

# Brief Communication: Concepts and Terms – ISKO's Major Challenge\*

Ingetraut Dahlberg

Am Hirtenberg 13, 64732 Bad König, Germany, E-mail: IDahlberg@t-online.de

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**ABSTRACT:** Starting from the premise that extant knowledge of the discipline of Knowledge Organization ought to be made accessible by its knowledge units (concepts) this article includes short descriptions of the work of E. Wüster (Austria) and F. Riggs (USA) who both had laid foundations in this field. A noematic concept of knowledge (Diemer 1962, 474) is used for the necessary work to be done. It is shown how a concept-theoretical approach (relying on the characteristics of concepts and their system-building capacity) can be applied for pertinent terminological work. Earlier work in this regard by standardization bodies is mentioned. Seven necessary steps towards accomplishment are outlined.



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## 1.0 The Task

In their contribution "Disciplines as a differentiating force" N.W. Storer and Talcott Parsons (1968) mentioned four criteria which they consider as characteristics for the sociological relationship of members of a knowledge field in their environment. I would like to cite here the first two of them (retranslated from German translation) concerning:

- the responsibility of a professional group for the maintenance, furthering and management of a specific body of knowledge. The possession of this knowledge distinguishes the members of this professional group from so-called lay-people.
- the fact that the professional group possesses authorization for attracting, training and examining their members, who may be judged for their knowledge and the degree of their contributing to the respective field.

If we consider knowledge organization as a scientific discipline (Dahlberg 2006) and our International Society for Knowledge Organization as its representatives, then these criteria also apply to our case. Keeping this in mind, our task consists accordingly in

elaborating distinctly and definitely the knowledge units of our craft. However, as this work so far has not as yet found the necessary attention, especially also regarding the new terminology drifting into our field from the area of the computer sciences which „discovered“ the need of knowledge organization for their field, the following contribution attempts to prompt a solution.

## 2.0 Earlier work

Among the preparatory works which we should mention, two are outstanding: already in the thirties the Austrian Eugen Wüster, while establishing an Esperanto-dictionary, considered it necessary to grapple with the philosophical foundations of concepts. Later on, when he became owner of a factory for the fabrication of saws, he found that in different factories engaged in this field, different terms were used for the same type of saws. He therefore looked for a way to streamline products and their names and wrote his internationally well-known book *International Language Standardization in Technology* (Wüster 2.1966). From then on he started the elaboration of terminological standards. Thus the DIN Standards 2330-2339 can be attributed to him and to those col-

laborators in Germany and Austria, who became interested in this field through him. The standards DIN 2330 *Concepts and Terms* as well as DIN 2331 *Concept systems and their representation* contain essential preliminary works for later developments which will also be treated in this contribution. They were already anticipated in the journal *Muttersprache* (Dahlberg 1976). (When I corresponded once with an Indian in the United States in the seventies about these topics, I was advised by him not to use 'concepts' as this is considered an unknown term in this country. However, in the meantime I am sure it must have changed. Most of the newcomers to our field as well as linguists are still only familiar with 'term' and speak of its meaning, not realizing that there is something more behind it, which will be explained in Section 4.)

Another pathfinder was Fred W. Riggs, USA, who elaborated together with his friends in the Committee for Conceptual and Terminological Analysis (COCTA) methodical approaches in terminological work for international social science societies, as e.g. the matrix of contexts for the recognition of characteristics of a concept and the so-called onomasiological approach in concept representation, which does not care about the meaning of a term (semasiological approach) but starts from the definition of a concept. By this, one should be able to recognize just through its definition at which position in a system a concept belongs and how it has to be differently named, that is, existing also as synonym. By this Riggs did not decide that a definition must be connected to a specific term. He wanted to let everybody freely decide on which term to use, provided the relation to the definition is respected. By this, he preferred a descriptive instead of a prescriptive way of procedure (Riggs, 1981, 1988).

