



Knowledge Organization: Its Scope and Possibilities

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Sketch of historical development of knowledge organization and presentation of its scope as shown by the contents of the literature service, now called *Knowledge Organization Literature* (formerly *Classification Literature*) in the renamed journal KNOWLEDGE ORGANIZATION. The scheme is explained and shown on its three levels as well as its correlation to a universal classification system of knowledge fields, the *Information Coding Classification*. The possibilities of Knowledge Organization as a help for everybody, especially also students and above all students of education, and a help for political, industrial and social leaders are discussed. 10 measures for consideration and activation are listed. (Author)

1. Knowledge Organization, a new subject field

The necessity of ordering knowledge has always been recognized, but in ancient times it seems to have remained the exclusive domain of librarians and philosophers. Later on, authors of encyclopedias (Avicenna, Hugo of St. Victor, Vincent of Beauvais, Bartholomaeus Anglicus) as well as educationists (Comenius, J.H. Alsted, W. Ratke, etc.) came to join them. The history of this development has been most excellently documented by our Russian colleague, E.I. Shamurin (1).

Beginning with Otlet and LaFontaine at the turn of our century, documentalists and information science people joined this group, and ever since E. Wiister's work (2), terminologists became involved into this matter too.

In our present period, the representatives of Artificial Intelligence and the producers of Expert Systems, the Hypermedia experts and again colleagues from the education field are getting interested in applying the methodologies of knowledge organization, and it happens more than once that they "reinvent the wheel" for their own interests.

While classification systems and their verbal offspring, thesauri, are still being used effectively by librarians and information science people, we must say that the representatives of these newest technologies look rather disdainful at these tools, probably assuming that knowledge is far too complex to be captured by any consistent theory or by an ordering system with generally applicable principles.

Now this is exactly where the International Society for Knowledge Organization (ISKO) would like to lend a helping hand and to show that the theoretical foundations

developed in classification and thesaurus research during the past decades can well be used in all types of knowledge organization and for all kinds of general and special systems of knowledge organization and representation.

I would like to add here that the most essential item in the theoretical background of *knowledge organization* is the fact that any organization of knowledge must be based on knowledge units - which are nothing else but *concepts*. Concepts consist of *concept elements*, also called *concept characteristics* and exactly these are the factors by which *concept systems* - and classification systems are such *concept systems* - can be constructed. Knowledge by itself cannot be grasped or represented unless it is presented by knowledge units and their many possible combinations in words/terms or statements. The implications of this insight have been shown in a number of articles (see e.g. (3) and (4)). It can also be related to Ranganathan's theory of faceted classification (5). With the knowledge about this theoretical background it will be possible to easily construct reproducible classification systems or faceted thesauri and to facilitate the very necessary collaboration with our colleagues from the field of terminology.

Therefore, we are dealing here with a volume of knowledge collected, deepened and matured over many centuries which, however, only today has been recognized as being an autonomous field of knowledge which needs to find its proper place in society and which demands to be recognized as such in the system of the sciences.

What Evelyn Bliss put together 64 years ago in his book entitled "The Organization of Knowledge and the System of the Sciences" (6) now seems to become a program for all those with an insight into the integrating force of this knowledge and its potential for the future of mankind.

2. Knowledge Organization: Its Scope

Ever since 1974, the journal INTERNATIONAL CLASSIFICATION had been carrying a current bibliography of its pertinent literature. By the subtitle of this journal, viz.: "*Devoted to Concept Theory, Systematic Terminology and Organization of Knowledge*" it was already indicated that its scope was going much beyond what one would expect to be expressed by the term "classification". Indeed we had always been including all those references, often with their abstracts, which we considered to belong to the field of *knowledge organization*. The basis on which the references were selected are some 300 journals and relevant

monographs and proceedings volumes in the fields of the information sciences (archive and library science, general documentation, data and museum documentation), computer science/informatics (including programming, online technology, artificial intelligence, expert systems), linguistics and terminology, systems research, etc.

When the journal changed its name in 1993 into KNOWLEDGE ORGANIZATION it was therefore not necessary to change or widen the scope of its bibliographical service. Thus, by looking at the outlines (Tables 1 and 2) of this service, the contents of the new subject field, *Knowledge Organization*, can very well be recognized. Let us first look at the rough outline of its 10 major groupings:

- 0 Form Divisions
- 1 Theoretical Foundations and General Problems of KO
- 2 Classification Systems and Thesauri: Structure & Construction
- 3 Classing and Indexing Methodology
- 4 On Universal Classification Systems
- 5 On Special Objects Classification Systems (Taxonomies)
- 6 On Special Subjects Classification Systems
- 7 Knowledge Representation by Language and Terminology
- 8 Applied Classing and Indexing
- 9 Knowledge Organization Environment

Table 1: First Level Outline of the Classification System for the Literature on Knowledge Organization

This outline needs some explanation as it does not give enough detail. Of the ten major divisions we will leave out the first one, as it is only devoted to forms of documents, like bibliographies, reviews, dictionaries, classification systems and thesauri, proceedings, textbooks, other monographs and standards.

Groups 1-3 represent the constituent divisions of this field, characterized by 1) Theoretical Foundations, 2) Structure and Construction of Classification Systems and Thesauri, and 3) Classing and Indexing.

Groups 4-6 represent the application of the constituent divisions in 4) Universal Systems, 5) Object-oriented Classification systems and Thesauri, 6) Special Subject-oriented CS and T.

