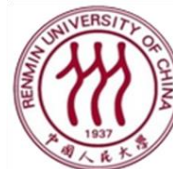


Ontology Definitions in International Standards and the Issues for Harmonization

Virtual International Seminar



Thursday, 19 November 2020
19:00 – 22:00 Beijing Time

Terminology and Ontology Harmonization: the ISO point of view.

Illustration with the ISO 860 Standard



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Abstract

If everybody agrees to say that ontology is at the core of the digital society, it remains to agree on what ontology is. For example, the ISO standards offer more than forty definitions of ontology ranging from a conceptual system to a structured vocabulary. However, while we can agree on a definition of ontology, ontologies in the same domain may differ and need to be harmonized.

There are different approaches, methods and techniques for ontology-terminology harmonization (including ontology-terminology alignment) ranging from a linguistic one focusing on terms to a conceptual one focusing on concepts and their relationships.

These issues will be studied from the point of view of ISO on Terminology where a term is a verbal designation of a concept, and a concept is a unique combination of characteristics. This talk will be illustrated with the ISO 860 Standard on “Harmonization of concepts and terms”.

Contents

- 1) Harmonization
- 2) Definitions of Terminology in ISO Standard
- 3) Definitions of Ontology in ISO Standard
- 4) Definitions of Concept in ISO Standard
- 5) Which Definitions?
- 6) Harmonization: The ISO 860 Standard
- 7) Conclusion

1) Harmonization

"Make consistent or compatible"

Oxford Dictionary



- Definition of Terminology?
- Definition of Ontology?
↳ *definition of Concept?*

- Harmonization of Terminologies?
- Harmonization of Ontologies?



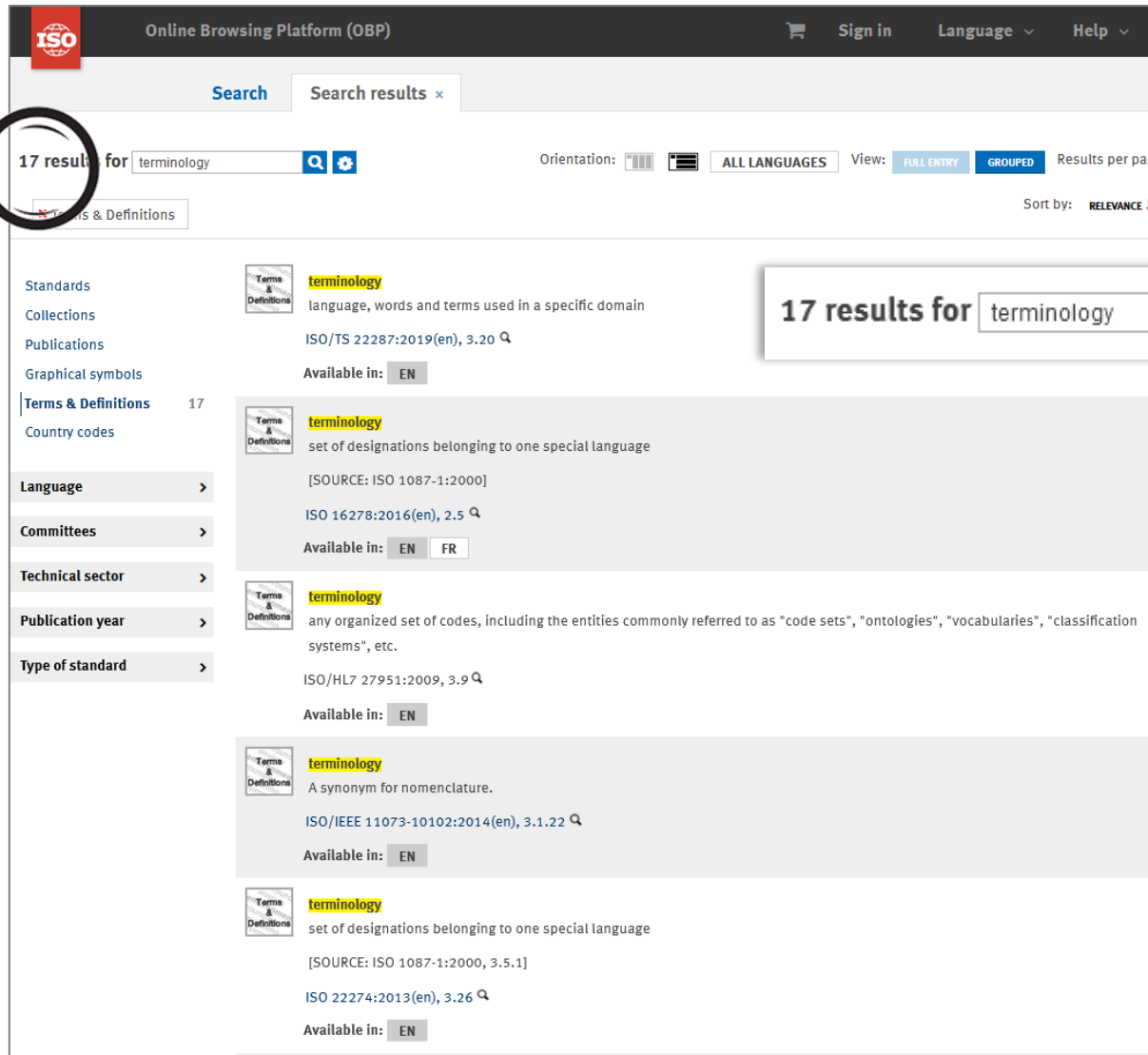
International
Organization for
Standardization



ISO 860:2007
Terminology work —
Harmonization of concepts and terms

2) Definitions of Terminology in the ISO Standards

ISO Online Browser Platform (OBP)



The screenshot shows the ISO Online Browser Platform (OBP) search results for the term 'terminology'. The interface includes a search bar at the top with the text '17 results for terminology'. Below the search bar, there are filters for 'Orientation', 'ALL LANGUAGES', 'View' (FULL ENTRY, GROUPED), and 'Sort by: RELEVANCE'. A magnifying glass icon is positioned over the search bar. The search results are displayed in a list format, with each entry showing a 'Terms & Definitions' icon, the term 'terminology', a brief definition, the ISO standard number, and the available languages. The first result is 'terminology' defined as 'language, words and terms used in a specific domain' from ISO/TS 22287:2019(en), 3.20, available in EN. The second result is 'terminology' defined as 'set of designations belonging to one special language' from ISO 16278:2016(en), 2.5, available in EN and FR. The third result is 'terminology' defined as 'any organized set of codes, including the entities commonly referred to as "code sets", "ontologies", "vocabularies", "classification systems", etc.' from ISO/HL7 27951:2009, 3.9, available in EN. The fourth result is 'terminology' defined as 'A synonym for nomenclature.' from ISO/IEEE 11073-10102:2014(en), 3.1.22, available in EN. The fifth result is 'terminology' defined as 'set of designations belonging to one special language' from ISO 22274:2013(en), 3.26, available in EN. A search bar with '17 results for terminology' is also shown in a separate box on the right side of the screenshot.