### 3.0 The concept of knowledge in knowledge organization

What kind of knowledge is meant by Knowledge Organization? Gerhard Budin has put this question to himself too in his habilitation work (Budin 1996), which he started with a knowledge typology of antonymic concept pairs differing in their criteria and which could be extended ad libitum, e.g.:

- Implicit vs explicit knowledge
- Theoretical vs practical knowledge
- General knowledge vs subject knowledge

- Linguistic knowledge (lexical, semantical, syntactical, grammatical, etc)
- Declarative vs procedural knowledge
- Conceptual vs propositional knowledge
- Specific language vs terminological knowledge
- Knowledge of details vs knowledge of facts
- Knowledge concerning activities, experience, names
- Public vs private knowledge

In all these cases the substantive 'knowledge' is connected with a property—or activity concept, thus we can distinguish—as already pointed out in an earlier publication (Dahlberg 1974, 10):

- the act of knowing (i.e. cognition ID) as the psychological procedure of becoming conscious; comprehending, recognizing, grasping—what has been called the 'noetic concept of knowledge.'
- the known as result of such an act of cognition, the consciously known, what has been called the 'noematic concept of knowledge' and
- the disposing of known items (knowledge units, ID) into active habit, as active consciousness by a constant relating of new or extant known items to stored items.

This 'disposing of known items', i.e. its possession and its conscious usage leads to the forms of knowledge listed above as well as to educational knowledge, knowledge about achievements, knowledge about salvation, as understood by Max Scheler (1926, 250-1).

The noematic concept of knowledge is best fitted for our programme of concept work in knowledge organization, i.e. the known as result of an act of cognition. It can best be achieved on the basis of statements about a referent, be it an object, a property, an activity, a dimension or a subject which thereby can be understood, verified and justified.

We should like to refer also to the distinction which Karl Popper made in his work *Objective Knowledge* (1972) when he compared objective knowledge, which manifests thoughts in the form of a sentence, independent of persons, possessing this knowledge with a knowledge, which is derived of the subjective state of mentality of persons, having certain ideas—viz. his 'world 3' as against his 'world 2.' Already Essers and Schreinemakers had pointed this out, when they tried to clarify the difference between 'knowledge' in Knowledge Organization and in Corporate Knowledge Management (Essers & Schreinemakers 1996). We are facing here also the difference between Wues-

ter’s understanding of concepts as units of thought (Denkeinheiten) which are necessarily subjective and units of knowledge which are objective and hence verifiable and justifiable.

#### 4.0 Conceptualization and Determination

Each true statement about a certain item of reference delivers a knowledge element about this together with a characteristic of its concept. The sum of necessary statements about such an item of reference forms the whole of characteristics of its concept, it presents distinctly the contents of it. With this procedure we obtain the characteristics, which build the concept of the item of reference; they are, so-to-speak its elements. In order to handle the result of this quasi analysis of the item of reference a designation is necessary, which can be either a code or a term, possibly one which relates to the main characteristic of the referent. By this designation—if done by a term, a kind of de-term-ination takes place. If done by a code, it will be a codification—in any way an indication of the contents of the concept. See for this also Fig. 1 as well as the concept triangle in Fig. 2.

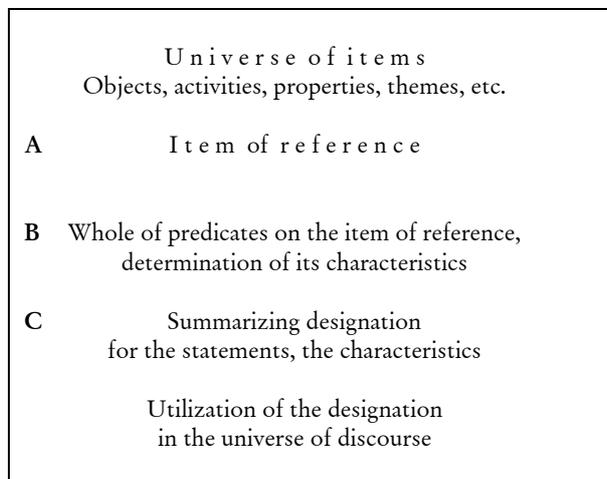


Figure 1. Conceptualization on the basis of a chosen item of reference

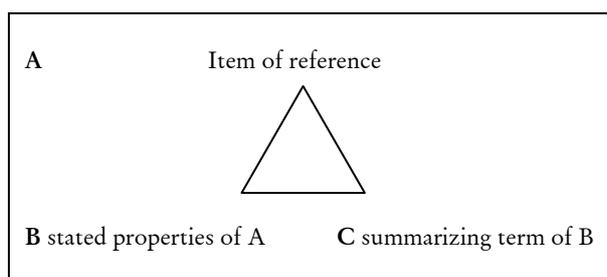


Figure 2. The Concept Triangle

When I spoke above of necessary statements, one might ask why this restriction? In philosophy one speaks of essential characteristics and means those, which characterize the nature of a thing. Its opposite, the unnecessary statements, resp. knowledge elements or characteristics, which may indeed be given, are not important for the knowledge act in question, they are superfluous, as they are not characterizing, they are included.

