
UF	Used for (see Table 1, Clause 4)
ALT	Alternate descriptor, to provide for singular as well as plural form
HN	History Note (see Table 1, Clause 4)

To help with the display of hierarchical structure as shown in Figures A.4 and A.6 the AAT uses "Guide Terms" enclosed in angle brackets, for example <components by specific context>. Like the node labels described in Clause 11, Guide Terms are not considered broader terms and are not used as indexing terms; they are typographically distinguished from terms through their enclosure in angle brackets.

PJ.2010	components
PJ.2011	<components by specific context>
PJ.2012	architectural elements
PJ.2013	<structural elements and structural element components>
PJ.2014	<structural element components>
PJ.2015	<arch, dome or vault components>
PJ.2016	crowns (architectural elements)
PJ.2017	extradoses
PJ.2018	intradoses
PJ.2019	ribs
PJ.2020	diagonal ribs
PJ.2021	flying ribs
PJ.2022	liernes
PJ.2023	ridge ribs
PJ.2024	tiercerons
PJ.2025	transverse ribs
PJ.2026	wall ribs
PJ.2027	voussoirs
PJ.2028	keystones
PJ.2029	key consoles
PJ.2030	springers
PJ.2031	<balloon and platform frame components>
PJ.2032	headers
PJ.2033	ledger boards
PJ.2034	plates (balloon and platform frame components)
PJ.2035	sill plates
PJ.2036	wall plates (structural element components)
PJ.2037	roof plates
PJ.2038	rough sills
PJ.2039	studs (structural components)
PJ.2040	trimmers
PJ.2041	<rolled sections>
	angles (rolled sections)
	channels (rolled sections)
	H-beams
	I-beams

NOTE Reproduced from Volume 2 (p.204) of *Art & Architecture Thesaurus* by Petersen, Toni (1994), by permission of Oxford University Press, Inc.

Figure A.4 — Detail from an example page in the hierarchical section of the printed Art & Architecture Thesaurus

ID: 300001183

Record Type: concept

 **keystones** (voussoirs, <arch, dome or vault components>, ... Components (Hierarchy Name))

Note: Central wedge-shaped voussoirs in arches or vaults; also, similar elements used as ornaments on the heads of doors or windows.

Terms:

keystones (preferred,C,U,English-P,D,U,PN)
keystone (C,U,English,AD,U,SN)
key blocks (keystones) (C,U,English,UF,U,N)
clefs de voûte (C,U,French-P,D,U,PN)
clef de voûte (C,U,French,AD,U,SN)
claves (arco) (C,U,Spanish-P,D,U,PN)
clave (arco) (C,U,Spanish,AD,U,SN)

Facet/Hierarchy Code: V.PJ

Hierarchical Position:



```

graph TD
    A[Objects Facet] --> B[.... Components (Hierarchy Name) (G)]
    B --> C[..... components (objects) (G)]
    C --> D[.....<components by specific context> (G)]
    D --> E[..... architectural elements (G)]
    E --> F[.....<structural elements and structural element components> (G)]
    F --> G[.....<structural element components> (G)]
    G --> H[.....<arch, dome or vault components> (G)]
    H --> I[..... voussoirs (G)]
    I --> J[..... keystones (G)]
  
```

Sources and Contributors:

clave (arco).....	[CDBP-DIBAM Preferred]
 Alvarez et al., Diccionario de la decoración (1968) 162
claves (arco).....	[CDBP-DIBAM]
 Comité, Plural del término en singular
clef de voûte.....	[CHIN, VP]
 CHIN database
clefs de voûte.....	[CHIN Preferred]
 CHIN database
key blocks (keystones).....	[VP]
 Dictionary of Architecture and Construction (1975) key blocks
 Getty Vocabulary Program rules
 RILA, Subject Headings (1975-1990) key blocks
keystone.....	[VP]
 Getty Vocabulary Program rules
keystones.....	[VP Preferred]
 Avery Index (1963-) (source AAT)
 Dictionary of Architecture and Construction (1975) illustration
 Lever and Harris, Illustrated Glossary of Architecture (1966) illustration
 Pierce, From Abacus to Zeus (1987) illustration, 5
 RIBA, Architectural Keywords (1982)
 RILA, Subject Headings (1975-1990)

Subject: [CDBP-DIBAM, CHIN, VP]
..... CHIN database
..... RIBA, Architectural Keywords (1982) Arches: keystones

Note:

English.....	[VP]
 Lever and Harris, Illustrated Glossary of Architecture (1966)

NOTE Extracts from *Art & Architecture Thesaurus Online* are used with permission of the Getty Research Institute. A full explanation of the flags, codes and abbreviations shown in this Figure can be found at <http://www.getty.edu/research/tools/vocabularies/aat/about.html>.

Figure A.5 — A single record display from Art & Architecture Thesaurus Online

 **Research**

Research Home ▶ Conducting Research ▶ Art & Architecture Thesaurus ▶ Hierarchy Display

 **Art & Architecture Thesaurus® Online**
Hierarchy Display

[!\[\]\(f560006fa4b5d99714680c4d7ef269db_img.jpg\) New Search](#) [!\[\]\(b32c032df03ba5e9beaf9379a4092207_img.jpg\) Previous Page](#) [!\[\]\(5d662fe2964215f7eee179ccc77f8a7a_img.jpg\) Help](#)

[!\[\]\(779bb8fd9f3102085a57eb566fbbfa09_img.jpg\) View Selected Records](#) [!\[\]\(17e529635f3b2c30868c330524d5c473_img.jpg\) Clear All](#)

Click the  icon to view the hierarchy.
Check the boxes to view multiple records at once.

-   Top of the AAT hierarchies
-   Objects Facet
-   Components (Hierarchy Name)
-   components (objects)
-   <components by specific context>
-   architectural elements
-   <structural elements and structural element components>
-   <structural element components>
-   <arch, dome or vault components>
-   voussoirs
-   keystones
-   key consoles

[!\[\]\(9a2202a022c0978a29b87e10d5a4f174_img.jpg\) New Search](#)

[!\[\]\(cbdacadb41d9796ca0a2e6a7b9783fc3_img.jpg\) Back to top](#)

[!\[\]\(8eab28538773739e4ce0cd6016edcdb7_img.jpg\) Printer-friendly version](#)

 The J. Paul Getty Trust
© 2004 J. Paul Getty Trust
[Terms of Use](#) / [Privacy Policy](#) / [Contact Us](#)

NOTE Extracts from *Art & Architecture Thesaurus Online* are used with permission of the Getty Research Institute. A full explanation of the flags, codes and abbreviations shown in this Figure can be found at <http://www.getty.edu/research/tools/vocabularies/aat/about.html>.

**Figure A.6 — Hierarchy display page illustrating “keystones”
from the Art & Architecture Thesaurus Online**

A.4 Integrated Public Sector Vocabulary (IPSV)

IPSV is not published in print. The electronic version (both the interactive viewer online and downloadable files in several formats) is hosted by the esd-toolkit at <http://www.esd.org.uk/standards/ipsv/>.

The online display of IPSV (as presented in October 2010 and retained at <http://www.esd.org.uk/standards/ipsv/2.00/viewer/>) combines a hierarchical view with the full record for each concept, on a single screen, as shown in Figure A.7.

In addition to standard features such as showing non-preferred terms and related terms, the display shows links to resources indexed using the vocabulary, as seen in the labels "Term Usage Count" and "List of pages using this term". It also includes mappings from other vocabularies such as LGCL (Local Government Category List) and LGSL (Local Government Service List).

ID:	1001
Preferred Term:	Employees
Scope Note:	
History Note:	
A to Z:	No
Term Usage Count:	679 [List of pages using this term]
Non-preferred:	<ul style="list-style-type: none"> + 1318 Professional staff + 1319 Staffing + 6032 Personnel (employees) + 6033 Staff (personnel) + 6042 Workers (employees) + 6045 Human resources (employees) + 6047 Workforce (employees)
Related Terms:	<ul style="list-style-type: none"> + 5916 Human resource management
Broader Terms:	<ul style="list-style-type: none"> + 6024 Business people
Mapping from LGCL:	

Figure A.7 — A single record display from IPSV, with hierarchical view on the left

A.5 UNESCO Thesaurus

The UNESCO Thesaurus is in four languages, as shown in Figures A.8 and A.9, which were found at <http://databases.unesco.org/thesaurus/> in October 2010. Within the main hierarchical list Figure A.9 was drawn from the “Social and human sciences” section, which is divided into several “microthesauri”. The tag “MT” designates the microthesaurus to which a particular term belongs (“Psychology” in the case of Figure A.9). The alphabetical and hierarchical displays online make different choices as to how much information to include for each term, and are not very different from the long-established style of alphabetical display often used in print. Corresponding displays are available in French, Spanish and Russian.

The screenshot shows the UNESCO Thesaurus interface. At the top left is the UNESCO logo and text: "United Nations Educational, Scientific and Cultural Organization". To the right is the title "UNESCO Thesaurus". Below the title, a green header says "2 records found for: behaviour". Underneath, blue text says "Click on the [number] to display the records indexed with that descriptor in unesdoc/unesbib." The main content area lists terms under the heading "Term:":

- Term: Behaviour [407]
 - Terme français: Comportement
 - Término español: Comportamiento
 - Русский термин : Поведение
- MT 4.10 Psychology
- UF Human behaviour
- NT Emotions [85]
- NT Lateral dominance [5]
- NT Psychological effects [276]
 -NT2 Mental stress [68]
- NT Sensorimotor activities [13]
 -NT2 Perception [147]
 -NT2 Visualization [28]
- NT Sexual behaviour [319]
- NT Unconscious [9]
 -NT2 Sleep [17]
- RT Behavioural sciences [95]
- RT Human nature [95]
- RT Motivation [379]
- RT Philosophy of action [25]
- RT Psychology [361]

NOTE This extract from the UNESCO Thesaurus © 2009 was reproduced by permission of UNESCO.

Figure A.8 — Extract from online alphabetical display of UNESCO Thesaurus



UNESCO Thesaurus

8 records found for: Psychology

Click on the [number] to display the records indexed with that descriptor in unesdoc/unesbib.