<https://www.iso.org/obp/ui#search>

2) Definitions of Terminology in the ISO Standards

- set of **designations** belonging to one **special language** – ISO 1087-1: 2000

language used in a **subject field** and characterized by the use of specific linguistic means of expression

field of special knowledge

- any organized set of codes, including the entities commonly referred to as "code sets", "ontologies", "vocabularies", "classification systems", etc. - ISO/HL7 27951:2009, 3.9
- a synonym for nomenclature - ISO/IEEE 11073-10102:2014(en), 3.1.22
- concept representation system - ISO 17117-1:2018(en), 3.4.2
- structured, human readable, and machine-readable representation of concepts - ISO/TR 12300:2014(en), 2.2.9

2) Definitions of Terminology in the ISO Standards


INTERNATIONAL
STANDARD

ISO
1087

Second edition
2019-09

Terminology work and terminology science — Vocabulary

Travail terminologique et science de la terminologie — Vocabulaire



The main purpose of this document is to provide a systematic description of the concepts related to terminology work and terminology science and to clarify the use of the terms in this field.

3.1.4 domain

subject field
field of special knowledge

3.1.5 subject

area of interest or expertise

3.4.1 designation


designator
representation of a *concept*
by a sign which denotes it in
a *domain* or *subject*

3.4.2 term

designation that represents a
general concept by linguistic
means

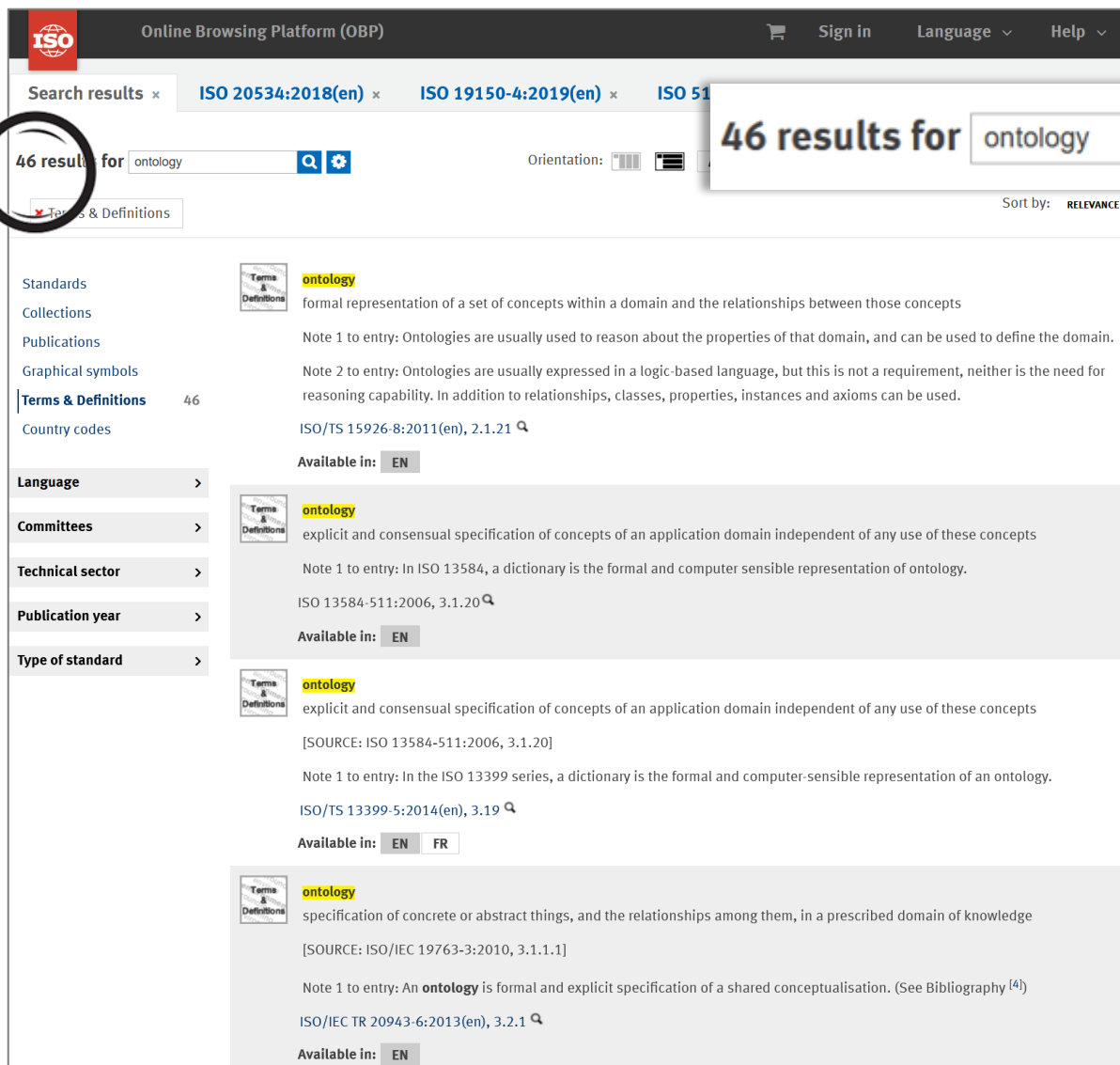
3.1.11 terminology

set of *designations* (3.4.1) and *concepts* (3.2.7)
belonging to one *domain* (3.1.4) or *subject* (3.1.5)



3) Definitions of Ontology in the ISO Standards

ISO Online Browser Platform (OBP)



The screenshot shows the ISO Online Browser Platform (OBP) search results for the term 'ontology'. The search bar at the top indicates '46 results for ontology'. The results are sorted by relevance. The first result is for 'ontology' in ISO/TS 15926-8:2011(en), 2.1.21. The second result is for 'ontology' in ISO 13584-511:2006, 3.1.20. The third result is for 'ontology' in ISO/TS 13399-5:2014(en), 3.19. The fourth result is for 'ontology' in ISO/IEC TR 20943-6:2013(en), 3.2.1. The left sidebar shows navigation options such as Standards, Collections, Publications, Graphical symbols, Terms & Definitions (46), and Country codes. The 'Terms & Definitions' section is highlighted with a magnifying glass.

Online Browsing Platform (OBP)

Search results x ISO 20534:2018(en) x ISO 19150-4:2019(en) x ISO 51

46 results for ontology

Orientation: [Icons]

Sort by: RELEVANCE ↓

Terms & Definitions 46

Standards

Collections

Publications

Graphical symbols

Terms & Definitions 46

Country codes

Language >

Committees >

Technical sector >

Publication year >

Type of standard >

ontology
formal representation of a set of concepts within a domain and the relationships between those concepts

Note 1 to entry: Ontologies are usually used to reason about the properties of that domain, and can be used to define the domain.

Note 2 to entry: Ontologies are usually expressed in a logic-based language, but this is not a requirement, neither is the need for reasoning capability. In addition to relationships, classes, properties, instances and axioms can be used.

ISO/TS 15926-8:2011(en), 2.1.21 🔍

Available in: EN

ontology
explicit and consensual specification of concepts of an application domain independent of any use of these concepts

Note 1 to entry: In ISO 13584, a dictionary is the formal and computer sensible representation of ontology.