A definition is the shortest form of such a whole of statements on the contents of characteristics of an item of reference. It presents, however, by these characteristics the possible relationships between the concepts thus gained—similar to the analytically obtained whole of statements of an item of reference. Take for example the whole of statements about a general object, as e.g. a museum as a building, then all characteristics are listed which distinguishes a museum from any other building, such as

- A museum
- Is a public building
- Serves for the exhibition of objects
- Possesses collections of certain fields of study
- Presents collections thematically
- Has certain times for visitors
- Controls visitors (in general) by tickets,
- etc.

Here the general but necessary statements on museums are listed. Unnecessary because irrelevant would have been to say that the building has an entrance, or windows, or a roof, since these are already contained in building as correspondingly also all the additional statements on the characteristics of an exhibition, a collection, a field of study. However, these additional statements will play their role when the concept of a certain kind of museum must be characterized, as e.g. an archeological museum.. It will be still more definite, if an individual concept for a certain archeological museum is attempted, e.g. the one in Konstanz (Constance). By this we can speak—as shown in Figure 3—of general, special and individual concepts and their characteristics showing the generic relationship.

It must, however be admitted, that the scheme presented in Figure 3 is a simplification of the “real world,” as there are usually a number of differentiating items between the three vertical sections.

Steps in differentiation/ Levels of reference	All items of a certain kind	Some items of a certain kind	–a single item
A Item reference	Genus	Species (Kind)	Individuum
B Statement reference	Essential characteristics	Essential and additional characteristics	Essential, additional & individualiz. Characteristics
C Designation	General term	Special term	Proper name
Sum of A + B + C	General concept	Special concept	Individual concept

Figure 3. Diagram of conceptual differentiations of the generic relationship

## 5.0 Concept relationships

How do conceptual relationships come into being and how is it possible to establish thereby a system of concepts? It should be noted that the so-called Formal Concept Analysis as used by the mathematicians of the R.Wille school, Darmstadt and elsewhere (Wille 1994), also based their analysis of concepts on statements about referents (relating this to DIN 2330). Their aim, however, exists primarily in establishing object-property matrices and derive from them with computer assisted displays of kinds of concept relationships for use of various applications. If two concepts have the same or similar characteristics, one can assume that a relationship must exist between both. If we take the predicate “is a building,” it follows that this characteristic assembles all predicates concerning buildings, this then forms a class of buildings. If we take the predicate, “is a public building“ we separate such buildings in the system from all private buildings. This is of course a rather primitive knowledge, but it seemed necessary to show very simply, how a system of concepts and classes of concepts arises.

Now there are three essentially different kinds of concept relations, namely A) formal, B) categorial and C) contents related.

A) Formal relations are those, which establish the kind of characteristics of a concept. Here four possibilities can be distinguished:

- Identity, i.e. two concepts (with e.g. different terms) have the same characteristics. In this case we are dealing with synonymy.
- Inclusion—two concepts can be distinguished by only one additional characteristic, by this the one with the additional characteristic becomes a sub-concept to the other one.
- Intersection—the characteristics of two concepts cross each other (they intermingle)

- Disjunction—two concepts exclude each other, their characteristics differ entirely.

B) The categorial relationships between concepts can equally be subdivided into four different kinds. If one relates e.g. to the categories of Aristotle which can be grouped into four times three subkinds, as follows, one gets:

1) Entities	Abstract entities Concrete entities Principles
2) Properties	Quantity Quality Relation (in the sense of comparison)
3) Activities	Operation (active) Process (procedure) State (passive, zero-activity)
4) Dimensions	Time Space Position

Figure 4. The categories of Aristotle grouped by super-categories, the concept of substance was enlarged.

If one can assign an item of reference to one of these 12 categories, a categorial assignment has taken place, its concept has been categorized. An item of reference can be assigned to only one category, only if the item of reference is a subject, which usually has an object and an activity, the analysis must state this.