Term: [Attitudes](#) [407]

[MT 4.10 Psychology](#)

[NT Attitude change](#) [299]

[NT Intolerance](#) [80]

[NT Prejudice](#) [64]

[NT Tolerance](#) [363]

Term: [Behaviour](#) [407]

[MT 4.10 Psychology](#)

[UF Human behaviour](#)

[NT Emotions](#) [85]

[NT Lateral dominance](#) [5]

[NT Psychological effects](#) [276]

....[NT2 Mental stress](#) [68]

[NT Sensorimotor activities](#) [13]

....[NT2 Perception](#) [147]

....[NT2 Visualization](#) [28]

[NT Sexual behaviour](#) [319]

[NT Unconscious](#) [9]

....[NT2 Sleep](#) [17]

Term: [Cognition](#) [385]

[MT 4.10 Psychology](#)

[UF Cognitive processes](#)

NOTE This extract from the UNESCO Thesaurus © 2009 was reproduced by permission of UNESCO.

Figure A.9 — Extract from online hierarchical display in UNESCO Thesaurus

A.6 AGROVOC

AGROVOC, the multilingual thesaurus published by the Food and Agriculture Organization of the United Nations (FAO) is available and searchable online in 19 languages, at <http://aims.fao.org/website/AGROVOC-Thesaurus/sub>. As illustrated in Figure A.10 (accessed in October 2010), the hierarchical display of a concept shows its broader and narrower terms at all levels above and below, and also shows its related terms.

The screenshot shows the AIMS website interface. On the left is a sidebar with the FAO logo, a search bar, and links to FAO Home, AIMS Home, Latest News, Events Service, Standards (including AGROVOC Thesaurus), Projects, Publications, Registry of tools, and Communities. The main content area has a header 'Agricultural Information Management Standards (AIMS)' with icons for print, email, and search. Below this is a 'Hierarchy' section with the breadcrumb 'AGROVOC > Functionalities > Hierarchy'. A text block explains the hierarchy and how to use the tree icons. A language dropdown set to English and a search bar are present. The main content displays a hierarchical tree for 'Wildlife' (8389). The tree structure is as follows:

- BT resources (9001017) E +
- BT Natural resources (5091) E +
- BT Biological resources (92341) E +
- Wildlife (8389) +
 - NT Wild animals (24103) E +
 - NT Game (3179) E +
 - NT Game mammals (3182) E +
 - NT game birds (3180) E +
 - NT game fishes (3181) E +
 - NT Wild boar (24131) E +
 - NT Wild plants (24126) E +
 - RT biota
 - RT Nature reserves
 - RT wildlife management

On the right side, there are 'RELATED LINKS' (AGRIS search engine, AgriFeeds, CIARD Ring, e-agriculture, VERCON) and 'PARTNERSHIPS' (CIARD). The footer includes 'Contact us' and '© FAO, 2010'.

NOTE AGROVOC screenshot reproduced with permission of the Food and Agriculture Organization (FAO) of the United Nations.

Figure A.10 — Hierarchical display of “Wildlife” from AGROVOC

A.7 GEneral Multilingual Environmental Thesaurus (GEMET)

On the website at <http://www.eionet.europa.eu/gemet/about?langcode=en>, GEMET currently (October 2010) provides terms in 28 languages, as shown in the single record display in Figure A.11.

The concepts are organized in several different ways, allowing the user to find them alphabetically (see Figure A.12), or by “Theme” (Figure A.13), or by “Group” (Figure A.14).

The alphabetical display dispenses altogether with conventional tags such as BT, NT etc. (see Table 1 Clause 3) but navigation between languages relies heavily on the language tags from ISO 639-1 and RFC 4646^[45], as recommended in 9.4.

EEA | EnviroWindows | [Login](#) | [Acronyms](#) | [Search](#) Search Eionet | [Help](#)

EIONET

GEMET Thesaurus

SERVICES REPORTNET TOOLS TOPICS (ETCS)

You are here: Eionet > GEMET

Local navigation

- > User directory
- >> Roles
- >> NFP/Eionet IG
- >> Mails to NFPs
- >> SERIS
- > Eionet Wiki
- >> Workplan/planner
- >> Meetings & events
- >> Priority dataflows
- >> SOER2010

Find a person

[Thematic Listings](#) | [INSPIRE Spatial Data Themes](#) | [Alphabetic Listings](#) | [Hierarchical Listings](#) | [Search Thesaurus](#)

Select language: [ar](#) [bg](#) [cs](#) [da](#) [de](#) [el](#) [en](#) [en-US](#) [es](#) [et](#) [eu](#) [fi](#) [fr](#) [ga](#) [hu](#) [it](#) [lt](#) [lv](#) [mt](#) [nl](#) [no](#) [pl](#) [pt](#) [ro](#) [ru](#) [sk](#) [sl](#) [sv](#) [tr](#)

employment

Definition:
The work or occupation in which a person is employed. (Source: CED)

broader terms

- labour

narrower terms

- employment and environment
- employment level effect
- employment structure
- occupational status
- termination of employment
- trade (profession)
- unemployment

Scope note:
scope note is not available

Groups:
SOCIETY

Themes:
economics
social aspects, population

Arabic:	تَشْغِيل - تَرْبِيزَة
Bulgarian:	Заетост
Czech:	zaměstnání
Danish:	erhvervsaktivitet
German:	Beschäftigung
Greek:	απασχόληση/εργασία
English (US):	employment
Spanish:	empleo
Estonian:	teenistus, töö, amet; töökoht; tööhõive
Basque:	enplegu
Finnish:	töilyisyys
French:	emploi
Irish:	fostaiocht
Hungarian:	foglakoztatottság
Italian:	impiego
Lithuanian:	darbas
Latvian:	nodarbinātība; nodarbošanās
Maltese:	impieg
Dutch:	werkgelegenheid
Norwegian:	sysselsetting
Polish:	zatrudnienie
Portuguese:	emprego
Romanian:	ocupare a locurilor de muncă
Russian:	занятость
Slovak:	zamestnanie
Slovenian:	zaposlitev, služba
Swedish:	anställning; sysselsättning
Turkish:	istihdam

[Download](#) | [Administration](#) | [Alphabets](#) | [About GEMET](#) | [Web services](#) | [Definition sources](#)
GEMET - Concepts, version 2.4, 2010-01-13

Document last modified 2010/01/18 13:23:32.253 GMT+1. Content in this portal is [modified daily](#) by a community of providers - [Disclaimer](#).
[Notifications](#) | [Validate HTML](#)

NOTE Screenshot from the *GEMET Thesaurus* used with permission of the European Environment Agency (EEA).

Figure A.11 — Complete display of the record for “employment”, in GEMET

EEA | EnviroWindows | [Login](#) | [Acronyms](#) | [Search](#) Search Eionet | [Help](#)

EIONET

GEMET Thesaurus

SERVICES REPORTNET TOOLS TOPICS (ETCS) You are here: Eionet» GEMET

Local navigation

- » User directory
- » Roles
- » NFP/Eionet IG
- » Mails to NFPs
- » SERIS
- » Eionet Wiki
- » Workplan/planner
- » Meetings & events
- » Priority dataflows
- » SOER2010

Find a person

[Thematic Listings](#) | [INSPIRE Spatial Data Themes](#) | [Alphabetic Listings](#) | [Hierarchical Listings](#) | [Search Thesaurus](#)

Select language: [ar](#) [bg](#) [cs](#) [da](#) [de](#) [el](#) [en](#) [en-US](#) [es](#) [et](#) [eu](#) [fi](#) [fr](#) [ga](#) [hu](#) [it](#) [lt](#) [lv](#) [mt](#) [nl](#) [no](#) [pl](#) [pt](#) [ro](#) [ru](#) [sk](#) [sl](#) [sv](#) [tr](#)

Alphabetic listing of terms

emancipation	emission reduction banking
embryo	emission register
embryogenesis	emission situation
emergency law	emission source
emergency lodging	emission standard
emergency plan	emission to water
emergency relief	employment
emergency relief measure	employment and environment
emergency shelter	employment level effect
emission	employment structure
emission control	emulsification
emission data	emulsion
emission factor	encapsulation
emission forecast	encyclopaedia
emission reduction	end-of-pipe technology

[« Previous](#) [1](#) [2](#) [3](#) [4](#) [5](#) [6](#) [7](#) [8](#) [9](#) [10](#) [11](#) [12](#) [13](#) [14](#) [15](#) [Next »](#)

[all](#) [a](#) [b](#) [c](#) [d](#) [e](#) [f](#) [g](#) [h](#) [i](#) [j](#) [k](#) [l](#) [m](#) [n](#) [o](#) [p](#) [q](#) [r](#) [s](#) [t](#) [u](#) [v](#) [w](#) [x](#) [y](#) [z](#) [other](#)

[Download](#) | [Administration](#) | [Alphabets](#) | [About GEMET](#) | [Web services](#) | [Definition sources](#)
GEMET - Concepts, version 2.4, 2010-01-13

Document last modified 2010/01/18 13:23:32.253 GMT+1. Content in this portal is [modified daily](#) by a community of providers - [Disclaimer](#).
[Notifications](#) | [Validate HTML](#)

NOTE Screenshot from the *GEMET Thesaurus* used with permission of the European Environment Agency (EEA).