ISO 13584-511:2006, 3.1.20 🔍

Available in: EN

ontology
explicit and consensual specification of concepts of an application domain independent of any use of these concepts

[SOURCE: ISO 13584-511:2006, 3.1.20]

Note 1 to entry: In the ISO 13399 series, a dictionary is the formal and computer-sensible representation of an ontology.

ISO/TS 13399-5:2014(en), 3.19 🔍

Available in: EN FR

ontology
specification of concrete or abstract things, and the relationships among them, in a prescribed domain of knowledge

[SOURCE: ISO/IEC 19763-3:2010, 3.1.1.1]

Note 1 to entry: An **ontology** is formal and explicit specification of a shared conceptualisation. (See Bibliography ^[4])

ISO/IEC TR 20943-6:2013(en), 3.2.1 🔍

Available in: EN

<https://www.iso.org/obp/ui#search>

3) Definitions of Ontology in the ISO Standards

- “a conceptualisation of a domain” - ISO/TS 21526:2019(en), 3.36 - Health informatics
- “organization of concepts for which a rational argument can be made” - ISO/TR 13054:2012(en), 2.6
- “explicit and consensual specification of concepts of an application domain independent of any use of these concepts” - ISO 18435-3:2015(en), 3.1
- “specification of concrete or abstract things, and the relationships among them, in a prescribed domain of knowledge” - ISO 37105:2019(en), 3.2
- “organization of concept for which a rational argument can be made” - ISO/TR 12300:2014(en), 2.1.15
- “specification of concrete or abstract things, and the relationships among them, in a prescribed domain of knowledge” - ISO/IEC 19763-1:2015(en), 4.1.20
- “logical structure of the terms used to describe a domain of knowledge, including both the definitions of the applicable terms and their relationships” (3.47) - ISO 20534:2018(en), 3.36
- “formal representation of phenomena of a universe of discourse (3.1.23) with an underlying vocabulary including definitions and axioms that make the intended meaning explicit and describe phenomena and their interrelationships” - ISO 19150-4:2019(en), 3.1.19
- ...
- **“formal, explicit specification of a shared conceptualization”** - ISO 5127:2017(en), 3.1.2.03 - Information and documentation — Foundation and vocabulary
Note 1 to entry: An ontology typically includes definitions of concepts and specified relationships between them, set out in a formal way so that a machine can use them for reasoning.
- ...
- **“a lexicon of specialised terminology along with some specification of the meaning of terms in the lexicon”** - ISO 18629-42:2006(en), 3.1.11 - Industrial automation systems and integration

3) Definitions of Ontology in the ISO Standards

Not defined in the ISO 1087

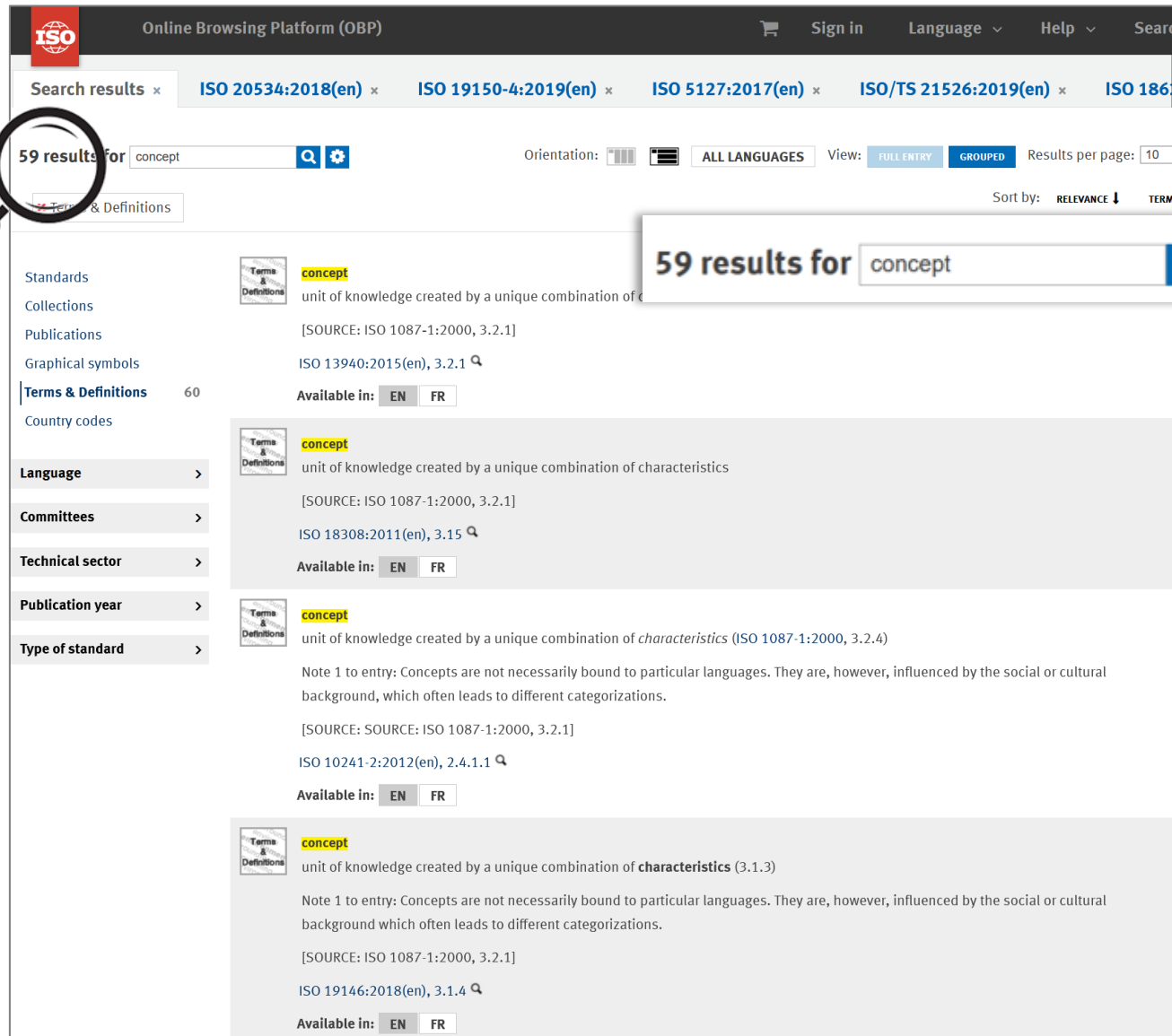
“An ontology is a shared description of **concepts** and relationships of a domain expressed in a formal and computer readable language”

C. Roche



4) Definitions of Concept in the ISO Standards

ISO Online Browser Platform (OBP)



The screenshot displays the ISO Online Browser Platform (OBP) interface. At the top, the ISO logo and navigation links (Sign in, Language, Help, Search) are visible. Below the navigation bar, there are search filters for ISO standards: ISO 20534:2018(en), ISO 19150-4:2019(en), ISO 5127:2017(en), ISO/TS 21526:2019(en), and ISO 1863. The search results section shows 59 results for the term 'concept'. The first result is highlighted with a magnifying glass. A callout box also shows the search bar with '59 results for concept'.