Groups 7-9 represent the influence, application and environment fields, 7) influence from outside, viz. the problems of knowledge representation by language and terminology, 8) the application of classing and indexing to different kinds of data, statements (titles), documents, and 9) the carrying of the special field knowledge to "the outside", the organization of the field on a national and international level, its education and training, its legal and economic aspects; user studies and standardization.

The sequence of these 3 x 3 divisions has been called the "Systematifier". It is a sequence of facets which can be used in almost every subject area and field and helps to mnemotechnically memorize what must be considered as belonging to every subject field (for more of this see (7)).

The next level of specification will show what is covered in each of the 9 divisions (see Table 2).

Again, Table 2 provides only a rough idea on the contents of each grouping. We provided therefore an Appendix 1 including the third level with the topics for the relevant references as "Classification System for Knowledge Organization Literature".

It will be seen from Table 2 and Appendix 1 that at many positions of the system a connection has been established to a universal classification system of knowledge fields called INFORMATION CODING CLASSIFICATION (ICC). In order to understand the implications of the areas 1-9 (occurring e.g. under 5, 6, 78, 82, 88, and at many other positions of the subdivisions ending by 8) the outline of ICC has been added as Appendix 2 in linear and in diagrammatic form. A description of this system has been published in (8) and its 3-level outline was included in the Annexes to (9).

The *Classification System for Knowledge Organization Literature* (formerly *Classification Literature Classification (CLC)*) has served also to structure the *International Classification and Indexing Bibliography* which was published in the years 1982-1985 with references to the literature of the years 1950-1982. (So far, however, only 3 volumes covering the literature of Groups 0-3 could appear (9-11); two further volumes for groups 4-6 and 7-9 are still awaiting publication by the INDEKS Verlag.)

In order to watch how the scope of our new subject field is developing it should be helpful to look into the Calls for Papers of past and future conferences of ISKO; their topics should be taken into consideration, as well as the conference papers of the ISKO Conferences of the past years (12-14). Such topics provide a clear indication of the scope of Knowledge Organization as understood by representatives working in this old and new subject field.

3. Knowledge Organization: Its Possibilities

Knowledge Organization, so far the specific domain of librarians and information science people could become the necessary methodology for the following three main user groups, namely:

(A) Everybody willing to adopt a more conscious way of life and his studies. Wherever possible the teaching of the knowledge of Knowledge Organization to students at the beginning of their university studies ought to be started soon, with a repeating course in the middle of their studies. With this knowledge, I am sure students will be much better equipped to organize their own studies and their further careers than hitherto (a paper by N. Meder, based on an unpublished Memorandum concerning such a university teaching outlines this idea (15)).

(B) In a very special way, Knowledge Organization should be taught to students of education, as it is rather essential for their professional activity; viz. in order to use their educational material in such a way as to optimally transfer it to their future students. Work in this direction has recently been started at a German university institute for didactics; for more on this see the article by E. Kiel (16);

Classification System for Knowledge Organization Literature

Outline

0 Form Divisions

- 01 Bibliographies
- 02 Literature Reviews
- 03 Dictionaries, Terminologies
- 04 Classif. Systems & Thesauri
- 05 Periodicals and Serials
- 06 Conf. Reports, Proceedings
- 07 Textbooks (whole field)**
- 08 Other monographs**
- 09 Standards, guidelines

1 Theoretical Foundations & General Problems

- 11 Order & Knowl. Organiz.(KO)
- 12 Conceptology in KO
- 13 Mathematics in KO
- 14 Systems Theory and KO
- 15 Psychology and KO
- 16 Science & Knowledge Org.
- 17 Problems in KO
- 18 Classification Research (CR)
- 19 History of KO

2 Classif. Systems & Thesauri (CS&T). Structure & Constr.

- 21 General Questions of CS&T
- 22 Structure & Elements of CS&T
- 23 Construction of CS&T
- 24 Relationships
- 25 Numerical Taxonomy
- 26 Notation. Codes
- 27 Maintenance, Updating & Storage of CS&T
- 28 Compatibility & Concordance between Indexing Languages
- 29 Evaluation of CS&T

3 Classing & Indexing (C&I) (Meth.)

- 31 Theory of Classing & Indexing
- 32 Subject Analysis
- 33 C & I Techniques
- 34 Automatic C & I
- 35 Manual & Automatic Ordering
- 36 Coding
- 37 Reclassification
- 38 Index Generation and Programs
- 39 Evaluation of C & I

4 On Universal Classification Systems and Thesauri

- 41 On Universal Systems in general
- 42 On the Universal Decimal Classif.
- 43 On the Dewey Decimal Classif.
- 44 On the Library of Congress Classif. & the LC Subject Headings
- 45 On the Bliss Bibliographic Classification
- 46 On the Colon Classification
- 47 On the Library Bibliographical Classif.
- 48 On Other Universal CS and T
- 49 free

5 On Special Objects CS (Taxonomies)

- 51 In the Form & Structure Area 1
- 52 In the Energy & Matter Area 2
- 53 In the Cosmo & Geo-Area 3
- 54 In the Bio Area 4
- 55 In the Human Area 5
- 56 In the Socio Area 6
- 57 In the Econom.& Technol.Area 7
- 58 In the Science & Inform.Area 8
- 59 In the Culture Area 9