Figure A.12 — Extract from alphabetical listing in GEMET

EEA | EnviroWindows | [Login](#) | [Acronyms](#) | [Search](#) Search Eionet | [Help](#)

EIONET

GEMET Thesaurus

SERVICES | REPORTNET | TOOLS | TOPICS (ETCS) | You are here: Eionet» GEMET

Local navigation

- >> User directory
- >> Roles
- >> NFP/Eionet IG
- >> Mails to NFPs
- >> SERIS
- >> Eionet Wiki
- >> Workplan/planner
- >> Meetings & events
- >> Priority dataflows
- >> SOER2010

Find a person

Themes list

administration	legislation
agriculture	materials
air	military aspects
animal husbandry	natural areas, landscape, ecosystems
biology	natural dynamics
building	noise, vibrations
chemistry	physics
climate	pollution
disasters, accidents, risk	radiations
economics	research
energy	resources
environmental policy	social aspects, population
fishery	soil
food, drinking water	space
forestry	tourism
general	trade, services
geography	transport
human health	urban environment, urban stress
industry	waste
information	water

[Thematic Listings](#) | [INSPIRE Spatial Data Themes](#) | [Alphabetic Listings](#) | [Hierarchical Listings](#) | [Search Thesaurus](#)

Select language: [ar](#) [bg](#) [cs](#) [da](#) [de](#) [el](#) [en](#) [en-US](#) [es](#) [et](#) [eu](#) [fi](#) [fr](#) [ga](#) [hu](#) [it](#) [lt](#) [lv](#) [mt](#) [nl](#) [no](#) [pl](#) [pt](#) [ro](#) [ru](#) [sk](#) [sl](#) [sv](#) [tr](#)

[Download](#) | [Administration](#) | [Alphabets](#) | [About GEMET](#) | [Web services](#) | [Definition sources](#)
GEMET - Themes, version 2.4, 2010-01-13

Document last modified 2010/01/18 13:23:32.253 GMT+1. Content in this portal is [modified daily](#) by a community of providers - [Disclaimer](#).
[Notifications](#) | [Validate HTML](#)

NOTE Screenshot from the *GEMET Thesaurus* used with permission of the European Environment Agency (EEA).

Figure A.13 — Themes list in GEMET

The screenshot shows the GEMET Thesaurus interface. At the top, there's a navigation bar with links for EEA, EnviroWindows, Login, Acronyms, Search, and Search Eonet. The main header reads "EIONET GEMET Thesaurus". Below the header, a menu bar includes "SERVICES", "REPORTNET", "TOOLS", and "TOPICS (ETCS)". A breadcrumb trail indicates the user is at "You are here: Eionet» GEMET".

Local navigation

- » User directory
- » Roles
- » NFP/Eionet IG
- » Mails to NFPs
- » SERIS
- » Eionet Wiki
- » Workplan/planner
- » Meetings & events
- » Priority dataflows
- » SOER2010

Find a person

Groups list

NATURAL ENVIRONMENT, ANTHROPIC ENVIRONMENT

- ANTHROPOSPHERE (built environment, human settlements, land setup)
- ATMOSPHERE (air, climate)
- BIOSPHERE (organisms, ecosystems)
- ENVIRONMENT (natural environment, anthropic environment)
- HYDROSPHERE (freshwater, marine water, waters)
- LAND (landscape, geography)
- LITHOSPHERE (soil, geological processes)
- SPACE
- TIME (chronology)

SOCIAL ASPECTS, ENVIRONMENTAL POLICY MEASURES

- ADMINISTRATION, MANAGEMENT, POLICY, POLITICS, INSTITUTIONS, PLANNING
- ECONOMICS, FINANCE

NOTE Screenshot from the *GEMET Thesaurus* used with permission of the European Environment Agency (EEA).

Figure A.14 — Extract from Groups list in GEMET

A.8 UNBIS Thesaurus

The thesaurus of the United Nations Bibliographic Information System (UNBIS) is published in six languages on the Internet at <http://unhq-appspub-01.un.org/LIB/DHLUNBISThesaurus.nsf>, as shown in Figure A.15 (accessed online in October 2010). The display for a particular concept is found either by direct search, or by browsing through a list of categories, under each of which the relevant terms are listed alphabetically.

Full Display		
Back 16.05.00 علوم الحيوان	سلوك الحيوان 动物行为 16.05.00 - 生命科学	ANIMAL BEHAVIOUR 16.05.00 - LIFE SCIENCES Used For: ETHOLOGY
▼ Relations: Termes génériques: ZOOLOGIE Termes associés: ANIMAUX Termes génériques supérieurs: SCIENCE ET TECHNOLOGIE	▼词间关系: 广义词: 动物学 相关词: 动物 族首词: 科学和技术	▼ Term Relationships: Broader terms: ZOOLOGY Related terms: ANIMALS Top terms: SCIENCE AND TECHNOLOGY
COPORTEMENT ANIMAL 16.05.00 - SCIENCES DE LA VIE	Поведение животных 16.05.00 - НАУКИ О ЖИЗНИ Использовать вместо: Этология	COMPORTAMIENTO ANIMAL 16.05.00 - CIENCIAS BIOLÓGICAS
▼ Relations: Termes génériques: ZOOLOGIE Termes associés: ANIMAUX Termes génériques supérieurs: SCIENCE ET TECHNOLOGIE	▼Связь с другими терминами: Более широкие термины: Зоология Смежные термины: Животные Головные термины: Наука и техника	▼ Relaciones: Términos genéricos: ZOOLOGIA Términos relacionados: ANIMALES Términos genéricos superiores: CIENCIA Y TECNOLOGIA
Please contact us with any questions or comments عربى 中文 English Français Pусский Español © United Nations 2001-2010		

NOTE Display from the *UNBIS Thesaurus* used with permission of the United Nations.

Figure A.15 — Full display for a single concept in UNBIS Thesaurus

A.9 Thesaurus Ethics in the Life Sciences

This thesaurus, available online at <http://www.drze.de/thesaurus>, has three languages and features a split screen, with hierarchical display on the left and full concept details on the right. Concepts are grouped into 14 broad subject areas and a single concept can occur in more than one of these (see example in Figure A.16 accessed October 2010). The tag "Conc" stands for "concordance" and shows mappings to the terms used for the same concept in several other thesauri. The "Add to basket" feature supports indexers, allowing them to collect up and if necessary annotate the terms selected while indexing. The "Search in BELIT" feature supports users who wish to search the associated Bioethics Literature Database using terms selected from the thesaurus.

Thesaurus Ethics in the Life Sciences

6th edition – September 2009

Subject Area I:
Ethics, Philosophy, Theology

ethics
perspectives and levels of ethics (node label)
applied ethics
bioethics
medical ethics
clinical ethics
medical art
medical judgement
medical teleology
nursing ethics
physician's role
duty of beneficence
duty to heal

Subject Area V:
Medicine and Care

medicine
accidents +
diagnosis +
disability
diseases +
drugs +
enhancement +
healing
health +
hormones +
human body +
injuries +
medical documentation +
medical practice +
medical specialties +
medical technology +
medical treatment +
medicalisation
patients +
physicians +
physician's role
duty of beneficence
duty to heal

physician's role

Subj. Area: I Ethics, Philosophy, Theology
V Medicine and Care
Ger: Arztrolle
Fr: rôle du médecin
SN: Refers to role, responsibility and the expected function of a member of the medical profession (based on MeSH-2005); also covers theoretical discussions of this role
UF: medical ethics
RT: medical practice
Conc: physician's role
B: Physician's role
E: physician's role
I: rôle du médecin
M: Physician's Role (D010819)

Add to basket Search in BELIT

©DRZE Imprint Last update: 05/31/2010 webmaster@drze.de

NOTE Display from *Thesaurus Ethics in the Life Sciences* used with permission of DRZE, German Reference Centre for Ethics in the Life Sciences.

Figure A.16 — Split screen display in Thesaurus Ethics in the Life Sciences

Annex B (informative)

XML Schema for data exchange

A schema intended for use when exchanging thesauri in whole or in part has been derived from the data model shown in Clause 15. It is available at <http://www.niso.org/schemas/iso25964/>.

The same site provides a space for additional content, such as registration of thesauri encoded with the schema.

Bibliography

Standards publications

- [1] ISO 9:1995, *Information and documentation — Transliteration of Cyrillic characters into Latin characters — Slavic and non-Slavic languages*
- [2] ISO 233 (all parts), *Information and documentation — Transliteration of Arabic characters into Latin characters*
- [3] ISO 259 (all parts), *Information and documentation — Transliteration of Hebrew characters into Latin characters*
- [4] ISO 639-1, *Codes for the representation of names of languages — Part 1: Alpha-2 code*
- [5] ISO 639-2, *Codes for the representation of names of languages — Part 2: Alpha-3 code* [For information, see <http://www.loc.gov/standards/iso639-2/faq.html>]
- [6] ISO 843, *Information and documentation — Conversion of Greek characters into Latin characters*
- [7] ISO 999, *Information and documentation — Guidelines for the content, organization and presentation of indexes*
- [8] ISO 2709, *Information and documentation — Format for information exchange*
- [9] ISO 3166 (all parts), *Codes for the representation of names of countries and their subdivisions*
- [10] ISO 8601, *Data elements and interchange formats — Information interchange — Representation of dates and times*
- [11] ISO 9984:1996, *Information and documentation — Transliteration of Georgian characters into Latin characters*
- [12] ISO 9985:1996, *Information and documentation — Transliteration of Armenian characters into Latin characters*
- [13] ISO 11940:1998, *Information and documentation — Transliteration of Thai*
- [14] ISO 12199, *Alphabetical ordering of multilingual terminological and lexicographical data represented in the Latin alphabet*
- [15] ISO 12620, *Terminology and other language and content resources — Specification of data categories and management of a Data Category Registry for language resources*
- [16] ISO 16642, *Computer applications in terminology — Terminological markup framework*
- [17] ISO 25577, *Information and documentation — MarcXchange*
- [18] ISO/IEC 8859-1, *Information technology — 8-bit single-byte coded graphic character sets — Part 1: Latin alphabet No. 1*
- [19] ISO/IEC 10646, *Information technology — Universal Coded Character Set (UCS)*
- [20] ISO/IEC 14651, *Information technology — International string ordering and comparison — Method for comparing character strings and description of the common template tailorable ordering*
- [21] ISO/TR 11941:1996, *Information and documentation — Transliteration of Korean script into Latin characters*
- [22] ANSI/NISO Z39.19:2005, *Guidelines for the Construction, Format, and Management of Monolingual Controlled Vocabularies*. Available at: <http://www.niso.org/standards/z39-19-2005/>