Search results for **concept**

Orientation: [Icons] ALL LANGUAGES View: FULL ENTRY GROUPED Results per page: 10 Sort by: RELEVANCE ↓ TERM

59 results for **concept**

Terms & Definitions

Standards
Collections
Publications
Graphical symbols
Terms & Definitions 60
Country codes

Language >
Committees >
Technical sector >
Publication year >
Type of standard >

concept
unit of knowledge created by a unique combination of characteristics
[SOURCE: ISO 1087-1:2000, 3.2.1]
ISO 13940:2015(en), 3.2.1
Available in: EN FR

concept
unit of knowledge created by a unique combination of characteristics
[SOURCE: ISO 1087-1:2000, 3.2.1]
ISO 18308:2011(en), 3.15
Available in: EN FR

concept
unit of knowledge created by a unique combination of *characteristics* (ISO 1087-1:2000, 3.2.4)
Note 1 to entry: Concepts are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background, which often leads to different categorizations.
[SOURCE: SOURCE: ISO 1087-1:2000, 3.2.1]
ISO 10241-2:2012(en), 2.4.1.1
Available in: EN FR

concept
unit of knowledge created by a unique combination of **characteristics** (3.1.3)
Note 1 to entry: Concepts are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background which often leads to different categorizations.
[SOURCE: ISO 1087-1:2000, 3.2.1]
ISO 19146:2018(en), 3.1.4
Available in: EN FR

4) Definitions of Concept in the ISO Standards

unit of knowledge created by a unique combination of characteristics

ISO 1087: ISO 10241-2, ISO 10241-2, ISO 19146, ISO 18104, ISO 13606-2, ISO/IEC 11179-4, ISO/IEC 15944-9, ISO/IEC 15944-10, ISO 17117-1, etc.

- abstract entity for determining category membership

ISO/IEC 2382:2015(en) Information technology — Vocabulary

4) Definitions of Concept in the ISO Standards

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2019-09

**Terminology work and terminology
science — Vocabulary**

Travail terminologique et science de la terminologie — Vocabulaire



The main purpose of this document is to provide a systematic description of the concepts related to terminology work and terminology science and to clarify the use of the terms in this field.

3.2.7

concept

unit of knowledge created by a unique combination
of *characteristics*



4) Definitions of Concept in the ISO Standards

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**Terminology work and terminology
science — Vocabulary**

Travail terminologique et science de la terminologie — Vocabulaire



The main purpose of this document is to provide a systematic description of the concepts related to terminology work and terminology science and to clarify the use of the terms in this field.

**3.1.3
property**
feature of an *object*

**3.2.1
characteristic**
abstraction of a *property*

**3.2.3
essential characteristic**
characteristic of a *concept* that is
indispensable to understand that concept

**3.2.7
concept**
unit of knowledge created by a unique combination
of *characteristics*



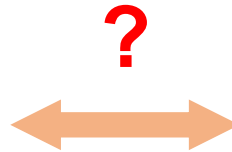
5) Which Definitions?

Terminology

3.1.11 terminology ISO 1087 ✓
set of *designations* and *concepts*
belonging to one *domain* or *subject*



3.2.7 concept ISO 1087 ✓
unit of knowledge created by a unique
combination of *characteristics*



Ontology

An ontology is a shared description of **concepts** and relationships of a domain expressed in a formal and computer readable language ✓



concept? class?
- Theory of Knowledge?
- W3C?
Unit of knowledge about a plurality of things sharing a common property?

concepts are expressed in a formal and computer readable language ✓

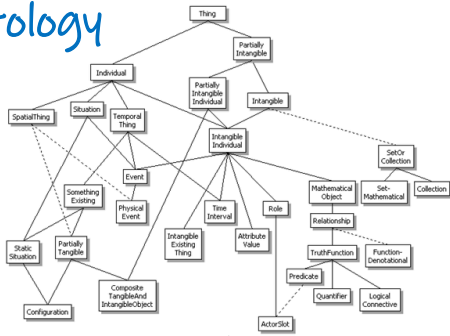


6) Harmonization

"Make consistent or compatible"
Oxford Dictionary

A term is a verbal designation of a concept

Ontology



?

Alignment



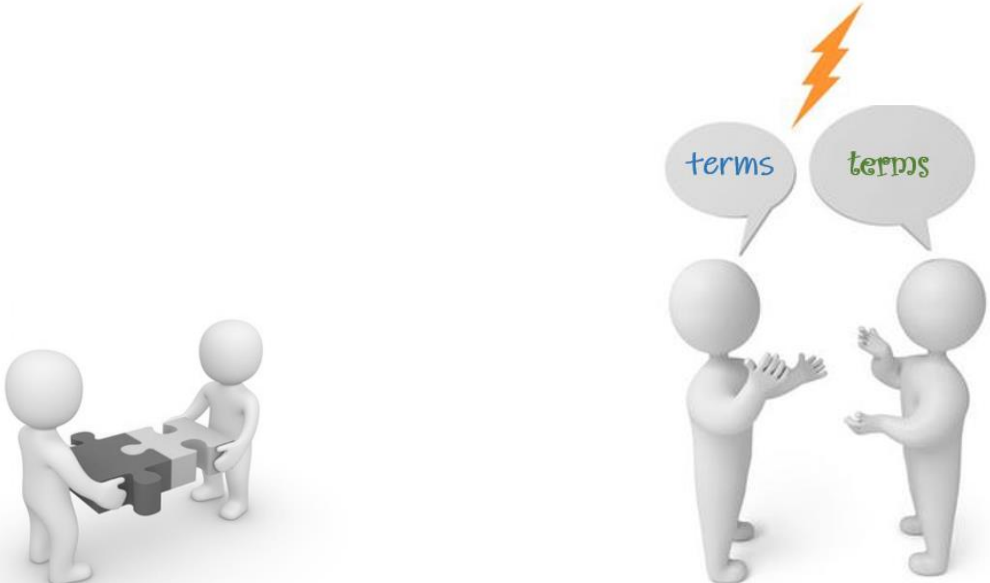
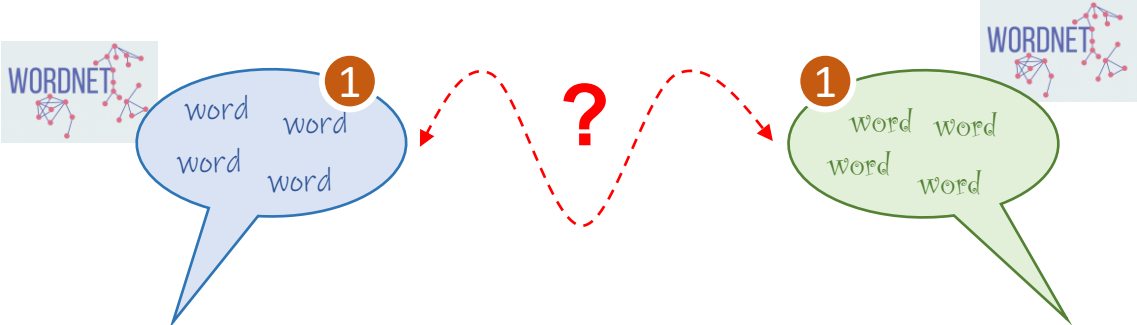
Ontology