6 On Special Subjects CS & T

- 61 In the Form & Structure Area 1
- 62 In the Energy & Matter Area 2
- 63 In the Cosmos & Geo Area 3
- 64 In the Bio Area 4
- 65 In the Human Area 5
- 66 In the Socio Area 6
- 67 In the Econom.& Technol.Area 7
- 68 In the Science & Inform.Area 8
- 69 In the Culture Area 9

7 Knowledge Representation by Language and Terminology

- 71 General Problems of Natural Language in Relation to KO
- 72 Semantics
- 73 Automatic Language Processing
- 74 Grammar Problems
- 75 Online Retrieval Systems and Technologies
- 76 Lexicon/Dictionary problems
- 77 Problems of Terminology
- 78 Subject-oriented Terminology Work (TW)
- 79 Problems of Multilingual Systems and Translation

8 Applied Classing & Indexing (C&I)

- 81 General Problems, Catalogues, Guidelines, Rules, Indexes
- 82 Data Classing and Indexing
- 83 Title Classing and Indexing
- 84 Primary Literature C & I (except 85)
- 85 (Back of the) Book C & I
- 86 Secondary Literature C & I
- 87 C & I of Non-book Materials
- 88 C & I in Subjects Fields (manual and computerized)
- 89 C & I in Certain Languages

9 Knowledge Organization Environment

- 91 Professional & Organizational Problems in gen. & in Institutions
- 92 Persons & Institutions in KO
- 93 Organizat. of C & I on a National and International level
- 94 free
- 95 Education and Training in KO
- 96 Legal Questions
- 97 Economic Aspects in KO
- 98 User Studies
- 99 Standardization in KO work

Table 2

(C) Furthermore, the knowledge of Knowledge Organization must be mastered by all those who lend a helping hand to our political, industrial and social leaders.

All of this presupposes, however, some measures which are herewith proposed for consideration and activation:

1) Function of ISKO Membership

In each country the membership of ISKO should be extended and the organization strengthened in order to provide for a strong background of professionals to work towards the common goals.

2) Elaboration of textbooks

Next to providing textbooks on the theoretical background and general methodology of KO, a series of textbooks needs to be written and translated into the major languages of this world on KO in special subject fields.

3) Training of Teachers

Academies and/or Chairs at universities should be established for the training of the future teachers in knowledge organization on a national, European and an international level.

4) Meetings

Conferences ought to be held regularly on current topics and their proceedings should be of interest and available to every ISKO member soon after the event.

5) Current Research

Research centers should be established to collaborate with terminologists (using e.g. the help of Infoterm, Vienna) in pinpointing new concepts, their terms and relationships to existing ones and keeping thesauri and classification systems constantly up-to-date with the possibility to publish the results of their findings in a proper way. The INTERCOCTA glossaries could be taken as an example for such a necessary work (17).

6) Switching Centers

Also, centers for the coordination of conceptual systems, switching centers between special and general classification systems and thesauri should be established in order to facilitate the exchange of knowledge on existing and new concepts. Such centers might well establish also compatibility between the six existing universal classification systems.

7) Survey on Colleagues working in KO

A Who's Who with the roster of people, not only ISKO members but also all those working in and contributing to the field of knowledge organization, should be published at regular intervals.

8) Current Information

Journals, newsletters and serial publications in KO should concentrate on making known the results of the research and development work done in the field.

9) A Concept System for KO

A classification system for the pertinent literature with a thesaurus-like index should facilitate the current survey on the field itself, especially for the necessary access to the

10) Current Literature Survey

by publication of a current bibliography of all kinds of pertinent literature on Knowledge Organization.

4. Conclusion

It has been said, that information is "Knowledge in Action". But it is also true that "knowledge is ordered and digested information" (18). We are living in a world flooded by information which needs very urgently to be ordered and digested to become available knowledge and not only personal but interpersonal, objective, public knowledge too. Very much needs to be done until some results will become visible. And much more support is needed, especially as personal support from the ISKO membership. So far we are only a very small group of some 400 members in 43 countries of this world. But what was achieved by only 12 apostles in the right spirit some 2000 years ago? If each of our members activates a strong will towards our common goals and is willing to contribute his/her share by the special personal graces which he or she has been given, I am sure, that the day will come when changes in our world will become visible.

We are not so much confronted here with the intellectual tasks - although these are definitely not to be neglected - rather it is collaboration and the good will to help without looking at possible personal advantages that is demanded. Of course, we will also need a lot of manpower for all the necessary work to be done and must find somehow the sources for their proper remuneration.

Thus, keeping the goals in mind we shall try to proceed step by step and let us be guided by the Higher Will Who took care - now almost four years ago - that ISKO could be started. This Will will take care - I am sure - that ISKO will succeed if ISKO's members are willing to follow the guidance which has been offered so kindly.