- [23] ANSI/NISO Z39.50:2003, *Information Retrieval: Application Service Definition & Protocol Specification*. Available at: <http://www.niso.org/standards/z39-50-2003/>
- [24] BS 1749, *Recommendations for alphabetical arrangement and the filing order of numbers and symbols*
- [25] BS 8723, *Structured vocabularies for information retrieval — Guide*

Other documents

- [26] *Art & architecture thesaurus*, 2nd ed. New York; Oxford: Oxford University Press on behalf of the Getty Art History Information Program, 1994. In 5 vols. A continuously updated version is available on the Internet at: http://www.getty.edu/research/conducting_research/vocabularies/aat
- [27] Barry, Randall K., compiler and editor. *ALA-LC romanization tables: transliteration schemes for non-roman scripts*. Washington, DC: Library of Congress, Network Development and MARC Standards Office, 1997. ISBN 0-8444-0940-5. Also available at: <http://www.loc.gov/catdir/cpso/roman.html>
- [28] Clinton, DeWitt. *OpenSearch 1.1, draft 3*. Palo Alto, CA: A9.com, Inc. Available at: http://www.opensearch.org/Specifications/OpenSearch/1.1/Draft_4 [Latest version available at <http://www.opensearch.org/Specifications/OpenSearch/1.1>]
- [29] *CQL: Contextual Query Language*. Washington, DC: Library of Congress. Available at: <http://www.loc.gov/standards/sru/specs/cql.html>
- [30] Davis, Mark, and Ken Whistler. *Unicode Collation Algorithm, version 5.1.0*. Unicode Technical Standard #10. Mountain View, CA: The Unicode Consortium, 28 March 2008. Available at: <http://unicode.org/reports/tr10/>
- [31] DCMI Registry Task Group. *Registry List* [metadata schema, terminology or ontology]. Available at: http://wiki.metadataregistry.org/Registry_list
- [32] Denenberg, Ray. "Search Web Services — The OASIS SWS Technical Committee Work: The Abstract Protocol Definition, OpenSearch Binding, and SRU/CQL 2.0." *D-Lib Magazine*, 15 (1/2), January/February 2009. Available at: <http://www.dlib.org/dlib/january09/denenberg/01denenberg.html>
- [33] Dublin Core Metadata Initiative. *Dublin core metadata element set, version 1.1*. DCMI recommendation, 11 October 2010. Latest version available at <http://dublincore.org/documents/dces/> [Full set of DCMI standards available at <http://dublincore.org/>]
- [34] Fielding, R. T. "Representational State Transfer (REST)." In: *Architectural Styles and the Design of Network-based Software Architectures, Chapter 5*. University of California Irvine Ph.D. Dissertation, 2000. Available at: http://www.ics.uci.edu/~fielding/pubs/dissertation/rest_arch_style.htm
- [35] Internet Assigned Numbers Authority. *Language Subtag Registry*. Available at: <http://www.iana.org/assignments/language-subtag-registry>
- [36] Janée, G., S. Ikeda, and L.L. Hill. *The ADL Thesaurus Protocol* — Version 1.0, 2002. Latest version available at <http://www.alexandria.ucsb.edu/thesaurus/specification.html>
- [37] Joint Steering Committee for Revision of AACR. *Anglo-American cataloguing rules, 2nd ed., 2002 revision with 2004 update*. London: Facet Publishing for Chartered Institute of Library and Information Professionals, 2004. ISBN 0-85604-469-6
- [38] *JSON-RPC Specification*. JSON-RPC.ORG, 2005. Available at: <http://json-rpc.org/wiki/specification>
- [39] *KOS-based web services*. Pontypridd, UK: University of Glamorgan. Available at: http://hypermedia.research.glam.ac.uk/kos/terminology_services/links/
- [40] *Linked Data* [website]. Available at: <http://linkeddata.org/>

- [41] OASIS Search Web Services Technical Committee [webpage]. Available at: http://www.oasis-open.org/committees/tc_home.php?wg_abbrev=search-ws
- [42] Object Management Group. *Unified Modeling Language™: UML® resource page*. Needham, MA: Object Management Group, 2007. [Available at <http://www.uml.org/>.]
- [43] Object Management Group. *Unified Modeling Language (UML), version 2.1.2*. Needham, MA: Object Management Group, 2007. Available at <http://www.omg.org/technology/documents/formal/uml.htm>
- [44] Object Management Group. *Unified Modeling Language Specification, version 1.4.2*. Needham, MA: Object Management Group, January 2005. Available at <http://www.omg.org/spec/UML/ISO/19501/PDF/> [Also available from ISO as ISO/IEC 19501:2005]
- [45] Phillips, A. and M. Davis, eds. *Tags for identifying languages*, RFC 4646. The Internet Society, September 2006. Available at <http://www.rfc-editor.org/rfc/rfc4646.txt>
- [46] SRU: *Search/Retrieve via URL, version 1.2*. Washington, DC: Library of Congress. Available at <http://www.loc.gov/standards/sru/>
- [47] STITCH (Semantic Interoperability To access Cultural Heritage). *Repository — Related Work* [webpage]. Available at: <http://www.cs.vu.nl/STITCH/repository/services.html>
- [48] SWAD-Europe [website]. Available at: <http://www.w3.org/2001/sw/Europe/>
- [49] Tudhope, Douglas, Traugott Koch, and Rachel Heery. *Terminology Services and Technology: JISC state of the art review*. Bath, UK: UKOLN, 15 September 2006. Available at: http://www.jisc.ac.uk/media/documents/programmes/capital/terminology_services_and_technology_review_sep_06.pdf
- [50] The Unicode Consortium. *The Unicode Standard, Version 5.1.0*, defined by: The Unicode Standard, Version 5.0. (Boston, MA, Addison-Wesley, 2007. ISBN 0-321-48091-0), as amended by Unicode 5.1.0. Available at: <http://www.unicode.org/versions/Unicode5.1.0/> [See also The Unicode Character Code Charts By Script, available at <http://www.unicode.org/charts/>]
- [51] US Library of Congress Network Development and MARC Standards Office. *MARC Standards*. <http://www.loc.gov/marc/authority/>
- [52] US Library of Congress Network Development and MARC Standards Office. *MARC 21 format for authority data*. Washington, DC: Library of Congress. Concise version available online at <http://www.loc.gov/marc/authority/>
- [53] US Library of Congress Network Development and MARC Standards Office. *MARC 21 format for classification data*. Washington, DC: Library of Congress. Concise version available online at <http://www.loc.gov/marc/classification/>
- [54] US Library of Congress. *MADS (Metadata Authority Description Schema)*. Washington, DC: Library of Congress. Available at <http://www.loc.gov/standards/mads/>
- [55] World Wide Web Consortium. *Character model for the World Wide Web 1.0: Fundamentals*. W3C Recommendation, 15 February 2005. Latest version available at <http://www.w3.org/TR/charmod>
- [56] World Wide Web Consortium. *Character model for the World Wide Web 1.0: Normalization*. W3C Working Draft, 27 October 2005. Latest version available at <http://www.w3.org/TR/charmod-norm>
- [57] World Wide Web Consortium. *Extensible Markup Language (XML) 1.0 (fifth edition)*. W3C Recommendation 26 November 2008. Available at: <http://www.w3.org/TR/2008/REC-xml-20081126/> [Latest version available at <http://www.w3.org/TR/xml>]
- [58] World Wide Web Consortium. *Extensible Markup Language (XML) 1.1 (second edition)*. W3C Recommendation, 16 August 2006, edited in place 29 September 2006. Available at: <http://www.w3.org/TR/2006/REC-xml11-20060816/>

- [59] World Wide Web Consortium. *HTML 4.01 specification*. W3C Recommendation, 24 December 1999. Latest version available at <http://www.w3.org/TR/html401>
- [60] World Wide Web Consortium. *SKOS Simple Knowledge Organization System Reference*. W3C Recommendation, 18 August 2009. Latest version available at <http://www.w3.org/TR/skos-reference>
- [61] World Wide Web Consortium. *SKOS Simple Knowledge Organization System Primer*. W3C Working Group Note, 18 August 2009. Latest version available at <http://www.w3.org/TR/skos-primer>
- [62] World Wide Web Consortium. *SOAP Version 1.2*. W3C Recommendation, 27 April 2007. Available at: <http://www.w3.org/TR/soap12>
- [63] World Wide Web Consortium. *SPARQL Protocol for RDF*. W3C Recommendation, 15 January 2008. Available at: <http://www.w3.org/TR/rdf-sparql-protocol/>
- [64] World Wide Web Consortium. *XML Schema Part 0: Primer Second Edition*. W3C Recommendation, 28 October 2004. Available at <http://www.w3.org/TR/xmlschema-0/>
- [65] World Wide Web Consortium. *XML Schema Part 1: Structures Second Edition*. W3C Recommendation, 28 October 2004. Available at <http://www.w3.org/TR/xmlschema-1/>
- [66] World Wide Web Consortium. *XML Schema Part 2: Datatypes Second Edition*. W3C Recommendation, 28 October 2004. Available at <http://www.w3.org/TR/xmlschema-2/>
- [67] World Wide Web Consortium, Information Society Technologies and SWAD Europe. *SKOS API (Simple Knowledge Organization Systems Application Programming Interface)*. Latest version available at <http://www.w3.org/2001/sw/Europe/reports/thes/skosapi.html>
- [68] XML-RPC [website]. UserLand Software, Inc. Available at: <http://www.xmlrpc.com/>
- [69] Zthes Working Group. *The Zthes specifications for thesaurus representation, access and navigation*. 17 February 2006. Available at <http://zthes.z3950.org/>

Index

This index conforms to ISO 999.

Location is to numbered clause and paragraph. A single letter following a numerical locator refers to a subparagraph within that locator, e.g. 8.2*h* refers to list item *h*) of the second subclause of Clause 8. The abbreviation *def* stands for “definition”.