6) Harmonization: Ontology Alignment

1 Terms

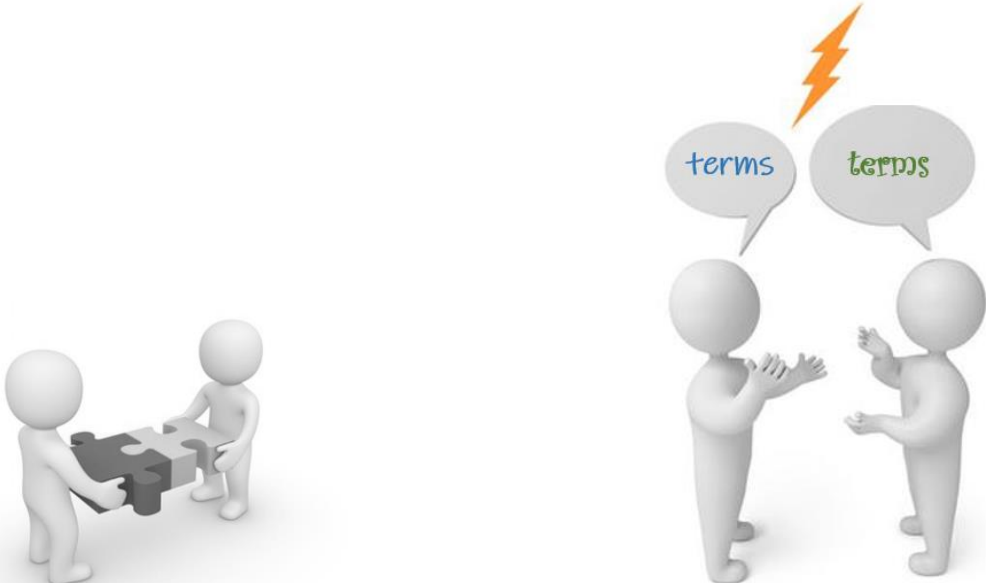
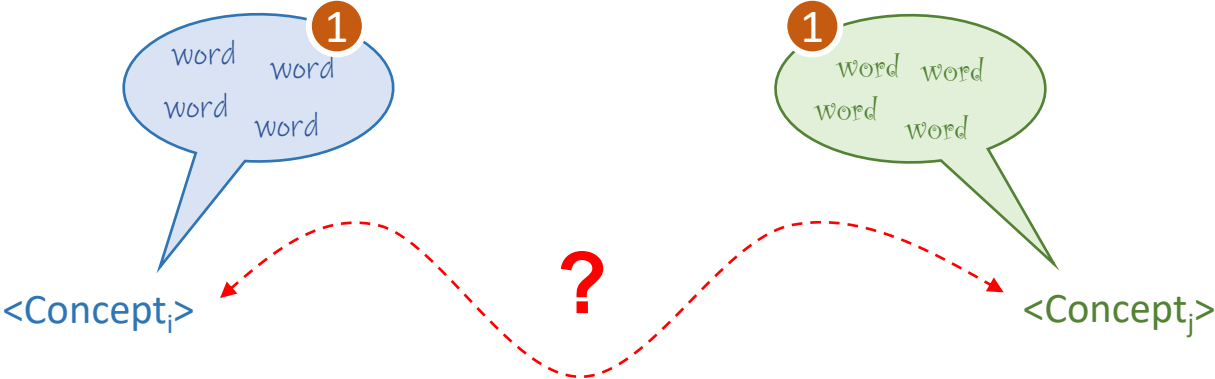
A term is a verbal designation of a concept