C) Contents-related relations are likewise fourfold and can be grouped into 1) generic, 2) partitive, 3) opposition/complementarity, and 4) functional relations.

- The generic relation which has been called by computer specialists in children’s language the “is-a-relationship” is a hierarchical relationship and distinguishes a higher concept and its lower concepts according to kinds of the higher concept, e.g. a museum and the different kinds of museums.
- The partitive relation, called a “has a relationship” by computer people, is also hierarchical, however it is one that lists under a higher concept the concepts which relate to parts of its item of reference, e.g. regarding museums its rooms, tables, exhibition objects, etc. The partitive relation has also been termed meronymic relation (Winston et al 1987) from the Greek word ‘mero’ = part. He and his collaborators had looked into Reget of 1962 and found some 400 synonyms for ‘part,’ for the conceptual level they distinguished only six kinds, of which only the following four kinds are real whole-part ones (see also Dahlberg 1988):

Integral object/component	cup – handle
Collection/member	forest – tree
Activity/feature	Shopping – paying
Area/place	Florida – Everglades

Six years before Winston’s publication, Y. Shrejder (Moscow) (1981) had already used the term meronymy for the partitive relation.

- The opposition/complementary relation is one of property. It also can be subdivided into four kinds, namely: 1) contrast as in clean-dirty, light-dark, often-seldom; 2) as contradiction, as in understandable-not understandable, harmony-disharmony, 3) complementarity as in above, middle, below; high, even, deep (here as visible, even triades can occur—for this see also the relator schema of Perreault (1965/1994); and 4) analogous, homologous, or dual cases as, e.g., model and reality, arm of a human being and wing of a bird, North pole and South pole.
- The functional relation, which can also be called a syntactical one, as it joins the parts of a sentence with subject, predicate, object. This relationship can be found in definitions and is also the typical relationship between the higher- and lower concepts of a faceted classification as far as the concept of a knowledge field can be subdivided into the parts of object-related, activity-related, property-related and further concept classes, which form the facets, i.e. the category-related classes of a knowledge field. In this very special case the

functional relation includes a partition relationship, as it assembles, as said above, the parts of a knowledge field. In an earlier publication (Dahlberg 1988) I showed that to all of these four relationships there exist also kinds of characteristics. Regarding the functional relation the following 17 questions can be put, listed here together with their categories (which might well be related to Aristotle’s and to the facets of a faceted classification system) and their Latin forms (as far as available from the medieval philosopher Raimundus Lullus, who used them in his *Ars Magna*):

Questions	Categories	Latin questions
1 What if?	Possibility	utrum?
2 What?	Nature, essence	quid?
3 From what?	Material stuff, substance	de quo?
4 Why?	Causality, reason	quare?
5 How big?	Quantity, size	quantum?
6 How good?	Quality	quale?
7 When? Since when?	Time	quando?
8 Where? From where?	Place	ubi?
9 How? In which way?	Modality	quomodo?
10 By which means?	Instrumentality	cum quo?
11 By what?	Potentiality, capability	
12 How generated?	Genesis	
13 By whom?	Originator, producer	
14 With whom?	Accompanied by, together with	
15 For what purpose?	Finality	
16 How occurring?	Occurrence, in parallel, in connection	
17 Under which condition?	Condition	

Figure 5. Functional characteristics and their questions

Figures to all these kinds of relationships can be found in earlier publications of the author, as e.g. (Dahlberg 1978, 1987, 1995). Also of interest is the fact that just these four kinds of relationships can be used for the formulation of four different kinds of real definitions. In general dictionaries one will find mostly the generic relationship in its definitions, in special dictionaries the partition and often also the functional relationships are added, when a concept should be explained thereby. For this see (Dahlberg 1987 and 1995).

## 6.0 Seven Steps for Conceptual Work in Knowledge Organization

It is assumed that the following seven steps are necessary for a reasonable representation of the concepts and terms of Knowledge Organization with their contents and their relationships. If they can be undertaken, the result would then be a databank, a systematic and alphabetical dictionary and also a classification system.

