# Necessary Conditions (Characteristics) of the Concept ‘concept’ in ISO 704:2009 and 1087-1:2000

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| **Necessary Characteristic (Condition) of ‘concept’** | **Source Reference** | **Comments** |
| created and documented for the purpose of unambiguous human communication | The terminology work dealt with in this International Standard is concerned with terminology used for unambiguous communication in natural, human language. The goal of terminology work as described in this International Standard is, thus, a clarification and standardization of concepts and terminology for communication between humans. Terminology work may be used as input for information modelling and data modelling, but this International Standard does not cover the relation with these fields. [ISO 704:2009, Clause 0.1 paragraph 3] |  |
| being the result of a conceptualization from within a given subject field | **subject field**:field of special knowledge  NOTE The borderlines of a subject field are defined from a purpose-related point of view. [1087-1:2000, 3.1.2]    *concepts* shall be considered mental representations of *objects* within a specialized context or field. [ISO 704:2009, Clause 5.1 paragraph 1] | A subject field can be an profession, discipline, field of study, industry, shared activity (e.g. scuba diving), etc.  The “unit of thought” / “unit of knowledge” is the mental representation. |
| being a unit of knowledge | **concept:** unit of knowledge created by a unique combination of **characteristics** (3.2.4) [ISO 1081-1:2000, 3.2.1]  Producing a *terminology* requires an understanding of the conceptualization that underpins human knowledge in a subject area. Because *terminology work* always deals with specialized language in a particular field of knowledge (i.e. a *subject field*), the *concept* should be viewed not only as a unit of thought but also as a unit of knowledge. [ISO 704:2009, Clause 5.1 paragraph 3] | The prior version of ISO 1087-1 said “unit of thought’ which was enriched in ISO 1087-1:2000 to “unit of knowledge’ to indicate that the thought contained a specific meaning.  The important point is that a concept exists as a unit of thought with a specific meaning in the minds of the people who are part of the subject field within which the concept is conceptualized.  While objects *(see immediately below)* are “anything perceivable or conceivable”, concepts are the perceptions or conceptions of people in the subject field who do the perceiving and conceiving.  An entry in an ISO 1087 Terminological Dictionary documents the concept that is the minds of the people who are part of the subject field within which the concept is conceptualized, and shared among them via its definition and other contents of its terminological entry. |
| corresponds to things (objects) in the universe of discourse | **object:** anything perceivable or conceivable (in the universe of discourse) [ISO 1087-1:2000, 3.1.1]  **4 Objects**  In *terminology work*, an *object* is defined as anything perceived or conceived. Some *objects*, such as a machine, a diamond, or a river, should be considered concrete or material; others, such as each manifestation of financial planning, gravity, fluidity, or a conversion ratio, should be considered immaterial or abstract; still others, for example, a unicorn, a philosopher's stone or a literary character should be considered purely imaginary. In the course of producing a *terminology*, philosophical discussions on whether an object actually exists in reality are unproductive and should be avoided. Attention should be focused on how one deals with *objects* for the purposes of communication. *Objects* are described and identified by their properties (see example in 5.4.1), but neither properties of specific *objects* nor the *objects* themselves are recorded in the terminological resource. [ISO 704:2009, Clause 4]  *Concepts* are not to be confused with abstract or imagined *objects* [ISO 704:2009, Clause 5.1 paragraph 2]  **individual concept: concept** (3.2.1) which corresponds to only one **object** (3.1.1)  NOTE 1 Examples of individual concepts are 'Saturn', 'the Eiffel Tower'.  NOTE 2 Individual concepts are usually represented by **appellations** (3.4.2). [ISO 1087-1:2000, 3.2.2]  **general concept: concept** (3.2.1) which corresponds to two or more **objects** (3.1.1) which form a group by reason of common properties  NOTE Examples of general concepts are 'planet', 'tower'. [ISO 1087-1:2000, 3.2.3] | In ISO 704 and 1087-1 the term ‘object’ has nothing to do with software or IT systems, unless the Terminological Dictionary is about IT activities rather than the organization and its business activities. E.g. a person and their personnel record are two different objects (things). |
| has an extension | **extension:** totality of **objects** (3.1.1) to which a **concept** (3.2.1) corresponds [ISO 1087-1:2000, 3.2.8] |  |
| created by a unique combination of characteristics (necessary conditions) (i.e. an intension) | **concept** [ISO 1087-1:2000, 3.2.1]  **characteristic:** abstraction of a property of an **object** (3.1.1) or of a set of objects [ISO 1087-1:2000, 3.2.4]  **intension:** set of **characteristics** (3.2.4) which makes up the **concept** (3.2.1) [ISO 1087-1:2000, 3.2.9]  **5.4.1 Nature of characteristics**  *Concept* formation plays a pivotal role in organizing human knowledge because it provides the means for recognizing *objects* and for grouping them into meaningful units in a particular field. In order to categorize an *object* for the purposes of *concept* formation, it is necessary to identify its properties (see the example below). *Objects* perceived as sharing the same properties are grouped into units. Once similar *objects,* or occasionally a single *object*, are viewed as a meaningful unit of knowledge within a branch of human knowledge, the properties of an *object*, or those common to a set of *objects*, are abstracted as *characteristics* that are combined as a set in the formation of a *concept.