6) Harmonization: Ontology Alignment

1 Terms

A term is a verbal designation of a concept

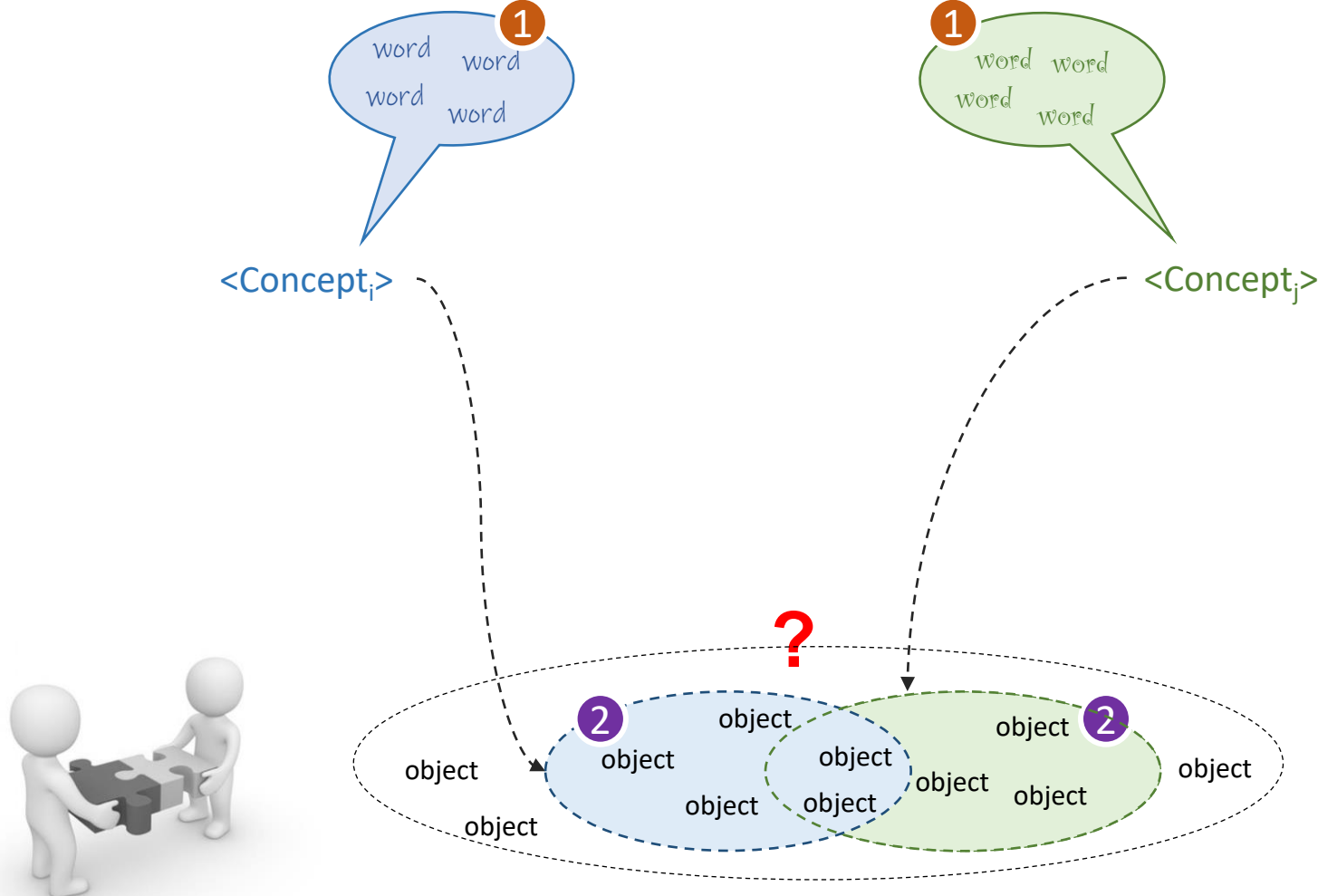


6) Harmonization: Ontology Alignment

1 Terms

2 Extensions

A concept is a knowledge about a plurality of things



6) Harmonization: Ontology Alignment

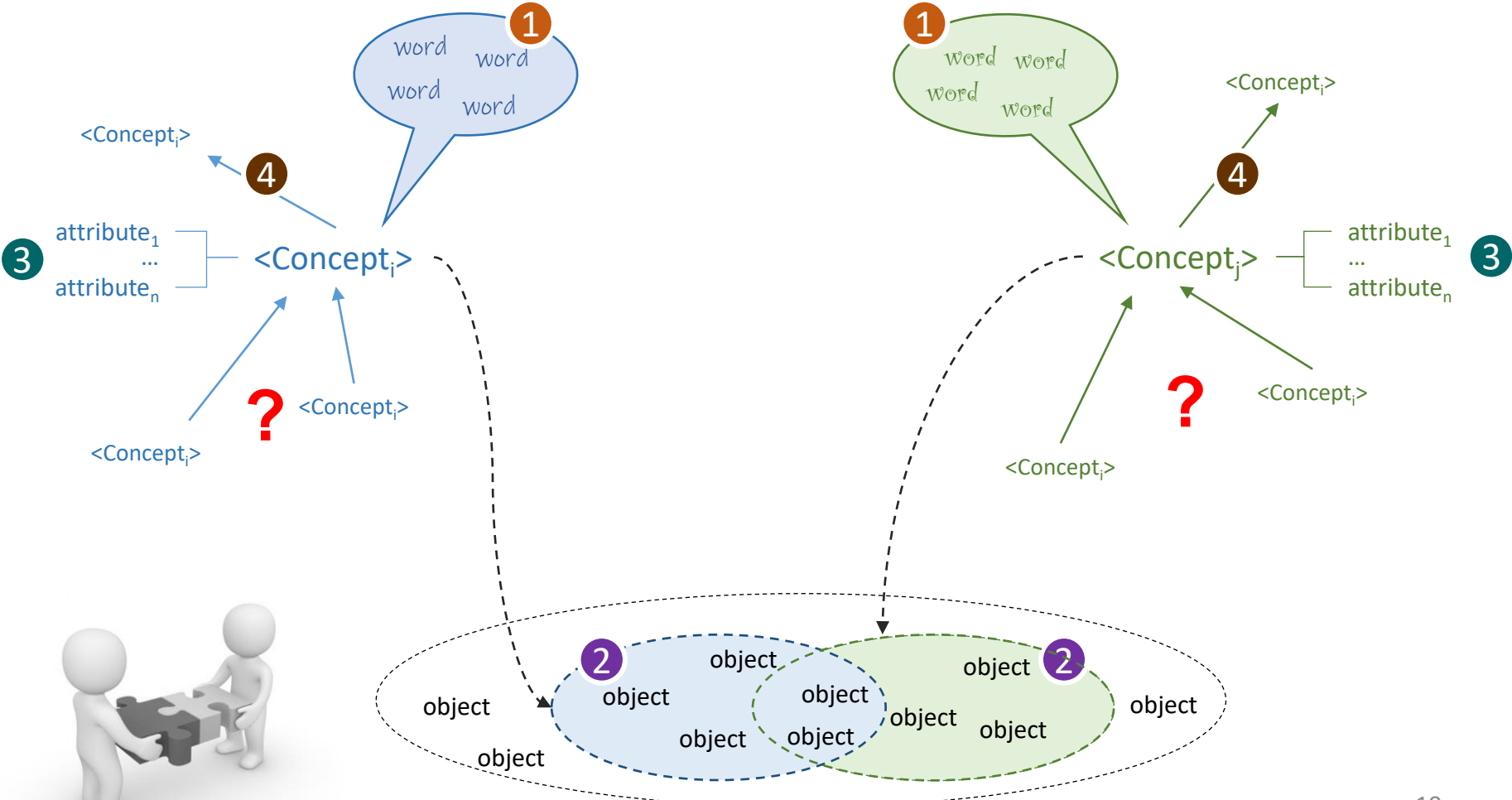
1 Terms

3 Attributes

2 Extensions

4 Relationships

Concepts are linked together into a structured system



6) Harmonization: Ontology Alignment

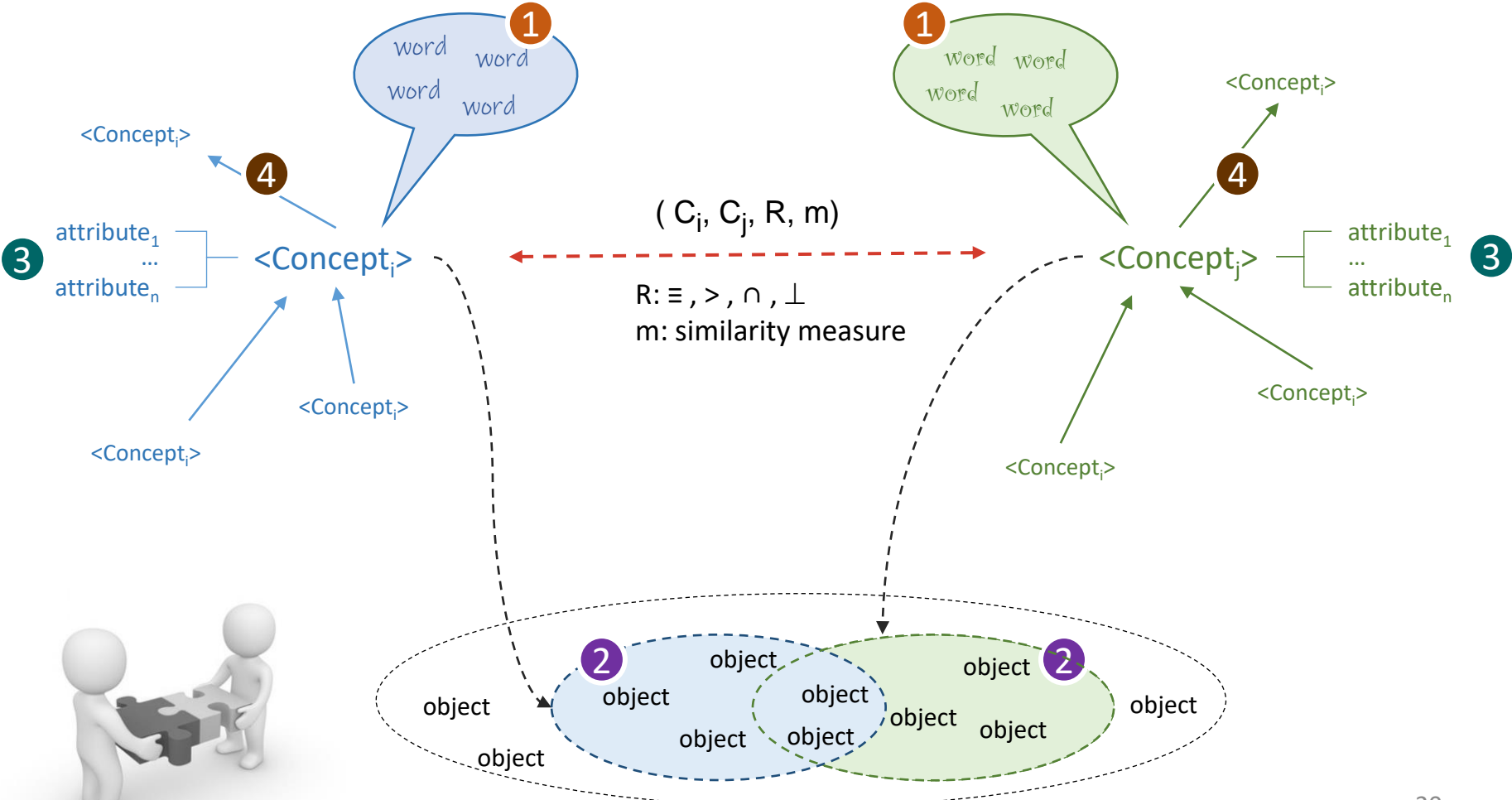
1 Terms

3 Attributes

2 Extensions

4 Relationships

- 1 A term is a verbal designation of a concept
- 2 A concept is a knowledge about a plurality of things
- 3 A concept is defined as a unique combination of characteristics
- 4 Concepts are linked into a structured system



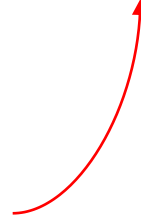
6) ISO 860:2007

Terminology work — Harmonization of concepts and terms



*This standard was last reviewed and confirmed in 2016.
Therefore this version remains current.*

2007



6) ISO 860:2007

Terminology work — Harmonization of concepts and terms



*This standard was last reviewed and confirmed in 2016.
Therefore this version remains current.*

Abstract