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Annex 1:

Classification System for Knowledge Organization Literature

Abbreviations:

- CS & T Classification Systems and Thesauri
 C & I Classification and Indexing
 KO Knowledge Organization

0 FORM DIVISION

01 Bibliographies

- 011 Gen.Bibliographies
 012 Current Bibliographies
 013 Bibliogr.of CS & T
 014 Bibliogr.of Universal CS
 015 Recurring Bibliographies
 016 Bibliogr.of Spec. C&I Fields
 017 Bibliogr.of Spec.Index.Syst.
 018 Bibliogr.of CS & T in Subj.Fields
 019 Bibliogr.of the Works of Persons

02 Literature Reviews in KO

- 021 General Review Articles
 025 Recurring Reviews
 026 Reviews in Special KO Fields
 028 Reviews of C&I in Subject Fields

03 Glossaries, Vocabularies, Terminologies in KO

- 031 Gen.Glossaries in KO
 032 Glossaries containing KO Sections
 034 Terminol.of Universal Syst.
 036 Terms & Glossaries in KO fields
 037 Terminol.of Spec.C&I Syst.
 038 Terms & Glossaries in KO Application Fields

04 Universal Classif. Systems

- 041 Library Classif.Systems
 042 Universal Decimal Classif.
 043 Dewey Decimal Classif.
 044 Library of Congress Classif.
 0448 LC Subject Headings
 045 Bliss Bibliographic Classif.
 046 Ranganathan Colon Classif.
 047 Library Bibliographical Classif.
 048 Other Universal CS

048- Special CS&T

- 048-1 CS&T in the Form & Structure Area 1
 048-2 CS&T in the Energy & Matter Area 2
 048-3 CS&T in the Cosmo & Geo Area 3
 048-4 CS&T in the Bio Area 4
 048-5 CS&T in the Human Area 5
 048-6 CS&T in the Socio Area 6
 048-7 CS&T in the Econ.& Product.Area 7
 048-8 CS&T in the Science & Inform.Area 8
 048-9 CS&T in the Culture Area 9

05 Periodicals and Serials in KO

- 051 KO Journals
 052 KO Newsletters, Bulletins
 053 Serials in KO
 054 Periodicals and Serials for Universal CS&T
 055 Periodicals on Spec.CS&T
 056 Periodicals on Spec.KO fields
 057 Periodicals with Bearings on KO
 058 KO Periodicals in Spec.Subj.Fields

06 Conference Reports & Proceedings

- (listed according to year, month and day(s):
 06.93-11-18/19

07 Textbooks in KO

- (subdivision according to the outline notation, for example:
 07.1 Textbooks on Theor.Foundations
 07.23 Textbooks on the Construction of CS&T...)

08 Other Monographs in KO

(subdivisions as under 07)

09 Standards and Guidelines in KO

(subdivisions as under 07, for example:

- 09.01 Bibliographies of Standards and Guidelines
- 09.12 Standards on Concepts and Concept Systems
- 09.38 Standards for Indexes, etc.)

1 THEORETICAL FOUNDATIONS AND GENERAL PROBLEMS

11 Order and Knowledge Organization (KO)

- 111 Classification theory in general
- 112 Structures in general
- 113 General activities in KO
- 114 Universal order
- 115 General order of objects, object orientation
- 116 General order of subjects
- 117 free
- 118 Problems of order in application fields
- 119 Role and significance of KO

12 Conceptology in KO

- 121 Logical & philosophical bases of concepts
- 122 Theory of concepts
- 123 Concept construction, definitions
- 124 Logic of knowledge representation
- 125 Basic concepts, categories
- 126 General and special kinds of concepts
- 127 Individual concepts
- 128 Concepts of certain subject fields
- 129 Concept documentation

13 Mathematics in KO

- 131 Mathematical theory of KO
- 132 Algebraic methods of KO
- 133 Formalization and mathematical models
- 134 Geometrical methods
- 135 Graph-theoretical methods
- 136 Distribution theory and frequency studies
- 137 Numbers in KO
- 138 Mathematical methods in subject fields
- 139 Mathematical methods for certain purposes

14 Systems Theory and KO

- 141 Systems principles
- 142 Systems, typology of
- 143 Systems analysis and description
- 144 Systems approach, knowledge analysis
- 145 free
- 146 Level theory, integrative levels
- 147 Neural networks
- 148 Systems in specific fields of knowledge
- 149 free

15 Psychology and KO

- 151 Psychological basis of KO
- 152 Thought and memory
- 153 Intellectual work
- 154 Concept formation (non-scientific)
- 155 Psychology of KO processes
- 156 Knowledge acquisition
- 157 Computerization of thought processes, Knowledge-based systems
- 158 Psychology of KO in special subject fields
- 159 free

16 Science and Knowledge Organization

- 161 General problems
- 162 Structure and interrelationship of science
- 163 Science methodology
- 164 Development of knowledge and science
- 165 Control of knowledge, growth, knowledge systems
- 166 Structure of scientific literature
- 167 Contribution of KO to science development
- 168 Development of fields of knowledge
- 169 Documentation of scientific progress

17 Problems in KO

- 171 KO/Classification problems in general
- 172 Problems from classification systems
- 173 Methodological problems
- 174 Organizational problems
- 175 Problems of choice of class.systems
- 176 Problems from new methods, e.g. pattern recognition
- 177 Problems from new technology
- 178 KO problems in subject fields
- 179 Trends and future tasks in KO

18 Classification Research (CR)

- 181 General problems
- 182 State-of-the-art of CR in general
- 183 Research on classif. methods and techniques
- 184 Research on classification systems
- 185 Areas for research, proposals
- 186 Research on new topics in classification
- 187 Influence from outside on CR
- 188 CR in special subject fields
- 189 CR in certain countries and institutions

19 History of KO

- 191 History of knowledge and library classif.
- 192 History of construction of classif.systems
- 193 History of indexing and subject cataloging
- 194 History of certain classif.systems
- 195 free
- 196 History of subjects related to KO
- 198 History of KO in special subject fields
- 199 History of KO in certain countries & inst.