**Step 1: Collection of all relevant terms into a databank.** To accomplish this we have a huge source in the papers of our international proceedings volumes and in all issues of our Journal, including the bibliographic items in the KO Literature Section. In addition we have the proceedings volumes existing in German, French and Spanish which will need a bilingual approach. All relevant terms of our discipline should be identified and entered into this first database together with their contexts or, if applicable, with their definitions and source indications. This could be done by a volunteering team of experts in our field with experience of many years. It might be useful, if for each proceedings or KO volume one expert underlines the terms and another takes a critical look at these underlinings (and vice versa) before entering them with their differing contexts into the first database. After alphabetical sorting of these entries, creating by this a second database, one will recognize that many terms will be listed more than once, however, probably with different contexts, so that on this basis one may make conclusions about the use of the terms.

In addition to the collection of terms on the basis of the proceedings volumes from the past 20 years, there are already existing standards and dictionaries with definitions of relevant concepts<sup>5</sup> as well as those proper terms used by universal classification systems such as the DDC, UDC, Bliss and Colon Classification. They ought to be collected too, alphabetized and joined to the second database with their sources. Here I would like to mention first of all the International Standard ISO 5127 (1st ed. 2001) "Information and Documentation Vocabulary." The standard comprises 152 pages. Its terms and definitions are subdivided into seven sections of which section one lists 97 "Basic and framework terms" and section 4.2.2, entitled "Content analysis and description," covers 94 terms. In each case a short definition is given in English, together with its equivalent in French. As each term received a notation, it was possible to refer to the definitions of entailed terms (terms with definitions at other

points in the alphabet) by citing their notation in brackets. In some cases, additional notes are provided. An English and French index concludes the volume, indeed a major accomplishment of its contributors.

Another interesting document is the Draft for Development of the British Standard DD247:1998 „Documentation—Vocabulary“. (Its final version as a Standard had apparently been given up for money reasons). It comprises 114 pages and lists all terms with their definitions in alphabetical order, the entailed terms are printed in bold face. In each case a notation is given after the definition, which refers to the systematic subject index at the end of the document. 130 relevant terms may be found here under the heading 2.3 "Classification." A closer look reveals that all of Ranganathan's special terms in our field have been included.

A third document to mention in this regard is the 2<sup>nd</sup> ed. of *Terminologie der Information und Dokumentation* published as a book by G.Beling, P.Port, H. Strohl-Goebel, issued by the German Society for Information (DGI) in 2006 with an Annex in sheet form listing the terms systematically and alphabetically in German, English and French. This kind of glossary is arranged in the form of a classification system and differs insofar from the aforementioned standards as it does not only present terms of the special written language of the information sciences with their definitions (in German only) but introduces also terms, which fit into the context of the chosen structure and endeavors to complete it. As an example of this approach, one will find under "Types of Notation" altogether 19 entries (the ISO Standard has just one entry, the British one lists eleven). Already the large number of entries shows what had been intended and outlined in the Foreword, viz. "that a scientific and systematic permeation of the foundations of practical work.... had been attempted to be presented by verbal means." The document thus contains many proposed and not as yet used terms but still recommends that it be considered as a standard vocabulary.

A closer comparison of the pertinent terms in each of the three documents would have been desirable but cannot be given here. It might be possible when, according to the proposed Step 1, these terms and their definitions will be collected and joined to the second database with their sources.

**Step 2: Investigating the characteristics of each concept.** As to each term found in the proceedings and KO volumes contexts or existing definitions are to be added, it will be possible to recognize similar or

dependent characteristics of concepts which should be considered and respective conclusions drawn.

**Step 3: Categorization of all terms.** The 12 categorial relationships mentioned above (section 5B) will be a first help in sorting all terms according to this formal faceted order and within the facets also in alphabetical order. This third step can be accomplished separately, or together with the first step. In any way, a sorting according to this categorization will yield a new (our third) database for further procedure.

**Step 4: Purification of the third database.** On the basis of the contexts found under step 2 one should be able to identify all synonyms. At this juncture, a provisional decision ought to be taken as to which term should be used as the preferred term for a concept and keep its synonyms together with the selected preferred term. If one would like to work in the final version of the dictionary with all synonyms in the alphabet according to the onomasiological method used by F. Riggs, one could still use sub-entries for synonyms and enter it into the final version. After this ‚purification‘ each entry should receive its running (a serial, a decimal) number.