ISO 860:2007 specifies a methodological approach to the harmonization of concepts, concept systems, definitions and terms. It applies to the development of harmonized terminologies, at either the national or international level, in either a monolingual or a multilingual context.

Harmonization starts at the concept level and continues at the term level.

Concepts shall be analysed by comparing their characteristics and not their designations.



6) ISO 860:2007 Harmonization of concepts and terms

Concept harmonization

activity leading to the establishment of a correspondence between two or more closely related or overlapping concepts having professional, technical, scientific, social, economic, linguistic, cultural or other differences, in order to eliminate or reduce minor differences between them

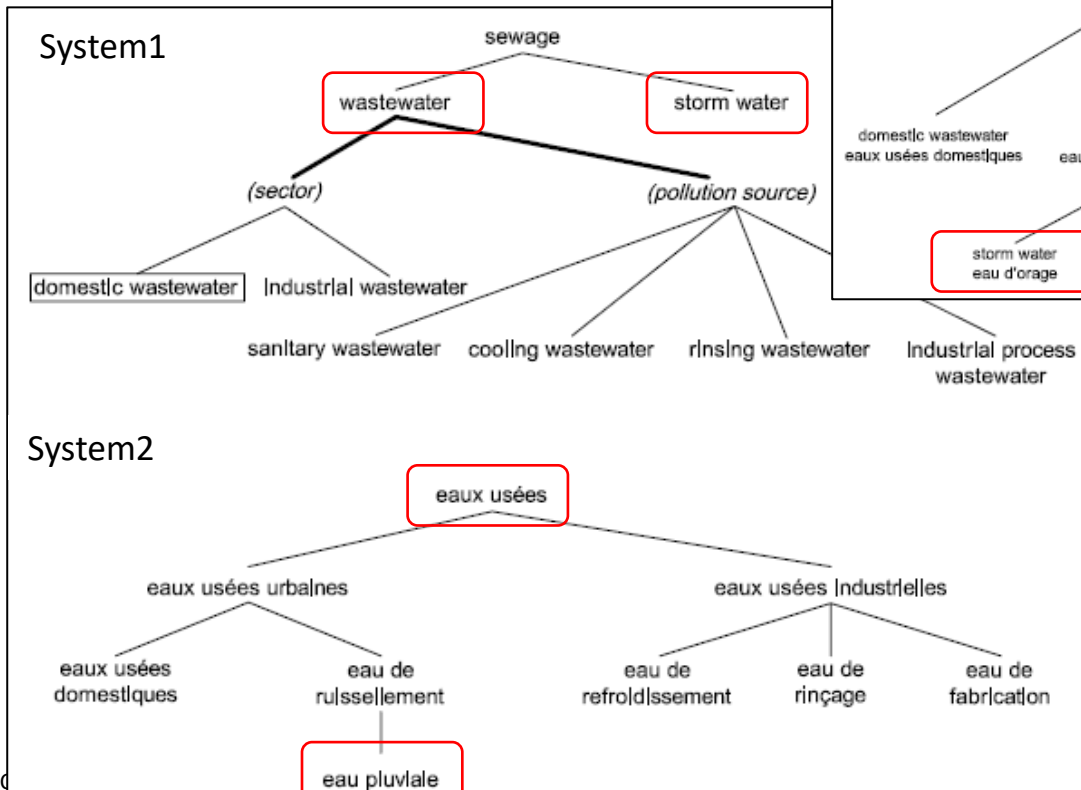
Similarity between concepts

- a) which characteristics the concepts of each concept system have in common
 - 1) within a language,
 - 2) across languages;
- b) which characteristics of the concepts differ from one concept system to another
 - 1) within a language,
 - 2) across languages;
- c) which characteristics are essential to each key concept.

6) ISO 860:2007 Harmonization of concepts and terms

Harmonization procedure

All relevant concept systems shall be examined. Ideally, a new set of concept systems, containing all the material from all the sources to be harmonized, will be produced.