2 CLASSIFICATION SYSTEMS AND THE- SAURI (CS & T). STRUCTURE AND CON- STRUCTION

21 General Questions of CS & T

- 211 Theory of CS and T
- 212 Typology and characteristics of CS
- 213 Management of CS, incl.computerization
- 214 Thesauri in general, def.,etc.
- 215 Characteristics and kinds of thesauri
- 216 Thesaurus systems, integrated T.
- 217 Role & function of CS & T
- 218 Use of CS & T in spec.environments
- 219 Comparisons between CS & T

22 Structure & Elements of CS & T

- 221 Conceptual structures of CS
- 222 Components of CS & T in general
- 223 Vocabulary selection and extraction
- 224 Hierarchy & hierarchical levels
- 225 Facets, faceted classification
- 226 Descriptors, keywords, subject headings:
properties and functions
- 227 Compound descriptors, descr.combinations
- 228 Descriptors in certain subject fields
- 229 Representation form of descriptors
Graphical form of CS & T

23 Construction of CS & T

- 231 Preconditions for construction
- 232 Design principles for CS
- 233 Methodology for CS construction
- 234 Linguistic support of descriptor languages
- 235 Construction of T in general
- 236 Construction of T for special purposes
- 237 Computer supported construction of CS & T
(programs see 276)
- 238 CS & T construction in diff.natural languages
(in subject fields see 5-6)
- 239 Evaluation of thesaurus construction work

24 Relationships

- 241 Gen.& theor.problems of relationships
- 242 Paradigmatic relationships
(hierarchy see 224)
- 243 Syntagmatic relationships
- 244 Descriptor relationships
- 245 Roles and links
- 246 Weights
- 247 Relational data files
- 248 Relations in special subject fields
- 249 Representation of relationships

25 Numerical Taxonomy (NT)

- 251 General and theoretical problems
- 252 Cluster Analysis
- 253 Classification procedures

- 254 Hierarchy in NT
- 255 Pattern recognition
- 256 Place-related NT
- 257 Time-related NT
- 258 Application of NT in spec.subj.fields
- 259 Evaluation of NT procedures

26 Notation. Codes

- 261 General problems of notations
- 262 Notational systems
- 263 Code & notation development,
construction and manipulation
- 264 Characteristics of codes
- 265 Book numbers, call numbers
- 266 Class numbers, notation of CS and T
- 267 Number syst. & Codes for special purposes
(e.g. MARC format)
- 268 Notation in certain subj.fields
- 269 Evaluation of notations & codes

27 Maintenance, Updating and Storage of CS & T

- 271 Revision principles
- 272 Maintenance of CS & T
- 273 Methods of revision and updating
- 274 Revision of CS & T in general
- 275 Computer programs for CS
- 276 Computer programs for thesaurus compilations
- 277 Updating, maintenance programs
- 278 Storage problems of CS & T

28 Compatibility & Concordance between Indexing Languages

- 281 Objectives & nature of systems compatibility
- 282 Intermediate languages
- 283 Compatibility in classing and indexing
- 284 Establishment of concordances
- 285 Correlative indexes. Mapping
- 286 Systems reconciliation, e.g.between CS & T,
linking terms
- 287 Organized compilation of compatible CS & T,
integration
- 288 Compatibility in subject areas
- 289 Evaluation of compatibility

29 Evaluation of CS & T

- 291 Principles for evaluating CS & T
- 292 Comparison of CS among each other
- 293 Testing & evaluating the validity of one or
more CS and T
- 294 Natural vs controlled languages
- 295 Comparative analysis of CS & T
- 296 Descriptor languages vs CS
- 297 Evaluation of patent CS
- 298 Evaluation of CS & T in certain subject fields

3 CLASSING & INDEXING (C&I) (Meth.)

31 Theory of Classing and Indexing

- 311 Principles of C & I
- 312 Methodology of C
- 313 Methodology of I
- 314 Indexing errors, constraints
- 315 Indexing characteristics (depth, intensity, objectivity, etc.)
- 316 Indexing on different levels of abstraction
- 317 Author and editor indexing
- 318 Special purpose indexing

32 Subject Analysis

- 321 General problems of "aboutness"
- 322 Data analysis and interpretation
- 323 Subject/information/knowledge analysis
- 324 Contents analysis - text analysis
- 325 Facet analysis, indexat.formulac
- 326 Preparation of inform.for machine handling
- 327 Subj.analysis of kinds of documents
- 328 Subj.analysis in certain fields
- 329 Comp.analysis of data and subjects

33 Classing and Indexing Techniques

- 331 C & I in general
- 332 Classing methods & techniques
- 333 Indexing methods (exc.334/7)
- 334 Coordinate indexing
- 335 Phrase indexing (in general)
- 336 Chain indexing
- 337 PRECIS indexing
- 338 Other phrase ind.methods by name

34 Automatic Classing and Indexing

- 341 Theory of automatic C & I
- 342 Term values, discrimination, precision, etc.
- 343 General, linguistic & statistical methods
- 344 Semi-automatic methods and computer-assisted indexing
- 345 Permutation indexing
- 346 Thesaurus-based automatic indexing
- 347 Online indexing
- 348 Automatic classification
- 349 Evaluation of automatic indexing