A	alphabetical displays	associative relationships
a posteriori relationship 2.59 <i>def</i>	arrays 11	2.2 <i>def</i> , 10.3
a priori relationship 2.41 <i>def</i>	as indexes 12.1.3	concepts 4.4 <i>c</i>
AB abbreviation tag 8.2	distinct, multilingual	and thesaurus construction
abbreviations 3	thesauri 12.3.1, 12.3.3	sequence 13.3.2
as tags 3.3	monolingual 12.1.2 <i>b</i> , 12.2.3	special tags 10.4
capitalization 6.4.1	multilingual thesauri 12.3.3	attributes, data model 15.2.16
equivalence 8.2 <i>h</i>	alphabetical filing	authority lists, proper
preferred forms 6.6.8	multilingual displays 12.3.4,	names 6.6.9. <i>1</i>
punctuation 6.4.2	12.4.3	automatic indexing systems
qualifiers 6.2.2	order options, display	integration 16.3.8
separate designation 10.4	outputs 14.8 <i>e</i> , 14.8 <i>f</i>	support 4.1
absent terms, multilingual	singular and plural	
thesauri 9.1, 9.3.1, 9.3.3	forms 6.5.4	B
abstract phenomena, singular or plural forms 6.5.3	<i>Alphabetical ordering of multilingual..., ISO</i>	
Abstract Protocol Definition (APD) 18.5	12199 12.4.3	
access levels, software and 14.10 <i>d</i>	ambiguity	
acronyms	and complex concepts 7.3.2 <i>f</i>	
capitalization 6.4.1	and splitting decisions 7.3.4 <i>b</i>	
equivalence 8.2 <i>h</i>	scope notes 5.2, 5.3, 6.2.1	
preferred forms 6.6.8	terms 6.2	
qualifiers 6.2.2	analytical stage, thesaurus compilation 13.2.3	
separate designation 10.4	Anglo-American cataloguing rules 6.6.9.1, 6.6.9.3	
action/ patient or target, associative relationships 10.3.3 <i>d</i>	ANSI/NISO Z39.19 18.4	
action/ product, associative relationships 10.3.3 <i>c</i>	ANSI/NISO Z39.50 18.5	
actions, properties 5.1.2 <i>e</i>	antonyms, as quasi-synonyms 8.3	
activities 5.1.2 <i>c</i>	APIs (Application Programming Interface) 18.4	
singular or plural forms 6.5.3	apostrophes, usage 6.4.2	
adjectival phrases 6.3.1 <i>a</i>	applications	
adjectives, avoidance 6.3.2	environment/ architecture, networking 18.3	
ADL Thesaurus Protocol 18.4	integration 16	
admission decisions, complex concepts 7.3, 7.3.1	see also networking; systems; thesaurus management software	
adverbs, avoidance 6.3.3	arrays 2.1 <i>def</i>	
AGROVOC, display examples A.6	data model 15.2.17	
aims, thesaurus 4	facet analysis 11	
ALA-LC romanization tables... 6.6.4	indentation, hierarchical	
Alexandria Digital Library (ADL) Protocol 18.4	displays 12.2.4	
"all-and-some tests" 10.2.2.1, 10.2.2.2	Art & Architecture Thesaurus (AAT), display examples 7.6, A.3	
alpha-2 language codes, ISO 639-1 12.3.2, 15.2.10, A.7	artefact/ parts, associative relationships 10.3.3 <i>f</i>	
alpha-3 language codes, ISO 639-2 12.3.2, 15.2.10	artificiality, controlled vocabularies 4.2	
	associations, data model 15.2.2	
	associative relationships, non-overlapping 10.3.3	

BTP broader term (partitive) tag 3.1 *Table1*, 10.2.3.2

C

candidate terms 13.6.2
review procedures 13.6.3
systems integration 16.3.7
capitalization 6.4.1
case
 limitations, thesaurus
management software 14.2e
usage 3.4a
cataloguing systems
 integration 16.3.7
causal dependence, associative relationships 10.3.3g
CAUSE/EFFECT tag 10.4
CC concept code or notation tag 3.1 *Table1*, 12.2.2a
changes
 propagation, thesaurus
management software and 14.3d
tracking 13.6.5.4
updating 13.6.4
character string matching, normalization for 12.4.4
characteristics of division 2.4def
facet analysis 11
characters
 display issues, multilingual systems 12.4.2
 encoding issues 12.4
 limitations, thesaurus
management software 14.2b
restricted, XML format 13.5.2
support, applications integration 16.3.2
chemical names, punctuation 6.4.2
Chinese language tags 3.1 *Table2*
clarification, terms 6.2
class code 2.40def
class number 2.40def
class/species
 relationships 10.2.1a, 10.2.2
classes, UML sense 15.1
classification 2.5def
classification schemes 2.6def
 existing, as vocabulary
 resource 13.1.3.3a
 copyright issues 13.3.1
classified displays
 expanded 12.2.5.3
 monolingual 12.1.2d, 12.2.5
 multilingual thesauri 12.3.4
classified structure, concept groups, data model 15.2.18
classifying 2.5def
classmark 2.40def
clearinghouse deposit 13.5.5, 16.2
codes, thesaurus management software and 14.5

coined terms 2.7def
multilingual thesauri 9.2c, 9.3.3.2, 9.3.3.3
combination, vs compound terms 7.1, 7.3
commitment, thesaurus projects 13.1.3.2a
common names see popular names
compilation, early stages 13.2
complex concepts 7
 admission decisions 7.3
 admission factors 7.3.2
 constituent concepts
 provision 7.5
 decisions, consistency 7.6
 representation by terms
combination 8.1d, 8.5
split, presentation 7.4
splitting decisions 7.3.3, 7.3.4
complex objects, whole/part separation 7.5.2
components, complex objects 7.5.2
compound equivalence 2.8def, 8.1d, 8.5
compound terms 2.9def, 7.1
 components 7.2
 meaning when split 7.3.4f, 7.3.4g
 see also complex concepts
computer application 2.10def
computer displays
 look-up displays 12.2.5.2
 polyhierarchical relationships 12.2.6.3
 split screen 12.3.4
systems suitability, multilingual systems 12.4.1
computer software see applications; software; thesaurus management software
concept groups
 data model 15.2.18
 facet analysis 11
concepts 2.11def
 absent terms, multilingual thesauri 9.1, 9.3.1, 9.3.3
associative relationship 4.4c
collecting 13.2.2
complex see **complex concepts**
 data model 15.2.3
multiple subject
fields 12.2.5.1
mutually exclusive categories 5.1.2
new, preferred forms 6.6.5
overlapping, associative relationships 10.3.1, 10.3.2
relationships 10
 hierarchical 4.4b, 10.2
thesaurus management software 14.3
representation 4.1
scattered by facets 12.2.4
scope 5
scope notes 5.2, 5.3
selection rules, defined, thesaurus introductions 13.4f
shared characteristics 5.1.2
conceptual basis 5.1
conceptually associative relationships 10.3.1
consistency, complex concepts decisions 7.6
constraints, thesaurus planning 13.1.2
construction 13.3
sequence 13.3.2
Contextual Query Language (CQL) 18.5
controlled vocabulary 2.12def
conventions 3
 defined, thesaurus introductions 13.4d
ISO 25964 3.4
selection, thesaurus planning 13.1.2
UML 15.1
copy function, systems integration 16.3.7
copyright issues, imports from extant sources 13.3.1
corporate bodies, as subject terms 5.1.3c
 names see institutions, names
corporate commitment, thesaurus projects 13.1.3.2a
correspondence tables, multilingual thesauri 12.3.5
count nouns, English/Spanish 6.5.2
countries see place names
cross-language equivalence 2.13def
non-preferred terms 9.5
preferred terms
 records 12.3.3
 representation 9.4
multilingual thesauri 12.3.1, 12.3.3
cultural differences, non-symmetrical structures 10.2.6
cultural factors, singular or plural forms 6.5.1
custom attributes, data model 15.2.16
customized relationships 10.4

D

Danish language tags 3.1 *Table2*
data
 entry systems suitability, multilingual systems 12.4.1
 exchange, applications 16.1
 import/export, thesaurus management software and 14.8
 sets, bulk import 14.8a
data model 2.14def, 15 *Figure15*

introduction	15
notes	15.2
tabular presentation	15
Tables 3-9	
introduction	15.3
databases	
compilation, and thesaurus	
compilation	13.2.1
presentation	
information	12.1.1
dates	
data model	15.2.5
date last modified field,	
thesaurus management	
systems	13.6.5.3, 13.6.5.4
format, date last modified	
field	13.6.5.4
DEF definition tag	3.1 <i>Table1</i> , 12.2.2 <i>h</i> , 12.2.2 <i>bb</i>
definitions	2
definitions in thesauri	6.2.3
introductions	13.4
tags	3.1 <i>Table1</i> , 12.2.2 <i>h</i> , 12.2.2 <i>bb</i>
deletions, avoiding	13.6.4
derived substances, associative	
relationships	10.3.3 <i>k</i>
descriptors	2.45 <i>def</i>
diacritics	6.4.2
dialects	
identification	12.4.5
multilingual thesauri	10.3.4
symmetrical structures	9.1
difference parts	
compound terms	7.2 <i>b</i>
metaphors, and splitting	
decisions	7.3.4 <i>e</i>
multiple	
and complex concepts	7.3.2 <i>d</i>
and splitting decisions	7.3.3 <i>c</i>
original meanings lost, splitting	
decisions	7.3.4 <i>d</i>
directories, publicizing	
thesaurus	13.5.4, 13.5.6
disambiguation, terms	6.2
disciplines	5.1.2 <i>f</i>
discipline/ field of discourse,	
hierarchical whole-part	
relationships	10.2.3.1 <i>c</i>
discipline/ object of study,	
associative	
relationships	10.3.3 <i>a</i>
singular or plural forms	6.5.3
discrimination factors, complex	
concepts	7.3.2 <i>b</i>
displays	
alphabetical	
arrays	11
as indexes	12.1.3
distinct, multilingual	
thesauri	12.3.1, 12.3.3
monolingual	12.1.2 <i>b</i> , 12.2.3
multilingual thesauri	12.3.3
classified	
expanded	12.2.5.3
monolingual	12.1.2 <i>d</i> , 12.2.5
multilingual thesauri	12.3.4
examples, published	
thesauri	Annex A
issues, multilingual	
systems	12.4.2
outputs	14.8 <i>e</i>
parallel, multilingual	
thesauri	12.3.4
requirements, thesaurus	
planning	13.1.2
styles	
monolingual	12.2
summary	12.1.2
systematic	
arrays	11
multilingual thesauri	12.3.4, 12.4.3
see also	computer displays
dissemination, thesaurus	13.5
documents	2.15 <i>def</i>
collections, searchable,	
applications integration	16.3.4
Dublin Core Metadata Initiative	
(DCMI)	
elements, data model	15.2.11
"lower Camel Case"	
convention	15.2.1
terminology registry	13.5.6
duplicate terms, thesaurus	
management software	
and	14.3 <i>a</i>
Dutch language tags	3.2
E	
edit/ delete batch facility	14.8 <i>c</i>
editions, new, and updates	
dissemination	13.6.5.1
editorial notes, on scope note	
usage	5.3
editorial review boards, thesaurus	
construction	13.3.4 <i>b</i>
editors	
coordination, thesaurus	
projects	13.1.3.2
managing, thesaurus	
projects	13.1.4
safeguards, software	
and	14.10
support, software and	14.9
electronic publication	13.5.2
updates	13.6.5.3
electronic systems	see systems
encoding issues, characters	12.4
English language	
singular or plural forms	6.5.1, 6.5.2, 6.5.3
tags	3.1
entities, as subject terms	5.1.3
entry term	2.16 <i>def</i>
eponymous terms, and splitting	
decisions	7.3.4 <i>c</i>
equivalence	
multilingual thesauri	9
F	
facet analysis	2.21 <i>def</i> , 11
basic categories	12.2.4
facet indicator	2.22 <i>def</i>
facets	2.20 <i>def</i>
lists, thesaurus	
compilation	13.2.3
names, display	11
treatment, data model	15.2.19
within subject fields	12.2.5.2
features selection, thesaurus	
planning	13.1.2
field tags	see tags
filings	
alphabetical	
multilingual displays	12.3.4, 12.4.3
order options, display	
outputs	14.8 <i>e</i> , 14.8 <i>f</i>