6) ISO 860:2007 Harmonization of concepts and terms

4.2 Feasibility study

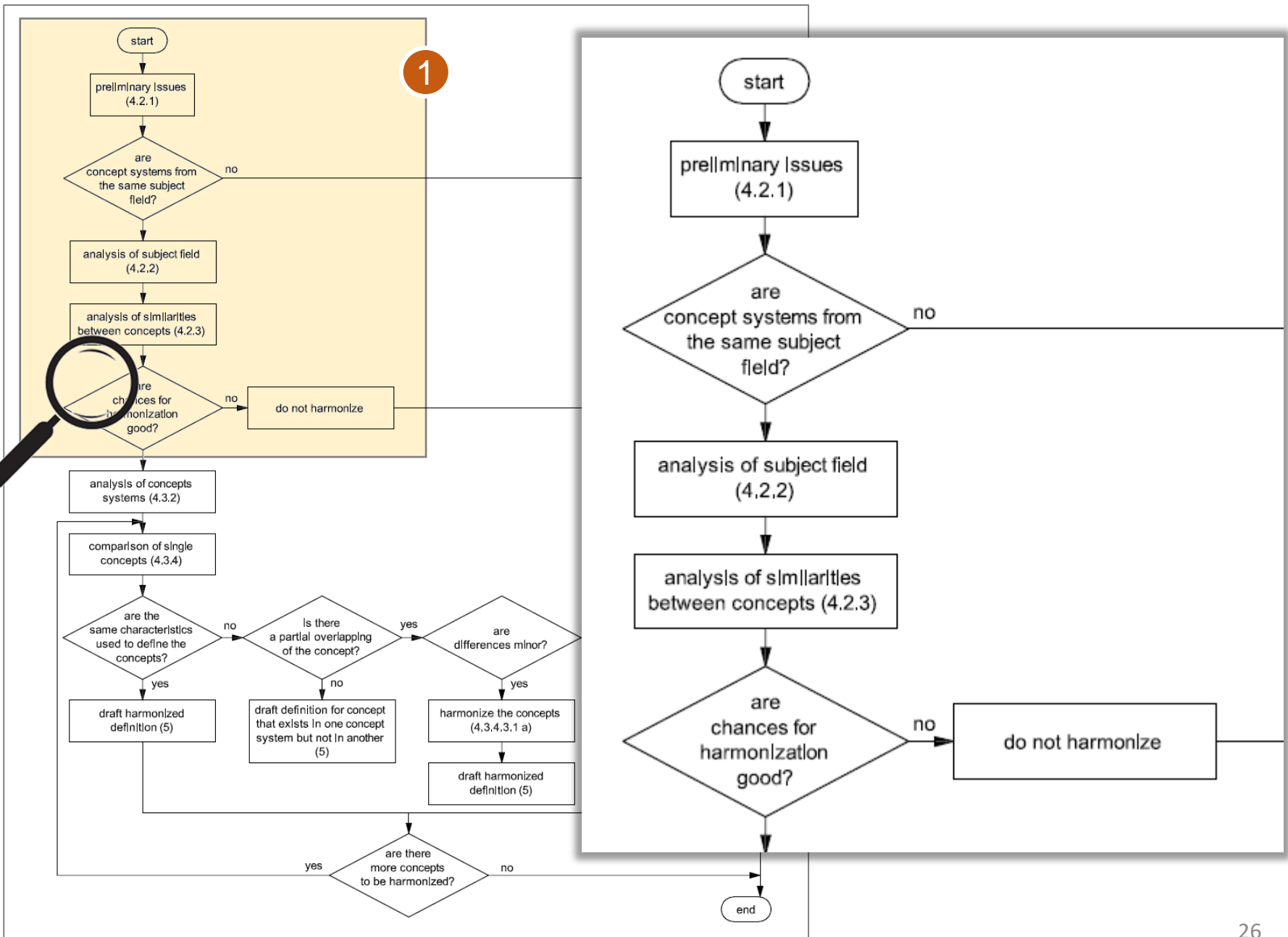
4.2.1 Preliminary analysis

Before conducting concept harmonization, differences and similarities between concepts and concept systems shall be examined in order to determine the feasibility of harmonization. Preliminary issues will be concerned with whether the concept systems to be harmonized are from the same subject field, the extent to which both contain the same concepts and, if the content is overlapping, whether the harmonization project is to be directed towards the area of overlap, or all the concepts in the systems to be harmonized.

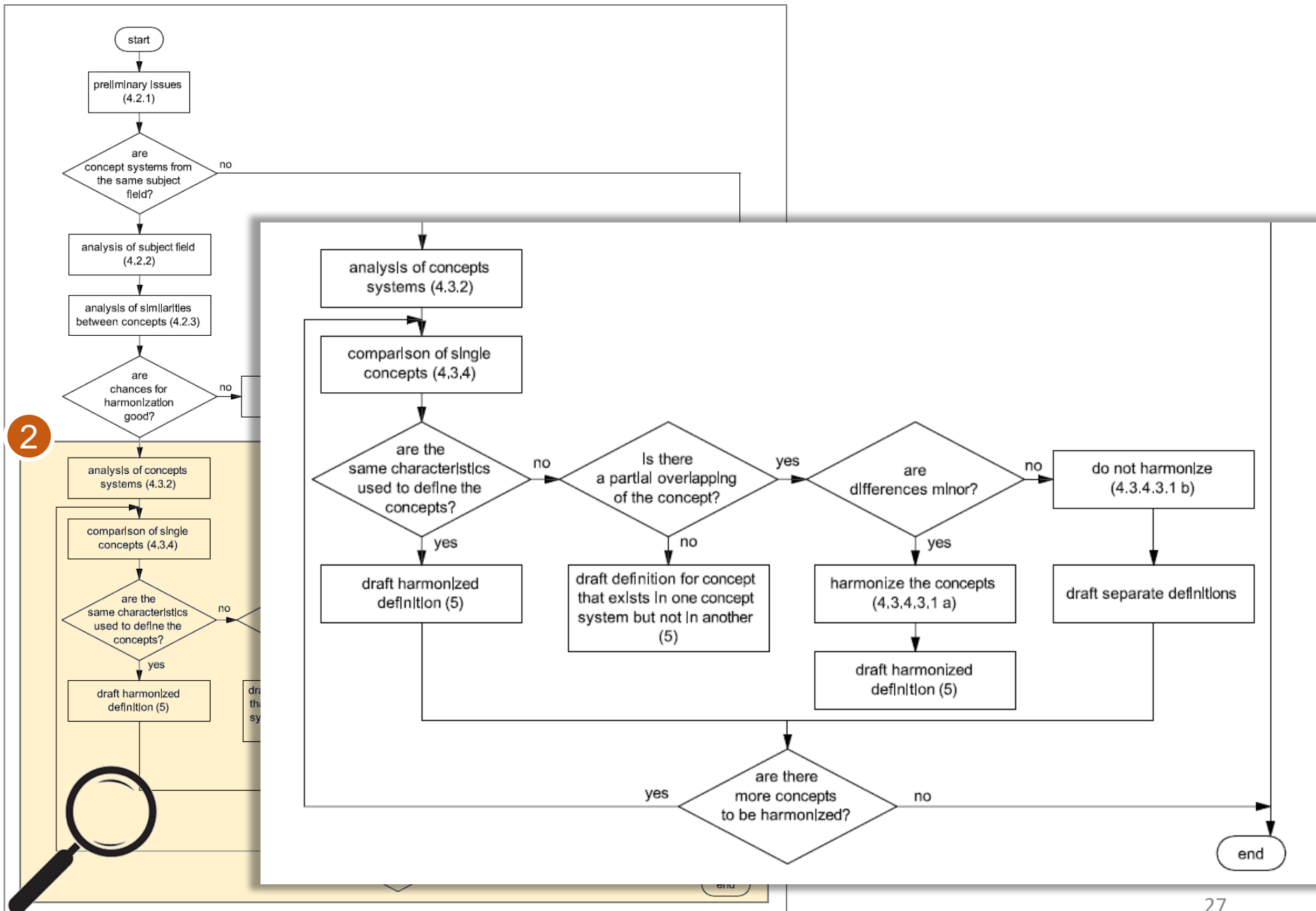
The comparative analysis of the different concept systems shall take account of the following:

- a) the number of concepts included;
- b) the relationships between concepts;
- c) the depth of structuring;
- d) the criteria of subdivision used to develop the concept system.

ISO 860: The concept harmonization process



ISO 860: The concept harmonization process



7) Conclusion

Alignment more than Harmonization