**Step 5: Systematizing each concept.** To accomplish this, a print-out of the single cleared data sets of each concept is necessary. Although it might sound old-fashioned to use now again catalog cards or sheets of paper for of each concept, it is the only method to recognize and compare the hierarchical dependencies and the functional relationships between single concepts. It is recommended to use for the arrangement of concepts the so-called ‘Systematifier‘ (Dahlberg 1995) which has also been used in the classification system for the bibliographical entries in our journal *Knowledge Organization*. Thereby a faceted classification system of the collected concepts and their terms can be established which can be compared with the classification system mentioned (extant for the past 34 years) while also testing its adequacy. Consequently, this new classification system should receive its own notation. Robert Fugmann suggested that this Step 5 could also be done electronically (by software) if an intelligent program were available. So I hope, the necessary intelligence can be detected.

**Step 6: Establish definitions of the concepts collected.** Based on the systematization process of Step 5, it is now possible to develop definitions for the

concepts and their terms, as a classification system is in fact a definition system. These definitions should then be entered into the catalog cards under Step 5.

**Step 7: Transfer of the concepts into the database of Step 4.** Now it is possible to relate the numbering of Step 4 to each catalog card with its concept, definition and notation and create thus a final database which can be printed out in alphabetical or systematic order with all the different data.

It will of course be useful, to include control mechanisms between the steps mentioned. The whole project could be treated as a model project and as one which might need public support if the enthusiasm of our members for voluntary work does not appear to suffice. Also one may face a lot of situations not clearly explained; these should be considered, tried to be solved and finally documented for later cases. One should also envisage to handle in a similar manner the field of Corporate Knowledge Management, there exist also proceedings and journal volumes for about ten years in order to clarify the differences between the two fields. Only recently Kasten (2007) referred to the fact that this field should lend itself to using the knowledge of Knowledge Organization..

## 7.0 Future Possible Uses of the Model Project

If the dedication of those responsible for our Society is strong enough to recognize the need for launching such a model project, it will be first of all carried out in English. At the same time, however, all interested countries, such as Germany, France, Spain, Italy, Poland and perhaps others too, should try to find and elaborate verbal equivalents to the English original term. The ISKO directing group should realize that with such a model project and its organized representation it is possible to mediate a sort of standard comprehension of the concept contents of its „craft“. This seems to be essential for a proper self-understanding, also for the training of experts in Knowledge Organization, as well as for a necessary profile for the outside world. For only when the contents of a discipline have been clarified, it is possible, e.g. to apply this methodical knowledge also to other knowledge fields.

It has been proposed in an earlier publication (Dahlberg 2006) to establish *Institutes for Knowledge Organization* which should have to perform the essential concept work in any knowledge field, as summarized in this contribution by relying on experts of Knowledge Organization in collaboration with ter-

minologists and subject scientists of the various fields of knowledge. The model project could, for such cases, serve as an example to rely on. However, in order not to get lost in such an undertaking as witnessed in the seventies of last century with the establishment of macrothesauri, it seems to be essential to stick to a given universal scheme of well-delimited subject fields. For this the Information Coding Classification (ICC) (Dahlberg 1982 and 2008) might serve, which starts from areas of being, subdivided into aspect areas, with mutually excluding categories.

As the ICC is a universal system, the field of Knowledge Organization has been subordinated to the Science of Science. From this position it might be applied with its objects and methods to all knowledge fields. Here we face a similar development to what had already been experienced in philosophy after the beginning of the 19<sup>th</sup> century covering many disciplines which ever since have found their own *raison d'être*, e.g. anthropology, psychology, law, politicalology, the arts, religion, etc. (see e.g. the scheme which G.W.F.Hegel designed 1817 (Dahlberg 1974, p.310). Similarly our own field grew out of library and information science and owing to its new position under the science of science it has „emancipated“ to cater properly to all other sciences.

In conclusion, it would be a positive development if the proposals of this note could be regarded as a programme. This could not only supply a new aim to ISKO, but also the framework for any scientific discipline by the criteria mentioned by Storer and Parsons. It seems now to be up to our expert colleagues to collaborate in the way mentioned. Do we have the enthusiasm and motivation we initially set out on our field of study? I would wish that all of us could make an effort in order that the vision of the model project presented and its application to an appropriate modern organization of the concepts of all knowledge fields becomes a reality.

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