singular and plural forms 6.5.4
orders 12.4.3
rules, defined, thesaurus introductions 13.4h
see also displays
finance assessment, thesaurus planning 13.1.3.1
Finnish language tags 3.1 Table2
focus, compound terms 7.2a
form, terms 6.1
format, thesaurus planning 13.1.2
French language singular or plural forms 6.5.1
tags 3.1 Table2
FT full form of term tag 8.2
FT/AB full term and abbreviation tag 10.4
fundamental categories, facet analysis 11

G
General Multilingual Environmental Thesaurus (GEMET), display examples A.7
generic relationships 10.2.1a, 10.2.2
broader term, tags 3.1 Table1
narrower term, tags 3.1 Table1
polyhierarchical 10.2.5
geographical locations, hierarchical whole-part relationships 10.2.3.1b
geographical regions see place names
German language singular or plural forms 6.5.1
tags 3.1 Table2
gerunds 6.3.1, 6.3.4
grammatical form of terms 6.3
graphical displays 12.1.2e
coordinates 12.1.3

H
hard copy see printed thesauri
head parts see focus parts
hierarchical displays
 monolingual 12.1.2c, 12.2.4
 multilingual 12.3.4
hierarchical levels limitations, thesaurus management software 14.2c
hierarchical relationships 2.23def, 10.2
 concepts 4.4b
 thesaurus construction 13.3.1, 13.3.2
 whole-part relationships 10.2.1b, 10.2.3
hierarchical social structures, whole-part relationships 10.2.3.1d

hierarchy indication, alphabetical displays 12.2.3.2, 12.2.3.3
history notes 6.2.4
 on updating 13.6.4
HN history note tag 3.1 Table1, 12.2.2i, 12.2.2cc
homographs 2.24def
 multilingual thesauri 9.3.1, 9.3.2
normalization byproducts 12.4.4
not equivalence sets 8.5
qualifiers 6.2.2
housekeeping fields 12.2.2
housekeeping tools, software 14.11
HTML (Hypertext Markup Language) 2.32def, 12.4.1
human resources assessment, thesaurus planning 13.1.3.2
hyperlinks
 thesaurus management software and 14.4b
hyphens, usage 6.4.2

I
IANA subtag registry 9.4, 12.3.2, 12.4.5, 15.2.10
identifiers 2.25def
 unique, automatic assignment 14.5c
 XML schema 15.2.4
implementation platforms, networking 18.3
importing systems
 change recording for data 14.8
indentation, BT/NT
 alphabetical displays 12.2.3.3
 hierarchical displays 12.2.4
index term 2.26def
indexers, suggestion procedures 13.6.2
indexes
 alphabetical sequences as 12.1.3
 existing as vocabulary resource 13.1.3.3c
 copyright issues 13.3.1
 Guidelines for the content..., ISO 999 12.4.3, 14.8f
indexing 2.27def
indexing systems
 integration 16.3, 16.3.7
 automatic systems, integration 16.3.8
individuals, as subject terms 5.1.3c
inexact equivalence, multilingual thesauri 9.2b, 9.3.1
infinitives 6.3.4
information professionals, thesaurus projects 13.1.3.2c

J
jargon terms 8.2i
 preferred forms 6.6.5
JSON-RPC implementation platform 18.3

K
KWIC (key word in context) permuted display 12.1.2

KWOC (key word out of context) permuted display	lower case, usage	3.4a	mutually exclusive categories	5.1.2
	M		N	
L				
language codes	maintenance, thesaurus	13.6	naming conventions, data model	15.2.1
data model	management, thesaurus	construction/ maintenance	narrow/broad terms treated as equivalent	8.1c, 8.4
ISO 639-1/ ISO 639-2	mapping, monolingual vs multilingual thesauri	9.1, 9.2c	narrower term	2.37def
12.3.2, 15.2.10, A.7	MARC (MACHINE-Readable Cataloguing) format	17	non-equivalence solution, multilingual thesauri	9.3.4
languages	MarcXchange, ISO 25577	17	tags	3.1 Table 1
character encoding	markup	2.31def	near-equivalence, multilingual thesauri	9.2b, 9.3.1
issues	markup language	2.32def	near-synonyms	2.47def
equal status, thesaurus management software	master database safeguards, software and materials	14.10	thesaurus construction	13.3.1
and 14.7	properties	5.1.2b	neologisms	
experts/ expertise, thesaurus projects	associative relationships	5.1.2e	preferred forms	6.6.5
13.1.3.2, 13.3.4e	singular or plural forms	10.3.3e	see also coined terms	
limitations, thesaurus management software	merging, monolingual thesauri	13.3.3b	networking	16.1, 16.2
14.2f	metadata	2.33def	protocols	18
linguistic differences, non-symmetrical structures	metaphors, and splitting decisions	7.3.4e	see also integration	
10.2.6	misspelt terms, popular modifier parts	6.6.2	new concepts, preferred forms	6.6.5
linguistic factors, singular or plural forms	monohierarchical structure	2.34def	node labels	2.38def
6.5.1	monolingual display styles	12.2	classified displays	12.2.5.1
official, place names	hierarchical displays	12.2.4	data model	15.2.8, 15.2.17
simultaneous thesaurus construction in	monolingual equivalence relationships	8	facet analysis	11
13.3.3c	monolingual mapping, vs multilingual thesauri	9.1, 9.2c	hierarchical displays	12.2.4
simultaneous updating in	monolingual thesauri, and multilingual thesaurus construction	13.3.3	thesaurus management software and ignored by validation checks	14.6
13.6.4	MS misspelling tag	6.6.2, 8.2	locating	14.6a
translations, loan terms	multi-word terms	2.36def	non-alphabetic characters	6.4.2
6.6.3	complex concepts	7.1	non-count nouns, singular or plural forms	6.5.3
transliteration, preferred forms	permuted display	12.1.2f	non-descriptor	2.39def
6.6.4	vs qualifiers	6.2.2	non-equivalence, multilingual thesauri	9.2d
user selection, single-record displays	word order	7.7	non-preferred terms	2.39def
12.3.2	multilingual thesauri	2.35def	cross-language equivalence	9.5
vernacular form, place names	and complex concepts	7.3.2g	expanded classified displays	12.2.5.3
6.6.9.2b	construction	13.3.3	italics	3.4b
see also dialects; multilingual thesauri	equivalence	9	split, data model	15.2.21
Latin names see scientific names	relationships see cross-language equivalence		typographic distinction, alphabetical displays	12.2.3.1
lead-in term	vs monolingual mapping	9.1, 9.2c	validation checks	14.3g
letter-by-letter alphabetical order, display outputs	multicultural issues	10.3.4	non-symmetrical associative relationships	10.3.4
14.8f	non-symmetrical structures	10.2.6	non-symmetrical structures, multilingual thesauri	10.2.6
levels numbering, alphabetical displays	multinational teams, projects	13.1.3.2	normalization rules, multilingual systems	12.4.4
12.2.3.3	preferred term multiplicity, data model	15.2.12	Norwegian language tags	3.1 Table 2
limitations, unacceptable, thesaurus management software	simultaneous updating	13.6.4	notation	2.40def
14.2	symmetry	4.2	classified displays	12.1.3
linguistic differences, non-symmetrical structures	multiple hierarchical relationships		links, for term	
10.2.6	see polyhierarchical relationships		location	12.2.5.2, 12.2.5.3
linguistic factors, singular or plural forms	museum objects, singular or plural forms	6.5.2	multilingual thesauri	12.3.4
6.5.1			thesaurus management software and	14.5
link targets, validation checks				
14.4b				
Linked Data implementation platform				
18.3				
living organisms, singular or plural forms				
6.5.2				
loan terms				
2.30def				
and non-equivalence, multilingual thesauri				
9.2d, 9.3.3.2				
preferred forms				
6.6.3				
translations				
6.6.3				
look-up displays computer displays				
12.2.5.2				
procedures, and updates dissemination				
13.6.5.1				

data model 15.2.8
note references, data model 15.2.15
notes
data model 15.2.14
editorial
 on definitions in thesauri 6.2.3
 on scope note usage 5.3
history notes 6.2.4
scope notes 5.2, 5.3, 6.2.1
thesaurus management
 software and 14.4
noun parts, compound terms 7.2a
nouns/ noun phrases 6.3.1
NT narrower term tag 3.1Table1, 10.2.1, 12.2.2f
NTG narrower term (generic)
 tag 3.1Table1, 10.2.2.3
NTI narrower term (instantial)
 tag 3.1Table1, 10.2.4.2
NTP narrower term (partitive)
 tag 3.1Table1, 10.2.3.2
numerical characters, usage 6.4.2