35 Manual and Automatic Ordering

- 351 General and theoretical problems
- 352 Math.basis of file organization
- 353 Generation of clustered files
- 354 Manual ordering, shelving
- 355 File ordering/organization
- 356 Hypermedia, Hypertext, etc.
- 357 Document structuring, SGML etc.
- 358 File organization in subject fields
- 359 Evaluation of ordering procedures

36 Coding

- 361 General and theoretical problems
- 362 Coding systems
- 363 Coding methods
- 364 Encoding of index entries
- 365 Encoding of catalogue data
- 366 Encoding of text and data
- 367 Coding of techno-economic data
- 368 Coding in subject fields

37 Reclassification

- 371 Gen. & theor. problems
- 372 Parameters of reclassification
- 373 Organization of reclassification
- 374 Administrative viewpoints
- 375 Reclassification to LCC
- 376 Conversion to LBC
- 377 Other reclassification projects
- 378 Reclassification in subject areas

38 Index Generation and Programs

- 381 Gen. & theor. problems of index generation
- 382 Special kinds of indexes
- 383 Manual & computerized methods for index preparation
- 384 Programs for index prep., general
- 385 Index generation programming systems
- 386 Index generation programs, by name
- 387 Programs for other activities in C & I
- 388 Index generation in subject fields
- 389 Representation form of indexes

39 Evaluation of Classing and Indexing

- 391 Problems and principles of indexing evaluation
- 392 Evaluation criteria: consistency, functional efficiency, etc.
- 393 Methods of evaluation
- 394 Evaluation of a single CS application
- 395 Evaluation of a single indexing system
- 396 Comparative studies of subject indexing systems, incl. thesaurus vs free indexing
- 397 Comparative studies of CS vs indexing systems
- 398 Comparative studies of indexing in subject fields
- 399 Comparison of certain indexes

4 ON UNIVERSAL CLASSIFICATION SYSTEMS

41 On Universal CS in general

- 411 Library classification in general
- 412 Surveys on existing univ.syst.
- 413 free
- 414 Problems of library classification
- 415 Specific. for a new univ. system or thesaurus
- 416 free
- 417 Problems from comparative studies of univ. CS
- 418 Special topics treated in universal CS
- 419 Trends in the development of universal CS

- 42 On the Universal Decimal Classification (UDC)
- 43 On the Dewey Decimal Classification
- 44 On the Library of Congress Classification
- 45 On the Bliss Bibliographic Classification
- 46 On the Colon Classification
- 47 On the Library Bibliographical Classification

48 On other Universal CS & T

- 481 On proposals for universal CS & T
- 482 On CS for general purposes
- 483 On thesauri & other devices for gen. purposes
- 484 On CS & T for archives
- 485 On CS & T for libraries
- 486 On CS & T for doc.& inf.serv.
- 487 On patent CS & T (subdivide by country codes)
- 488 On CS & T for research & terminology
- 489 On CS for other spec.purposes
(Children, School and Youth libraries
Public offices, state documents, etc.)

5 ON SPECIAL OBJECTS CS (Taxonomies)

- 51 On taxonomies in Area 1 (ICC)
- 52 On taxonomies in Area 2
- 53 On taxonomies in Area 3
- 54 On taxonomies in Area 4
- 55 On taxonomies in Area 5
- 56 On taxonomies in Area 6
- 57 On taxonomies in Area 7
- 58 On taxonomies in Area 8
- 59 On taxonomies in Area 9

6 ON SPECIAL SUBJECTS CS & T

- 61 On CS & T in Area 1 (ICC)
- 62 On CS & T in Area 2
- 63 On CS & T in Area 3
- 64 On CS & T in Area 4
- 65 On CS & T in Area 5
- 66 On CS & T in Area 6
- 67 On CS & T in Area 7
- 68 On CS & T in Area 8
- 69 On CS & T in Area 9

7 KNOWLEDGE REPRESENTATION BY LANGUAGE AND TERMINOLOGY

71 Gen. Problems of Natural Language in rel. to KO

- 711 Linguistics and KO
- 712 Natural Language and metalanguage
- 713 Mathematical and comput.linguistics, gen.
- 714 Semiotics
- 715 Formalization of natural language
Artificial Intelligence
- 716 Problems of structure
- 717 Language universals
- 718 Problems of diff.natural languages

72 Semantics

- 721 General problems of semantics
- 722 Word & sentence meaning
- 723 Semantic analysis
- 724 On synonyms & other ambiguities
- 725 Semantic networks & associations
- 726 Semantics of texts & languages
- 727 Semantics of data bases, memory systems
- 728 Semantics in subject fields

73 Automatic Language Processing

- 731 General and theoretical problems
- 732 On language items for processing
- 733 Methods and procedures of natural language
processing, parsing, word allocation, etc.
- 734 Computer programs for ALP
- 735 Word truncation, root, stem proc.
- 736 File, text compression
- 737 Automatic analysis of special natural languages
- 738 Automatic analysis in subject fields

74 Grammar Problems

- 741 General & theoretical problems of grammar
- 742 Grammars
- 743 Syntactic analysis & their algorithms
- 744 Gramm.forms, e.g. of keywords, terms, words
- 745 Special grammatical problems, e.g. frames
- 746 Generation of phrases, syntax structures
- 747 Syntax of special natural languages
- 748 Syntax in special subject fields