* [ISO 704:2009, Clause 5.4.1 paragraph 1]  Thus, *objects* in the real world are identified by their properties. The *objects* are then abstracted as *concepts* and the properties are abstracted as *characteristics* making up the *concepts*. Abstraction is the process of recognizing some set of common features in an individual set of *objects* and, on that basis, forming a *concept* of that set of *objects*. *Characteristics* are qualifiers and narrow the meaning of a *superordinate concept* (see 5.5.2.1). It should be noted that ‘*characteristic’* is a linguistic *concept* which should not be confused with the information technology (IT) *concept* ‘property’. [ISO 704:2009, Clause 5.4.1 paragraph 2] | In terms of grammar, a characteristic is the meaning of a an adjective or adjectival phrase.  NOTE: ISO 704 and 1087 characteristics in the intension of a concept are equivalent to necessary conditions in OWL. |
| interconnects its intension and its extension | Necessary *characteristics* hold for all *objects* in the *extension* of a *concept*, i.e. they correspond to properties that all *objects* in the *extension* must have. [ISO 704:2009, Clause 5.4.5 paragraph 2]  A sufficient *characteristic* is one of a set of *characteristics* that determines whether a specific *object* belongs in the *extension* of a given *concept*. A sufficient *characteristic* is not necessarily true of all *objects* in the *extension* of the *concept*, but any *object* having the properties corresponding to the *characteristics* in this set belong to the *extension* of the *concept*. [ISO 704:2009, Clause 5.4.5 paragraph 3]  An *essential characteristic* is one of a set of *characteristics* that is both necessary and sufficient to determine the *extension* of a *concept*. [ISO 704:2009, Clause 5.4.5 paragraph 4] |  |
| not bound to particular languages | **concept** [ISO 1087-1:2000, 3.2.1]  NOTE Concepts are not necessarily bound to particular languages. They are, however, influenced by the social or cultural background which often leads to different categorizations. [ISO 1087-1, 3.2.1] |  |
| has a representation (I.e. a designation) | **designation:** representation of a **concept** (3.2.1) by a sign which denotes it [ISO 1087-1:2000, 3.4.1]  The *concepts* contextualized in the *special language* of the *subject field* can be represented in the various forms of human communication according to the system used. In natural language, *concepts* can be represented by *terms*, *appellations*, *definitions* or other linguistic forms; they may also be represented by symbols; in artificial language, they can be represented by codes or formulae, while in multimedia they can be represented by icons, pictures, diagrams, graphics, sound clips, video or other multimedia representations. *Concepts* may also be represented with the human body as they are in sign language, facial expressions or body movements. This International Standard does not deal with the representation of *concepts* by sign or body language. [ISO 704:2000, Clause 5.1,, paragraph 4] |  |
| is part of a concept system within its subject field | **concept system:** set of **concepts** (3.2.1) structured according to the relations among them [ISO 1087-1:2000, 3.2.11]  **5.6.1 Nature of concept systems**  The *terminology* of a *subject field* is not an arbitrary collection of *terms*. The relevant *concepts* constitute a coherent *concept system* based on the relations existing between *concepts*. The unique position of each *concept* within a system is determined by the *intension* and the *extension*. In the case of *concept systems* based on *generic relations*, the *concept system* also reflects inheritance systems, because *specific concepts* inherit *characteristics* from their generic *superordinate concept*s. [ISO 704:2009, Clause 5.6.1 paragraph 1]  Different *subject fields* view the same bodies of knowledge in different ways. The same *objects* may be combined to form different units of knowledge with different *intensions* and *extensions*, thus resulting in different *concept systems* and distinct *designations*. Hypothetical-deductive approaches such as mathematics may create *concept systems* based on statistics or abstract mathematical formulae, whereas the natural sciences may view the same body of knowledge, but draw up systems resulting from the classification of observed phenomena. Engineering and technology may structure a system according to production processes, whereas specialists in law or sociology can view the same phenomena in terms of legal liability or social interaction. [ISO 704:2009, Clause 5.6.1 paragraph 2] |  |
| does not exist in isolation, but always being related to other concepts | **5.5.1 Types of concept relations**  *Concepts* do not exist as isolated units of knowledge but always in relation to each other. Our thought processes constantly create and refine the relations between *concepts*, whether these relations are formally acknowledged or not. A set of *concepts* structured according to the relations among them is said to form a *concept system*. [ISO 704:2009, Clause 5.5.1 paragraph 1]  In organizing *concepts* into a *concept system*, it is necessary to bear in mind the *subject field* that gave rise to the *concept* and to consider the expectations and objectives of the target users. The *subject field* shall act as the framework within which the *concept field*, the set of thematically related but unstructured *concepts*, is established. [ISO 704:2009, Clause 5.5.1 paragraph 2]  To model a *concept system*, the *concepts* of the *concept field* have to be examined and compared. In *terminology work*, at least the following relations shall be used to model a *concept system*:  ⎯ *hierarchical relations:*  ⎯ *generic relations*;  ⎯ *partitive relations*;  ⎯ *associative relations*. [ISO 704:2009, Clause 5.5.1 paragraph 3] |  |