O

OASIS Search Web Services
 Technical Committee 18.5
object/ counter agent, associative relationships 10.3.3h
object/ properties, associative relationships 10.3.3e
objectives, thesaurus 4
 planning 13.1.1
objects, specific, as subject terms 5.1.3b
OpenSearch 18.5
operation/ agent, associative relationships 10.3.3b
opposites, as quasi-synonyms 8.3
optional features, data model 15.1
"OR" combinations, to avoid 8.5
organizations
 posts, as subject terms 5.1.3c
 types 5.1.2h
output sequences, thesaurus
 management software and 14.5d
overlapping concepts/ terms, associative relationships 10.3.1, 10.3.2
overview, thesaurus 4

P

paradigmatic relationship 2.41def, 4.3b, 4.4
 vs **syntagmatic relationships** 4.3
parallel displays, multilingual thesauri 12.3.4

parentheses, usage 6.4.2
partial equivalence, multilingual thesauri 9.2c, 9.3.1
partitive broader term
 tag 3.1Table1
partitive narrower term
 tag 3.1Table1
parts, complex objects 7.5.2
parts/ things, physical 5.1.2a
password controls, software 14.10c
people, types 5.1.2h
permuted displays 12.1.2f
persons, names 6.6.9.1, 6.6.9.3
 as subject terms 5.1.3c
persons, properties 5.1.2e
phrases
 adjectival 6.3.1a
 noun 6.3.1
 prepositional 6.3.1b
physical parts/ things 5.1.2a
place names 6.6.9.2
 as subject terms 5.1.3a
planning, thesaurus
 management 13.1
plural or singular forms 6.5
 as different concepts 6.5.4
polyhierarchical structure 2.42def
 relationships 10.2.5
monolingual, display 12.2.6
popular names
 and scientific names 6.6.7
 equivalence 8.2b
 and trade names 6.6.6
 form, place names 6.6.9.2a
post-coordination 2.43def
postings display, applications
 integration 16.3.4
pre-coordinated notation, classified displays 12.1.3
pre-coordination 2.44def
preferred terms 2.45def
 candidate 13.6.2
 review procedures 13.6.3
systems integration 16.3.7
case 3.4a
cross-language equivalence representation 9.4
multiplicity, data model 15.2.12
records, cross-language equivalents 12.3.3
revision, multilingual thesauri 9.3.3.1
selection 4.1, 6.6
 rules defined, thesaurus introductions 13.4g
thesaurus construction 13.3.1
typographic distinction, alphabetical displays 12.2.3.1
 validation checks 14.3i
prepositional phrases 6.3.1b
prepositions, avoidance 6.3.1b
presentation/ layout 12
 multilingual thesauri 12.3

"principal location", printed displays 12.2.5.2, 12.2.6.2
printed thesauri
alphabetical sequence 12.1.3
conventional publication 13.5.4
and inversion 7.7
of limited distribution 13.5.3
polyhierarchical relationships 12.2.6.2
"principal location" 12.2.5.2, 12.2.6.2
size limitation 12.2.5.2
styles 12.1.2
typographical distinctions 12.2.3.1
updates 13.6.5.2
processes 5.1.2c
process/ agent, associative relationships 10.3.3b
process/ counter agent, associative relationships 10.3.3h
proper names 6.6.9
capitalization 6.4.1
as eponymous terms, splitting decisions 7.3.4c
initial articles 6.3.5.2
instance
relationships 10.2.4.1
punctuation 6.4.2
 as subject terms 5.1.3
properties 5.1.2e
 singular or plural forms 6.5.3
protocols 2.46def, 18
 general-purpose, used with thesauri 18.5
thesaurus-specific 18.4
publication, thesaurus 13.5
 on networks 16.2
 see also printed thesauri
punctuation marks in terms 6.4.2

Q

qualifiers
homographs 6.2.2
 multilingual thesauri 9.3.2
and initial articles
omission 6.3.5
singular and plural forms 6.5.4
quality control, thesaurus construction 13.3.2
quasi-synonyms 2.47def
 equivalence 8.1b, 8.3
 multilingual thesauri 9.3.1, 9.3.2
preferred term selection 4.2b
queries, existing, as vocabulary resource 13.1.3.3b

R

RDF (Resource Description Framework) 17

RDF query language, SPARQL 18.5	schedule 2.49def	overlapping 10.3.2.2
reader-friendly updates 13.6.5.2	scientific names and popular names 6.6.7	single record displays 12.1.2a, 12.2.2
reciprocity	equivalence 8.2b	multilingual 12.3.2
equivalence relationships 8.1	singular or plural forms 6.5.2	single word terms, complex concepts 7.1
scope notes 5.3	scope	singular or plural forms 6.5
support, thesaurus management	concepts 5	as different concepts 6.5.4
software and 14.3c	ISO 25964-1 1	English/ Spanish 6.5.2, 6.5.3
user-defined, thesaurus management software and 14.3f	terms 4.2a	size limitations, thesaurus management software 14.2a
records status, data model 15.2.7	thesaurus, defined in introductions 13.4a	SKOS (Simple Knowledge Organization Systems) format 17
reference works, standard, as vocabulary resource 13.1.3.3e	scope notes 2.50def, 5.2, 6.2.1	SWAD-E SKOS API 18.4
related terms 2.48def	expanded classified displays 12.2.5.3	slang terms
tags 3.1 Table1	reciprocal 5.3	equivalence 8.2i
and thesaurus construction	singular and plural forms 6.5.4	preferred forms 6.6.5
sequence 13.3.2	thesaurus construction 13.3.1	SN scope note tag 3.1 Table1, 12.2.2b
expanded classified displays 12.2.5.3	thesaurus management software and 14.4a	SOAP implementation platform 18.3
relationships	scripts, alternative, identification 12.4.5	social structures, hierarchical whole-part
concepts 10	search engines, user-transparent integration 16.3.5	relationships 10.2.3.1d
concepts, thesaurus management software 14.3	search	software
conventional tags 4.4	applications, integration with 16.3	applications
limitations, thesaurus management software 14.2d, 14.3e	expansion 4.1	environment/ architecture, networking 18.3
paradigmatic vs syntagmatic 4.3	and equivalence relationships 16.3.6	integration 16
reciprocity 4.4	explosion 10.2.1	general, selection 14.1note
roles, data model 15.2.20	facilities, integration 16.3.3	text analysis 13.2.1
tags, data model 15.2.22	impairment, by updating 13.6.1	thesaurus management see thesaurus management software
symbols 3.1 Table1	normalization for, multilingual systems 12.4.4	sorting orders see filing orders
terms, thesaurus management software 14.3	options multiplicity, complex concepts 7.3.2c	source language 2.54def
Representation of dates and times, ISO 8601 13.6.5.4	refining 4.1	sources, terms
resource assessment, thesaurus planning 13.1.3	software capabilities, and complex concepts 7.3.2h	data model 15.2.9
responsibilities, establishing, thesaurus projects 13.1.4	system integration, thesaurus dissemination 13.5.1	acknowledgement, thesaurus introductions 13.4j
REST implementation platform 18.3	search terms 2.51def	SP spelling variant tag 8.2
restore function, software and 14.10f	alternative 4.1	Spanish language
review procedures 13.6.3	Search and Retrieval via URL (SRU) 18.5	singular or plural forms 6.5.1, 6.5.2, 6.5.3
RFC 4646 Tags for identifying languages 9.4, 12.3.2, 12.4.5, 15.2.10, A.7	Search Web Services (OASIS) 18.5	tags 3.1 Table2
roll-back (undo) function, software and 14.10e	searchable document collections, applications integration 16.3.4	SPARQL (Simple Protocol and RDF Query Language) 18.5
RT related term tag 3.1 Table1, 12.2.2g	security, software and 14.10	special characters 6.4.2
RT/RT relationships data model 15.2.20	Semantic Web Advanced Development (SWAD) Europe project 18.4	specificity 2.55def
thesaurus management software and 14.3b	and SKOS 17	and compound terms 7.1
rules establishment, complex concepts decisions 7.6	SWAD-E SKOS API 18.4	and hierarchical relationships 10.2.1
Russian language tags 3.1 Table2	semantically associative relationships 10.3.1	spelling mistakes, identification 4.1
	sequences	spellings, variant
	display styles 12.1.2, 12.2	equivalence 8.2e
S	linking 12.1.3	selection 6.6.2
SC subject category/ concept group tag 3.1 Table1, 12.2.2j	SHL (subject heading language) 2.57def	split non-preferred terms, data model 15.2.21
	sibling concept 2.52def	split screen display, multilingual thesauri 12.3.4, A11, A15, A20
	sibling terms 2.53def	splitting decisions, complex concepts 7.3.3, 7.3.4
		spreadsheets, and thesaurus compilation 13.2.3