75 Online Retrieval Systems and Technologies

- 751 General and theoretical problems
- 752 Dialogue systems. Interactive, Online Catalogs
- 753 Online access, query optimization, navigation
- 754 Programs for online queries
- 755 Problems of online syst., e.g.
structured searches
- 756 Classification and thesaurus-based queries
- 757 Expert systems
- 758 Online systems in subject fields
- 759 Evaluation of online retrieval techniques

76 Lexicon/Dictionary Problems

- 761 General & theoretical problems
- 762 Dictionary structures
- 763 Construction and updating of dictionaries
- 764 Kinds of dictionaries, except
- 765 Automatic, monolingual ones
- 766 Automatic, multilingual ones
- 767 Data bases in dictionary form
- 768 Dictionaries in subject fields

77 Problems of Terminology

- 771 General & theoretical problems
- 772 Form and designation of terms and names
- 773 Terminological work (TW)
- 774 Computer programs for TW
- 774 Term systems and terminological systems

- 775 Classification and terminology
- 776 Terminological databanks
- 777 Country and language-oriented TW
- 778 Special language research
- 779 Contrastive terminology

78 Subject-oriented Terminology Work (TW)

- 78-1 TW in Area 1 (ICC)
- 78-2 TW in Area 2
- 78-3 TW in Area 3
- 78-4 TW in Area 4
- 78-5 TW in Area 5
- 78-6 TW in Area 6
- 78-7 TW in Area 7
- 78-8 TW in Area 8
- 78-9 TW in Area 9

79 Problems of Multilingual Syst. & Translation

- 791 General & theoretical problems
- 792 Aspects and models of translation
- 793 Methods of machine translation
- 794 Translation of CS & T
- 795 Bilingual CS & T
- 796 Multilingual CS & T
- 797 Indexing, multilingual syst.
- 798 Transl.problems in subject fields
- 799 Interlinguistics and translation

8 APPLIED CLASSING & INDEXING (C&I)

81 General Problems, Catalogues, Guidelines, Rules, Indexes

- 811 General problems of indexes and indexers
- 812 Alphabetical and classed subject catalogues
- 813 Establishment and maintenance of subject catalogues
- 814 Manual, rules, codes for subject catalogues
- 815 Index specifications
- 816 Rules for good indexes
- 817 Editing and printing of indexes
- 818 Subject indexes and catalogues in certain institutions
- 819 Evaluation of indexes and catalogues

82 Data Classing and Indexing

- 820 Data C & I in general
- 82-1 Data C & I in Area 1 (ICC)
- 82-2 Data C & I in Area 2
- 82-3 Data C & I in Area 3
- 82-4 Data C & I in Area 4
- 82-5 Data C & I in Area 5
- 82-6 Data C & I in Area 6
- 82-7 Data C & I in Area 7
- 82-8 Data C & I in Area 8
- 82-9 Data C & I in Area 9

83 Title Classing and Indexing

- 831 General problems
- 832 Information contents of titles
- 833 Methodology of title and sentence C & I
- 834-837 free
- 838 Title indexes in subject fields
- 839 Title indexing in special institutions

84 Primary Literature C & I (except 85)

- 841 C & I of research reports
- 842 C & I of patents and similar docs.
- 843 C & I of biographies
- 844 C & I of news and newspapers
incl.Prestel/Viewdata, etc.
- 845 C & I of journals and serials
- 846 C & I of theses and dissertations
- 847 C & I of archival materials
- 848 C & I of field-oriented primary documents
- 849 C & I of other kinds of primary documents

85 (Back of the) Book C & I

- 851 General problems
- 852 Term or topic for entries
- 853 Methodology of book indexing
- 854 Characteristics of book indexing
- 855 free
- 856 Index generation of special books,
e.g. proceedings
- 857 Computerized book indexing
- 858 Book indexing in subject fields
- 859 Evaluation of book indexing

86 Secondary Literature C & I

- 861 C & I of encyclopedias, manuals, dictionaries
- 862 C & I of bibliographies
- 863 C & I of abstracts and abstracting journals
- 864 Citation indexing
- 865 C & I of library catalogues
- 866 Establishment of indexes to CS in general
- 867 Establishment of indexes to universal CS
- 868 Establishment of indexes to special CS
- 869 C & I of other secondary literature

87 C & I of Non-book Materials

- 871 General problems
- 872 Picture C & I, including photographs
- 873 Microform C & I
- 874 Slides C & I
- 875 Video tape & film C & I
- 876 Cartographic C & I
- 877 C & I of phonographic records
- 878 Museum objects C & I
- 879 C & I of other non-book materials, e.g. CD-ROM

88 C & I in Subject Fields (manual & comput.)

- 88-1 C & I in Area 1 (ICC)
- 88-2 C & I in Area 2
- 88-3 C & I in Area 3
- 88-4 C & I in Area 4

- 88-5 C & I in Area 5
- 88-6 C & I in Area 6
- 88-7 C & I in Area 7
- 88-8 C & I in Area 8
- 88-9 C & I in Area 9

89 C & I in Certain Languages
(Subdivide by language code)

9 KNOWLEDGE ORGANIZATION ENVIRONMENT

91 Professional and Organizational Problems in General and in Institutions

- 911 free
- 912 Professional questions, new professions
- 913 Work descriptions, etc.
- 914 Workstations
- 915 Ergonomic factors in KO
- 916 Organization of work in institutions
- 917-918 free
- 919 MARC format for classification data; also classif.data in MARC