- SRU (Search and Retrieval via URL)** 17
- stakeholders involvement**
- thesaurus**
 - construction** 13.3.4c, 13.3.4d
 - thesaurus objectives** 13.1.1
- structure**
- data model** 15.1
 - see also presentation/ layout
- structured vocabulary** 2.56def
- styles**
- capitalization** 6.4.1
 - italics** 3.4b
 - upper case** 3.4a
- subject expertise, thesaurus**
- projects** 13.1.3.2
- subject fields** 5.1.2f
- facets within** 12.2.5.2
 - terms arranged by** 12.2.5.1
- subject heading**
- language** 2.57def
- subject heading list** 2.57def
- subject heading scheme** 2.57def
- subject indexing** 2.27defn
- subject lists, thesaurus**
- compilation** 13.2.3
- subject terms, scope** 5.1
- sublanguages, symmetrical structures** 9.1
- subordinate terms, NT**
- tags** 10.2.1
- substances, singular or plural forms** 6.5.3
- suggestions for thesaurus**
- updating,**
 - procedures** 13.6.2
 - review procedures** 13.6.3
- superordinate terms, BT**
- tags** 10.2.1
- SWAD** see Semantic Web Advanced Development
- Swedish language tags** 3.1
Table2
- symbols** 3
- data model** 15.2.2
 - see also tags
- symmetry, in multilingual thesauri** 4.2, 9
- and construction** 13.3.3
- synonyms** 2.58def
- equivalence** 8.1a, 8.2
 - preferred term selection** 4.2b, 6.6.1
 - thesaurus construction** 13.3.1
- syntagmatic relationship** 2.59def
- not recommended** 4.3a
- synthesis, vs compound terms** 7.1, 7.3
- systematic display**
- arrays** 11
 - multilingual thesauri** 12.3.4, 12.4.3
- systematic names** see scientific names
- systems integration, thesaurus applications** 16
- dissemination** 13.5.1
- formats, thesaurus**
- planning** 13.1.2
- networking** 16.1, 16.2
- protocols** 18
- updates** 13.6.5.3
- T**
- tabular displays, multilingual thesauri** 12.3.4
- tabular presentation, data model** 15.1
- tags**
- AB abbreviation** 8.2
 - BTG broader term (generic)** 10.2.2.3
 - BTI broader term (instantial)** 10.2.4.2
 - BTP broader term (partitive)** 10.2.3.2
 - CAUSE/EFFECT** 10.4
 - conventions** 3
 - for relationships 4.4
 - DEF definition** 3.1 *Table1*, 12.2.2h, 12.2.2bb
 - FT full form of term** 8.2
 - FT/AB full term and abbreviation** 10.4
 - HN history note** 3.1 *Table1*, 12.2.2i, 12.2.2cc
 - MS misspelling** 6.6.2, 8.2
 - non-standard** 8.2
 - NTG narrower term (generic)** 10.2.2.3
 - NTI narrower term (instantial)** 10.2.4.2
 - NTP narrower term (partitive)** 10.2.3.2
 - polyhierarchical relationships** 10.2.5
 - SC subject category/ concept group** 3.1 *Table1*, 12.2.2j
 - single record displays** 12.2.2
 - special, associative relationships** 10.4
 - SN scope note** 3.1 *Table1*, 12.2.2b
 - SP spelling variant** 8.2
 - standard** 3.1, 10.2.1
 - TT top term** 3.1 *Table1*, 12.2.2d
 - UF use for/ used for** 3.1 *Table1*, 12.2.2c
 - UF+ use for together** 3.1 *Table1*, 8.5
 - USE** 3.1 *Table1*, 12.2.2aa
 - USE+ use together** 3.1 *Table1*
- Tags for identifying languages**
- RFC 4646** 9.4, 12.3.2, 12.4.5, 15.2.10, A.7
- target language** 2.60def
- Terminological Markup Framework (TMF), ISO 16642** 17
- terminology, UML** 15.1
- terms** 2.61def, 6
- arrangement**
- facets within subject fields** 12.2.5.2
- subject fields** 12.2.5.1
- see also displays; filing
- clarification/ disambiguation** 6.2
- definitions, in thesauri** 6.2.3
- equivalent, absence, multilingual thesauri** 9.1, 9.3.1, 9.3.3
- form** 6.1
- combination, vs compound terms** 7.1, 7.3
- preferred forms selection** 6.6
- single concept** 5.1.2
- singular or plural** 6.5
- multi-word, vs qualifiers** 6.2.2
- loan terms** 6.6.3
- records**
- amended, export** 14.8d
 - deleted** 13.6.5.4
 - identifiers, thesaurus construction** 13.3.1
- relationships**
- equivalence** 4.4a
 - broad/ narrow, as set 8.1c, 8.4
 - monolingual** 8
 - multilingual** 9
- overlapping meanings** 10.3.1, 10.3.2
- presentation** 4.1
- thesaurus management software and** 14.3
- thesaurus compilation analysis** 13.2.3
- candidate terms** 13.6.2
- review procedures** 13.6.3
 - systems**
 - integration 16.3.7
- collecting** 13.2.2
- duplicate, software and** 14.3a
- sources** 13.1.3.3, 13.2.1, 13.2.2
- usage monitoring, software** 14.11
- validation, systems integration** 16.3.7
- text analysis software** 13.2.1
- thesauri, existing as vocabulary**
- resource** 13.1.3.3a
 - copyright issues** 13.3.1
- thesaurus** 2.62def
- applications integration** 16
 - compilation, early stages** 13.2
 - construction/ maintenance** 13
 - dissemination** 13.5
 - introductions content** 13.4
 - maintenance** 13.6
 - objectives** 13.1.1
 - planning** 13.1
 - size considerations**

compound terms 7.1
 proper names
 inclusion 6.6.9.1
 vocabularies
 registration 13.5.6, 16.2

Thesaurus Ethics in the Life Sciences, display
 examples A.9

thesaurus management software
 assessment/ selection 13.1.5
 thesaurus planning 13.1.3.1

backfile records
 updating 13.6.1
 change recording 13.6.5.3
 for complex concepts 7.3.2h
 conventional filing sequences, multilingual systems 12.4.3
 date last modified
 field 13.6.5.3, 13.6.5.4
 export capability 13.5.1
 guidelines for 14
 inputs, thesaurus construction 13.3.1
 issues, thesaurus objectives 13.1.1
 unacceptable limitations 14.2
 vocabulary management software, multilingual systems 12.4.1

thesaurus-specific protocols 18.4

things
 instance
 relationships 10.2.4.1
 physical parts 5.1.2a
 properties 5.1.2e

timing, thesaurus compilation 13.2.1

top level concepts, data model 15.2.13

top term 2.63def
 tags 3.1 Table1, 12.2.2d

topographical features, as subject terms 5.1.3b

tracking changes 13.6.5.4

trade names, and popular names 6.6.6
 equivalence 8.2c

trademarks 6.6.6
 punctuation 6.4.2

translation
 loan terms 6.6.3
 monolingual thesauri 13.3.3a

transliteration 12.4.1
 preferred forms 6.6.4
 schemes, identification 12.4.5

TT top term tag 3.1 Table1, 12.2.2d

U

UF use for/ used for
 tag 3.1 Table1, 12.2.2c

UF+ use for together
 tag 3.1 Table1, 8.5

UML classes, "Upper Camel Case" convention 15.2.1

UNBIS Thesaurus, display
 examples A.8

UNESCO Thesaurus, display
 examples A.5

Unicode Collation Algorithm 12.4.3, 12.4.4

Unicode Standard 12.4.1

Unified Modelling Language (UML) 15.1

unique entities, as subject terms 5.1.3

unit of thought 2.11def

units of measurement 5.1.2g
 associative relationships 10.3.3i

Universal Coded Character Set (UCS), ISO/IEC 10646 12.4.1, 12.4.3 12.4.1, 14.8a

updates
 dissemination 13.6.5
 history, data model 15.2.6
 reader-friendly 13.6.5.2
 terms export 14.8d
 thesaurus maintenance 13.6
 thesaurus planning 13.1.2

updating
 and networks 16.2
 policy defined, thesaurus introductions 13.4i

upper case, usage 3.4a

usage factors, complex concepts 7.3.2a
 low, and splitting decisions 7.3.3b

usage monitoring, software 14.11

USE tag 3.1 Table1, 12.2.2aa

USE/UF relationships
 data model 15.2.20
 thesaurus management software and 14.3b
 tags, preferred/ non-preferred terms 8.1

USE+ use together
 tag 3.1 Table1
 data model 15.2.22

user-defined notes, thesaurus management software and 14.4c

user-transparent integration, search engines 16.3.5

users
 anticipated, and complex concepts 7.3.2e
 and controlled vocabulary artificiality 4.2
 language selection, single-record displays 12.3.2
 reader-friendly updates 13.6.5.2
 and search system integration 13.5.1
 supportive, thesaurus projects 13.1.3.2b
 and terms collecting 13.2.2
 thesaurus objectives 13.1.1

V

validation checks, thesaurus management software and 14.3g, 14.6a
 verbal nouns 6.3.1
 verbs, avoidance 6.3.4
 vernacular form, place names 6.6.9.2b

versions/ version history, data model 15.2.6

Virtual International Authority File (VIAF) 6.6.2note

vocabularies registration 13.5.6, 16.2

vocabulary control 2.64def, 4.2 purpose 4.2

vocabulary resources, thesaurus projects 13.1.3.3, 13.2.1, 13.2.2

W

W3C Semantic Web Deployment Working Group (SWDWG)
SKOS 17, 18.4
SPARQL (Simple Protocol and RDF Query Language) 18.5
 web database protocols, general-purpose, used with thesauri 18.5

Web Service API (Application Programming Interface) 18.4

web-based directories 13.5.6

website transaction logs, as vocabulary resource 13.1.3.3d

whole-part relationships
 hierarchical 10.2.1b, 10.2.3
 polyhierarchical 10.2.5
 separation, complex objects 7.5.2

word order, multi-word terms 7.7

word-by-word alphabetical order, display outputs 14.8f

X

XML (Extensible Markup Language) 2.32def, 12.4.1, 13.5.2

formats
 restricted characters 13.5.2
SKOS format 17
 thesaurus publication 13.5.2
MARC formats 17

schema
DD 8723-5 17
XML schema for data exchange Annex B
 and data model 15.1

terminological markup languages 17

XML-RPC implementation platform 18.3

Z

Zthes 17

ICS 01.140.20

Price based on 152 pages

Licensed to National Agricultural Library / Patsy Graves (patsy.graves@ars.usda.gov)
ISO Store Order: OP-118537 / Downloaded: 2016-02-01
Single user licence only, copying and networking prohibited.

© ISO 2011 – All rights reserved