92 Persons and Institutions in KO

- 921 free
- 922 Historical persons
- 923 Comparison of persons
- 924 Contemporaries
- 925 Societies, research groups,
- 926 International societies and groups
- 927 International institutions
- 928 free
- 929 Awards in C & I

93 Organization of C & I on a National and International Level

- 931 General principles
- 932 International cooperation & systems
- 933 International activities
- 934 Activities in Europe (subdivide by country code)
- 935 Activities in Asia
- 936 Activities in Africa
- 937 Activities in America
- 938-9 free

94 Free

95 Education and Training in KO

- 951 General problems
- 952 Subject, curricula and training programs
- 953 Methodology of teaching KO
- 954 Side effects of teaching KO
- 955 Teaching aids
- 956 Educational requirements
- 957 Education and training in particular countries
- 958 Teaching of subject-oriented C & I systems
- 959 Teaching of end-users

96 Legal Questions

(e.g. Copyright of CS, copyright of computer programs in C & I)

97 Economic Aspects in Knowledge Organization

- 971-2 free
- 973 Economizing KO work
- 975 Economic aspects in CS construction
- 976 Economic aspects in cataloguing
- 977 Economic aspects in C & I
- 978 Economic aspects of publishing CS
- 979 free

98 User Studies

(Application of systems see 218)

- 981 Studies of users, readers in general
- 982 Requirements of C & I users (user interfaces, user feedback, search term selection)
- 983 Use of certain C & I practices
- 984 Use of CS
- 985 Use of thesauri
- 986 Use of subject catalogues
- 987 Use of indexing systems and methods
- 988 Use of indexes
- 989 Use of CS & T in certain institutions

99 Standardization in KO Work

- 991 General problems
- 992 Standardization of terms and characteristics
- 993 Standardization in shelving and organizing materials
- 994 Standardization of CS
- 995 Standardization of thesauri
- 996 Standardization of subject catalogues
- 997 Standardization in indexing
- 998-9 free

(Following page:)

Annex 2:

Information Coding Classification (ICC) - Outline

INFORMATION CODING CLASSIFICATION

Outline

0 GENERAL FORM CONCEPTS

- 01 Theories, Principles
- 02 Objects, Parts
- 03 Activities
- 04 Properties, Attributes
- 05 Persons
- 06 Institutions
- 07 Techn.Production
- 08 Applications, Determination
- 09 Synthesis, Distribution

1 FORM AND STRUCTURE AREA

- 11 Logic
- 12 Mathematics
- 13 Statistics
- 14 Systemology
- 15 Organization Sci.& Technol.
- 16 Metrology
- 17 Cybernetics (Control, Automat.)
- 18 Standardization
- 19 Testing and Checking

2 ENERGY AND MATTER AREA

- 21 Mechanics
- 22 Physics and Matter
- 23 Gen.& Technical Physics
- 24 Electronics
- 25 Physical Chemistry
- 26 Pure Chemistry
- 27 Chemical Technology and Engg.
- 28 Energy Science and Technol.
- 29 Electrical Engineering

3 COSMO- AND GEO-AREA

- 31 Astronomy & Astrophysics
- 32 Astronautics & Space Research
- 33 Basic Geosciences
- 34 Atmospher.Sci., Meteorology
- 35 Hydrospher.& Oceanol.Sci.
- 36 Geological Sciences
- 37 Mining
- 38 Materials Sci.& Metallurgy
- 39 Geography

4 BIO-AREA

- 41 Basic Biological Sciences
- 42 Microbiology and Cultivation
- 43 Plant Biology and Cultivation
- 44 Animal Biology and Breeding
- 45 Veterinary Science
- 46 Agriculture and Horticulture
- 47 Forestry and Wood Sci.& Technol.
- 48 Food Sciences and Technol.
- 49 Ecology and Environm.Sci.& Techn.

5 HUMAN AREA

- 51 Human Biology
- 52 Health & Theor.Medicine
- 53 Pathology & Spec.Medicine
- 54 Clinical Med.& Nature Cure
- 55 Psychology
- 56 Education
- 57 Profession, Labour, Leisure
- 58 Sports and Games
- 59 Household and Home Life

6 SOCIO-AREA

- 61 Sociology
- 62 State and Politics
- 63 Public Administration
- 64 Money and Finances
- 65 Social Aid, Social Politics
- 66 Law
- 67 Area Planning and Urbanism
- 68 Military Sci.& Technol.
- 69 History

7 ECON.& TECHN.PROD.AREA

- 71 Gen.Economics & Natl.Economy
- 72 Management of Enterprises
- 73 Technol., Engg. in general
- 74 Mechanical Engg.
- 75 Building
- 76 Commodity Sci.& Technol.
- 77 Vehicle Sci.& Technol.
- 78 Transport Technol.& Serv.
- 79 Service Economics

8 SCIENCE AND INFORMATION AREA

- 81 Science of Science
- 82 Information Sciences
- 83 Computer Sci. & Technol.
- 84 Information in general
- 85 Communication Sci. & Technol.
- 86 Mass Communication
- 87 Printing and Publishing
- 88 Communication Engineering
- 89 Semiotics

9 HUMANITIES & CULTURE AREA

- 91 Language
- 92 Literature and Philology
- 93 Music
- 94 Fine Arts
- 95 Performing Arts, Theatre
- 96 Culture Science (Ethnol.,etc.)
- 97 Philosophy
- 98 Non-Christ.Rel.& Secret Teaching
- 99 Christian Religion & Theology